SYLLABUS - 2016

FINAL : PAPER - 14

STRATEGIC FINANCIAL MANAGEMENT (SFM)

FINAL

STUDY NOTES

The Institute of Cost Accountants of India
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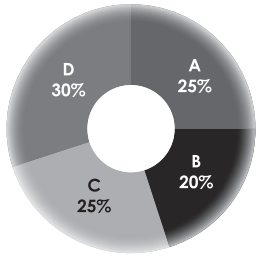
Syllabus- 2016

PAPER 14: STRATEGIC FINANCIAL MANAGEMENT

Syllabus Structure

A	Investment Decisions	25%
B	Financial Markets and Institutions	20%
C	Security Analysis and Portfolio Management	25%
D	Financial Risk Management	30%



ASSESSMENT STRATEGY

There will be examination of three hours.

OBJECTIVES

To provide expert knowledge on setting financial objectives and goals, managing financial resources, financial risk management, thorough understanding of investment portfolios and financial instruments.

Learning Aims

The syllabus aims to test the student's ability to :

- Evaluate the role of agents and instruments in financial markets
- Interpret the relevance of financial institutions
- Analyze the degree of risk for its effective management
- Advise on investment opportunities

Skill set required

Level C: Requiring skill levels of knowledge, comprehension, application, analysis, synthesis and evaluation.

Section A : Investment Decisions	**25%**
1. Investment Decisions, Project Planning and Control	
2. Evaluation of Risky Proposals for Investment Decisions	
3. Leasing Decisions	
Section B : Financial Markets and Institutions	**20%**
4. Institutions in Financial Markets	
5. Instruments in Financial Markets	
6. Capital Markets	
7. Commodity Exchange	
Section C : Security Analysis and Portfolio Management	**25%**
8. Security Analysis & Portfolio Management	
Section D : Financial Risk Management	**30%**
9. Financial Risks & Management	
10. Financial Derivatives – Instruments for Risk Management	
11. Financial Risk Management in International Operations	

SECTION A: INVESTMENT DECISIONS **[25 MARKS]**

1. Investment Decisions, Project Planning and Control

(i) Estimation of project cash flow

(ii) Relevant cost analysis for projects

(iii) Project appraisal Methods – DCF and Non-DCF Techniques

(iv) Capital Rationing

(v) Social Cost Benefit analysis

2. Evaluation of Risky Proposals for Investment decisions

(i) Investment decisions under uncertainties

(ii) Effect of Inflation on Capital Budgeting Decisions

(iii) Sensitivity Analysis, Certainty Equivalent Approach, Decision Tree Analysis, Standard Deviation in Capital Budgeting, Risk Adjusted Discount Rate, Options in Capital Budgeting

3. Leasing Decisions

(i) Lease Financing – Evaluation of Lease vs Buy options

(ii) Break-Even Lease rental determination

(iii) Cross Boarder Leasing, Sale and Lease back

SECTION B: FINANCIAL MARKETS AND INSTITUTIONS **[20 MARKS]**

4. Institutions in Financial Markets

(i) Reserve Bank of India, Commercial Banks, NBFCs

(ii) Insurance Companies, Pensions Funds.

5. Instruments in Financial Market

(i) Money Market Instruments - Call money, Treasury Bills, Commercial Bills, Commercial Paper; Certificate of Deposits, Repo, Reverse Repo and Promissory Notes, Government Securities, Bonds, Valuation of Bonds, Price Yield Relationship.

(ii) Hedge Funds

(iii) Mutual Funds – Computation of NAV and Evaluation of Mutual fund's Performance

6. Capital Markets

(i) Primary and secondary markets and its instruments

(ii) Optionally convertible debentures, Deep discount bonds

(iii) Rolling settlement, Clearing house operations

(iv) Dematerialization, Re-materialization and Depository system

(v) Initial Public Offering (IPO) / Follow on Public Offer (FPO) ; Book Building

(vi) Insider trading

(vii) Credit rating - Credit rating agencies in India

7. Commodity Exchange

(i) Regulatory Structure, Design of markets

(ii) Issues in Agricultural, Non-Agricultural Markets, Product design, Spot price and present practices of commodities exchanges

(iii) Intermediaries in the commodity exchanges & Clearing house operations, risk management related issues

(iv) Commodity Options on futures and its mechanism

SECTION C: SECURITY ANALYSIS & PORTFOLIO MANAGEMENT **[25 MARKS]**

8. Security Analysis & Portfolio Management including Equity Research

(i) Security analysis- Fundamental analysis- Economic analysis, Industry analysis, Company analysis, Technical analysis, Momentum analysis - arguments and criticisms

(ii) Market indicators, Support and resistance level, Patterns in stock price

(iii) Statistic models – Moving Averages, Bollinger bands

(iv) Theories on stock market movements – Dow Jones Theory

(v) Portfolio Management – meaning, objectives and basic principles

(vi) Portfolio Management theories – Efficient Market Hypothesis, Markowitz Model, Random Walk theory, CAPM, APT, Sharpe Index.

(vii) Portfolio Management – Construction of a Portfolio, Computing the Portfolio Total risk, Classification of risk into systematic and unsystematic, Minimization of Portfolio risk, Monitoring the Risk and Return of a portfolio

(viii) Portfolio Analysis - Security and Capital Market Line, Beta, Levered and Unlevered Beta

SECTION D: FINANCIAL RISK MANAGEMENT **[30 MARKS]**

9. Financial Risks

(i) Credit Risk, Liquidity Risk, Asset based risk, Operational Risk

(ii) Foreign investment risk, Market Risk

10. Financial Derivatives - Instruments for Risk Managment

(i) Forward & Futures – Meaning and Difference between Forwards and Future, Stock futures, Hedging through futures and benefits of Future market, Components of Future Price, Index based Futures, Margins in the derivatives market

(ii) Options – Meaning, types of Options (Call & Put), Put-Call Parity theory, Determination of Option Premium, Strategies in Options market – spread, bull spread, bear spread, butterfly spread, combination, straddle, Strangle, Strips and Straps, Valuation of Options using-Option Equivalent, Stock Equivalent, Binomial tree approach, Risk neutral and Black-Scholes Model

(iii) Swaps and Swaptions – Meaning, types, features, benefits of Swaps, Interest rate swaps,

(iv) Interest rate derivatives – Meaning, Interest rate caps, interest rate collars, forward rate agreements

11. Financial Risk Management in International Operations

(i) Sources of Foreign currency, debt route, depository receipts, American Depository Receipts (ADRs) – sponsored, unsponsored, Global Depository Receipts (GDRs), Warrants, Foreign Currency Convertible Bonds (FCCBs), Euro Issues, Euro Commercial Paper, Euro Convertible Bonds, Note Issuance Facility, Participating Notes, Foreign Direct Investment

(ii) Foreign Exchange Market – Exchange Rate determination – Exchange Rate Forecasting-Purchasing Power Parity-Interest Rate Parity

(iii) Exchange Rate Risk management – Forex Hedging tools, exposure netting, currency forward, cross currency roll over, Currency futures, options, money market hedge, asset-liability management

(iv) Foreign Investment Analysis: International Portfolio Investment – International Capital Budgeting.

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Section A

Investment Decisions




INTRODUCTION

This Study Note includes

Investment Decisions

Financial Markets and Institutions

Security Analysis and Portfolio Management

Financial Risk Management

The financial system plays the key role in the economy by way of (a) stimulating economic growth, (b) impacting economic performance, and (c) affecting economic welfare. All these can be achieved by financial infrastructure in which the companies having funds do allocate those funds to those who have potentially more productive ways to invest those funds. A financial system makes it possible for more efficient transfer of funds. Financial management on the other, aims at procuring the funds in the most economic and the prudent manner and optimum utilization of the funds with a view to maximizing the value of the firm.

INVESTMENT DECISIONS

One of the broad areas of decision concerning financial management is investment decisions. The investment decisions are related to long term investment and/or short term investment. The long term investment decisions are concerned with the investment in the long term assets or projects for the purpose of generating future benefits. Such decisions are popularly known as capital budgeting decisions. Such decisions involve (a) substantial amount of investment, (b) difficulties in estimating the benefits to be derived out of such investment over the future years involving many uncertainties, (c) possibilities of incurring substantial losses if such decisions need to be reversed. Therefore lot of risks and uncertainties are involved in estimation of future cash flows since it is difficult with certainty what exactly will happen in future. Of course, there are plenty of ways and means to deal with the risks and uncertainties in capital investment decisions.

FINANCIAL MARKETS AND INSTITUTIONS

Having taken the investment decisions a firm has to look for the funds/finance from various sources available in the financial markets and financial institutions. Financial markets comprise (a) Capital market and (b) Money market. In order to raise long term finance the firm has to depend on capital market – both primary & secondary and derivatives. The capital market is the market for equity shares and long term debt. In this market the capital funds comprising both equity and debt are issued and traded following the regulations of the Government, SEBI, RBI, Stock Exchanges and other regulators. This also includes private placement sources of debt and equity as well as organised markets like stock exchanges. The capital market is characterized by a large variety of financial instruments namely viz. (i) Equity and Preference shares-IPO & FPO, and Private placement, (ii) Fully Convertible Debentures (FCDs), (iii) Non Convertible Debentures (NCDs), (iv) Partly Convertible Debentures (PCDs), (v) Debentures with Warrants, (vi) Participating Preference Shares, (vii) Zero-coupon bonds (viii) Secured Premium Notes, etc.

Quite often, the large companies are required to raise medium to long term foreign currency finance for their operational activities. The major sources for raising such finance can be (I) Foreign currency term loan, (II) Export credit schemes - (a) Buyer's credit and (b) Supplier's credit, (III) external commercial borrowings(ECB), (IV) Euro

issues – (a) Depository receipts, (b) Foreign currency/ Euro convertible issues and (c) Debt bonds, (V) Issues in foreign domestic markets, etc.

In order to meet short term finance a firm has to depend on money market. It is the market for dealing in monetary assets of short-term nature. Short-term funds up to one year and for financial assets being close substitutes for money are dealt in the money market. The money market is characterized by a variety of financial instruments viz. (i) Call/Notice money, (ii) Treasury bills (T-bills), (iii) Commercial bills(CBs), (iv) Commercial papers(CPs), (v) Certificate of deposits(CDs), (vi) Collateralised borrowing and lending obligations(CBLO), etc.

Apart from the money market, the short to medium term loans are also available from the banking and insurance sectors. The commercial banks mobilise savings in urban and rural areas and make them available to large and small industrial firms and trading organizations mainly for their working capital requirements, following the provisions of RBI guidelines. These banks also do provide various types of financial services to their customers against fees. The funds are also available from the various non banking financial companies (NBFCs) which are guided by the Reserve Bank of India Act, 1934. These NBFCs are engaged in the business of loans and advances, acquisition of shares/stocks/bonds/debentures/securities issued by government or local authority or other marketable securities of a like nature, leasing, hire-purchase, insurance business, chit business, etc.

It is quite apparent from the above discussion that the investment in securities whether long or short term, is a part of the savings of individuals/organizations which flow into the capital market/money market either directly or indirectly through institutions, divided into 'new' and 'second hand financing'. Investors as 'suppliers' and investees as 'users' of funds find a meeting place in the market. While selecting where to invest the funds, the individuals/firms have to analyze and manage three basic objectives: (I) Security of investment, (II) Liquidity of investment, and (III) Yield of investment. While identifying the importance of security, one can identify and select the instrument that meets this criterion. For example, one can vouch the safety of return of investment in 'treasury bonds' as these are highly secured instruments issued by the government. Similarly the safest investments in the money market are found in securities such as 'treasury bills', 'certificate of deposits', 'commercial papers', etc. Liquidity is possible in the case of investment, which has always ready market and willing buyers and sellers. Such instruments of investment are called highly liquid investment, for example common stock. On the other hand 'yield' is the net return out of the investment. Given the level or kind of security and the liquidity of the investment, the appropriate yield should encourage the investor to go for the investment. However there has to be a trade off between risk (security) and return (yield) on the one hand and liquidity and return (yield) on the other. Generally higher the risk an investment carries, the greater will be the yield to compensate the possible loss. However all these three objectives make an excellent triangle in the matter of investment decision making by the investors.

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

It is no denial of the fact that an investor or an investing organization is required to conduct security analysis before making investment in securities. Security is an instrument of promissory note or a method of borrowing or lending, or a means of contributing funds needed by the corporate body or firm. Security analysis is the first part of investment decision process that involves valuation and analysis of individual securities. It is primarily concerned with the analysis of a security with a view to determine the value of the security so that appropriate decision may be taken on the basis of such valuation as compared with the value placed on the security in the market. Therefore two types of analysis viz. fundamental analysis and technical analysis are required to be done.

Apart from security analysis, the second part of investment decision process is portfolio management. Portfolio is the combination of securities with different risk return characteristics. A portfolio of securities can enhance the return by balancing the risk among the constituent securities. The efficiency of a portfolio depends on its ability to give the required rate of return to the investor. Portfolio management is a complex process or activity which involve several interrelated phases viz. (i) specification of investment objectives and constraints, (ii) choice of asset mix, (iii) formulation of portfolio strategy, (iv) selection of securities, (v) portfolio execution, (vi) portfolio revision and (vii) performance evaluation. The factors commonly considered in selecting fixed income revenues are (a) yield to maturity, (b) risk of default, (c) tax shield, and (d) liquidity.

FINANCIAL RISK MANAGEMENT

While managing the portfolio of securities the investors have to consider the various types of risks involved in investment. Generally the risks are: (a) The systematic risk – (i) Market risk (ii) Interest rate risk, and (iii) Purchasing power risk; (b) Unsystematic risk – (i) Business risk, (ii) Financial risk and (iii) Default risk; (c) Risk involved in investment in government securities – (i) Interest rate risk, (ii) Reinvestment rate risk, and (iii) Default rate risk.

Sometimes, derivatives are used to reduce risk by allowing the investor to hedge an investment or exposure, and hence function as a sort of insurance policy against adverse market movements. The most common types of derivatives are: (i) Forwards, (ii) Futures, (iii) Swaps and (iv) Options. Normally the companies are exposed to the impact of foreign exchange market while dealing in foreign exchanges for their business operations. Naturally they are exposed to various types of exchange rate risk such as, (i) Transaction risk, (ii) Translation risk and (iii) Economic risk. Hence they have to apply various methods of managing such risks viz. (a) Forward exchange contracts, (b) Currency futures and options, (c) Currency swap arrangement, (d) Exposure netting, etc.

This study material on "Strategic Financial Management" aims to integrate four very important components of financial management viz. 'Investment Decisions', 'Financial Markets and Institutions', 'Security Analysis and Portfolio Management' and 'Financial Risk Management', so that readers can acquire profound and in depth knowledge on the subject. This integrated approach towards financial management will enhance one's practical aptitude on the subject.

Study Note - 1

INVESTMENT DECISIONS, PROJECT PLANNING AND CONTROL

This Study Note includes

1.1 Estimation of Project Cash Flow

1.2 Relevant Cost Analysis for Projects

1.3 Project Appraisal Methods – DCF and Non-DCF Techniques

1.4 Capital Rationing

1.5 Social Cost Benefit Analysis (SCBA)

INTRODUCTION

Financial management aims at procuring the funds in the most economic and prudent manner and optimum utilization of the funds in order to maximize value of the firm. Broad areas of decisions concerning financial management are: investment decisions, financing decisions and dividend decisions. The investment decisions may relate to long-term investment or short-term investment. The long-term investment decisions are related to investment in long-term assets or projects for generating future benefits. Such decisions are popularly known as capital budgeting decisions. In accounting, any expenditure for earning future income over a long period of time is known as capital expenditure. Therefore, long term investment decisions are also known as capital expenditure decisions.

Long term investment decisions are considered as the most important decisions in financial management, as it involves substantial amount of investment, difficulties in estimating the benefits to be derived out of such investment over the future periods involving many uncertainties, possibility of incurring huge amount of losses if such decisions are required to be reversed. Therefore, such decisions involve a largely irreversible commitment of resources with long term implications having its huge impact on the future growth and profitability of the firm.

Types of Long-term Investment Decisions: Such decisions may relate to the *new investments* in case of a newly established firm or an existing firm, e.g., purchase of a new machinery, setting up of a new plant, taking up a new project, etc. Apart from new investments, there may be investments for *replacement or modernization or expansion* programme. Investment may also be required for *diversification* into new product lines, new market etc.

Phases in Long-term Investment Decisions: Like any other managerial decision making, long-term investment decisions also involve the following steps: *Planning, Analysis, Selection, Implementation and Review*. At the planning stage, the project proposal or proposal for the long term investment considering the need and availability of different investment opportunities is identified. Thereafter, a detailed analysis of marketing, technical, financial, economic (social cost benefit) and ecological aspects of different alternative investment opportunities is required to be conducted. Based on the detailed analyses, the best alternative fulfilling the selection criteria like NPV > 0 or IRR> K or Benefit Cost Ratio >1, etc. is to be selected. Then the actual investment is made for purchasing the asset or setting up the manufacturing facilities, etc. Once the investment is made towards commissioning a project or setting up of manufacturing facilities, process of periodical performance review should be started with a view to compare the actual performance with the planned or projected performance.

Different Analyses for Evaluating an Investment Proposal: Apart from analyzing the financial viability of an investment proposal, other analyses like market analysis, technical analysis, economic analysis or social cost-benefit analysis, ecological or environmental analysis are also required to be carried on. *Market analysis* focuses on the demand for the proposed products or services desired to be provided through the investment proposal, expected market

share, etc. *Technical analysis* considers the preliminary tests, layout of the factory, availability of inputs, etc. *Economic analysis or Social Cost Benefit analysis* focuses on the possible impact of the investment proposal from the societal point of view, e.g., construction of a river bridge may result in the unemployment of the ferry operators. Therefore, while estimating the benefits receivable from the bridge, the compensation or rehabilitation of displaced ferry operators should not be lost sight of. *Ecological analysis or Environmental analysis* considers the impact of the proposed investment on the environment. Many projects like power project, projects relating to chemical, leather processing etc., may have significant environmental implications, hence, the assessment of the likely damage caused by such projects on the environment and cost of controlling or restoring such damages should also form part of the analyses.

1.1 ESTIMATION OF PROJECT CASH FLOW

Financial analysis of long-term investment decisions basically involves estimating cost of the asset / project and benefits receivable thereon over the economic life of the asset or project for which investments are made. Estimating cost is relatively easier as it is made in the current period, but estimating benefits is very difficult as it relates to future period involving risk and uncertainty.

For estimating benefits, two alternatives are available – *(i) Cash Inflow and (ii) Accounting Profit*. The cash flow approach is considered as superior to accounting profit approach and cash flows are theoretically better measures of net economic benefits associated with the long-term investments. Moreover, as cost of investment is represented by cash outflows, benefit out of such investment is better represented through cash inflows. The difference between the two measures – cash flow and accounting profit – arises because of inclusion of some non-cash items, e.g., depreciation, in determining accounting profit. Moreover, accounting profit differs depending on accounting policies, procedures, methods (e.g., method of depreciation, method of inventory valuation) used. Moreover, the cash flow approach takes cognizance of the time value of money. Usually, accrual concept is followed in determining accounting profit, e.g., revenue is recognized when the product is sold, not at the time when the cash is collected from such sale; similarly revenue expenditure is recognized when it is incurred, not at the time of actual payment. Thus, the cash flows as a measure of cost and benefit of an investment proposal is better to use for evaluating the financial viability of a proposal and for this purpose, the *incremental cash flows* are considered. For new investment decisions, all the cash flows are incremental but in case of investment decisions relating to replacement of old assets by the new ones, the incremental costs (cash outflows) and incremental benefits (cash inflows) are to be estimated. The cash flows associated with a proposal may be classified into: *(i) Initial Cash Flow, (ii) Subsequent Cash Flow and (iii) Terminal Cash Flow*.

(i) Initial Cash Flow: Any long term investment decision will involve large amount of initial cash outlay. It reflects the cash spent for acquiring the asset, known as initial cash outflow. For estimating the initial cash outflow, the following aspects are taken into consideration.

(a) The cost of the asset, installation cost, transportation cost and any other incidental cost, i.e., all the costs to be incurred for the asset in order to bring it to workable condition, are to be taken into consideration.

(b) *Sunk cost* which has already been incurred or committed to be incurred, hence, which has no effect on the present or future decision, will be ignored as it is irrelevant cost for the decision. For example, a plot of land which is owned by the firm and lying idle is the sunk cost, hence, the cost of such plot of land will not be considered for estimating the initial cost. But, if it has any alternative use, the *opportunity cost* of such alternative use is the relevant cost and such opportunity cost will have to be considered. On the other hand, if a new plot of land is required to be purchased for the proposal, the cost of such plot of land is the relevant cost and will form part of initial investment.

(c) For investment decisions relating to replacement of an existing asset usually involve salvage value which is considered as cash inflow and subtracted from the cash outflow relating to the installation of the new asset. If the existing asset is the only asset in the concerned block of asset, the incidence of income tax on gain or loss on sale of the existing asset is also to be considered, as the block of asset will cease to exist due to sale of the asset. The tax impact on gain on sale of asset represent burden of tax, hence cash outflow and tax impact on loss on sale represent savings of tax, hence, cash inflow. Therefore, tax on gain

on sale of asset has to be added and tax on loss on sale has to be subtracted in order to determine initial cash outflow. However, if there are other assets in the same block, the question of gain or loss on sale of asset will not arise, only the sale proceed from sale of old asset will be deducted from the total initial cash outflow.

(d) Change in working capital requirement due to the new investment decision requires to be considered. If additional working capital is required, it will increase the initial cash outflow. On the other hand, in a replacement situation, if requirement of working capital is decreased, such decrease in working capital requirement will reduce the total initial cash outflow.

Initial Cash Outflow:

Cost of the new asset including installation, transportation and other incidental costs related to the asset

(±) Change in working capital requirement (Addition for increase, Subtraction for decrease)

(–) Salvage value of the old asset (in case of replacemenst of old asset)

(–) Tax savings for loss on sale of asset (if the block ceases to exist due to sale of old asset), or

(+) Tax payable for profit on sale of asset (if the block ceases to exist due to sale of old asset)

(ii) Subsequent Cash Flow

In *conventional cash flow*, cash outflow occurs at the initial period and a series of cash inflows occur in the subsequent periods. On the other hand, *non-conventional cash flow* involves intermittent cash outflows in the subsequent periods also for major repairing, additional working capital requirement, etc. Therefore, apart from estimating initial cash flow, subsequent cash flows are also required to be estimated. For estimating future cash inflows, i.e., cash inflows of the subsequent periods, the following aspects need to be considered.

(i) Cash inflows are to be estimated on an after tax basis.

(ii) Depreciation being a non-cash item is to be added back to the amount of profit after taxes.

(iii) Interest being a financial charge will be excluded for estimating cash inflow for investment decisions (*Interest Exclusion Principal*). However, interest (on debt capital) is taken into consideration for determining weighted average cost of capital which is used for discounting the cash inflows to arrive at its present value.

Net Cash Inflow after Taxes (CFAT):

Net Sales Revenue
Less: Cost of Goods Sold
Less: General Expenses (other than Interest)
Less: Depreciation
Profit before Interest and Taxes (PBIT or EBIT)
Less: Taxes
Profit after Taxes (excluding Interest) [PAT]
Add: Depreciation
Net Cash Inflow after Taxes

In short, CFAT = EBIT (1 – t) + Depreciation [where, t is income tax rate]

If PAT is taken from accounting records, which is arrived at *after charging Interest, 'Interest Net of Taxes'* is to be added back along with the amount of Depreciation, i.e.,

PAT *after charging Interest*
Add: Depreciation
Add: Interest Net of Taxes (i.e., Total Interest – Tax on Interest)
Net Cash Inflow after Taxes

Example:

		₹	₹
	Net Sales Revenue		10,00,000
Less:	Cost of Goods Sold	5,00,000	
	Operating Expenses	2,00,000	
	Depreciation	1,00,000	8,00,000
	PBIT or EBIT		2,00,000
	Interest		50,000
	PBT or EBT		1,50,000
	Tax (30%)		45,000
	PAT		1,05,000

Net Cash Inflow after Taxes:

	₹
EBIT	2,00,000
Tax (30%)	60,000
	1,40,000
Depreciation	1,00,000
Net Cash Inflow after Taxes	*2,40,000*

Alternatively,

		₹
	PAT	1,05,000
	Add: Depreciation	1,00,000
		2,05,000
	Add: Interest Net of Taxes	
	Total Interest	50,000
	Less: Tax on Interest (30%)	15,000
	Net Cash Inflow after Taxes	**2,40,000**

(iii) Terminal Cash Flow: In the last year, i.e., at the end of the economic life of the asset or at the time of termination of the project, usually some additional cash inflows occur in addition to the operating cash inflows, viz., salvage value of the asset, release of working capital (the working capital that is introduced at the beginning will no longer be required at the end of the life of the asset or at the termination of the project). Moreover, tax impact on gain or loss on sale of the asset if the block of asset ceases to exist.

Terminal Cash Inflow: Salvage or Scrap Value + Tax Savings on Loss on Sale of Asset or (-) Tax Burden on Gain on Sale of Asset + Release of Working Capital

1.2 RELEVANT COST ANALYSIS FOR PROJECTS

Relevant costs or revenues are those expected future costs or revenues that differ among alternative courses of action. It is a future cost/revenue that would arise as a direct consequence of the decision under review and it differs among the alternative courses of action. Any decision making relates to the future as nothing can be done to alter the past and the function of decision making is to select courses of action for the future.

Relevant cost analysis or relevant costing is used for various managerial decisions like:

- Make or buy decision
- Accepting or rejecting a special order
- Continuing or discontinuing a product line
- Using scarce resources optimally, etc.

In the context of investment decisions, incremental cash flows are considered as relevant. The sunk costs, which have already been incurred, or committed costs which are committed to be incurred in future, are considered as irrelevant, as it will have no impact on whatever decisions are taken. However, the opportunity costs, imputed costs, out of pocket costs, avoidable costs and differential costs are relevant.

Example:

A company is considering replacement of one of its old machine, purchased three years ago at a cost of ₹5,00,000 with a life of 5 years. It follows straight line method of depreciation. Annual revenue from the sale of the product manufactured using the machine is ₹5,50,000 and the annual operating cost is ₹4,00,000. The current salvage value of the machine is ₹1,00,000. The cost of the new machine is ₹3,00,000 and its salvage value at the end of its life 2 years is nil. The annual operating cost of the new machine is estimated at ₹2,30,000 and the revenue is expected to be same as to that of the old machine.

Relevant Costs and Revenues are shown below:

	Old	**New**	**Difference**	**Relevant or Not**
	₹	₹	₹	
Revenue	11,00,000	11,00,000	NIL	Not relevant
(for next two years)*				
Book Value of Old Machine				Not relevant
at the end of three years	2,00,000	—	—	(Sunk Cost)
Current Salvage Value	1,00,000	—	1,00,000	Relevant
Cost of the new machine	—	3,00,000	(3,00,000)	Relevant
Operating Cost (2 years)	8,00,000	4,60,000	3,40,000	Relevant

*(as the old machine with a life of 5 years is being considered for replacement after 3 years)

1.3 PROJECT APPRAISAL METHODS – DCF AND NON-DCF TECHNIQUES

For financial appraisal of the project / investment proposals different techniques are used. They are generally classified into Discounted Cash Flow (DCF) and Non Discounted Cash Flow (Non-DCF) or traditional techniques. In DCF techniques, time value of money is taken into consideration while in Non-DCF techniques it is ignored. As the investment decisions involve long period of time and value of money does not remain same over this period of time, DCF techniques are preferred in financial appraisal of the project proposals.

Non-DCF Techniques

(i) Pay Back Period

(ii) Pay Back Reciprocal

(iii) Pay Back Profitability

(iv) Average or Accounting Rate of Return (ARR)

DCF Techniques

(i) Discounted Pay Back Period

(ii) Net Present Value (NPV)

(iii) Profitability Index or Benefit Cost Ratio

(iv) Internal Rate of Return (IRR)

(v) Modified NPV

(vi) Modified IRR

(vii) Adjusted Present Value

Non-DCF Techniques

(i) *Pay Back Period*

Payback period represents the time period required for recovery of the initial investment in the project. It is the period within which the total cash inflows from the project equals the cash outflow (cost of investment) in the project. The *lower the payback period, the better it is,* since initial investment is recouped faster.

In case of uniform net cash inflows over time, i.e., if same amount of net cash inflows are generated every year, the Pay Back Period will be: Initial Investment ÷ Net Cash Inflow after Tax per annum.

Example: Suppose a project with an initial investment of ₹ 100 lakh generates net cash inflow after tax of ₹ 25 lakh per annum.

Pay Back Period = Initial Investment ÷ Net Cash inflow after Tax

= ₹100 lakh ÷ ₹25 lakh = 4 years.

However, in case of unequal net cash inflows over time, the Pay Back Period has to be determined on the basis of cumulative net cash inflows after tax as follows.

(i) Calculate cumulative net cash inflows after tax from year to year over the life of the project

(ii) If the cumulative net cash inflows after tax matches with the initial investment, the corresponding year will be the Pay Back Period, otherwise select the two consecutive cumulative cash inflows within which the initial investment lies.

(iii) Use the simple interpolation to find out the Pay Back Period.

Example: Initial investment is ₹100 lakh is same for both the projects A & B. The net cash inflows after taxes for project A is ₹25 lakh per annum for 5 years and those for project B over its life of 5 years are ₹ 20 lakh, 25 lakh, 30 lakh, 30 lakh and 20 lakh respectively.

Pay Back Period for Project A (with uniform cash inflow every year) = ₹100 lakh / ₹25 lakh
= 4 years

Pay Back Period for Project B (with unequal cash inflow over time):

Year	CFAT ₹	Cumulative CFAT ₹
1	20 lakh	20 lakh
2	25 lakh	45 lakh
3	30 lakh	75 lakh
4	30 lakh	105 lakh
5	20 lakh	125 lakh

4 years	105 lakh
Pay Back Period	**100 lakh (Initial Investment)**
5 years	125 lakh

By simple interpolation:

$$\frac{4-5}{4-\text{Pay Back Period}} = \frac{105-125}{105-100}$$

Or, $(-1).5 = (-20)(4 - \text{Pay Back Period})$

Or, $-5 / -20 = 4 - \text{Pay Back Period}$

Or, Pay Back Period $= 4 - 0.25 = 3.75$ (years)

Advantages of Payback Period

- This method is simple to understand and easy to operate.
- It clarifies the concept of profit or surplus. Surplus arises only if the initial investment is fully recovered.
- Hence, there is no profit on any project unless the life of the project is more than the payback period.
- This method is suitable in the case of industries where the risk of technological obsolescence is very high and hence only those projects which have a shorter payback period should be financed.
- This method focusses on projects which generates cash inflows in earlier years, thereby eliminating projects bringing cash inflows in later years. As time period of cash flows increases, risk and uncertainty also increases. Thus payback period tries to eliminate or minimise risk factor.
- This method promotes liquidity by stressing on projects with earlier cash inflows. This is a very useful evaluation tool in case of liquidity crunch and high cost of capital.
- The payback period can be compared to break-even point, the point at which the costs are fully recovered.

Limitations

- It lays emphasis on capital recovery rather than profitability.
- It does not consider the cash flows after the pay back period. Hence, it is not a good measure to evaluate where the comparison is between two projects, one involving a long gestation period and the other yielding quick results but only for a short period.
- This method becomes an inadequate measure of evaluating two projects where the cash inflows are uneven. There may be projects with heavy initial inflows and very less inflows in later years. Other projects with moderately higher but uniform CFAT may be rejected because of longer payback.
- This method ignores the time value of money. Cash flows occurring at all points of time are treated equally while value of money changes over time.

(ii) *Payback Reciprocal*

It is the reciprocal of Payback Period, i.e., 1÷ Pay Back Period. Therefore,

$$\text{Payback Reciprocal} = \frac{\text{Average Annual Net Cash Inflow after Taxes (i.e. CFAT p.a)}}{\text{Initial Investment}}$$

Higher the payback reciprocal, better is the project.

The Payback Reciprocal is considered to be an approximation of the Internal Rate of Return, if-

(a) The life of the project is at least twice the payback period and

(b) The project generates equal amount of the annual cash inflows.

Example:

A project with an initial investment of ₹ 50 Lakh and life of 10 years, generates CFAT of ₹10 Lakh per annum. Its Payback Reciprocal will be ₹10 Lakhs ÷ ₹ 50 Lakhs = 1/5 or 20%.

(iii) **Accounting or Average Rate of Return Method (ARR)**

Accounting or Average Rate of Return means the average annual yield on the project, i.e., Average Profit After Tax ÷ Average Investment. Project with *Higher ARR is preferred. In this method,* ***Profit After Taxes*** *(instead of CFAT) is generally used for evaluation.*

Where equal amount of depreciation is charged every year,

Average Investment = Half of the Depreciable Part (Cost – Salvage Value) + Non-Depreciable Part (Salvage Value).

In other cases, average investment is to be determined taking the book value of the investment of different years separately and average is to calculated accordingly.

Example:

A project costing ₹ 10 lacs having a life of 5 years is expected to generate Profit before tax and depreciation of ₹ 2,50,000; ₹ 3,00,000; ₹ 3,50,000; ₹ 4,00,000 and ₹ 5,00,000 respectively. Assume 33.99% tax and 30% depreciation on WDV Method.

Solution:

Computation of ARR :

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Average
PBDT	2,50,000	3,00,000	3,50,000	4,00,000	5,00,000	3,60,000
Less: Depreciation	3,00,000	2,10,000	1,47,000	1,02,900	72,030	1,66,386
EBT / PBT	(50,000)	90,000	2,03,000	2,97,100	4,27,970	1,93,614
Less: Tax @ 33.99%	-	13,596	69,000	1,00,984	1,45,467	65,809
EAT / PAT	(50,000)	76,404	1,34,000	1,96,116	2,82,503	1,27,805

Average Investment:

Beginning	10,00,000	7,00,000	4,90,000	3,43,000	2,40,100	
Depreciation	3,00,000	2,10,000	1,47,000	1,02,900	72,030	
End	7,00,000	4,90,000	3,43,000	2,40,100	1,68,070	
Average	8,50,000	5,95,000	4,16,500	2,91,550	2,04,085	4,71,427

$$ARR = \frac{\text{Average EBIT (1-T)}}{\text{Average Investment}} \times 100$$

$$= \frac{1,27,805}{4,71,427} \times 100$$

= 27.11%

Note: Unabsorbed depreciation of Yr. 1 is carried forward and set-off against profits of Yr. 2. Tax is calculated on the balance of profits

= 33.99% (₹ 90,000 – 50,000)

= ₹ 13,596.

Advantages

- It is simple to understand.
- It is easy to operate and compute.
- Income throughout the project life is considered.
- In this method the net income after depreciation is used, therefore it is theoretically sound.

Limitations

- It does not consider cash inflows (CFAT), which is important in project evaluation rather than PAT.
- It ignores time value of money, which is important in capital budgeting decisions.

(iii) ***Pay Back Profitability:*** As the profitability beyond the Pay Back Period is not taken into consideration in Pay Back Period method, the projects with higher pay back period are rejected though such projects with longer life may generate higher benefits after recovering its initial investment. In Pay Back Profitability method, the profitability beyond the pay back period is considered and projects generating higher benefits after the recovery of initial investment are considered for selection.

Pay Back Profitability = *Net Cash Inflow after Taxes after recovering the Initial Investment, i.e., Total Net Cash Inflow after Taxes – Initial Investment*

DCF Techniques

As mentioned earlier, the DCF techniques consider the time value of money while Non-DCF techniques ignore the same. For incorporating time value of money, cash flows are discounted using appropriate discounting factor (marginal cost of capital or weighted average cost of capital, as the case may be) in order to derive Present Value of such cash flows over the life of the project and thereafter decision is taken using different appraisal methods using the present value of the cash flows.

(i) Discounted Payback Period

Discounted Payback Period is the pay back period calculated on the basis of discounted cash flows, i.e., present value of cash flows, over the life of the project.

Procedure for computation of Discounted Payback Period

Step 1: Determine the Total Cash Outflow of the project. (Initial Investment)

Step 2: Determine the Cash Inflow after Taxes (CFAT) for each year.

Step 3: Determine the present value of net cash inflow after taxes (CFAT)

= CFAT of each year x PV Factor for that year.

Step 4: Determine the cumulative present value of CFAT of every year.

Step 5:

- Find out the Discounted Payback Period as the time at which cumulative DCFAT equals Initial Investment.
- This is calculated on "time proportion basis" (usually following simple interpolation method).

Selection Criteria or Decision Making Rule:

- The projects are selected on the basis of minimum Discounted Payback Period. If any maximum / benchmark period is fixed by the management, projects with the discounted pay back period less than that period are considered for selection.

(ii) Net Present Value Method (NPV)

The Net Present Value of an investment proposal is defined as the sum of the Present Values of all future Cash Inflows less the sum of the Present Values of all Cash Outflows associated with the proposal. Thus, NPV is calculated as under -

NPV = Present value of Cash Inflows -- Present value of Cash Outflows.

= Sum of $[CFAT_t \div (1+k)^t]$ – Initial Investment*

* In case of conventional cash flows, cash outflow relates to initial cash outlay, i.e., initial investment for acquiring the asset. However, cash outflow may occur after the initial investment also (Non-conventional Cash Flow) and in that case, present value of cash outflow has to be determined in the same way as to that of Cash Inflows.

$CFAT_t$ = Net Cash Inflows after Taxes of the tth period.

K = Weighted Average Cost of Capital or Marginal Cost of Capital

Selection Criteria:

If NPV > 0, i.e., if NPV is positive, the project is acceptable

If NPV > 0, i.e., if NPV is negative, the project is not acceptable

If NPV = 0, it refers to the point of indifference, i.e., the project may be or may not be accepted.

Present value of Cash Inflows and Outflows: Cash inflow and outflow of each period is discounted to ascertain its present value. For this purpose, the discounting rate is generally taken as the Cost of Capital since the project must earn at least what is paid out on the funds blocked in the project. The Present Value tables may be used to calculate the present value of various cash flows. In case of Uniform Cash Inflows p.a, Annuity Tables may be used.

However, instead of using the PV factor tables, the relevant discount factor can be computed as

$1/(1 + k)^t$. where, k = cost of capital and t= year in which the inflow or outflow takes place.

Hence, PV factor at 10% after one year = 1 / (1.10)1 = 0.9091

Similarly, PV factor at the end of two years = 1 / (1.10)2 = 0.8264 and so on.

Note: *The underlying assumption in NPV method is that the cash inflows are immediately reinvested at a rate of return equal to the Firm's Cost of Capital.*

Example:

Z Ltd. has two projects under consideration A & B, each costing ₹60 lacs. The projects are mutually exclusive. Life for project A is 4 years & project B is 3 years. Salvage value NIL for both the projects. Tax Rate 33.99%. Cost of Capital is 15%.

Cash Inflow (₹ Lakhs)

At the end of the year	Project A	Project B	P.V. @ 15%
1	60	100	0.870
2	110	130	0.756
3	120	50	0.685
4	50	-	0.572

Solution:

Computation of Net Present Value of the Project A. **(₹ lakhs)**

Particulars	Yr. 1	Yr. 2	Yr. 3	Yr. 4
1. Cash Inflows	60.00	110.00	120.00	50.00
2. Depreciation	15.00	15.00	15.00	15.00
3. PBT (1-2)	45.00	95.00	105.00	35.00
4. Tax @ 33.99%	15.30	32.29	35.70	11.90
5. PAT (3-4)	29.70	62.71	69.30	23.10
6. Net Cash Inflows (PAT+Depn)	44.70	77.71	84.30	38.10
7. Discounting Factor	0.870	0.756	0.685	0.572
8. P.V of Net Cash Inflows	38.89	58.75	57.75	21.79
9. Total P.V. of Net Cash Inflows				177.18
10. P.V. of Cash Out Flow (Initial Investment)				60.00
Net Present Value (9-10)				117.18

Computation of Net Present Value of the Project B **(₹ lakhs)**

Particulars	Yr. 1	Yr. 2	Yr. 3
1. Cash Inflows	100.00	130.00	50.00
2. Depreciation	20.00	20.00	20.00
3. PBT (1-2)	80.00	110.00	30.00
4. Tax @ 33.99%	27.19	37.39	10.20
5. PAT (3-4)	52.81	72.61	19.80
6. Net Cash Inflows (PAT+Depn)	72.81	92.61	39.80
7. Discounting Factor	0.870	0.756	0.685
8. P.V of Net Cash Inflows	63.345	70.013	27.263
9. Total P.V. of Net Cash Inflows			160.621
10. P.V. of Cash Out Flow (Initial Investment)			60.00
11. Net Present Value (9-10)			100.621

As Project "A" has a higher Net Present Value, it has to be taken up.

Advantages

(i) It considers the time value of money. Hence it satisfies the basic criterion for project evaluation.

(ii) Unlike payback period, all cash flows (including post-payback returns) are considered.

(iii) NPV constitutes addition to the wealth of Shareholders and thus focuses on the basic objective of financial management.

(iv) Since all cash flows are converted into present value (current rupees), different projects can be compared on NPV basis. Thus, each project can be evaluated independent of others on its own merit.

Limitations

(i) It involves complex calculations in discounting and present value computations.

(ii) It involves forecasting cash flows and application of discount rate. Thus accuracy of NPV depends on accurate estimation of these two factors which may be quite difficult in practice.

(iii) NPV and project ranking may differ at different discount rates, causing inconsistency in decision- making.

(iv) It ignores the difference in initial outflows, size of different proposals etc, while evaluating mutually exclusive projects.

(iii) Profitability Index (PI) or Desirability Factor or Benefit Cost Ratio

Benefit-Cost Ratio / Profitability Index or Desirability Factor is the ratio of present value of operating cash inflows to the present value of Cash Outflows.

$$\text{PI [or] Desirability Factor [or] Benefit Cost Ratio} = \frac{\text{Present Value of Cash Inflows (benefits)}}{\text{Present Value of Initial Investment (costs)}}$$

Significance: Profitability Index represents present value of benefit for each rupee of cash outlay.The higher the PI, the better it is, since the greater is the return for every rupee of investment in the project.

Decision Making or Acceptance rule:

If PI > 1, the project is acceptable.

If PI = 1, Project generates cash flows at a rate just equal to the Cost of Capital. Hence, it may be accepted or rejected. This constitutes an Indifference Point.

If PI < 1, the Project is not acceptable.

Note: When NPV > 0, PI will always be greater than 1. Both NPV and PI use the same factors i.e. Discounted Cash Inflows (A) and Discounted Cash Outflows (B), in the computation. NPV = A - B, whereas PI = A / B.

Example:

Initial investment ₹ 20 lacs. Expected annual cash flows ₹ 6 lacs for 10 years. Cost of Capital @ 15%. Calculate Profitability Index.

Solution:

Cumulative discounting factor @ 15% for 10 years = 5.019

P.V. of inflows = 6.00 × 5.019 = ₹ 30.114 lacs.

Profitability Index = P.V. of Cash Inflows / P.V. of Cash Outflows = 30.114 lac / 20 lac = 1.51

Decision: The project should be accepted.

Advantages:

(i) This method considers the time value of money.

(ii) It is a better project evaluation technique than Net Present Value and helps in ranking projects where Net Present Value is positive.

(iii) It focuses on maximum return per rupee of investment and hence is useful in case of investment in divisible projects, when availability of funds is restricted.

Disadvantages:

(i) In case a single large project with high Profitability Index is selected, possibility of accepting several small projects which together may have higher NPV than the single project is excluded.

(ii) Situations may arise where a project with a lower profitability index selected may generate cash flows in such a way that another project can be taken up one or two years later, the total NPV in such case being more than the one with a project with highest Profitability Index.

(iii) In case of more than one proposal, which are mutually exclusive, with different investment patterns or values, profitability index alone cannot be used as a measure for choosing.

(iv) Internal Rate of Return (IRR) and Modified Internal Rate of Returns (MIRR)

Internal Rate of Return (IRR)

Internal Rate of Return (IRR) is the rate of discount at which the sum of Discounted Cash Inflows equals the Discounted Cash Outflows. In other words, the Internal Rate of Return of a project is the discount rate which makes Net Present Value of the project equals to zero.

IRR refers to that discount rate (i), such that

Present value of cash inflows = Present value of cash outflows

Or, Present value of cash inflows – present value of cash outflows = 0

Or, NPV = 0

Therefore, at IRR, NPV = 0 and PI = 1.

Note: The method by which IRR is determined suggests that the IRR represents the reinvestment rate at which cash inflows are reinvested, i.e., IRR is the reinvestment rate of cash inflows. The IRR of different project proposals is expected to be different. But it may not be realistic to assume that rate of return from reinvesting the cash inflows of different projects by a particular firm will be different. It may be noted in this connection that the reinvestment rate in case of NPV is assumed to be cost of capital.

Selection Criteria

If IRR > Cost of Capital (K) or Cut off Rate, if any, the project is acceptable

If IRR > Cost of Capital (K) or Cut off Rate, if any, the project is not acceptable

If IRR = Cost of Capital (K) or Cut off Rate, if any, it refers to the point of indifference, i.e., the project may be or may not be accepted.

Procedure for computation of IRR :

Step 1: Determine the present value of cash outflows and cash inflows using cost of capital (K) as the discounting factor. The rationale behind use of K as the discounting factor to start with is that, the NPV can be easily determined. If NPV is less than zero (i.e., P.V. of cash inflows is equal to P.V. of cash outflows), no further calculation is necessary because it indicates that IRR is less than K, so the project is not acceptable. On the other hand if NPV is greater than zero, i.e., P.V. of cash inflows are more than the present value of cash outflows, the discount rate has to be increased in order to reduce the present value of cash inflows so as to make it equal or close to the present value of cash outflow. If increase in discount rate results in negative NPV, the rate of discount has to be decreased in order to increase the present value of cash inflows. The process of increase and decrease in discount rate is continued till the present value of cash inflow either equals to or becomes very close to the present value of present value of cash outflow.

Alternatively, a guidance rate may be calculated for using it as the starting discounting rate as shown in the example below.

Step 2: Identify the two discount rates for which the NPV is little more than and slightly less than zero.

Step 3: Compute the change in NPV over the two selected discount rates.

Step 4: On proportionate basis (or using simple interpolation method), compute the discount rate at which NPV is Zero.

Example:

	₹
Project Cost	1,10,000
Cash Inflows:	
Year 1	60,000
Year 2	20,000
Year 3	10,000
Year 4	50,000

Calculate the Internal Rate of Return.

Solution:

Internal Rate of Return will be calculated by the trial and error method. The cash flow is not uniform. To have an approximate idea about such rate we can calculate the guidance rate to start with. It represents the same relationship of investment and cash inflows as in case of payback period calculation, therefore, it is known as fake pay back period:

$F = I/C$

Where F = Fake pay back period

I = Original investment

C = Average Cash inflow per annum

Factor for the project = $\frac{1,10,000}{35,000}$ = 3.14 (also known as Fake Pay Back Period)

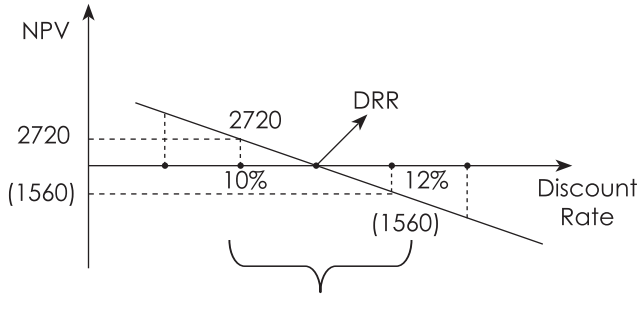
The factor will be located from the table "P.V. of an Annuity of ₹ 1" representing number of years corresponding to estimated useful life of the asset.

The approximate value of 3.14 is located against 10% in 4 years.

Applying 10% as the discount rate, it has been found that NPV is 2720. To make it zero, the present value of cash inflows is to be reduced. Therefore, a higher discount rate, 12% has been used in the next step and the NPV has been negative (-1560). So, NPV is positive at 10% and negative at 12%. It indicates that NPV is zero at a discount rate which is more than 10% but less than 12%.

Year	Cash Inflows (₹)	P.V. @ 10%	Discounted Figures (₹)	P.V. @ 12%	Discounted Figures (₹)
1	60,000	0.909	54,540	0.893	53,580
2	20,000	0.826	16,520	0.797	15,940
3	10,000	0.751	7,510	0.712	7,120
4	50,000	0.683	34,150	0.636	31,800
P.V. of Inflows			1,12,720		1,08,440
Less: Initial Investment			1,10,000		1,10,000
NPV			2,720		(1,560)

Graphically,



For 2%, Difference in rate
= Total Absolute Difference
= 4,280

IRR may be calculated in following ways:

1. **Forward Method:** Taking 10%, (+) **NPV**

$$IRR = 10\% + \frac{\text{NPV at 10\%}}{\text{Total Difference}} \times \text{Difference in Rate}$$

$$= 10\% + \frac{2720}{4280} \times 2\%$$

$$= 10\% + 1.27\% = 11.27\%$$

2. **Backward Method:** Taking 12%, (-) **NPV**

$$IRR = 12\% - \frac{NPV \text{ at } 12\%}{Total \text{ Difference}} \times Difference \text{ in Rate}$$

$$= 12\% - \frac{(1560)}{4280} \times 2\%$$

$$= 12\% - 0.73\% = 11.27\%$$

The decision rule for the internal rate of return is to invest in a project if its rate of return is greater than its cost of capital.

3. Alternatively, the IRR may be determined using **simple interpolation** also.

Advantages

(i) Time value of money is taken into account.

(ii) All cash inflows of the project, arising at different points of time are considered.

(iii) Decisions can be easily taken by comparing IRR with the cost of capital.

All projects having IRR above the Cost of Capital will be automatically accepted.

Disadvantages

(i) It is tedious to compute.

(ii) Decision making becomes difficult in case of Multiple IRRs

(iii) It may conflict with NPV in case of difference in inflow/ outflow patterns, or size of investment, or life of the alternative proposals.

(iv) The presumption that all the future cash inflows of a proposal are reinvested at a rate equal to the IRR may not be practically valid.

(v) Modified Net Present Value (MNPV)

One of the limitations of NPV method is that reinvestment rate in case of NPV is Cost of Capital (k). However, in case of MNPV, different reinvestment rates for the cash inflows over the life of the project may be used. Under this modified approach, terminal value of the cash inflows is calculated using such expected reinvestment rate (s). Thereafter, MNPV is determined with present value of such terminal value of the cash inflows and present value of the cash outflows using cost of capital (k) as the discounting factor.

Terminal value is the sum of the compounded value of cash inflows of different years at the end of the life of the project. If the life of the project is 'n' years, cash inflow of period 't' is CF_t and reinvestment rate is 'r', the terminal value will be $\sum (CF_t)^{n-t}$.

(vi) Modified IRR

One of the limitations of IRR as mentioned above is that reinvestment rate in case of IRR is IRR itself. This can be overcome changing the reinvestment rate incorporating the expected reinvestment rate for future periods over the life of the projects and using such expected reinvestment rate for calculating the terminal value of the cash inflows for different years of the life of the project. Thereafter, MIRR is determined with present value of such terminal value of the cash inflows and present value of the cash outflows. In other words, the MIRR is the discount rate which will make present /discounted value of terminal value of cash inflows equal to present/discounted value of cash outflow.

Modified NPV or Modified IRR may be used to resolve the conflict in ranking of the alternative projects under NPV and IRR methods arising out of differences in timing of cash flows, i.e., in one project, the cash inflows in the initial years may be more than the other or vice versa.

NPV vs IRR

In case of mutually exclusive projects, financial appraisal using NPV & IRR methods may provide conflicting results. The reasons for such conflicts may be attributed to (i) Difference in timing / pattern of cash inflows of the alternative proposals (Time Disparity), (ii) difference in their amount of investment (Size Disparity) and (iii) difference in the life of the alternative proposals (Life Disparity).

TIME DISPARITY: Main source of conflict is the different re-investment rate assumption. Such conflicts may be resolved using modified version of NPV and IRR using expected / defined reinvestment rate applicable to the firm.

For modified NPV and IRR, at first Terminal Value (TV) is calculated using the specified reinvestment rate.

$TV = \sum CF_t (1+r^*)^{n-t}$ $NPV^* = \{TV \div (1+k)^n\} - I$ $IRR^* = (TV \div I)^{1/n} - 1$

Where, r* = reinvestment rate

NPV* & IRR* are the modified NPV and modified IRR

Example:

	Project I ₹	Project II ₹
Investment	220000	220000
Year 1	62000	142000
Year 2	80000	80000
Year 3	100000	82000
Year 4	140000	40000

Cost of Capital: 10%

Solution:

	I	II
NPV (₹)	73226	62628
IRR (appx.)	22%	25%

According to NPV, Project I is better but according to IRR, Project II is better. So, there is conflicting results. The primary reason for such conflict is the difference in timing of cash inflows. In case of Project II, more cash inflows occur in the initial years while in case of Project I more cash flows occur towards the end of the project. Such conflict may be resolved using Modified version of NPV or IRR (MNPV or MIRR) as follows.

Using reinvestment rate of 14%,

$TV_I = 62000 (1 + .14)^3 + 80000 (1 + .14)^2 + 100000 (1 + .14)^1 + 140000 (1 + .14)^0$

$= 449822$

$TV_2 = 142000 (1 + .14)^3 + 80000 (1 + .14)^2 + 82000 (1 + .14)^1 + 40000 (1 + .14)^0$

$= 447822$

$NPV^*_I = \{449822 \div (1 + .10)^4\} - 220000 = 87228$

$NPV^*_{II} = \{447822 \div (1 + .10)^4\} - 220000 = 85862$

$IRR^*_I = (449822 \div 220000)^{1/4} - 1 = 19.57\%$

$IRR^*_{II} = (447822 \div 220000)^{1/4} - 1 = 19.32\%$

Both the MIRR and MNPV show that Project I should be accepted.

"Where NPV* and IRR* are the modified NPV and modified IRR"

SIZE DISPARITY:

Conflict may arise due to disparity in the size of initial investment /outlays. Such conflict may be resolved using ***incremental approach***.

(i) Steps: Find out the differential cash flows between the two proposals

(ii) Calculate the IRR of the incremental cash flows

(iii) If the IRR of the differential cash flows exceeds the required rate of return (usually cost of capital), the project having greater non-discounted net cash flows should be selected.

Example:

	Project A	**Project B**
Investment	5000000	7500000
Net Cash Inflow	6250000	9150000
K = 10%		

Solution: At first, NPV and IRR of the projects are calculated and it has been found that,

$NPV_A < NPV_B$

$IRR_A > IRR_B$

The above results indicate that there is a conflict in ranking of the projects under NPV and IRR. Such conflict is mainly due to the difference in the initial investment of the projects and it can be resolved using incremental approach as follows.

Differential Cash Outflows = 2500000, Differential Net Cash Inflows = 2900000

We know that IRR is the discount rate at which Present Value of Cash Inflows are equal to the Present Value of Cash Outflows.

So, $25,00,000 = 29,00,000 / (1+ r)^1$

Or, $1 + r = 29,00,000 / 25,00,000$ Or, $r = 1.16 – 1 = 0.16$

IRR (r) of the differential cash flows = 16%, which is greater than Cost of Capital (k).

Therefore, Project with higher non-discounted cash inflows, i.e., Project B would be selected.

Unequal Lives of the Projects or LIFE DISPARITY

In some cases, the mutually exclusive alternatives with different/ unequal lives may lead to conflict in ranking. To resolve such conflict, one approach is to compare the alternatives on the basis of their Equivalent Annual Benefit (EAB) or Equivalent Annual Cost (EAC) and select the alternative with the higher EAB or lower EAC.

EAB = NPV x Capital Recovery Factor or NPV ÷ $PVIFA_{k,n}$

Capital Recovery Factor = the inverse of $PVIFA_{k,n} = k (1+k)^n \div (1+k)^n – 1$

EAC = PV of Cost ÷ $PVIFA_{k,n}$

Another approach is to evaluate the alternatives over an equal time frame using the lowest common multiple (LCM) of the lives of the alternatives under consideration. This method is referred to as **LCM** method. For example, life of Proposal A is 3 Years and that of B is 5 years. Lowest common multiple period is 15 years, during which period, it may be assumed that Machine A will be replaced 5 times and Machine B will be replaced 3 times. Cash Flows are extended to this period and computations made. The final results would then be on equal platform i.e. equal years, and hence would be comparable.

Example :

	P	Q
Investment (₹)	5000000	5000000
Cash Inflows (₹):		
Year 1	7500000	2000000
Year 2		2000000
Year 3		7000000

K = 12%

Solution.

	P	Q
NPV (₹)	1696400	3362800
IRR	50%	40%

From the above, it is found that there is conflict in ranking of the projects under NPV and IRR. The reason may be attributed primarily to the unequal lives, i.e., life disparity. In such situation, EAB approach may be followed as follows.

	P	Q
Capital Rec. Factor	1.12	.416*
*1 ÷ (.893+.797+.712)		
EAB (₹)	1900000	1398900
Based on EAB, Project P is better.		

Example 2:

Cost of Machine I – ₹ 75000, Life 5 years, annual operating cost ₹12000.

Cost of Machine II – ₹ 50000, Life 3 years, annual operating cost ₹20000.

Cost of Capital 12%.

Present Value of all costs:

Machine I : 118260; Machine II : 86030.

EAC (Equivalent Annual Cost): PV of Cost ÷ $PVIFA_{k,n}$

Machine I: 118260 / 3.605 = 32804

Machine II: 86030/ 2.402 = 35816

So, the machine I is preferable to Machine II

(vii) ADJUSTED NET PRESENT VALUE: For determining NPV, weighted average cost of capital is used as the discounting factor, based on the assumption that every project is financed by the same proportions of debt and equity as found in the capital structure of the firm. However that may not be true. Moreover, tax advantages (savings in tax) due to use of borrowed fund is not usually considered in financial appraisal of investment proposals discussed so far. But impact of debt financing can be incorporated using Adjusted Present Value Method with an adjustment of tax aspects of debt financing with the **Base Case NPV**.

Base Case NPV is the NPV under the assumption that the project is all-equity financed.

Adjusted NPV = Base case NPV + NPV of Tax Shields arising out of financing decisions associated with the project.

Example: A firm is considering a project requiring ₹50 lakh of investment. Expected cash flow is ₹10 lakh per annum for 8 years. The rate of return required by the equity investors from the project is 15%. The firm is able to raise ₹ 24 lakh of debt finance carrying 14% interest for the project. The debt is repayable in equal annual installments over the eight year period – the first to be paid at the end of the first year. The tax rate is 40%.

Base case NPV = – 5000000 + $\sum$ 1000000 / 1.15^t = – 512700

Equity Finance ₹ 26 lakh, Debt Finance ₹ 24 lakh.

Equity Issue Cost is assumed to be 5%. Therefore, to get ₹ 26 lakh, total equity issue = ₹ 26 / 0.95

= ₹27.37 lakh

Difference of ₹ (27.37 – 26) lakh = ₹ **01.37 lakh** is the cost of underwriting, brokerage, etc. for the issue.

(₹ Lakh)

Year:	1	2	3	4	5	6	7	8
O/S Debt at the beginning:	24	21	18	15	12	09	06	03
Interest:	3.36	2.94	2.52	2.10	1.68	1.26	0.84	0.42
Tax Shield:	1.344	1.176	1.008	0.840	0.672	0.504	0.336	0.168
PV of Tax Shield:	1.179	0.9049	0.6804	0. 497	0.349	0.230	0.134	0.059
(discounting at 14%, cost of debt)					Total PV of Tax Shield:4.0333			

Adjusted NPV = Base case NPV – Issue Cost + Present Value of Tax Shield

= ₹ (– 512700 – 137000 + 403333) = ₹ (–) 246367

1.4 CAPITAL RATIONING

There may be situations where a firm has a number of independent projects that yield a positive NPV or having IRR more than its cut off rate, PI more than 1, i.e., the projects are financially viable, hence, acceptable. However, the most important resource in investment decisions, i.e. funds, are not sufficient enough to undertake all the projects. In such a case, the projects are selected in such a way so that NPV becomes maximum in order to maximize wealth of shareholders. Investment planning in such situation is Capital Rationing.

There are two possible situations of Capital Rationing

(i) Generally, firms fix up maximum amount that can be invested in capital projects, during a given period of time, say a year. This budget ceiling imposed internally is called as Soft Capital Rationing or Internal Capital Rationing.

(ii) There may be a market constraint on the amount of funds available for investment during a period. This inability to obtain funds from the market, due to external factors is called Hard Capital Rationing or External Capital Rationing.

Different proposals may be classified into **two categories**: DIVISIBLE and INDIVISIBLE

In case of divisible projects, part acceptance of the project is possible.

Indivisible projects are either to be accepted in its entirety or to be rejected, i.e., part acceptance is not possible.

For divisible projects, **PI** approach help in selecting the proposals providing the **highest NPV**.

For indivisible projects, through *trial and error methods*, best combination of the projects with the **highest NPV** may be ascertained.

For Divisible Projects

Rank the projects following PI and arrange them in descending order. Go on selecting the projects till the fund is available.

For Indivisible Projects

Determine all the feasible combination of the projects and rank them according to total NPV of the combinations. Select the combination with the highest NPV.

Example:

X Ltd. has a capital budget of ₹1.5 crore for the year. From the following information relating to six independent proposals, select the projects if (i) the projects are divisible and (ii) the projects are indivisible.

Proposal	Investments (₹)	NPV (₹)
A	70,00,000	30,00,000

B	25,00,000	16,00,000
C	50,00,000	20,00,000
D	20,00,000	10,00,000
E	55,00,000	45,00,000
F	75,00,000	-25,00,000

If the projects are divisible

Projects are ranked according to PI and arranged in descending order.

Proposal	Investments (₹)	PV of Inflows (NPV+I)	PI	Rank	NPV (₹)
A	70,00,000	1,00,00,000	100/70 = 1.43	(4)	30,00,000
B	25,00,000	41,00,000	41/25 = 1.64	(2)	16,00,000
C	50,00,000	70,00,000	70/50 = 1.4	(5)	20,00,000
D	20,00,000	30,00,000	30/20 = 1.5	(3)	10,00,000
E	55,00,000	1,00,00,000	100/55 = 1.8	(1)	45,00,000
F	75,00,000	50,00,000	50/75 = 0.67		-25,00,000

Proposal	Investments (₹)	Cum. Inv. (₹)	NPV (₹)	Cum. NPV
E	55,00,000	55,00,000	45,00,000	45,00,000
B	25,00,000	80,00,000	16,00,000	61,00,000
D	20,00,000	100,00,000	10,00,000	71,00,000
A*	70,00,000	170,00,000	30,00,000	92,42,857*
C	50,00,000	220,00,000	20,00,000	

*only ₹50,00,000 can be invested in Project A, i.e., 5/7 th of the total investment can be made. Proportionate NPV is 5/7 x ₹30,00,000 = ₹2142857

- So selected projects are E, B, D and 5/7 th part of A

If the projects are indivisible

Feasible Sets	Investments (₹)	NPV (₹)
EBDC	15000000	91,00,000
EBA	15000000	91,00,000
BAC	14500000	66,00,000
DAC	14000000	60,00,000
EBC	13000000	81,00,000

Either EBDC or EBA, which provides the maximum NPV, may be undertaken.

1.5 SOCIAL COST BENEFIT ANALYSIS (SCBA)

In evaluation of investment proposals, more emphasis is given on the return on investment as the firms usually face the limitations or scarcity of funds. However, the impact of investment proposals from the larger social point of view is considered in Social Cost Benefit Analysis (SCBA). The social costs and benefits of a project differ from the costs incurred and benefits earned in monetary terms primarily due to market imperfections, externalities, taxes, concern for savings and redistribution, merit and demerit goods. As the focus of SCBA is on the social costs and benefits of the projects, the perspectives and parameters provided by the macro level plans often serve as the basis of SCBA.

The purpose of SCBA to supplement and strengthen the existing techniques of financial analysis.

Need for Social Cost Benefit Analysis (SCBA)

(i) Monetary Cost Benefit Analysis fails to consider the external effects of a project, which may be positive like development of infrastructure or negative like pollution and imbalance in environment.

(ii) Taxes and subsidies are monetary costs and gains, but these are only transfer payments from social point of view and therefore irrelevant.

(iii) Market prices used to measure costs and benefits in project analysis, do not represent social values due to imperfections in market.

(iv) SCBA is essential for measuring the redistribution effect of benefits of a project as benefits going to poorer section are more important from social point of view than one going to sections which are economically better off.

(v) Projects, manufacturing life necessities like medicines, or creating infrastructure like construction of road or electricity generation are more important than projects for manufacture of liquor and cigarettes. Thus merit wants are important appraisal criterion for SCBA.

Relevance of Social Cost Benefit Analysis for Private Enterprises

(i) SCBA is one of the most important criteria for taking up any project by the Government enterprises. For example, if government wants to take up a project relating to expansion of road for which Hawkers are to be removed, it has to consider the rehabilitation of the hawkers and cost involved therein. SCBA is important for private corporations also which have a moral responsibility to undertake socially desirable projects.

(ii) If the private sector includes social cost benefit analysis in its project evaluation techniques, it will ensure that it is not ignoring its own long-term interest, since projects that are socially beneficial and acceptable are expected to survive in the long run. Therefore, SCBA is important for private enterprises also.

Methodology of SCBA

Two principal approaches for SCBA are: (i) UNIDO approach and (ii) Little-Mirrlees (L-M) approach. The L-M approach has considerable similarity with the UNIDO approach. However, there are certain important differences as well. The Financial Institutions like ICICI, IDBI, and IFCI evaluate the project proposals primarily from the financial point of view and also incorporate the larger social aspect in their analyses. These institutions follow the simplified version of L-M approach with some minor variation.

2. Evaluation of Risky Proposals for Investment decisions

(i) Investment decisions under uncertainties

(ii) Effect of Inflation on Capital Budgeting Decisions

(iii) Sensitivity Analysis, Certainty Equivalent Approach, Decision Tree Analysis, Standard

Deviation in Capital Budgeting, Risk Adjusted Discount Rate, Options in Capital Budgeting.

Illustration 1.

A large profit making company is considering the installation of a machine to process the waste produced by one of its existing manufacturing process to be converted into a marketable product. At present, the waste is removed by a contractor for disposal on payment by the company of ₹ 50 lakhs per annum for the next four year The contract can be terminated upon installation of the aforesaid machine on payment of a compensation of ₹30 lakhs before the processing operation starts. This compensation is not allowed as deduction for tax purposes.

The machine required for carrying out the processing will cost ₹ 200 lakhs to be financed by a loan repayable in 4 equal instalments commencing from the end of year 1. The interest rate is 16% per annum. At the end of the 4th year, the machine can be sold for ₹ 20 lakhs and the cost of dismantling and removal will be ₹15 lakhs.

Sales and direct costs of the product emerging from waste processing for 4 years are estimated as under:

			₹ in lakhs	
Year	**1**	**2**	**3**	**4**
Sales	322	322	418	418
Material consumption	30	40	85	85
Wages	75	75	85	100

Other expenses	40	45	54	70
Factory overheads	55	60	110	145
Depreciation (as per income-tax rules)	50	38	28	21

Initial stock of materials required before commencement of the processing operations is ₹ 20 lakhs at the start of year 1. The stock levels of materials to be maintained at the end of year 1, 2 and 3 will be ₹55 lakhs and the stocks at the end of year 4 will be nil. The storage of materials will utilize space which would otherwise have been rented out for ₹ 10 lakhs per annum. Labour costs include wages of 40 workers, whose transfer to this process will reduce idle time payments of ₹ 15 lakhs in year 1 and ₹ 10 lakhs in year 2. Factory overheads include apportionment of general factory overheads except to the extent of insurance charges of ₹ 30 lakhs per annum payable on this venture. The company's tax rate is 35%.

Present value factors for four years are as under:

Year	**1**	**2**	**3**	**4**
Present value factors	0.870	0.756	0.658	0.572

Advise the management on the desirability of installing the machine for processing the waste. All calculations should form part of the answer.

Solution:

Statement of Incremental Profit **(₹ in lakhs)**

Years	**1**	**2**	**3**	**4**
Sales: (A)	322	322	418	418
Material consumption	30	40	85	85
Wages	60	65	85	100
Other expenses	40	45	54	70
Factory overheads (Insurance)	30	30	30	30
Loss of rent	10	10	10	10
Interest	32	24	16	8
Depreciation (as per income tax rules)	50	38	28	21
Total cost: (B)	252	252	308	324
Incremental profit: (C) = (A) – (B)	70	70	110	94
Tax (35% of (C))	24.5	24.5	38.5	32.9

Statement of Incremental Cash Flows **(₹ in lakhs)**

Years	0	1	2	3	4
Material stocks	(20)	(35)	-	-	-
Compensation for contract	(30)	-	-	-	-
Contract payment saved	-	50	50	50	50
Tax on contract payment	-	(17.5)	(17.5)	(17.5)	(17.5)
Incremental profit	-	70	70	110	94
Depreciation added back	-	50	38	28	21
Tax on profits	-	(24.5)	(24.5)	(38.5)	(32.9)
Loan repayment	-	(50)	(50)	(50)	(50)
Profit on sale of machinery (net)	-	-	-	-	5
Total incremental cash flows	(50)	43	66	82.0	69.60
Present value factor	1.00	0.870	0.756	0.658	0.572
Net present value of cash flows	(50)	37.410	49.896	53.956	39.811

Net present Value = ₹ 181.073 – ₹ 50 = ₹ 131.073 lakhs.

Advice: Since the net present value of cash flows is ₹ 131.073 lakhs which is positive the management should install the machine for processing the waste.

Notes:

1. Materials stock increase are taken in cash flows.
2. idle-time wages have also been considered.
3. Apportioned factory overheads are not relevant only insurance charges of this project are relevant.
4. Interest calculated at 16% based on 4 equal instalments of loan repayment.
5. Sale of machinery – Net income after deducting removal expenses taken. Tax on capital gains ignored.
6. Saving in contract payment and income tax there on considered in the cash flows.

Illustration 2.

Following are the data on a capital project being evaluated by the management of X Ltd.

	Project M
	₹
Annual cost saving	4,00,000
Useful life	4 years
I.R.R.	15%
Profitability Index (PI)	1.064
NPV	?
Cost of capital	?
Cost of project	?
Payback	?
Salvage value	0

Find the missing values considering the following table of discount factor only:

Discount factor	**15%**	**14%**	**13%**	**12%**
1 year	0.869	0.877	0.885	0.893
2 years	0.756	0.769	0.783	0.797
3 years	0.658	0.675	0.693	0.712
4 years	0.572	0.592	0.613	0.636
	2.855	2.913	2.974	3.038

Solution:

Cost of Project M

At 15% I.R.R., the sum total of cash inflows = Cost of the project i.e. Initial cash outlay

Given:

Annual cost saving	₹ 4,00,000
Useful life	4 years
I.R.R.	15%

Now, considering the discount factor table @ 15% cumulative present value of cash inflows for 4 years is 2.855. Therefore, Total of cash inflows for 4 years for Project M is (₹ 4,00,000 × 2.855) = ₹ 11,42,000

Hence cost of project is = ₹ 11,42,000

Payback period of the Project M

$$\text{Pay back period} = \frac{\text{Cost of the project}}{\text{Annuity cost saving}} = \frac{₹\ 11,42,000}{4,00,000} = 2.855 \text{ or 2 years 11 months approximately}$$

Cost of Capital

If the profitability index (PI) is 1, cash inflows and outflows would be equal. In this case, (PI) is 1.064. Therefore, cash inflows would be more by 0.064 than outflow.

$$\text{Profitability index (PI)} = \frac{\text{Discounted Cash inflows}}{\text{Cost of the project}}$$

$$\text{or } 1.064 = \frac{\text{Discounted Cash inflows}}{₹11,42,000}$$

or 1.064 x ₹ 11,42,000 = ₹ 12,15,088. Hence, Discounted cash inflows = ₹ 12,15,088

Since, Annual cost saving is ₹ 4,00,000. Hence, cumulative discount factor for 4 years

= ₹ 12,15,088 / 4,00,000 = 3.037725 or 3.038

Considering the discount factor table at discount rate of 12%, the cumulative discount factor for 4 years is 3.038. Hence, the cost of capital is 12%.

Net present value of the project.

N.P.V. = Total present value of cash inflows – Cost of the project

= ₹ 12,15,088 – ₹ 11,42,000 = ₹ 73,088.

Illustration 3.

Nine Gems Ltd. has just installed Machine – R at a cost of ₹ 2,00,000. The machine has a five year life with no residual value. The annual volume of production is estimated at 1,50,000 units, which can be sold at ₹ 6 per unit. Annual operating costs are estimated at ₹ 2,00,000 (excluding depreciation) at this output level. Fixed costs are estimated at ₹ 3 per unit for the same level of production.

Nine Gems Ltd. has just come across another model called Machine – S capable of giving the same output at an annual operating cost of ₹ 1,80,000 (exclusive of depreciation). There will be no change in fixed costs. Capital cost of this machine is ₹ 2,50,000 and the estimated life is for five years with nil residual value.

The company has an offer for sale of Machine – R at ₹ 1,00,000. But the cost of dismantling and removal will amount to ₹ 30,000. As the company has not yet commenced operations, it wants to sell Machine – R and purchase Machine –S.

Nine Gems Ltd. will be a zero-tax company for seven years in view of several incentives and allowances available.

The cost of capital may be assumed at 15%. P.V. factors for five years are as follows:

Year	P.V. Factors
1	0.8696
2	0.7561
3	0.6575
4	0.5717
5	0.4972

(i) Advise whether the company should opt for the replacement.

(ii) Will there be any change in your view, if Machine-R has not been installed but the company is in the process of selecting one or the other machine?

Support your view with necessary workings.

Solution :

(i) Replacement of Machine – R:

Incremental cash out flow

		₹	₹
(i)	Cash outflow on Machine – S		2,50,000
	Less: Sale value of Machine – R	1,00,000	
	Less: Cost of dismantling and removal	30,000	70,000
	Net outflow		1,80,000
	Incremental cash flow from Machine –S		
	Annual cash flow from Machine – S [(1,50,000×₹6) – (1,50,000×₹3) – 1,80,000]		2,70,000
	Annual cash flow from Machine – R [(1,50,000×₹6) – (1,50,000×₹3) – 2,00,000]		2,50,000
	Net incremental cash in flow		**20,000**

Present value of incremental cash in flows = ₹ 20,000 ₹ (0.8696 + 0.7561 + 0.6575 + 0.5717 + 0.4972)

= 20,000 x 3.3523 = ₹ 67,046

NPV of Machine – S = ₹ 67,046 – ₹ 1,80,000 = (–) ₹ 1,12,954.

₹ 2,00,000 spent on Machine – R is a sunk cost and hence it is not relevant for deciding the replacement.

Decision: Since Net present value of Machine –S is in the negative, replacement is not advised.

If the company is in the process of selecting one of the two machines, the decision is to be made on the basis of independent evaluation of two machines by comparing their Net present values.

(ii) Independent evaluation of Machine– R and Machine –S

	Machine– R	**Machine– S**
Units produced	1,50,000	1,50,000
Selling price per unit (₹)	6	6
Sale value	9,00,000	9,00,000
Less: Operating Cost (exclusive of depreciation)	2,00,000	1,80,000
Contribution	7,00,000	7,20,000
Less: Fixed cost	4,50,000	4,50,000
Annual Cash flow	2,50,000	2,70,000
Present value of cash flows for 5 years	8,38,075	9,05,121
Cash outflow	2,00,000	2,50,000
Net Present Value	6,38,075	6,55,121

As the NPV of Cash in flow of Machine-S is higher than that of Machine-R, the choice should fall on Machine-S.

Note: As the company is a zero tax company for seven years (Machine life in both cases is only for five years), depreciation and the tax effect on the same are not relevant for consideration.

Illustration 4.

S Engineering Company is considering to replace or repair a particular machine, which has just broken down. Last year this machine costed ₹ 2,00,000 to run and maintain. These costs have been increasing in real terms in recent years with the age of the machine. A further useful life of 5 years is expected, if immediate repairs of ₹ 1,90,000 are carried out. If the machine is not repaired it can be sold immediately to realize about ₹ 50,000 (Ignore loss/gain on such disposal).

Alternatively, the company can buy a new machine for ₹ 4,90,000 with an expected life of 10 years with no salvage value after providing depreciation on straight line basis. In this case, running and maintenance costs

will reduce to ₹ 1,40,000 each year and are not expected to increase much in real term for a few years at least. S Engineering Company regard a normal return of 10% p.a. after tax as a minimum requirement on any new investment. Considering capital budgeting techniques, which alternative will you choose? Take corporate tax rate of 50% and assume that depreciation on straight line basis will be accepted for tax purposes also. Given cumulative present value of ₹ 1 p.a. at 10% for 5 years ₹ 3.791, 10 years ₹ 6.145.

Solution :

Evaluation of proposal to repair existing machine or buy a new machine for M/s S. Engineering Company

(i) To repair existing machine:

	Amount (₹)
Present value of after-tax cash outflows	
Cost of repairs immediately net of tax 95,000 (50% of 1,90,000)	
Equivalent annual cost for 5 years $\frac{95,000}{3.791}$	25,059
Running and maintenance cost per annum net of tax (50% of 2,00,000)	1,00,000
Total net equivalent cash outflows p.a.	**1,25,059**

(ii) To buy a new machine:

	Amount (₹)
Present value of after-tax cash outflows	
Purchase cost of new machine	4,90,000
Less: Sale Proceeds of old machine	50,000
	4,40,000
Equivalent annual cost for 10 years $\frac{4,40,000}{6.145}$	71,603
Tax saving of depreciation (4,90,000/10) × 50%	(24,500)
Running and maintenance cost p.a. net of tax (50% of 1,40,000)	70,000
Total net equivalent cash outflows p.a.	**1,17,103**

Since, net equivalent cash outflows p.a. for buying a new machine ₹ 1,17,103 is less than net equivalent cash outflows of ₹ 1,25,059 for repairing of an existing machine. Therefore, it is advisable that the company should go for buying a new machine.

Alternative Solution:

(i) To repair an existing machine:

	Amount (₹)
Present value of after-tax cash outflow	
Cost of repairs immediately net of tax (1,90,000 x 50%)	95,000
Running and maintenance cost for 5 years (2,00,000 × 50% 3.791)	3,79,100
Total net present value of after tax cash outflows for 5 years	4,74,100
Hence, net equivalent cash outflows p.a. = $\frac{4,74,100}{3.791}$	1,25,059

(ii) To Buy new machine

	Amount (₹)	Amount (₹)
Present value of after-tax cash outflow		
Purchase cost of new machine	4,90,000	
Less: Sale proceeds of old machine	50,000	4,40,000

Tax benefit on depreciation p.a. (4,90,000/10) × 50%	(24,500)	
Running and maintenance cost p.a. (50% of 1,40,000)	70,000	
	45,500	
Net cash outflows for 10 years (45,500 × 6.145)		2,79,598
Total net present value of after tax cash outflows for 10 years		7,19,598
Hence, net equivalent cash outflow p.a = $\frac{7,19,95,000}{6.145}$		1,17,103

Since, net equivalent cash outflows p.a. for buying a new machine ₹ 1,17,103 is less than net equivalent outflows of ₹ 1,25,509 for repairing of an existing machine. Therefore, it is advisable that the company should go for buying a new machine.

Illustration 5.

(a) ABC Company Ltd. has been producing a chemical product by using machine Z for the last two years. Now the management of the company is thinking to replace this machine either by X or by Y machine. The following details are furnished to you:

	Z (₹)	X (₹)	Y (₹)
Books value	1,00,000	-	-
Resale value now	1,10,000	-	-
Purchase price	-	1,80,000	2,00,000
Annual fixed costs (including depreciation)	92,000	1,08,000	1,32,000
Variable running costs (including labour) per unit	3	1.50	2.50
Production per hour (unit)	8	8	12

You are also provided with the following details:

Selling price per unit	(₹) 20
Cost of materials per unit	(₹) 10
Annual operating hours	2,000
Working life of each of the three machines (as from now)	5 years
Salvage value of machines Z ₹ 10,000, X ₹ 15,000, Y ₹ 18,000	

The company charges depreciation using straight line method. It is anticipated that an additional cost of ₹ 8,000 per annum would be incurred on special advertising to sell the extra output of machine. Assume tax rate of 40% and cost of capital 10%. The present value of ₹ 1 to be received at the end of the year at 10% is as under:

Year	1	2	3	4	5
Present value	0.909	0.826	0.751	0.683	0.621

Required: Using NPV method, you are required to analyse the feasibility of the proposal and make recommendations.

Solution:

ABC Company Ltd.

Computation of yearly cash inflow

Machine	Z (₹)	X (₹)	Y (₹)
Sales (units)	16,000	16,000	24,000
Selling price per unit	20	20	20

Sales : (A)	3,20,000	3,20,000	4,80,000
Less: Costs			
Variable running costs	48,000	24,000	60,000
Material cost	1,60,000	1,60,000	2,40,000
Annual fixed cost	92,000	1,08,000	1,32,000
Additional cost (Special advertising)	-	-	8,000
Total costs: (B)	3,00,000	2,92,000	4,40,000
Profit before tax: (A) – (B)	20,000	28,000	40,000
Less: Tax @ 40%	8,000	11,200	16,000
Profit after tax	12,000	16,800	24,000
Add: Depreciation	20,000	33,000	36,400
Cash inflow	32,000	49,800	60,400

Computation of cash inflow in 5th year

Machine	Z (₹)	X (₹)	Y (₹)
Cash in flow	32,000	49,800	60,400
Add: Salvage value of machines	10,000	15,000	18,000
Cash inflow	42,000	64,800	78,400

Computation of Net Present Value

Year	Machine	Z		X		Y	
	Discounting factor	Cash inflow	P.V. of cash inflow	Cash inflow	P.V. of cash inflow	Cash inflow	P.V. of cash inflow
		₹	₹	₹	₹	₹	₹
1	0.909	32,000	29,088	49,800	45,268	60,400	54,904
2	0.826	32,000	26,432	49,800	41,135	60,400	49,890
3	0.751	32,000	24,032	49,800	37,400	60,400	45,360
4	0.683	32,000	21,856	49,800	34,013	60,400	41,253
5	0.621	42,000	26,082	64,800	40,241	78,400	48,686
			1,27,490		1,98,057		2,40,093
Less: Purchase price			1,10,000		1,80,000		2,00,000
Net present value			17,490		18,057		40,093

Recommendation:

The net present value is higher in the case of Machine Y. Therefore, it is advisable that the company should replace machine Z with machine Y.

However, as the cost of investment is not the same for all machines, it would be better to base the decision on profitability index which is as under:

$$P.I. = \frac{P.V.\ of\ cash\ inflow}{P.V.\ of\ cash\ outflow}$$

$$Machine Z = \frac{1,27,490}{1,10,000} = 1.159$$

$$Machine X = \frac{1,98,057}{1,80,000} = 1.10$$

$$Machine Z = \frac{2,40,093}{2,00,000} = 1.20$$

Since the profitability index of machine Y is the highest therefore machine Z should be replaced by machine Y.

Illustration 6.

Complex Ltd., an infrastructure company is evaluating a proposal to build, operate and transfer a section of 20 kms. of road at a project cost of ₹ 400 crores to be financed as follows:

Equity Shares Capital ₹ 100 crores, loans at the rate of interest of 15% p.a. from financial institutions ₹ 300 crores. The Project after completion will be opened to traffic and a toll will be collected for a period of 15 years from the vehicles using the road. The company is also required to maintain the road during the above 15 years and after the completion of that period, it will be handed over to the Highway authorities at zero value. It is estimated that the toll revenue will be ₹ 100 crores per annum and the annual toll collection expenses including maintenance of the roads will amount to 5% of the project cost. The company considers to write off the total cost of the project in 15 years on a straight line basis. For Corporate Income-tax purposes the company is allowed to take depreciation @ 10% on WDV basis. The financial institutions are agreeable for the repayment of the loan in 15 equal annual instalments – consisting of principal and interest.

Calculate Project IRR and Equity IRR. Ignore Corporate taxation. Explain the difference in Project IRR and Equity IRR.

Solution:

Computation of Project IRR (₹ in crore)

Project IRR is computed by using the following equation: $CO_0 = \frac{CF_i}{(1+r)^n}$

Where,

CO_0 = Cash outflow at time zero

CF_i = Net cash inflow at different points of time

N = Life of the project and

R = Rate of discount (IRR)

Now,

CO_0 = ₹ 400

CF_i = ₹ 80 p.a. for 15 years

(Refer to working note (i))

Therefore,

₹ 400 crores = ₹80/(1+r)

The value of IRR of the project:

1. An approximation of IRR is made on the basis of cash flow data. A rough approximation may be made with reference to the payback period. The payback period in the given case is 5 years i.e. $\left(\frac{₹\ 400}{₹\ 80}\right)$. From the PVAF table the closest figures are given in rate 18% (5.092) and the rate 19% (4.876). This means the IRR of the project is expected to be between 18% and 19%.
2. The estimate of IRR cash inflow of the project for both these rates is as follows:

   At 18% = ₹ 80 × PVAF (18%, 15 years)

   = ₹ 80 × 5.092 = ₹ 407.36

at 19% = ₹ 80 × PVAF (19%, 15 years)

   = ₹ 80 crores x 4.876 = ₹ 390.08

3. The exact IRR by interpolating between 18% and 19% is worked out as follows:

$$IRR = 18\% + \frac{₹\ 407.36 - ₹\ 400}{₹\ 407.36 - ₹\ 390.08} \times 1\%$$

$$= 18\% + \frac{₹\ 7.36}{₹\ 17.28} \times 1\% = 18\% + 0.426\% = 18.43\%$$

Therefore, the IRR of the project is 18.43%.

Working Notes:

(i) Net cash inflow of the project

Cash inflow	₹ in crore
Toll revenue	100 crores p.a. for 15 years
Cash outflow	₹ in crore
Toll collection expenses including maintenance of the roads	20 crores p.a. for 15 years
(5% of ₹ 400 crores)	
Net cash inflow	80 crores p.a. for 15 years

Note: Since corporate taxes is not payable. The impact of depreciation need not be considered.

Computation of Equity IRR

Equity IRR is computed by using the following equation:

$$\text{Cash inflow at zero date from equity shareholders} = \frac{\text{Cash inflow available for equity shareholders}}{(1 + r)^n}$$

Where,

r = Equity IRR

n = Life of the project

Here, Cash inflow at zero date from equity shareholders = ₹ 100

Cash inflow for equity shareholders = ₹ 28.69 crores p.a. (Refer to working note)

Therefore: ₹ 100 crores $= \frac{₹28.69}{(1 + r)^{15}}$

The value of equity IRR of the project is calculated as follows:

An approximation of IRR is made on the basis of cash flow data. A rough approximation may be made with reference to the payable period. The payback period in the given case is 3.484 $\left(\frac{₹\ 100}{₹\ 28.69}\right)$.

From the PVAF table at 28% the cumulative discount factor for 1 –15 years is 3.484. Therefore, the equity IRR of project is 28%.

(ii) Equated annual instalment (i.e. principal + interest) of loan from financial institution:

Amount of loan from financial institution (₹ in crore)	₹ 300
Rate of interest	15% p.a.
No. of years	15
Cumulative discount factor for 1-15 years	5.847

Hence, equated yearly instalment will be ₹ 300 crores/5.847 i.e. ₹ 51.31.

(iii) Cash inflow available for equity shareholders ₹ in crore

Net cash inflow of the project [Refer to working note (i)]	₹ 80.00
Equated yearly instalment of the project [Refer to working note (ii)]	₹ 51.31
Cash inflow available for equity shareholders	₹ 28.69

Difference in Project IRR and Equity IRR:

The project IRR is 18.4% whereas Equity IRR is 28%. This is attributed to the fact that XYZ Ltd. is earning 18.4% on the loan from financial institution but paying only 15%. The difference between the return and cost of funds from financial institution has enhanced equity IRR. The 3.4% (18.4% - 15%) earnings on ₹300 crores goes to equity shareholders who have invested ₹ 100 crore i.e.

$3.4\% \times \frac{₹\ 300}{₹\ 100}$ = 10.2% is added to the project IRR is equity IRR of 28%.

Illustration 7.

X Ltd. an existing profit-making company, is planning to introduce a new product with a projected life of 8 years Initial equipment cost will be ₹ 120 lakhs and additional equipment costing ₹ 10 lakhs will be needed at the beginning of third year. At the end of the 8 years, the original equipment will have resale value equivalent to the cost of removal, but the additional equipment would be sold for ₹1 lakhs. Working Capital of ₹ 15 lakhs will be needed. The 100% capacity of the plant is of 4,00,000 units per annum, but the production and sales-volume expected are as under:

Year	Capacity in percentage
1	20
2	30
3-5	75
6-8	50

A sale price of ₹ 100 per unit with a profit-volume ratio of 60% is likely to be obtained. Fixed Operating Cash Cost are likely to be ₹ 16 lakhs per annum. In addition to this the advertisement expenditure will have to be incurred as under:

Year	1	2	3-5	6-8
Expenditure in ₹ lakhs each year	30	15	10	4

The company is subject to 40% tax, straight-line method of depreciation, (permissible for tax purposes also) and taking 15% as appropriate after tax Cost of Capital, should the project be accepted?

Solution:

(a) Computation of initial cash outlay

	(₹ in lakhs)
Equipment Cost (0)	120
Working Capital (0)	15
	135

Calculation of Cash Inflows:

Year	**1**	**2**	**3-5**	**6-8**
Sales (in units)	80,000	1,20,000	3,00,000	2,00,000
	₹	₹	₹	₹
Contribution @ ₹ 60 p.u.	48,00,000	72,00,000	1,80,00,000	1,20,00,000
Fixed cost	16,00,000	16,00,000	16,00,000	16,00,000
Advertisement	30,00,000	15,00,000	10,00,000	4,00,000
Depreciation	15,00,000	15,00,000	16,50,000	16,50,000
Profit/(loss)	(13,00,000)	26,00,000	1,37,50,000	83,50,000
Tax @ 40%	Nil	10,40,000	55,00,000	33,40,000
Profit/(loss) after tax	(13,00,000)	15,60,000	82,50,000	50,10,000
Add: Depreciation	15,00,000	15,00,000	16,50,000	16,50,000
Cash Inflow	2,00,000	30,60,000	99,00,000	66,60,000

Computation of PV of CIF

Year	CIF (₹)	PV Factor @ 15%	(₹)
1	2,00,000	0.8696	1,73,920
2	30,60,000	0.7561	23,13,666
3	99,00,000	0.6575	65,09,250
4	99,00,000	0.5718	56,60,820
5	99,00,000	0.4972	49,22,280
6	66,60,000	0.4323	28,79,118
7	66,60,000	0.3759	25,03,494
8	66,60,000	0.3269	21,77,154
WC	15,00,000	0.3269	4,90,350
SV	(1,00,000)	0.3269	(32,690)
			2,75,97,362
		PV of COF_0	1,35,00,000
		Additional Investment = ₹ 10,00,000 × 0.7561	7,56,100
		NPV	1,33,41,262

Recommendation: Accept the project in view of positive NPV.

Illustration 8.

A & Co. is contemplating whether to replace an existing machine or to spend money on overhauling it. A & Co. currently pays no taxes. The replacement machine costs ₹ 1,00,000 now and requires maintenance of ₹ 10,000 at the end of every year for eight years. At the end of eight years it would have a salvage value of ₹ 20,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value falls each year as follows:

Year	Maintenance (₹)	Salvage (₹)
Present	0	40,000
1	10,000	25,000
2	20,000	15,000
3	30,000	10,000
4	40,000	0

The opportunity cost of capital for A & Co. is 15%. When should the company replace the machine?

(Notes: Present value of an annuity of ₹ 1 per period for 8 years at interest rate of 15% : 4.4873; present value of ₹ 1 to be received after 8 years at interest rate of 15% : 0.3269).

Solution:

A & Co.

Equivalent cost of (EAC) of new machine

		₹
(i)	Cost of new machine now	1,00,000
	Add: P.V. of annual repairs @ ₹ 10,000 per annum for 8 years (₹ 10,000 × 4.4873)	44,873
		1,44,873
	Less: P.V. of salvage value at the end of 8 years (₹20,000 × 0.3269)	6,538
		1,38,335
	Equivalent annual cost (EAC) (₹ 1,38,335/4.4873)	30,828

Equivalent Cost (EAC) of keeping the machine

Present value	I Year	II Year	III Year	IV Year
(P.V)	(₹)	(₹)	(₹)	(₹)
Value Present	40,000	25,000	15,000	10,000
Add:P.V of annual maintenance (Annual Maintenance/1.15)	8,696	17,391	26,087	34,783
Total	48,696	42,391	41,087	44,783
Less: P.V. of salvage value at the end of the year (P.V./1.15)	21,739	13,043	8,696	Nil
	26,957	29,348	32,391	44,783
	1.15	1.15	1.15	1.15
Equivalent Annual Cost (EAC)	31,000	33,750	37,250	51,500

Advice: The company should replace the old machine immediately because the Equivalent Annual Cost (EAC) of the new machine at ₹ 30,828 is lower than the cost of using the existing machine in first year, second year, third year and fourth year.

Illustration 9.

S Ltd. has ₹ 10,00,000 allocated for capital budgeting purposes. The following proposals and associated profitability indexes have been determined as follows:

Project	Amount (₹)	Profitability Index
1	3,00,000	1.22
2	1,50,000	0.95
3	3,50,000	1.20
4	4,50,000	1.18
5	2,00,000	1.20
6	4,00,000	1.05

Which of the above investments should be undertaken? Assume that projects are indivisible and there is no alternative use of the money allocated for capital budgeting.

Solution:

Statement showing ranking of projects on the basis of Profitability Index

Project	Amount	P.I.	Rank
1	3,00,000	1.22	1
2	1,50,000	0.95	5
3	3,50,000	1.20	2
4	4,50,000	1.18	3
5	2,00,000	1.20	2
6	4,00,000	1.05	4

Assuming that projects are indivisible and there is no alternative use of the money allocated for capital budgeting on the basis of P.I., the S Ltd., is advised to undertake investment in projects 1.3, and 5. However, among the alternative projects the allocation should be made to the projects which adds most to the shareholders wealth. The NPV method, by its definition, will always select such projects.

Statement showing NPV of the projects

Project	Amount (₹)	P.I.	Cash inflows of project (₹)	N.P.V. of Project (₹)
(i)	(ii)	(iii)	(iv) = [(ii) x (iii)]	(v) = [(iv) – (ii)]
1	3,00,000	1.22	3,66,000	66,000
2	1,50,000	0.95	1,42,500	(-)7,500
3	3,50,000	1.20	4,20,000	70,000
4	4,50,000	1.18	5,31,000	81,000
5	2,00,000	1.20	2,40,000	40,000
6	4,00,000	1.05	4,20,000	20,000

The allocation of funds to the projects 1, 3 and 5 (as selected above on the basis of P.I.) will give N.P.V. of ₹ 1,76,000 and ₹ 1,50,000 will remain unspent.

However, the N.P.V. of the projects 3, 4 and 5 is ₹ 1,91,000 which is more than the N.P.V. of projects 1, 3 and 5. Further, by undertaking projects 3, 4 and 5 no money will remain unspent. Therefore, S Ltd. is advised to undertake investments in projects 3, 4 and 5.

Illustration 10.

Electromatic Excellers Ltd. specialise in the manufacture of novel transistors. They have recently developed technology to design a new radio transistor capable of being used as an emergency lamp also. They are quite confident of selling all the 8,000 units that they would be making in a year. The capital equipment that would be required will cost ₹ 25 lakhs. It will have an economic life of 4 years and no significant terminal salvage value.

During each of the first four years promotional expenses are planned as under:

₹

1st Year	1	2	3	4
Advertisement	1,00,000	75,000	60,000	30,000
Others	50,000	75,000	90,000	1,20,000
Variable cost of production and selling expenses: ₹250 per unit				

Additional fixed operating costs incurred because of this new product are budgeted at ₹75,000 per year.

The company's profit goals call for a discounted rate of return of 15% after taxes on investments on new products. The income tax rate on an average works out to 40%. You can assume that the straight line method of depreciation will be used for tax and reporting.

Work out an initial selling price per unit of the product that may be fixed for obtaining the desired rate of return on investment.

Present value of annuity of ₹ 1 received or paid in a steady stream throughout 4 years in the future at 15% is 3.0079.

Solution:

Calculation of Selling Price

Let x be the selling price.

Evaluation under NPV method

Step 1:

Initial Investment = 25,00,000

Step 2:

PV of operating cash inflows per annum

A. Sales p.a.	=	8,000 X
B. Expenses		
Depreciation [(25,00,000 – 0) / 4]	=	6,25,000
Promotion Expenses	=	1, 50,000
Variable costs	=	20, 00,000
Fixed costs	=	75,000
		₹28,50,000

PBT (A-B)	= 8,000 X-28,50,000
Less: Tax at 40%	= 3,200 X-11,40,000
PAT	= 4,800 X-17,10,000
Add: Depreciation	6,25,000
Cash inflow after tax	= 4,800 X-10,85,000

At required return at 15%

PV of total cash inflow = outflow

[4,800 X – 10,85,000] x 3.0079 = 25,00,000

14,437.92 X – 32,63,572 = 25,00,000

14,437.92 X = 32,63,572 + 25,00,000

$$X = \frac{32,63,572 + 25,00,000}{14,437.92}$$

= 399.196

= 400

Initial selling Price = ₹ 400

Illustration 11.

A product is currently manufactured on a machine that is not fully depreciated for tax purposes and has a book value of ₹70,000. It was purchased for ₹2,10,000 twenty years ago. The cost of the product are as follows:

	Unit Cost
Direct Labour	₹28.00
Indirect labour	14.00
Other variable overhead	10.50
Fixed overhead	17.50
	70.00

In the past year 10,000 units were produced. It is expected that with suitable repairs the old machine can be used indefinitely in future. The repairs are expected to average ₹ 75,000 per year.

An equipment manufacturer has offered to accept the old machine as a trade in for a new equipment. The new machine would cost ₹4,20,000 before allowing for ₹1,05,000 for the old equipment. The Project costs associated with the new machine are as follows:

	Unit Cost
Direct Labour	₹14.00
Indirect labour	21.00
Other variable overhead	7.00
Fixed overhead	22.75
	64.75

The fixed overhead costs are allocations for other departments plus the depreciation of the equipment. The old machine can be sold now for ₹50,000 in the open market. The new machine has an expected life of 10 years and salvage value of ₹20,000 at that time. The current corporate income tax rate is assumed to be 50%. For tax purposes cost of the new machine and the book value of the old machine may be depreciated in 10 years. The minimum required rate is 10%. It is expected that the future demand of the product will stay at 10,000 units per year. The present value of an annuity of ₹ 1 for 9 years @ 10% discount factor = 5.759. The present value of ₹1 received at the end of 10th year @10% discount factor is = 0.386. Should the new equipment be purchased?

Solution:

Evaluation of replacement decision under NPV Method

Step 1: Calculation of PV of net cash outflow

Cost of new machine	4,20,000
Less: Exchange price for old machine	1,05,000
	3,15,000
Add: Tax on profit on exchange	
[1,05,000 – 70,000]	
[35,000 x 50%]	= 17,500
Net Investment	= 3,32,500

Step 2: Calculation of PV of incremental operating cash inflows for 10 years

	Existing	New	Incremental
Number of units	10,000	10,000	–
	₹	₹	₹
Variable cost per unit	52.5	42	1,05,000
Variable Cost	5,25,000	4,20,000	75,000
Repairs	75,000	--	[33,000]
Depreciation	7,000	40,000	
[2,10,000 – 70,000]/20			
[4,20,000 – 20,000]/10			
Total Savings before tax			1,47,000
Less: Tax at 50%			73,500
Savings after tax			73,500
Add: Depreciation			33,000
CIAT			1,06,500

Note: The allocations from other department are irrelevant for decision making.

Step 3: Calculation of terminal cash inflows

Salvage value of machine = ₹20,000

Step 4: Calculation of NPV:

Operating cash inflow from 1 to 9 years	₹
[1,06,500 x 5.759]	= 6,13,334
PV of cash inflow for 10th year = 48,829	
(1,06,500 + 20,000) x 0.386	
PV of total cash inflow	= 6,62,163
Less: Outflow	= 3,32,500
NPV	**= 3,29,663**

Comment:

Since NPV is positive, it is advised to replace the machine.

Note:

Since the exchange value is greater than open market value, the open market value is irrelevant.

Illustration 12.

Techtronics Ltd., an existing company, is considering a new project for manufacture of pocket video games involving a capital expenditure of ₹ 600 lakhs and working capital of ₹150 lakhs. The capacity of the plant is for an annual production of 12 lakh units and capacity utilisation during the 6-year working life of the project is expected to be as indicated below.

Year	Capacity utilisation (%)
1	33 1/3 %
2	66 2/3 %
3	90 %
4-6	100 %

The average price per unit of the product is expected to be ₹200 netting a contribution of 40%. Annual fixed costs, excluding depreciation, are estimated to be ₹480 lakhs per annum from the third year onwards; for the first and second year it would be ₹240lakhs and ₹360 lakhs respectively. The average rate of depreciation for tax purposes is 33 1/3% on the capital assets. No other tax reliefs are anticipated. The rate of income-tax may be taken at 50%.

At the end of the third year, an additional investment of ₹100 lakhs would be required for working capital.

The company, without taking into account the effects of financial leverage, has targeted for a rate of return of 15%.

You are required to indicate whether the proposal is viable, giving your working notes and analysis.

Terminal value for the fixed assets may be taken at 10% and for the current assets at 100%. Calculation may be rounded off to lakhs of rupees. For the purpose of your calculations, the recent amendments to tax laws with regard to balancing charge may be ignored.

Solution:

Evaluation of Expansion decision under NPV method

Step 1: ₹ In lakhs

Calculation of PV of cash outflow	
Cost of fixed asset at [t0] – 600 x 1	= ₹ 600
Cost of working capital at [t0] – 150 x 1	= ₹ 150
Additional WC required at [t3] – 100 x PVF 3yrs 15%	
- 100 x 0.66	= ₹ 66
PV of cash outflow	= ₹ 816

Step 2:

Calculation of PV of operating cash inflow for six years (working notes) = ₹ 826 lakhs

Step 3:

Calculation of PV of terminal cash inflow	₹ In lakhs
Salvage value of fixed assets[600 x 10/100]	= 60
Less: Tax on profit at 50% [60-53] x 50/100 = 3.5(rounded off)	= 4
	56
WC recovered [100%] [100 + 150]	= 250
	= 306

Its present value = 306 x PVAF 6 yrs 15%

= 306 x 0.432

= ₹ 132 lakhs

Step 4:

Calculation of NPV	₹ In lakhs
PV of total cash inflows	= ₹ 958
[Recurring + Terminal i.e., 826 + 132]	
Less: Outflow	= ₹ 816
NPV =	₹ 142

Comment:

As NPV is positive, it is advised to implement the new project.

Working Notes:

1. Calculation of Operating Cash Inflows

Year	Production	Contribution	Fixed expenses	Depreciation (WDV)	PBT	PAT	CIAT	PV at 15%	PV
1	400	320	240	200	(120)	(60)	140	0.870	121.80
2	800	640	360	133	147	74	207	0.756	156.49
3	1080	864	480	89	295	148	237	0.658	155.95
4	1200	960	480	59	421	210	269	0.572	153.87
5	1200	960	480	40	440	220	260	0.497	129.22
6	1200	960	480	26	454	227	253	0.432	109.29
PV of operating cash inflows for 6 years									**826.62**

Illustration 13:

From the following information determine the optimal combination of projects assuming that the projects are divisible and indivisible.

Project	Required Initial Investment	NPV at appropriate cost of capital
A_1	1,00,000	20,000
A_2	3,00,000	35,000
A_3	50,000	16,000
A_4	2,00,000	25,000
A_5	1,00,000	30,000

Solution:

When the projects are divisible:

Project	Profitability Index (PI)	Projects arranged in descending order of PI	Cumulative fund exhausted	Cumulative NPV
A_1	20,000/1,00,000 = 0.20	A_3 (0.32)	50,000	16,000
A_2	0.117	A_5 (0.30)	1,50,000	46,000
A_3	0.32	A_1 (0.20)	2,50,000	66,000
A_4	0.125	A_4 (0.125)	50,000 (₹ 2, 00,000 x ¼)	72,250
A_5	0.30	A_2 (0.117)	-	-
			3, 00,000	

Therefore the optimal combination of projects is A_3, A_5, A_1 and ¼ th of A_4.

When projects are indivisible:

Feasible Combination	Aggregate of NPVs (₹)
A_1A_3	36,000
A_1A_4	45,000
A_1A_5	50,000
A_3A_4	41,000
A_3A_5	46,000
A_4A_5	55,000
$A_1A_3A_5$	66,000

Here the optimal feasible project mix will be A_1,A_3,A_5 as the aggregate of their NPVs is maximum.

Illustration 14

Projects	NPV at appropriate cost of capital	Present Value of outlays	
		Period 1	Period 2
1	14	12	3
2	17	54	7
3	17	6	6
4	15	6	2
5	40	30	35
6	12	6	6
7	14	48	4
8	10	36	3
9	12	18	3

In this case the selection process is subject to restrictions on the total amount of investment in each of the periods: ₹ 50 in period 1 and ₹ 20 in period 2. Formulate a linear programming problem to determine the optimal project mix.

Solution:

Let Xj (j=1,2,……,9) denote the proportion of the j th project which is executed. The LP model can be written as:

Maximize NPV = $14 X_1 + 17 X_2 + 17 X_3 + 15 X_4 + 40 X_5 + 12 X_6 + 14 X_7 + 10 X_8 + 12 X_9$

Subject to the two budget constraints:

$12 X_1 + 54 X_2 + 6 X_3 + 6 X_4 + 30 X_5 + 6 X_6 + 48 X_7 + 36 X_8 + 18 X_9 \leq 50$

$3 X_1 + 7 X_2 + 6 X_3 + 2 X_4 + 35 X_5 + 6 X_6 + 4 X_7 + 3 X_8 + 3 X_9 \leq 20$

$0 \leq Xj \leq 1$ (j = 1, 2,… ,9).

Study Note - 2

EVALUATION OF RISKY PROPOSALS FOR INVESTMENT DECISIONS

This Study Note includes

2.1 Investment Decisions under uncertainties

2.2 Effect of Inflation on Capital Budgeting Decisions

2.3 Senitivity Analysis, Certainty Equivalent Approach, Decision Tree Analysis, Standard Deviation in Capital Budgeting, Risk Adjusted Discount Rate, Options in Capital Budgeting

2.1 INVESTMENT DECISIONS UNDER UNCERTAINTIES

Uncertainty refers to the outcomes of a given event which are too unsure to be assigned probabilities, while **Risk** refers to a set of unique outcomes for a given event which can be assigned probabilities. In investment decisions, cash outflows and cash inflows over the life of the project are estimated and on the basis of such estimates, decisions are taken following some appraisal criteria (NPV, IRR, etc.). Risk and uncertainties are involved in the estimation of such future cash flows as it is very difficult to predict with certainty what exactly will happen in future. Therefore, the risk with reference to capital budgeting is referred to as the variability in actual returns of a project over its working life in relation to the estimated return as forecast at the time of the initial capital budgeting decision. The difference between the risk and uncertainty, therefore, lies in the fact that variability is less in risk than in uncertainty.

So, the risk exists when the decision maker is in a position to assign probabilities to various outcomes. This happens when the decision maker has some historical data on the basis of which he assigns probabilities to other projects of the same type.

Different techniques that are used to deal with the risk and uncertainties in capital investment decisions are briefly discussed below.

- **Pay Back Period:** The firms using pay back period in investment decisions considers risk and uncertainties indirectly. The principle for selection of projects under pay back period is that lower the pay back period, better is the project. Therefore, project with the lowest pay back period is ultimately selected and thereby risk and uncertainties of the longer future is avoided through recovery of initial investments at the earliest opportunity.
- **Risk Adjusted Discount Rate (RAD):**

  Any investor usually expects higher return for taking higher risk. The same concept is incorporated in the Risk Adjusted Discount Rate (RAD) Method of dealing with risk in the context of capital investment decisions. If the risk of the project is similar to the existing project, the weighted average cost of capital is used as the discounting rate. But, if the project involves higher risk, a higher discounting rate is used for adjusting the risk involved. The discounting rate over and above the weighted average cost of capital is known as risk premium. The risk premium takes care of the project risk and may vary from project to project depending on the risk involved in it. So, RAD rate is the aggregate of weighted average cost of capital and risk premium. Due to increase in the discount rate, present value will be less and value of NPV or IRR, etc., will be less and more conservative estimate of benefits will take care of risk and uncertainties. The risk-adjusted discount rate method can be formally expressed as follows:

  Risk-adjusted Discount Rate = Weighted Average Cost of Capital (k) + Risk Premium (Ø)

  Under capital asset pricing model, the risk premium is the difference between the market rate of return and the risk free rate multiplied by the beta of the project.

The risk adjusted discount rate accounts for risk by varying the discount rate depending on the degree of risk of investment projects. A higher rate will be used for riskier projects and a lower rate for less risky projects. The net present value will decrease with increasing risk adjusted rate, indicating that the riskier a project is perceived, the less likely it will be accepted. If the risk free rate is assumed to be 10%, some rate would be added to it, say 5%, as compensation for the risk of the investment, and the composite 15% rate would be used to discount the cash flows.

- **Certainty Equivalent (CE) Approach**

  Under this approach, the estimated cash flows over the life of the project proposal, i.e., risky cash flows, are converted to its certainty equivalent. Certainty equivalent of estimated cash flow will indicate the cash flows that are likely to be received with almost certainty (certain cash flows or riskless cash flows) and the certain cash flows are derived through multiplying the estimated risky cash flows of the future periods by Certainty Equivalent Co-efficient of the respective periods.

  CE Co-efficient = Riskless cash flow / Risky cash flow

  Riskless or Certain Cash Flows of period 't' = Estmated or risky cash flows of period 't' (CF_t)
  × CE Co-efficient of period 't' (α_t)

  Simbolically,

  Riskless $Cashflow_t = \alpha_t CF_t$

  The CE Co-efficient (a_t) is a fractional amount that assumes a value between 0 and 1 and there is an inverse relationship between the degree of risk and the value of co-efficient.

  NPV is calculated with present value of risk less or certain cash flows using risk free rate.

  Therefore, NPV = $\sum_{t=1}^{n} \frac{\alpha_t CF_t}{(1+i)^t}$, where 'i' is the risk free rate, CF_0 = Cash outlay at the initial period (i.e. period '0')

  and CF_1, CF_2,.....CF_n are the Risky or Uncertain Cash Inflows from year 1 to year 'n' and a_t is the CE Co-efficient.

  It may be observed that the major difference between the RADR and CE methods is that the RADR method adjusts for risk in the discount rate while the CE method adjusts the cash flows for risk and then discounts at a risk-free rate of interest.

- **Standard Deviation in Capital Budgeting**

  Standard Deviation is considered as the best measure of dispersion or variability. Higher value of standard deviation indicates higher variability and vice versa. Higher variability means higher risk. As future cash flows cannot be estimated with certainty, it involves risk. Therefore, risk in investment analysis can be measured using standard deviation. Investment proposal with lower standard deviation will indicate lower variability in cash flow estimates, hence such investment proposal may be preferred to the proposal having higher standard deviation. For comparing different alternative investment proposals, coefficient of variation is preferred to standard deviation because coefficient of variation is a relative measure (which is derived through dividing standard deviation by expected NPV) while standard deviation is an absolute measure.

Hillier's Model & Hentz's Model

Hillier's Model

H.S.Hillier argues that the uncertainty or the risk associated with a capital expenditure proposal is shown by the standard deviation of the expected cash flows. In other words, the more certain a project is lesser would be the deviation of various cash flows from the mean cash flows. Let us take the example of a bank deposit where the rate of interest stipulated is subject to changes according to the Reserve Bank Regulations. It is also known with a fair degree of certainty that even if the rate of interest is revised downwards or upwards, such changes are not quite high. But in case of any business, actual cash flows and estimated cash flows may widely differ because of existence of many factors, which are difficult to predict with certainty, affecting the cash flows. Now there may be

at best two or three possible cash flows: the first at the contracted rate of interest, the second at a rate of interest one step higher and third at a rate of interest two steps higher. It is quite obvious that the standard deviation of this proposal would be much lower as compared to the standard deviation of the cash flows related to an investment proposal. In the latter case there are a large number of variables which would affect the cash inflows and therefore, the variation in the cash inflows would be much higher resulting in a higher standard deviation. Hillier argues that working out the standard deviation of the various ranges of possible cash flows would be helpful in the process of taking cognisance of uncertainty involved with future projects.

Hillier has developed a model to evaluate the various alternative cash flows that may arise from a capital expenditure proposal. He considers the correlation of cash flows from year to year. Accordingly, cash flows may be independent, i.e., uncorrelated, perfectly correlated or neither uncorrelated nor perfectly correlated, say, moderately If:

(i) If cash flows are uncorrelated: Standard Deviation of the NPV of the project is calculated in the following way.

$$S.D.(\sigma) = \sqrt{[\Sigma\, \sigma_t^2 / (1+i)^{2t}]}$$

(ii) If the cash flows over the life of the project are perfectly correlated, the Standard Deviation is determined using the formula given below.

$$S.D.(\sigma) = [\Sigma\, \sigma_t / (1+i)^t]$$

In the above formula, 'i' denotes risk free interest rate and 'σ_t'denotes Standard Deviation of cash flows occurring at 't'-th period.

Example:

A project having a life of 3 years and involving an outlay of Rs. 500000 has the following benefits associated with it.

Year 1		Year 2		Year 3	
Net Cash Flows (₹)	Prob.	Net Cash Flows (₹)	Prob.	Net Cash Flows (₹)	Prob.
15000	0.3	10000	0.2	15000	0.3
25000	0.4	20000	0.6	25000	0.4
35000	0.3	30000	0.2	35000	0.3

Caculate ENPV and S.D (NPV), assuming that risk free rate is 6% and k is 12%.

Solution:

Expected NPV (ENPV) = P.V. of Expected Cash Inflows – PV of outflows

= 25000/1.06 + 20000/ 1.06^2 + 25000/1.06^3 – 50000 = ₹12375

Year 1					Year 2					Year 3				
NCF	p	y	py	py^2	NCF	p	y	py	py^2	NCF	p	y	py	py^2
15000	0.3	-1	-0.3	0.3	10000	0.2	-1	-0.2	0.2	15000	0.3	-1	-0.3	0.3
25000	0.4	0	0	0	20000	0.6	0	0	0	25000	0.4	0	0	0
35000	0.3	1	0.3	0.3	30000	0.2	1	0.2	0.2	35000	0.3	1	0.3	0.3

NCF has been reduced by change of scale (division) and change of origin (subtraction) and reduced value is denoted by 'y'.

However, S.D. is independent of change of origin but dependent on change of scale. Therefore, S.D. of y needs adjustment for change of scale only.

$S.D_1 = \sqrt{(0.6 - 0)} = 0.7746$ $S.D_2 = \sqrt{(0.4 - 0)} = 0.6325$ $S.D_3 = \sqrt{(0.6 - 0)} = 0.7746$

After adjusting for change of scale,

$S.D_1$ = 7746 $S.D_2$ = 6325 $S.D_3$ = 7746

(i) Independent cash flow over time

σ (NPV) = $\sqrt{\sum SD_t^2}$ / **$(1+i)^{2t}$ = ₹11286**

(ii) For Perfectly Correlated Cash Flows

σ (NPV) = $\sum SD_t$ / **$(1+i)^t$ = ₹ 19440**

It may be noted that S.D. is higher in case of perfectly correlated cash flows over the life of the project.

If cash flows are neither perfectly correlated nor uncorrelated, NPV will be calculated considering joint probabilities (i.e., conditional probabilities) of the series of cash flows occurring over the life of the project and thereafter Standard Deviation of NPV will be calculated. For example, for a project with a life of 2 years, if one of the cash flow estimates of 2nd year is ₹10,000 with a probability of 0.4 corresponding to the cash flow of the 1st year of ₹8,000 with probability of 0.3, probability of occurring cash flow of ₹10,000 in the 2nd year is 0.4×0.3 or 0.12 provided cash flow of the 1st year is ₹8,000.

Hertz's Model

Hertz has suggested that simulation technique which is a highly flexible tool of operational research may be used in capital budgeting exercise. He argues that planning problems of a firm are so complex that they cannot be described by a mathematical model. Even if we do so we may make certain inherent assumption because of which the solution may not be reliable for practical purposes. Moreover, in most of the solutions, due to the uncertainties involved, a satisfactory mathematical model cannot be built. He, therefore suggests that a simulation model may be developed for the investment decision making also. The suggested model for introduction of a new product developed by Hertz is given below:

	Range	(Expected value)
1. Market size	1,00,000 — 3,40,000	(1,50,000)
2. Selling prices	385 — 575	(1,50,000)
3. Market growth rate	0 — 6%	(510)
4. Eventual share of market	3 — 17%	(3%)
5. Total investment required (for computing its cost)	7 — 10	(9.5)
6. Useful life of facilities	5 — 13	(10)
7. Residual value	35 — 50	(45)
8. Operating cost	370 — 545	(450)
9. Fixed cost	253 — 375	(300)

It is obvious that the above factors do have bearing on net present value. The discounted cash flow model would merely consider the expected value of each input variable (shown in brackets above). Its absurdity is to be seen from a simple example. Suppose that each of the expected value of these variables has 60% chances of being true (this is because these are estimates after all) the chances of all of them being true is only (0.6)9 = .01 (i.e. 1 in 100).

Hertz proposes that the distribution be described for each variable. This may be on the basis of past data and/ or by subjective estimate of the executives. The executives need to be aided by or expects to enable them to describe the distribution and its parameters. First of all the decision maker would be asked to pick up a value that he believes that there is the same chance of his estimate being too high as there is of its being too low. This furnishes the mean. For an ideal of the variability, he would be asked to select two points, one each side the mean and equally distant from it, so that he believed that the probability of the true value of mean being between these two points. Form this normal distribution may be derived.

Having derived the distributions of all the input variables, i.e., mean standard deviation and shape of distribution for each variable the simulation experiment may be performed by considering different levels of these factors. For example, in the first run a very high operating cost with a low market share, etc,. may be used for computing net present value. In the next run, it may be moderate operating cost with a very large market size. Similarly, large number of runs, it may be moderate operating cost with a very large market size. Similarly, large number of runs can be made which would cover most of the possible situations.

- **Use of Normal Probability Distribution (NPD)**

  NPD is a smooth, symmetric, continuous bell shaped curve. It can be used to analyse the risk element in capital budgeting.

Properties of NPD:

- The area under the Normal Curve is 1.
- The curve reaches its maximum at the expected value (Mean) of the distribution and one-half of the area lies on either side of the mean.
- About 50% (49.72%) of the area lies within ± 0.67 standard deviation of the expected value

  About 68% (68.26%) of the area lies within ± 1.00 standard deviation of the expected value

  About 95% (95.46%) of the area lies within ± 2.00 standard deviation of the expected value

  About 100% (99.74%) of the area lies within ± 3.00 standard deviation of the expected value,

  i.e., only 0.26% of the area lies outside ± 3.00 standard deviation.

Normal Probability Table may be used to determine the area under Normal Curve for various standard deviation (S.D.) and Probability of occurrence can be read from the Normal Probability Table. The Table is the 'right-tail' of the distribution.

The negative signs for the value of Z simply reflect that the value lies to the left of the mean value.

Example:

The project has a mean value of ₹800, S.D. of ₹400. The management wants to determine the probability of the NPV under the following ranges.

(i) Zero or less

(ii) Greater than zero

(iii) Between the range of ₹500 and ₹900

(iv) Between the range of ₹300 and ₹600

Solution:

(i) Z = (0 – 800) / 400 = -- 2 [Z = (Variable – Mean)/S.D.]

The figure Z = - 2 indicates that a NPV of 0 lies 2 S.D. to the left of the expected value of the probability distribution of possible NPV. From Normal Distribution Table, Prob of Z = 2 is 0.4772. So, P (NPV being Zero or Less) = 0.50 – 0.4772 = 0.0228 or 2.28%.

(ii) P (NPV being Greater tha Zero) = 1-- P (NPV being Zero or Less) = 1 -- .0228 = .9772 or 97.72%

(iii) Z_1 = (500 – 800) / 400 = -- 300/400 = -- 3/ 4 = -- 0.75

Z_2 = (900 – 800) / 400 = 100/400 = 1/ 4 = 0.25

Table Value of 0.75 = .2734 and 0.25 = .0987

P (NPV between 500 & 900) = .2734 + .0987 = .3721 or 37.21%

(iv) Z_1 = (300 – 800) / 400 = -- 500/400 = -- 5/ 4 = -- 1.25

Z_2 = (600 – 800) / 400 = -- 200/400 = -- 2/ 4 = -- 0.50

Table Value of 1.25 = ..3944 and 0.50 = ..1915

P (NPV between 500 & 900) = .3944 -- .1915 = .2029 or 20.29%

- **Decision Tree Analysis**

  Decision Tree Analysis is a useful tool for analysis of investment proposals incorporating project flexibility. The decision-tree method analyzes investment opportunities involving a sequence of decisions over time. Various decision points are defined in relation to subsequent chance events. The Expected NPV for each decision point is computed based on the series of NPVs and their probabilities that branch out or follow the decision point in question. In other words, once the range of possible decisions and chance events are laid out in tree-diagram form, the NPVs associated with each decision are computed by working backwards on the diagram from the expected cash flows defined for each path on the diagram. The optimal decision path is chosen by selecting the highest expected NPV for the first decision point.

The following is an example of a decision tree relating to an investment proposal.

Illustration 1.

(a) A firm has an investment proposal, requiring an outlay of ₹ 40,000. The investment proposal is expected to have 2 years' economic life with no salvage value. In year 1, there is a 0.4 probability that cash inflow after tax will be ₹ 25,000 and 0.6 probability that cash inflow after tax will be ₹30,000. The probabilities assigned to cash inflows after tax for the year 2 are as follows:

The Cash inflow year 1	₹25,000		₹30,000	
The Cash inflow year 2		Probability		Probability
	₹ 12,000	0.2	₹ 20,000	0.4
	₹ 16,000	0.3	₹ 25,000	0.5
	₹ 22,000	0.5	₹ 30,000	0.1

The firm uses a 12% discount rate for this type of investment.

Required:

(i) Construct a decision tree for the proposed investment project.

(ii) What net present value will the project yield if worst outcome is realized? What is the probability of occurrence of this NPV?

(iii) What will be the best and the probability of that occurrence?

(iv) Will the project be accepted?

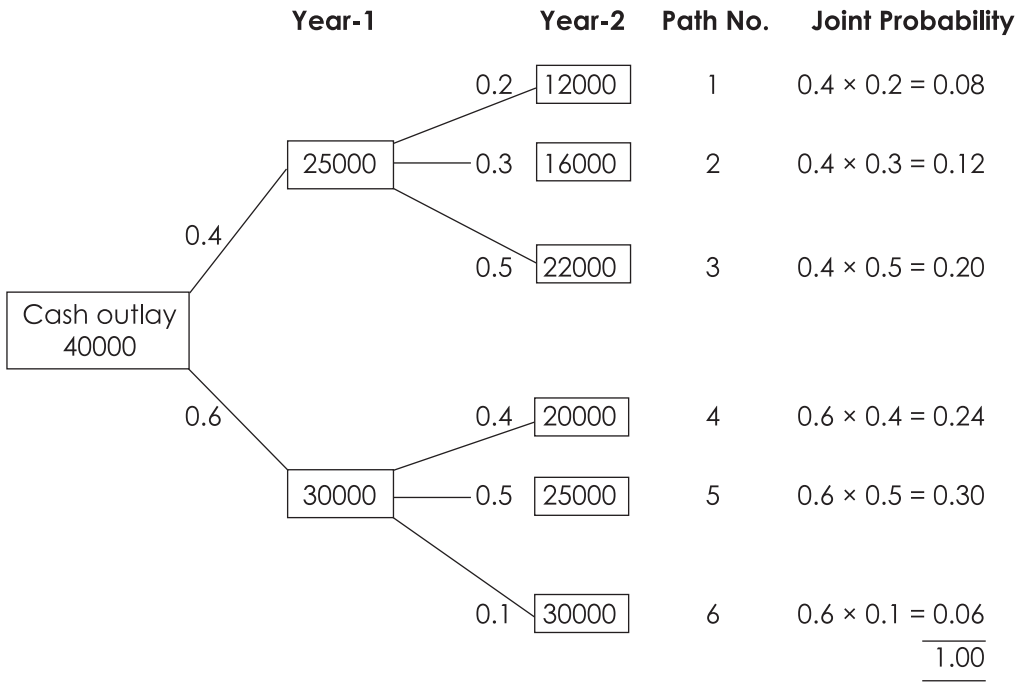
(12% Discount factor 1 year 0.8929

2 year 0.7972)

(b) Do the profitability index and the NPV criterion of evaluating investment proposals lead to the same acceptance – rejection and ranking decisions? In what situations will they give conflicting results?

Solution:

(i)



The decision tree given above shows that there are six possible outcomes each represented by a path. The net present value of each path at 12% discount rate is given below: (Fig in ₹)

Path	(Cash inflow year 1 x discount factor year 1)	(Cash inflow year 2 x discount factor year 2)	Total Cash inflow	Cash outflow	Net present value
	(a)	(b)	(c) = (a) + (b)	(d)	(e) = (c) – (d)
			₹	₹	₹
1	(₹ 25,000 × 0.8929) = 22,323	(₹ 12,000 × 0.7972) = 9,566	31,889	40,000	-8,111
2	(₹ 25,000 × 0.8929) = 22,323	(₹ 16,000 × 0.7972) = 12,755	35,078	40,000	-4,922
3	(₹ 25,000 × 0.8929) = 22,323	(₹ 22,000 × 0.7972) = 17,538	39,861	40,000	-139
4	(₹ 30,000 × 0.8929) = 26,787	(₹ 20,000 × 0.7972) = 15,944	42,731	40,000	2,731
5	(₹ 30,000 × 0.8929) = 26,787	(₹ 25,000 × 0.7972) = 19,930	46,717	40,000	6,717
6	(₹ 30,000 × 0.8929) = 26,787	(₹ 30,000 × 0.7972) = 23,916	50,703	40,000	10,703

Statement showing the expected Net Present Value

Path	Net present value @ 12% (Refer above)	Joint probability (Refer above)	Expected Net present value
	(a)	(b)	(a) × (b)
1	-8,111	0.08	-648.88
2	-4,922	0.12	-590.64

3	-139	0.20	-27.80
4	2,731	0.24	655.44
5	6,717	0.30	2,015.10
6	10,703	0.06	642.18
			2,045.40

(ii) If the worst outcome is realized the Net present value which the project will yield is ₹ 8,111 (negative). The probability of occurrence of this Net present value is 8%.

(iii) The best outcome will be path 6 when Net present value is higher i.e. ₹ 10,703 (positive). The probability of occurrence of this Net present value is 6%.

(iv) Yes, the project will be accepted since the Expected Net present value x probability sum total is positive.

(b) In most of the situations the Net present value method (NPV) and Profitability Index (PI) yield same accept or reject decision. In general terms, under PI method a project is acceptable if profitability index value is greater than 1 and rejected if it is less than 1. Under NPV method a project is acceptable if Net present value of a project is positive and rejected if it is negative. Clearly a project offering a profitability index greater than 1 must also offer a net present value which is positive. But a conflict may arise between two methods if a choice between mutually exclusive projects has to be made. Consider the following example:

	Project A	**Project B**
PV of Cash inflows	2,00,000	1,00,000
Initial cash outflows	1,00,000	40,000
Net present value	1,00,000	60,000
P.I.	$\frac{2,00,000}{1,00,000} = 2$	$\frac{1,00,000}{40,000} = 2.5$

According to NPV method, project A would be preferred, whereas according to profitability index method project B would be preferred. This is because Net present value gives ranking on the basis of absolute value of rupees. Whereas profitability index gives ranking on the basis of ratio. Although PI method is based on NPV, it is a better evaluation technique than NPV in a situation of capital rationing.

Illustration 2.

A firm has an investment proposal, requiring an outlay of ₹ 80,000. The investment proposal is expected to have two years economic life with no salvage value. In year 1, there is a 0.4 probability that cash inflow after tax will be ₹ 50,000 and 0.6 probability that cash inflow after tax will be ₹60,000. The probability assigned to cash inflow after tax for the year 2 are as follows:

The cash inflow year 1	₹ 50,000		₹ 60,000	
The cash inflow year 2	Probability		Probability	
	₹ 24,000	0.2	₹ 40,000	0.4
	₹ 32,000	0.3	₹ 50,000	0.5
	₹ 44,000	0.5	₹ 60,000	0.1

The firm uses a 8% discount rate for this type of investment.

Required:

(i) Construct a decision tree for the proposed investment project and calculate the expected net present value (NPV).

(ii) What net present value will the project yield, if worst outcome is realized? What is the probability of occurrence of this NPV?

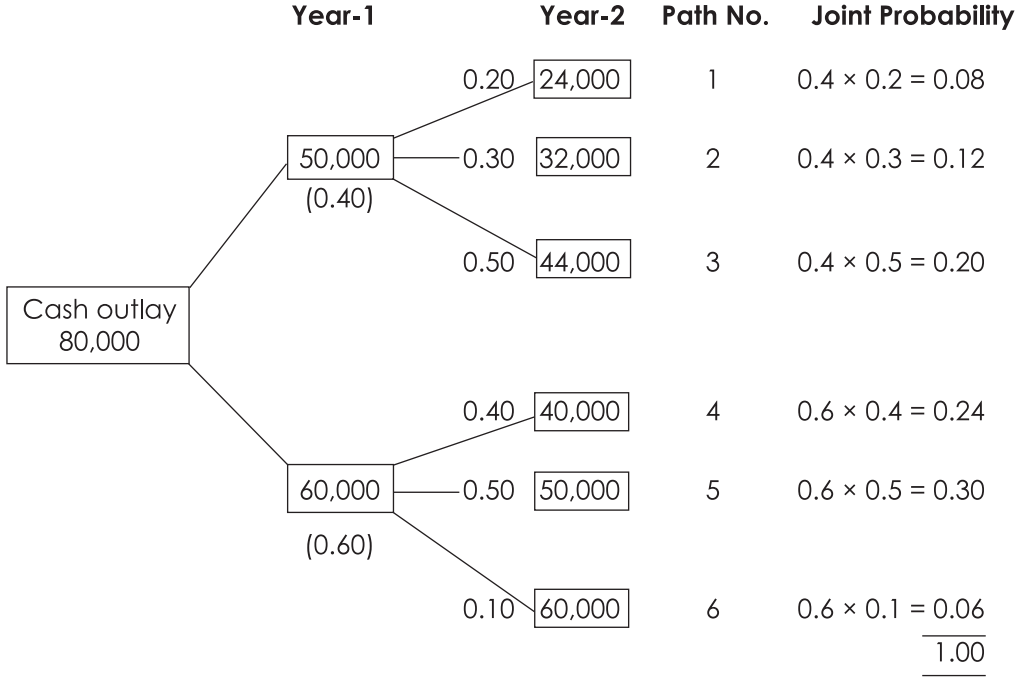
(iii) What will be the best outcome and the probability of that occurrence?

(iv) Will the project be accepted?

(Note: 8% discount factor 1 year 0.9259; 2 year 0.8573)

Solution:

(i) The decision tree diagram is presented in the chart, identifying various paths and outcomes, and the computation of various paths/outcomes and NPV of each path are presented in the following tables:



The Net Present Value (NPV) of each path at 8% discount rate is given below:

Path	Year 1 Cash Flows (₹)	Year 2 Cash Flows (₹)	Total Cash Inflows (PV) (₹)	Cash Outflows (₹)	NPV (₹)
1	50,000×.9259= 46,295	24,000×.8573= 20,575	66,870	80,000	(—) 13,130
2	50,000×.9259= 46,295	32,000×.8573= 27,434	73,729	80,000	(—) 6,271
3	50,000×.9259= 46,295	44,000×.8573= 37,721	84,016	80,000	4,016
4	60,000×.9259= 55,554	40,000×.8573= 34,292	89,846	80,000	9,846
5	60,000×.9259= 55,554	50,000×.8573= 42,865	98,419	80,000	18,419
6	60,000×.9259= 55,554	60,000×.8573= 51,438	1,06,992	80,000	26,992

Statement showing Expected Net Present Value ₹

Path	NPV(₹)	Joint Probability	Expected NPV
1	(—) 13,130	0.08	—1,050.40
2	(—) 6,271	0.12	—752.52
3	4,016	0.20	803.20
4	9,846	0.24	2,363.04
5	18,419	0.30	5,525.70
6	26,992	0.06	1,619.52
			8,508.54

Conclusions:

(ii) If the worst outcome is realized the project will yield NPV of – ₹13,130. The probability of occurrence of this NPV is 8% and a loss of ₹ 1,050.40 (path 1).

(iii) The best outcome will be path 5 when the NPV is at ₹ 18,419. The probability of occurrence of this NPV is 30% and an expected profit of ₹ 5,525.70.

(iv) The project should be accepted because the expected NPV is positive at ₹ 8,508.54 based on joint probability.

2.2 EFFECT OF INFLATION ON CAPITAL BUDGETING DECISIONS

Concept of Inflation

The term 'Inflation' refers to the increase in general price level of goods and services. Due to such increase in price level, value of money decreases. As a result, more money is required to acquire same quantity of goods and services or less quantity can be procured with the same amount of money. For example, a person can purchase 5 kg of apple with ₹100 at present, i.e., at ₹20 per kg. If rate of inflation is 5%, the price per kg will be ₹21 and the person would require ₹105 to buy the same quantity (5 kg) of apples, or would get less than 5 kg (₹100/₹21 = 4.76 kg), of apple for ₹100. The causes of inflation are generally attributed to increase in aggregate demand due to increase in private and government spending (Demand Pull Inflation) or drop in aggregate supply of goods and services due to natural disasters, increase in the price of inputs, etc., for which cost increases (Supply Shock Inflation or Cost Push Inflation).

Rate of inflation is measured by observing the change in the price of a specified number of goods and services in an economy over a period of time, usually based on data collected by government agencies and an index is determined to indicate the inflation rate. The some of the widely used measures of inflation include: Consumer Price Index (CPI), Producer Price Index (PPI), Wholesale Price Index (WPI), Commodity Price Index, etc.

Impact of Inflation on Investment Analysis

The Capital Investment Analysis will be unrealistic if the impact of inflation is not properly incorporated. As the cash flows of future periods over the life of the project are considered for the analysis and price level does not remain same over such period (usually price level increases over time, i.e., inflationary situation), the nominal value of cash flow estimates will not reflect the real purchasing power resulting in the distortion in the capital budgeting decisions. In order to reflect the true picture, cash flows should be adjusted to accommodate the effect of the inflation. The process of adjustment for inflation is as follows.

Nominal or Money Cash Flows are discounted with the Inflation Rate (IR) to arrive at the Real Cash Flows.

Real Cash Flows are discounted with the Real Discount Rate (RDR) to get the Present Value.

Alternatively, Nominal Cash Flows may be discounted with the Nominal Discount Rate (NDR) directly to get the Present Value.

So, either a two-stage process – (i) finding out the real cash flow by discounting the nominal cash flow with the inflation rate and (ii) the real cash flows are discounted with the real discount rate to get the present value of the real cash flows – or a single stage process may be followed to get the present value of real cash flows directly discounting the money / nominal cash flows with the nominal discount rate which incorporates both the inflation rate and real discount rate as shown below.

Real Cash Flows = Nominal Cash Flows of the Period 't' ÷ (1 + Inflation Rate)^t

Present Value of Real Cash Flows = Real Cash Flows of the period 't' as calculated above ÷ (1+ RDR)^t

Alternatively,

Present Value of Real Cash Flows = Nominal Cash Flows of the period 't' ÷ (1+ NDR)^t

It may be noted that *Nominal or Money Cash Flows* are the actual amount expected to arise in future while *Real Cash Flows* are the nominal cash flows expressed in terms of real values representing purchasing power. Therefore, it is prudent to use the real cash flows for analysis instead of money or nominal cash flows.

Relationship between NDR and RDR:

1 + Nominal Discount Rate = (1 + Real Discount Rate) (1 + Inflation Rate)

or, NDR = (1 + RDR) (1 + IR) – 1

It may be observed from the above equation, Nominal Discount Rate contains two elements – Real Discount Rate and Inflation Rate. Real Discount Rate helps maintaining the shareholders wealth and Inflation Rate is the compensation for giving up the purchasing power today for a purchasing power in future.

Example:

Initial Outlay ₹24 lakh. Life 4 years. Annual PBDT ₹10 lakh. Income Tax Rate 40%. Inflation Rate 5%. Real Discount Rate (Cost of Capital 10%).

In absence of Inflation:

Year	PBDT	Depreciation	PBT	Tax	PAT	Cash Flow
0						– 2400000
1 - 4	10,00,000	600000	400000	160000	240000	840000

In absence of Inflation, NPV will be as follows:

PV of Cash Inflows = 840000 x (0.9091 + 0.8264 + 0. 7513 + 0.6830) = ₹26,62,632

Less PV of Cash Outflows (Initial Outlay) = ₹24,00,000

NPV = ₹2,62,632

As the NPV is positive, the project is acceptable.

With 5% Inflation, Nominal Cash Inflow will be discounted with Inflation Rate for finding out the Real Cash Flow and thereafter Real Cash Inflow will be discounted with Real Discount Rate to get the present value.

	Year 1	2	3	4
Nominal Cash Inflow after Tax (₹):	8,40,000	8,40,000	8,40,000	8,40,000
Real Cash Inflow	8,00,000	7,61,905	7,25,624	6,91,070
(Nominal Cash Inflow / (1+ Inflation Rate)				
PV of Real Cash Inflow	7,27,273	6,29,674	5,45,172	4,72,010

(Real Cash Flow / (1+ Real Discount Rate, K)

Total PV of Real Cash Inflows: ₹23,74,129

PV of Cash Outflow (Initial Outlay): ₹24,00,000

NPV ₹ (-) 25,871

The project is not acceptable as NPV is negative.

Alternatively, the Nominal Cash Inflows may be discounted with the Nominal Discount Rate.

Nominal Discount Rate = 1 – (1+IR)(1+RDR)

NDR = 1- (1+0.05)(1+0.10) = 1- 1.155 = 0.155 or 15.5%

PV of Real Cash Inflows = 8,40,000 x $(1/1.155 + 1/1.155^2 + 1/1.155^3 + 1/1.155^4)$ = 23,74,176

NPV (after considering inflation) = ₹(23,74,176 – 24,00,000) = ₹(-) 25,824

[**N.B.** Two results are same, difference between two figures (₹25871 & ₹25,824) is due to approximation of discounting factors.]

The project is not acceptable as NPV is negative.

2.3 SENSITIVITY ANALYSIS, CERTAINTY EQUIVALENT APPROACH, DECISION TREE ANALYSIS, STANDARD DEVIATION IN CAPITAL BUDGETING, RISK ADJUSTED DISCOUNT RATE, OPTIONS IN CAPITAL BUDGETING

SENSITIVITY ANALYSIS

Sensitivity analysis in the context of capital budgeting decisions refers to the analysis of impact of changes in the underlying variables or parameters on the decisions regarding acceptance or rejection of the investment proposal. If NPV method is followed for financial appraisal, the changes in the factors or variables or parameters on the basis of which NPV is determined (i.e., Cash Outlay, Cash Inflow, Discounting Factor, Life of the Project) are taken into consideration. While analyzing the sensitivity, change in each of the variables is considered one by one and other variables are taken as constant, that means, when impact of changes in cash inflow is considered, the other elements, viz., Cash outflow, discount rate, life of the project, are taken as remaining unchanged (changing one variable at a time, keeping other variables unchanged). Similarly, when changes in discount rate is considered, other elements, i.e., cash outlay, cash inflow and life of the project, are taken as remaining unchanged and so on. The objective of the sensitivity analysis is to measure the impact of changes in the parameters on the decision criteria and identify the key factors or parameters having more adverse impact on the decision criteria, hence, require more attention.

In other words, Sensitivity is the term used to describe the process where each estimated element of a project's cash flow is taken in turn (holding all other estimates constant) to see the extent to which it can vary before the project's positive expected net present value (ENPV) is reduced to zero, as zero NPV is the tolerance limit. Therefore, if the estimated element varies by more than this amount, then the decision advice given by the original estimate of the project's NPV will be incorrect. So, it may be said that sensitivity analysis measures to what extent the changes in the underlying variables of the measurement criteria, e.g., NPV, can be tolerated for acceptance of the project. For example, if NPV is ₹2,00,000, the project will remain acceptable even if the initial investment increases up to Rs.2,00,000, beyond which NPV will be negative and the project will be unacceptable. If the original estimated cost of the project is ₹10,00,000, it can be said that tolerance limit of increase in cost will be 20%, i.e., if cost increases by more than 20% of the original estimate, the project will not be acceptable. It may be noted that while measuring the impact of changes in cost (cash outlay), it has been assumed that other elements like cash inflow, discounting factor, life of the project are remaining unchanged.

Example:

Investment ₹1,00,000, Life 3 years, Annual Cash Inflows ₹2,00,000, Annual Cash Outflows ₹1,50,000, Appropriate Discount Rate 10%.

Expected NPV (ENPV) = -100000 + (200000 – 150000) (.909 + .826 + .751) = 24300

Taking each of the estimated factors in turn (and holding all others as constant at their initial estimated values), we shall examine the degree of variation necessary to reduce the ENPV of ₹24,300 to Zero.

Investment: Let the investment be X

- X + 50000 (.909 + .826 + .751) = 0

X = 50000 (.909 + .826 + .751) = 124300

So, the investment can be as high as ₹1,24,300 before the appraisal advice to invest becomes incorrect. In other words, if the original estimate increases by more than ₹24,300 or 24.30%, the NPV will be negative.

Life:

Let the life be X years.

- 100000 + 50000 $A_{x\,0.10}$ = 0

$A_{x,\,0.10}$ = 100000 / 50000 = 2

$A_{2,0.10}$ = 1.74 $A_{3,0.10}$ = 2.49 [i.e., (.909 + .826 + .751)]

Using simple interpolation, X = 2.35 years.

So, if the life of the asset decreases by more than 0.65 years or 21.67%, the ENPV will be negative.

Net Cash Flow (NCF):

Let the anuual NCF be X

- 100000 + X (.909 + .826 + .751) = 0

2.486 X = 100000

X = 100000 / 2.486 = 40225

Decrease in NCF that can be tolerated = 50,000 – 40225 = 9775

Percentage change = (9775/50,000) × 100 = 19.55%

So, if the NCF decreases by more than 9775 or 19.55%, the NPV will be negative

Discount Rate:

$-100000 + 50000\ A_{3,x} = 0$

$A_{3,x} = 100000 / 50000 = 2$

From Table,

$A_{3,0.20} = 2.11$ $A_{3,0.25} = 1.95$

Using simple interpolation, X = 0.234 or 23.4%

Discount rate can be increased from 10% to 23.4% or it can tolerate an increase of 134% in discount rate before ENPV becomes zero.

Results may be shown in summarized form through a Sensitivity Table as follows:

Element or Variable	**Sensitivity**
Initial Investment	24.30%
Net Cash Inflow	19.55%
Life	21.67%
Discount Rate	23.40%

Certainty Equivalent Approach, Decision Tree Analysis, Standard Deviation in Capital Budgeting and Risk Adjusted Discount Rate have been discussed above in Section 2.1 (Investment Decision under Uncertainties) as different methods of dealing with risk and uncertainties.

- **Options in Capital Budgeting**

  An Option is a special contract under which the option owner enjoys the right to buy or sell something, without any obligation to do the same. The option to buy is a 'call option' and the option to sell is a 'put option'. While there is no restriction of using option on the kind of asset, it is used most widely in financial assets, i.e., option on stocks. In the context of capital budgeting decisions, the opportunities that managers have are called managerial options or real options, involving the real assets, not financial assets. The following types of options (real options) are found in Capital Projects:

  (i) Option to delay the project

  (ii) Option to expand the project

  (iii) Option to abandon the project

  (iv) Option to change the outputs or inputs of the project.

The options provide the managers opportunity or flexibility to increase gains or reduce losses.

Value of Option = NPV with Option – NPV without Option

There are some important differences between the financial and real options.

(i) Decision making in financial option is relatively easier as the information required in valuing options and exercising them is readily available.

(ii) There is no ambiguity as to the exercise of a financial option but the holder of a real option is often unclear as to what the precise right is and how long the same will last.

Illustration 3.

(a) A company is considering two mutually exclusive projects X and Y. Project X costs ₹ 3,00,000 and Project Y ₹3,60,000. You have been given below the net present value, probability distribution for each project:

Project X		Project Y	
NPV Estimate (₹)	Probability	NPV Estimate (₹)	Probability
30,000	0.1	30,000	0.2
60,000	0.4	60,000	0.3
1,20,000	0.4	1,20,000	0.3
1,50,000	0.1	1,50,000	0.2

(i) Compute the expected net present value of Projects X and Y.

(ii) Compute the risk attached to each project i.e., Standard Deviation of each probability distribution.

(iii) Which project do you consider more risky and why?

(iv) Compute the profitability index of each project.

(b) Determine the risk adjusted net present value of the following projects:

	A	B	C
Net cash outlays (₹)	1,00,000	1,20,000	2,10,000
Project life	5 years	5 years	5 years
Annual cash inflow (₹)	30,000	42,000	70,000
Coefficient of variation	0.4	0.8	1.2

The company selects the risk-adjusted rate of discount on the basis of the co-efficient of variation:

Coefficient of variation	Risk adjusted rate of discount	Present value factor 1 to 5 years at risk adjusted rate of discount
0.0	10%	3.791
0.4	12%	3.605
0.8	14%	3.433
1.2	16%	3.274
1.6	18%	3.127
2.0	22%	2.864
More than 2.0	25%	2.689

Solution:

(a) **Project X**

NPV Estimate (N_i) (₹)	Probability (P_i)	NPV Estimate x Probability ($N_i - P_i$) (₹)	Deviation from Expected NPV i.e. ₹90,000 ($N_i - \bar{N}$) (₹)	Square of the deviation $(N_i - \bar{N})^2$ (₹)	Square of the deviation x Probability $(N_i - \bar{N})^2 \cdot P_i$ (₹)
30,000	0.1	3,000	–60,000	36,00,000,000	3,60,000,000
60,000	0.4	24,000	–30,000	9,00,000,000	3,60,000,000
1,20,000	0.4	48,000	30,000	9,00,000,000	3,60,000,000
1,50,000	0.1	15,000	60,000	36,00,000,000	3,60,000,000
Expected NPV		$\bar{N} = \Sigma N_i P_i =$ 90,000			14,40,000,000

Project Y

NPV Estimate (N_i) (₹)	Probability (P_i)	NPV Estimate x Probability ($N_i - P_i$) (₹)	Deviation from Expected NPV i.e. ₹90,000 ($N_i - \bar{N}$) (₹)	Square of the deviation ($N_i - \bar{N})^2$ (₹)	Square of the deviation x Probability ($N_i - \bar{N})^2 \cdot P_i$ (₹)
30,000	0.2	6,000	–60,000	36,00,000,000	7,20,000,000
60,000	0.3	18,000	–30,000	9,00,000,000	2,70,000,000
1,20,000	0.3	36,000	30,000	9,00,000,000	2,70,000,000
1,50,000	0.2	30,000	60,000	36,00,000,000	7,20,000,000
Expected NPV		90,000			19,80,000,000

(i) The expected net present value of Projects X and Y is ₹ 90,000 each.

(ii) Standard Deviation = $\sqrt{\text{Square of the deviation x probability}} = \sqrt{(N_i - \bar{N})^2 - p_i}$

In case of Project X : Standard Deviation = ₹ $\sqrt{14,40,000,000}$ = ₹ 37,947

In case of Project Y : Standard Deviation = ₹ $\sqrt{19,80,000,000}$ = ₹ 44,497

(iii) Coefficient of variation = $\frac{\text{Standard deviation}}{\text{Expected net present value}}$

In case of Project X : Coefficient of variation = $\frac{37,947}{90,000}$ = 0.42

In case of Project Y : Coefficient of variation = $\frac{44,497}{90,000}$ = 0.4944 or 0.50

Project Y is riskier since it has a higher coefficient of variation.

(iv) Profitability index = $\frac{\text{Discounted cash inflow}}{\text{Discounted cash outflow}}$

In case of Project X : Profitability Index = $\frac{90,000 + 3,00,000}{3,00,000} = \frac{3,90,000}{3,00,000}$ = 1.30

In case of Project Y : Profitability Index = $\frac{90,000 + 3,60,000}{3,60,000} = \frac{4,50,000}{3,60,000}$ = 1.25

(b) Statement showing the determination of the risk adjusted net present value

Pro-jects	Net cash outlays	Coefficient of variation	Risk adjust-ed discount rate	Annual cash inflow	PV factor 1-5 years at risk adjusted rate of discount	Discounted cash inflow	Net present value
	₹			₹	₹	₹	₹
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii) = (v) x (vi)	(viii) = (vii) - (ii)
A	1,00,000	0.4	12%	30,000	3.605	1,08,150	8,150
B	1,20,000	0.8	14%	42,000	3.433	1,44,186	24,186
C	2,10,000	1.20	16%	70,000	3.274	2,29,180	19,180

Illustration 4.

Skylark Airways is planning to acquire a light commercial aircraft for flying class clients at an investment of ₹ 50,00,000. The expected cash flow after tax for the next three years is as follows:

Year 1		Year 2		Year 3	
CFAT	Probability	CFAT	Probability	CFAT	Probability
14,00,000	0.1	15,00,000	0.1	18,00,000	0.2
18,00,000	0.2	20,00,000	0.3	25,00,000	0.5
25,00,000	0.4	32,00,000	0.4	35,00,000	0.2
40,00,000	0.3	45,00,000	0.2	48,00,000	0.1

The Company wishes to take into consideration all possible risk factors relating to an airline operations. The company wants to know:

(i) The expected NPV of this venture assuming independent probability distribution with 8 per cent risk free rate of interest.

(ii) The possible deviation in the expected value.

(iii) State the importance of standard deviation of the present value distribution in Capital Budgeting decisions?

Solution:

(i) Expected NPV (₹ in lakhs)

Year I			Year II			Year III		
CFAT	**P**	**CF×P**	**CFAT**	**P**	**CF×P**	**CFAT**	**P**	**CF×P**
14	0.1	1.4	15	0.1	1.5	18	0.2	3.6
18	0.2	3.6	20	0.3	6.0	25	0.5	12.5
25	0.4	10.0	32	0.4	12.8	35	0.2	7.0
40	0.3	12.0	45	0.2	9	48	0.1	4.8
$\bar{x}$ or $\overline{CF}$		27.0	$\bar{x}$ or $\overline{CF}$		29.3			$\bar{x}$ or $\overline{CF}$ 27.9

NPV	PV factor @ 8%	Discounted Figure
27	0.9259	25.00
29.3	0.8573	25.12
27.9	0.7938	22.15
	PV of cash inflow	72.27
	Less: Cash outflow	50.00
	NPV	**22.27**

(ii) Possible deviation in the expected value

Year I			
$X - \bar{X}$	$(X - \bar{X})^2$	P_1	$(X - \bar{X})^2 P_1$
14 – 27 = -13	169	0.1	16.9
18 – 27 = -9	81	0.2	16.2
25 – 27 = -2	4	0.4	1.6
40 – 27 = 13	169	0.3	50.7
			85.4

$\sigma_1 = \sqrt{85.4} = 9.241$

Year II			
$X - \bar{X}$	$(X - \bar{X})^2$	P_2	$(X - \bar{X})^2 \times P_2$
15-29.3 = -14.3	204.49	0.1	20.449

20-29.3 = -9.3	86.49	0.3	25.947
32-29.3 = 2.7	7.29	0.4	2.916
45-29.3 = 15.7	246.49	0.2	49.298
			98.61

$\sigma_2 = \sqrt{98.61} = 9.930$

Year III			
$X - \bar{X}$	$(X - \bar{X})^2$	P_3	$(X - \bar{X})^2 \times P_3$
18-27.9 = -9.9	98.01	0.2	19.602
25-27.9 = -2.9	8.41	0.5	4.205
35-27.9 = 7.1	50.41	0.2	10.082
48-27.9 = 20.1	404.01	0.1	40.401
			74.29

$\sigma_3 = \sqrt{74.29} = 8.619$

Standard deviation about the expected value:

$$\delta = \sqrt{\frac{85.4}{(1.08)^2} + \frac{98.61}{(1.08)^4} + \frac{74.29}{(1.08)^6}} = 13.8749$$

(iii) Standard deviation is a statistical measure of dispersion; it measures the deviation from a central number i.e. the mean.

In the context of capital budgeting decisions especially where we take up two or more projects giving somewhat similar mean cash flows, by calculating standard deviation in such cases, we can measure in each case the extent of variation. It can then be used to identify which of the projects is least riskier in terms of variability of cash flows.

A project, which has a lower coefficient of variation will be preferred if sizes are heterogeneous.

Besides this, if we assume that probability distribution is approximately normal we are able to calculate the probability of a capital budgeting project generating a net present value less than or more than a specified amount.

Illustration 5.

(a) Cyber Company is considering two mutually exclusive projects. Investment outlay of both the projects is ₹5,00,000 and each is expected to have a life of 5 years. Under three possible situations their annual cash flows and probabilities are as under:

₹

		Cash Flow	
Situation	**Probabilities**	**Project A**	**Project B**
Good	0.3	6,00,000	5,00,000
Normal	0.4	4,00,000	4,00,000
Worse	0.3	2,00,000	3,00,000

The cost of capital is 9 per cent, which project should be accepted? Explain with workings.

(b) A company is considering Projects X and Y with following information:

Project	Expected NPV (₹)	Standard deviation
X	1,06,000	75,000
Y	2,40,000	1,35,000

(i) Which project will you recommend based on the above data?

(ii) Explain whether your opinion will change, if you use coefficient of variation as a measure of risk.

(iii) Which measure is more appropriate in this situation and why?

Solution:

(a) Project A

Expected Net Cash flow (ENCF)

0.3 (6,00,000) + 0.4 (4,00,000) + 0.3 (2,00,000) = 4,00,000

$\sigma^2 = 0.3\ (6,00,000 - 4,00,000)^2 + 0.4\ (4,00,000 - 4,00,000)^2 + 0.3\ (2,00,000 - 4,00,000)^2$

$\sigma = \sqrt{24,00,00,00,000}$

σ = 1,54,919.33

ENPV = 4,00,000 × 3.890 = 15,56,000

NPV = 15,56,000 – 5,00,000 = 10,56,000

Project B

ENCF = 0.3 (5,00,000) + 0.4 (4,00,000) + 0.3 (3,00,000) = 4,00,000

$\sigma^2 = 0.3\ (5,00,000 - 4,00,000)^2 + 0.4\ (4,00,000 - 4,00,000)^2 + 0.3\ (3,00,000 - 4,00,000)^2$

$\sigma = \sqrt{6,00,00,00,000}$

σ = 77,459.66

ENPV = 4,00,000 × 3.890 = 15,56,000

NPV = 15,56,000 – 5,00,000 = 10,56,000

Recommendation:

NPV in both projects being the same, the project should be decided on the basis of standard deviation and hence project 'B' should be accepted having lower standard deviation, means less risky.

(b) (i) On the basis of standard deviation project X be chosen because it is less risky than Project Y having higher standard deviation.

(ii) $CV_x = \frac{SD}{ENVP} = \frac{75,000}{1,06,000} = 0.71$

$CV_y = \frac{1,35,000}{2,40,000} = 0.5626$

On the basis of Co-efficient of Variation (C.V.) Project X appears to be more risky and Y should be accepted.

(iii) However, the NPV method in such conflicting situation is best because the NPV method is in compatibility of the objective of wealth maximisation in terms of time value.

Illustration 6.

The Globe Manufacturing Company Ltd. is considering an investment in one of the two mutually exclusive proposals – Projects X and Y, which require cash outlays of ₹ 3,40,000 and ₹ 3,30,000 respectively. The certainty-equivalent (C.E.) approach is used in incorporating risk in capital budgeting decisions. The current yield on government bond is 10% and this be used as the riskless rate. The expected net cash flows and their certainty-equivalents are as follows:

Project X			**Project Y**	
Year-end	Cash flow **(₹)**	C.E.	Cash flow **(₹)**	C.E.
1	1,80,000	0.8	1,80,000	0.9
2	2,00,000	0.7	1,80,000	0.8
3	2,00,000	0.5	2,00,000	0.7

Present value factors of ₹ 1 discounted at 10% at the end of year 1, 2 and 3 are 0.9091, 0.8264 and 0.7513 respectively.

Required:

(i) Which project should be accepted?

(ii) If risk adjusted discount rate method is used, which project would be analysed with a higher rate?

Solution:

(i) Statement showing Net Present Value of Project X

Year-end	**Cash flow (₹)**	**C.E.**	**Adjusted Cash flow (₹)**	**Present value factor at 10%**	**Total present value (₹)**
	(a)	(b)	(c) = (a) x (b)	(d)	(e) = (c) x (d)
1	1,80,000	0.8	1,44,000	0.9091	1,30,910
2	2,00,000	0.7	1,40,000	0.8264	1,15,696
3	2,00,000	0.5	1,00,000	0.7513	75,130
					321,736
Less: Initial investment					3,40,000
Net present value					(18,264)

Statement showing the Net Present Value of Project Y

Year-end	**Cash flow (₹)**	**C.E.**	**Adjusted Cash flow (₹)**	**Present value factor 10%**	**Total present value (₹)**
	(a)	(b)	(c) = (a) x (b)	(d)	(e) = (c) x (d)
1	1,80,000	0.9	1,62,000	0.9091	1,47,274
2	1,80,000	0.8	1,44,000	0.8264	1,19,002
3	2,00,000	0.7	1,40,000	0.7513	1,05,182
					3,71,458
Less: Initial investment					3,30,000
Net present value					**41,458**

Decision: Since the net present value of project Y is positive, the project Y should be accepted.

(ii) Since the certainty-equivalent (C.E.) Co-efficient of project X is lower than project Y, project X is riskier than project Y. Therefore, if risk adjusted discount rate method is used then project X would be analysed with a higher rate.

Illustration 7.

The management of Power Tech. Ltd. must choose whether to go ahead with either of two mutually exclusive projects A and B. The expected profits are as follows:

Particulars		Profit if there is strong demand	Profit/(loss) if here is weak demand
Option A	(₹)	4,000	(1.000)
Option B	(₹)	1,500	500
Probability of demand		0.3	0.7

a. What would be the decision based on expected values. If no information about demands were available?

b. What is the value of perfect information about demand?

Solution :

(a) If there were no information to help with the decision, the project with the higher EV of profit would be selected.

(₹)

Probability	Project A		Project B	
	Profit	EV	Profit	EV
0.3	4,000	1,200	1,500	450
0.7	(1,000)	(700)	500	350
1.0		500		800

Analysis : Project B would be selected. This is clearly the better option if demand turns out to be weak. However, if demand were to turn out to be strong, Project A would be more profitable. There is a 30% chance that this could happen.

(b) Perfect information will indicate for certain whether demand will be weak or strong. If demand is forecasted '*weak*' Project B would be selected. If demand is forecasted as '*strong*', Project A would be selected, and perfect information would improve the profit from ₹1,500, which would have been earned by selecting B to ₹ 4,000.

Forecast demand	Probability	Project chosen	Profit	EV of profit
Weak	0.7	B	500	350
Strong	0.3	A	4,000	1,200
EV of profit with perfect information				1,550

The Value of Perfect Information derives from the 0.3 probability that if demand is going to be strong, the information would reveal this fact, and the decision is changed from '*choose B*' to '*choose A*' thereby earning ₹ 2,500 more profit. The EV of the Value of Perfect Information is therefore 0.3 × ₹2,500 = ₹750. Another way of making this same calculation is as follows:

(₹)

EV of profit without Perfect Information (*i.e.*, choose B all the time)	800
EV of profit with Perfect Information	1,550
Value of Perfect Information	750

Analysis: Provide that the information does not cost more than ₹ 750 to collect, it would be worth having.

Illustration 8.

A manager is trying to decide which of the three mutually exclusive projects to undertake. Each of the projects could lead to varying net profits which are classified as outcomes I, II and III. The manager has constructed the following pay-off table or matrix (a conditional profit table).

Net profit if outcome turns out to be :

Project	I	II	III
A	50,000	65,000	80,000
B	70,000	60 ,000	75,000
C	90,000	80,000	55,000
Probability	0.2	0.6	0.2

Which project should be undertaken?

Solution:

If the project with the highest EV of profit were chosen, this would be project C. (₹)

Outcome	Probability	Project A EV	Project B EV	Project C EV
I	0.2	10,000	14,000	18,000
II	0.6	39,000	36,000	48,000
III	0.2	16,000	15,000	11,000
	1.0	65,000	65,000	77,000

However, if the maximum criterion were applied, the assessment would be as follows:

Project Selected	The worst outcome that could happen	Profit (₹)
A	I	50,000
B	II	60,000
C	III	55,000

Analysis: By choosing B, we are '*guaranteed*' a profit of at least ₹ 60,000, which is more than we would get from project A or C if the worst outcome were to occur for them. The decision would therefore be to choose project B.

Illustration 9.

A manager is trying to decide which of the three mutually exclusive projects to undertake. Each of the projects could lead to varying net profits which are classified as outcomes I, II and III. The manager has constructed the following pay-off table or matrix (a conditional profit table).

Net profit if outcome turns out to be:

Outcomes		Project		
(Net profit)	Probability	A	B	C
I (Worst)	0.2	50,000	70,000	90,000
II (Most likely)	0.5	85,000	75,000	1,00,000
III (Best)	0.3	1,30,000	1,40,000	1,10,000

Which project should be undertaken?

Which project is profitable, if minimax regret rule is applicable?

Solution:

If the project with the highest EV of profit were chosen, this would be project C. (₹)

Outcome	Probability	Project A EV	Project B EV	Project C EV
I (Worst)	0.2	10,000	14,000	18,000
II (Most likely)	0.5	42,500	37,500	50,000
III (Best)	0.3	39,000	42,000	33,000
	1.0	91,500	93,500	1,01,000

A table of regrets can be compiled, as follows, showing the amount of profit that might be foregone for each project, depending on whether the outcome is I, II or III.

Outcome	Project		
	A	B	C
I (Worst)	[90,000 – 50,000] = 40,000	[90,000 – 70,000] = 20,000	[90,000 – 90,000] = 0
II (Most likely)	[1,00,000 - 85,000] = 15,000	[1,00,000 - 75,000] = 25,000	[1,00,000 – 1,00,000] = 0
III (Best)	[1,40,000 – 1,30,000] = 10,000	[1,40,000 – 1,40,000] = 0	[1,40,000 – 1,10,000] = 30,000

Analysis: The **maximum regret** is 40,000 with project A, 25,000 with B and 30,000 with C. The lowest of these three maximum regrets is 25,000 with B, and so **project B would be selected** if the minimax regret rule is used.

Note: The **minimax regret rule** aims to **minimize the regret from making the wrong decision**. **Regret** is the **opportunity lost through making the wrong decision**.

Illustration 10.

A Production Manager is planning to produce a new product and he wishes to estimate the raw material requirement for that new product. On the basis of usage for a similar product introduced previously, he has developed a frequency distribution of demand in tonnes per day for a two month period. Use this data to simulate the raw material usage requirements for 7 days. Compute also the expected value and comment on the result.

Demand Tonnes/day	Frequency No. of days
10	6
11	18
12	15
13	12
14	6
15	3

Random Number : 27, 13, 80, 10, 54, 60, 49.

Solution:

Demand Tonnes/day	Frequency No. of days	Probability	Cumulative Probability	Random Numbers
10	6	6÷60 = 0.10	0.10	00 - 09
11	18	18÷60 = 0.30	0.40	10 - 39
12	15	15÷60 = 0.25	0.65	40 - 64
13	12	12÷60 = 0.20	0.85	65 - 84
14	6	6÷60 = 0.10	0.95	85 - 94
15	3	3÷60 = 0.05	1.00	95 - 99
	60	1.00		

The first seven random numbers (two digits only) are simulated:

Random No.	Corresponding demand Tonnes/day
27	11
13	11
80	13
10	11
54	12
60	12
49	12
	82

Mean requirement per day = 82 / 7 = 11.7 Tonnes

The expected value (EV) = (10×0.1)+(11×0.3)+(12×0.25)+(13×0.2)+(14×0.1)+(15×0.05)

= 12.05 Tonnes

The difference = 12.05 – 11.7 = 0.35

This indicates that the small sample size of only 7 days had resulted in some error. A much larger sample should be taken and several samples should be simulated before the simulation results are used for decision making.

Illustration 11.

An investment corporation wants to study the investment project based on three factors: market demand in units, contribution (sales price - variable cost) per unit and investment required. These factors are felt to be independent of each other. In analysing a new consumer product for a washing powder factory the corporation estimates the following probability distributions:

Annual demand		Contribution per unit		Required investment	
Units	Probability	₹	Probability	₹	Probability
20,000	0.05	3.00	0.10	17,50,000	0.25
25,000	0.10	5.00	0.20	20,00,000	0.50
30,000	0.20	7.00	0.40	25,00,000	0.25
35,000	0.30	9.00	0.20		
40,000	0.20	10.00	0.10		
45,000	0.10				
50,000	0.05				

Use Monte-Carlo simulation for 10 runs, estimate the percentage of return on investment (ROI %) defined by

$$\text{ROI \%} = \frac{\text{Cash inflow}}{\text{Investment}} \times 100$$

For each run, recommend an optimum investment strategy based on model value of ROI %.

Use the following sets of random numbers:

28, 57, 60, 17, 64, 20, 27, 58, 61, 30; 19, 07, 90, 02, 57, 28, 29, 83, 58, 41; and 18, 67, 16, 71, 43, 68, 47, 24, 19, 97 respectively for each of the 10 simulation run.

Solution:

To determine a cumulative probability distribution corresponding to each of the three factors, appropriate set of random numbers representing each of the three factors are assigned below:

Table 1

Annual Demand	Probability	Cumulative Probability	Random Numbers
20,000	0.05	0.05	00 — 04
25,000	0.10	0.15	05 —14
30,000	0.20	0.35	15 — 34
35,000	0.30	0.65	35 — 64
40,000	0.20	0.85	65 — 84
45,000	0.10	0.95	85 — 94
50,000	0.05	1.00	95 — 99

Table 2

Contribution per unit (₹)	Probability	Cumulative Probability	Random Numbers
3.00	0.10	0.10	00 — 09
5.00	0.20	0.30	10—29
7.00	0.40	0.70	30—69
9.00	0.20	0.90	70—89
10.00	0.10	1.00	90—99

Table 3

Investment required (₹)	Probability	Cumulative Probability	Random Numbers
17,50,000	0.25	0.25	00 — 24
20,00,000	0.50	0.75	25 — 74
25,00,000	0.25	1.00	75 — 99

New simulated work sheet for 10 trials. The simulated return on investment (ROI) is also calculated by using the formula for ROI %. The results of simulation are shown in the table given below:

Trials	RN for demand	Simulated Demand ('000)	RN for Contribution	Simulated Contribution (₹)	RN for Investment	Simulated Investment ('000)	Simulated return ROI %
1	28	30	19	5.00	18	1,750	8.57*
2	57	35	07	3.00	67	2,000	5.25
3	60	35	90	10.00	16	1,750	20.00
4	17	30	02	3.00	71	2,000	4.50
5	64	35	57	7.00	43	2,000	12.25
6	20	30	28	5.00	68	2,000	7.50
7	27	30	29	5.00	47	2,000	7.50
8	58	35	83	9.00	24	1,750	18.00
9	61	35	58	7.00	19	1,750	14.00
10	30	30	41	7.00	97	2,500	8.40

* Simulated Return on Investment (ROI) % = $\frac{\text{Demand} \times \text{Contribution per unit}}{\text{Investment}} \times 100$

$= [(30 \times 5) \div 1,750] \times 100 = 8.57\%.$

Other values have been worked out similarly.

The above table shows the highest likely ROI % of 20%, which is corresponding to the annual demand of 35,000 units resulting in a profit of ₹ 10 per unit and the required investment will be ₹17,50,000.

Illustration 12.

Infoway Ltd. is considering the purchase of an automatic pack machine to replace the 2 machines which are currently used to pack Product X. The new machine would result in reduced labour costs because of the more automated nature of the process and in addition, would permit production levels to be increased by creating greater capacity at the packing stage with an anticipated rise in the demand for Product X, it has been estimated that the new machine will lead to increased profits in each of the next 3 years. Due to uncertainty in demand however, the annual cash flows (including savings) resulting from purchase of the new machine cannot be fixed with certainty and have therefore, been estimated probabilically as follows:

Annual cost flows:

Year 1	Probability	Year 2	Probability	Year 3	Probability
10	0.3	10	0.1	10	0.3
15	0.4	20	0.2	20	0.5
20	0.3	30	0.4	30	0.2
		40	0.3		

Because of the overall uncertainty in the sales of Product X, it has been decided that only 3 years cash flows will be considered in deciding whether to purchase the new machine. After allowing for the scrap value of the existing machines, the net cost of the new machine will be ₹42,000. The effects of taxation should be ignored.

Required:

(a) Ignoring the time value of money, identify which combinations of annual cash flows will lead to an overall negative net cash flow, and determine the total probability of this occurring.

(b) On the basis of the average cash flow for each year, calculate the net present value of the new machine given that the company's cost of capital is 15%. Relevant discount factors are as follows:

Year	Discount factor
1	0.8696
2	0.7561
3.	0.6575

(c) Analyse the risk inherent in this situation by simulating the net present value calculation. You should use the random number given at the end of the illustration in 5 sets of cash flows. On the basis of your simulation results what is the expected net present value and what is the probability of the new machine yielding a negative net present value?

	Set 1	Set 2	Set 3	Set 4	Set 5
Year 1	4	7	6	5	0
Year 2	2	4	8	0	1
Year 3	7	9	4	0	3

Solution:

(a) If the total cash flow in years 1, 2 and 3 is less than ₹42,000, the net cash flow will be negative. The combinations of cash flow with total less than ₹42,000 are given in table below:

Cash flow (₹ '000)

Year 1	Probability	Year 2	Probability	Year 3	Probability	Total	Probability
10	0.3	10	0.1	10	0.3	30	0.3 × 0.1 × 0.3 = 0.009
10	0.3	10	0.1	20	0.5	40	0.3 × 0.1 × 0.5 = 0.015
10	0.3	20	0.2	10	0.3	40	0.3 × 0.2 × 0.3 = 0.018
15	0.4	10	0.1	10	0.3	35	0.4 × 0.1 × 0.3 = 0.012
20	0.3	10	0.1	10	0.3	40	0.3 × 0.1 × 0.3 = 0.009
							Total = 0.063

The probability of a negative cash flow is 0.063

(b) Expected cash flow = Σ [Cash flow×Probability]

		(₹ '000)
Year 1 EV	=(10×0.3) + (15×0.4) + (20×0.3)	15
Year 2 EV	=(10×0.1) + (20×0.2) + (30×0.4) + (40×0.3)	29
Year 3 EV	=(10×0.3) + (20×0.5) + (30×0.2)	19

P.V. of the cash = (15×0.8696) + (29×0.7561) + (19×0.6575) =47,4634

The net present value of the new machine = 47,463 – 42,000 = ₹ 5,463

(c) Allocated random number ranges to the cash flows for each year.

	Cashflow (₹ '000)	Probability	Random number
Year 1	10	0.3	0 - 2
	15	0.4	3 - 6
	20	0.3	7 - 9
Year 2	10	0.1	0
	20	0.2	1 - 2
	30	0.4	3 - 6
	40	0.3	7 - 9
Year 3	10	0.3	0 - 2
	20	0.5	3 - 7
	30	0.2	8 - 9

We can now carry out the simulation. (₹ 000)

	Year 1			Year 2			Year 3			
Number	Random	Cash	DCF	Random	Cash	DCF	Random	Cash	DCF	Net PV
1	4	15	13.044	2	20	15.122	7	20	13.150	-0.684
2	7	20	17.392	4	30	22.683	9	30	19.725	17.800
3	6	15	13.044	8	40	30.244	4	20	13.150	14.438
4	5	15	13.044	0	10	7.561	0	10	6.575	-14.820
5	0	10	8.696	1	20	15.122	3	20	13.150	-5.032
									Total	11.702

The average net present value of the cash flow = 11,702/5 = ₹2,340.40

Three out of the five simulations produced negative NPV, therefore, we estimate the probability of a negative NPV as 3/5=0.6. Since the simulation is small, the estimates are unlikely to be reliable.

Illustration 13

X Co. is evaluating an investment proposal which has uncertainty associated with the three important aspects: original cost, useful life and annual net cash flows. The three probability distributions for these variables are shown below:

Original Cost		Useful life		Annual net cash inflows	
Value	Probability	Period	Probability	Value	Probability
₹ 60,000	0.30	5 years	0.40	₹ 10,000	0.10
₹ 70,000	0.60	6 years	0.40	₹ 15,000	0.30
₹ 90,000	0.10	7 years	0.20	₹ 20,000	0.40
				₹ 25,000	0.20

The company wants to perform five simulation runs of this project's life. The firm's cost of capital is 15% and the risk-free rate is 6%; for simplicity it is assumed that these two values are known with certainty and will remain constant over the life of the project.

To simulate the probability distribution of original cost, useful life and annual net cash inflows, are the following are

the sets of random numbers:

09, 84, 41, 92, 65; 24, 38, 73, 07, 04; and 07, 48, 57, 64, 72 respectively each of the five simulation runs.

Solution:

To simulate the probability distribution corresponding to original cost, useful life and annual net cash inflows, we assign an appropriate set of random numbers as shown in the following table:

Original Cost

Value	Probability	Cumulative Probability	Random Numbers
60,000	0.30	0.30	00-29
70,000	0.60	0.90	30-89
90,000	0.10	1.00	90-99

Useful Life

Period	Probability	Cumulative Probability	Random Number
5	0.40	0.40	00-39
6	0.40	0.80	40-79
7	0.20	1.00	80-99

Net Cash Inflows

Value (₹)	Probability	Cumulative Probability	Random Probability
10,000	0.10	0.10	00-09
15,000	0.30	0.40	10-39
20,000	0.40	0.80	40-79
25,000	0.20	1.00	80-99

The five simulation runs are now performed and the results are tabulated below:

Simulation Worksheet

Simulation Run	Original Cost		Useful life		Annual net cash inflows	
	Random Number	Value (`)	Random Number	Period(years)	Random Number	Value (₹)
1	09	60,000	24	5	07	10,000
2	84	70,000	38	5	48	20,000
3	41	70,000	73	6	57	20,000
4	92	90,000	07	5	64	20,000
5	65	70,000	04	5	72	20,000

Now let us calculate NPV for run 1 to run 5.

Run 1

(1)Period	(2) Cash flows	(3)PV factor @ 6%	Present Value (4)= (2) x (3)
0	-60,000	1.000	-60,000
1	10,000	0.943	9,430
2	10,000	0.890	8,900
3	10,000	0.840	8,400
4	10,000	0.792	7,920
5	10,000	0.747	7,470

Net Present Value = ₹ -17,880

Run 2

(1)Period	(2) Cash flows	(3)PV factor @ 6%	Present Value (4)= (2) x (3)
0	-70,000	1.000	-70,000
1	20,000	0.943	18,860
2	20,000	0.890	17,800
3	20,000	0.840	16,800
4	20,000	0.792	15,840
5	20,000	0.747	14,940

NPV = ₹14, 240

Run 3

Period	Cash flows
0	-70,000
1	20,000
2	20,000
3	20,000
4	20,000
5	20,000
6	20,000

Therefore, NPV = (20,000 x PV of annuity factor for 6 years @ 6%) – 70,000

= (₹ 20,000 x 4.917) – ₹70,000

= (₹ 98,340 – 70,000) = ₹ 28,340

Run 4

Period	Cash flows
0	-90,000
1	20,000
2	20,000
3	20,000
4	20,000
5	20,000

Therefore, NPV = (20,000 x PV of annuity factor for 5 years @ 6%) – 90,000

=₹ (20,000 x 4.212) – ₹ 90,000

= ₹ 84,240 – 90,000 = ₹ -5760

Run 5

Period	Cash flows
0	-70,000
1	20,000
2	20,000
3	20,000
4	20,000
5	20,000

Therefore, NPV = (₹ 20,000 x PV of annuity factor for 5 years @ 6%) – ₹70,000

= ₹(20,000 x 4.212) – ₹ 70,000

= ₹ (84,240 – 70,000) = ₹ 14,240

Illustration 14

A project has a mean NPV of ₹ 40 and standard deviation of NPV is 20. The finance manager wants to determine the probability of the NPV under the following ranges:

(a) Zero or less

(b) Greater than zero

(c) Between the range of ₹ 25 and ₹ 45

Solution:

(a) Probability of NPV being zero or less = Area under the standard normal curve to the left of the standard value

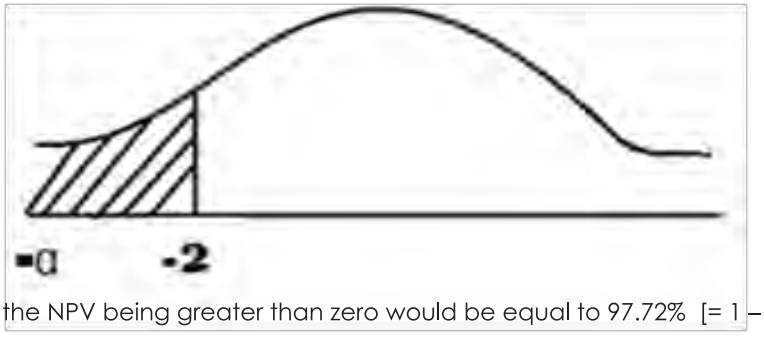
$Z = (x-\mu)/\sigma = (0-40)/20 = -2$

Now $P [x \leq 0] = P [Z \leq -2] = \int_{-\infty}^{-2} \Phi (z)\, dz$

$= 1 - \int_{-\infty}^{-2} \Phi (z)\, dz$

$= 1 - \Phi (2)$

$= 1 - 0.9772 = 0.0228 = 2.28\%$



(b) The probability for the NPV being greater than zero would be equal to 97.72% [= 1 – 0.0228]

(c) Probability of the NPV between the range of ₹ 25 and ₹ 45 = Area under the standard normal curve between the vertical lines at the corresponding standardized values

$Z_1 = (x_1 - \mu)/\sigma = (25-40)/20$ and $Z_2 = (x_2 - \mu)/\sigma = (45-40)/20$

i.e.; $P [25 \leq x \leq 45] = P [(25-40)/20 \leq (x-40)/20 \leq (45-40)/20]$

$= P[-0.75 \leq Z \leq +0.25]$

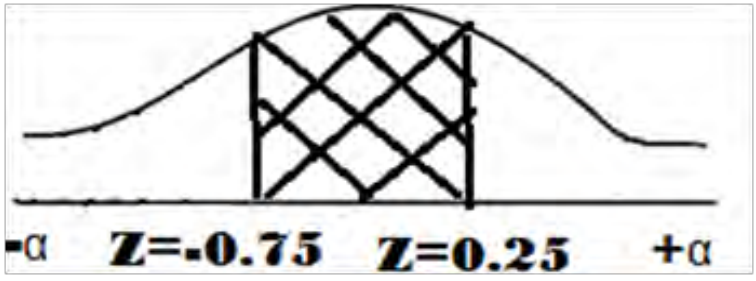
$= \int_{-\infty}^{+0.25} \Phi (Z)\, dz - \int_{-\infty}^{+0.75} \Phi (Z)\, dz$

$= \Phi(0.25) - \Phi(-0.75)$

= Φ(0.25) – [1- Φ(0.75)]

= 0.598 – [1 – 0.773]

= 0.598 – 0.227 = 0.371 = 37.10%



Study Note - 3

LEASING DECISIONS

This Study Note includes

3.1 Lease Financing – Evaluation of Lease vs. Buy Options
3.2 Break-Even Lease Rentals
3.3 Cross Border Leasing

3.1 LEASE FINANCING – EVALUATION OF LEASE vs. BUY OPTIONS

LEASING DECISIONS

(i) Lease Financing – Evaluation of Lease vs Buy options

(ii) Break-Even Lease rental determination

(iii) Cross Boarder leasing, Sale and Lease back]

(i) **Lease Financing – Evaluation of Lease vs Buy Options**

Concept of Lease : A lease is an agreement whereby the lessor conveys to the lessee in return for a payment or series of payments the right to use an asset for an agreed period of time. Leases are of two types viz., Finance lease and Operating lease. A finance lease is a lease that transfers substantially all the risks and rewards incidental to ownership of an asset. Whereas an operating lease is a lease other than a finance lease, i.e., it does not transfer substantially all the risks and rewards incidental to ownership. So, the basic concept of lease accounting is that operating lease is merely rental, whereas financial lease is a disguised purchase.

Guidance notes on Cost Accounting Standard on Administrative Overhead (CAS 11), Section 5.2 provides that Lease Rentals in respect of assets taken on 'Operating Lease' for administrative activities should be included under Administrative Overheads. Payments under an operating lease will be recognised by the lessee as an expense over the lease term. Lease rentals for assets acquired under Financial Lease should be segregated between the cost component of asset and interest component by applying an implicit rate of return. Interest component should form part of the Finance Cost and should not be included under Administrative Overheads.

For income tax purpose, the lessor (being the owner of the asset) is entitled to claim depreciation on leased assets.

- **Advantages of Leasing Transaction**

(i) Advantages to the Lessor

(a) **Full Security:** Lessor's interest is fully secured as he is always the owner of the asset and can take repossession of the asset, if the Lessee defaults.

(b) **Tax Benefits:** Tax Relief is available by way of depreciation. If the lessor is in high tax bracket, he can lease out assets with high depreciation rates and thus reduce his tax liability substantially. Besides, the rentals can be suitably structured to pass on some tax benefit to the assessee. Generally, assets that are leased out carry a higher depreciation rate.

(c) **High Profits:** Because of a higher depreciation charge, there is a quicker capital recovery and also higher profitability since rate of return is more than what is available in case of lending business.

(d) **Trading on Equity:** Lessors have very low equity and use substantial amount of borrowed funds and deposits for their business. Thus, they carry out their operation with great financial leverage. Hence, the return on equity is very high.

(ii) **Advantages to the Lessee**

(a) **Source of Financing:** Leasing is a source of financing provided by the lessor to the lessee. The lessee may use the asset against payment of lease rental without purchasing the asset. Therefore, the amount which would have been required for purchasing the asset may be used for other purposes.

(b) **No Dilution of Ownership:** Leasing provides finance without diluting the ownership or control of the promoters, unlike equity or debt financing.

(c) **No Loss of Control:** In case of Institutional Financing (Bank and Other Term Lending Institutions), the lender may have restrictive conditions in the sanction letter such as representation in the Board, conversion of debt into equity, payment of dividend, etc. Such restrictions are not present in case of lease financing. This enhances the independence of the firm in its operations.

(d) **Tax Benefits:** Since the entire lease rental is treated as an expenditure, cost of the asset is amortized rapidly under this option, and hence there is huge tax savings, when compared to similar outflow under borrow and procure option.

(e) **Less Risk:** Risk of obsolescence rests with the lessor, and the Lessee always has the option of replacing the asset with latest technology, by opting for a different asset or lessor.

(f) **Sale and Leaseback:** By employing sale and lease back arrangement, the lessee may overcome a financial crisis by immediately arranging financial resources.

Limitations of Leasing

(a) **Restrictions on Use:** The lessor generally imposes certain restrictions on the leased assets. The Lessee may not be permitted to make additions on alterations to suit his needs.

(b) **High Payout:** A Financial Lease may entail a higher payout obligation, if the equipment is not found useful subsequently, and the lessee opts for premature termination of the Lease arrangement.

(c) **No Ownership:** In most circumstances, the Lessee does not become the owner of the asset, and is thus deprived of the residual value of the asset.

- **Evaluation of Lease vs Buy options**

  Once a firm decides to acquire an asset, it has to evaluate different alternatives or options available. In the context of lease, the firm will have two options: (i) it may buy the asset or (ii) it may acquire the asset under lease agreement. The decision may be taken on the basis of evaluation of both the options (*lease* as well as *buy*). For this purpose, relevant cash flows are required to be identified and analysed. In case of lease, the lessee firm has to make the lease payments and also to meet some or all of the maintenance expenses as per contract and all such payments (lease rentals and maintenance expenses) are tax deductible.

  In case of a Lessee, according to Ind AS 17, Finance Lease gives rise to depreciation expense for depreciable assets as well as finance expense for each accounting period. The depreciation policy for depreciable leased assets shall be consistent with that for depreciable assets that are owned. But lease payments under an Operating Lease shall be recognised as an expense on a straight-line basis over the lease term unless another systematic basis is more representative of the time pattern of the user's benefit.

  Under a finance lease substantially all the risks and rewards incidental to legal ownership are transferred by the lessor, and thus the lease payment receivable is treated by the lessor as repayment of principal and finance income to reimburse and reward the lessor for its investment and services. While lease income from operating leases is recognised in income on a straight-line basis over the lease term.

Example: A firm need an asset for which it is considering the following two options:

(i) Purchasing the asset for Rs.1,00,000 borrowing the amount @12% interest and repaying the same together with interest in 4 equal annual installments.

(ii) Acquiring the asset on lease with a payment of annual lease rentals of Rs.30,000 per annum for 4 years.

The firm follows straight line method of depreciation and the income tax rate applicable to the firm is 30%. Which is a better option to the firm – lease or buy?

Solution:

Decision will be based on after tax cash flows. In this case, it will be after tax net cash outflow.

In case of lease, the cash outflow is ₹ 30,000 per annum for 4 years. As lease rental is tax deductible, after tax cash flow will be ₹ 30,000 (1 – 0.30) or ₹ 21,000 per annum for 4 years.

In case of buying the asset, cash outflow is annual installment of interest and principal. From annuity table, it may be seen that annuity of ₹1 is payable for ₹ 3.037 when rate of interest is 12% and period of repayment is 4 years. Therefore, annual installment will be ₹ 1,00,000/3.037 or 32,928 (principal and interest). In the first year, interest is payable on the total cost of the asset, i.e., ₹ 1,00,000 @ 12% or ₹ 12,000. So, the principal amount is ₹ 20,928 (₹ 32,928 – 12,000). The outstanding amount at the beginning of the second year will be ₹ 79,072 (₹ 1,00,000 – 20,928). So, interest for the second year will be 12% of ₹ 79,072 or ₹ 9488. In this way, the interest for 3rd and 4th year will be ₹ 6,676 and ₹ 3552.

Depreciation will be ₹ 25,000 per annum as straight line method is followed by the firm.

The firm will have tax savings on both interest as well as depreciation resulting in reduction in net cash outflow. The net cash outflow (NCF) for buying option is shown below.

Year	Repayment (₹)	Interest (₹)	Tax savings (₹)	Depreciation (₹)	Tax Savings (₹)	NCF (₹)
1	32,928	12,000	3,600	25,000	7,500	21,828
2	32,928	9,488	2,856	25,000	7,500	22,572
3	32,928	6,676	2,003	25,000	7,500	23,425
4	32,928	3,552	1,066	25,000	7,500	24,362

Now, the NCF of different years of both the options (Lease and Buy) requires to be discounted with the after tax cost of the borrowed fund (as borrowed fund is planned to be used for this situation) to get the present value. So, discounting factor in this case will be 12%(1-0.30) or 8.4%.

Present Value of the NCF of the two options are shown below.

Lease			**Buy**		
Year	NCF (₹)	PV@ 8.4% (₹)	Year (₹)	NCF (₹)	PV @ 8.4% (₹)
1	21,000	19,372	1	21,828	21,136
2	21,000	17,871	2	22,572	19,498
3	21,000	16,486	3	23,425	17,987
4	21,000	15,208	4	24,362	16,593
Total		**68,937**			**75,214**

The PV of net cash outflow of leasing option is less than that of buying option. Therefore, Leasing option is preferable to buying option.

[**N.B.** If estimated cash inflows are available, decision will be based on NPV and higher the NPV better is the alternative].

Sale and Leaseback

(a) **Definition:** Under a Sale and Leaseback transaction, the owner of the asset, sells it to another person, and takes back the asset on lease. Under this transaction, only the ownership is transferred, the possession remains with the original owner, who pays lease rentals to the new owner (lessor).

(b) **Interdependence:** Lease payments and the sale price are usually interdependent as they are negotiated as a package.

(c) **Purpose:** It is generally done to raise funds immediately required by lessor for working capital or for other purposes. Sometimes, it can also be used as a tax saving mechanism.

(d) **Benefits:** The lessee continues to make economic use of assets against payment of lease rentals while ownership vests with the lessor.

3.2 BREAK-EVEN LEASE RENTALS

The break-even lease rental is the rental at which the lessee remains indifferent to a choice between leasing and buying. It reflects the maximum amount of lease rentals that the lessee is willing to pay. If the actual lease rental is less than the break-even lease rental, the lessee will accept the lease proposal otherwise the lessee will reject it. On the other hand, from the view point of the lessor, break-even lease rental represents the minimum lease rental that he can accept. The NPV of leasing will be zero at this stage.

3.3 CROSS BORDER LEASING

Cross-border leasing is a leasing arrangement where lessor and lessee are situated in different countries. Cross-border leasing can be considered as an alternative to equipment loans to foreign buyers, the only difference being the documentation, down payments, payment streams, and lease-end options as offered under Equipment Loans. Operating leases may be feasible for exports of large equipment with a long economic life relative to the lease term.

Objectives of Cross Border I easing:

(a) **Overall Cost of Financing:** A major objective of cross-border leases is to reduce the overall cost of financing through utilization by the lessor of tax depreciation allowances in order to reduce its taxable income. The

tax savings are passed through to the lessee as a lower cost of finance. The basic prerequisites are relatively high tax rates in the lessor's country, liberal depreciation rules and either very flexible or very formalistic rules governing tax ownership.

(b) **Security:** The lessor is often able to utilize non-recourse debt to finance a substantial portion of the equipment cost. The debt is secured by among other things, a mortgage on the equipment and by an assignment of the right to receive payments under the lease.

(c) **Accounting Treatment:** Also, depending on the structure, in some countries the lessor can utilize very favourable "Leveraged Lease" Financial Accounting treatment for the overall transaction.

(d) **Repossession:** In some countries, it is easier for a lessor to repossess the leased equipment following a Lessee default because the lessor is an owner and not a mere secured lender.

Advantages of Cross Border Leasing

(a) Double Dip Lease: Cross-border leasing has been widely used to arbitrage the difference in the tax laws of different countries. This is possible since each country applies differing rules for determining whether the party acting as lessor under a cross-border lease is the "owner" of the leased asset for tax purposes enabling him to claim tax allowances.

Example: In the United States the criteria is that the lessor possesses substantially all attributes of economic ownership of the leased asset. In the European Union, Formalistic Property law concepts focus primarily on the location of legal title, although these countries usually also require that the lessor have some attributes of economic ownership or, at least, that the lessee have only a minimal economic interest in the equipment. In these cases, with sufficiently long leases (often 99 years), an asset can end up with two effective owners, one each in different countries, this is often referred to as a double-dip lease.

(b) Sale and Lease Back: Often the original owner of an asset is not subject to taxation in any country and therefore not able to claim depreciation. The transaction often involves an entity selling an asset (such as sewerage system or power plant) to an investor (who can claim depreciation), and long-term leasing it right back (often referred to as a sale leaseback).

(c) Financing Infrastructure: Cross-border leasing has been in practice as a means of financing infrastructure development in emerging nations. Cross-border Leasing may have significant applications in Financing Infrastructure development in emerging nations in the areas of rail and air transport equipment, telephone and telecommunications, equipment, and assets incorporated into power generation and distribution systems and other projects that have predictable revenue streams.

Suggested Readings:

- Chandra, P., Projects – Planning, Analysis, Selection, Financing, Implementation, and Review, Mc-Graw Hill Education (India) Pvt. Ltd., New Delhi
- Khan, M.Y., and Jain, P.K., Financial Management, Tata Mc-Graw Hill Education (India) Pvt. Ltd., New Delhi
- Rustagi, R.P., Financial Management, Taxmann Publications(P) Ltd., New Delhi
- Bierman, H.Jr., and Smidt, S., The Capital Budgeting Decision, Routledge, New York.

Illustration 1.

Your company is considering to acquire an additional computer to supplement its time-share computer services to its clients. It has two options:

(i) To purchase the computer for ₹ 22 lakhs.

(ii) To lease the computer for three years from a leasing company for ₹ 5 lakhs as annual lease rent plus 10% of gross time-share service revenue. The agreement also requires an additional payment of ₹6 lakhs at the end of the third year. Lease rents are payable at the year-end, and the computer reverts to the lessor after the contract period.

The company estimates that the computer under review will be worth ₹ 10 lakhs at the end of third year.

Forecast Revenues are:

Year	1	2	3
Amount (₹ in lakhs)	22.5	25	27.5

Annual operating costs excluding depreciation/lease rent of computer are estimated at ₹9 lakhs with an additional ₹ 1 lakh for start up and training costs at the beginning of the first year. These costs are to be borne by the lessee. Your company will borrow at 16% interest to finance the acquisition of the computer. Repayments are to be made according to the following schedule:

Year end	1	2	3
Principal (₹'000)	500	850	850
Interest (₹'000)	352	272	136

The company uses straight line method (SLM) to depreciate its assets and pays 50% tax on its income. The management approaches you to advice. Which alternative would be recommended and why?

Note: The PV factor at 8% and 16% rates of discount are:

Year	1	2	3
8%	0.926	0.857	0.794
16%	0.862	0.743	0.641

Solution:

Working Notes:

(a) Depreciation: ₹ (22,00,000 – 10,00,000)/3 = ₹ 4,00,000 p.a.

(b) Effective rate of interest after tax shield: 0.16 × (1 - 0.50) = 0.08 or 8%.

(c) Operating and training costs are common in both alternatives hence not considered while calculating NPV of cash flows.

Calculation of NPV

1. Alternative I: Purchase of Computer

Particulars	**Year 1**	**Year 2**	**Year 3**
	₹	₹	₹
Instalment Payment			
Principal	5,00,000	8,50,000	8,50,000
Interest	3,52,000	2,72,000	1,36,000
Total (A)	8,52,000	11,22,000	9,86,000
Tax shield @ 50%;			
Interest payment	1,76,000	1,36,000	68,000
Depreciation	2,00,000	2,00,000	2,00,000
Total (B)	3,76,000	3,36,000	2,68,000
Net Cash outflows (A – B)	4,76,000	7,86,000	7,18,000
PV factor at 8%	0.926	0.857	0.794
PV of Cash outflows	4,40,776	6,73,602	5,70,092
Total PV of Cash outflows:			16,84,470
Less: PV of salvage value (₹ 10 lakhs × 0.794)			7,94,000
Net PV of cash outflows			8,90,470

2. Alternative II: Lease of the Computer

Particulars	Year 1	Year 2	Year 3
	₹	₹	₹
Lease rent	5,00,000	5,00,000	5,00,000
10% of gross revenue	2,25,000	2,50,000	2,75,000
Lump sum payment	-	-	6,00,000
Total Payment	7,25,000	7,50,000	13,75,000
Less: Tax shield @ 50%	3,62,500	3,75,000	6,87,500
Net Cash outflows	3,62,500	3,75,000	6,87,500
PV of Cash outflows @ 8%	3,35,675	3,21,375	5,45,875
Total PV of cash outflows			**12,02,925**

Recommendation:

Since the Present Value (PV) of net cash outflow of Alternative I is lower, the company should purchase the computer.

Illustration 2.

Fair finance, a leasing company, has been approached by a prospective customer intending to acquire a machine whose Cash Down price is ₹ 3 crores. The customer, in order to leverage his tax position, has requested a quote for a three year lease with rentals payable at the end of each year but in a diminishing manner such that they are in the ratio of 3: 2 : 1. Depreciation can be assumed to be on straight line basis and Fair Finance's marginal tax rate is 35%. The target rate of return for Fair Finance on the transaction is 12%.

Required:

Calculate the lease rents to be quoted for the lease for three years.

Solution:

Capital sum to be placed under Lease

	₹ in lakhs	
Cash Down price of machine	300.00	
Less: Present value of depreciation		
Tax Shield		
$100 \times .35 \times \frac{1}{(1.12)}$	31.25	
$100 \times .35 \times \frac{1}{(1.12)^2}$	27.90	
$100 \times .35 \times \frac{1}{(1.12)^3}$	24.91	84.06
		215.94

If the normal annual lease rent per annum is x, then cash flow will be:

Year	Post-tax cash flow	P.V. of post-tax cash flow
1	$3x \times (1 - .35) = 1.95x$	$1.95 \times (1/1.12) = 1.7411x$
2	$2x \times (1 - .35) = 1.3x$	$1.30 \times [(1/(1.12)^2] = 1.0364x$
3	$x \times (1 - .35) = 0.65x$	$0.65 \times [1/(1.12)^3] = 0.4626x$
		$= 3.2401x$

Therefore $3.2401x = 215.94$ or $x =$ ₹ 66.6409 lakhs

Year-wise lease rentals: **₹ in lakhs**

Year 1	3 × 66.6409 lakhs	= 199.9227
2	2 × 66.6409 lakhs	= 133.2818
3	1 × 66.6409 lakhs	= 66.6409

Illustration 3.

ABC Company Ltd. is faced with two options as under in respect of acquisition of an asset valued ₹1,00,000/-

EITHER

(a) to acquire the asset directly by taking a Bank Loan of ₹1,00,000/- repayable in 5 year-end instalments at an interest of 15%.

OR

(b) to lease in the asset at yearly rentals of ₹320 per ₹1,000 of the asset value for 5 years payable at year end.

The following additional information are available.

(a) The rate of depreciation of the asset is 15% W.D.V.

(b) The company has an effective tax rate of 50%.

(c) The company employs a discounting rate of 16%.

You are to indicate in your report which option is more preferable to the Company. Restrict calculation over a period of ten years

The present value of one Rupee due at the end of each year is

End of year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Present Value	0.86207	0.74316	0.64066	0.55229	0.47611	0.41044	0.35313	0.30503	0.26295	0.22668

Solution:

ABC Company Ltd :

Appraisal of Buying Decision: PV of Cash Out Flows **(fig in ₹)**

Year	**Principal repayment**	**Interest**	**Out flow**	**Tax savings on dep**	**Tax savings on int**	**Net cash out flow**	**PV factor @ 16%**	**Present value**
1	20000	15000	35000	7500	7500	20000	0.86207	17241.4
2	20000	12000	32000	6375	6000	19625	0.74316	14584.5
3	20000	9000	29000	5420	4500	19080	0.64066	12223.8
4	20000	6000	26000	4606	3000	18394	0.55229	10158.8
5	20000	3000	23000	3915	1500	17585	0.47611	8372.4
6	-	-	-	3328	–	(3328)	0.41044	(1366)
7	-	-	-	2829	–	(2829)	0.35313	(999.0)
8	-	-	-	2405	–	(2405)	0.30503	(733.6)
9	-	-	-	2044	–	(2044)	0.26295	(537.5)
10	-	-	-	1737	–	(1737)	0.22668	(393.7)
								58560

Net present value of out flows ₹ 58,560

(b) Appraisal of Leasing Decision: Present Value of Cash outflows under Lease Alternative

Lease rent per year is 320/1000X100000 = ₹ 32,000

Year	Lease rent (₹)	Tax savings (₹)	Net out flow (₹)	PVCF @ 16%	Present value (₹)
1-5	32000	16000	16000	3.27429	52390

PVCF = Present Value of Cashflow

From "a" and "b" ,it is Advised to lease, Since the net cash outflow is lower under Lease alternative.

However , It is not wise to compare the two project with different life periods. So,consider equivalent annual cash out flows ,which is calculated as follows,

Leasing : ₹52,390/3.27429 = ₹16,000

Buying : ₹58,552/4.83252 =₹12,115. **So advised to Buy the Asset.**

Illustration 4.

Elite Builders has been approached by a foreign embassy to build for it a block of six flats to be used as guest houses. As per the terms of the contract, the foreign embassy would provide Elite Builders the plans and the land costing ₹25 lakhs. Elite Builders would build the flats at their own cost and lease them to the foreign embassy for 15years. At the end of which the flats will be transferred to the foreign embassy for a nominal value of ₹ 8 lakh. Elite Builders estimates the cost of constructions as follows:

Area per flat, 1,000 sq. feet ; Construction cost, ₹400 per sq. feet ; Registration and other costs, 2.5 per cent of cost of construction; Elite Builders will also incur ₹4 lakhs each in years 14 and 15 towards repairs.

Elite Builders proposes to charge the lease rentals as follows:

Years	Rentals
1 - 5	Normal
6 – 10	120 per cent of normal
11 - 15	150 per cent of normal

Elite builders present tax rate averages at 35 per cent which is likely to be the same in future. The full cost of construction and registration will be written off over 15 years at an uniform rate and will be allowed for tax purposes.

You are required to calculate the normal lease rental per annum per flat. For your exercise you may assume: (a) Minimum desired return of 10 per cent, (b) Rentals and repairs will arise on the last day of the year, and, (c) Construction, registration and other costs will be incurred at time = 0.

Solution:

Calculation of present value of Cash out flow: (₹)

Cost of construction 400x1,000x6		24,00,000
Registration and other costs @ 2.5%		60,000
Cost of Repairs	4,00,000	
(-) tax savings @ 35%	1,40,000	
	2,60,000	
At t_{14} = Present value = 2,60,000 x 0.26333 = 68466		
At t_{15} = present value = 2,60,000 x 0.23939 = 62241		
		1,30,707
		25,90,707 (Rounded of to 25,90,700)

Let 'X' be Normal lease rent per 6 flats per annum. P/V of Recurring Cash Inflow for 15 years

Particulars	1-5 years	6-10 years	11-15 years
Lease Rent p.a.	X	1.2 X	1.5 X
Depreciation (24,60,000/15)	164,000	164,000	164,000
PBT	X-164,000	1.2X-164000	1.5X-164,000
PAT 65 %	0.65X-106600	0.78X-106600	0.975X-106600
CIAT = PAT + Dep.	0.65X + 57400	0.78X + 57400	0.975X + 57400
PVCF	3.7908	2.3538	1.4615
PV	2.464X + 217592	1.836X + 135108	1.425X + 83890

Total = 5.725 X + 436590

P/V of Terminal Cash Inflows:	₹
Nominal value of flats after 15 years	800,000
Less: Tax on Profit [800000 x 35%]	280,000
	520,000

P/V = 520,000 x 0.239 = ₹124,280

At 10% Rate of Return: P/V of Cash Inflows = P/V of Cash outflows

5.725X + 436,590 + 124,280 = 2590700

X = ₹3,54,555.

Lease Rent per Flat = 3,54,555/6 = ₹59,092.50

Illustration 5.

The Sharda Beverages Ltd has taken a plant on lease, valued at ₹ 20 crore. The lease arrangement is in the form of a leveraged lease. The Kuber Leasing Limited is the equity participant and the Hindusthan Bank Ltd. (HBL) is the loan participant. They fund the investment in the ratio of 2:8. The loan from HBL carries a fixed rate of interest of 19 percent, payable in 6 equated annual installments. 'The lease term is 6 years, with lease rental payable annually in arrear.

(a) Compute the equated annual installment from the point or view- of HBL.

(b) If the lease rate is unknown, and HBL's per-tax yield is 25 percent, what is the minimum lease rent that must be quoted'?

Solution:

Cost of the asset		₹ 20cr
Debt Equity ratio		2: 8
Loan raised	(20 x 8 / 10)	₹16cr
Rate of interest		19%

(a) Computation of annual installment

$X \div PVCF_{6yr19\%} = ₹16cr$

$$X = \frac{₹16\ cr}{3.4098}$$

X = 4,69,23,573

(b) Let the lease rent be X

Net out flow = Lease rent – Loan installment

= X – 46923573

Then,

$(X - 46923573)\ PVCF_{6yr25\%} = 40000000$

X = 6,04,76,463.

Illustration 6.

Basic Information:

(i) Asset related: Cost ₹120 lacs; Tax depreciation 40%; Useful life 4 years; Residual value after three years ₹25.92 lacs.

(ii) Leasing: Full pay out; Three year lease; Lease Quote ₹434 per 1,000; Payment annually in arrears

(iii) Borrow and buy Three-year loan; Interest rate 15%; Quantum to be determined, such that annual repayment of principal will be equal to annual lease rental payment.

(iv) Other: Tax Rate is 40%, and opportunity cost of capital is 11%.

Based on information given above, determine the preferred option as between leasing and buying.

Solution:

Appraisal of Leasing decision

Benefits of leasing **(₹ in lakhs)**

1.	Saving in Investment	120.00
2.	PV of tax shield on lease rentals	50.91
		170.91

Cost of leasing **(₹ in lakhs)**

Present Value of lease rentals	118.91
PV of tax shield on depreciation	31.70
PV of tax shield on Interest	12.54
PV of terminal cash inflows (25.92X0.7312)	18.95
	182.10

Net advantage of leasing ₹ = (170.91 -182.1) lakhs ₹ = (11.19) lakhs. Hence, it is better to purchase the asset than to lease.

Working notes:

1. Calculation of present value of lease rentals

		(₹ in lakhs)
Lease rent per year	434/1000 × 120	52.08
Present value lease rent	52.08 × $PVCF_{3yr15\%}$	118.91

2. Present value of tax shield on lease rentals

(Amount in ₹ lakhs)

Year	Lease rental	Tax saving	PV @ 11%	Present value
1	52.08	20.83	0.9009	18.7657
2	52.08	20.83	0.8116	16.9056
3	52.08	20.83	0.7312	15.2308

TOTAL = 50.9100

3. Present value of depreciation tax shield

(Amount in ₹ lakhs)

Year	Book value	Depreciation	Tax savings	PV @11%	Present value
1	120	48	19.20	0.9009	17.2972
2	72	28.8	11.52	0.8116	9.3496
3	43.2	17.28	6.91	0.7312	5.0526
4	25.92	10.368	4.147	0.6587	2.7316

4. Calculation of interest tax shield

(Amount in ₹ lakhs)

Year	o/s loan	Interest	Installment	Principal	PV @ 11%	Present value
1	118.91	17.835	52.08	34.245	0.9009	6.427
2	84.655	12.698	52.08	39.382	0.8116	4.122
3	45.263	6.817	52.08	45.263	0.7312	1.995
					Total	12.54

Present value of terminal cash inflows = 25.92 × 0.7312 = ₹18.95 lakhs

Present value of lease rental = ₹118.91 lakhs

Interest rate @ 15% ; No of installments = 3

Installment amount = 118.91/PVCF $_{3yr15\%}$ = ₹52.08 lakhs

Illustration 7.

HB Finance Ltd is considering to enter the computer leasing business. Mainframe computers can be purchased for ₹2,00,000 each and, in turn, be leased out at ₹50,000 per year for 8 years with the initial payment occurring at the end of first year. You may ignore taxes and depreciation.

(a) Estimate the annual before tax expenses and internal rate of return (IRR) for the company.

(b) What should be the yearly lease payment charged by the company in order to earn a 20 percent annual compounded rate of return before expenses and taxes?

(c) Assume that the firm uses the straight-line method of depreciation, there is no salvage value , the annual expenses are ₹20,000, and the tax rate is 35%. Calculate the yearly lease payment in order to enable the firm to earn 20 percent after tax annual compound rate of return.

(d) Further, assume that computer has a resale value of ₹40,000. Determine the revised lease rental to enable the firm to earn 20 per cent.

Solution:

(a) Cost of the Asset ₹ 2,00,000

Life 8 years

Lease rent ₹ 50,000 p.a

(50,000)PVCF $_{8yrIRR}$ = 2,00,000

PVCF $_{8yrIRR}$ = 4

IRR = 18.63%

(b) Calculation of yearly lease rent to be charged to earn 20% return

Let the yearly lease rent be x

xPVCF $_{8yr\,20\%}$ = 200000

x = 200000 / 3.8372

x = ₹ 52120

(c) Let x be the yearly lease rent

Computation of cash inflows per annum

Lease rent	x
(-) annual expenses	20,000
(-) Depreciation	25,000
PBT	x-45,000

	PAT @ (1-35%)	0.65x – 29,250
	CIAT	0.65x – 4,250
	Cash in flows after tax	
	Present value for 8years @ 20% = (0.65x – 4250) 3.8372 =	2,00,000
	Yearly lease rent x = ₹86,725	
(d)	**Present value of cash outflows**	
	Cost of computer	2,00,000
	Present value of recurring cash inflows	
	Lease rent	x
	(-) annual expenses	20,000
	(-) Depreciation	20,000
	PBT	x – 40,000
	PAT @ (1-35%)	0.65x - 26,000
	CIAT	0.65x-6000
	Present value for 8years @20% = (0.65x-6,000)3.872	
	Present value of terminal cash inflows	
	Resale value 40000	
	Its present value (40000 x 0.23257) = ₹9303	
	At 20%,	
	Inflows = Outflows	
	(0.65x – 6,000) 3.8372 + 9303 = 2,00,000; **Revised lease rent, x = ₹85,687.**	

Illustration 8.

Beta Ltd is considering the acquisition of a personal computer costing ₹50,000. The effective life of the computer is expected to be five year. The company plans to acquire the same either by borrowing ₹ 50,000 from its bankers at 15% interest p.a. or on lease. The company wishes to know the lease rentals to be paid annually, which match the loan option. The following further information is provided to you:

(a) The principal amount of loan will be paid in five annual equal installments.

(b) Interest, lease rentals, principal repayment are to be paid on the last day of each year.

(c) The full cost of the computer will be written off over the effective life of computer on a straight-line basis and the same will be allowed for tax purposes

(d) The company's effective tax rate is 40% and the after-tax cost of capital is 9%

(e) The computer will be sold for ₹1,700 at the end of the 5th Year. The commission on such sales is 9% on the sale value.

You are required to compute the annual lease rentals payable by Beta Ltd, which will result in indifference to the loan option.

Solution:

Computation of Net Cash outflow if the Asset is Purchased by Borrowing

Year	Principal repayment (₹)	Interest (₹)	Installment (₹)	Tax savings on interest (₹)	Tax savings on dep (₹)	Net cash out flow (₹)	PV @ 9%	Present value (₹)
1	10000	7500	17500	3000	4000	10500	0.91743	9633
2	10000	6000	16000	2400	4000	9600	0.84168	8080
3	10000	4500	14500	1800	4000	8700	0.77218	6718
4	10000	3000	13000	1200	4000	7800	0.70843	5526
5	10000	1500	11500	600	4000	6900	0.64993	4485

Present Value of Total out flow of cash = ₹ 34,442

Less: Present value of terminal cash inflows

Sale value of asset	₹1700
(-) Commission	₹153
	₹1547
(-)Tax on profit @ 40%	₹619
	₹928
Its Present value ₹(928 × 0.64993)	₹603

Net cash out flow ₹33,839

Since we are required to find the annual lease rental payable, which will result in indifference to loan option. The present value of net cash outflow will be the same in each case.

Computation of break even lease rent :

Let x be the break even lease rent

Present value of cash inflows

Lease rent	x
(-) Tax saving (x @ 40%)	0.4x
Lease rent after tax per year	0.6x

Present value of lease rental for five years = (0.6x) x (3.8896) = 33,839

x = ₹14,500.

Illustration 9.

ABC leasing Ltd. is in the process of making out a proposal to lease certain equipment. The cost of the equipment is ₹10,00,000 and the period of lease is 10 years. The following additional information is available. You are required to determine the equated annual rent to be charged for the proposal.

(a) The machine can be depreciated fully over the 10 years on straight-line basis

(b) The current effective tax rate is 40% and expects to go down to 30% from the beginning of the 6th year of the lease.

(c) It is the normal objective to make a 10% post-tax return in its lease pricing

(d) Lease management fee of 1% of the value of the assest is usually collected from the lessees upon signing of the contract of lease, to cover the overhead costs related to processing of the proposal.

(e) Annual lease rents are collected at the beginning of every year.

Solution:

TVS Leasing Company

Present value of cash outflow

Cost of equipment ₹10,00,000 = let X be the equated annual lease rent

Present value of lease rentals after tax

Year	Lease rent	Tax	Net cash inflows	Pv @ 10%	Present value
0	X	-	X	1.0000	X
1-5	X	0.4X	0.6X	3.7908	2.2745X
6-9	X	0.3X	0.7X	1.9680	1.3776X
10	0	0.3X	(0.3X)	0.3855	(0.1158X)

Present value of total recurring cash inflows = 4.5364X

Calculation of tax shield on depreciation

Year	Depreciation	Tax benefit	Pv @ 10 %	Present value
1-5	100000	40000	3.7908	151600
6-10	100000	30000	2.3540	70620
				222220

At 10%, Inflows = Outflows

Or, 1000000 = 4.5364X + 222220

X = ₹ 1,71,453. Therefore, Equated annual rent is ₹1,71,453





Section B

Financial Markets and Institutions




Study Note - 4

INSTITUTIONS IN FINANCIAL MARKETS

This Study Note includes

4.1 Financial System

4.2 Reserve Bank of India

4.3 Banking Institutions – Commercial Banks

4.4 Non-Banking Financial Company (NBFC)

4.5 Insurance Companies

4.6 Pensions Funds

4.1 FINANCIAL SYSTEM

The financial system plays the key role in the economy by stimulating economic growth, influencing economic performance of the actors, affecting economic welfare. This is achieved by financial infrastructure, in which entities with funds allocate those funds to those who have potentially more productive ways to invest those funds. A financial system makes it possible for more efficient transfer of funds. As one party of the transaction may possess superior information than the other party, it can lead to the information asymmetry problem and inefficient allocation of financial resources. By overcoming asymmetry problem the financial system facilitates balance between those with funds to invest and those needing funds.

According to the **structural approach,** the financial system of an economy consists of three main components:

1) Financial markets;
2) Financial intermediaries (institutions);
3) Financial regulators.

Each of the components plays a specific role in the economy.

According to the **functional approach, financial markets** facilitate the flow of funds in order to finance investments by corporations, governments and individuals. **Financial institutions** are the key players in the financial markets as they perform the function of intermediation and thus determine the flow of funds. The **financial regulators** perform the role of monitoring and regulating the participants in the financial system.

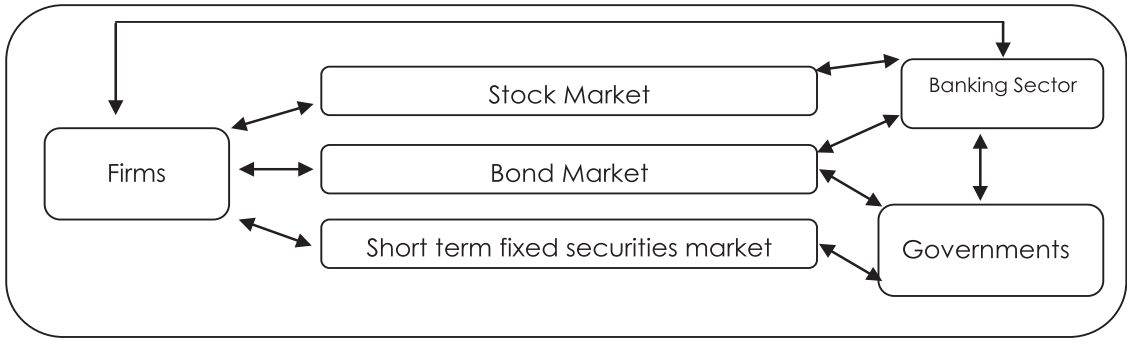


Figure: The Structure of financial system

Financial markets studies, based on capital market theory, focus on the financial system, the structure of interest rates, and the pricing of financial assets.

An **asset** is any resource that is expected to provide future benefits, and thus possesses economic value. Assets are divided into two categories: tangible assets with physical properties and intangible assets. An intangible asset represents a legal claim to some future economic benefits. The value of an intangible asset bears no relation to the form, physical or otherwise, in which the claims are recorded.

Financial assets, often called **financial instruments**, are intangible assets, which are expected to provide future benefits in the form of a claim to future cash. Some financial instruments are called *securities* and generally include stocks and bonds.

Any transaction related to financial instrument includes at least two parties:

1) the party that has agreed to make future cash payments and is called the *issuer;*

2) the party that owns the financial instrument, and therefore the right to receive the payments made by the issuer, is called the *investor.*

Financial assets provide the following key economic **functions**.

- ❖ they allow the transfer of funds from those entities, who have surplus funds to invest in those who need funds to invest in tangible assets;
- ❖ they redistribute the unavoidable risk related to cash generation among deficit and surplus economic units.

The claims held by the final wealth holders generally differ from the liabilities issued by those entities who demand those funds. Their role is performed by the specific entities operating in financial systems, called **financial intermediaries**. The latter ones transform the final liabilities into different financial assets preferred by the public.

Financial markets and their economic functions

A financial market is a market where financial instruments are exchanged or traded. Financial markets provide the following three major **economic functions**:

1) Price discovery

2) Liquidity

3) Reduction of transaction costs

1) **Price discovery** function means that transactions between buyers and sellers of financial instruments in a financial market determine the price of the traded asset. At the same time the required return from the investment of funds is determined by the participants in a financial market. The motivation for those seeking funds (deficit units) depends on the required return that investors demand. It is these functions of financial markets that signal how the funds available from those who want to lend or invest funds will be allocated among those needing funds and raise those funds by issuing financial instruments.

2) **Liquidity** function provides an opportunity for investors to sell a financial instrument, since it is referred to as a measure of the ability to sell an asset at its fair market value at any time. Without liquidity, an investor would be forced to hold a financial instrument until conditions arise to sell it or the issuer is contractually obligated to pay it off. Debt instrument is liquidated when it matures, and equity instrument is until the company is either voluntarily or involuntarily liquidated. All financial markets provide some form of liquidity. However, different financial markets are characterized by the degree of liquidity.

3) The function of **reduction of transaction costs** is performed, when financial market participants are charged and/or bear the costs of trading a financial instrument. In market economies the economic rationale for the existence of institutions and instruments is related to transaction costs, thus the surviving institutions and instruments are those that have the lowest transaction costs.

Functions of a Financial System

The following are the functions of a Financial System:

(i) **Mobilise and allocate savings –** linking the savers and investors to mobilise and allocate the savings efficiently and effectively.

(ii) **Monitor corporate performance –** apart from selection of projects to be funded, through an efficient financial system, the operators are motivated to monitor the performance of the investment.

(iii) **Provide payment and settlement systems –** for exchange of goods and services and transfer of economic resources through time and across geographic regions and industries. The clearing and settlement mechanism of the stock markets is done through depositories and clearing operations.

(iv) **Optimum allocation of risk-bearing and reduction** - by framing rules to reduce risk by laying down the rules governing the operation of the system. This is also achieved through holding of diversified portfolios.

(v) **Disseminate price-related information –** which acts as an important tool for taking economic and financial decisions and take an informed opinion about investment, disinvestment, reinvestment or holding of any particular asset.

(vi) **Offer portfolio adjustment facility** – which includes services of providing quick, cheap and reliable way of buying and selling a wide variety of financial assets.

(vii) **Lower the cost of transactions** – when operations are through and within the financial structure.

(viii) **Promote the process of financial deepening and broadening** – through a well-functional financial system. Financial deepening refers to an increase of financial assets as a percentage of GDP. Financial depth is an important measure of financial system development as it measures the size of the financial intermediary sector. Financial broadening refers to building an increasing number of varieties of participants and instruments.

Key elements of a well-functioning Financial System

The basic elements of a well-functional financial system are:

(i) a strong legal and regulatory environment;

(ii) stable money;

(iii) sound public finances and public debt management;

(iv) a central bank;

(v) a sound banking system;

(vi) an information system; and

(vii) well functioning securities market.

Designing a Financial System

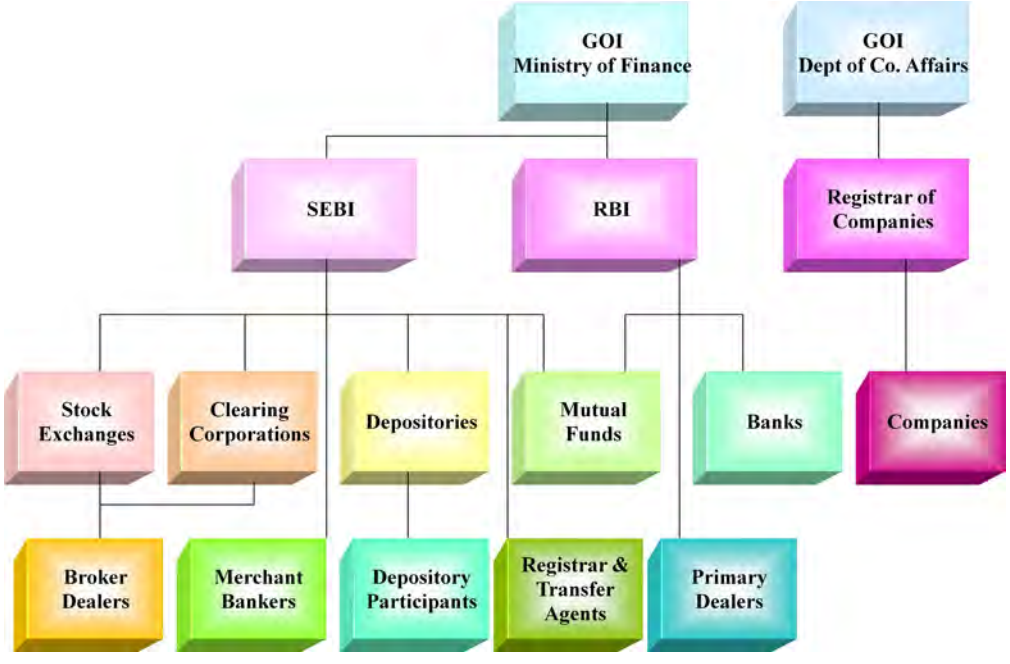
A well-functioning financial system allows individuals, households, firms and entire nations to:

1. Think long-term and make investments both personal (e.g. advanced education) and financial (e.g. municipal finance) that have long horizons.
2. Assume risks that they are in the best position to beneficially manage (e.g. building hydro-electric power plants in the Himalayas) and shed the risks that they are unable to (e.g. credit exposure to vendors, wholesale price index).
3. Focus their attention on a few skill sets and activities (e.g. bio-medical engineering) and not be required to over-diversify physical skills to protect themselves against adverse shocks (e.g. shifts in the fortunes of the pharmaceutical industry).
4. To get resources at a "reasonable" price to build and grow high quality businesses (e.g. steel plants), should they have the skills and the desire to do so. If not, to have the ability to invest their resources in other businesses or in the larger economy at a level of risk that they are comfortable in taking (e.g. participations in shipping insurance).
5. Ensure that day-to-day lives of individuals are smooth and risk free so that children can go to school, mothers can live lives without stress and the entire family can sit together and plan for a better future without being beset by unexpected shocks (e.g. cost of a home or a medical education).
6. Receive good guidance on how they might best live their financial lives from well-trained specialists who have the patience to understand their particular circumstances and their plans, dreams, and fears and have the competence to provide them with a sound set of financial tools that modern financial systems have the ability to provide and to be protected from deliberate or accidental mis-selling by their financial product providers and advisors (e.g. inappropriate sale of interest rate derivate products to companies).
7. Grow as far as their capacities and human and technological resources would allow them to without being bound by the limitations and size of financial systems (e.g. power plants, mining companies).

Indian Financial System

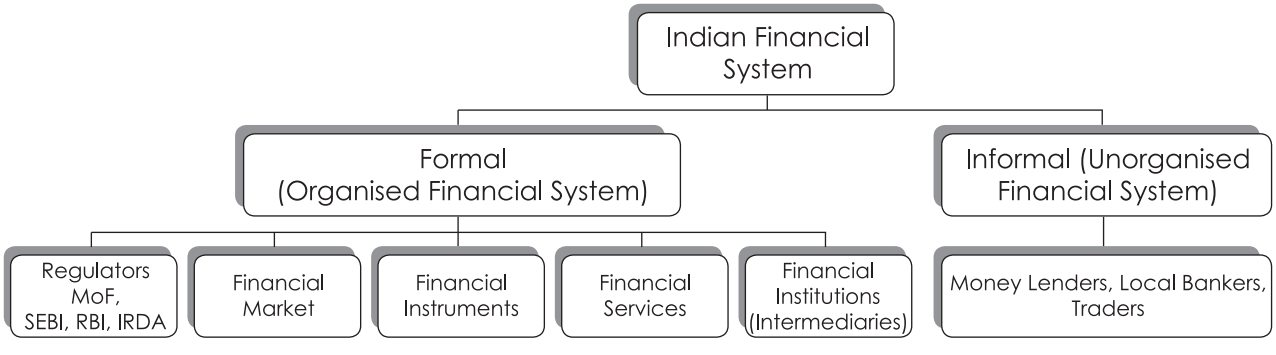
The Indian Financial System before independence closely resembled the model given by RL Benne in his theory of financial organization in a traditional economy. According to him in a traditional economy the per capita output is low and constant. Some principal features of the Indian Financial system before independence were: closed-circle character of industrial entrepreneurship; a narrow industrial securities market, absence of issuing institutions and no intermediaries in the long-term financing of the industry. Outside savings could not be invested in industry. That is, the savings of the financial system could not be channeled to investment opportunities in industrial sector. Indian Financial System to supply finance and credit was greatly strengthened in the post-1950. Significant diversification and innovations in the structure of the financial institutions, have accompanied the growth of Indian Financial System.

In the past 50 years the Indian financial system has shown tremendous growth in terms of quantity, diversity, sophistication, innovations and complexity of operation. Indicators like money supply, deposits and credit of banks, primary and secondary issues, and so on, have increased rapidly. India has witnessed all types of financial innovations like diversification, disintermediation, securitization, liberalization, and globalization etc. As a result, today the financial institutions and a large number of new financial instruments lead a fairly diversified portfolio of financial claims.



Regulatory Structure of Indian Financial System

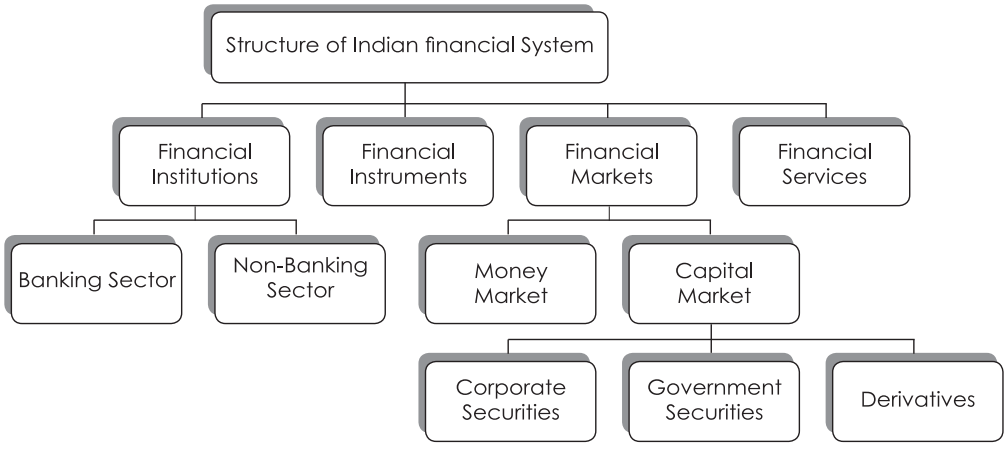
The Indian financial system consists of formal and informal financial system. Based on the financial system financial market, financial instruments and financial intermediation can be categorized depending upon functionality.



Structure of Indian Financial System

The financial structure refers to the shape, constituents and their order in the financial system. The financial system consists of specialized and unspecialized financial institutions, organized and unorganized financial markets, financial instruments and services which facilitate transfer of funds.

A financial system consists of financial institutions, financial markets, financial instruments and financial services which are all regulatory by regulators like Ministry of Finance, the Company Law Board, RBI, SEBI, IRDA, Department of Economic Affairs, Department of Company Affairs, etc., which facilitate the process of smooth and efficient transfer of funds.



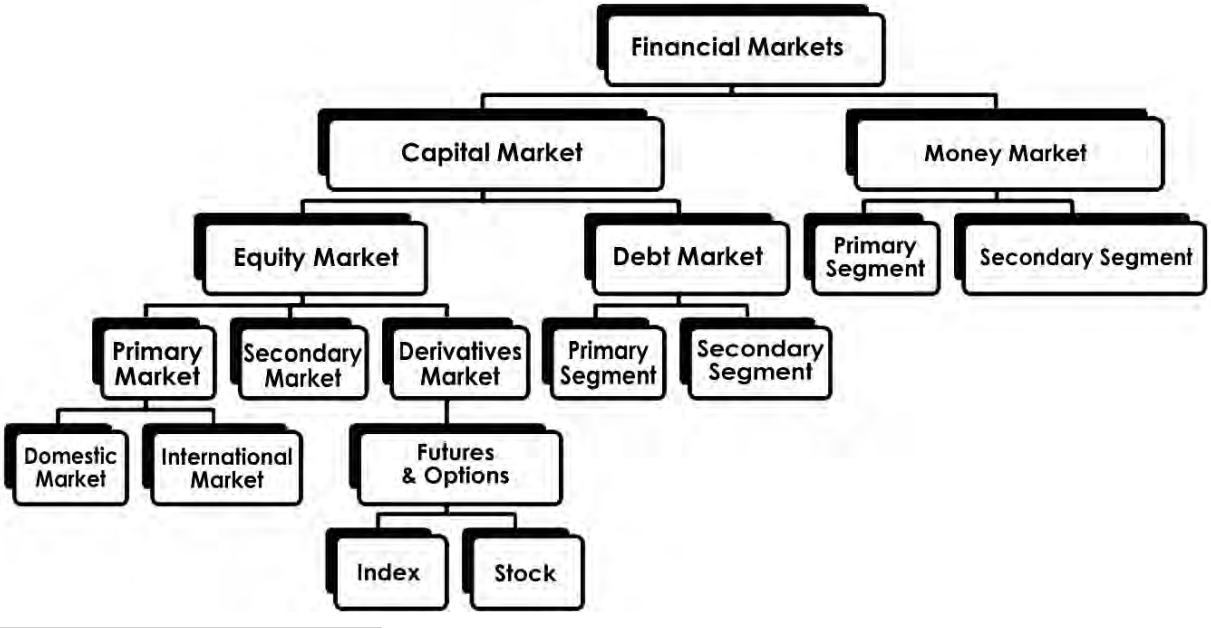
Structure of Indian Financial System

Each of the elements of financial system is detailed hereunder. The financial institutions may be business organizations or non-business organizations.

Classification of Financial Markets

There are different ways of classifying financial markets. One way of classifying the financial markets is by the type of financial claim into the debt market and the equity market. The debt market is the financial market for fixed claims like debt instruments. The equity market is the financial market for residual claims i.e. equity instruments.

A second way of classifying the financial markets into money market and capital market is on the basis of maturity of claims.



4.2 RESERVE BANK OF INDIA

The Reserve Bank of India (RBI) is the nation's central bank. Since 1935, RBI began operations, and stood at the centre of India's financial system, with a fundamental commitment to maintaining the nation's monetary and financial stability.

From ensuring stability of interest and exchange rates to providing liquidity and an adequate supply of currency and credit for the real sector; from ensuring bank penetration and safety of depositors' funds to promoting and developing financial institutions and markets, and maintaining the stability of the financial system through continued macro-financial surveillance, the Reserve Bank plays a crucial role in the economy. Decisions are adopted by RBI to touch the daily life of all the Indians and help chart the country's current and future economic and financial course.

The origin of the Reserve Bank can be traced to 1926, when the Royal Commission on Indian Currency and Finance—also known as the Hilton-Young Commission— recommended the creation of a central bank to separate the control of currency and credit from the government and to augment banking facilities throughout the country. The Reserve Bank of India Act of 1934 established the Reserve Bank as the banker to the central government and set in motion a series of actions culminating in the start of operations in 1935. Since then, the Reserve Bank's role and functions have undergone numerous changes—as the nature of the Indian economy has changed.

Today's RBI bears some resemblance to the original institution, but the mission has expanded along with the deepened, broadened and increasingly globalised economy.

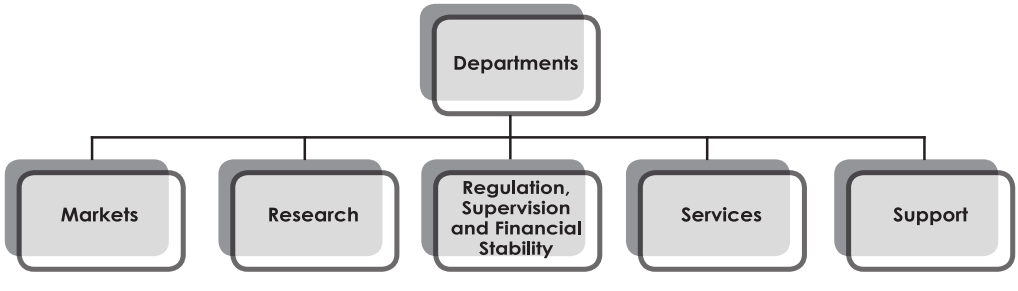
Over the years, RBI's specific roles and functions have evolved. However, there have been certain constants, such as the integrity and professionalism with which the Reserve Bank discharges its mandate.

RBI at a Glance

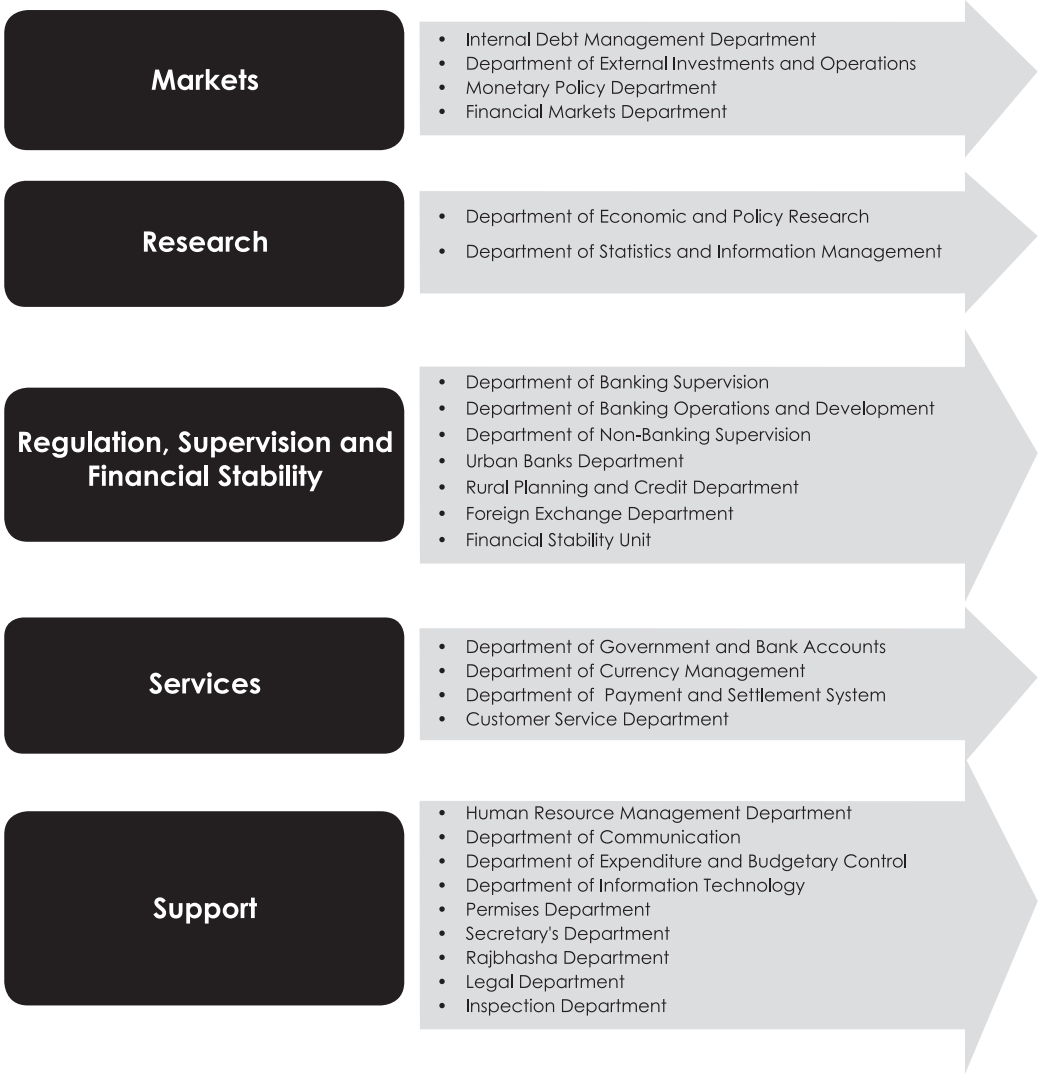
- Managed by Central Board of Directors
- India's monetary authority
- Supervisor of financial system
- Issuer of currency
- Manager of foreign exchange reserves
- Banker and debt manager to government'
- Supervisor of payment system
- Banker to banks
- Maintaining financial stability
- Developmental functions
- Research, data and knowledge sharing

Management and Structure

The Governor is the Reserve Bank's Chief Executive. The Governor supervises and directs the affairs and business of the Reserve Bank. The management team also includes Deputy Governors and Executive Directors.



The Departments has the following sub-departments:



Functions/Main Activities of RBI

The Reserve Bank is the umbrella network for numerous activities, all related to the nation's financial sector, encompassing and extending beyond the functions of a typical central bank. This section provides an overview of our primary activities:

- ❖ Monetary Authority
- ❖ Issuer of Currency
- ❖ Banker and Debt Manager to Government
- ❖ Banker to Banks
- ❖ Regulator of the Banking System
- ❖ Manager of Foreign Exchange
- ❖ Maintaining Financial Stability
- ❖ Regulator and Supervisor of the Payment and Settlement Systems
- ❖ Developmental Role

(i) Monetary Authority

Monetary policy refers to the use of instruments under the control of the central bank to regulate the availability, cost and use of money and credit. The goal: achieving specific economic objectives, such as low and stable inflation and promoting growth.

"The basic functions of the Reserve Bank of India are to regulate the issue of Bank notes and the keeping of reserves with a view to securing monetary stability in India and generally to operate the currency and credit system of the country to its advantage" – From the Preamble of the Reserve Bank of India Act,1934.

The main objectives of monetary policy in India are:

- ❖ Maintaining price stability
- ❖ Ensuring adequate flow of credit to the productive sectors of the economy to support economic growth
- ❖ Financial stability

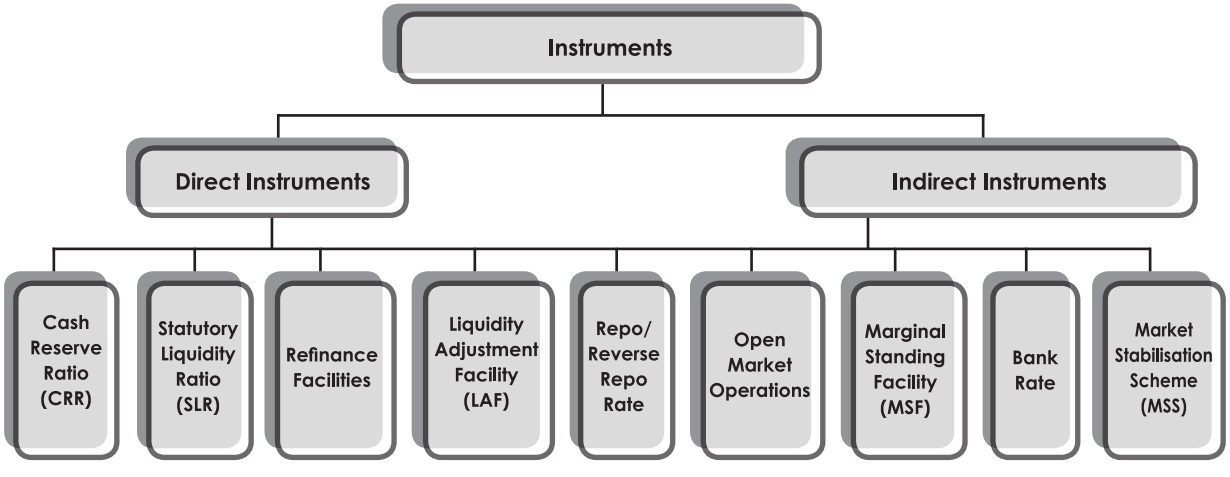
The relative emphasis among the objectives varies from time to time, depending on evolving macroeconomic developments.

Approach

The operating framework is based on a multiple indicator approach. This means that there is a close monitoring and analysis of the movement of a number of indicators including interest rates, inflation rate, money supply, credit, exchange rate, trade, capital flows and fiscal position, along with trends in output as we develop our policy perspectives.

Tools

The Reserve Bank's Monetary Policy Department (MPD) formulates monetary policy. The Financial Markets Department (FMD) handles day-to-day liquidity management operations. There are several direct and indirect instruments that are used in the formulation and implementation of monetary policy.



The instruments are discussed in details hereunder:

(A) Direct Instruments

(a) **Cash Reserve Ratio (CRR):** The share of net demand and time liabilities that banks must maintain as cash balance with the Reserve Bank. The Reserve Bank requires banks to maintain a certain amount of cash in reserve as percentage of their deposits to ensure that banks have sufficient cash to cover customer withdrawals. The adjustment of this ratio, is done as an instrument of monetary policy, depending on prevailing conditions. Our centralized and computerized system allows for efficient and accurate monitoring of the balances maintained by banks with the Reserve Bank of India.

(b) **Statutory Liquidity Ratio (SLR):** The share of net demand and time liabilities that banks must maintain in safe and liquid assets, such as government securities, cash and gold.

(c) **Refinance facilities:** Sector-specific refinance facilities (e.g., against lending to export sector) provided to banks exchange or other commercial papers. It also signals the medium-term stance of monetary policy.

(B) Indirect Instruments

(a) **Liquidity Adjustment Facility (LAF):** Consists of daily infusion or absorption of liquidity on a repurchase basis, through repo (liquidity injection) and reverse repo (liquidity absorption) auction operations, using government securities as collateral.

(b) **Repo/Reverse Repo Rate:** These rates under the Liquidity Adjustment Facility (LAF) determine the corridor for short-term money market interest rates. In turn, this is expected to trigger movement in other segments of the financial market and the real economy.

(c) **Open Market Operations (OMO):** Outright sales/purchases of government securities, in addition to LAF, as a tool to determine the level of liquidity over the medium term.

(d) **Marginal Standing Facility (MSF):** was instituted under which scheduled commercial banks can borrow over night at their discretion up to one per cent of their respective NDTL at 100 basis points above the repo rate to provide a safety value against unanticipated liquidity shocks.

(d) **Bank Rate:** It is the rate at which the Reserve Bank is ready to buy or rediscount bills of exchange or other commercial papers. It also signals the medium-term stance of monetary policy.

(e) **Market Stabilization Scheme (MSS):** This instrument for monetary management was introduced in 2004. Liquidity of a more enduring nature arising from large capital flows is absorbed through sale of short-dated government securities and treasury bills. The mobilized cash is held in a separate government account with the Reserve Bank.

Current Policy Rates Reserve Ratios of RBI (31st August 2016)	
Repo Rate	6.50%
Reverse Repo Rate	6.00%
Marginal Standing Facility Rate	7.00%
Bank Rate	7.00%
SLR	21.00%
CRR	4.00%

(ii) Issuer of Currency

The Reserve Bank is the nation's sole note issuing authority. Along with the Government of India, RBI is responsible for the design and production and overall management of the nation's currency, with the goal of ensuring an adequate supply of clean and genuine notes. The Reserve Bank also makes sure there is an adequate supply of coins, produced by the government. In consultation with the government, RBI routinely addresses security issues and target ways to enhance security features to reduce the risk of counterfeiting or forgery.

Approach

- The Department of Currency Management in Mumbai, in co-operation with the Issue Departments in the Reserve Bank's regional offices, oversees the production and manages the distribution of currency.
- Currency chests at more than 4,000 bank branches – typically commercial banks – contain adequate quantity of notes and coins so that the currency is accessible to the public in all parts of the country.
- The Reserve Bank has the authority to issue notes upto the value of Rupees Ten Thousand.

Tools

Four printing presses actively print notes: Dewas in Madhya Pradesh, Nasik in Maharashtra, Mysore in Karnataka, and Salboni in West Bengal.

The presses in Madhya Pradesh and Maharashtra are owned by the Security Printing and Minting Corporation of India (SPMCIL), a wholly owned company of the Government of India. The presses in Karnataka and West Bengal are set up by Bharatiya Reserve Bank Note Mudran Private Limited (BRBNMPL), a wholly owned subsidiary of the Reserve Bank.

Coins are minted by the Government of India. RBI is the agent of the Government for distribution, issue and handling of coins. Four mints are in operation: Mumbai, Noida in Uttar Pradesh, Kolkata, and Hyderabad.

RBI's Anti-counterfeiting Measures

- Continual upgrades of bank note security features
- Public awareness campaigns to educate citizens
- Installation of note sorting machines

(iii) Banker and Debt Manager to Government

Managing the government's banking transactions is a key RBI role. Like individuals, businesses and banks, governments need a banker to carry out their financial transactions in an efficient and effective manner, including the raising of resources from the public. As a banker to the central government, the Reserve Bank maintains its accounts, receives money into and makes payments out of these accounts and facilitates the transfer of government funds. RBI also act as the banker to those state governments that has entered into an agreement.

Approach

The role as banker and debt manager to government includes several distinct functions:

- Undertaking banking transactions for the central and state governments to facilitate receipts and payments and maintaining their accounts.
- Managing the governments' domestic debt with the objective of raising the required amount of public debt in a cost-effective and timely manner.
- Developing the market for government securities to enable the government to raise debt at a reasonable cost, provide benchmarks for raising resources by other entities and facilitate transmission of monetary policy actions.

Tools

At the end of each day, RBI's electronic system automatically consolidates all of the government's transactions to determine the net final position. If the balance in the government's account shows a negative position, RBI extends a short-term, interest-bearing advance, called a Ways and Means Advance-WMA-the limit or amount for which is set at the beginning of each financial year in April.

The RBI's Government Finance Operating Structure

The Reserve Bank's Department of Government and Bank Accounts oversees governments' banking related activities. This department encompasses:

- **Public accounts departments:** manage the day-to-day aspects of Government's banking operations. The Reserve Bank also appoints commercial banks as its agents and uses their branches for greater access to the government's customers.
- **Public debt offices:** provide depository services for government securities for banks, institutions and service government loans.
- **Central Accounts Section at Nagpur:** consolidates the government's banking transactions.

The Internal Debt Management Department based in Mumbai raises the government's domestic debt and regulates and develops the government securities market. RBI plays a critical role managing the issuance of public debt. Part of this role includes informing potential investors about upcoming debt auctions through notices.

RBI as the Governments' Debt Manager

In this role, we set policies, in consultation with the government and determine the operational aspects of raising money to help the government finance its requirements:

- Determine the size, tenure and nature (fixed or floating rate) of the loan
- Define the issuing process including holding of auctions
- Inform the public and potential investors about upcoming government loan auctions

The Reserve Bank also undertakes market development efforts, including enhanced secondary market trading and settlement mechanisms, authorization of primary dealers and improved transparency of issuing process to increase investor confidence, with the objective of broadening and deepening the government securities market.

(iv) Banker to Banks

Like individual consumers, businesses and organisations of all kinds, banks need their own mechanism to transfer funds and settle inter-bank transactions—such as borrowing from and lending to other banks— and customer transactions. As the banker to banks, the Reserve Bank fulfills this role. In effect, all banks operating in the country have accounts with the Reserve Bank, just as individuals and businesses have accounts with their banks.

Approach

As the banker to banks, RBI focuses on:

- Enabling smooth, swift and seamless clearing and settlement of inter-bank obligations.
- Providing an efficient means of funds transfer for banks.
- Enabling banks to maintain their accounts with us for purpose of statutory reserve requirements and maintain transaction balances.
- Acting as lender of the last resort.

Tools

The Reserve Bank provides products and services for the nation's banks similar to what banks offer their own customers. Here's a look at how RBI help:

Non-interest earning current accounts: Banks hold accounts with the Reserve Bank based on certain terms and conditions, such as, maintenance of minimum balances. They can hold accounts at each of our regional offices. Banks draw on these accounts to settle their obligations arising from inter-bank settlement systems. Banks can electronically transfer payments to other banks from this account, using the Real Time Gross Settlement System (RTGS).

Deposit Accounts Department: This department's computerized central monitoring system helps banks manage their funds position in real time to maintain the optimum balance between surplus and deficit centres.

Remittance facilities: Banks and government departments can use these facilities to transfer funds.

Lender of the last resort: The Reserve Bank provides liquidity to banks unable to raise short-term liquid resources from the inter-bank market. Like other central banks, the Reserve Bank considers this a critical function because it protects the interests of depositors, which in turn, has a stabilizing impact on the financial system and on the economy as a whole.

Loans and advances: The Reserve Bank provides short-term loans and advances to banks/ financial institutions, when necessary, to facilitate lending for specified purposes.

(v) Regulator of the Banking System

Banks are fundamental to the nation's financial system. The central bank has a critical role to play in ensuring the safety and soundness of the banking system—and in maintaining financial stability and public confidence in this system. As the regulator and supervisor of the banking system, the Reserve Bank protects the interests of depositors, ensures a framework for orderly development and conduct of banking operations conducive to customer interests and maintains overall financial stability through preventive and corrective measures.

Approach

The Reserve Bank regulates and supervises the nation's financial system. Different departments of the Reserve Bank oversee the various entities that comprise India's financial infrastructure. RBI oversees:

- **Commercial banks and all-India development financial institutions:** Regulated by the Department of Banking Operations and Development, supervised by the Department of Banking Supervision
- **Urban co-operative banks:** Regulated and supervised by the Urban Banks Department
- **Regional Rural Banks (RRB), District Central Cooperative Banks and State Co-operative Banks:** Regulated by the Rural Planning and Credit Department and supervised by NABARD
- **Non-Banking Financial Companies (NBFC):** Regulated and supervised by the Department of Non- Banking Supervision

Tools

The Reserve Bank makes use of several supervisory tools:

- On-site inspections
- Off-site surveillance, making use of required reporting by the regulated entities.
- Thematic inspections, scrutiny and periodic meetings

The Board for Financial Supervision oversees the Reserve Bank's regulatory and supervisory responsibilities.

Consumer confidence and trust are fundamental to the proper functioning of the banking system. RBI's supervision and regulation helps ensure that banks are stable and that the system functions smoothly.

The RBI's Regulatory Role

As the nation's financial regulator, the Reserve Bank handles a range of activities, including:

- Licensing
- Prescribing capital requirements
- Monitoring governance
- Setting prudential regulations to ensure solvency and liquidity of the banks
- Prescribing lending to certain priority sectors of the economy
- Regulating interest rates in specific areas
- Setting appropriate regulatory norms related to income recognition, asset classification, provisioning, investment valuation, exposure limits and the like
- Initiating new regulation

Looking Ahead

In the regulatory and supervisory arena, there are several challenges going forward.

- **For commercial banks:** Focus is on implementing Basel II norms, which will require improved capital planning and risk management skills.
- **For urban cooperative banks:** Focus is on profitability, professional management and technology enhancement.
- **For NBFCs:** Focus is on identifying the interconnections and the roles these institutions should play as the financial system deepens.
- **For regional rural banks:** Focus is on enhancing capability through IT and HR for serving the rural areas.
- **For rural cooperative banks:** Focus is on ensuring that they meet minimum prudential standards.

(vi) Manager of Foreign Exchange

With the transition to a market-based system for determining the external value of the Indian rupee, the foreign exchange market in India gained importance in the early reform period. In recent years, with increasing integration of the Indian economy with the global economy arising from greater trade and capital flows, the foreign exchange market has evolved as a key segment of the Indian financial market.

Approach

The Reserve Bank plays a key role in the regulation and development of the foreign exchange market and assumes three broad roles relating to foreign exchange:

- Regulating transactions related to the external sector and facilitating the development of the foreign exchange market
- Ensuring smooth conduct and orderly conditions in the domestic foreign exchange market
- Managing the foreign currency assets and gold reserves of the country

Tools

The Reserve Bank is responsible for administration of the Foreign Exchange Management Act, 1999 and regulates the market by issuing licences to banks and other select institutions to act as Authorised Dealers in foreign exchange. The Foreign Exchange Department (FED) is responsible for the regulation and development of the market.

On a given day, the foreign exchange rate reflects the demand for and supply of foreign exchange arising from trade and capital transactions. The RBI's Financial Markets Department (FMD) participates in the foreign exchange market by undertaking sales / purchases of foreign currency to ease volatility in periods of excess demand for/ supply of foreign currency.

The Department of External Investments and Operations (DEIO) invests the country's foreign exchange reserves built up by purchase of foreign currency from the market. In investing its foreign assets, the Reserve Bank is guided by three principles: safety, liquidity and return.

Looking Ahead

The challenge now is to liberalise and develop the foreign exchange market, with an eye toward ushering in greater market efficiency while ensuring financial stability in an increasingly global financial market environment. With current account convertibility achieved in 1994, the key focus is now on capital account management.

(vii) Regulator and Supervisor of Payment and Settlement Systems

Payment and settlement systems play an important role in improving overall economic efficiency. They consist of all the diverse arrangements that we use to systematically transfer money - currency, paper instruments such as cheques, and various electronic channels.

Approach

The Payment and Settlement Systems Act of 2007 (PSS Act) gives the Reserve Bank oversight authority, including regulation and supervision, for the payment and settlement systems in the country. In this role, RBI focus on the development and functioning of safe, secure and efficient payment and settlement mechanisms.

Tools

The Reserve Bank has a two-tiered structure. The first tier provides the basic framework for our payment systems. The second tier focuses on supervision of this framework. As part of the basic framework, the Reserve Bank's network of secure systems handles various types of payment and settlement activities. Most operate on the security platform of the Indian Financial Network (INFINET), using digital signatures for further security of transactions. The various systems used are as follows:

- **Retail payment systems:** Facilitating cheque clearing, electronic funds transfer, through National Electronic Funds Transfer (NEFT), settlement of card payments and bulk payments, such as electronic clearing services, Operated through local clearing houses throughout the country.
- **Large value systems:** Facilitating settlement of inter-bank transactions from financial markets.

  These include:
  - ✓ Real Time Gross Settlement System (RTGS): for funds transfers
  - ✓ Securities Settlement System: for the government securities market
  - ✓ Foreign Exchange Clearing: for transactions involving foreign currency
- **Department of Payment and Settlement Systems:** The Reserve Bank's payment and settlement systems regulatory arm.
- **Department of Information Technology:** Technology support for the payment systems and for the Reserve Bank's internal IT systems.

Looking Ahead

Going forward, we are practically identifying and addressing issues that help mitigate the risks for large value systems. Efforts on the retail payment system side will focus on operational efficiencies, cost effectiveness, innovation and risk management.

(viii) Maintaining Financial Stability

Pursuit of financial stability has emerged as a key critical policy objective for the central banks in the wake of the recent global financial crisis. Central banks have a critical role to play in achieving this objective. Though financial stability is not an explicit objective of the Reserve Bank in terms of the Reserve Bank of India Act, 1935, it has been an explicit objective of the Reserve Bank since the early 2000s.

Approach

In 2009, the Reserve Bank set up a dedicated Financial Stability Unit mainly to, put in place a system of continuous monitoring of the macro financial system. The department's remit includes:

- Conduct of macro-prudential surveillance of the financial system on an ongoing basis
- Developing models for assessing financial stability in going forward
- Preparation of half yearly financial stability reports.
- Development of a database of key variables which could impact financial stability, in co-ordination with the supervisory wings of the Reserve Bank
- Development of a time series of a core set of financial indicators
- Conduct of systemic stress tests to assess resilience

Following the establishment of the Financial Stability Unit, the Reserve Bank started publishing periodic financial stability reports, with the first Financial Stability Report (FSR) being published in March 2010. FSRs are now being published on a half yearly basis - in June and December every year. Internally, quarterly Systemic Risk Monitors and

monthly Market Monitors are prepared to place before the Bank's Top Management a more frequent assessment of the risks to systemic stability of the economy.

In the Union Budget for 2010-11, the Finance Minister announced the establishment of Financial Stability and Development Council (FSDC) to provide, among other things, a high level focus to financial stability. The Reserve Bank plays a critical role in the Council. The Governor, Reserve Bank, is the ex- officio chairperson of the Sub Committee of the FSDC – the Council's main operating arm. The Financial Stability Unit of the Reserve Bank of India acts as the Secretariat for the Sub Committee.

Tools

The Reserve Bank makes use of a variety of tools and techniques to assess the build-up of systemic risks in the economy and to provide critical inputs in this respect to its policy making departments. The tools include:

- A **Financial Stress Indicator** - a contemporaneous indicator of conditions in financial markets and in the banking sector;
- **Systemic Liquidity Indicator** for assessing stresses in availability of systemic liquidity;
- A **Fiscal Stress Indicator** for assessing build up of risks from the fiscal;
- A **Network Model** of the bilateral exposures in the financial system - for assessing the inter- connectedness in the system;
- A **Banking Stability Indicator** for assessing risk factors having a bearing on the stability of the banking sector; and
- A series of **Banking Stability Measures** for assessing the systemic importance of individual banks.

Looking Ahead

Launching a Systemic Risk Survey to more formally elicit market views on the possible sources of risk to systemic stability of the country - both, domestic and global.

(ix) Developmental Role

This role is, perhaps, the most unheralded aspect of our activities, yet it remains among the most critical. This includes ensuring credit availability to the productive sectors of the economy, establishing institutions designed to build the country's financial infrastructure, expanding access to affordable financial services and promoting financial education and literacy.

Approach

Over the years, the Reserve Bank has added new institutions as the economy has evolved. Some of the institutions established by the RBI include:

- Deposit Insurance and Credit Guarantee Corporation (1962), to provide protection to bank depositors and guarantee cover to credit facilities extended to certain categories of small borrowers
- Unit Trust of India (1964), the first mutual fund of the country
- Industrial Development Bank of India (1964), a development finance institution for industry
- National Bank for Agriculture and Rural Development (1982), for promoting rural and agricultural credit
- Discount and Finance House of India (1988), a money market intermediary and a primary dealer in government securities
- National Housing Bank (1989), an apex financial institution for promoting and regulating housing finance
- Securities and Trading Corporation of India (1994), a primary dealer

Tools

The Reserve Bank continues its developmental role, while specifically focusing on financial inclusion. Key tools in this on-going effort include:

- **Directed credit for lending to priority sector and weaker sections:** The goal here is to facilitate/ enhance credit flow to employment intensive sectors such as agriculture, micro and small enterprises (MSE), as well as for affordable housing and education loans.
- **Lead Bank Scheme:** A commercial bank is designated as a lead bank in each district in the country and this bank is responsible for ensuring banking development in the district through coordinated efforts between

banks and government officials. The Reserve Bank has assigned a Lead District Manager for each district who acts as a catalytic force for promoting financial inclusion and smooth working between government and banks.

- **Sector specific refinance:** The Reserve Bank makes available refinance to banks against their credit to the export sector. In exceptional circumstances, it can provide refinance against lending to other sectors.
- **Strengthening and supporting small local banks:** This includes regional rural banks and cooperative banks.
- **Financial inclusion:** Expanding access to finance and promoting financial literacy are a part of our outreach efforts.

Looking Ahead

The developmental role of the Reserve Bank will continue to evolve, along with the Indian Economy. Through the outreach efforts and emphasis on customer service, the Reserve Bank will continue to make efforts to fill the gaps to promote inclusive economic growth and stability.

Financial Inclusion and Literacy: Expanding Access; Encouraging Education

Expanding access to and knowledge about finance is a fundamental aspect of the Reserve Bank's operations. These efforts are critical to ensuring that the benefits of a growing and healthy economy reach all segments of the population. RBI's activities here include:

- Encouraging provision of affordable financial services like zero-balance, no-frills bank accounts, access to payments and remittance facilities, savings, loans and insurance services.
- Expanding banking outreach through use of technology, such as banking by cell phone, smart cards and the like
- Encouraging bank branch expansion in parts of the country with few banking facilities
- Facilitating use of specified persons to act as agents to perform banking functions in hard-to- reach parts of the country.

RBI's work to promote financial literacy focuses on educating people about responsible financial management. Efforts here include:

- Information and knowledge-sharing: User-friendly website includes easy-to-understand tips and guidance in multiple languages, brochures, advertisements and other marketing materials educate the public about banking services.
- Credit counseling: The Reserve Bank encourages commercial banks to set up financial literacy and credit counseling centres, to help people develop better financial planning skills.

4.3 BANKING INSTITUTIONS – COMMERCIAL BANKS

In recent years India's national economy has developed certain serious economic maladies. In the first instance the economy has become heavily dependent on foreign aid.

The proportion of foreign aid in the Plan Development Programme has been continuously rising since the First Five Year Plan. Since the prospects of the availability of foreign aid in the last two or three years have become very uncertain and rather dim, there has been a slack in the levels of economic activity and employment in the country.

Secondly, there has been the paradox of inflationary recession having come in the economy and tending to become all pervasive. The chief characteristic of the recession is that, while on the one hand there are large unutilised industrial capacities in the economic system, the supply of raw materials and other components for production of final goods is extremely deficient. The decline of agricultural production explains only a part of this phenomenon, while another part will have to be ascribed to the general shortages in the economy which have been generated as a result of the growing inter- sectoral imbalances caused by the functioning of the financial institutions and the economic system in a particular manner.

The most curious aspect of the present situation is that the price level of industrial and agricultural goods continues to be very high despite the slack in demand. Obviously, the financial system of the country seems to have acquired such characteristics that it is able to sustain a prolonged holding of goods in the economy without leading to the adjustments of the price level with the existing state of demand and supply.

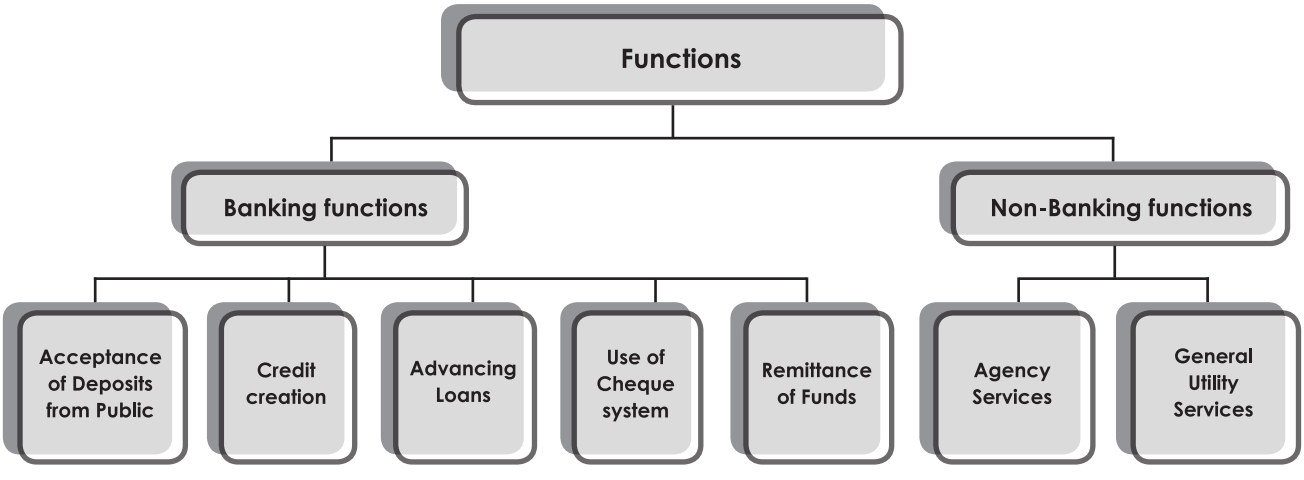
The role of bank credit in the situation is obviously an important factor to be examined in so far as it helps to create the present situation as well as to maintain it for a long period.

In addition, due to various political and economic reasons, both national and international, the perspective of long term development of the economy is tending to get blurred. The commitment to long term programmes of plan development has tended to become weak in recent years and greater attention is being given to measures of policy which seek to attain economic stability rather than economic growth. In this context too, it has become necessary to examine the role that the banking system of the country has played so far in promoting the long term growth of the economy as well as in creating conditions in which further growth of industry and agriculture has been halted in recent years.

Commercial Banks

Commercial banks are a part of an organized money market in India. Commercial banks are joint stock companies dealing in money and credit that accept demand deposits from public which are withdrawable by cheques and use these deposits for lending to others. Deposits are accepted from large group of people in forms of money and deposits are withdrawable on demand. Commercial banks mobilize savings in urban and rural areas and make them available to large & small industrial units and trading units mainly for working capital requirements. Commercial banks provide various types of financial services to customers in return of fees.

Functions: Functions of commercial banks can be divided in 2 groups–Banking functions (primary functions) and non-banking functions (secondary functions).



(i) Banking functions (primary functions): Most of the banking functions are:–

(a) **Acceptance of deposits from public**:- Banks accept following deposits from the public :-

(i) Demand deposits can be in the form of current account or savings account. These deposits are withdrawable any time by depositors by cheques. Current deposits have no interest or nominal interest. Such accounts are maintained by commercial firms and business man. Interest rate of saving deposits varies with time period. Savings accounts are maintained for encouraging savings of households.

(ii) Fixed deposits are those deposits which are withdrawable only after a specific period. It earns a higher rate of interest.

(iii) In recurring deposits, people deposit a fixed sum every month for a fixed period of time.

(b) **Advancing loans**: It extends loans and advances out of money deposited by public to various business units and to consumers against some approved securities. Usually banks grant short term or medium term loans to meet requirements of working capital of industrial units and trading units. Banks discourage loans for consumption purposes. Loans may be secured or unsecured. Banks do not give loan in form of cash. They make the customer open account and transfer loan amount in the customer's account.

Banks grant loan in the following ways:–

(i) **Overdraft:** - Banks grant overdraft facilities to current account holders to draw amount in excess of balance held.

(ii) **Cash credit:** - Banks grant credit in cash to current account holders against hypothecation of goods.

(iii) **Discounting trade bills**:- The banks facilitate trade and commerce by discounting bills of exchange.

(iv) **Term loans**: - Banks grant term loans to traders and to agriculturists against some collateral securities.

(v) **Consumer credit**:- Banks grant credit to households in a limited amount to buy durable goods.

(vi) **Money at call or short term advances**:- Banks grant loan for a very short period not exceeding 7 days to dealers / brokers in stock exchange against collateral securities.

(c) **Credit Creation**: Credit creation is another banking function of commercial banks. i,e. it manufactures money.

(d) **Use of cheque system**: - Banks have introduced the cheque system for withdrawal of deposits. There are two types of cheques – bearer & cross cheque. A bearer cheque is encashable immediately at the bank by its possessor. A crossed cheque is not encashable immediately. It has to be deposited only in the payee's account. It is not negotiable.

(e) **Remittance of funds**:- Banks provides facilities to remit funds from one place to another for their customers by issuing bank drafts, mail transfer etc.

(ii) Non Banking functions (secondary functions): Non banking functions are (a) Agency services (b)

General utility services

(a) **Agency services**:- Banks perform following functions on behalf of their customers: -

(i) It makes periodic payments of subscription, rent, insurance premium etc as per standing orders from customers.

(ii) It collects bill, cheques, demand drafts, etc on behalf of their customers

(iii) It acts as a trustee for property of its customers.

(iv) It acts as attorney. It can help in clearing and forwarding goods of its customers.

(v) It acts as correspondents, agents of their clients.

(b) **General utility services**:- General utility services of commercial banks are as follows:-

(i) Lockers are provided by banks to its customers at nominal rate.

(ii) Shares, wills, other valuable documents are kept in safe custody. Banks return them when demanded by its customers.

(iii) It provides travelers cheque and ATM facilities.

(iv) Banks maintain foreign exchange department and deal in foreign exchange.

(v) Banks underwrites issue of shares and debentures of concerns.

(vi) It compiles statistics and business information relating to trade & commerce.

(vii) It accepts public provident fund deposits.

Classification:

Commercial banks are classified into (a) scheduled banks and (b) non-scheduled banks.

A scheduled bank is so called because it has been included in the second schedule of the Reserve Bank of India Act, 1934. To be eligible for this inclusion, a bank must satisfy the following three conditions:-

(i) it must have a paid-up capital and reserves of an aggregate value of at least ₹ 5.00 lakh.

(ii) it must satisfy the RBI that its affairs are not conducted in a manner damaging to the interests of its depositors; and

(iii) it must be a corporation and not a partnership or a single-owner firm.

Scheduled banks enjoy certain advantages :- (i) Free / concessional remittance facilities through the offices of the RBI and its agents. (ii) Borrowings facilities from the RBI by depositing necessary documents. In return, the scheduled banks are under obligation to:-

(i) maintain an average daily balance of cash reserves with the RBI at rates stipulated by it; and

(ii) submit periodical returns to the RBI under various provisions of the Reserve Bank of India Act, 1934 and the Banking Regulation Act, 1949 (as amended from time to time).

All commercial banks such as Indian, foreign, regional rural banks and state co-operative banks are scheduled banks.

Non-scheduled banks are also subject to the statutory cash reserve requirement. But they are not required to keep them with the RBI; they may keep these balances with themselves. They are not entitled to borrow from the RBI for normal banking purposes, though they may approach the RBI for accommodation under abnormal circumstances.

Commercial banks may be classified as (a) Indian and (b) foreign banks.

(a) Indian banks are those banks which are incorporated in India and whose head offices are in India.

(b) Foreign banks are those banks which are incorporated outside India and whose head offices are in outside India.

Both types of bank will have to maintain cash reserves with the RBI at rates stipulated by it. Besides, RBI can supervise over working of foreign banks operating in India.

Commercial banks may also be classified as (a) Private and (b) Public sector banks.

(a) Private sector banks are those banks whose at least 51% shares are held by private sectors.

(b) Public sector banks are those banks which are not private sectors.

4.4 NON-BANKING FINANCIAL COMPANY (NBFC)

The Reserve Bank of India is entrusted with the responsibility of regulating and supervising the Non- Banking Financial Companies by virtue of powers vested in Chapter III B of the Reserve Bank of India Act, 1934. The regulatory and supervisory objective is to:

(a) ensure healthy growth of the financial companies;

(b) ensure that these companies function as a part of the financial system within the policy framework, in such a manner that their existence and functioning do not lead to systemic aberrations; and that

(c) the quality of surveillance and supervision exercised by the Bank over the NBFCs is sustained by keeping pace with the developments that take place in this sector of the financial system.

It has been felt necessary to explain the rationale underlying the regulatory changes and provide clarification on certain operational matters for the benefit of the NBFCs, members of public, rating agencies, Chartered Accountants etc. To meet this need, the clarifications in the form of questions and answers, is being brought out by the Reserve Bank of India (Department of Non-Banking Supervision) with the hope that it will provide better understanding of the regulatory framework.

The information given below is of general nature for the benefit of depositors/public and the clarifications given do not substitute the extant regulatory directions/instructions issued by the Bank to the NBFCs.

Definition

A Non-Banking Financial Company (NBFC) is a company registered under the Companies Act, 1956 engaged in the business of loans and advances, acquisition of shares/stocks/bonds/debentures/ securities issued by Government or local authority or other marketable securities of a like nature, leasing, hire-purchase, insurance business, chit business but does not include any institution whose principal business is that of agriculture activity, industrial activity, purchase or sale of any goods (other than securities) or providing any services and sale/purchase/construction of immovable property. A non-banking institution which is a company and has principal business of receiving deposits under any scheme or arrangement in one lump sum or in installments by way of contributions or in any other manner, is also a non-banking financial company (Residuary non-banking company).

Difference between banks & NBFCs

NBFCs lend and make investments and hence their activities are akin to that of banks; however there are a few differences as given below:

(i) NBFCs cannot accept demand deposits;

(ii) NBFCs do not form part of the payment and settlement system and cannot issue cheques drawn on itself;

(iii) Deposit insurance facility of Deposit Insurance and Credit Guarantee Corporation is not available to depositors of NBFCs, unlike in case of banks.

Registration requirement of NBFCs

In terms of Section 45-IA of the RBI Act, 1934, no Non-banking Financial company can commence or carry on business of a non-banking financial institution without a) obtaining a certificate of registration from the Bank and without having a Net Owned Funds of ₹ 25 lakhs (₹ two crore since April 1999). However, in terms of the powers given to the Bank to obviate dual regulation, certain categories of NBFCs which are regulated by other regulators are exempted from the requirement of registration with RBI viz. Venture Capital Fund/Merchant Banking companies/ Stock broking companies registered with SEBI, Insurance Company holding a valid Certificate of Registration issued by IRDA, Nidhi companies as notified under Section 620A of the Companies Act, 1956, Chit companies as defined in clause (b) of Section 2 of the Chit Funds Act, 1982, Housing Finance Companies regulated by National Housing Bank, Stock Exchange or a Mutual Benefit company.

Different types/categories of NBFCs registered with RBI

NBFCs are categorized a) in terms of the type of liabilities into Deposit and Non-Deposit accepting NBFCs, b) non deposit taking NBFCs by their size into systemically important and other non-deposit holding companies (NBFC-NDSI and NBFC-ND) and c) by the kind of activity they conduct. Within this broad categorization the different types of NBFCs are as follows:

(i) Asset Finance Company (AFC) : An AFC is a company which is a financial institution carrying on as its principal business the financing of physical assets supporting productive/economic activity, such as automobiles, tractors, lathe machines, generator sets, earth moving and material handling equipments, moving on own power and general purpose industrial machines. Principal business for this purpose is defined as aggregate of financing real/physical assets supporting economic activity and income arising there from is not less than 60% of its total assets and total income respectively.

(ii) Investment Company (IC) : IC means any company which is a financial institution carrying on as its principal business the acquisition of securities,

(iii) Loan Company (LC): LC means any company which is a financial institution carrying on as its principal business the providing of finance whether by making loans or advances or otherwise for any activity other than its own but does not include an Asset Finance Company.

(iv) Infrastructure Finance Company (IFC): IFC is a non-banking finance company (a) which deploys at least 75 per cent of its total assets in infrastructure loans, (b) has a minimum Net Owned Funds of ₹ 300 crores, (c) has a minimum credit rating of 'A 'or equivalent (d) and a CRAR of 15%.

(v) Systemically Important Core Investment Company (CIC-ND-SI): CIC-ND-SI is an NBFC carrying on the business of acquisition of shares and securities which satisfies the following conditions:-

(a) it holds not less than 90% of its Total Assets in the form of investment in equity shares, preference shares, debt or loans in group companies;

(b) its investments in the equity shares (including instruments compulsorily convertible into equity shares within a period not exceeding 10 years from the date of issue) in group companies constitutes not less than 60% of its Total Assets;

(c) it does not trade in its investments in shares, debt or loans in group companies except through block sale for the purpose of dilution or disinvestment;

(d) it does not carry on any other financial activity referred to in Section 45I(c) and 45I(f) of the RBI act, 1934 except investment in bank deposits, money market instruments, government securities, loans to and investments in debt issuances of group companies or guarantees issued on behalf of group companies

(e) Its asset size is ₹ 100 crores or above and

(f) It accepts public funds

(vi) Infrastructure Debt Fund: Non- Banking Financial Company (IDF-NBFC): IDF-NBFC is a company registered as NBFC to facilitate the flow of long term debt into infrastructure projects. IDF-NBFC raise resources through issue of Rupee or Dollar denominated bonds of minimum 5 year maturity. Only Infrastructure Finance Companies (IFC) can sponsor IDF-NBFCs.

(vii) Non-Banking Financial Company - Micro Finance Institution (NBFC-MFI): NBFC-MFI is a non-deposit taking NBFC having not less than 85% of its assets in the nature of qualifying assets which satisfy the following criteria:

(a) loan disbursed by an NBFC-MFI to a borrower with a rural household annual income not exceeding ₹60,000 or urban and semi-urban household income not exceeding ₹ 1,20,000;

(b) loan amount does not exceed ₹ 35,000 in the first cycle and ₹ 50,000 in subsequent cycles;

(c) total indebtedness of the borrower does not exceed ₹ 50,000;

(d) tenure of the loan not to be less than 24 months for loan amount in excess of ₹ 15,000 with prepayment without penalty;

(e) loan to be extended without collateral;

(f) aggregate amount of loans, given for income generation, is not less than 75 per cent of the total loans given by the MFIs;

(g) loan is repayable on weekly, fortnightly or monthly installments at the choice of the borrower.

(viii) Non-Banking Financial Company – Factors (NBFC-Factors): NBFC-Factor is a non-deposit taking NBFC engaged in the principal business of factoring. The financial assets in the factoring business should constitute at least 75 percent of its total assets and its income derived from factoring business should not be less than 75 percent of its gross income.

Requirements for registration with RBI

A company incorporated under the Companies Act, 1956 and desirous of commencing business of non-banking financial institution as defined under Section 45 I (a) of the RBI Act, 1934 should comply with the following:

(i) it should be a company registered under Section 3 of the companies Act, 1954

(ii) It should have a minimum net owned fund of ₹ 200 lakh. (The minimum net owned fund (NOF) required for specialized NBFCs like NBFC-MFIs, NBFC-Factors, CICs.

Acceptance of Public Deposit

All NBFCs are not entitled to accept public deposits. Only those NBFCs to which the Bank had given a specific authorisation are allowed to accept/hold public deposits.

Ceiling on acceptance of Public Deposits and the rate of interest and period of deposit which NBFCs can accept
The ceiling on acceptance of Public Deposits by NBFCs authorized to accept deposits. An NBFC maintaining required minimum NOF/Capital to Risk Assets Ratio (CRAR) and complying with the prudential norms can accept public deposits as follows:

Category of NBFC having minimum NOF of ₹200 lakhs	**Ceiling on public deposit**
AFC* maintaining CRAR of 15% without credit rating	1.5 times of NOF or ₹ 10 crore whichever is less
AFC with CRAR of 12% and having minimum investment grade credit rating	4 times of NOF
LC/IC** with CRAR of 15% and having minimum investment grade credit rating	1.5 times of NOF
* AFC = Asset Finance Company ** LC/IC = Loan company/Investment Company	

As has been notified on June 17, 2008 the ceiling on level of public deposits for NBFCs accepting deposits but not having minimum Net Owned Fund of ₹ 200 lakh is revised as under:

Category of NBFC having NOF more than ₹25 lakh but less than ₹200 lakh	**Revised Ceiling on public deposits**
AFCs maintaining CRAR of 15% without credit rating	Equal to NOF
AFCs with CRAR of 12% and having minimum investment grade credit rating	1.5 times of NOF
LCs/ICs with CRAR of 15% and having minimum investment grade credit rat- ing	Equal to NOF

Presently, the maximum rate of interest an NBFC can offer is 12.5%. The interest may be paid or compounded at rests not shorter than monthly rests.

The NBFCs are allowed to accept/renew public deposits for a minimum period of 12 months and maximum period of 60 months. They cannot accept deposits repayable on demand.

Salient features of NBFCs regulations which the depositor may note at the time of investment

Some of the important regulations relating to acceptance of deposits by NBFCs are as under:

(i) The NBFCs are allowed to accept/renew public deposits for a minimum period of 12 months and maximum period of 60 months. They cannot accept deposits repayable on demand.

(ii) NBFCs cannot offer interest rates higher than the ceiling rate prescribed by RBI from time to time.

The present ceiling is 12.5 per cent per annum. The interest may be paid or compounded at rests not shorter than monthly rests.

(iii) NBFCs cannot offer gifts/incentives or any other additional benefit to the depositors.

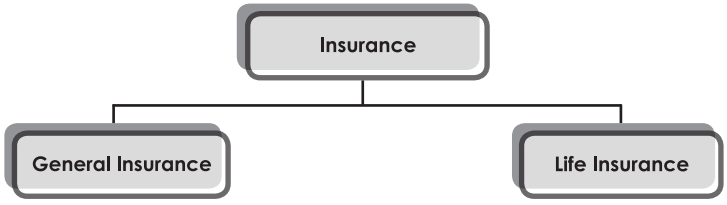
(iv) NBFCs (except certain AFCs) should have minimum investment grade credit rating.

(v) The deposits with NBFCs are not insured.

(vi) The repayment of deposits by NBFCs is not guaranteed by RBI.

(vii) Certain mandatory disclosures are to be made about the company in the Application Form issued by the company soliciting deposits.

4.5 INSURANCE COMPANIES



General Nature of Insurance Companies

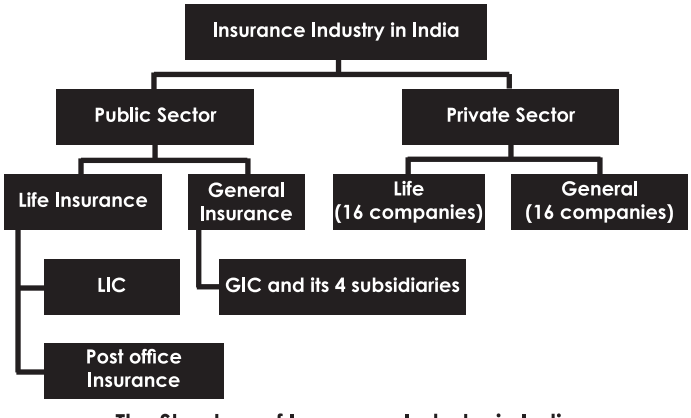
The insurance industry has both economic and social purpose and relevance. It provides social security and promotes individual welfare. It reduces risk and helps to raise productivity in the economy. The **actual premium** of insurance companies comprises the pure premium and administrative as well as marketing cost. The **pure premium** is the present value of the expected cost of an insurance claim. Since there is a lag between payment of premiums and payment of claims, there is generation of investible funds known as **insurance reserves**. Insurance companies may be organised as either corporations or mutual associations. A **corporation** is owned by its stock holders. In mutual association form, the customers are the owners, and management is formally subject to their control. There are various parts of insurance industry: life insurance, health insurance, general (property liability/property casualty) insurance, etc. While the **cash flow of insurance companies** is constant, their payout is deferred and contingency related. But general insurance, suffers from underwriting cycles i.e. wide swings in premiums, profitability, funds availability, etc. Generally, the insurance companies are big investors in long-gestation infrastructure development projects; they are major mobilisers of funds. But it has been found that restrictions on permitted investments have put insurance companies at a competitive disadvantage, which has led them to enter into retirement related products.

The insurance companies are financial intermediaries as they collect and invest large amounts of premiums. They offer protection to the investors, provide means for accumulating savings, and channelise funds to the government, and other sectors. They are contractual saving agencies which receive, mostly without fail, steady inflow of funds in the form of premiums or regular contributions to pension plans. They are also in a position to predict, relatively accurately, when what amounts of insurance or pension benefits have to be paid. Further, their liabilities in most cases are long-term liabilities, for many life policies are held for 30 or 40, or 50 or even more years. As a result, the liquidity is not a problem for them, and their major activity is in the field of long-term investments. Since they offer life-cover to the investors, the guaranteed rate of return specified in insurance policies is relatively low. Therefore, they do not need to seek high rates of return on their investments.

The insurance companies are active in the following fields among other—life, health, and general, and they have begun to operate the pension schemes and mutual funds also. Insurance business consists of spreading risks over time and sharing them between persons and organisations. The major part of insurance business is life insurance, the operations of which depend on the laws of mortality. The distinction between life and general insurance business is that with regard to the former, the claim is fixed and certain, but in the case of the latter, the claim is uncertain i.e., the amount of claim is variable and it is ascertainable only sometime after the event. Pension business is a specialised form of life assurance.

Insurance Sector Reforms

The insurance sector in India has gone through the process of reforms following these recommendations. The Insurance Regulatory & Development Authority (IRDA) Bill was passed by the Indian Parliament in December 1999. The IRDA became a statutory body in April, 2000 and has been framing regulations and registering the private sector insurance companies. The insurance sector was opened upto the private sector in August 2000. Consequently, some Indian and foreign private companies have entered the insurance business now. There are about seven general insurance and eleven life insurance companies operating in the private sector in India, early in 2004.



The Structure of Insurance Industry in India

Statutory functions of IRDA are as follows:

- Issue to the applicant a certificate of registration, renew, modify, withdraw, suspend or cancel such registration
- Protection of the interests of the policyholders in matters concerning assigning of policy, nomination by policy holders, insurable interest, settlement of insurance claim, surrender value of policy and other terms and conditions of contracts of insurance
- Specifying requisite qualifications, code of conduct and practical training for intermediaries or insurance intermediaries and agents
- Specifying the code of conduct for surveyors and loss assessors
- Promoting efficiency in the conduct of insurance business
- Promoting and regulating professional organisations connected with insurance and reinsurance business
- Levying fees and other charges for carrying out the purposes of the Act
- Calling for information from, undertaking inspection of, conducting enquiries and investigations including audit of the insurers, intermediaries, insurance intermediaries and other organisations connected with the insurance business
- Control and regulation of rates, advantages, terms and conditions that may be offered by the insurers in respect of general insurance business not so controlled and regulated by the Tariff Advisory Committee under Section 64 U of the Insurance Act 1938 (4 of 1938)
- Specifying the form and manner in which books of accounts shall be maintained and statements of accounts shall be rendered by insurers and other insurance intermediaries
- Regulating investment of funds by insurance companies
- Regulating maintenance of margin of solvency
- Adjudication of disputes between insurers and intermediaries or insurance intermediaries
- Supervising the functioning of the Tariff Advisory Committee
- Specifying the percentage of the premium income of the insurer to finance schemes for promoting and regulating professional organisations referred to in clause (f)
- Specifying the percentage of life insurance business and general insurance business to be undertaken by the insurers in the rural and social sector
- Exercising such other powers as may be prescribed.

4.6 PENSION FUNDS

Pension Funds (PNFs) have grown rapidly to become the primary vehicle of retirement benefit or retirement saving, and retirement income in many countries. A Pension Plan (PP) is an arrangement to provide income to participants in the Plan when they retire. PPs are generally sponsored by private employers, government as an employer, and labour unions. They may be Funded Pension Plans (FPPs) or Unfunded Pension Plans (UPPs). If the benefits promised by the PP are secured by assets specifically dedicated for that purpose, it is called a FPP. If the fulfillment of the promised benefits by the sponsor depends on the general credit and not by any specific contribution to be made year after year, it is called an UPP. There may also be Individual Retirement Pension Plans (IRPPs)

Pension Funds

In other countries, pension funds are a powerful financial intermediary. It was estimated that at the world level, pension funds controlled $6,700 billion in 1995. In India, private pension funds still do not exist but many people have begun to stress the need for setting up such funds; and a small beginning was recently made in this respect. The setting up of the first investment-based pension fund proposed by the UTI was approved by the government in October 1994. This retirement benefit plan is meant to enable self-employed people to contribute to a pension fund so as to provide security in their old age. It is an open-ended plan in which anyone between the age of 18-52 years can contribute and receive regular monthly income from 58 years onwards. The subscriptions to the fund are expected to grow by investment in equities and debt in the ratio of 40:60. The minimum subscription is to be ₹10,000 to be paid in not more than 20 instalments of a minimum of ₹ 500 each. The withdrawal is permitted after 70 years of age, and even a premature withdrawal is allowed at a discount.

Classification of Pension Plans - The financial intermediary, or an organisation, or an institution, or a trust that manages the assets and pays the benefits to the old and retirees is called a Pension Fund (PNF). Some pension

plans are said to be insured i.e. in such cases, the sponsor pays premiums to a life insurance company in exchange for a group annuity that would pay retirement benefits to the participants.

Another classification of PPs is:

(a) Defined Benefits Pension Plan (DBPP),

(b) Defined Contribution Pension Plan (DCPP) or Money Purchase Pension Plan (MPPP),

(c) Pay-as-you-go Pension Plan (PAYGPP)

(i) Defined Benefits Pension Plan (DBPP)

Under DBPP, the final pension is pre-defined based on the final salary and the period of service. Most of the pension plans offered by public sector enterprises and the government as employer in India are of DBPP variety. This type ensures a predictable amount of pension to the employees for all the years after their retirement and it is guaranteed by the State. DBPPs involve considerable cost to the employer. The firms with DBPP typically establish a legally separate trust fund, and the trustees invest employers' contributions in shares and bonds.

(ii) Defined Contribution Pension Plan (DCPPs)

It is popular in US, do not guarantee the amount of final benefit which the employees would get after they retire. In DCPP, the employee and employer make a predetermined contribution each year, and these funds are invested over the period of time till the retirement of employee. Whatever the value of these investments at the time of retirement, the employee will get a certain amount which he would use to purchase an annuity. From the point of view of the employer, DCPP is also known as "money purchase pension plan".

(iii) Pay-As-You-Go-Pension Plan (PAYGPP)

In most European countries, including France and Germany, pensions are paid through PAYGPP, under which the current employees pay a percentage of their income to provide for the old, and, this, along with the contribution of the State, goes as a pension that sustains the older generation. In US, there has been a trend towards a decline in DBPPs and an increase in DCPPs.

Management of Pension Funds Some sponsors of pension plans manage their pension funds themselves, but most of the sponsors appoint a trustee to do so on their behalf. This trustee is usually a trust department of a commercial bank, or an insurance company, or a mutual fund. The trustee- manager invests contributions provided by the sponsor and pays benefits to the retired persons. In the case of DBPPs, the assets of the PNF remain the property of the sponsor, who sets general investment policy in respect of portfolio composition, target return, quality of securities, etc. The fund manager takes day-today decisions on buying or selling specific assets. Some large sponsors may divide the management of their PNFs among several trustee-managers.

There are certain advantages in managing PNFs by outside trustees: (a) Transaction costs are lower. The trustee has greater expertise and he possesses all the necessary personnel, equipment, and expertise in regulatory requirements, (b) It enhances the credibility of the pension plan.

Pension System in India

In India, the pension system coverage is very small at present. The pension market in India is highly unorganised which covers hardly three per cent of the Indian population. The Employees' Provident Fund (EPF), Employees' Pension Scheme (EPS), and the PPF are the only schemes, which cover the pension market in India. The regular salaried employees in the organised sector have been relatively better off in that public policy provided vehicles for compulsory savings and old age provisions. It is estimated that by the year 2000, around 23 per cent of people employed in the government sector were the beneficiaries of the government's 'defined benefit pension scheme', and 49 per cent of people employed in the private sector were covered by the mandatory employee provident fund.

The pension schemes in operation in India currently can broadly be divided into the following categories:

(1) Civil Services Pension Schemes (Pay as- you-go), (2) Employees' Provident Fund (EPF), (3) Employees' Pension Scheme (EPS). (4) New Pension Scheme (NPS), (5) Voluntary Pension Schemes under which two schemes are in operation such as (i) Personal / Group Pension Plans, (ii) Public Provident Fund.

Current Pension Schemes

Some of the pension schemes available in India at present are:

(i) Government Employees' Pension Scheme: The Government Employees' Pension Scheme (GEPS), which has been made mandatory from 1995. It is a subset of Employees' Provident Fund (EPF). It provides (a) superannuation pension, (b) retirement pension, (c) permanent total disability pension, (d) widow or widower's pension, and (e) orphan pension. It is essentially a defined-contribution and defined benefit pay-as-you-go scheme, which is financed by diverting 8.33 per cent of the employers' existing share of PF contributions.

The Central government contributes an amount equivalent to 1.16 percent of a worker's salary. The scheme provides a minimum pension of ₹ 500 per month and a maximum pension of 60 per cent of the salary. All assets and liabilities of the erstwhile Family Pension Fund Scheme, 1971 have been transferred to this GEPS, 1995 scheme. After the introduction of this scheme, the employees who had enrolled in the LIC pension schemes will also obtain pension benefits from GEPS, which is also known as Employees Pension Scheme (EPS), 1995. However, only the scheme (Pension and Provident Fund Scheme for employees of establishments covered under the Employees Provident Fund Act, 1952) run by Central Provident Fund Commissioner (CPFC) is eligible for the government contribution of 1.16 per cent of salary, thereby discouraging establishments to seek exemption from running their own schemes. The employers who want to be exempted have to contribute the balance 1.16 per cent of the salary, thereby ensuring that a contribution rate of 9.5 per cent is maintained for both exempted and non-exempted schemes. All benefits from exempted schemes have to be at least equal to those provided under the EPS 1995. Employers who do not wish to contribute to centrally administered EPF can set up their own trustee managed funds and seek the same exemption from Employees' Provident Fund Organisation.

The EPF and EPS funds are invested mainly in government securities and government special deposit schemes, and individual employees do not have any say in the choice of investments. Investments of privately managed "exempted Provident Funds" are governed by guidelines which are at present as given below:

Security	Minimum % to be invested
1. Central Govt. Securities	25%
2. Govt. Securities and State Govt. Securities or guaranteed by them	15%
3. Public sector units and financial institutions bonds	30%
4. Any of the above 3 categories	30%

(ii) BEPS and IEPS

Bank Employees Pension Scheme (BEPS), 1993, and Insurance Employees Pension Scheme (IEPS), 1993 are for the benefit of the employees of public sector banks, and government owned insurance companies respectively. They are financed by the entire employer's portion of the PF contribution which is 10% of the basic salary. The main benefit under these schemes (after superannuation at 60 years of age or after 33 years of service) is in the form of a pension of 50% of the average basic salary during the last 10 months of employment. An additional benefit of 50% of the average of the allowances which rank for the PF but not for DA during the last 10 months of service is also provided to the employees, and this amounts to 2-4% of the employee's salary.

(iii) Privately Administered Superannuation Fund

So far, the private sector has been kept out in respect of setting up and running of pension funds; they have been run by the government or semi-government organisations. If any employer sets up a privately administrated superannuation fund, it is stipulated that he can accumulate funds in the form of an irrevocable trust fund during the employment period of the employee concerned, but when the pension becomes payable, suitable annuities have to be purchased from the LIC. Alternatively, the employer can have a superannuation scheme with the LIC and pay suitable contributions for the employees in service.

LIC has introduced 4 pension plans in the recent past:

(i) Varistha Pension Bima Yojana (VPBY)

(ii) New Jeevan Akshay (NJA)

(iii) New Jeevan Dhara (NJD)

(iv) New Jeevan Suraksha (NJS)

Study Note - 5

INSTRUMENTS IN FINANCIAL MARKETS

This Study Note includes

5.1 Financial Market
5.2 Money Market
5.3 Money Market Instruments
5.4 Repo and Reverse Repo
5.5 Promissory Notes
5.6 Government Securities and Bonds
5.7 Bonds, Valuation of Bonds, Price Yield Relationship
5.8 Hedge Funds
5.9 Mutual Funds

5.1 FINANCIAL MARKET

In a market economy, the allocation of economic resources is the outcome of many private decisions. In an economy, market can be divided into (1) product market (i.e. manufactured goods and services) (2) factor market (i.e. factors of production such as labour and capital). One part of the factor market is the market for financial assets.

A financial market is a market where financial instruments are exchanged or traded. The market in which a financial asset trades for immediate delivery is called the spot and cash market. The three important functions are to improve the price discovery process, enhance liquidity and reduce the cost of transacting. The market participants in financial markets include households, business entities, government state and local agencies and regulators.

Classification of financial markets

There are different ways to classify financial markets. They are classified according to the financial instruments they are trading, features of services they provide, trading procedures, key market participants, as well as the origin of the markets.

The generalized financial market classification is given in the Table below:

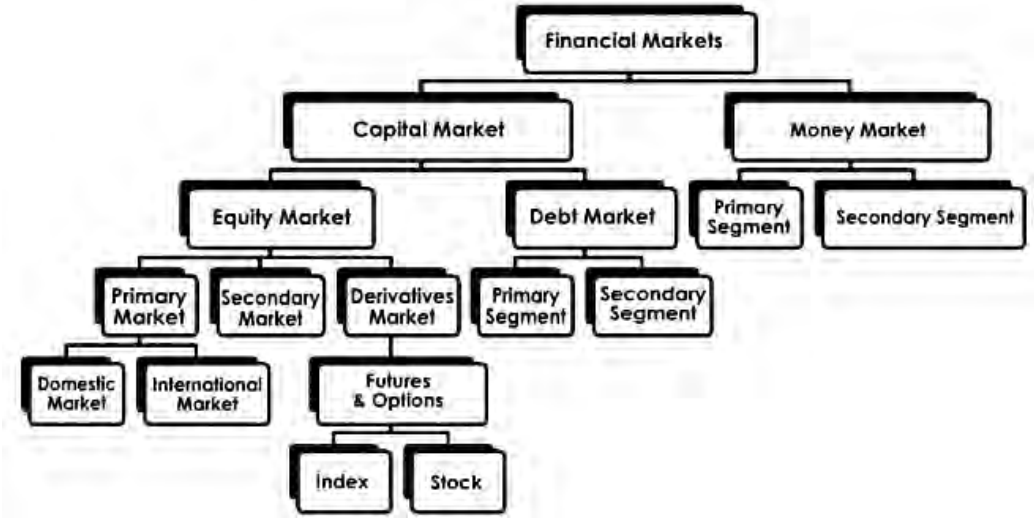
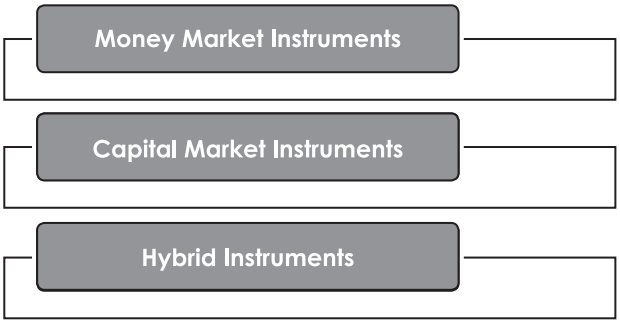


Table: Financial market classification

Criterion	Features	Examples
Products	Tradability, transferability, ownership, maturity, denomination, substance	Equity, debt instruments, derivatives
Services	Technical, advisory, information and knowledge-based, administrative	IT support, research and analysis, custody
Ways of trading	Physical, electronic, virtual	Over the counter, exchange, internet
Participants	Professionals, non-professionals, institutions, officials	Banks, central banks, non-bank financial companies, institutional investors, business firms, households
Origin	Domestic, cross-border, regional, international	National markets, regionally integrated markets, Euromarkets, domestic/foreign currency markets, onshore/offshore markets

Types of Financial Market Instruments:



5.2 MONEY MARKET

Money market is a very important segment of the Indian financial system. It is the market for dealing in monetary assets of short-term nature. Short-term funds up to one year and for financial assets that are close substitutes for money are dealt in the money market. It is not a physical location (like the stock market), but an activity that is conducted over the telephone. Money market instruments have the characteristics of liquidity (quick conversion into money), minimum transaction cost and no loss in value. Excess funds are deployed in the money market, which in turn is availed of to meet temporary shortages of cash and other obligations.

Money market provides access to providers (financial and other institutions and individuals) and users (comprising of institutions and government and individuals) of short-term funds to fulfill their borrowings and investment requirements at an efficient market-clearing price. The rates struck between borrowers and lenders represent an array of money market rates. The interbank overnight money rate is referred to as the call rate. There are also a number of other rates such as yields on treasury bills of varied maturities, commercial paper rate and rates offered on certificates of deposit. Money market performs the crucial role of providing an equilibrating mechanism to even out short-term liquidity and in the process, facilitating the conduct of monetary policy. Short-term surpluses and deficits are evened out. The money market is the major mechanism through which the Reserve Bank influences liquidity and the general level of interest rates. The Bank's interventions to influence liquidity serve as a signaling device for other segments of the financial system.

The Indian money market was segmented and highly regulated and lacked depth till the late eighties. A limited number of participants, regulation of entry and limited availability of instruments characterized it. The instruments were limited to call (overnight) and short notice (up to 14 days) money, inter-bank deposits and loans and commercial bills. Interest rates on market instruments were regulated. Sustained efforts for developing and deepening the money market were made only after the initiation of financial sector reforms in early nineties.

Features of Money Market:

(a) Instruments Traded: Money Market is a collection of Instruments like Call Money, Notice Money, Repos, Term Money, Treasury Bills, Commercial Bills, Certificate of Deposits, Commercial Papers, Inter-Bank Participation Certificates, Inter Corporate Deposits, Swaps, etc.

(b) Large Participants: The participants of Money Market are — (i) Lenders, (ii) Mutual Funds, (iii) Financial Institutions including the RBI, Scheduled Commercial Banks, Discount and Finance House of India and (iv) Borrowers. Network of a large number of participants exists which add greater depth to the market. This network can be broadly classified as follows :

Organized Sector	Unorganized Sector
1. Commercial and Other Banks	1. Indigenous Bankers
2. Non-Banking Financial Companies	2. Nidhis and Chit Funds
3. Co—operative Banks	3. Unorganized Money Lenders

(c) Zone Centric Activities: Activities in the money market tend to concentrate in some centre, which serves a region or an area. The width of such area may vary depending upon the size and needs of the market itself.

(d) Pure Competition: Relationship between Participants in a money market is impersonal in character, and the competition is relatively pure.

(e) Lower Price Differentials: Price differentials for assets of similar type tend to be eliminated by the interplay of demand and supply.

(f) Flexible Regulations: Certain degree of flexibility in the regulatory framework exists and there are constant endeavours for introducing a new instruments / innovative dealing techniques.

(g) Market Size: It is a wholesale market and the volume of funds or financial assets traded are very large, i.e. in crores of rupees.

Functions of the Money Market:

A money market is generally expected to perform three broad functions:

- ❖ Provide a balancing mechanism to even out the demand for and supply of short- term funds.
- ❖ Provide a focal point for central bank intervention for influencing liquidity and general level of interest rates in the economy.
- ❖ Provide reasonable access to suppliers and users of short-term funds to fulfill their borrowings and investment requirements at an efficient market clearing price.

Besides the above functions, a well-functioning money market facilitates the development of a market for longer-term securities. The interest rates for extremely short-term use of money serve as a benchmark for longer-term financial instruments.

Pre- requisites for an efficient Money Market:

1. Features of a well developed Money Market:

(a) Uses a broad range of financial instruments (treasury bills, bills of exchange etc).

(b) Channelizes savings into productive investments.

(c) Promote financial mobility in the form of inter sectoral flows of funds.

(d) Facilitate the implementation of monetary policy by way of open market operations.

2. Pre-Requisites for an Efficient Money Market:

(a) Economic System: Institutional development, relative political stability and a reasonably well developed banking and financial system.

(b) Integrity: Transactions in money market are concluded over telephone followed by written confirmation from the contracting parties. Hence, integrity is a basic necessity. Thus banks and other players in the market may have to be licensed and effectively supervised by regulators.

(c) Short Term Funds: The market should be able to provide an investment outlet for any temporarily surplus funds that may be available. Thus, there must be effective demand and supply of short term monies the demand for which arises from short term liquidity requirements and supply of which arises from idle cash available for temporary investment.

(d) Clearing Mechanism: Efficient clearing and settlement systems. Electronic Funds Transfer (EFT), Depository System, Delivery versus Payment (DVP), High Value Inter-bank Payment System, etc. are essential pre-requisites for ensuring a risk free and transparent payment and settlement system.

(e) Regulation: Government and Central Bank intervention to moderate liquidity profile.

(f) Apex Body: An empowered Central Bank to ensure credibility in the system and to supervise the players in the market.

(g) Instruments: The market should have varied instruments with distinctive maturity and risk profiles to serve the needs of the players in the market. Multiple instruments add strength and depth to the market.

(h) Integration: Market should be integrated with the rest of the markets in the financial system to ensure perfect equilibrium. The funds should move from one segment of the market to another for exploiting arbitrage opportunities.

Benefits of an efficient Money Market:

- ❖ Provides a stable source of funds to banks
- ❖ Encourages development of non-bank entities
- ❖ Facilitates government market borrowing
- ❖ Makes effective monetary policy actions
- ❖ Helps in pricing different floating interest products

Differences between Capital Market and Money Market:

Aspect	Capital Market	Money Market
Type of Instruments	Debt and Equity Instruments.	Debt Instruments only.
Tenor of Instruments	Medium and Long Term Instruments.	Short Term usually less than one year.
Examples	Equity Shares, Preference Stock, Debenture Stock, Zero Coupon Bonds, etc.	Treasury Bills, Certificates of Deposits, Commercial Papers, Banker's Acceptance.
Classification	Capital Market is further classified into Primary Market and Secondary Market.	There is no such further classification.
Participants	Retail Investors, Institutional Investors (Mutual Funds), Financial Institutions, etc.	Banks, Financial Institutions, Reserve Bank of India, Government.
Risk	Low credit and market risk involved.	High credit and market risk.
Regulator	SEBI	RBI

Role of the Reserve Bank of India in the Money Market:

The Reserve Bank of India (RBI) is the most important constituent of the money market. The market comes within the direct purview of the Reserve Bank regulations.

The aims of the Reserve Bank's operations in the money market are:

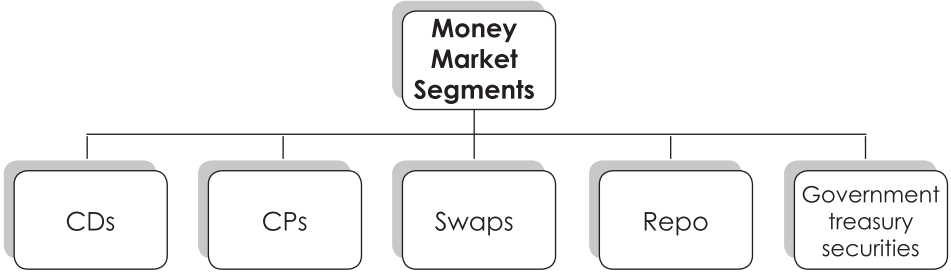
- To ensure that liquidity and short-term interest rates are maintained at levels consistent with the monetary policy objectives of maintaining price stability;
- To ensure an adequate flow of credit to the productive sectors of the economy; and
- To bring about order in the foreign exchange market.

The Reserve Bank influences liquidity and interest rates through a number of operating instruments- cash reserve requirement (CRR) of banks, conduct of open market operations (OMOs), repos, change in bank rates, and, at times, foreign exchange swap operations.

Money Market Segments:

In a broad sense, money market consists of the market for short-term funds, usually with maturity up to one year. It can be divided into several major segments:

Money Market Segments



5.3 MONEY MARKET INSTRUMENTS

A. Call/notice money market

B. Treasury bill (T-bills)

C. Commercial Bills (CBs)

D. Commercial Papers (CPs)

E. Certificate of Deposits (CDs)

F. Collateralised Borrowing and Lending Obligation

Call/notice money market and treasury bills form the most important segments of the Indian money market. Treasury bills, call money market, and certificates of deposit provide liquidity for government and banks while commercial paper and commercial bills provide liquidity for the commercial sector and intermediaries.

Major characteristics of money market instruments are:

- Short-term nature;

- Low risk;
- High liquidity (in general);
- Close to money.

The various instruments are now detailed as under:

5.3.1 Call/Notice Money

Call/Notice money is an amount borrowed or lent on demand for a very short period. If the period is more than one day and upto 14 days, it is called notice money and if the period is more than 14 days, it is called call money.

Exclusions: Intervening holidays and / or Sundays are excluded for this purpose. No collateral security is required to cover these transactions.

Participants of Call money:

Nature of Persons	Persons
Borrow and Lend	Reserve Bank of India (RBI) through LAFs, Banks, Primary Dealers (PD)
Lenders	Financial Institutions such as:-
	(a) Life Insurance Corporation of India (LIC)
	(b) Unit Trust of India (UTI) and Mutual Funds
	(c) General Insurance Corporation (GIC)
	(d) Industrial Development Bank of India (IDBI)
	(e) National Bank for Agricultural and Rural Development (NABARD)
	(f) Industrial Credit Investment Corporation of India (ICICI)

Benefits:

(a) Banks and Institutions: Call Market enables Banks and Financial Institutions to even out their day- to-day deficits and surpluses of money.

(b) Cash Reserve Requirements: Commercial Banks, Co-operative Banks and Primary Dealers are allowed to borrow and lend in this market for adjusting their cash reserve requirements.

(c) Outlet for Deploying Funds: It serves as an outlet for deploying funds on short-term basis to the lenders having steady inflow of funds.

Other Features:

(a) Restriction on Participation:

- ❖ Specified All-India Financial Institutions, Mutual Funds and certain specified entities are allowed to access Call/Notice money only as Lenders.
- ❖ Call money is an inter-bank market, hence non-bank entities are not allowed access to this market.

(b) Interest Rates: Interest rates in the call and notice money market are market determined.

(c) Account with RBI: In view of the short tenure of such transactions, both the Borrowers and the Lenders are required to have current accounts with the Reserve Bank of India.

Purposes: Banks borrow in this money market for the following purpose—

(a) To fill the gaps or temporary mismatches in funds.

(b) To meet the Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR) mandatory requirements as stipulated by RBI.

(c) To meet sudden demand for funds arising out of large outflows.

Nature of Call money market:

Call money represents the amount borrowed by the commercial banks from each other to meet their temporary funds requirements. The market for such extremely short period loans is referred to as the "call money market".

Call loans in India are given:

(i) to the bill market,

(ii) to dealers in stock exchange for the purpose of dealings in stock exchange,

(iii) between banks, and

(iv) to individuals of high financial status in Mumbai for ordinary trade purpose in order to save interest on cash credit and overdrafts.

Among these uses, inter-bank use has been the most significant. These loans are given for a very short duration, between 1 day to 15 days. There are no collateral securities demanded against these loans i.e., unsecured. The borrower has to repay the loans immediately they are called for i.e., highly liquid. As such, these loans are described as "call loans" or "call money".

Call money market -An edge for Commercial Banks

Call loans are preferable to Commercial Banks because:

(i) It is available from other banks in order to meet a sudden demand for funds, large payments, large remittance and to maintain cash reserve ratio (CRR) with the RBI.

(ii) These loans are given for a very short duration between 1day to 15 days. Banks can easily and quickly borrow from call market to meet their needs.

(iii) There are no collateral securities demanded against these loans i.e., unsecured. The RBI had recommended that the call market should be reserved for commercial banks without any ceiling on call rates.

(iv) Banks can invest their temporary surplus fund in call market of high call rate to earn maximum profit without hampering liquidity.

Volatile nature of Call money rate

The rate of interest paid on call loans is known as the call rate. The call rate is highly variable with changes in demand for and supply of call loans. It varies from day to day, from hour to hour and from centre to centre. Average monthly call rates are higher in March, April, May, October & November. Average monthly call rates are lower in January, August, and December because demand for liquid fund is lower in that time.

Factors affecting fluctuation of call rate:

After the removal of ceiling, the call rate has fluctuated widely. The call rate is volatile due to the following reasons:

(a) Large borrowings on certain dates by banks to meet the CRR requirements (then call rate rise sharply) and demand for call money falls when CRR needs are met.

(b) The credit operations of certain banks tend to be much in excess of their own resources.

(c) Disturbance in the banking industry.

(d) When liquid fund of an institution is very essential to repay the loan, advance tax, matured amount of security, and at the boom position of institution the call rates increase.

(e) When call market is easy, Banks invest funds in govt. securities, bonds in order to maximise earnings. But with no buyers in the market, these securities are not cashed. Due to such liquidity crisis, call rate is high.

(f) The structural deficiencies in the banking system. The banking system tries to build up deposits in last week at the end of the year.

(g) Forex market turbulence.

(h) Call market is over-the-telephone-market. Borrowers and lenders contact each other over telephone. In the absence of perfect communication they deal at different rates.

(i) In call market, main borrowers are commercial banks and lenders are UTI, LIC etc .In absence of lenders for few days, call rates rise up.

(j) When Govt. securities mature and are encashed by the public, supply of call loans increases and call rates fall.

(k) Cyclical mass import payments reduce liquidity in the money market and hence call rates decreases.

Measures adopted from time to time for stabilizing call rates:

The volatility of call rate can be controlled to achieve a state of stability by the following ways:

(i) Intervention by the DFHI as market maker.

(ii) Channelization of more funds by the RBI through the DFHI, & STCI.

(iii) Channelization of more funds by certain financial institutions with surplus funds.

(iv) Introduction of new money market instruments and allowing large number of participants in call money market.

(v) Use of call loans for normal banking operation.

For this purpose, the RBI has established different policy. The money market support by RBI and the reduction in CRR for credit expansion & for increase in liquidity, and increasing Govt. securities refinancing had helped to moderate the call rate in 1995. The spot foreign exchange purchases by the RBI had helped to reduce the call rate in March 1996. The recommencement of repo auctions by RBI in November 1996 had provided a reasonable floor to call money rates.

It cannot be said that these measures have reduced the volatility in the call market in India. Inter – Bank Money and its distinction from Call Money and Notice Money:

Inter Bank Market for deposits of maturity beyond 14 days is referred to as Inter-Bank Term Money. Term Money is accepted by the institutions at a discounted value, and on the due date payment will be made equal to the face value.

Participants: Financial Institutions permitted by RBI such as IFCI, SIDBI, NABARD, EXIM Bank, DFHI (Discount & Finance House of India), etc.

Tenor of Instrument: 3 Months to 6 Months.

Rate of Interest: Negotiated between the Participants.

Other Feature: Investment in Term Money is unsecured and the limits are fixed by RBI.

Reasons for Development of Term Money Market:

(a) Declining spread in lending operations

(b) Volatility in the call money market with accompanying risks in running mismatches.

(c) Growing desire for fixed interest rate borrowing by corporates.

(d) Fuller integration between forex and money markets.

Inter Bank Participation Certificate:

Inter Bank Participation Certificates (IBPC) are short-term instruments to even out the short term liquidity within the Banking system particularly when there are imbalances affecting the maturity mix of assets in Banking Book.

Objective: To provide a degree of flexibility in the credit-portfolio of Banks. It can be issued by Scheduled Commercial Bank and can be subscribed by any Commercial Bank.

Types: There are two types of participation certificates-

Aspect	Without Risk to Lender	With Risk to Lender
Period	Period not exceeding 90 Days	91 Days to 180 Days
Disclosure	Issuing Bank: Disclose as Liability under Borrowing from Banks. participating Bank: Advances to Bank	Issuing Bank: Reduce from Advances Outstanding. Participating Bank: Under Advances

Other Features:

(a) Interest rate on IBPC is freely determined in the market, i.e. negotiable.

(b) Certificates are neither transferable nor prematurely redeemable by the Issuing Bank.

(c) Issuing Bank can secure funds against advances without actually diluting its asset-mix.

Inter Corporate Deposits & Public Deposits:

1. Inter Corporate Deposits: (ICD's)

(a) Companies can borrow funds for a short period, for example 6 months or less, from other companies which have surplus liquidity.

(b) Such deposits made by one Company in another are called Inter-Corporate Deposits (ICD's) and are subject to the provisions of the Companies Act, 1956.

(c) The rate of interest on ICD's varies depending upon the amount involved and time period.

(d) RBI permits Primary Dealers to accept Inter Corporate Deposits up to fifty per cent of their Net Worth and that also for a period of not less than 7 days. Primary Dealers cannot lend in the Inter Corporate Deposits market.

(e) The risk on ICDs is very high.

2. Public Deposits:

(a) Public Deposits are a very important source for short-term and medium term finance.

(b) A Company can accept public deposits from members of the public and shareholders, subject to the stipulations laid down by RBI from time to time.

(c) The maximum amount that can be raised by way of Public Deposits, maturity period, procedural compliance, etc. are laid down by RBI, from time to time.

(d) These deposits are unsecured loans and are used for working capital requirements. They should not be used for acquiring fixed assets since they are to be repaid within a period of 3 years.

5.3.2 Treasury Bills

Treasury bills are short-term instruments issued by the Reserve Bank on behalf of the government to tide over short-term liquidity shortfalls. This instrument is used by the government to raise short-term funds to bridge seasonal or temporary gaps between its receipts (revenue and capital) and expenditure. They form the most important segment of the money market not only in India but all over the world as well.

T-bills are repaid at par on maturity. The difference between the amount paid by the tenderer at the time of purchase (which is less than the face value) and the amount received on maturity represents the interest amount on T-bills and is known as the discount. Tax deducted at source (TDS) is not applicable on T-bills.

Features of T-bills:

- ❖ They are negotiable securities.
- ❖ They are highly liquid as they are of shorter tenure and there is a possibility of inter-bank repos in them.

- There is an absence of default risk.
- They have an assured yield, low transaction cost, and are eligible for inclusion in the securities for SLR purposes.
- They are not issued in scrip form. The purchases and sales are effected through the Subsidiary General Ledger (SGL) account.
- At present, there are 91-day, 182-day, and 364-day T-bills in vogue. The 91-day T-bills are auctioned by the RBI every Friday and the 364-day T-bills every alternate Wednesday, i.e., the Wednesday preceding the reporting Friday.
- Treasury bills are available for a minimum amount of ₹25,000 and in multiiples thereof.

Issue Price: Treasury Bills are issued at a discount and redeemed at face value.

Auction Method: 91 days T-Bills are auctioned under uniform price auction method whereas 364 days T-Bills are auctioned on the basis of multiple price auction method.

Investors: Banks, Primary Dealers, State Governments, Provident Funds, Financial Institutions, Insurance Companies, NBFCs, FIIs (as per prescribed norms), NRIs & OCBs can invest in T-Bills.

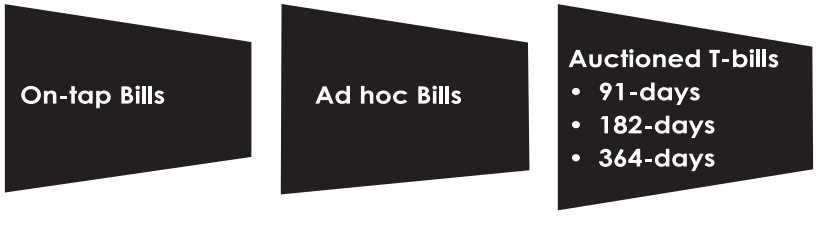
Yield in T-Bill : Yield = $\frac{F-P}{P} \times \frac{365}{M} \times 100$ P

Where, F = Face Value of T-Bill

P = Purchase Price or Issue Price M = Maturity Period

Types of Treasury Bills available in the Money Market:

There are three categories of T-bills:



On-tap Bills:

On-tap Bills, as the name suggests, could be bought from the Reserve Bank at any time at an interest yield of 4.66 per cent. They were discontinued from April 1, 1997, as they had lost much of their relevance.

Ad hoc Bills:

Ad hoc Bills were introduced in 1955. It was decided between the Reserve bank and the Govt. of India that the government could maintain with the Reserve Bank a cash balance of not less than ₹50 crore on Fridays and ₹4 crore on other days, free of obligation to pay interest thereon, and whenever the balance fell below the minimum, the govt. account would be replenished by the creation of ad hoc bills in favour of the Reserve Bank. Ad hoc 91-day T-bills were created to replenish the government's cash balances with the Reserve Bank. But, they were discontinued from April 1, 1997.

Auctioned T-bills:

Auctioned T-bills, the most active money market instrument, were first introduced in April 1992. The Reserve Bank receives bids in an auction from various participants and issues the bills subject to some cut-off limits. Thus, the yield of this instrument is market determined. These bills are neither rated nor can they be rediscounted with the Reserve Bank. At present, the Reserve Bank issues T-bills of three maturities: 91-days, 182-days, and 364-days.

14 Day T-bills:

With the 91-day tap T-bills being discontinued, a scheme for the sale of 14-day intermediate T-bills was introduced effective from April 1, 1997 and 14-day auction T-bills was introduced from May 20, 1997 to facilitate the cash management requirements of various segments of the economy and emergence of a more comprehensive yield curve.

These represent Government's contribution to the money market. They are intended to Mop-up short- term funds in the money market, and hence act as an important tool in monetary policies. The Treasury Bills are generally sold through auctions, the discount rate determined by the market.

Features	Advantages
1. Sold for a minimum amount of ₹1,00,000 and in multiples of ₹ 1,00,000.	1. Manage cash position with minimum balances.
2. Issued only in book entry form.	2. Increased liquidity.
3. Not transferable.	3. Minimal risk of Capital Loss.
4. Re-discounted at 50 basis points higher than the discount rate and on re-discounting are extinguished.	4. Market related yield.
	5. Eligible for repo transactions.
	6. Classifiable as SLR security.

91 Day T-bills: These are again of two types- ordinary and ad-hoc. Ordinary treasury bills are issued to public and RBI for enabling central government to meet temporary requirements of funds. Treasury bills were used to be sold to public at a fixed rate throughout the week to commercial banks and the public. They are repaid at par on maturity. The difference between the amount paid by the tenderer at the time of purchase and the amount received on maturity represents the interest earned and also known by discount.

182 Day T-bills: These bill were reintroduced in 1999 to enable the development of a market for government securities. The Reserve Bank of India introduced 182 days Treasury Bills, as an active money market instrument with flexible interest rates. Its features include:

(a) These Treasury Bills are issued following the procedure of auction.

(b) 182 Days Treasury Bills are issued in minimum denomination of ₹1 lakh and in multiples thereof.

However, in the secondary market, the deals are presently transacted for a minimum amount of ₹25 lakhs and thereafter in multiples of ₹10 lakhs.

(c) RBI does not purchase 182 Days Treasury Bills before maturity but the investors (holders of these Treasury Bills) can sell them in the secondary market.

(d) These bills are also eligible for Repo Transactions.

364 Day T-bills: In April 1992, the 364-day T-bills were introduced to replace the 182-day T-bills. These T-bills are issued to generate market loans. The auction of these bills is done fortnightly, as their issue has become a regular activity by the Central Government. These bills offer short-term investment offer for investors and created good response. RBI offers these bills periodically and auctions by giving an opportunity to Banks and other financial institutions. The Government of India has now floated Treasury bills of varying maturities upto 364 days on an auction basis which are identical to that for the 182 days treasury bills. They contain varying period of maturities help the short term investors to decide on the period of investment of their funds.

Treasury Bill Market in India:

The market that deals in treasury bills is the Treasury bill market. These bills are short-term (91 days) liability of the Government of India. Treasury bills are claims against the central government and so they do not require any grading or further endorsement or acceptance.

The important qualities of treasury bills are: the high liquidity, absence of risk of default, ready availability, assured yield, low transactions costs, eligibility for inclusion in statutory liquidity ratio and negligible capital depreciation.

Treasury bills are of two kinds: adhoc and ordinary.

Adhoc means for the particular end. Thus, adhoc treasury bills are issued for providing investment funds to the State Government, semi government departments. The ordinary treasury bills are sold to the public or banks which are freely marketable.

Treasury bills are bought and sold on discounted basis. This price is lower than its face value by the amount of interest due on the bill. When the RBI buys back bills, it is said to rediscount them i.e., discount them all over again for their remaining maturity period.

India has experimented with 91-day treasury bills. In November 1986 the Government of India introduced a new 182 day treasury bill. The 182-day Treasury bill is eligible for borrowing Standby refinance facility. In April 1992, 364-day Treasury bill is introduced.

The Treasury bill market in India is highly undeveloped. The RBI is the sole dealer in them. There are no dealers outside the RBI who may be willing to buy and sell of such bills, because treasury bill discount rate in India had been kept at very low level of 4.6% p.a. Regarding the size of the treasury bill market outstanding amount at the end of each year may be highlighted. The amount increased from ₹ 2,518 crore in 1970-71 to ₹ 56,517 crore in 1996-97. The size of the Treasury bill market has been narrow for different reasons. First, RBI freely rediscounts treasury bills. As a result banks take this opportunity frequently. Secondly, the difference between Treasury bill rate and deposit rates has been wide enough to discourage people from investing in treasury bills. Thirdly, RBI policy of requiring banks to invest in treasury bills to fulfill SLR obligation and stable condition in the government securities market make treasury bills an unattractive investment.

Many observers think that treasury bills being short term instruments should be used to meet only the temporary needs of the government. They should not be used as a cheap source of long-term funds and RBI should not extend help in this regard.

5.3.3 Commercial Bills

The working capital requirement of business firms is provided by banks through cash-credits / overdraft and purchase/discounting of commercial bills.

Commercial bill is a short term, negotiable, and self-liquidating instrument with low risk. It enhances the liability to make payment in a fixed date when goods are bought on credit. The bill of exchange is a written unconditional order signed by the drawer requiring the party to whom it is addressed to pay on demand or at a future time, a definite sum of money to the payee. It is negotiable and self-liquidating money market instrument which evidences the liquidity to make a payment on a fixed date when goods are bought on credit. It is an asset with a high degree of liquidity and a low degree of risk. Such bills of exchange are discounted by the commercial banks to lend credit to the bill holder or to borrow from the Central bank. The bank pays an amount equal to face value of the bill minus collection charges and interest on the amount for the remaining maturity period. The writer of the bill (debtor) is drawer, who accept the bill is drawee and who gets the amount of bill is payee.

Types of Commercial Bills:

Commercial bills can be inland bills or foreign bills.

Inland bills must:

(1) be drawn or made in India and must be payable in India: or

(2) drawn upon any person resident in India.

Foreign bills, on the other hand, are:

(1) drawn outside India and may be payable and by a party outside India, or may be payable in India or drawn on a party in India or

(2) it may be drawn in India and made payable outside India. A related classification of bills is export bills and import bills. While export bills are drawn by exporters in any country outside India, import bills are drawn on importers in India by exporters abroad.

Purpose:

Commercial Bills may be used for financing the movement and storage of goods between countries, before export (pre-export credit), and also within the country. In India, the use of bill of exchange appears to be in vogue for financing agricultural operations, cottage and small scale industries, and other commercial and trade transactions.

The indigenous variety of bill of exchange for financing the movement of agricultural produce, called a 'hundi' has a long tradition of use in India. It is vogue among indigenous bankers for raising money or remitting funds or to finance inland trade. A hundi is an important instrument in India; so indigenous bankers dominate the bill market. However, with reforms in the financial system and lack of availability of funds from private sources, the role of indigenous bankers is declining.

Reasons for under-developed market in India:

The bills are a very important device for providing short-term finance to trade and industry. But bill market in India is under developed. Market for bills is limited, because:

(i) The practice of borrowing against commercial bills is not well-established. Only exception is the market created by the RBI for accommodation. The share of bill finance in the total bank credit is quite small. It has varied 8% to 22% during 1950-51 to 1995-96.

(ii) The supply of bills is neither continuous nor substantial. In fact borrowing against bills, purchasing on credit is not a common practice in India. The culture of depending on bills is yet to develop.

(iii) Commercial banks do not make much use of bills of exchange while granting loans.

(iv) Lack of uniformity throughout the country and high stamp duty are also responsible.

(v) In India, the cash credits and overdrafts are cheaper & safer than bill financing.

(vi) In India, the number of branches of commercial banks has increased tremendously. This development must have facilitated the direct discounting & collection of bills by branches of banks and it slow downed the development of the bill market.

(vii) Bill markets were mostly established for the purpose of financing foreign trade. But in India, the volume of foreign trade has remained very small.

(viii) The absence of specialized credit information agencies.

Initiative to develop bill market:

With a view to eliminating movement of papers and facilitating multiple rediscounting, RBI introduced an innovation instruments known as 'Derivative Usance Promissory Notes (DUPN)' backed by such eligible commercial bills for required amounts and usance period (up to 90 days). Government has exempted stamp duty on derivative usance promissory notes. This has simplified and streamlined bill rediscounting by institutions and made the commercial bill an active instrument in the secondary money market. This instrument, being a negotiable instrument issued by banks, is a sound investment for rediscounting institutions. Moreover rediscounting institutions can further discount the bills any time prior to the date of maturity. Since some banks were using the facility of rediscounting commercial bills and derivative usance promissory notes of as short a period as one day, the Reserve Bank restricted such rediscounting to a minimum period of 15 days. The eligibility criteria prescribed by the Reserve Bank for rediscounting commercial bills are that the bill should arise out of a genuine commercial transaction showing evidence of sale of goods and the maturity date of the bill should to exceed 90 days from the date of rediscounting.

So far, the RBI has introduced two bill market schemes – one in 1952 another in 1970, to develop the bill market. According to the scheme of 1952, advances were granted to scheduled banks by way of demand loans on the security of 'usance bills.' The 1952 scheme aimed at encouraging commercial banks accepts more bills. It did not try to promote creation of bills as such. Naturally the scheme did not make much of an impact.

RBI introduced the new bill in November 1970 with the object of promoting a genuine bill market in India. According to scheme of 1970, all commercial banks are eligible for offering bills of exchange to the RBI for rediscount. It has

been modified from time to time. Its main features are: (a) The bills covered under the scheme must be genuine trade bills – with evidence of sale or dispatch of goods. (b) The RBI rediscounts these bills. So it is often called 'Bills Rediscounting Scheme'. (c) All commercial banks will be eligible to offer bill of exchange. (d) The bill should bear at least two good signatures, one of which scheduled bank. From May, 1990, more than 25 institutions (Like LIC, GIC, UTI, ICICI etc) have been permitted to rediscount commercial bills. DFHI was set up to develop money market including the market for commercial bills. Remission of stamp duty on bills of exchange was also permitted by the government.

Important changes have taken place in the structure of bill finance. From around 1991-1992, the supply of foreign bills has exceeded that of inland bills and the amount of bills discounted has exceeded that of bills purchased in respect of inland bills.

5.3.4 Commercial Paper

Commercial paper (CP) is an unsecured short-term promissory note, negotiable and transferable by endorsement and delivery with a fixed maturity period. It is issued only by large, well known, creditworthy companies and is typically unsecured, issued at a discount on face value, and redeemable at its face value. The aim of its issuance is to provide liquidity or finance company's investments, e.g. in inventory and accounts receivable.

The major issuers of commercial papers are financial institutions, such as finance companies, bank holding companies, insurance companies. Financial companies tend to use CPs as a regular source of finance. Non-financial companies tend to issue CPs on an irregular basis to meet special financing needs.

Commercial paper was introduced in 1990 to enable highly rated investors to diversify their sources, of their short-term borrowings and also to produce an additional instrument in the market. Guidelines issued by RBI are applicable to issuers of CP like Non-banking finance companies and non- financial companies. Primary dealers are also permitted to issue commercial paper. CP should be issued for a minimum period of 7 days to a maximum period of one year. No grace period is allowed for payment and if the maturity date falls on a holiday it should be paid on the previous working day. Commercial paper can be permitted to be issued by the companies whose tangible net worth is not less than ` 4 crore. And fund based working capital limits are not less than Rs4 crore. It must be a listed company on a stock exchange and should have given credit rating by CRISIL.

The difference between the initial investment and the maturity value, constitutes the income of the investor.

e.g. A Company issues a Commercial Paper each having maturity value of ₹ 5,00,000. The Investor pays (say) ₹4,82,850 at the time of his investment. On maturity, the Company pays ₹ 5,00,000 (maturity value or redemption value) to the Investor. The Commercial Paper is said to be issued at a discount of ₹5,00,000 - ₹4,82,850 = ₹17,150. This constitutes the interest income of the investor.

Commercial Paper- Salient Features

- ❖ CPs are issued by companies in the form of usance promissory notes, redeemable at par to the holder on maturity.
- ❖ The tangible net worth of the issuing company should be not less than ₹4 crores.
- ❖ Working capital (fund based) limit of the company should not be less than ₹4 crores.
- ❖ Credit rating should be at least equivalent of P-2 of CRISIL/P2/PP2/D2 or higher from any approved rating agencies and should be more than 2 months old on the date of issue of CP.
- ❖ Corporates are allowed to issue CP up to 100% of their fund based working capital limits.
- ❖ It is issued at a discount to face value.
- ❖ CP attracts stamp duty.
- ❖ CP can be issued for maturities between 15 days and less than one year from the date of issue.
- ❖ CP may be issued in the multiples of ₹5 lakhs.

- ❖ No prior approval of RBI is needed to issue CP and underwriting the issue is not mandatory.
- ❖ All expenses (such as dealers' fees, rating agency fee and charges for provision of stand-by facilities) for issue of CP are to be borne by the issuing company.

Commercial Paper- Advantages

(1) Simplicity: Documentation involved in issue of Commercial Paper is simple and minimum.

(2) Cash Flow Management: The Issuer Company can issue Commercial Paper with suitable maturity periods (not exceeding one year), tailored to match the cash flows of the Company.

(3) Alternative for bank finance: A well-rated Company can diversify its sources of finance from Banks, to short-term money markets, at relatively cheaper cost.

(4) Returns to Investors: CP's provide investors with higher returns than the banking system.

(5) Incentive for financial strength: Companies which raise funds through CP become well-known in the financial world for their strengths. They are placed in a more favourable position for raising long-term capital also. So, there is an inbuilt incentive for Companies to remain financially strong.

RBI Guidelines in respect of issue of "Commercial Paper"

(1) Eligible issuers of CP: (a) Corporates, (b) Primary Dealers (PDs), and (c) All-India Financial Institutions (FIs) that have been permitted to raise short-term resources under the umbrella limit fixed by RBI are eligible to issue CP.

- ❖ **All-India Financial Institutions** (FIs) mean those financial institutions which have been permitted specifically by the RBI to raise resources by way of Term Money, Term Deposits, Certificates of Deposit, Commercial Paper and Inter-Corporate Deposits, where applicable, within umbrella limit.
- ❖ **Primary Dealer** means a non-banking financial company which holds a valid letter of authorization as a Primary Dealer issued by the RBI.

(2) Investors for CP: CP may be issued to and held by —

(a) Individuals

(b) Banking Companies

(c) Other Corporate Bodies registered/ incorporated in India

(d) Unincorporated Bodies

(e) Non-Resident Indians (NRIs) and

(f) Foreign Institutional Investors (FIIs)

(3) Maturity: CP can be issued for maturities between a minimum of 7 days and a maximum up to one year from the date of issue. Maturity date of CP should not go beyond the date up to which the credit rating of the issuer is valid.

(4) Denominations: CP can be issued in denominations of ₹5 lakh or multiples thereof. Amount invested by a single investor should not be less than ₹5 lakh (face value).

(5) Basic issue conditions for a Corporate: A Corporate would be eligible to issue CP provided –

(a) Its tangible Net Worth, as per the latest audited Balance Sheet, is not less than ₹4 Crores,

(b) It has been sanctioned working capital limit by bank/s or all-India financial institution/s,

(c) Its borrowal account is classified as a Standard Asset by the financing bank(s)/ institution(s).

(6) Credit Rating: All eligible participants shall obtain the credit rating for issuance of CP from –

(a) Credit Rating Information Services of India Ltd. (CRISIL) or

(b) Investment Information and Credit Rating Agency of India Ltd. (ICRA) or

(c) Credit Analysis and Research Ltd. (CARE) or

(d) FITCH Ratings India Pvt. Ltd. or

(e) Such other credit rating agencies as may be specified by the RBI.

Minimum credit rating shall be P-2 of CRISIL or such equivalent rating by other agencies. At the time of issuance of CP, the rating so obtained should be current and not fallen due for review.

(7) Amount of CP

(a) The aggregate amount of CP from an issuer shall be the least of—

- ❖ limit as approved by its Board of Directors, or
- ❖ quantum indicated by the Credit Rating Agency for the specified rating.

(b) An FI can issue CP within the overall umbrella limit fixed by the RBI, i.e. issue of CP together with Term Money Borrowings (TMB), Term Deposits (TD), Certificates of Deposit (CD) and Inter-

Corporate Deposits (ICD) should not exceed 100% of its Net Owned Funds, as per the latest audited Balance Sheet.

(8) Time Period: The total amount of CP proposed to be issued should be raised within two weeks from the date on which the issue is open for subscription. Every CP issue shall be reported to the RBI, through the Issuing and Paying Agent (IPA) within three days from the date of completion of the issue.

(9) Mode of Issuance: The following points are relevant –

(a) CP can be issued either in the form of a promissory note (physical form) or in a dematerialized form (demat form) through any of the depositories approved by and registered with SEBI.

(b) CP will be issued at a discount to face value as may be determined by the issuer.

(c) No issuer shall have the issue of CP underwritten or co-accepted.

(10) Issuing and Paying Agent (IPA): Only a Scheduled Bank can act as an IPA for issuance of CP. Every issuer must appoint an IPA for issuance of CP.

(11) Procedure for Issuance: Issuer should disclose its financial position to the potential investors. After the exchange of deal confirmation, issuing Company shall issue physical certificates to the investor or arrange for crediting the CP to the investor's account with a depository. Investors shall be given a copy of IPA certificate to the effect that the issuer has a valid agreement with the IPA and documents are in order.

(12) Mode of Investment in CP: The investor in CP shall pay the discounted value (issue price) of the CP by means of a crossed account payee cheque to the account of the issuer through IPA.

(13) Repayment of CP on maturity: On maturity of CP, when the CP is held in physical form, the holder of the CP shall present the instrument for payment to the issuer through the IPA. When the CP is held in demat form, the holder of the CP will get it redeemed through the depository and receive payment from the IPA.

(14) Defaults in CP market: In order to monitor defaults in redemption of CP, Scheduled Banks which act as IPAs, shall immediately report, on occurrence, full particulars of defaults in repayment of CPs to the RBI.

(15) Stand-by Facility: Non-bank entities including corporates may provide unconditional and irrevocable guarantee for credit enhancement for CP issue provided –

(a) the issuer fulfils the eligibility criteria prescribed for issuance of CP,

(b) the guarantor has a credit rating at least one notch higher than the issuer given by an approved credit rating agency, and

(c) the offer document for CP properly discloses the net worth of the guarantor Company, the names of the Companies to which the guarantor has issued similar guarantees, the extent of the guarantees offered by the guarantor Company, and the conditions under which the guarantee will be invoked.

5.3.5 Certificate of Deposits

Certificates of Deposit (CDs) - introduced since June 1989 - are unsecured, negotiable, short-term instruments in bearer form, issued by a commercial bank(s)/Financial Institution(s) at discount to face value at market rates, with maturity ranging from 15 days to one year.

Being securities in the form of promissory notes, transfer of title is easy, by endorsement and delivery. Further, they are governed by the Negotiable Instruments Act. As these certificates are the liabilities of commercial banks/ financial institutions, they make sound investments.

DFHI trades in these instruments in the secondary market. The market for these instruments is not very deep, but quite often CDs are available in the secondary market. DFHI is always willing to buy these instruments thereby lending liquidity to the market.

CD is a negotiable money market instrument and issued in dematerialized form or as a Usance Promissory Note, for funds deposited at a Bank or other eligible Financial Institution for a specified time period.

Salient features:

- ❖ CDs can be issued to individuals, corporations, companies, trusts, funds, associates, etc.
- ❖ NRIs can subscribe to CDs on non-repatriable basis.
- ❖ CDs attract stamp duty as applicable to negotiable instruments.
- ❖ Banks have to maintain SLR and CRR on the issue price of CDs. No ceiling on the amount to be issued.
- ❖ The minimum issue size of CDs is Rs1 lakh and in multiples thereof.
- ❖ CDs are transferable by endorsement and delivery.
- ❖ The minimum lock-in-period for CDs is 15 days.

CDs are issued by Banks, when the deposit growth is sluggish and credit demand is high and a tightening trend in call rate is evident. CDs are generally considered high cost liabilities and banks have recourse to them only under tight liquidity conditions.

CPs enable highly rated corporate borrowers to diversify their sources of short-term borrowings and raise a part of their requirement at competitive rates from the market. The introduction of Commercial Paper (CP) in January 1990 as an additional money market instrument was the first step towards securitization of commercial bank's advances into marketable instruments.

Eligible issuers of CD: CDs can be issued by - (a) Scheduled Commercial Banks excluding Regional Rural Banks (RRBs) and Local Area Banks (LABs), and (b) select All-India Financial Institutions that have been permitted by RBI to raise short-term resources within the umbrella limit fixed by RBI.

Investors in CD: CDs can be issued to Individuals, Corporations, Companies, Trusts, Funds, Associations, etc. Non-Resident Indians (NRIs) may subscribe to CDs, but only on non-repatriable basis which should be clearly stated on the Certificate. Such CDs cannot be endorsed to another NRI in the secondary market.

Maturity Period: The maturity period shall be as under —

(a) CD's issued by Banks: Not less than 7 days and not more than 1 year from the date of issue.

(b) CD's issued by FIs: Not less than 1 year and not exceeding 3 years from the date of issue.

Repayment: There will be no grace period for repayment of CDs. If the maturity date happens to be holiday, the issuing bank should make payment on the immediate preceding working day. Banks/FIs may, therefore, so fix the period of deposit that the maturity date does not coincide with a holiday to avoid loss of discount/ interest rate.

Minimum Size of Issue and Denominations: Minimum amount of a CD should be Rs1 lakh i.e., the minimum deposit that could be accepted from a single subscriber should not be less than ₹1 lakh and in the multiples of Rs1 lakh thereafter.

Aggregate Amount of CD: Banks have the freedom to issue CDs depending on their requirements. An FI may issue CDs within the overall umbrella limit fixed by RBI, i.e., issue of CD together with Term Money Borrowings (TMB), Term Deposits (TD), Commercial Papers (CP) and Inter-Corporate Deposits should not exceed 100% of its Net Owned Funds, as per the latest audited Balance Sheet.

Format of CDs: Issuance of CD will attract stamp duty. Banks / FIs should issue CDs only in the dematerialized form. However, under the Depositories Act, 1996, investors have the option to seek certificate in physical form. Such requests should be reported to RBI separately.

Transferability: Physical CDs are freely transferable by endorsement and delivery. Dematted CDs can be transferred as per the procedure applicable to other demat securities. There is no lock-in period for CDs.

Security Aspect: Physical CDs are freely transferable by endorsement and delivery. So, the CD certificates should be printed on good quality security paper and necessary precautions are taken to guard against tampering with the document. The CD should be signed by two or more authorized signatories.

Duplicate Certificates: In case of the loss of physical CD certificates, duplicate certificates can be issued after compliance of the following: (a) Public Notice in at least one local newspaper, (b) Lapse of a reasonable period (say 15 days) from the date of the notice in newspaper, and (c) Execution of an indemnity bond by the investor to the satisfaction of the issuer of CD. Duplicate Certificate should state so and should only be issued in physical form. No fresh stamping is required.

Discount/ Coupon Rate: CDs may be issued at a discount on face value. Banks/FIs are also allowed to issue CDs on floating rate basis provided the methodology of compiling the floating rate is objective, transparent and market based. The issuing bank/FI is free to determine the discount/coupon rate. The interest rate on floating rate CDs would have to be reset periodically in accordance with a pre- determined formula that indicates the spread over a transparent benchmark.

Reserve Requirements: Banks have to maintain the appropriate reserve requirements, i.e., Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR), on the issue price of the CDs.

Loans/Buy-backs: Banks / FIs cannot grant loans against CDs. They cannot buy-back their own CDs before maturity.

Payment of Certificate: Since CDs are transferable, the physical certificate may be presented for payment by the last holder and payment shall be made only by a crossed cheque. The holders of dematted CDs will claim the payment through their respective depository participants (DPs) and give transfer/delivery instructions to transfer the demat security. The holder should also communicate to the issuer by a letter/fax enclosing the copy of the delivery instruction it had given to its DP and intimate the place at which the payment is requested to facilitate prompt payment.

Accounting: Banks/FIs may account the issue price under the head "CDs issued" and show it under Deposits. Accounting entries towards discount will be made as in the case of "Cash Certificates". Banks/ FIs should maintain a register of CDs issued with complete particulars.

Standardized Market Practices and Documentation: Fixed Income Money Market and Derivatives Association of India (FIMMDA) may prescribe, in consultation with the RBI, for operational flexibility and smooth functioning of CD market, any standardized procedure and documentation that are to be followed by the participants, in consonance with the international best practices.

Reporting: Banks should include the amount of CDs in the fortnightly return u/s 42 of RBI Act and also separately indicate the amount so included by way of a footnote in the return. A further fortnightly return is required to be submitted to the RBI within 10 days from the end of the fortnight date.

5.3.6 Collateralised borrowing and Lending Obligation (CBLO)

The Clearing Corporation of India Ltd. (CCIL) launched a new product- CBLO- on January 20, 2003 to provide liquidity to non-bank entities hit by restrictions on access to the call money market. CBLO is a discounted instrument available in electronic book entry for the maturity period ranging from 1 day to 19 days. The maturity period can range up to one year as per the RBI guidelines. The CBLO is an obligation by the borrower to return the borrowed money, at a specified future date, and an authority to the lender to receive money lent, at a specified future date with an option/privilege to transfer the authority to another person for value received. The eligible securities are central government securities including treasury bills with a residual maturity period of more than six months. There are no restrictions on the minimum denomination as well as lock-in period for its secondary market transactions.

Banks, Cooperative Banks, Financial Institutions, Insurance Companies, Mutual funds, and Primary Dealers who are members of negotiated dealing system (NDS) are allowed to participate in CBLO transactions. Non-members like corporate, NBFCs, pension/provident funds, and trusts are allowed to participate by obtaining associate membership to CBLO segment.

There are two types of markets available for trading in CBLO: the normal market and the auction market. Under normal market, there are two settlement cycles available to members, viz, T+0 and T+1. Normal market is available for all members including associate members. Auction market is available only to NDS members for overnight borrowing and settlement on T+0 basis. Associate members are not allowed to borrow and lend funds in auction market. Currently, the minimum order lot for auction market is fixed at ₹50 lakh and in multiples of ₹5 lakh thereof. The minimum order lot for normal market is fixed at ₹5 lakh and in multiples of ₹5 lakh thereof. Order lot refers to the minimum amount that is required to constitute a successful trade in the auction and normal market.

As the repayment of borrowing under CBLO segment is guaranteed by CCIL, all CBLO members have to maintain collateral or cash margin with the CCIL as cover. CCIL sets up borrowing limits for the members against their deposits of government securities as collaterals.

In order to increase the depth and liquidity in the CBLO market, CCIL is planning to introduce an internet- based trading platform for its CBLO product which would provide access to corporate and other non- banking entities to the institutional lending and borrowing segment of money markets.

5.4 REPO AND REVERSE REPO

Repo or ready forward contact is an instrument for borrowing funds by selling securities with an agreement to repurchase the said securities on a mutually agreed future date at an agreed price which includes interest for the funds borrowed. Repo rate is the return earned on a repo transaction expressed as an annual interest rate.

The reverse of the repo transaction is called 'reverse repo' which is lending of funds against buying of securities with an agreement to resell the said securities on a mutually agreed future date at an agreed price which includes interest for the funds lent.

It can be seen from the definition above that there are two legs to the same transaction in a repo/ reverse repo. The duration between the two legs is called the 'repo period'. Predominantly, repos are undertaken on overnight basis, i.e., for one day period. Settlement of repo transactions happens along with the outright trades in government securities.

The consideration amount in the first leg of the repo transactions is the amount borrowed by the seller of the security. On this, interest at the agreed 'repo rate' is calculated and paid along with the consideration amount of the second leg of the transaction when the borrower buys back the security. The overall effect of the repo transaction would be borrowing of funds backed by the collateral of Government securities.

Features of Repo:

(1) Banks and primary dealers are allowed to undertake both repo and reverse repo transactions.

(2) It is a collateralized short term lending and borrowing agreement.

(3) It serves as an outlet for deploying funds on short-term basis.

(4) The interest rates depend on the demand and supply of the short-term surplus/deficit amongst the interbank players.

(5) In addition to T-Bills all Central and State Government securities are eligible for repo.

(6) No sale of securities should be affected unless the securities are actually held by the seller in his own investment portfolio.

(7) Immediately on sale, the corresponding amount should be reduced from the investment account of the seller.

(8) The securities under repo should be marked to market on the balance sheet.

Participants: Buyer in a Repo is usually a Bank which requires approved securities in its investment portfolio to meet the Statutory Liquidity Ratio (SLR).

Types of Repo:

- **Overnight Repo:** When the term of the loan is for one day, it is known as an overnight repo. Most repos are overnight transactions, with the purchase and sale taking place one day and being reversed the next day.
- **Term Repo:** When the term of the loan is for more than one day it is called a term repo. Long-term repos which are as such can be extended for a month or more.
- **Open Repo:** Open repo simply has no end date. Usually, repos are for a fixed period of time, but open-ended deals are also possible.

Interest:

(a) Computation: Interest for the period of Repo is the difference between Sale Price and Purchase Price.

(b) Recognition: Interest should be recognized on a time-proportion basis, both in the books of the buyer and seller.

RBI Guidelines:

(a) Accounting for Repo / Reverse Repo transactions should reflect their legal form, viz., an outright purchase and outright sale.

(b) Thus securities sold under Repo would not be included in the Investment Account of the seller, instead, these would be included by the Buyer in its Investment Account.

(c) The buyer can consider the approved securities acquired under Reverse Repo Transactions for the purpose of SLR during the period of the Repo.

Sale Price of Securities: Sale of Securities should be recognized by the Seller at prevailing market rate comprising of accrued interest to date and the clean price. Repurchase of Securities by the Seller, would be at the above Market Rate plus Interest for the period of Repo.

Consider a situation where Bank X wants to raise funds from Bank Y for fifteen days at a repo rate of 9.00% p. a. The securities for this transaction is an 8% semi-annual coupon (Coupon date 25th April and 25th October) of face value ₹500 million which is presently trading at 98.2 for ₹100 face value. Hence the amount that Bank X will borrow from Bank Y = Ex-interest price of the security + accrued interest based on 30/360 day count convention.

Ex-interest price = 98.2% of 500 million = ₹ 491 million

Add : Accrued interest for 25th October to 12th February i.e. 107 days = 8% of 500 x 107/360 = ₹ 11.89 million

∴ Amount borrowed = 491 + 11.89 = ₹ 502.89 million

Repo interest based on actual 360 days count convention = 9% of 502.89 x 15/365 = ₹1.86 million Amount to be repaid by Bank X after 15 days = 502.89 + 1.86 = ₹ 504.75 million.

This includes accrued interest for 107 + 15 i.e. 122 days = 11.89/107 x 122 = ₹13.56 million Ex-interest re-purchase price = 504.75 – 13.56 = ₹ 491.19 million.

5.5 PROMISSORY NOTES

A written, dated and signed two-party instrument containing an unconditional promise by the maker to pay a definite sum of money to a payee on demand or at a specified future date.

Essentials of a Promissory Note:

- ❖ It must be in writing.
- ❖ It must not be a bank note or a currency note.
- ❖ It must contain unconditional undertaking.
- ❖ It must be signed by the maker.
- ❖ The undertaking must be to pay on demand or at a fixed or determinable future time.
- ❖ The undertaking must be to pay a certain sum of money.
- ❖ The money must be payable to a certain person or to his order, or to the bearer of the instrument.

"Derivative Usance Promissory Notes" (DUPN)

Derivative Usance Promissory Notes is an innovative instrument issued by the RBI to eliminate movement of papers and facilitating easy multiple rediscounting.

Features:

(a) Backing: DUPN is backed by up to 90 days Usance Commercial bills.

(b) Stamp Duty: Government has exempted stamp duty on DUPN to simplify and stream line the instrument and to make it an active instrument in the secondary market.

(c) Period: The minimum rediscounting period is 15 days.

(d) Transfer: DUPN is transferable by endorsement and delivery and hence is liquid.

(e) Regulated Entry: RBI has widened the entry regulation for bill market by selectively allowing, besides banks and PDs, Co-operative Banks, Mutual Funds and financial institutions.

(f) Rediscounting: DFHI trades in these instruments by rediscounting DUPNs drawn by commercial banks. DUPNs which are sold to investors may also be purchased by DFHI.

5.6 GOVERNMENT SECURITIES AND BONDS

Government Securities

A Government security is a tradable instrument issued by the Central Government or the State Governments. It acknowledges the Government's debt obligation. Such securities are short term (usually called treasury bills, with original maturities of less than one year) or long term (usually called Government bonds or dated securities with original maturity of one year or more). In India, the Central Government issues both, treasury bills and bonds or dated securities while the State Governments issue only bonds or dated securities, which are called the State Development Loans (SDLs). Government securities carry practically no risk of default and, hence, are called risk-

free gilt-edged instruments. Government of India also issues savings instruments (Savings Bonds, National Saving Certificates (NSCs), etc.) or special securities (oil bonds, Food Corporation of India bonds, fertilizer bonds, power bonds, etc.). They are, usually not fully tradable and are, therefore, not eligible to be SLR securities.

Government Securities are mostly interest bearing dated securities issued by RBI on behalf of the Government of India. GOI uses these funds to meet its expenditure commitments. These securities are generally fixed maturity and fixed coupon securities carrying semi-annual coupon. Since the date of maturity is specified in the securities, these are known as dated Government Securities, e.g. 8.24% GOI 2018 is a Central Government Security maturing in 2018, which carries a coupon of 8.24% payable half yearly.

Features of Government Securities

1) Issued at face value.
2) No default risk as the securities carry sovereign guarantee.
3) Ample liquidity as the investor can sell the security in the secondary market.
4) Interest payment on a half yearly basis on face value.
5) No tax deducted at source.
6) Can be held in demat form.
7) Rate of interest and tenor of the security is fixed at the time of issuance and is not subject to change (unless intrinsic to the security like FRBs - Floating Rate Bonds).
8) Redeemed at face value on maturity.
9) Maturity ranges from 91 days-30 years.
10) Government Securities qualify as SLR (Statutory Liquidity Ratio) investments, unless otherwise stated.

Government Securities- Types

1) Treasury Bills.

2) Government Bonds or Dated Securities.

3) State Development Loans.

4) Any other security created and issued by the Government in such form and for such of the purposes of the Act as may be prescribed.

Government Securities- Issuers

Government securities are issued by the following agencies:

1) Central Government.

2) State Government.

3) Semi-government Authorities.

4) Public sector undertakings.

Government Securities- Issue Procedure

Government securities are issued through auctions conducted by the RBI. Auctions are conducted on the electronic platform called the NDS – Auction platform. Commercial banks, scheduled urban co-operative banks, Primary Dealers, insurance companies and provident funds, who maintain funds account (current account) and securities accounts (SGL account) with RBI, are members of this electronic platform. All members of PDO-NDS can place their bids in the auction through this electronic platform. All non-NDS members including non-scheduled urban co-operative banks can participate in the primary auction through scheduled commercial banks or Primary Dealers. For this purpose, the urban co-operative banks need to open a securities account with a bank / Primary Dealer – such an account is called a Gilt Account. A Gilt Account is a dematerialized account maintained by a scheduled commercial bank or Primary Dealer for its constituent (e.g., a non-scheduled urban co-operative bank).

The RBI, in consultation with the Government of India, issues an indicative half-yearly auction calendar which contains information about the amount of borrowing, the tenor of security and the likely period during which auctions will be held. A Notification and a Press Communique giving exact particulars of the securities, viz., name, amount, type of issue and procedure of auction are issued by the Government of India about a week prior to the actual date of auction. RBI places the notification and a Press Release on its website (www.rbi.org.in) and also issues an advertisement in leading English and Hindi newspapers. Information about auctions is also available with the select branches of public and private sector banks and the Primary Dealers.

Risks involved in holding Government securities:

Government securities are generally referred to as risk free instruments as sovereigns are not expected to default on their payments. However, as is the case with any financial instrument, there are risks associated with holding the Government securities. Hence, it is important to identify and understand such risks and take appropriate measures for mitigation of the same. The following are the major risks associated with holding Government securities.

(i) **Market risk –** Market risk arises out of adverse movement of prices of the securities that are held by an investor due to changes in interest rates. This will result in booking losses on marking to market or realizing a loss if the securities are sold at the adverse prices. Small investors, to some extent, can mitigate market risk by holding the bonds till maturity so that they can realize the yield at which the securities were actually bought.

(ii) **Reinvestment risk** – Cash flows on a Government security includes fixed coupon every half year and repayment of principal at maturity. These cash flows need to be reinvested whenever they are paid. Hence there is a risk that the investor may not be able to reinvest these proceeds at profitable rates due to changes in interest rate scenario.

(iii) **Liquidity risk** – Liquidity risk refers to the inability of an investor to liquidate (sell) his holdings due to non availability of buyers for the security, i.e., no trading activity in that particular security. Usually, when a liquid bond of fixed maturity is bought, its tenor gets reduced due to time decay. For example, a 10 year security will become 8 year security after 2 years due to which it may become illiquid. Due to illiquidity, the investor may need to sell at adverse prices in case of urgent funds requirement. However, in such cases, eligible investors can participate in market repo and borrow the money against the collateral of the securities.

Technique for Mitigating the Risks:

Risk Mitigation

Holding securities till maturity could be a strategy through which one could avoid market risk. Rebalancing the portfolio wherein the securities are sold once they become short term and new securities of longer tenor are bought could be followed to manage the portfolio risk. However, rebalancing involves transaction and other costs and hence needs to be used judiciously. Market risk and reinvestment risk could also be managed through Asset Liability Management (ALM) by matching the cash flows with liabilities. ALM could also be undertaken by matching the duration of the cash flows.

Advanced risk management techniques involve use of derivatives like Interest Rate Swaps (IRS) through which the nature of cash flows could be altered. However, these are complex instruments requiring advanced level of expertise for proper understanding. Adequate caution, therefore, need to be observed for undertaking the derivatives transactions and such transactions should be undertaken only after having complete understanding of the associated risks and complexities.

Dated Government Securities

Dated Government securities are long term securities and carry a fixed or floating coupon (interest rate) which is paid on the face value, payable at fixed time periods (usually half-yearly). The tenor of dated securities can be up to 30 years.

The Public Debt Office (PDO) of the Reserve Bank of India acts as the registry / depository of Government securities and deals with the issue, interest payment and repayment of principal at maturity. Most of the dated securities are fixed coupon securities.

The nomenclature of a typical dated fixed coupon Government security contains the following features - coupon, name of the issuer, maturity and face value. For example, 7.49% GS 2017 would mean:

Coupon	:	7.49% paid on face value
Name of Issuer	:	Government of India
Date of Issue	:	April 16, 2007
Maturity	:	April 16, 2017
Coupon Payment Dates	:	Half-yearly (October 16 and April 16) every year
Minimum Amount of issue/sale	:	₹10,000

In case there are two securities with the same coupon and are maturing in the same year, then one of the securities will have the month attached as suffix in the nomenclature. For example, 6.05% GS 2019 FEB, would mean that Government security having coupon 6.05 % that mature in February 2019 along with the other security with the same coupon, namely, 6.05% 2019 which is maturing in June 2019.

If the coupon payment date falls on a Sunday or a holiday, the coupon payment is made on the next working day. However, if the maturity date falls on a Sunday or a holiday, the redemption proceeds are paid on the previous working day itself.

The dated Government securities market in India has two segments:

1) **Primary Market**: The Primary Market consists of the issuers of the securities, viz., Central and Sate Government and buyers include Commercial Banks, Primary Dealers, Financial Institutions, Insurance Companies & Co-operative Banks. RBI also has a scheme of non-competitive bidding for small investors.

2) **Secondary Market**: The Secondary Market includes Commercial banks, Financial Institutions, Insurance Companies, Provident Funds, Trusts, Mutual Funds, Primary Dealers and Reserve Bank of India. Even Corporates and Individuals can invest in Government Securities. The eligibility criteria are specified in the relative Government notification.

Auctions: Auctions for government securities are either multiple- price auctions or uniform price auction - either yield based or price based.

Yield Based: In this type of auction, RBI announces the issue size or notified amount and the tenor of the paper to be auctioned. The bidders submit bids in term of the yield at which they are ready to buy the security. If the Bid is more than the cut-off yield then its rejected otherwise it is accepted.

Price Based: In this type of auction, RBI announces the issue size or notified amount and the tenor of the paper to be auctioned, as well as the coupon rate. The bidders submit bids in terms of the price. This method of auction is normally used in case of reissue of existing Government Securities. Bids at price lower than the cut off price are rejected and bids higher than the cut off price are accepted. Price Based auction leads to a better price discovery then the Yield based auction.

Underwriting in Auction: One day prior to the auction, bids are received from the Primary Dealers (PD) indicating the amount they are willing to underwrite and the fee expected. The auction committee of RBI then examines the bid on the basis of the market condition and takes a decision on the amount to be underwritten and the fee to be paid. In case of devolvement, the bids put in by the PD's are set off against the amount underwritten while deciding the amount of devolvement and in case the auction is fully subscribed, the PD need not subscribe to the issue unless they have bid for it.

G-Secs, State Development Loans & T-Bills are regularly sold by RBI through periodic public auctions. SBI DFHI Ltd. is a leading Primary Dealer in Government Securities. SBI DFHI Ltd gives investors an opportunity to buy G-Sec / SDLs / T-Bills at primary market auctions of RBI through its SBI DFHI Invest scheme. Investors may also invest in high yielding Government Securities through "SBI DFHI Trade" where "buy and sell price" and a buy and sell facility for select liquid scrips in the secondary markets is offered.

Open Market Operations (OMOs)

OMOs are the market operations conducted by the Reserve Bank of India by way of sale/ purchase of Government securities to/ from the market with an objective to adjust the rupee liquidity conditions in the market on a durable basis. When the RBI feels there is excess liquidity in the market, it resorts to sale of securities thereby sucking out the rupee liquidity. Similarly, when the liquidity conditions are tight, the RBI will buy securities from the market, thereby releasing liquidity into the market.

Buyback of Government securities

Buyback of Government securities is a process whereby the Government of India and State Governments buy back their existing securities from the holders. The objectives of buyback can be reduction of cost (by buying back high coupon securities), reduction in the number of outstanding securities and improving liquidity in the Government securities market (by buying back illiquid securities) and infusion of liquidity in the system. Governments make provisions in their budget for buying back of existing securities. Buyback can be done through an auction process or through the secondary market route, i.e., NDS/NDS-OM.

Liquidity Adjustment Facility (LAF)

LAF is a facility extended by the Reserve Bank of India to the scheduled commercial banks (excluding RRBs) and primary dealers to avail of liquidity in case of requirement or park excess funds with the RBI in case of excess liquidity on an overnight basis against the collateral of Government securities including State Government securities. Basically LAF enables liquidity management on a day to day basis. The operations of LAF are conducted by way of repurchase agreements with RBI being the counter-party to all the transactions. The interest rate in LAF is fixed by the RBI from time to time. Currently the rate of interest on repo under LAF (borrowing by the participants) is 6.25% and that of reverse repo (placing funds with RBI) is 5.25%. LAF is an important tool of monetary policy and enables RBI to transmit interest rate signals to the market.

Government Securities- Form in which held

The Public Debt Office (PDO) of the Reserve Bank of India, Mumbai acts as the registry and central depository for the Government securities. Government securities may be held by investors either as physical stock or in dematerialized form. From May 20, 2002, it is mandatory for all the RBI regulated entities to hold and transact in Government securities only in dematerialized (SGL) form. Accordingly, UCBs are required to hold all Government securities in demat form.

(a) **Physical form:** Government securities may be held in the form of stock certificates. A stock certificate is registered in the books of PDO. Ownership in stock certificates cannot be transferred by way of endorsement and delivery. They are transferred by executing a transfer form as the ownership and transfer details are recorded in the books of PDO. The transfer of a stock certificate is final and valid only when the same is registered in the books of PDO.

(b) **Demat form:** Holding government securities in the dematerialized or scripless form is the safest and the most convenient alternative as it eliminates the problems relating to custody, viz., loss of security. Besides, transfers and servicing are electronic and hassle free. The holders can maintain their securities in dematerialsed form in either of the two ways:

(i) SGL Account: Reserve Bank of India offers Subsidiary General Ledger Account (SGL) facility to select entities who can maintain their securities in SGL accounts maintained with the Public Debt Offices of the Reserve Bank of India.

(ii) Gilt Account: As the eligibility to open and maintain an SGL account with the RBI is restricted, an investor has the option of opening a Gilt Account with a bank or a Primary Dealer which is eligible to open a Constituents' Subsidiary General Ledger Account (CSGL) with the RBI. Under this arrangement, the bank or the Primary Dealer, as a custodian of the Gilt Account holders, would maintain the holdings of its constituents in a CSGL account (which is also known as SGL II account) with the RBI. The servicing of securities held in the Gilt Accounts is done electronically, facilitating hassle free trading and maintenance of the securities. Receipt of maturity proceeds and periodic interest is also faster as the proceeds are

credited to the current account of the custodian bank / PD with the RBI and the custodian (CSGL account holder) immediately passes on the credit to the Gilt Account Holders (GAH).

Investors also have the option of holding Government securities in a dematerialized account with a depository (NSDL / CDSL, etc.). This facilitates trading of Government securities on the stock exchanges.

Government securities- Trading Mechanism

There is an active secondary market in Government securities. The securities can be bought / sold in the secondary market either (i) Over the Counter (OTC) or (ii) through the Negotiated Dealing System (NDS) or (iii) the Negotiated Dealing System-Order Matching (NDS-OM).

(i) Over the Counter (OTC)/ Telephone Market: In this market, a participant, who wants to buy or sell a government security, may contact a bank / Primary Dealer / financial institution either directly or through a broker registered with SEBI and negotiate for a certain amount of a particular security at a certain price. Such negotiations are usually done on telephone and a deal may be struck if both counterparties agree on the amount and rate. In the case of a buyer, like an urban co- operative bank wishing to buy a security, the bank's dealer (who is authorized by the bank to undertake transactions in Government Securities) may get in touch with other market participants over telephone and obtain quotes. Should a deal be struck, the bank should record the details of the trade in a deal slip and send a trade confirmation to the counterparty. The dealer must exercise due diligence with regard to the price quoted by verifying with available sources. All trades undertaken in OTC market are reported on the secondary market module of the NDS.

(ii) Negotiated Dealing System: The Negotiated Dealing System (NDS) for electronic dealing and reporting of transactions in government securities was introduced in February 2002. It facilitates the members to submit electronically, bids or applications for primary issuance of Government Securities when auctions are conducted. NDS also provides an interface to the Securities Settlement System (SSS) of the Public Debt Office, RBI, Mumbai thereby facilitating settlement of transactions in Government Securities (both outright and repos) conducted in the secondary market. Membership to the NDS is restricted to members holding SGL and/or Current Account with the RBI, Mumbai.

In August, 2005, RBI introduced an anonymous screen based order matching module on NDS, called NDS-OM. This is an order driven electronic system, where the participants can trade anonymously by placing their orders on the system or accepting the orders already placed by other participants. NDS-OM is operated by the Clearing Corporation of India Ltd. (CCIL) on behalf of the RBI. Direct access to the NDS-OM system is currently available only to select financial institutions like Commercial Banks, Primary Dealers, Insurance Companies, Mutual Funds, etc. Other participants can access this system through their custodians, i.e., with whom they maintain Gilt Accounts. The custodians place the orders on behalf of their customers like the urban co- operative banks. The advantages of NDS-OM are price transparency and better price discovery.

Gilt Account holders have been given indirect access to NDS through custodian institutions. A member (who has the direct access) can report on the NDS the transaction of a Gilt Account holder in government securities. Similarly, Gilt Account holders have also been given indirect access to NDS-OM through the custodians. However, currently two gilt account holders of the same custodian are not permitted to undertake repo transactions between themselves.

(iii) Stock Exchanges: Facilities are also available for trading in Government securities on stock exchanges (NSE, BSE) which cater to the needs of retail investors.

Government Securities market- Major Players

Major players in the Government securities market include commercial banks and primary dealers besides institutional investors like insurance companies. Primary Dealers play an important role as market makers in Government securities market. Other participants include co-operative banks, regional rural banks, mutual funds, provident and pension funds. Foreign Institutional Investors (FIIs) are allowed to participate in the Government securities market within the quantitative limits prescribed from time to time. Corporates also buy/ sell the government securities to manage their overall portfolio risk.

5.7 BOND, VALUATION OF BONDS, PRICE YIELD RELATIONSHIP

Definition of Bond

Bond is a negotiable certificate evidencing indebtedness. It is normally unsecured. A debt security is generally issued by a company, municipality or government. A bond investor lends money to the issuer and in exchange, the issuer promises to repay the loan amount on a specified maturity date. The issuer usually pays the bond holder periodic interest payments over the life of the bond.

Bonds are the instruments of borrowing by governments and corporate. They promise a fixed rate of return, known as a coupon rate, till the date of maturity and the payback of the principal sum in a phased manner or at maturity.

There are two categories of bonds- those issued by government and those issued by firms (also known as debentures). From the perspective of risk, the bonds issued by the government are regarded as risk free, while those issued by firms are deemed to bear default risk.

Features of Bond:

The terms and conditions for the issue of bonds are pre-decided at the time of the issue as a part of bond indenture.

(i) **Face value:** Face value, also referred as par value, of the bond is the amount of money that is stated on the face of the instrument. Usually, bonds are issued with the face value of ₹100 or ₹1000, though there is no such rule that prescribes the face value.

(ii) **Coupon rate:** The rate of interest payable by the issuer to the subscriber of the bond is referred to as the coupon rate.

(iii) **Periodicity of coupon payment:** The coupon rate of the bond is specified as annual interest payment. However, the issuer may decide to pay the interest at regular intervals as opposed to annual payments.

(iv) **Maturity:** The principal sum borrowed through the issue of bonds is for a finite period of time that is predetermined and specified at the time of issue. The duration from the date of issue until the bonds are redeemed is referred to as the maturity period of the bond.

(v) **Redemption value:** At the end of maturity, the borrowed sum must be refunded. The amount of money paid at the time of maturity is referred to as the redemption value.

Types of Bond:

- **Zero Coupon Bond:**
  - ✓ Zero Coupon Bond is issued at a discount and repaid at face value. No periodic interest is paid.
  - ✓ The difference between the issue price and redemption price represents the return to the holder.
- **Convertible Bond:** Bond which carries an option to convert the bond into Equity at a fixed conversion price.
- **Bearer Bonds:** It is an official certificate issued without recording the name of the holder. These are very risky because they can be either lost or stolen.
- **Registered Bonds:** It is a bond whose ownership is recorded by the issuer or by a transfer agent.
- **Term Bonds:** Most corporate bonds are term bonds, that is, they run for a specific term of years and then become due and payable.
- **Serial Bonds:** While issuing bonds some corporate arrange them in such a way that specific principal amounts become due on specified dates prior to maturity. They are termed as serial bonds.
- **Puttable Bonds:** A puttable bond grants the bondholder the right to sell the issue back to the issuer at par value on designated dates.
- **Callable Bonds:** These bonds refer to the ability of the issuer to pay off a debt obligation prior to its maturity at the option of the issuer of debt.

- **Exchangeable Bonds:** It grants the bondholder the right to exchange the bonds for the common stock of a firm other than that of the issuer of the bond.
- **Fixed Rate Bonds:** These are bonds with a coupon or a stated rate of interest which remains constant throughout the life of the bond.
- **High Yield Bonds:** They are bonds that are rated below investment grade by the credit rating agencies. They are also called junk bonds.
- **Mortgage Bonds:** A bond that is secured through a lien against the property of the firm is known as mortgage bond.
- **Subordinated Bonds:** These bonds have a lower priority than secured debts, debentures and other bonds and the general creditors of the issuer in case of liquidation.
- **Guaranteed Bonds:** It is an obligation guaranteed by another entity.
- **Perpetual Bonds:** These bonds are also called perpetuities. It has no maturity date.
- **Global bonds:** Bonds that are designed so as to qualify for immediate trading in any domestic capital market and in the Euro market are called global bonds.
- **Easy Exit Bonds:** These are bonds which provide easy liquidity and exit route to investors by way of redemption or buy back facility where investors can get the benefit of ready encashment in case of need to withdraw before maturity.
- **Option Bonds:** These are cumulative and non-cumulative bonds where interest is payable on maturity or periodically. Redemption premium is also offered to attract investors. These were issued by institutions like IDBI, ICICI, etc.
- **Double Option Bonds:** The face value of each bond is ₹5,000. The bond carries interest at 15% p.a. compounded half-yearly from the date of allotment. The bond has a maturity period of 10 years. Each bond has two parts in the form of two separate certificates, one for principal of ₹5,000 and other for interest (including redemption premium) of ₹16,500. Both these certificates are listed on all major stock exchanges. The Investor has the facility of selling either one or both parts at anytime he wishes so.
- **Floating Rate Bonds:** Here, Interest rate is not fixed and is allowed to float depending upon the market conditions. This is an instrument used by the issuing Companies to hedge themselves against the volatility in the interest rates. Financial institutions like IDBI, ICICI, etc. have raised funds from these bonds.
- **Inflation Bonds:** Inflation Bonds are bonds in which interest rate is adjusted for inflation. Thus, the investor gets an interest free from the effects of inflation. For example, if the interest rate is 10% and the inflation is 2%, the investor will earn 12.20% [i.e. (1 + Interest Rate) X (1 + Inflation Rate) -1]. This is similar to Floating Rate Bonds, i.e. rate of return varies over a period of time.

Valuation of Bonds

A bond or debenture is a contractual financial instrument which obligates its issuer to pay a given sum of money (face value) at a maturity date in future and a periodic interest payment at a fixed rate of interest (coupon rate).

Bonds are issued by different organisations. The principal issuers of bonds in India are the central government, state government, public sector undertakings, private Sector undertakings and municipal bodies.

The value of a bond is equal to the present value of the cash flows expected from it. Valuation of bond requires

(i) An estimate of expected cash flows

(ii) An estimate of the required return

Assumptions:

(i) The coupon interest rate is fixed for the term of the bond.

(ii) The coupon payments are made annually and the next coupon payment is receivable exactly a year from now.

(iii) The bond will be redeemed at par on maturity.

The value of callable bond (a bond that cannot be prematurely retired) is:

$$P = \sum_{t=1}^{n} \frac{C}{(1+r)^t} + \frac{M}{(1+r)^n}$$

Where p is the bond value, n is the number of years to maturity, C is the annual coupon payment, r is the periodic required return, M is the maturity value and t is the time when the payment is received.

If the coupon payment is an ordinary annuity, the formula for present value of annuity will be:

$P = C\times (PVIFA_{r,n}) + M \times (PVIF_{r,n})$

Illustration: Consider a 10 year, 12% coupon bond with a par value of ₹ 10,000. Assume that the required yield on this bond is 13%. Find out the value of the bond.

Ans: The cash flows for this bond are as follows:

10 annual coupon payments of ₹120

₹10,000 principal repayment 10 years from now

The value of the bond is:

$P = 120\times (PVIFA_{13\%,10\ years})+ 10{,}000\times (PVIF_{13\%,10\ years})$

P =120× 5.426+ 10,000× 0.295

P = 651.1+2950

P = ₹ 3,601.1

Bond values with Semi-annual Interest: Most of the bonds pay interest semi-annually. For valuation of those bonds the equation is given below:

$$P = \sum_{t=1}^{2n} \frac{C/2}{(1+r/2)^t} + \frac{M}{(1+r/2)^{2n}}$$

Where P is the value of the bond, C/2 is the semi-annual coupon payment, r/2 is the periodic applicable to a half year period, M is the maturity value and 2n is the maturity period expressed in terms of half yearly periods.

Illustration: Consider an 8 year, 12% coupon bond with a par value of ₹ 1000 on which interest is payable semi-annually. The required rate of return on this bond is 14. Find out the value of the bond.

Ans: The value of the bond is

$P = 6\times (PVIFA_{7\%,16})+ 1000\times (PVIF_{7\%,16})$

P = 6× (9.447)+ 1000× (0.339)

P = 56.682+339

P = 395.682

P = ₹ 396

Price Yield Relationship

The earlier section discussed price of bond. However, it is required to understand different types of bond yield. The commonly employed bond yield measures are:

(i) **Current yield**: The current yield relates the annual coupon interest to the market price. It is calculated by using the formula:

Current Yield=Annual Interest/Price

(ii) Yield to Maturity : The yield to maturity (YTM) is defined as the interest rate that makes the present value of a bond's payments equal to its price. This interest rate is often interpreted as a measure of the average rate of return that will be earned on a bond if it is bought now and held until maturity.

(iii) Yield to Call: Some bonds carry a call feature that entitles the issuer to call (buy back) the bond prior to the stated maturity date in accordance with a call schedule.

The basic property of a bond is that its price varies inversely with yield. If the required yield decreases, the present value of the cash flow increases; hence the price of the bond increases. Conversely, when the required yield increases, the present value of cash flow decreases. The higher the coupon rate, the smaller the percentage price change due to any given change in interest rate are positively related. The graph of the price-yield relationship for the bond has a convex shape.

The relationship between the coupon rate, the required yield and the price of bond is as follows:

Coupon Rate > Required Yield ⟷ Price > Par (Premium Bond)
Coupon Rate = Required Yield ⟷ Price = Par
Coupon Rate < Required Yield ⟷ Price > Par (Discount Bond)

Consider, a bond carrying a coupon rate of 14% issued 3 years ago for ₹1000 (its par value) by XYZ Co. The original maturity of bond was 10 years, so its residual maturity now is 7 years. The interest rate is fallen in the last 3 years and investors now expect a return of 10% from this bond. So the price of the bond now would be ₹1194.70 (based on the formula mentioned above).

5.8 HEDGE FUNDS

Hedge funds are private investment vehicles not open to the general investment public. Hedge funds face less regulation than publicly traded mutual funds, allowing them to hold substantial short positions to preserve capital during market downturns. Typically, hedge fund managers generate profit from both long as well as short positions. The private nature of hedge funds often suits both the needs of investors and managers.

Features of Hedge Funds:

(a) Reduce risk, enhance returns and minimize the correlation with equity and bond markets.

(b) Flexibility in investment options.

(c) Variety in terms of investment returns, volatility and risk.

(d) Consistency of returns and capital preservation.

(e) Managed by experienced investment professionals who are generally disciplined and diligent.

(f) Pension funds, endowments, insurance companies, private banks and high net worth individuals and families invest in hedge funds to minimize overall portfolio volatility and enhance returns.

(g) Hedge funds benefit by heavily weighting hedge fund managers' remuneration towards performance incentives.

Hedging strategies adopted in case of Hedge Funds:

(a) Selling short: Selling shares without owning them, to buy them back at a future date at a lower price in the expectation that their price will drop.

(b) Using arbitrage: Seeking to exploit pricing inefficiencies between related securities.

(c) Trading Options or Derivatives: Contracts whose values are based on the performance of any underlying financial asset, index or other investment.

(d) Investing in anticipation of a specific event: Merger transaction, hostile takeover, spin-off, exiting of bankruptcy proceedings, etc.

(e) Investing in deeply discounted securities: Of companies about to enter or exit financial distress or bankruptcy, often below liquidation value.

Benefits of Hedge Funds:

(a) Seek higher returns: Hedge fund strategies generate positive returns in both rising and falling equity and bond markets.

(b) Investment styles: Huge variety of hedge fund investment styles - many uncorrelated with each other -provides investors with a wide choice of hedge fund strategies to meet their investment objectives.

(c) Long term Solution: Hedge funds provide an ideal long-term investment solution, eliminating the need to correctly time entry and exit from markets.

(d) Diversification:

(i) Inclusion of hedge funds in a balanced portfolio reduces overall portfolio risk and volatility and increases returns.

(ii) Adding hedge funds to an investment portfolio provides diversification not otherwise available in traditional investing.

Different Styles of Hedge Funds:

(a) Aggressive Growth: Invests in equities, expected to experience acceleration in growth of earnings per share; generally high P/E ratios, low or no dividends. Often smaller and micro cap stocks which are expected to experience rapid growth. Includes sector specialist funds such as technology, banking, or biotechnology. Hedges by shorting equities where earnings disappointment is expected or by shorting stock indexes. Tends to be "long-biased." Expected volatility is high.

(b) Distressed Securities: Buys equity, debt, or trade claims at deep discounts of companies in or facing bankruptcy or reorganization. Profits from the market's lack of understanding of the true value of the deeply discounted securities and because the majority of institutional investors cannot own below investment grade securities. Results generally not dependent on the direction of the markets. Expected volatility ranges from Low — Moderate.

(c) Emerging Markets: Invests in equity or debt of emerging (less mature) markets that tend to have higher inflation and volatile growth. Short selling is not permitted in many emerging markets, and, therefore, effective hedging is often not available. Expected volatility is very high.

(d) Funds of Hedge Funds: Mix and match hedge funds and other pooled investment vehicles. This blending of different strategies and asset classes aims to provide a more stable long-term investment return than any of the individual funds. Returns, risk, and volatility can be controlled by the mix of underlying strategies and funds. Capital preservation is generally an important consideration. Volatility depends on the mix and ratio of strategies employed. Expected volatility range is Low - Moderate - High.

(e) Income: Invests with primary focus on yield or current income rather than solely on capital gains.

May utilize leverage to buy bonds and sometimes fixed income derivatives in order to profit from principal appreciation and interest income. Expected volatility is low.

(f) Macro: Aims to profit from changes in global economies, typically brought about by shifts in government policy that impact interest rates, in turn affecting currency, stock, and bond markets. Participates in all major markets - equities, bonds, currencies and commodities - though not always at the same time. Uses leverage and derivatives to accentuate the impact of market moves. Utilizes hedging, but the leveraged directional investments tend to make the largest impact on performance. Expected volatility is very high.

(g) Arbitrage: Attempts to hedge out most market risk by taking offsetting positions, often in different securities of the same issuer. May also use futures to hedge out interest rate risk. Focuses on obtaining returns with low or no correlation to both the equity and bond markets. These relative value strategies include fixed income arbitrage, mortgage backed securities, capital structure arbitrage, and closed-end fund arbitrage. Expected volatility is low.

(h) Securities Hedging: Invests equally in long and short equity portfolios generally in the same sectors of the market. Market risk is greatly reduced, but effective stock analysis and stock picking is essential to obtaining meaningful results. Leverage may be used to enhance returns. Usually low or no correlation to the market. Sometimes uses market index futures to hedge out systematic (market) risk. Relative benchmark index usually T-bills. Expected volatility is low.

(i) Market Timing: Allocates assets among different asset classes depending on the manager's view of the economic or market outlook. Portfolio emphasis may swing widely between asset classes. Unpredictability of market movements and the difficulty of timing entry and exit from markets add to the volatility of this strategy. Expected volatility is high.

(j) Opportunistic: Investment theme changes from strategy to strategy as opportunities arise to profit from events such as IPOs, sudden price changes often caused by an interim earnings disappointment, hostile bids, and other event-driven opportunities. May utilize several of these investing styles at a given time and is not restricted to any particular investment approach or asset class. Expected volatility is variable.

(k) Multi Strategy: Investment approach is diversified by employing various strategies simultaneously to realize short- and long-term gains. Other strategies may include systems trading such as trend following and various diversified technical strategies. This style of investing allows the manager to overweight or underweight different strategies to best capitalize on current investment opportunities. Expected volatility is variable.

(l) Short Selling: Sells securities short in anticipation of being able to re-purchase them at a future date at a lower price due to the manager's assessment of the overvaluation of the securities, or the market, or in anticipation of earnings disappointments often due to accounting irregularities, new competition, change of management, etc. Often used as a hedge to offset long-only portfolios and by those who feel the market is approaching a bearish cycle. Risk is high. Expected volatility is very high.

(m) Special Situations: Invests in event-driven situations such as mergers, hostile takeovers, reorganizations, or leveraged buyouts. May involve simultaneous purchase of stock in companies being acquired, and the sale of stock in its acquirer, hoping to profit from the spread between the current market price and the ultimate purchase price of the company. May also utilize derivatives to leverage returns and to hedge out interest rate and/or market risk. Results generally not dependent on direction of market. Expected volatility is moderate.

(n) Value: Invests in securities perceived to be selling at deep discounts to their intrinsic or potential worth. Such securities may be out of favour or under followed by analysts. Long-term holding, patience, and strong discipline are often required until the ultimate value is recognized by the market. Expected volatility is Low - Moderate.

Comparison of Hedge Funds and Mutual Funds:

1) Similarities between Hedge Funds and Mutual Funds: They are pooled investment vehicles (i.e. several investors entrust their money to a manager) and invest in publicly traded securities.

2) Differences between Mutual Funds and Hedge Funds:

(a) Mutual Funds seek Relative Returns whereas Hedge Funds actively seek Absolute Returns.

(b) In a bull market, hedge funds may not perform as well as mutual funds, but in a bear market - taken as a group or asset class - they do better than mutual funds because they hold short positions and hedges.

Categories of Hedge Funds:

1) **Arbitrage Strategies (Relative Value):** Arbitrage is the exploitation of observable price inefficiency and, as such, pure arbitrage is considered risk less. The arbitrage strategies include use of - (1) Derivative Instruments, (2) Trading Software, and (3) Various Trading Exchanges.

2) **Event-Driven Strategies:** Event-driven strategies take advantage of transaction announcements and other one-time events. There are various types of event-driven strategies.

   Example: "Distressed Securities" involves investing in companies that are re-organizing or have been unfairly beaten down.

3) **Directional or Tactical Strategies:** The largest group of hedge funds uses directional or tactical strategies. Directional or tactical strategies are:

   (a) Long/short strategies to combine purchases (long positions) with short sales.

   (b) Dedicated short strategies to specialize in the short sale of over-valued securities.

Demerits associated with Hedge Funds:

1) **Multiple Risks:** Hedge fund investors are exposed to multiple risks, and each strategy has its own unique risks.

2) **Skewed Return paths:** Hedge fund returns tend to be negatively skewed, which means they bear the dreaded "fat tails", which are characterized by positive returns but a few cases of extreme losses.

3) **Time-consuming:** Investing in a single hedge fund requires time-consuming due diligence and concentrates risk.

4) **Cost:** Hedge funds create a double-fee structure. There is a payment of management fee to the fund manager in addition to fees normally paid to the underlying hedge funds.

5) **Over-diversification:** A fund of hedge funds needs to coordinate its holdings or it will not add value. (If it is not careful, it may inadvertently collect a group of hedge funds that duplicates its various holdings or ends up constituting a representative sample of the entire market).

5.9 MUTUAL FUNDS

A mutual fund is a pure intermediary which performs a basic function of buying and selling securities on behalf of its unit holders, which latter also can perform but not easily, conveniently economically, and profitably. The investors in mutual fund are given the share in its total funds which is proportionate to their investments, and which is evidenced by the unit certificates.

Mutual Fund (MF) is a fund established in the form of a Trust, to raise monies through sale of units to the public or a section of the public under one or more schemes for investing in Securities, including Money Market Instruments. [Trust Deed should be duly registered under the Indian Registration Act, 1908.]

However unlike share holders in a company, the share holders in mutual funds do not have any voting rights.

Mutual fund is the most suitable investment for the common man as it offers an opportunity to invest in a diversified, professionally managed basket of securities at a relatively low cost.

In India, a mutual fund is required to be registered with Securities and Exchange Board of India which regulates securities markets before it can collect funds from public.

Mutual Funds are required to get registered with the Securities and Exchange Board of India (SEBI).

Activities involved:

(i) Formulation of Scheme: A Mutual Fund formulates a scheme with a specified objective to meet the investment needs of various investors i.e. High Return Scheme, Fixed Return Scheme etc. The Scheme should be approved by the Trustees and filed with SEBI.

(ii) **Sale of Units:** Units under the scheme are sold to the investors to collect funds from them.

(iii) **Investment by AMC:** An AMC can invest in any of the schemes of a MF only if full disclosure of its intention to invest has been made in the offer documents. An AMC shall not be entitled to charge any fees on its investment in that scheme.

(iv) **Portfolio Creation:** Resources so received from investors are pooled to create a diversified portfolio of securities by investing the money in instruments, which are in line with the objectives of respective schemes.

(v) **Investment Pattern:** The Investment Pattern of Mutual Funds is governed partly by Government Guidelines and partly by nature and objective of Mutual Fund.

(vi) **Daily Operations:** Daily operations are managed by professionals and Expert Fund Managers who take investment decisions regarding where, when and what to invest and disinvest to get the maximum return as well as higher capital appreciation.

(vii) **Meeting of Expenses:** Expenses like custodial fee, cost of dividend warrants, Registrar's Fee, Asset Management Fee etc, are borne by the respective scheme.

(viii) **Purchase and Repurchase Price:** The purchase and repurchase price of Mutual Funds are generally fixed and also vary in Stock Exchanges if the security is quoted on the basis of its Net Asset Value.

(ix) **Maturity:** Balance remaining in the scheme is returned to the investors upon its maturity on the basis of the Net Assets Value of the scheme on that date.

Role of Mutual Fund in Financial Market:

(i) **Organized Investments:** Due to participation of Mutual Funds in a large scale, it has transformed the Financial Market Transactions into a much more organized. Individual investors may speculate to the maximum, but under the collective investment scheme (i.e. Mutual Fund), the tendency to speculate greatly reduced at an individual level.

(ii) **Evolution of Stock Markets:** Large scale transactions entered into by Mutual Funds, headed by team professionals, have helped in the evolution of stock markets and financial markets.

(iii) **Household Savings:** They are the ideal route for many a household to invest their savings for a higher returns, than normal term deposits with banks.

The advantages of investing in Mutual Funds:

(i) **Professional Management:** Investors avail the services of experienced and skilled professionals who are backed by a dedicated investment research team which analyses the performance and prospects of companies and selects suitable investments to achieve the objectives of the scheme.

(ii) **Diversification:** MFs invest in a number of companies across a broad cross-section of industries and sectors. Investors achieve this diversification through a MF with less money and risk.

(iii) **Convenient Administration:** Investing in a MF reduces paper work and helps investors to avoid many problems such as bad deliveries, delayed payments and unnecessary follow up with brokers and companies.

(iv) **Return Potential:** Over a medium to long term, MF has the potential to provide a higher return as they invest in a diversified basket of selected securities.

(v) **Low Costs:** MFs are a relatively less expensive way to invest compared to directly investing in the capital markets because the benefits of scale in brokerage, custodial & other fees translate into lower costs for investors.

(vi) **Liquidity:** In open ended schemes, investors can get their money back promptly at Net Asset Value (NAV) related prices from the Mutual Fund. With close-ended schemes, investors can sell their units on a stock exchange at the prevailing market price, or avail of the facility of direct repurchase at NAV related prices which some close ended and interval schemes offer periodically.

(vii) **Transparency:** Investors get regular information on the value of their investment in addition to disclosure on the specific investments made by scheme, the proportion invested in each class of assets and the Fund Manager's investment strategy and outlook.

Limitations of taking the Mutual Fund route for investment:

(i) No Choice of Securities: Investors cannot choose the securities which they want to invest in.

(ii) Relying on Other's Performance:

- ❖ Investors face the risk of Fund Manager not performing well. Investors in Mutual Fund have to rely on the Fund Manager for receiving any earning made by the fund, i.e. they are not automatic.
- ❖ If Fund Manager's pay is linked to performance of the fund, he may be tempted to perform only on short-term and neglect long-term performance of the fund.

(iii) High Management Fee: The Management Fees charged by the fund reduces the return available to the investors.

(iv) Diversification: Diversification minimizes risk but does not guarantee higher return.

(v) Diversion of Funds: There may be unethical practices e.g. diversion of Mutual Fund amounts by Mutual Fund/s to their sister concerns for making gains for them.

(vi) Lock-In Period: Many MF schemes are subject to lock in period and therefore, deny the investors market drawn benefits.

Functions of Asset Management Company and The Statutory Requirements for a Company to be Registered as AMC:

A. Functions:

(i) Operations: Asset Management Company (AMC) manages the affairs of the Mutual Fund in relation to the operation of Mutual Fund schemes. The Asset Management Company is a key link in the success of the scheme and the interests of the unit holders.

(ii) Records: It is expected to maintain a record in support of each investment decision.

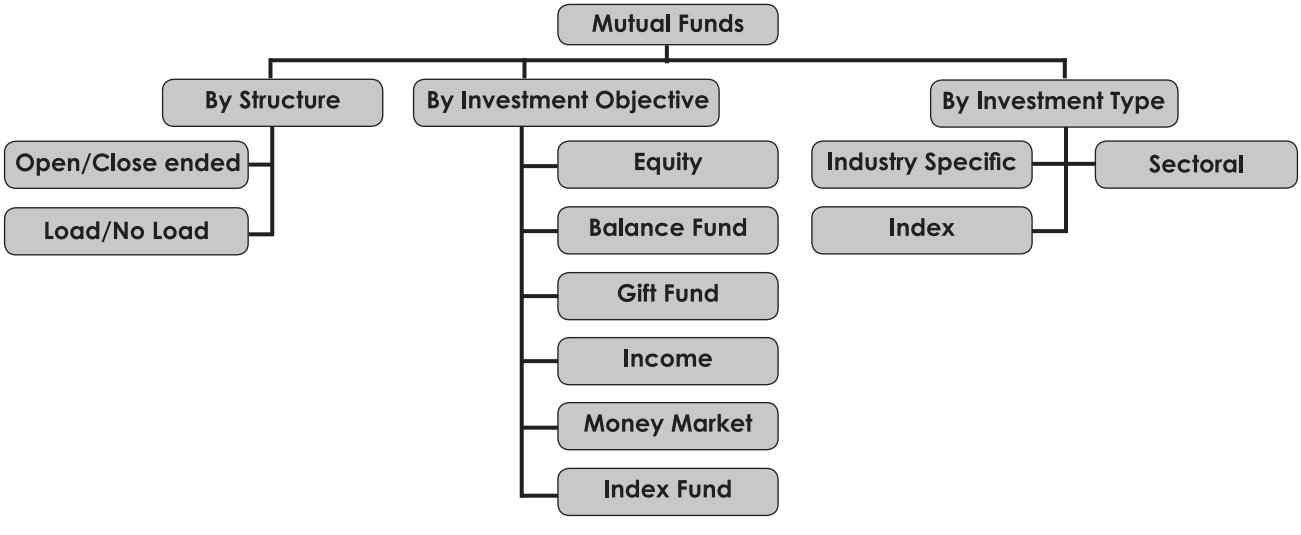
B. Statutory Requirements:

(i) SEBI Approval: AMC should be approved by SEBI and cannot be changed, except unless by a majority of the trustees or by 75% of the unit-holders.

(ii) Other Conditions:

- ❖ AMC's Directors should be persons of standing and suitable professionals.
- ❖ Chairman of the AMC should not be the trustee of any Mutual Fund.
- ❖ AMC should have a minimum Net Worth of ₹10 Crores.

Different types of Mutual Fund schemes



Now the different Types of Mutual Fund Schemes are detailed as under:

(A) By Structure

I. Open End and Closed End Funds:

Aspect	Open End Funds	Closed End Funds
Initial Subscription	Open-End Fund is one which is available for subscription all through the year.	Fund is open for subscription only during a specified period.
Maturity	Do not have a fixed maturity.	Stipulated maturity period (3 to 15 Years)
Subsequent Transactions	Investors can buy and sell units at Net Asset Value related prices.	Investors can invest at the time of the initial public issue and thereafter they can buy or sell the units of the scheme on the stock exchanges where they are listed.
Repurchase	Any time.	Based on terms of the fund. Periodic repurchase at NAV related price.

Interval Funds: Interval funds combine the features of open-ended and close ended schemes. They are open for sale or redemption during pre-determined intervals at NAV related prices.

II. Load Funds and No-Load Funds:

(a) Load Funds: MF can recover the initial marketing expenses (loads) in any of the following ways —

- **Entry Load:** Deducting these expenses at the joining time (suitably adding to the existing NAV, thus allotting less units).
- **Deferred Load:** By deducting deferred load, where the expenses are charged over a specified period.
- **Exit Load:** By deducting these expense when investors exit the scheme (suitable reducing from the existing NAV while making payment)

(b) No Load Funds: Investor in a No-Load fund enters and exits the fund at the NAV, i.e. they do not bear the initial marketing expenses.

Note: Load / No—Load Funds are differentiated on the basis of initial marketing expenses and not on the basis of other running/ management expenses.

(B) By Investment Objectives:

(I) Growth Funds:

(a) Object: To provide capital appreciation over the medium to long term.

(b) Investment Pattern: Such schemes invest a majority of their corpus in equities. It has been proved that returns from stocks, have outperformed most other kind of investments held over the long term.

(c) For Whom? Growth Schemes are meant for investors who have a long-term outlook, and seek growth over a period.

(II) Income Funds:

(a) Object: To provide regular and steady income to investors.

(b) Investment Pattern: Fixed income securities such as Bond, Corporate Debentures and Government Securities.

(c) For Whom? Income Funds are ideal for capital stability and regular income.

(d) Variants:

- **Gilt Fund:** Fund that invests its proceeds only in Government Securities and Treasury Bills.
- **Bond Fund:** Fund that invests its proceeds only in Bonds and Corporate Debt Instruments.

(III) Balance Funds:

(a) Object: Provide both growth and regular income. Such schemes periodically distribute a part of their earning.

(b) Investment Pattern: Both in Equities and Fixed Income Securities, in the proportion indicated in their offer documents.

(c) For Whom? For investors looking for a combination of income and moderate growth.

(d) Less Sensitive to Market Movements: In a rising stock market, the NAV of these schemes may not normally keep pace, or fall equally when the market falls.

(IV) Money Market Funds:

(a) Object: Provide easy liquidity, preservation of capital and moderate income.

(b) Investment Pattern: Safer Short-Term Instruments such as Treasury Bills, Certificates of Deposit, Commercial Paper and Inter-Bank Call Money. Returns on these schemes may fluctuate depending upon the interest rates prevailing in the market.

(c) For Whom? For corporate and individual investors, who wish to invest their surplus funds for short period.

(V) Tax Saving Schemes:

(a) Object: Provide tax rebates to the investors under specific provisions of the Indian Income Tax laws as the Government offers tax incentives for investment in specified avenues.

(b) For Whom? For persons who seek to park their otherwise taxable income in funds for a moderate income, to reduce their tax liability.

(VI) BY INVESTMENT TYPES:

(a) Industry Specific Schemes: Industry-Specific Schemes invest only in the industries specified in the offer document. The investment of these fund is limited to specific industries like Infotech, FMCG, Pharmaceuticals, etc.

(b) Index Schemes: Index Funds attempt to replicate the performance of a particular index such as the BSE Sensex or the NSE 50

(c) Sectoral Schemes: Invest exclusively in a specified sector. This could be an industry or a group of industries or various segments such as "A" Group shares or initial public offerings.

An overview of new types of Mutual Funds that are in vogue today:

(A) Exchange Traded Fund (ETF) :

(i) Nature: An ETF is a hybrid product having features of both an Open-Ended Mutual Fund and an exchange-listed security. It is a fund that tracks an index, but can be traded like a stock.

(ii) Scheme/Structure: In this type of fund, money is invested in the stocks of the index in the same proportion. ETF are traded on stock exchanges, and hence can be traded any time during the day.

(iii) Features:

- Prices fluctuate from moment to moment. The difference in price is due to the forces of demand and supply for ETF in the market at that point of time.
- Investor needs a broker to purchase units of ETF.
- They have very low operating and transaction costs, since there are no loads or investment minimums required to purchase and ETF.
- ETFs can be traded any time during the day, as against conventional index funds which can be

traded only at the end of the day.

- ETF units can be traded at a premium or discount to the underlying Net Asset Value.

(B) Fund of Funds:

(i) Nature: It is a Mutual Fund Scheme, where the subscription proceeds are invested in other Mutual Funds, instead of investing in Equity or Debt Instruments.

(ii) Features:

- These funds offer and achieve a greater diversification than traditional mutual funds.
- Expense/Fees on such funds are higher than those on regular funds because they include part of the expense fees charged by the underlying funds.
- Indirectly, the proceeds of Fund of Funds may be invested in its own funds, and can be difficult to keep track of overall holdings.

(C) Systematic Withdrawal Plan (SWP):

(i) Nature: SWP permits the investor to make an investment at one go and systematically withdraw at periodic intervals, at the same time permitting the balance funds to be re-invested.

(ii) Features:

- Investors can receive regular income while still maintaining their investment's growth potential.
- SWP includes convenient payout options and has several tax advantages.
- Withdrawal can be done either on a monthly basis or on a quarterly basis, based on needs and investment goals of an investor.
- Tax is not deducted, & dividend distribution tax is not applicable. There are no entry or exit loads.

(D) Systematic Investment Plan (SIP):

(i) Nature: Under a SIP, an investor can invest in the units of Mutual Funds at periodic intervals (monthly or quarterly) prevailing unit price of that time. This fund is for those investors who do not want to accumulate their savings and invest in one go. This fund permits them to accumulate their savings by directly investing in the mutual fund.

(ii) Feature: Investors can save a fixed amount of rupees every month or quarter, for the purchase of additional units.

Factors Affecting selection of Mutual Funds:

1) **Past Performance:** The Net Asset Value is the yardstick for evaluating a Mutual Fund. An increase in NAV means a capital appreciation of the investor. While evaluating the performance of the fund, the dividends distributed is to be considered as the same signifies income to the investor. Dividends distributed during a period go on to reduce the Net Asset Value of the fund to the extent of such distribution.

2) **Timing:** The timing when the mutual fund is raising money from the market is vital. In a bullish market, investment in mutual fund falls significantly in value whereas in a bearish market, it is the other way round where it registers growth.

3) **Size of Fund:** Managing a small sized fund and managing a large sized fund is not the same as it is not dependent on the product of numbers. Purchase through large sized fund may by itself push prices up while sale may push prices down. Medium sized funds are generally preferred.

4) **Age of Fund:** Longevity of the fund in business needs to be determined and its performance in rising, falling and steady markets have to be checked for consistency.

5) **Largest Holding:** It is important to note where the largest holdings in mutual fund have been invested in order to identify diversion of funds to Group Concerns.

6) **Fund Manager:** One should have an idea of the person handling the fund management. A person of repute gives confidence to the investors. His performance across varying market scenarios should also be evaluated.

7) **Expense Ratio:** SEBI has laid down the upper ceiling for Expense Ratio. A lower Expense Ratio will give a higher return which is better for an investor.

8) **PE Ratio:** The ratio indicates the weighted average PE Ratio of the stocks that constitute the fund portfolio with weights being given to the market value of holdings. It helps to identify the risk levels in which the mutual fund operates.

9) **Portfolio Turnover:** The fund manager decides as to when he should enter or quit the market. A very low portfolio turnover indicates that he is neither entering nor quitting the market very frequently. A high ratio, on the other hand, may suggest that too frequent moves have lead the fund manager to miss out on the next big wave of investments. A simple average of the portfolio turnover ratio of a peer group updated by mutual fund tracking agencies may serve as a benchmark. The ratio is annual purchase plus annual sale to average value of the portfolio.

Poorly Performing Fund used as Exit Criteria:

1) When the mutual fund consistently under performs the broad based index, it is high time, that it should get out of the scheme. It would be better to invest in the index itself either by investing in the constituents of the index or by buying into an index fund.

2) When the mutual fund consistently under performs its peer group instead of it being at the top.

   In such a case, it would have to pay to get out of the scheme and then invest in the winning schemes.

3) When the mutual fund changes its objectives e.g. instead of providing a regular income to the investor, the composition of the portfolio has changed to a growth fund mode which is not in tune with the investor's risk preferences.

4) When the investor changes his objective of investing in a mutual fund which no longer is beneficial to him.

5) When the fund manager, handling the mutual fund schemes, has been replaced by a new entrant whose image is not known.

Establishment of a Mutual Fund:

1) SEBI Regulations: Mutual Funds should be registered with SEBI, for collecting funds from the public. Mutual Funds are governed by SEBI Regulations, are subject to monitoring and inspection by SEBI.

2) Sponsor:

(a) Meaning: Sponsor is a Body Corporate who establishes a Mutual Fund after completing the formalities prescribed in the SEBI's Mutual Fund Regulations. A Mutual Fund has to be established through the medium of a sponsor.

(b) Conditions:

- ❖ Sponsor should have a sound track record and general reputation of fairness and integrity in all its business transactions.
- ❖ Sponsor should contribute at least 40% to the Net Worth of the Asset Management Company.
- ❖ A Deed shall be executed by the Sponsor, in favour of the trustees named in the instrument of trust.

3) Trust:

(a) Constitution: Mutual Fund should be established as either a Trustee Company or a Trust, under the Indian Trust Act and the instrument of trust shall be in the form of a deed.

(b) Registration: The Trust Deed shall be duly registered under the provisions of the Indian Registration Act, 1908.

(c) Contents: Deed should contain the clauses specified in the Third Schedule of SEBI Regulations.

Restrictions and Conditions for investments by Mutual Funds:

(I) Inter-Scheme Transfer: Transfers of Investments from one scheme to another scheme in the same Mutual Fund will be allowed only if—

(a) Market Price: Transfers are done at prevailing market price for quoted instruments on spot basis.

(b) Investment Objective: Securities transferred should be in conformity with the investment objective of the scheme to which such transfer has been made.

(II) Fees for Investment: A Scheme can invest in another scheme — (a) under the same AMC, (b) other Mutual Fund, without charging any fees.

(III) Issue Expenses: Initial Issue Expenses of any scheme should not exceed 6% of funds raised there under.

(IV) Delivery Based Transactions:

(a) Delivery: Mutual Fund should buy and sell securities only on the basis of deliveries. It should take, delivery of the securities for purchases, and deliver the securities in case of sale.

(b) Prohibition: Purchase and sale should not result in a position where the Mutual Fund has to make short sale or carry forward transaction.

(c) Derivative Transaction: Mutual Funds can enter into Derivatives Transactions in a Recognized Stock Exchange for the purpose of hedging and portfolio balancing, in accordance with the guidelines issued by SEBI.

(V) Title: Every MF should get the securities purchased or transferred in the name of Mutual Fund on account of the concerned scheme, wherever investments are intended to be of long-term nature.

(VI) Bank Deposits: Pending deployment of funds of a scheme as per the investment objective, Mutual Funds can invest the same in Short-term Deposits of Scheduled Commercial Banks.

(VII) Restriction on Investments: Investments made by Mutual Funds should confirm to the following limits :

Instrument / Investment in	**Quantum of Investment and**
(a) Debt instruments of a single issuer and Mortgaged backed Securitised Debt	❖ 15% of NAV of the Scheme ❖ 20% with approval of Board of Trustees and AMC ❖ Govt. Securities and Money Market ❖ Instruments.
(b) Unrated Debt Instruments (Approval of Board of Trustees and AMC required)	❖ Individually (for each issuer) - 10% of NAV of Scheme ❖ Aggregate Investment - 25% of the NAV of Scheme
(c) Share Capital of a Company	❖ 10% of the Company's Paid Up Capital.
(d) Scheme under the same AMC or other Mutual Fund under the same management or schemes of other AMC	❖ 5% of the NAV of the Mutual Fund.
(e) Equity Shar es o r Equit y Related instruments of a Company	❖ 10% of the NAV of the Scheme ❖ Not applicable to investments in index fund or sector or industry specific scheme
(f) Unlisted Equity Shares/Equity Related instrument — Open Ended Scheme — Close Ended Scheme	❖ 5% of the NAV of the scheme ❖ 10% of the NAV of the scheme

(VIII) Prohibited Investments: A Mutual Fund should not invest in -

(a) any unlisted security of an Associate or Group Company of the Sponsor,

(b) any security issued by way of private placement by an Associate or Group Company of the Sponsor,

(c) listed securities of Group Companies of the Sponsor which is in excess of 25% of the Net Assets,

(d) any Fund of a Fund Scheme.

NET ASSET VALUE (NAV) IN RELATION TO A MUTUAL FUND:

Net Asset Value (NAV) of a Mutual Fund (MF) Scheme is the Market Value per unit of all the assets of the scheme. It is the value of each unit of the scheme. It includes dividends, interest accruals and reduction of liabilities and expenses.

(A) Ascertainment:

(i) The investors' subscription is treated as the capital in the Balance Sheet of the Fund, and the investments on their behalf are treated as assets.

(ii) NAV per Unit = Net Asset Value of the Fund ÷ No. of Units Outstanding.

(iii) It reflects the realizable value that the investor will get for each unit that he is holding if the scheme is liquidated on that date.

(iv) Net Assets = Market Value of Investments + Receivables + Accrued Income + Other Assets - Accrued Expenses - Payables - Other Liabilities

(B) Utility:

(i) The performance of a particular scheme of a mutual fund is denoted by NAV.

(ii) NAV plays an important part in investors' decisions to enter or to exit the Scheme.

(iii) Analysts use the NAV to determine the yield on the schemes. Investors' Rights & Obligations under the Mutual Fund Regulations:

(A) Rights:

(i) Unit holder has proportionate right in the beneficial ownership of the scheme assets, as well as any dividend or income declared under the scheme.

(ii) Unit holder is entitled to receive dividend warrant within 42 days.

(iii) AMC can be terminated by 75% of the unit holders.

(iv) Unit Holder has the right to inspect major documents i.e. material contracts, Memorandum of Association and Articles of Association of the AMC, Offer Document, etc.

(v) 75% of the unit holders have the right to approve any changes in the close-ended scheme.

(vi) Every unit holder have right to receive copy of the annual statement.

(B) Limitations to Investors' Rights:

(i) **No right against Trust:** Unit holders cannot sue the Trust, but they can initiate proceedings against the Trustees, if they feel that they are being cheated.

(ii) **No right to sue for lower returns:** Except in certain circumstances, AMC cannot assure a specified level of return to the investors. AMC cannot be sued to make good any shortfall in such schemes.

(C) Investors' Obligations:

(i) **Study of risk factors:** An investor should carefully study the risk factors and other information provided in the Offer Document. Failure to study will not entitle him for any rights thereafter.

(ii) **Monitoring schemes:** It is the responsibility of the investor to monitor his schemes, by studying the Reports and other Financial Statements of the Funds.

The steps taken for improvement and compliance of standards of Mutual Fund:

(A) Disclosure of Schemes:

(i) Disclosure: Mutual Funds should disclose the full portfolio of their schemes in the annual report within 1 month of the close of each financial year.

(ii) Mode of Disclosure: Mutual Fund should either send it to each unit holder or publish it by way of an advertisement in one english daily and one in regional language.

(B) Committee:

(i) AMC should prepare a compliance manual and design internal audit systems, before the launch of any schemes.

(ii) The Trustees should constitute an Audit Committee, which will review the internal audit systems and the recommendation of the internal and statutory audit reports and ensure their rectification.

(D) Valuation Committee: The AMC shall constitute an in-house valuation committee consisting of senior executives including personnel from accounts, fund management and compliance departments. The Committee would review the system practice of valuation of securities on a regular basis.

(E) Transactions with Associates: The Trustees shall review all transactions of the Mutual Fund with the associates, on a regular basis.

Trustees with regard to setting up of a Mutual Fund and their eligibility for appointment:

(A) Meaning: Trustees means Board of Trustees or the Trustee Company who hold the property of the Mutual Fund in trust, for the benefit of the unit holders.

(B) Regulations: Mutual Fund shall appoint trustees in accordance with Mutual Fund regulations.

(C) Eligibility Conditions: A person can be appointed as a Trustee, only if he—

(a) is a person of ability, integrity and standing,

(b) Has not been found guilty of moral turpitude, and

(c) Has not been convicted of any economic offence or violation of any securities laws, and

(d) Has furnished the required particulars and information.

(D) Not Eligible for appointment as Trustee:

(a) Asset Management Company

(b) Officers or Employees of AMC

(E) Restriction on Further Appointment: A person who is appointed as a Trustee of a Mutual fund, cannot be appointed as a Trustee of any other Mutual Fund unless —

(a) He is an independent trustee.

(b) Prior approval of the Mutual Fund of which he is a trustee has been obtained for such an appointment.

(F) Independent Trustees: At least 2/3rd of the trustees should be independent persons and shall not be associated with the sponsors or be associated with them in any manner whatsoever.

(G) Company as Trustee: In case a Company is appointed as a Trustee, then its Directors can act as trustees of any other trust, provided that the object of the trust is not in conflict with the object of the Mutual Fund.

Rights and Obligations of the Trustees of a Mutual Fund, with reference to the operations of the Trust and the decisions they can take with reference to a fund:

1) **Agreement:** Trustees and the AMC should enter into an Investment Management Agreement. The Trustees have a right to obtain all information considered necessary from the AMC.

2) **Obligations before Launch of Scheme:** Before the launch of any new scheme, the Trustees should ensure that the AMC has —

   (i) Proper infrastructure for handling the data, records, and to take care of accounting and dealing room requirements.

   (ii) Appointed all key personnel including Fund Manager, and submitted their bio-data with the Trustees, within 45 days of their appointment.

   (iii) Appointed Auditors to audit its accounts.

   (iv) Appointed a Compliance Officer, for compliance with regulatory requirement and to redress investor grievances.

   (v) Appointed registrars and laid down parameters for their supervision.

   (vi) Prepared a Compliance Manual & designed internal control mechanisms including internal audit systems.

   (vii) Specified norms for empanelment of Brokers and Marketing Agents.

3) **Diligence and Integrity of AMC:** Trustees should ensure that the AMC —

   (i) Has been diligent in empanelling the brokers, in monitoring securities transactions with brokers and avoiding undue concentration of business with any brokers.

   (ii) Has not given any undue or unfair advantage to any associates or dealt with any of the associates of the AMC in any manner detrimental to interest of the unit holders.

   (iii) Has entered into transactions in accordance with SEBI regulations and the scheme and the Trust Deed.

   (iv) Has been managing the Mutual Fund Schemes independently of other activities, and have taken adequate steps to ensure that the interest of investors of one scheme are not being compromised with those of any other scheme or of other activities of the AMC.

4) **Intimation to SEBI:** If the Trustees believe that Mutual Fund Scheme is not being conducted in accordance with regulations, they should immediately inform SEBI of the violation and the action taken by them.

5) **Submission of Details:** Each Trustee should file details of his transactions of dealing in securities with the Mutual Fund on a quarterly basis.

6) **Custodian of Assets:** Trustees are accountable for and are the custodian of, the funds and property of the respective schemes.

7) **Calling for Information:** Trustees should call for the details of transactions in securities by the key personnel of the AMC in his own name/on behalf of the AMC & should report to SEBI, as & when required.

8) **Review Activities:** Trustees should review

   (i) **Related Party Transactions:** All transactions carried out between the Mutual Funds, AMC & its associates.

   (ii) **Net Worth:** Net Worth of the AMC and in case of any shortfall, ensure that the AMC make up for the shortfall as per SEBI Regulations.

   (iii) **Service Contracts:** All service contracts such as custody arrangements, transfer agency of the securities and satisfy itself that such contracts are executed in the interest of the unit holders.

   (iv) **Investor Complaints:** Investor complaints received and the redressal of the same.

9) **No Conflict of Interest:** Trustees should ensure that there are no conflict of interest between the manner of deployment of its Net worth by the AMC and the interest of the unit holders.

10) Furnishing of Information to SEBI: Trustees should furnish to the SEBI on a half yearly basis-

(i) **Activity Report:** Report on the activities of the Mutual Fund.

(ii) **Certificate on Transaction by Related Parties**: Certificate stating that the Trustees have satisfied themselves that there have been no instances of self dealing or front running by any of the Trustees, directors and key personnel of the AMC.

(iii) **Certificate on Management of Fund:** Certificate that the AMC has been managing the schemes independently of any other activities, by ensuring that the interest of the unit holders are protected.

11) Consent of Unit holders: The trustees shall obtain the consent of the unit holders when —

(i) Required to do so by the Board in the interest of the unit holders; or

(ii) Required to do so on the requisition made by 3/4ths of the unit holders of any scheme; or

(iii) When the majority of the trustees decide to wind up or prematurely redeem the units; or

(iv) When any change in the fundamental attributes of any scheme or the trust or fees and expenses payable or any other change which would modify the scheme or affect the interest of the unit holders is proposed to be carried out unless the consent of not less than 3/4ths of the unit holders is obtained.

Criteria for appointment of AMC and other conditions to be satisfied by an AMC:

(A) Eligibility Criterion:

(i) Financial Performance:

- Sound Track Record (Net Worth and Profitability), good reputation and fairness in transaction.
- Minimum Net Worth = ₹10 Crores.

(ii) Directors / Key Personnel

- **Qualification and Experience:** Directors of AMC to have adequate professional experience in finance and financial services related field.
- **Clean Records:** Should not have been found guilty of moral turpitude or convicted of any economic offence or violation of any securities laws / economic laws.
- **Previous Employment:** They should not have worked for any AMC / Mutual Fund / Intermediary during the period when such AMC / MF / Intermediary were suspended by SEBI.

(iii) Independent Directors: Board of Directors of AMC to have atleast 50% Independent Directors, i.e. not associated with, the sponsor or any of its subsidiaries or the Trustees.

(iv) Chairman: Chairman of the AMC should not be Trustee of any Mutual Fund.

(B) Other Terms and Conditions: Approval granted shall be subject to the following conditions —

(i) Restriction on Directorship: Director of the AMC shall not be Director in another AMC. Independent Directors are excluded from this restriction.

(ii) Furnishing of Particulars: In case of any material change in the information/ particulars previously furnished, AMC should immediately inform the SEBI.

(iii) Appointment of Directors: Appointment of Director of an AMC will require the prior approval of the Trustees.

(iv) Compliance with Regulations: AMC should comply with SEBI Regulations.

(v) Change in Controlling Interest: Change in controlling interest of the AMC will require the prior approval of Trustees, SEBI and the Unit Holders.

(vi) Furnishing of Documents / Information to Trustees: AMC should furnish information and documents to the Trustees as and when required by the Trustees.

(C) Restriction on Activities of AMC:

(i) Not to be Trustee: AMC should not act as a Trustee of any Mutual Fund.

(ii) Business Activities: Without the approval of SEBI, an AMC cannot undertake any other business activities except :-

- ❖ Portfolio Management Services,
- ❖ Management and advisory services to Offshore Funds, Pension Funds, Provident Funds, Venture Capital Funds, etc.

(iii) Not to Invest in Schemes: AMC should not invest in any of its schemes, unless full disclosure of such intention has been made in the offer document.

Duties and obligations of an AMC with reference to management of Mutual Fund Scheme:

1) Regulations: AMC should ensure that the Scheme Funds are invested only in accordance with SEBI Regulations and the Trust Deed.

2) Investment Decisions: It should take all its investment decisions with care and diligence, in the same manner as any other person in the same business would have taken.

(a) **Liability for Acts of Persons:** AMC is responsible for the acts of commission or omissions by its Employees, or

(b) Persons whose services have been procured by the AMC.

3) Non-Exclusion from Liability: AMC or its Directors or other Officers shall not be absolved of liability to the Mutual Fund for their acts of commission or omission, while holding such position or office.

4) Activity Report to Trustees: AMC should submit a report on its activities and the compliance with the SEBI regulations. Such a report should be furnished every quarter.

5) Related Party Transaction:

(a) AMC should not utilize the services of the — (i) Sponsor, or (ii) any of its Associates, or (iii) Employees or their relatives, for any securities transaction and distribution and sale of securities without proper disclosure.

(b) Report to SEBI/Trustees: Transactions entered into with any of the associates should be reported to SEBI and the Board of Trustees.

(c) Transactions by Key-Management Personnel: AMC should furnish the details of transactions in securities by the key personnel of the AMC in their own name or on behalf of the AMC and shall also report to SEBI, as and when required by SEBI.

6) Large Investor Particulars:

(a) **Situation:** Company has invested more than 5% of the NAV of a Scheme.

(b) **Reportable Information:** Investment made by the Mutual Fund in that Company/ Subsidiaries.

(c) **Reporting and Disclosure:** The above information should be brought to the notice of the Trustees by the AMC, and disclosed in the half yearly and annual accounts of the respective schemes.

7) Personnel Related Information: Detailed bio-data of all its Directors along with their interest in other Companies, within 15 days of their appointment, should be submitted to the Trustees.

8) Restriction on Appointment of Personnel: AMC should not appoint any person as key personnel who has been found guilty of any economic offence or involved in violation of securities laws.

9) Appointment of Registrar/Agents: AMC shall appoint Registrars and Share Transfer Agents who are registered with SEBI.

Regulatory requirements with regard to Money Market Funds and the issues that act as hurdles for the success of Money Market Mutual Funds:

1) Regulatory Framework: Instructions based on recommendations of the Task force constituted under the chairmanship of Shri D. Basu on MMMFs were as follows -

(a) No minimum amount of investments prescribed.

(b) Minimum lock-in-period is 46 days.

(c) Minimum of 25 percent of funds (20 percent earlier) shall be invested in treasury bills and dated Government securities having an unexpired maturity upto one year.

(d) Maximum of 30 percent of funds (20 percent earlier) shall be diverted to call money market.

(e) Investment in Commercial Papers restricted to 15 percent.

(f) Maximum of 20 percent of funds may be invested in commercial transactions and accepted/ co-accepted by banks.

(g) Investments in Capital Market Instruments have been barred so as to avoid undue risks.

(h) Borrowing and Lending between schemes of the Money Market Mutual Funds and between sponsoring bank and the Money Market Mutual Funds are also prohibited. Switching of assets between Schemes will have to be at market rates and based on conscious investment decisions.

2) Regulatory impediments for the success of Money Market Funds:

(a) The Lock-in period hampers the liquidity of the fund. Money Market Fund should ideally operate like a savings account.

(b) Investors expect to get more than what they would get on bank fixed deposits. Considering the administrative expenses involved, the yield on Money Market Funds should be relatively higher.

(c) Retail investors have to be educated about Money Market Funds. A huge network is needed to target such investors.

(d) A large corpus is needed to deal in the money market on a consistent basis.

(e) No regulatory body has been determined.

METHODS FOR EVALUATING THE PERFORMANCE OF MUTUAL FUND:

1) Sharpe Ratio:

(a) Nature: Sharpe Ratio is a composite measure to evaluate the performance of Mutual Funds by comparing the reward to risk ratio of different funds. This formula uses the volatility of portfolio return.

(b) Basis: The reward, i.e. portfolio return in excess of the average risk free rate of return, is divided by standard deviation. Since it considers standard deviation as a measure of risk, it takes into account both Systematic and Unsystematic Risk.

(c) Risk Premium: This measure indicates the risk premium return per unit of total risk. Excess return earned over the risk free return on portfolio to the portfolio's total risk measured by the standard deviation.

(d) Computation:

Sharpe Ratio = $(R_P - R_F) \div \sigma_P$

Where,

P_P = Return on Portfolio

R_F = Risk Free Return

σ_P = Standard Deviation of Portfolio

(e) Use: Sharpe Ratio is an appropriate measure of performance for an overall portfolio when it is compared with another portfolio. The result on its own cannot lead to any comparison. It has to be compared with returns from other portfolio for making any meaningful conclusion.

2) Treynor's Ratio:

(a) Nature: Treynor Ratio is a measure to evaluate the performance of mutual funds by comparing the reward to volatility ratio of different funds. Risk considered here is only Systematic Risk, and not Total Risk.

(b) Assumption: It assumes a completely diversified portfolio, i.e. that the investor would have eliminated all the unsystematic risk by holding a diversified portfolio.

(c) Basis: Excess return earned over the risk free return on portfolio to the portfolio's total risk measured by the Beta of Portfolio. The ratio expresses the portfolio's risk premium per unit of beta.

(d) Computation:

Treynor's Ratio = $(R_P - R_F) \div \beta_P$

Where, R_P = Return on Portfolio

R_F = Risk Free Return

β_P = Beta of Portfolio

(d) Use: It is appropriate only in case of comparison with completely diversified portfolio. As in the case of Sharpe Ratio, Treynor's measure cannot be used in an isolated manner. It should be compared with such results of other portfolio to draw conclusions.

3) Jensen's Alpha:

(a) Nature: It is an absolute measure of evaluating a fund's performance. It compares desired performance (based on benchmark portfolio) with actual performance.

(b) Benchmark Performance: Benchmark Performance is computed using Capital Asset Pricing Model (CAPM), i.e. by factoring the sensitivity of the portfolio return to that the Market Portfolio.

(c) Computation:

Jensen's Alpha [a] = Actual Return Less Return under CAPM

(d) Evaluation and Appropriateness:

- If Jensen's Alpha is positive, it reflects that the Mutual Fund has exceeded the expectations and outperformed the Market Portfolio and vice-versa.
- Alpha would give meaningful results only if its used to compare two portfolios of similar beta factors.
- It is used for measuring performance of a portfolio and to identify the part of the performance that can be attributed solely to the portfolio.
- This model considers only systematic risk and not the total risk.

Different kinds of expenditure incurred by a Mutual Fund and the way to treat them in computing the net asset value:

(A) Initial Issue Expenses: AMC incur some expenses when a scheme is launched. The benefits of these expenses accrue over many years. Therefore, they cannot be charged to any single year. SEBI permits amortization of initial expenses as follows —

i. Close End Scheme: Such schemes floated on a load basis, the initial issue expense shall be amortized on a weekly basis over the period of the scheme.

ii. Open Ended Scheme: Initial issue expenses may be amortized over a period not exceeding 5 years. Issue expenses incurred during the life of an open end scheme cannot be amortized.

(B) Recurring Expenses: It includes the followings :-

(i) Marketing and selling expenses including Agent's Commission.	(i) Cost of fund transfers from location to location.
(ii) Brokerage and Transaction Costs.	(ii) Cost of providing accounts statements and dividend/ redemption cheques and warrants.
(iii) Registrar Services for transfer of units sold or redeemed.	(iii) Insurance Premium paid by the Fund.
(iv) Audit Fees.	(iv) Winding up costs for terminating a fund or a scheme.
(v) Custodian Charges.	(v) Cots of Statutory Advertisements.
(vi) Costs related to investor communication.	(vi) Other costs as approved by SEBI.

(C) Total Expenses: Total Expenses of the scheme as charged by the AMC excluding issue or redemption expenses but including investment management and advisory fees, are subject to the following limits-

(i) On the first ₹100 Crores of the average weekly Net Assets - 1.5%

(ii) On the next ₹300 Crores of the average weekly Net Assets - 2.25%

(iii) On the next ₹300 Crores of the average weekly Net Assets - 2.0%

(iv) On the balance of the assets 1.75%

Value of Traded Securities and Non-Traded Securities of Mutual Fund:

1) Traded Securities:

(a) Last Quoted Closing Price: Traded Securities should be valued at the last quoted closing price on the Stock Exchange.

(b) More than One Stock Exchange: If the securities are traded on more than one Stock Exchange then the valuation should be as per the last quoted closing price on the Stock Exchange where the security is principally traded.

(c) No Trading on Principal Stock Exchange: When on a particular valuation day, a security has not been traded on the selected Stock Exchange, the value at which it is traded on another Stock Exchange may be used.

2) Non-Traded Securities:

(a) Meaning: If a security is not traded on any Stock Exchange for a period of 60 days prior to the valuation date, the scrip must be valued as a non-trade scrip.

(b) Valuation: Non-Traded Scrips should be valued in good faith by the AMC on the basis of valuation methods approved by the AMC.

(c) General Principles in Valuation:

- **Equity Instruments:** Valued on the basis of capitalization of earnings solely or in combination with the Net Asset Value. Price Earning Ratios of comparable traded securities, with an appropriate discount for lower liquidity, should be used for the purpose of capitalization.
- **Debt Instruments:** Valued on YTM (Yield to Maturity) basis. Capitalization factor being determined for comparable traded securities with an appropriate discount for lower liquidity.
- **Government Securities:** Valued at YTM based on the prevailing market rate.
- **Money Market Instruments:** Valued at Cost Plus Accruals.
- **Convertible Debentures/Bonds:** Non-convertible component should be valued as a debt Instrument, and Convertibles as any Equity Instrument.

Computation of the Time Weighted and Rupee Weighted Rate of Return:

1) Total Return (Investors' Perspective):

Total Return= Distributions + Capital Appreciation NAV at the beginning of the period

Where, Distributions = Dividend Distribution or Capital Distribution Capital Appreciation = Closing NAV Less Opening NAV

2) Time Weighted Rate of Return (TWROR):

(a) It is the rate of return earned per rupee invested over a period of time. It eliminates the effect of additional cash flows and the return on such cash flows.

(b) It seeks to measure the rate of return earned per rupee invested in the fund over a period of time, had there been no withdrawals from or further investments to that rupee.

3) Rupee Weighted Rate of Return (RWROR):

(a) This method seeks to measure the internal rate of return based on absolute movements in cash with reference to the Mutual Fund. The Fund Value at the beginning of the year is equated to investment and the dividend distribution and the year end fund value are equated to cash flows received.

(b) **Factors:** Factors affecting the RWROR are —

- Beginning and ending market values.
- Timing of the net contributions to the fund.

ILLUSTRATIONS

Computation of Net Asset Value (NAV)

Illustration1.

The following particulars relates to Gilt Fund Scheme :-

	Particulars	Value
1.	Investment in Shares (at Cost)	₹ in crore
	• IT and ITES Companies	28
	• Infrastructure Companies	15
	• Aviation, Transport and Logistics	7
	• Automotive	32
	• Banking / Financial Services	8
2.	Cash and Other Assets in Hand (even throughout the fund period)	2
3.	Investment in Fixed Income Bearing Bonds	
	• Listed Bonds [10,000 10.50% Bonds of ₹1 0,000 each]	10
	• Unlisted Bonds	8
4	Expenses payable as on closure date	3
5	Market Expectation on Listed Bonds	8.40%
6	No. of Units Outstanding	5.50

The particulars relating to sectoral index are as follows —

Sector	Index on the date of purchase	Index on the valuation date
IT and ITES	1750	2950
Infrastructure	1375	2475
Aviation, Transport & Logistics	1540	2570
Automotive	1760	2860
Banking / Financial	1600	2300

Required :-

- Net Asset Value of the Fund
- Net Asset Value per Unit
- If the period under consideration is 2 Years, and the Fund has distributed ₹2 per unit per year as Cash Dividend
- Ascertain the Net Return (Annualized). Ascertain the Expense Ratio, if the Fund has incurred the following expenses —

₹ in Lakhs

Management and Advisory Fees	275
Administration Expenses (including Fund Manager Remuneration)	350
Publicity and Documentation	80
	705

Solution:

1. Net Asset Value of the Fund

Particulars	₹ in Crore
1. Market Value of Shares in —	
(a) IT and ITES [Cost ₹28 X Closing Sector Index 2950 ÷ Opening Sector Index 1750]	47.20
(b) Infrastructure[Cost ₹15 X Closing Sector Index 2475 ÷ Opening Sector Index 1375]	27.00
(c) Aviation [Cost ₹7 X Closing Sector Index 2570 ÷ Opening Sector Index 1540]	11.68
(d) Automotive [Cost ₹32 X Closing Sector Index 2860 ÷ Opening Sector Index 1760]	52.00
(e) Banking [Cost ₹8 X Closing Sector Index 2300 ÷ Opening Sector Index 1600]	11.50
2. Market Value of Investment in Listed Bonds [Face Value ₹10 Crores X Interest on Face Value 10.50% ÷ Market Expectation 8.40%]	12.50
3. Cost of Investment in Unlisted Bonds	8.00
4. Cash and Other Assets	2.00
Total Assets of the Fund	171.88
Less: Outstanding Expenses	(3.00)
Net Asset Value of the Fund	168.88

Note: It is assumed that Cash and other Assets existed from the beginning of the period at the same values.

2. Net Asset Value per Unit

NAV per Unit = Net Asset Value of the Fund ÷ No. of Units Outstanding = ₹168.88 Crores ÷ 5.50 Crore Units = ₹30.71

3. Annualized Return on Fund

(a) Computation of Opening NAV

	Particulars	₹ in Crore
1.	Investment in Shares (at Cost)	
	• IT and ITES Companies	28.00
	• Infrastructure Companies	15.00
	• Aviation, Transport and Logistics	7.00
	• Automotive	32.00
	• Banking /Financial Services	8.00
2.	Investment in Fixed Income Bearing Bonds	
	• Listed Bonds [10,000 10.50% Bonds of ₹10,000 each]	10.00
	• Unlisted Bonds	8.00
Net Asset Value		108.00

Note: Cash and Other Assets are not included because they arise out of investments made in the beginning.

(b) Computation of Opening NAV per Unit

NAV per Unit = Net Asset Value of the Fund ÷ No. of Units Outstanding = ₹108.00 Crores ÷ 5.50 Crore Units = ₹19.64

(c) Computation of Returns per Unit

- Capital Appreciation = Closing NAV per Unit - Opening NAV per Unit

= ₹30.71 Less ₹19.64 = ₹11.07

- Cash Dividend = ₹2 X 2 Years = ₹4

- Returns = [Cash Dividend + Capital Appreciation] ÷ Opening NAV

  = [₹4.00 + ₹11.07] ÷ ₹19.64 = ₹15.07 ÷ ₹19.64 = 77%

- Return p.a = Total Return/Period = 77% ÷ 2 Years = 38.50%

4. Expense Ratio

(a) Total Expense = Management Advisory Fee ₹2.75 Cr. + Administration Exp. ₹3.50 Cr. + Publicity and Documentation ₹0.80 Cr. = ₹7.05 Crores

(b) Average Value of Portfolio

= (Opening Net Asset Value + Closing Net Asset Value) ÷ 2

= (₹108 Crores + ₹168.88 Crores) ÷ 2 = ₹276.88 Crores ÷ 2

= ₹138.44 Crores

(c) Expense Ratio = Total Expenses ÷ Average Value of Portfolio

= (₹7.05 Crores ÷ ₹138.44 Crores) × 100

= 5.09%

(d) Expense Per Unit = Total Expenses ÷ No. of Units = ₹7.05 Crores ÷ 5.50 Crores = ₹1.282

Illustration 2.

Find out NAV per unit from the following information of Scheme Money Plant

Name of the scheme	Money Plant
Size of the scheme	₹ 100 Lakhs
Face value of the shares	₹100
Number of the outstanding shares	1 Lakhs
Market value of the fund's investments	₹180 Lakhs
Receivables	₹2 Lakhs
Liabilities	₹1 Lakh

Solution:

Particulars	Amount
Total Assets	Market Value of Fund's Investments+ Receivables = ₹180 Lakhs + ₹ 2 Lakhs = ₹182 Lakhs
Liabilities	₹ 1 Lakhs
No. of shares	1 Lakhs
Net Asset Value	(Total Assets – Liabilities) / No. of shares = ₹ (182 – 1) Lakhs/ 1 Lakhs = ₹ 181.00 Lakhs

Illustration 3.

A Mutual Fund made an issue of 10,00,000 units of ₹10 each on 01.01.2012. No entry load was charged. It made the following investments:

Particulars	₹
50,000 Equity Shares of ₹100 each @ ₹160	80,00,000
7% Government Securities	8,00,000
9% Debentures (Unlisted)	5,00,000
10% Debentures (Listed)	5,00,000
Total	98,00,000

During the year, dividends of ₹12,00,000 were received on equity shares. Interest on all types of debt securities was received as and when due. At the end of the year equity shares and 10% debentures are quoted at 175% and 90% respectively. Other investments are quoted at par.

Find out the Net Asset Value (NAV) per unit given that the operating expenses during the year amounted to ₹5,00,000. Also find out the NAV, if the Mutual Fund had distributed a dividend of ₹0.90 per unit during the year to the unit holders.

Solution:

Given the Total Initial Investments is ₹98,00,000, out of issue proceeds of ₹1,00,00,000. Therefore the balance of ₹2,00,000 is considered as Issue Expenses.

Computation of Closing Net Asset Value

Particulars	Opening Value of Investments (₹)	Capital Appreciation (₹)	Closing Value of Investments (₹)	Income (₹)
Equity Shares	80,00,000	7,50,000	87,50,000	12,00,000
7% Govt. Securities	8,00,000	Nil	8,00,000	56,000
9% Debentures (unlisted)	5,00,000	Nil	5,00,000	45,000
10% Debentures (Listed)	5,00,000	-50,000	4,50,000	50,000
Total	98,00,000	7,00,000	1,05,00,000	13,51,000
Less: Operating Expenses during the period				(5,00,000)
Net Income				8,51,000
Net Fund Balance = ₹ (1,05,00,000 + 8,51,000)				1,13,51,000
Less: Dividend = ₹ 9,00,000 (10,00,000 × 0.90)				(9,00,000)
Net Fund Balance (after Dividend)				1,04,51,000
Net Asset Value (Before Considering Dividends) = ₹ 1,13,51,000 ÷10,00,000				11.351
Net Asset Value (After Dividends) = ₹ 1,04,51,000 ÷ 10,00,000				10.45

Note: It has been assumed that the Closing Market Price of the investments have been quoted at a percentage of the Face Value.

Computation of Annualised Return

Illustration 4.

A Good luck Mutual Fund that had a Net Asset Value of ₹17 at the beginning of a month, made income and capital gain distribution of ₹0.04 and ₹0.03 respectively per unit during the month, and then ended the month with a Net Asset Value of ₹17.08. Calculate monthly and annual rate of return.

Solution:

Particulars	Amount (₹)
Opening NAV	17.00
Closing NAV	17.08
Capital Appreciation = Closing NAV- Opening NAV = 17.08 - 17.00	0.08
Dividend Distribution	0.04
Capital Gain Distribution	0.03
Total Return for the period = Capital Appreciation + Income + Capital Gains = ₹ (0.08 + 0.04 + 0.03)	0.15
Monthly Return = Total Return ÷ Opening NAV = ₹0.15 ÷ ₹17	0.8824% p.m.
Annual Return = Monthly Return × 12 = 0.8824 × 12	10.59% p.a.

Computation of Annualised Return

Illustration 5.

Ram invested in a Mutual Fund when the Net Asset Value was ₹12.65. 60 Days later the Asset Value per unit of the fund was ₹12.25. In the meantime, Ram had received a cash dividend of ₹0.50 and a Capital Gain distribution of ₹0.30. Compute the monthly return.

Solution:

(a) Dividend = ₹ 0.50

(b) Capital Gain Distribution = ₹ 0.30

(c) Capital Appreciation = (₹ 0.40) (Closing NAV ₹12.25 Less Opening NAV ₹12.65)

(d) Returns = [Dividend + Capital Gain Distribution + Capital Appreciation] ÷ Opening NAV

= [₹ 0.50 + ₹ 0.30 – ₹ 0.40] ÷ ₹12.65

= ₹0.40 ÷ ₹12.65= 3.16%

(e) Annualized Return = Return x 365 ÷ Period

= 3.16% X 365 Days ÷ 60 Days = 19.22% p.a

(f) Monthly Return = 19.22% ÷12 = 1.60% per month

Net Asset Value of Mutual Fund

Illustration 6.

Mr. Arun on 1.7.2009, during the initial offer of some Mutual Fund invested in 10,000 units having face value of ₹10 for each unit. On 31.3.2010 the dividend operated by the M.F. was 10% and Mr. Arun found that his annualized yield was 153.33%.0n 31.12.2011, 20% dividend was given. On 31.3.2012 Mr. Arun redeemed all his balance of 11,296.11 units when his annualized yield was 73.52%. What are the NAVs as on 31.3.2010, 31.12.2011 and 31.3.2012.

Solution:

1. NAV as at 31.03.2010

Particulars	₹
Annualised Yield Yield for 9 months [From 1.7.2009 till 31.03.2010] [153.33% X 9 ÷ 12]	153.33% 115%
Return for 9 Months [Investment ₹1,00,000 X 115%] Less: Dividends at 10% of Opening Value [10,000 Units X ₹10 X 10%]	₹ 1,15,000 (₹10,000)
Net Capital Appreciation	₹1,05,000
Closing NAV (Investment ₹1,00,000 + Capital Appreciation ₹1,05,000) No. of Units Outstanding NAV per Unit	₹2,05,000 10,000 ₹20.50
Dividends are Reinvested at ₹20.50. Therefore, Additional Units purchased as at 31.03.2010 [Dividends ₹10,000 ÷ NAV p.u. ₹20.50) Total No. of Units as at 31.03.2010 (after reinvestment of dividend)	487.80 10,487.80

2. NAV as at 31.12.2011

Particulars	₹
Units Outstanding as at 31.12.2011	10,487.80
Face Value at ₹10 (10,487.80 Units X ₹10 p.u.)	₹1,04,878
Dividend distributed at 20% (₹1,04,878 X 20%)	₹20,975.6
No. of Units as at 31.03.2012 (Given) Less: No. of Units as at 31.12.2011	11,296.11 10,487.80
No. of Units issued against reinvestment of dividend	808.31
Dividends will be reissued at the NAV as at 31.12.2011. Therefore, NAV = Dividends ÷ No. of Units reissued = ₹20,975.60 ÷ 808.31 Units =	₹25.95

3. NAV as at 31.03.2012

Particulars	₹
Annualized Yield as on 31.03.2012 Yield for 33 months [From 1.7.2009 till 31.03.2012] [73.52% × 33 ÷ 12]	73.52% 202.18
Return for 33 Months [Investment ₹1,00,000 X 202.18%]	₹2,02,180
Add: Opening Investment	₹1,00,000
Closing Fund Value (Dividends need not be excluded, since they are reinvested)	₹3,02,180
No. of Units Outstanding as at 31.03.2012 NAV per Unit (₹3,02,180 ÷ 11,296.11 Units)	11,296.11 ₹26.75

RETURN ON MUTUAL FUND

Illustration 7.

In case of an open ended Mutual Fund scheme the market price (ex-dividend) was ₹65. A dividend of ₹14 has just been paid and ex-divided price now is ₹81 what return has been earned over the past year.

Solution:

(a) Capital Appreciation = Closing NAV p.u. - Opening NAV p.u
= ₹81 - ₹65 = ₹16

(b) Returns = [Cash Dividend + Capital Appreciation + Capital Gains] ÷ Opening NAV
= ₹(14 +16) / ₹65 = 46.15 %

Return on Mutual Fund

Illustration 8.

(a) A mutual fund had a Net Asset Value (NAV) of ₹62 at the beginning of the year. During the year a sum of ₹5 was distributed as dividend besides ₹3 as capital gains distribution. At the end of the year NAV was ₹70. Calculate total return for the year.

(b) Suppose the aforesaid mutual fund in the next year gives a dividend of ₹5 and no capital gains distribution and NAV at the end of second year is ₹65. What is the return for the second year?

Solution:

Basic Data for Computation of Total Return

Particulars	Amount (₹)	
	Case (a)	Case (b)
Opening NAV	62	70
Dividend	5	5
Capital Gains	3	0
Closing NAV	70	65

Computation of Return

	Case (a)	Case(b)
Capital Appreciation = Closing NAV p.u. Less Opening NAV p.u.	70- 62 = ₹8	65 - 70 = (₹5)
Returns = [Cash Dividend + Capital Appreciation + Capital Gains] ÷ Opening NAV	= [5.00+ 8.00+3.00] ÷ ₹62 = 16.00 ÷ 62.00 = 25.81%	= [(65-70) +5+0] ÷ 70 = 0

Effective Yield

Illustration 9.

A has invested in three mutual fund schemes as per details below:

	MF 1	MF 2	MF 3
Date of investment	01.12.2012	01.01.2013	01.03.2013
Amount of investment	₹50,000	₹1, 00,000	₹50,000
Net Asset Value (NAV) at entry date	₹10.50	₹10	₹10
Dividend received upto 31.03.2013	₹970	₹1,520	Nil
NAV as at 31.03.2013	₹10.40	₹10.10	₹9.80

What is the effective yield on per annum basis in respect of each of the three schemes to A upto 31.03.2013?

Solution:

1. Computation of Net Value Added during the year ended 31.03.2013

Schemes	Amount Invested (₹)	NAV as at entry date	No. of Units	NAV as at 31.03.2013 (₹)	Total NAV 31.03.2013 (₹)	Net NAV (₹)
[1]	[2]	[3]	[4] = [2] ÷[3]	[5]	[6] = [4]X[5]	[7] = [2]-[6]
MF 1	50,000	₹10.50	4761.905	10.40	49,523.812	(-)476.188
MF 2	1,00,000	₹10	10,000	10.10	1,01,000	(+)1,000
MF 3	50,000	₹10	5,000	9.80	49,000	(-) 1,000

2. Effective Yield in %

- Total Yield = Net NAV + Dividend
- Effective Yield in % = (Total Yield ÷ Amount Invested) × (365 ÷ No. of days of holding) × 100

Schemes	Dividend Received (₹)	Total Yield	No. of days	Effective yield % p.a
MF 1	970	493.812	121	2.98%
MF 2	1,520	2,520	90	10.22%
MF 3	—	(-) 1,000	31	(23.55)%

MUTUAL FUND AND EQUITY RETURN — INDIFFERENCE

Illustration 10.

Mr. Kiran can earn a return of 16 per cent by investing in equity shares on his own. Now he is considering a recently announced equity based mutual fund scheme in which initial expenses are 5.7 per cent and annual recurring expenses are 1.7 per cent. How much should the mutual fund earn to provide Mr. Kiran a return of 16 per cent?

Solution:

Let the Return on Mutual Funds be ₹ X

Investor's Expectation denotes the Return from the amount invested.

$$\text{Returns from Mutual Funds} = \frac{\text{Investors' Expectation}}{\text{100–Issue Expenses}} + \text{Annual Recurring Expenses}$$

$$X = \frac{16}{(100 - 5.7)\%} + 1.7 = 16.96 + 1.7 = 18.67\%$$

Return that the Mutual Fund should earn so as to provide a return of 16% = 18.67%

Monthly Return - Mutual Fund

Illustration 11.

A mutual fund that had a net asset value of ₹30 at the beginning of month and made income and capital gain distribution of ₹0.0375 and ₹ 0.03 per share respectively during the month, and then ended the month with a net asset value of ₹30.06. Calculate monthly return.

Solution:

Particulars	Amount (₹)
Opening NAV	30
Closing NAV	30.06
Capital Appreciation = Closing NAV - Opening NAV = 30.06 - 30.00	0.06
Capital Gain Distribution	0.03
Income during the period	0.0375
Total Return for the period Capital Appreciation + Income + Capital Gains = 0.06 + 0.0375 + 0.03	0.1275
Monthly Return =Total Return ÷ Opening NAV = 0.1275 ÷ 30	0.00425 / 0.425% p.m.
Annual Return = Monthly Return X 12 = 0.425 X 12	5.1% p.a.

RETURN — ANNUALIZED RETURN

Illustration 12.

From the following data relating to investment made by a Company for the past 5 years, ascertain the expected return for the 6th year —

Years	1	2	3	4	5
Closing Market Price (₹)	50.00	64.00	85.00	100.00	125.00
Dividend Yield (₹)	4.00	8.00	10.00	15.00	15.00

Opening Market Price in Year 1 was ₹45. Also ascertain the Compounded Annual Growth Rate. What would be the Capital Annual Growth Rate if there were no dividend payouts at all?

Solution:

1. Computation of Total Return and Return %

Year	Opening Price (₹)	Closing Price (₹)	Dividend (₹)	Capital Appreciation (₹)	Total Return (₹)	Return %
1	**2**	**3**	**4**	**5 = 3-2**	**6 = 4 + 5**	**7 = 6÷2**
1	45.00	50.00	4.00	5.00	9.00	20.00%
2	50.00	64.00	8.00	14.00	22.00	44.00%
3	64.00	85.00	10.00	21.00	31.00	48.44%
4	85.00	100.00	15.00	15.00	30.00	35.29%
5	100.00	125.00	15.00	25.00	40.00	40.00%
			52.00	**80.00**	**132.00**	

Expected Return = Average Return

= (20.00% + 44.00% + 48.44% + 35.29% + 40.00%) ÷ 5 = 187.73 ÷ 5 = 37.55%

2. Computation of Compounded Annual Growth Rate (CAGR)

$$= \sqrt{\frac{\text{Total Return + Initial Investment}}{\text{Initial Investment}}} - 1 \text{ [Inverse of Compound Interest Formula]}$$

Or = [(Total Return + Initial Investment) ÷ Initial Investment]$^{1/n}$ – 1

Where, "n" represents the period of holding.

(a) CAGR with Dividend Payouts:	**(b) CAGR without Dividend Payouts:**
= [(Total Return + Initial Investment) ÷ Initial Investment]$^{1/n}$-1	= [(Capital Appreciation Return + Initial Investment)÷ Initial Investment]$^{1/n}$ - 1
=[(₹132+ ₹45)/₹45]$^{1/5}$- 1	= [(₹80 + ₹45) / ₹45]$^{1/5}$–1
=3.933$^{1/5}$-1=1.3151-1= 0.3151 or 31.51	= 2.778$^{1/5}$-1=1. 2267-1= 0.2267 or 22.67

Annual Recurring Expenses of a Mutual Fund

Illustration 13.

You can earn a return of 13 percent by investing in equity shares on your own. You are considering a recently announced equity mutual fund scheme where the initial issue expense is 7 percent. You believe that the mutual fund scheme will earn 16.5 percent. At what recurring expenses (in percentage terms) will you be indifferent between investing on your own and investing through the mutual fund.

Solution:

Let the annual Recurring expenses be ₹X

$$\text{Returns from Mutual funds} = \frac{\text{Investors' Expectation}}{100 - \text{Issue Expenses}} + \text{Annual recurring expenses}$$

$$16.5\% = \frac{13}{(100 - 7)\%} + X$$

16.5% = 13.97 + X

X = 16.5 – 13.97 = 2.53%

Therefore, the Amount of Recurring Expenses for which the return will be indifferent is 2.53%.

Distribution / Reinvestment of Mutual Fund Returns

Illustration 14.

A Mutual Fund having 200 units has shown in NAV of ₹8.75 and ₹9.45 at the beginning and at the end of the year respectively.

The Mutual Fund has given two options:

(a) Pay ₹0.75 per unit as dividend and ₹0.60 per unit as a capital gain, or

(b) These distributions are to be reinvested at an average NAV of ₹8.65 per unit.

What difference it would make in terms of return available and which option is preferable?

Solution:

Basic Data for Computation

Particulars	Value (₹)
Opening NAV	8.75
Closing NAV	9.45
Dividend	0.75
Capital Gain Appreciation [Closing NAV - Opening NAV]	0.70
Capital Gain Distribution	0.60
Price Paid at the year beginning [200 units X ₹8.75]	1,750

Option 1: Returns are distributed to Mutual Fund Holders

(a) Preparation of Fund Balance Sheet

Liabilities	₹	Assets	₹
NAV on Closing Date	1,890	Fund Assets	2,160
Dividend Payable	150		
Capital Gain Distribution	120		
Total	2,160	Total	2,160

- NAV on Closing Date = [9.45 × 200]
- Dividend Payable = [0.75 × 200]
- Capital Gain Distribution = [0.60 × 200]

(b) $\text{Returns} = \left[\frac{\text{Closing Fund Assets} - \text{Opening Asset Value}}{\text{Opening Asset Value}}\right]$

$= \frac{2,160 - 1,750}{1,750}$

$= 23.43\%$

Option 2: The Distributions are reinvested at an average NAV of ₹8.65 per unit

(a) Distributions Reinvested

Particulars	₹
Capital Gain [0.60x200]	120
Dividend [0.75X200]	150
Total Distributions	270
No. of Units [Total Distributions ÷ Average NAV p.u. = 270 ÷ 8.65]	31.21 units

(b) Preparation of Fund Balance Sheet after Reinvestment

Liabilities	₹	Assets	₹
NAV on Closing Date	2,160	Fund Assets	2,160
Total	2,160	Total	2,160

- NAV on Closing Date = [9.45 × 200] + [8.65 × 31.21] = ₹ 2,160

(c) Returns

$$\text{Opening NAV} = \left[\frac{\text{Closing Fund Assets} - \text{Opening Asset Value}}{\text{Opening Asset Value}}\right]$$

$$= \frac{2,160 - 1,750}{1,750}$$

= 23.43%

Conclusion:

Holding period return is the same from Investor's view point irrespective of whether the return is reinvested or distributed in the form of Capital Gains or Dividends.

Computation of Sharpe Ratio – Risk Premium Approach

Illustration 15.

Chintamani Fund, a fund which invests exclusively in Public Sector Undertakings, yielded ₹3.75 per Unit for the year. The opening NAV was ₹21.20. Chintamani Fund has a risk factor of 3.50%.

Ascertain the Sharpe Ratio and evaluate the funds performance in juxtaposition with performance of the Sensex if —

(a) Risk Free Return is 5%, Return on Sensex is 15% with a standard deviation of 2.75%.

(b) Risk Free Return is 4%, Return on Sensex is 17% with a standard deviation of 3%.

(c) Risk Free Return is 7%, Return on Sensex is 18% with a standard deviation of 4%.

Solution:

1. Formula for Computing Sharpe Ratio.

Sharpe Ratio = $(R_P - R_F) \div \sigma_p$

Where, R_P= Return on portfolio

R_F= Risk Free Return

$\sigma_{P=}$ Standard Deviation of Portfolio

Particulars	Case A	Case B	Case C
Risk Free Return [R_F]	5%	4%	7%
Market Return [R_M]	15%	17%	18%
Standard Deviation of Market Return [σ_M]	2.75%	3.00%	4.00%
Sharpe Ratio for Chintamani Fund [$(R_P-R_F) \div \sigma_p$] [A]	3.63 [(17.69% - 5%)÷ 3.50%]	3.91 [(17.69% -4%) ÷ 3.50%]	3.05 [(17.69% -7%) ÷ 3.50%]
Sharpe Ratio for Market Return [$(R_M-R_F)- \sigma_M$] [B]	3.64 [(15% - 5%) ÷ 2.75%]	4.33 [(17%-4%) ÷ 3%]	2.75 [(18% -7%) ÷ 4%]
Sharpe Ratio is Higher for	Market Return	Market Return	Chintamani Fund
Inference / Evaluation	Market has outperformed Chintamani Fund's performance.	Market has outperformed Chintamani Fund's performance.	Chintamani Fund has outperformed Market's performance.

Note: Return on Chintamani Fund = Yield ₹ 3.75 ÷ Opening NAV ₹ 21.20 = 17.69%

Computation of Sharpe Ratio - Risk Premium Approach

Illustration16.

Soma Funds has a fund named "F3 Fund" (F3F), a fund which invests in 3 different funds— Fund X, Fund Y and Fund Z and the particulars of the Funds are -

Fund	Value Invested ₹	Return	Standard Deviation
X	2.5 Crores	15.50%	3.20%
Y	6.0 Crores	19.20%	4.50%
Z	1.5 Crores	12.80%	1.50%

Correlation between the Funds are as follows — XY 0.30; XZ 0.50; YZ 0.20

If the Risk Free Return is 5% and the return on Nifty is 17% with a standard deviation of 3%, ascertain the Sharpe's Index for F3F and evaluate its performance.

Solution:

1. Computation of Standard Deviation of F3F

(a) Basic Values of Factors for Determination of Portfolio Risk

Variance of Security X	σX^2	3.20^2 = **10.24**
Variance of Security Y	σY^2	4.50^2 = **20.25**
Variance of Security Z	σZ^2	1.50^2 = **2.25**
Covariance of Securities X and Y [ρ XY × σX × σY]	Cov_{XY}	0.30 × 3.20 × 4.50 = **4.32**
Covariance of Securities X and Z [ρ XZ × σX × σZ]	Cov_{XZ}	0.50 × 3.20 × 1.50 = **2.40**
Covariance of Securities Y and Z [ρ YZ × σY × σZ]	Cov_{YZ}	0.20 × 4.50 × 1.50 = **1.35**
Weight of Security X	W_x	₹2.5 Crore ÷ ₹10.0 Crore = **0.25**
Weight of Security Y	W_y	₹6.0 Crore ÷ ₹10.0 Crore = **0.60**
Weight of Security Z	W_z	₹1.5 Crore ÷ ₹10.0 Crore = **0.15**

(b) Matrix

Securities		X	Y	Z
	Weights	0.25 W_X	0.60 W_Y	0.15 W_Z
X	0.25 W_X	10.24 (σx^2)	4.32 (Cov_{xy})	2.40 (Cov_{xz})
Y	0.60 W_Y	4.32 (COV_{xy})	20.25 (σy^2)	1.35 (Cov_{yz})
Z	0.15 W_Z	2.40 (Cov_{xz})	1.35 (Cov_{yz})	2.25 (σz^2)

(b) Computation of Portfolio Variance (σXYZ^2)

	Description	Computation (W × W × Cov) or (W × W × σ^2)	Product
1	$W_x \times W_y \times \sigma x^2$	0.25 × 0.25 × 10.24	0.640
2	$W_x \times W_y \times Cov_{xy}$	0.25 × 0.60 × 4.32	0.648

3	$W_x \times W_z \times Cov_{xz}$	0.25 × 0.15 × 2.40	0.090
4	$W_y \times W_x \times Cov_{xy}$	0.60 × 0.25 × 4.32	0.648
5	$W_y \times W_y \times \sigma y^2$	0.60 × 0.60 × 20.25	7.290
6	$W_y \times W_z \times Cov_{yz}$	0.60 × 0.15 × 1.35	0.1215
7	$W_z \times W_x \times Cov_{xz}$	0.15 × 0.25 × 2.40	0.090
8	$W_z \times W_y \times Cov_{yz}$	0.15 × 0.60 × 1.35	0.1215
9	$W_z \times W_z \times \sigma z^2$	0.15 × 0.15 × 2.25	0.051
	Variance of the Portfolio (σxyz^2)		**9.70**
	Standard Deviation (Risk) of the Portfolio (σxyz) ie. F3F		**3.11%**

2. Return on F3F

Return on F3F = Weighted Average Return of Fund X Fund Y and Fund Z

= [0.25 x 15.50%] + [0.60 x 19.20%] + [0.15 x 12.80%]

= 3.875% + 11.52% + 1.92%

= **17.315%**

3. Computation of Sharpe Ratio for F3F and Evaluation

Sharpe Ratio =$(R_P-R_f) \div \sigma_P$

Where, R_P = Return on Portfolio

R_F = Risk Free Return

σ_P = Standard Deviation of Portfolio

Particulars	F3F	Market
Risk Free Return [R_F]	5%	5%
Return [R_P]	17.315%	17%
Standard Deviation of Market Return [σ_P]	3.11%	3%
Sharpe Ratio [$(R_P - R_F) \div \sigma_P$]	3.96 [(17.315% – 5%) ÷ 3.11%]	4.00 [(17% – 5%) ÷ 3%]
Sharpe Ratio is Higher for	Market Return	
Inference / Evaluation	Market has marginally outperformed F3F's performance.	

Evaluation of Fund Performance — Treynor Model

Illustration 17.

Four friends S, T, U, and V have invested equivalent amount of money in four different funds in tune with their attitude to risk, S prefers to play aggressive and is keen on equity-funds, T is moderately aggressive with a desire to invest upto 50% of his funds in Equity, whereas U does not invest anything beyond 20% in Equity. V, however, relies more on movement of market, and prefers any fund which replicates the market portfolio.

Their investment particulars, returns therefrom and Beta of the fund are given below —

Fund Invested	Return for the year	Beta Factor
Money Multiplier Fund (100% Equity)	23.50%	1.80
Balanced Growth Fund (50% Equity - 50% Debt)	16.50%	1.25
Safe Money Fund (20% Equity and 80% Debt Funds)	12.50%	0.60

If the Market Return was 16% and the Risk Free Return is measured at 7%, which of the four friends were rewarded better per unit of risk taken?

Solution:

Particulars	S	T	U	V
Risk Free Return [R_F]	7%	7%	7%	7%
Fund Invested	Money Multiplier Fund	Balanced Growth Fund	Safe Money Fund	Market Portfolio
Beta of the Portfolio [β_P]	1.80	1.25	0.60	1.00
Return on Portfolio [R_P]	23.50%	16.50%	12.50%	16.00%
Treynor Measure [$(R_P-R_F) \div \beta_P$]	9.17 [23.50–7] ÷1.80	7.60 [16.50–7] ÷ 1.25	9.17 [12.50–7] ÷ 0.60	9.00 [16–7] ÷ 1
Ranking	1	3	1	2

Evaluation: Both S and U have earned the same Reward per unit of risk taken, which is more than the Market Reward to Risk of 9.00.

Six Portfolios experienced the following results during a 7-year period:

Illustration 18.

Portfolio	Average annual return	Standard Deviation	Correlation with market
P	18.6	27.0	0.81
Q	14.8	18.0	0.65
R	15.1	8.0	0.98
S	22.0	21.2	0.75
T	-9.0	4.0	0.45
U	26.5	19.3	0.63
Market Risk	12.0	12.0	
Free Rate	9.0		

(a)

Rank these Portfolios using —

- Sharpe's method, and
- Treynor's Method.

(b) Compare the ranking in part (a) and explain the reasons behind the differences.

Solution:

Portfolio	Sharpe's Method [$(R_P– R_F) \div \sigma_P$]	Ranking on Sharpe	$\beta = \rho_{sm} \times \frac{\sigma_s}{\sigma_m}$	Treynor Method [$(R_P– R_F) \div \beta_P$]	Ranking on Treynor
P	0.3555 [(18.6 – 9) ÷ 27]	4	1.823 [27×0.81÷12]	5.266 [(18.6-9)÷1.823]	5
Q	0.3222 [(14.8 – 9)÷ 18]	5	0.975 [18×0.65÷12]	5.95 [(14.8-9)÷0.975]	4
R	0.7625 [(15.1 – 9) ÷ 8]	2	0.653 [8×0.98÷12]	9.342 [(15.1-9)÷0.653]	3
S	0.6132 [(22 – 9) ÷ 21.2]	3	1.325 [21.2×0.75÷12]	9.811 [(22-9)÷1.325]	2
T	– 4.5 [(– 9 – 9) ÷ 4]	6	0.15 [4×0.45÷12]	-120 [(-9-9)÷0.15]	6
U	0.9067 [(26.5 – 9) ÷ 19.3]	1	1.013 [19.3×0.63÷12]	17.27 [(26.5-9)÷1.013]	1

Reasons for Difference between Sharpe and Treynor's method:

(a) Sharpe Index considers only the Standard Deviation and leaves market Standard Deviation and the Correlation whereas Treynor considers market Standard Deviation and Correlation.

(b) Greater correlation result in greater value of Beta. This would reduce the points in Treynor.

(c) Portfolio R which is ranked '2' in Sharpe is pushed a position back in Treynor owing to the correlation effect. Also evident in Portfolio P and Q.

Illustration 19.

Following information is available regarding four mutual funds:

Mutual Fund	Return	Risk σ	β (Beta)	Risk free rate
P	13	16	0.90	10
Q	17	23	0.86	10
R	23	39	1.20	10
S	15	25	1.38	10

Evaluate performance of these mutual funds using Sharp Ratio and Treynor's Ratio. Comment on the evaluation after ranking the funds.

Solution:

Mutual Fund	Under Sharpe's Method $[(R_P-R_F) \div \sigma_P]$	Ranking	Under Treynor Method $[(R_P-R_F) \div \beta_P]$	Ranking
P	[(13-10) ÷ 16] = 0.19	4	[(13-10) ÷ 0.90] = 3.33	4
Q	[(17-10) ÷ 23] = 0.31	2	[(17-10) ÷ 0.86] = 8.14	2
R	[(23-10) ÷ 39] = 0.33	1	[(23-10) ÷ 1.20] = 10.83	1
S	[(15-10) ÷ 25] = 0.2	3	[(15-10) ÷ 1.38] = 3.63	3

Inference: Ranks obtained as per Sharpe Ratio as well as Treynor's Ratio is same. This indicates that all the mutual funds seem to be reasonably well diversified.

Reward to Variability / Volatility Ratio

Illustration 20.

The following are the data on Five mutual funds—

Fund	Return	Standard deviation	Beta
Raksha	16	8	1.50
Varsha	12	6	0.98
Vredhi	14	5	1.40
Mitra	18	10	0.75
Laheri	15	7	1.25

What is the reward-to-variability / volatility ratio and the ranking if the risk - free rate is 6 %?

Solution:

Formula for computing Reward-to-Volatility/Volatility Ratio is —

- Treynor's Ratio = $[(R_P - R_F) \div \beta_P]$

Formula for computing reward-to-variability is

- Sharpe's Measure = $[(R_P - R_F) \div \sigma_P]$

Ranking based on Sharpe's Ratio and Treynor Method

Portfolio	Under Sharpe's Method [$(R_P-R_F) \div \sigma_P$]	Ranking	Under Treynor Method [$(R_P-R_F) \div = \beta_P$]	Ranking
Raksha	[(16-6) ÷ 8] = 1.25	3	[(16-6) ÷ 1.5]=6.67	3
Varsha	[(12-6) ÷ 6] = 1	5	[(12-6) ÷ 0.98] = 6.12	4
Vredhi	[(14-6) ÷ 5] = 1.60	1	[(14-6) ÷ 1.4] = 5.71	5
Mitra	[(18-6) ÷ 10] = 1. 20	4	[(18-6) ÷ 0.75] = 16	1
Laheri	[(15-6) ÷ 7].= 1.29	2	[(15-6) ÷ 1.25] = 7.2	2

Evaluation of Fund Performance — Jensen's Alpha

Illustration 21.

Somnath Investments have floated a equity based fund scheme called "X-Cube", the funds of which will be invested only in stocks and bonds of infrastructure and construction companies.

60% of the Fund Value is invested in Companies engaged Commercial Construction Services and the other 40% in companies engaged in developing Residential Colonies/Townships.

Average Beta of return from development of Residential Townships is measured at 1.9 and that from commercial construction is measured at 1.4.

The benchmark index yields 11.20% return and RBI Bonds carry an interest rate of 4.25%.

Ascertain Jensen's Alpha from the following monthly particulars relating to "X-Cube" —

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Closing NAV	18.60	17.80	18.20	18.00	17.80	16.80	17.20	17.80	17.90	18.10	18.80	18.50
Dividend Payout	—	0.75	—	—	—	1.20	—	—	—	—	—	—

Opening NAV for January was ₹17.75.

Solution:

1. Computation of Return on "X-Cube" Scheme

Months	Opening NAV ₹	Closing NAV ₹	Dividend Distributed ₹	Total Return ₹	Return %
(1)	(2)	(3)	(4)	(5) = (4) + (3)–(2)	(6) = (5)÷(2) × 100
January	17.75	18.60	-	0.85	4.79%
February	18.60	17.80	0.75	(0.05)	(0.27%)
March	17.80	18.20	-	0.40	2.25%
April	18.20	18.00	-	(0.20)	(1.10%)
May	18.00	17.80	-	(0.20)	(1.11%)
June	17.80	16.80	1.20	0.20	1.12%
July	16.80	17.20	-	0.40	2.38%
August	17.20	17.80	-	0.60	3.49%
September	17.80	17.90	-	0.10	0.56%
October	17.90	18.10	-	0.20	1.12%
November	18.10	18.80	-	0.70	3.87%
December	18.80	18.50	-	(0.30)	(1.60%)
Total	214.75	215.50	1.95	2.70	15.50%

Therefore, Actual Return from "X—Cube" Scheme is [$R_{X—CUBE}$] 15.50%.

2. Computation of Beta of "X-Cube" Scheme

Beta of "X-Cube" = Weighted Average Beta of Commercial Construction and Residential Construction

β_{X-CUBE}= 60% x 1.40 + 40% X 1.90 = 0.84 + 0.76 = 1.60

3. Computation of Return of "X-Cube" under CAPM

Expected Return under CAPM [$E(R_{X-CUBE})$]

$E(R_{X-CUBE}) = RF + [\beta_{X-CUBE} x (R_M - R_F)]$

= 4.25% + [1.60 x (11.20% – 4.25%)]

= 4.25% + [1.60 x 6.95%]

= 4.25% + 11.12%

= 15.37%

4. Computation of Return of "X-Cube" under Jensen's Alpha

Jensen's Alpha [σ]= Actual Return Less Return under CAPM

= R_{X-CUBE} Less $E(R_{X-CUBE})$

= 15.50% -15.37% = 0.13%

Evaluation: Since, Jensen's Alpha is positive, it has exceeded the expectations and outperformed the Market Portfolio.

Evaluation of Fund Performance – Jensen's Alpha

Illustration 22.

The following particulars are furnished about three Mutual Fund Schemes, P, Q and R-

Particulars	Scheme P	Scheme Q	Scheme R
Dividend Distributed	₹1.75	—	₹1.30
Capital Appreciation	₹2.97	₹3.53	₹1.99
Opening NAV	₹32.00	₹27.15	₹23.50
Beta	1.46	1.10	1.40

Ascertain the Alpha of the three schemes and evaluate their performance, if Government of India Bonds carry an interest rate of 6.84% and the NIFTY has increased by 12; 13%.

Solution:

Particulars	Scheme P	Scheme Q	Scheme R
Dividend Distributed	₹1.75	-	₹1.30
Add: Capital Appreciation	₹2.97	₹3.53	₹1.99
Total Return [A]	₹4.72	₹3.53	₹3.29
Opening NAV [B]	₹32.00	₹27.15	₹23.50
Actual Return [A] ÷ [B] = [C]	14.75% [4.72 ÷32.00]	13.00% [3.53 ÷ 27.15]	14.00% [3.29 ÷ 23.50]
Beta [D]	1.46	1.10	1.40
Expected Return under CAPM [$E(R_P)$] [E] $R_F + \beta_P X (R_M – R_F)$ = 6.84 + [D] × (12.13 - 6.84)	14.56% [6.84 + 1.46 × (12.13 – 6.84]	12.66% [6.84 + 1.10 × 12.13 – 6.84]	14.25% [6.84 + 1.40 × (12.13 – 6.84]
Jensen's Alpha (σ_p) [C] – [E]	0.19% (14.75-14.56)	0.34% (13.00-12.66)	(0.25%) (14.00-14.25)
Ranking	2	1	3

Evaluation: Schemes P and Q have outperformed the Market Portfolio (NIFTY), whereas Scheme R has under—performed in comparison with the NIFTY.

Morning Star index — Evaluation of Fund and Market

Illustration 23.

The following are the monthly returns for "Advantage Fund" and the Market Portfolio —

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Advantage Fund (%)	2	3	(1)	2	4	1	1	2	0	2	(2)	1
Market Portfolio (%)	3	2	0	2	3	0	(1)	3	(2)	2	1	3

Ascertain the Excess Return under Morning Star Index and rate its performance in comparison with the Market Portfolio, if the Risk Free Return is 9% p.a.

Solution:

1. Computation of Factors

Month	Advantage Fund (%)	Risk of Loss	Market Portfolio (%)	Risk of Loss
(1)	(2)	(3) = (2) – 0.75 [if (2) < 0.75]	(4)	(5) = (4) – 0.75 [if (4) < 0.75]
Jan	2.00	—	3.00	—
Feb	3.00	—	2.00	—
Mar	(1.00)	1.75	0.00	0.75
Apr	2.00	—	2.00	—
May	4.00	—	3.00	—
Jun	1.00	—	0.00	0.75
Jul	1.00	—	(1.00)	1.75
Aug	2.00	—	3.00	—
Sep	0.00	0.75	(2.00)	2.75
Oct	2.00	—	2.00	—
Nov	(2.00)	2.75	1.00	—
Dec	1.00	—	3.00	
Total	15.00	5.25	16.00	6.00

Monthly Risk Free Return = 9% p.a.÷ 12 = 0.75% p.m.

2. Computation of Morning Star Index (MSI)

Particulars		Advantage Fund	Market Portfolio
Total Return for 12 Months		15.00%	16.00%
Average Monthly Return	[A]	15 ÷12 = 1.25%	16 ÷ 12 = 1.33%
Total Risk of Loss		5.25%	6.00%
Average Monthly Risk of Loss	[B]	5.25 ÷12 = 0.438%	6.00 ÷ 12 = 0.500%
Morning Star Index (i.e. Excess Return)	[A] – [B]	0.812% [1.25% – 0.438%]	0.83% [1.33% – 0.500%]

Evaluation: MSI of Advantage Fund is lesser than that of Market Portfolio. Therefore, Advantage Fund has underperformed.

Morning Star Index – Evaluation of Fund and Market

Illustration 24.

Evaluate performance of Funds M, N and the Market Portfolio from the following information available for the past six months —

Month (Return %)	Apr	May	Jun	Jul	Aug	Sep
Fund M	3.25	1.50	(1.00)	3.75	1.25	0
Fund N	2.50	(1.25)	0	2.75	2.25	1.25
Market Portfolio	1.00	(0.75)	2.00	1.75	0.25	3.25

The 6 Month Treasury Bills carry an interest rate of 6% p.a.

Solution:

1. Computation of Factors

Month	Fund M		Fund N		Market portfolio	
	Return	Risk of Loss	Return	Risk of Loss	Return	Risk of Loss
(1)	(2)	(3)=(2)- 0.50 [if (2)<0.50]	(4)	(5)=(4)- 0.50 [if (4)<0.50]	(6)	(7)=(6)- 0.50 [if (6)<0.50]
Apr	3.25	0.00	2.50	0.00	1.00	0.00
May	1.50	0.00	(1.25)	1.75	(0.75)	1.25
Jun	(1.00)	1.50	0.00	0.50	2.00	0.00
Jul	3.75	0.00	2.75	0.00	1.75	0.00
Aug	1.25	0.00	2.25	0.00	0.25	0.25
Sep	0.00	0.50	1.25	0.00	3.25	0.00
Total	8.75	2.00	7.50	2.25	7.50	1.50
Average	1.46 (8.75/6)	0.33 (2.00/6)	1.25 (7.50/6)	0.38 (2.25/6)	1.25 (7.50/6)	0.25 (1.50/6)

Monthly Risk Free Return = 6% p.a. ÷ 12 = 0.50% p.m.

2. Computation of Morning Star Index (MSI)

Particulars	Fund M	Fund N	Market Portfolio
Average Monthly Return [A]	1.46%	1.25%	1.25%
Average Monthly Risk of Loss [B]	0.33%	0.38%	0.25%
Morning Star Index (i.e. Excess Return) [A] - [B]	1.13% [1.46% -0.33%]	0.87% [1.25% -0.38%]	1% [1.25% -0.25%]
Ranking	1	3	2

Evaluation: Fund M has performed better than the Market Portfolio, while Fund N has not performed as good as the Market Portfolio despite having the equivalent average return during the period.

Fama's Net Selectivity — Evaluation of Fund and Market

Illustration 25.

You are given the following information about 3 funds, Tanni (All Equity Fund), Manni (Equal Debt and Equity Mix) and Danni (High Debt Low Equity Fund) -

Particulars	Tanni	Manni	Danni
Average Return	25%	18%	12%
Standard Deviation	10%	5%	3%
Correlation with Market	0.30	0.70	0.50

If Risk Free Return is 5%, Return on Market Portfolio is 16% with a standard deviation of 4%.

Ascertain —

1. Total Gain and the Net Gain under Fama's Net Selectivity.
2. Systematic Risk and Unsystematic Risk.

Solution:

Evaluation of Fund Tanni, Manni and Danni

Particulars	Tanni	Manni	Danni
Average Return [R_P]	25%	18%	12%
Standard Deviation [σ_P] [Total Risk]	10%	5%	3%
Correlation with Market [ρ_{PM}]	0.30	0.70	0.50
Portfolio Beta [β_P] = $\rho_{PM} \times \sigma_P \div \sigma_M$	[0.30 × 10 ÷4]	[0.70 × 5 ÷ 4]	[0.50 × 3 ÷ 4]
	0.75	0.875	0.375
Actual Risk Premium [$R_P - R_F$] [A]	[25 – 5] = 20%	[18 – 5] = 13%	[12 – 5] = 7%
Computation of Net Gain:			
Desired Risk Premium [$(R_M - R_F) \times \sigma_P \div \sigma_M$] [B]	[11% × 10 ÷ 4]	[11% × 5 ÷ 4]	[11% × 3 ÷4]
	27.5%	13.75%	8.25%
Fama's Net Selectivity [Net Gain] [A] – [B]	(7.5%)	(0.75%)	(1.25%)
Computation of Total Gain = Jensen's Alpha			
Desired Risk Premium [$(R_M - R_F) \times \rho_{PM} \times \sigma_P \div \sigma_M$]	[27.5% × 0.30]	[13.75% × 0.70]	[8.25% × 0.50]
Or [Risk Premium in [B] × ρ_{PM}] [C]	8.25%	9.63%	4.13%
Total Gain [A] - [C]	11.75%	3.37%	2.87%
	[20 – 8.25]	[13 – 9.63]	[7 – 4.13]
Systematic Risk and Unsystematic Risk:			
Systematic Risk [$\sigma_P \times \beta_P$]	7.50%	4.375%	1.125%
	[10% × 0.75]	[5 × 0.875]	[3 × 0.375]
Unsystematic Risk [Total Risk Less Systematic	2.50%	0.625%	1.875%
Risk]	[10 – 7.50]	[5 – 4.375]	[3 – 1.125]

Notes:

(1) Risk Free Return [R_F] = 5%;

(2) Market Return [R_M] = 16%;

(3) Market Standard Deviation [σM] = 4%;

(4) Market Risk Premium [$R_M - R_F$] = 16% – 5% = 11%.

Weighted Rate of Return

Illustration 26.

Ascertain the Time Weighted Rate of Return and Annual Compounded Rupee Weighted Rate of Return from the following information given relating to Som Fund.

- Fund Value at the beginning is ₹6 Crores.
- 3 Months hence, the value had increased by 15% of the opening value.
- 3 Months hence, the value had increased by12% of the value three months before. At that time, there was an outflow of ₹1Crore by way of dividends.
- 3 Months hence, the value had decreased by 10% of the value three months before.
- During the last three months of the year, value of the fund had increased by ₹1 Crore.

Solution:

1. Computation of Closing Value (as at the year end)

Time	Opening Value (₹ in crore)	Additions/ Appreciation (₹ in crore)	Distributions/ Depreciation	Closing Value (₹ in crore)
Months 1-3	6.0000	0.9000 [6.00 x 15%]	—	6.9000
Months 4-6	6.9000	0.8280 [6.90 x 12%]	1.0000	6.7280
Months 7-9	6.7280	—	0.6728 [6.7280 x 10%]	6.0552
Months 10-12	6.0552	1.0000	—	**7.0552**

2. Time Weighted Rate Return:

(a) Computation of Closing Value ignoring cash flows in between

Particulars			₹ Crores
	Opening Investment		**6.0000**
Add:	Value Appreciation for First Three Months	[₹6 Crores x 15%]	0.9000
	Value at the end of 3rd Month		6.9000
Add:	Appreciation for Months 4 to 6	[₹6.9 Crores X 12%]	0.8280
	Value at the end of 6th Month		7.7280
Less:	Depreciation for Months 7 to 9	[₹7.728 Crores X 10%]	(0.7728)
	Value at the end of 9th Month		6.9552
Add:	Appreciation for Months 10 to 12		1.0000
Value at the end of the Year			**7.9552**

(b) Computation of Return

Return in Value = Value at the end of the Year - Value at the beginning of the year

= ₹7.9552 Crores - ₹6 Crores = ₹1.9552 Crores

Return in % (Annual Compounding)

= Return in Value ÷ Value at the beginning of the year

= ₹1.9552 Crores ÷ ₹6 Crores = **32.59% (Annual Compounding)**

Return in % (Quarterly Compounding) =

Product of each quarter's Closing Value (before dividend) ÷ (Opening Value for the Quarter) - 1

$$= \frac{6.9000}{6.0000} \times \frac{7.7280}{6.9000} \times \frac{6.0552}{6.7280} \times \frac{7.0552}{6.0552} - 1 = 1.3506 - 1 = 0.3506 \text{ or } 35.06\%$$

3. Rupee Weighted Rate Return:

(Measured from the Investor's Perspective)

It is the rate at which the Net Present Value of Cash Flow will be equal to zero i.e. Internal Rate of Return presuming that the investor will receive equivalent to the closing value.

(a) Computation of Return in %

Return (Value) = Dividend + Capital Appreciation

= ₹1Crore + [Closing Value of ₹7. 0552 Crores **Less** Opening Value of ₹6 Crores]

= ₹1 Crore + ₹ 1. 0552 Crores = ₹2.0552 Crores

Return in % = Return in Value ÷ Opening Value = ₹2.0552 Crores ÷ ₹6 Crores = **34.253%** Average Quarterly Discount Rate = 34.253 ÷ 4 = 8.56%

(b) Computation of Net Present Value

Note: Since cash flows occur on a quarterly basis, Present Value factor is based on quarterly discount rate. The First Discount Rate chosen 9% (average quarterly discount rate rounded off to nearest %)

Time Period (Quarters)	Nature	Cash Flow	Discount Factor @ 9%	Discounted Cash Flow	Discount Factor @ 8%	Discounted Cash Flow
0	Investment (Opening NAV)	(6.000)	1.000	(6.000)	1.000	(6.000)
1	—	—	0.917	—	0.926	—
2	Dividend Distribution	1.000	0.842	0.842	0.857	0.857
3	—	—	0.772	—	0.794	—
4	Closing NAV	7.0552	0.708	4.993	0.735	5.186
				(0.165)		0.043

Since the NPV using Rate 1 is negative, Rate 2 should be lower than Rate 1 to get a positive NPV.

(c) Computation of Internal Rate of Return

Computation of Rupee Weighted Rate of Return (RWRR) = Internal Rate of Return:

Internal Rate of Return [IRR]

$$= R_2 \frac{[V_2 - V_M]}{[V_2 - V_1]} \times [R_1 - R_2]$$

$$= 8\% + \frac{[0.043 - V_M]}{[0.043 - (-0.165)]} \times [9\% - 8\%]$$

= 8% + [0.043 / 0.208] × 1% = 8.207%

= 8.207% per quarter

Therefore, RWRR per Quarter is 8.207% or 32.828% p.a.

(d) Rupee Weighted Rate of Return

Risk Weighted Rate of Return = Internal Rate of Return = **32.828%**

Illustration 27.

Gargi Ltd has promoted an open-ended equity oriented scheme in 2004 with two plans — Dividend Reinvestment Plan (Plan X) and Bonus Plan (Plan Y); the face value of the units was ₹10 each. P and Q invested ₹5 Lakhs each on 01.04.2006 respectively in Plan X and Plan Y, when the NAV was ₹42.18 for Plan X and P ₹35.02 for Plan Y. P and Q both redeemed their units on 31.03.2013. Particulars of dividend and bonus declared on the units over the period were as follows —

Date	Dividend	Bonus Ratio	NAV for Plan X	NAV for Plan Y
15.09.2006	15	—	46.45	29.10
28.07.2007	_	1 : 6	42.18	30.05
31.03.2008	20	—	48.10	34.95
31.10.2008	—	1 : 8	49.60	36.00
15.03.2009	18	—	52.05	37.00
24.03.2010	—	1:11	53.05	38.10
27.03.2011	16	—	54.10	38.40
28.02.2012	12	1:12	55.20	39.10
31.03.2013	—	—	50.10	34.10

You are required to calculate the annual return for P and Q after taking into consideration the following information —

(a) Securities Transaction Tax at 2% on redemption

(b) Liability of Capital Gains to Income Tax —

(i) Long Term Capital Gains — Exempt

(ii) Short Term Capital Gains —10% Plus Education Cess at 3%.

Solution:

Note: Under Dividend Reinvestment Plan, dividend will be declared as percentage of the face value of units outstanding, and units will be allotted for the amount of dividend based on the NAV on the date of dividend declaration.

1. Plan X for Mr. P

(a) Units Purchased

Particulars		Value
Amount Invested		₹5,00,000
NAV per Unit on 01.04.2006		₹42.18
No. of Units Purchased	[₹5,00,000 ÷ ₹42.18]	11,853.96

(b) Units Allotted under Dividend Reinvestment

Date of Dividend	Units Outstanding	Dividend Rate	Dividend Amount	NAV on that date	Additional Units Allotted	Total Units
1	2	3	4 = 2 × ₹10 × 3	5	6 = 4 × 5	7
15.09.2006	11,853.96	15%	₹ 17,780.94 [11,853.96 x ₹10 x 0.15]	₹46.45	382.79 [17780.94 ÷ 46.45]	12,236.75
31.03.2008	12,236.75	20%	₹24,473.50 [12,236.75 X ₹10 X 0.20]	₹48.10	508.80 [24473.50 ÷ 48.10]	12,745.55
15.03.2009	12,745.55	18%	₹22,941.99 [12,745.55 x ₹10 X 0.18]	₹52.05	440.77 [22941.99 ÷ 52.05]	13,186.32
27.03.2011	13,186.32	16%	₹21,098.11 [13,186.32 x ₹10 x 0.16]	₹54.10	389.98 [21098.11 ÷ 54.10]	13,576.30
28.02.2012	13,576.30	12%	₹16,291.56 [13,576.30 x ₹10 X 0.12]	₹55.20	295.14 [13576.3 ÷ 55.20]	13,871.44

(c) Redemption Proceeds and Annual Return

Particulars			Value
Units Redeemed			13,871.44
NAV per Unit on 31.03.2013 (date of redemption)			₹50.10
	Gross Redemption Proceeds [13,871.44 Units X ₹50.10]		₹6,94,959.14
Less:	Securities Transaction Tax @ 2%		₹13,899.18
	Net Proceeds		₹6,81,059.96
Less:	Initial Investment		₹5,00,000.00
Total Return for 7 Years			₹1,81,059.96
Annual Return $= \frac{\text{Total Return}}{\text{Initial Investment}} \times \frac{1}{\text{Period of Investment}}$ $= \frac{1,81,059.96}{5,00,000} \times \frac{1}{7 \text{ Years}} = 5.17\%$			5.17%

Note:

Since all the units redeemed are held for more than 12 months, all the units are long term capital assets under the income tax, and therefore, gain on their redemption is exempt from income tax.

2. Plan Y for Mr. Q

(a) Units Purchased

Particulars		Value
Amount Invested		₹5,00,000
NAV per Unit on 01.04.2006		₹35.02
No. of Units Purchased	[₹5,00,000 - ₹35.02]	14,277.56

(b) Units Allotted under Bonus

Date	Description	Units
01.04.2006	Purchase of Units for ₹5,00,000 at ₹35.02 per Unit	14,277.56
28.07.2007	Add: Bonus Issue at 1 : 6 = 1/6 X 14,277.56	2,379.59
31.10.2008	Total Units after: First Bonus Issue	16,657.15
	Add: Bonus Issue at 1 : 8 = 1/8 X 16,657.15	2,082.14
24.03.2010	Total Units after Second Bonus Issue	18,739.29
	Add: Bonus Issue at 1 : 11 = 1/11 X 18,739.29	1,703.57
28.02.2012	Total Units after Third Bonus Issue	20,442.86
	Add: Bonus Issue at 1 : 12 = 1/12 X 20,442.86	1,703.57
31.03.2013	**Total Units after Fourth Bonus Issue**	**22,146.43**
	= Units Outstanding on the date of redemption i.e. 31.03.2013	

(c) Redemption Proceeds and Annual Return

Particulars		Value
Units Redeemed		22,146.43
NAV per Unit on 31.03.2013 (date of redemption)		₹34.10
	Gross Redemption Proceeds [22,146.43 Units X ₹34.10]	₹7,55,193.26
Less:	Securities Transaction Tax @ 2%	₹15,103.87
	Net Proceeds	₹7,40,089.39
Less:	Initial Investment	₹5,00,000.00
Total Return for 7 Years		₹2,40,089.39
Annual Return $= \frac{\text{Total Return}}{\text{Initial Investment}} \times \frac{1}{\text{Period of Investment}}$ $= \frac{2,40,089.39}{5,00,000} \times \frac{1}{7 \text{ Years}} = 6.86\%$		6.86%

Note:

Since all the units (financial assets) redeemed are held for more than 12 months, all the capital assets under the income tax law, and therefore, gain on their redemption is exempt from units are long term income tax.

Illustration 28.

XXX Mutual Fund (approved Mutual Fund) sponsored open-ended equity oriented scheme "Chankya Opportunity Fund".

There were three plans viz., "S" Dividend Re-investment Plan, "T"-Bonus Plan & "U" - Growth Plan.

At the time of initial Public Offer on 1-4-2002, Mr.Gautam, Mr.Gaurav & Mrs.Ratna, three investors invested ₹1,00,000 each & chosen "T", "U" & "S" Plan respectively.

The history of the Fund is as follows:

Date	Dividend %	Bonus ratio	Net Asset Value per unit (F.V.₹ 10)		
			Plan S	Plan T	Plan U
28-07-2006	20	-	30.70	31.40	33.42
31-03-2007	70	5:4	58.42	31.05	70.05
31-10-2010	40	-	42.18	25.02	56.15
15-03-2011	25	-	46.45	29.10	64.28
31-03-2011	-	1: 3	42.18	20.05	60.12
24-03-20 12	40	1:4	48.10	19.95	72.40
31-07-2012	-	-	53.75	22.98	82.07

[Ignore Education Cess]

On 31st July all three investors redeemed all the balance units.

Calculate annual rate of return to each of the investors.

Consider:

(i) Long term capital gain is exempt from Income tax.

(ii) Short term capital gain is subject to 10% Income tax.

(iii) Security transaction tax 0.2 percent only on sale / redemption of units.

Solution:

1. Return from Plan S - Dividend Reinvestment for Mrs. Ratna

Under Dividend Reinvestment Plan, the amount of Dividend is reinvested in the business at the prevailing rate.

(a) Statement of Units, Value and Return on Investment

Date	Dividend %	Investment	Rate	Units	Cum. Units	Value (₹)
(1)	(2)	(3) = Div X Cum. Units	(4)	(5) = (3)÷ (4)	(6)	(7) = (6) × ₹10
01.04.2002	Initial Offer	1,00,000	10.00	10,000.00	10,000.00	1,00,000
28.07.2006	0.20	20,000 [2x10,000]	30.70	651.47	10,651.47	1,06,515
31.03.2007	0.70	74,560 [7X10,651.47]	58.42	1,276.28	11,927.75	1,19,278
31.10.2010	0.40	47,711 [4x11,927.75]	42.18	1,131.13	13,058.88	1,30,589
15.03.2011	0.25	32,647 [2.5X13,058.88]	46.45	702.85	13,761.73	1,37,617
24.03.2012	0.40	55,047 [4x13,761.73]	48.10	1,144.43	14,906.16	1,49,062
31.07.2012	-	-	53.75		14,906.16	1,49,062

(b) Return on Investment

Particulars	₹
Redemption value 14,906.16 X 53.75	8,01,206.10
Less: Short term capital gain tax @ 10% =1,144.43 units (53.75-48.10) X 10%	646.00
	8,00,560.10
Less: Securities Transaction Tax @ 0.2% [0.2% X 8,01,206.10]	1,602.41
Redemption Value net of Taxes	7,98,957.69
Less: Investment	1,00,000.00
Net Return from Investment	**6,98,957.69**
Period of Investment [1/4/02 to 31/07/12] in months	**124**
Annual Average Return $= \frac{[\text{Net Return} \times 12 \text{ months} \times 100]}{\text{Purchase Price} \times \text{Period of Investment (months)}}$ $= \frac{[6,98,957.69 \times 12 \times 100]}{1,00,000 \times 124}$	**67.64%**

- Short Term Capital Gains is only in respect of Investment made in 24/03/2012 where the period of holding is less than 1 year.
- Securities Transaction Tax is not to be considered for computation of Short term Capital Gains and hence deducted from the net amount to ascertain the Cash Flows.

2. Return from Plan T - Bonus Plan for Mr. Gautam

Under the Bonus Plan, Bonus units are issued in the specified ratio.

(a) Statement of Units, Bonus and Value per unit

Date	Bonus Ratio	Units	Cum. Units	NAV per unit
(1)	**(2)**	**(3)**	**(4)**	**(5)**
01.04.2002	Initial Issue	10,000	10,000	10
31.03.2007	5:4	12,500 [10,000 x 5 ÷ 4]	22,500	31.05
31.03.2011	1:3	7,500 [22,500 x 1 ÷ 3]	30,000	20.05
24.03.2012	1:4	7,500 [30,000 x 1 ÷ 4]	37,500	19.95

(b) Return on Investment

Particulars	₹
Redemption value 37,500 X 22.98	8,61,750.00
Less: Short term capital gain tax @ 10% = 7,500 X (22.98 - 0) X 10% (See Note (a) below)	17,235.00
	8,44,515.00
Less: Securities Transaction Tax @ 0.2%	1,723.50
Net of tax	8,42,791.50
Less: Investment	1,00,000.00
Net gain	7,42,791.50

Annual Average Return $= \frac{\text{[Net Return} \times \text{12 months} \times \text{100]}}{\text{Purchase Price} \times \text{Period of Investment (months)}}$ $= \frac{7,42,791.50 \times 12 \times 100}{1,00,000 \times 124}$	71.88%

Note:

(a) For Income tax purposes, Cost of Acquisition of Bonus Shares is considered as NIL.

(b) Short Term Capital Gains is only in respect of Bonus issued on 24/03/2012 as the period of holding is less than 1 year.

3. Return from Plan U - Growth Plan to Mr.Gaurav

Particulars	₹
Redemption value [10,000 X82.07]	8,20,700.00
Less: Security Transaction Tax (S.T.T) is 0.2%	1,641.40
Net amount received	8,19,058.60
Less: Investment	1,00,000.00
Net gain	7,19,058.60

There is no Short Term Capital Gains as the period of holding is more than '1 year.

Average Annual Return

$= \frac{7,19,058.60 \times 12 \times 100}{1,00,000 \times 124} = 69.59\%$

Illustration 29.

Equi-Stable, is a portfolio model where in 20% of Fund Value is invested in Fixed Income Bearing Instruments. The Balance of 80% is divided among Old Industry Stock (Iron and Steel), Automotive Industry Stock, Information Technology Stocks, Infrastructure Company Stocks and Financial Services Sector in the ratio of 4:2:6:3:5.

Three mutual funds X, Y and Z, offer a Fund Scheme based on the Equi-Stable Portfolio Model. The actual return on Equi-Stable portfolios of each of the three funds for the past 3 years is as follows —

Year	1	2	3
Portfolio X	17.35%	18.70%	21.60%
Portfolio Y	17.20%	18.25%	22.15%
Portfolio Z	17.10%	18.60%	22.00%

Beta factor of the Equi-Stable portfolio is measured at 1. 35. Return on Market Portfolio indicate that ₹1000 invested will fetch ₹153 in an year (including capital appreciation and dividend yield). RBI Bonds, guaranteed by the Central Government yields 4.50%.

Rate the fund managers of X, Y and Z.

Solution:

1. Computation of Expected Rate of Return under CAPM

$E(RX) = R_F + [B_X \times (R_M - R_F)]$ [Expected Return on portfolio X]

Risk Free Return R_F 4.50% [RBI Bonds]

Return on Market Portfolio R_M 15.30% $\left[\frac{\text{Annual Return}}{\text{Investment}} = \frac{₹153}{₹1,000}\right]$

Beta of Equi-Stable B_X 1.35 [Given]

Expected Return of Equi-Stable $E(R_E)$ = 4.50% + [1.35 × (15.30% -4.50%)] = **19.08%**

2. Computation of Alpha Factor of the 3 Funds

Year	Mutual Fund X		Mutual Fund Y		Mutual Fund Z	
	Actual Return	Abnormal Return [AR_X]	Actual Return	Abnormal Return [AR_Y]	Actual Return	Abnormal Return [AR_Z]
(1)	(2)	(3) = (2)- $E(R_E)$	(4)	(5) = (4) - $E(R_E)$	(6)	(7) = (6)- $E(R_E)$
1	17.35%	17.35 -19.08 = (1.73)	17.20%	17.20 -19.08 =(1.88)	17.10%	17.10 -19.08 = (1.98)
2	18.70%	18.70 -19.08 = (0.38)	18.25%	18.25 -19.08 = (0.83)	18.60%	18.60 -19.08 = (0.48)
3	21.60%	21.60 -19.08 = 2.52	22.15%	22.15 -19.08 = 3.07	22.00%	22.00 - 19.08 = 2.92
		0.41		**0.36**		**0.46**

Alpha Factor:

Fund X $\alpha_X = \Sigma AR_x \div n$ = 0.41 ÷ 3 Years = **0.137%**

Fund Y $\alpha_Y = \Sigma AR_y \div n$ = 0.36 ÷ 3 Years = **0.120%**

Fund Z $\alpha_Z = \Sigma AR_z \div n$ = 0.46 ÷ 3 Years = **0.153%**

Evaluation: Equi-Stable Scheme of Mutual Fund Z has the highest Alpha i.e. it has yielded 0.153% return more than the market expectations, when compared to 0.137% and 0.12% of Fund X and Y. Therefore, Fund Manager of Mutual Fund Z has performed better. Ranking of the fund managers are as follows —

1. → Fund Manager of Z
2. → Fund Manager of X
3. → Fund Manager of Y

Illustration 30.

An aggressive mutual fund promises an expected return of 18% with a possible volatility (standard deviation) of 20 %. On the other hand, a conservative mutual fund promises an expected return of 17% and volatility of 19%.

(a) Which fund would you like to invest in?

(b) Would you like to invest in both if you have money?

(c) Assuming you can borrow money from your provident fund at an opportunity cost of 10 %, which fund you would invest your money in?

(d) Would you consider both funds if you could lend or borrow money at 10 %?

Solution:

(a) It depends on your preference and risk-taking attitude.

(b) You can achieve diversification gains if you invest in both.

(c) The slopes of the capital market line for two funds are:

- Aggressive fund = (18 - 10)/20 = 0.40; and
- Conservative fund: (17-10)/19 = 0.368. Aggressive fund is preferable.

(d) Benefits of diversification can be obtained if you invest in both funds and also lend and borrow at the NPV.

Study Note - 6

CAPITAL MARKETS

This Study Note includes

6.1 Capital Market
6.2 Primary and Secondary Markets and its Instruments
6.3 Optionally Convertible Debentures and Deep Discount Bonds
6.4 Rolling Settlement, Clearing House Operations
6.5 Dematerialisation, Rematerialisation
6.6 Depository System
6.7 Initial Public Offer (IPO)/Follow on Public Offer (FPO); Book Building
6.8 Auction & Insider Trading
6.9 Credit Rating – Objectives, Sources, Process, Credit Rating Agencies in India

6.1 CAPITAL MARKET

Capital market is a market for equity shares and long-term debt. In this market, the capital funds comprising of both equity and debt are issued and traded. This also includes private placement sources of debt and equity as well as organized markets like stock exchanges. Capital market includes financial instruments with more than one year maturity. It is defined as a market in which money is provided for periods longer than a year, as the raising of short-term funds takes place on other markets (e.g., the money market). The capital market is characterized by a large variety of financial instruments: equity and preference shares, fully convertible debentures (FCDs), non-convertible debentures (NCDs) and partly convertible debentures (PCDs) currently dominate the capital market, however new instruments are being introduced such as debentures bundled with warrants, participating preference shares, zero-coupon bonds, secured premium notes, etc.

Functions of a Capital Market:

The capital market is an important constituent of the financial system. The functions of an efficient capital market are as follows:

- Mobilises long-term savings to finance long-term investments.
- Provide risk capital in the form of equity or quasi-equity to entrepreneurs.
- Encourage broader ownership of productive assets.
- Provide liquidity with a mechanism enabling the investor to sell financial assets.
- Lower the costs of transactions and information.
- Improve the efficiency of capital allocation through a competitive pricing mechanism.
- Enable quick valuation of financial instruments-both equity and debt.
- Provide insurance against market risk or price risk through derivative trading and default risk through investment protection fund.
- Provide operational efficiency through:
  - ✓ Simplified transaction procedures;
  - ✓ Lowering settlement timings; and
  - ✓ Lowering transaction costs.

- Develop integration among:
  - ✓ Real and financial sectors;
  - ✓ Equity and debt instruments;
  - ✓ Long-term and short-term funds;
  - ✓ Long-term and short-term interest costs;
  - ✓ Private and government sectors; and
  - ✓ Domestic and external funds.
- Direct the flow of funds into efficient channels through investment, disinvestment, and reinvestment.
- Enable wider participation by enhancing the width of the market by encouraging participation through networking institutions and associating individuals.

Constituents of Capital Market-

The following are the constituents of capital market:

- Investment Trust- Financial Institutions which collects savings from public and invest that amount in industrial securities. Example- Tata Investment Trust Pvt Ltd.
- Specalised Financial Institutions- These type of financial institutions provides long term finance to industries. Example- Industrial Financial Corporation of India (IFCI) Ltd.
- Insurance Company- Insurance companies collect premium from policy holders and invest the amount in different industrial securities. Example- Life Insurance Corporation of India (LICI).
- Securities Market- Securities is a broader term which encompasses shares, debentures, bonds etc. The market where securities transactions are held is known as securities market. Securities market can be further classified into primary or new issue market and secondary or share market.

Classification of Capital Market:



6.2 PRIMARY AND SECONDARY MARKETS AND ITS INSTRUMENTS

Primary Market:

The primary market is a market for new issues. Hence it is also known as new issue market. This refers to the long-term flow of funds from the surplus sector to the government and corporate sector through primary issues and to banks and non-bank financial intermediaries through secondary issues. Funds are mobilised in the primary market through prospectus, rights issues, and private placement.

Types of Issues or Methods of rising funds in Primary Market:

Public Issue	Rights Issue	Bonus Issue	Private Placement	Bought out deals	Depository Receipts
Initial Public offering (IPO)- This is the offer of sale of securities of an unlisted company for the first time.	If a company issues share in the market to raise additional capital, the existing members are given the first preference to apply for new shares in proportion to their existing share holdings. This is known as right issue mentioned in Sec 62(1) of Companies Act 2013.	Bonus Issues are made by the company when it has huge amount of accumulated reserves and wants to capitalize the reserves. Bonus shares are issued on fully paid up shares only, to the existing shareholders free of cost. Sec 63 of Companies Act states this.	1) Private Placement (Unlisted Companies)- It is direct sale of securities to some specified individuals or financial institutions. 2) Preferential Issue- allotment of shares to selected persons 3) Qualified Institutions Placement (for Listed Companies)- allotment of securities to qualified institutional buyers.	When the new issued shares of an unlisted company is bought at large by an investor or by small investors in groups it is known as the bought out deal.	Issue of negotiable equity instruments by Indian companies for raising capital from the international capital market. Example- ADRs, GDRs.
Follow-on Public Offering (FPO)-This is the offer of sale of securities by listed company					

Participants in the Primary Market:

- Merchant Bankers
- Bankers to an Issue
- Registrar to an Issue
- Underwriters to the Issue
- Debenture Trustees
- Investment Banks
- Depositories
- Portfolio Managers
- Custodians

Procedure of selling securities:

- Direct Sale
- Through Broker
- Through Underwriter
- Through intermediary financial institutions

Secondary Market:

The secondary market is a market in which existing securities are resold or traded. This market is also known as the stock market. It is a market where buying, selling of those securities which have been granted the stock exchange quotation takes place. In India, the secondary market consists of recognized stock exchanges operating under rules, by-laws and regulations duly approved by the government.

Bombay Stock Exchange (BSE) was established in 1875, it is the oldest stock exchange in India. Subsequently other stock exchanges like in Ahmedabad, Kolkata were established. At present, in India there are 23 stock exchanges, out of which 19 are regional stock exchanges and rest 4 are- BSE, National Stock Exchange (NSE), Over the Counter Exchange of India (OTECI) and Interconnected Stock Exchange of India (ICSE).

Functions of the Secondary Market:

- ❖ To contribute to economic growth through allocation of funds to the most efficient channel through the process of disinvestment to reinvestment.
- ❖ To facilitate liquidity and marketability of the outstanding equity and debt instruments.
- ❖ To ensure a measure of safety and fair dealing to protect investors' interests.
- ❖ To induce companies to improve performance since the market price at the stock exchanges reflects the performance and this market price is readily available to investors.
- ❖ To provide instant valuation of securities caused by changes in the internal environment.

The Indian secondary market can be segregated into two:

1. **The secondary market for corporate and financial intermediaries**. The participants in this market are registered brokers - both individuals and institutions. They operate through a network of sub- brokers and sub-dealers and are connected through an electronic networking system.
2. **The secondary market for government securities and public sector undertaking bonds**. The trading in government securities is basically divided into the short-term money market instruments such as treasury bills and long-term government bonds ranging in maturity from 5 to 20 years.

The main participants in the secondary market for government securities are entities like primary dealers, banks, financial institutions, and mutual funds.

Difference between Primary and Secondary Market:

Basis	Primary Market	Secondary Market
Nature of Securities	It deals with new securities, i.e. securities which were not previously available, and are offered for the first time to the investors.	It is a market for old securities which have been issued already and granted stock exchange quotation.
Sale/Purchase	Securities are acquired from issuing companies themselves.	Securities are purchased and sold by the investors without any involvement of the companies.
Nature of Financing	It provides funds to new enterprises & also for expansion and diversification of the existing one and its contribution to company financing is direct.	It does not supply additional funds to company since the company is not involved in transaction.
Liquidity	It does not lend any liquidity to the securities.	The secondary market provides facilities for the continuous purchase and sale of securities, thus lending liquidity and marketability to the securities.

Organisational Difference	It is not rooted in any particular spot and has no geographical existence. It has neither any tangible form nor any administrative organisational set up.	Secondary markets have physical existence in the form of stock exchange and are located in a particular geographical area having an administrative organisation.
Requirement	Helps in creating new capital.	Helps in maintenance of existing capital.
Volume	Volume of transaction is low as compared to secondary market.	Volume of transaction is high as compared to primary market.

Similarities between Primary and Secondary Market:

1. **Listing**: One aspect of inseparable connection between them is that the securities issued in the primary market are invariably listed on a secondary market (recognized stock exchange) for dealings in them. The practice of listing of new issues on the stock market is of immense utility to the potential investors who can be sure that when they receive an allotment of new issues, they will subsequently be able to dispose them off any time in the Stock Exchange.

2. **Control**: The stock exchanges exercise considerable control over the organization of new issues. The new issues of securities which seek stock quotation/listing have to comply with statutory rules as well as regulations framed by the stock exchanges. If the new issues do not conform to the prescribed stipulations, the stock exchanges would refuse listing facilities to them. This requirement obviously enables the stock exchange to exercise considerable control over the new issues market and is indicative of close relationship between the two.

3. **Mutual Interdependence**: The markets for new and old securities are, economically, an integral part of a single market- the capital market. Their mutual interdependence from the economic point of view has two dimensions. When value of share increases, the volume of new issue increases and vice-versa. The functioning of secondary market has direct influence on the activities of new issue market. If stock market performs well then it also inspires the new issue market.

Basic Capital Market Instruments:

A. Equity Securities	B. Debt Securities
Equity Shares	Debentures
Preference Shares	Bonds

These two types of securities are traded in separate markets in stock exchanges. They are briefly outlined as under:

A. Equity Securities:

(i) Equity Shares: Equity Share represents the form of fractional ownership in which a Shareholder, as a fractional owner, undertakes the maximum entrepreneurial risk associated with a business venture. A company may issue such shares with differential rights as to voting, payment of dividend, etc.

(ii) Preferred Stock/Preference Shares: Preference Shareholders are entitled to a fixed dividend or dividend calculated at a fixed rate to be paid regularly before dividend is paid in respect of Equity Share. They also enjoy priority over the Equity Shareholders in payment of surplus. There are various types of Preference Shares viz. Cumulative and Non-Cumulative Preference Shares, Convertible and Non-Convertible Preference Shares, Participating and Non-Participating Preference Shares, Redeemable and Non-Redeemable Preference Shares etc.

B. Debt Securities:

(i) Debentures: A Debenture is a document issued by a company under its common seal acknowledging a debt to the holders. It is a debt security issued by a company which offers to pay interest for the money it borrows for a certain period. Debenture holders are treated as creditors of the company. As per SEBI guidelines, no public or rights issue of convertible or non-convertible debentures shall be made unless a credit rating from a credit rating agency has been obtained and disclosed in the offer document.

Where the public or rights issue of debt security of issue greater than ₹100 crore or its equivalent are issued, two ratings from two different agencies shall be obtained. In case of issue of debentures with maturity of more than 18 months, the issuer shall also appoint a debenture trustee. The names of the debenture trustees must be stated in the offer document. A company issuing debentures with a maturity of more than 18 months should create a debenture redemption reserve.

Some of the prominent types of debentures are: a) Based on Security- Secured and Unsecured Debentures, b) Based on Registration of the instrument- Registered and Bearer Debentures, c) Based on Convertibility- Fully Convertible Debentures, Zero Interest Fully Convertible Debentures, Partly Convertible Debentures, Non-convertible Debentures, Non- convertible Debentures with Detachable Warrants, Optionally Convertible Debentures , d) Based on Redemption- Redeemable Debentures and Irredeemable Debentures, e) Other Types- Participating Debentures and Debentures with a Floating Rate of Interest.

(ii) **Bonds:** A bond is a negotiable certificate which entitles the holder for repayment of the principal sum plus interest. They are debt securities issued by a company, or Government agency whereby a bond investor lends money to the Issuer, and in exchange, the issuer promises to repay the loan amount on a specified maturity date. Features and the various types of Bonds have been discussed in study note 2.4 (Financial Market Instruments) already.

Other financial instruments that are traded in market:

1. **Secured Premium Notes (SPNs):**

   (a) **Meaning:** Secured Premium Notes are debt instruments issued along with a detachable warrant and is redeemable after a specified period (4 to 7Years).

   (b) **Option to Convert:** SPNs carry an option to convert into equity shares, i.e. the detachable warrant can be converted into Equity Shares.

   (c) **Period for Conversion:** Conversion of detachable warrant into equity shares should be done within a time period specified by the company.

2. **American Depository receipts (ADRs):** American Depository Receipts popularly known as ADRs were introduced in the American market in 1927. ADRs are negotiable instruments, denominated in dollars, and issued by the US Depository Bank. A non-US company that seeks to list in the US, deposits its shares with a bank and receives a receipt which enables the company to issue ADRs. These ADRs serve as stock certificates and are used interchangeably with ADRs which represent ownership of deposited shares. Among the Indian ADRs listed on the US markets, are Infy (the Infosys Technologies ADR), WIT (the Wipro ADR), Rdy(the Dr Reddy's Lab ADR), and Say (the Satyam Computer ADR). ADRs are listed in New York Stock Exchange (NYSE) and NASDAQ (National association of Securities Dealers automated quotations). Issue of ADR offers access to both institutional and retail market in US.

3. **Global Depository Receipts (GDRs):** GDRs are equity instruments issued abroad by authorized overseas corporate bodies against the shares/bonds of Indian companies held with nominated domestic custodian banks. An Indian company intending to issue GDRs will issue the corresponding number of shares to an overseas depository bank. GDRs are freely transferable outside India and dividend in respect of the share represented by the GDR is paid in Indian rupees only. They are listed and traded on a foreign stock exchange. GDRs are fungible, which means the holder of GDRs can instruct the depository to convert them into underlying shares and sell them in the domestic market. GDRs re traded on Over the Counter (OTC) basis. Most of the Indian companies have their GDR issues listed on the Luxembourg Stock Exchange and the London Stock Exchange. Indian GDRs are primarily sold to institutional investors and the major demand is in the UK, US, Hongkong, Singapore, France and Switzerland. There is no such difference between ADR and GDR from legal point of view.

4. **Derivatives:** A derivative is a financial instrument, whose value depends on the values of basic underlying variable. In the sense, derivatives is a financial instrument that offers return based on the return of some other underlying asset, i.e., the return is *derived* from another instrument. Derivatives are a mechanism to hedge

market, interest rate, and exchange rate risks. Derivatives market is divided into two types- Financial market and Commodity market. Types of Financial Derivatives include: Forwards, Futures, Options, Warrants, Swaps, Swaptions. There are three types of traders in the derivatives market: Hedger, Speculator and arbitrageur.

5. **External Commercial Borrowings** (ECBs): ECBs re used by Indian companies to rise funds from foreign sources like bank, export credit agencies, foreign collaborators, foreign share holders etc. Indian companies rise funds through ECBs mainly for financing infrastructure projects.

6. **Foreign Currency Convertible Bonds** (FCCBs)- Foreign Currency Convertible Bonds (FCCBs) re issued by Indian companies but are subscribed by non-residents. These bonds have a specified fixed interest rate and can be converted into ordinary shares at price preferred, either in part or in full.

6.3 OPTIONALLY CONVERTIBLE DEBENTURES AND DEEP DISCOUNT BONDS

Optionally Convertible Debentures (OCDs):

These are the debentures that include the option to get converted into equity. The investor has the option to either convert these debentures into shares at price decided by the issuer/agreed upon at the time of issue.

Advantages of OCD:

(a) Issuer

- **Quasi-Equity:** Dependence of Financial Institutions is reduced because of the inherent option for conversion (i.e. since these are converted into equity, they need not be repaid in the near future.)
- **High Equity Line:** It is possible to maintain Equity Price at a high level, by issuing odd-lot shares consequent to conversion of the debentures, and hence lower floating stocks.
- **Dispensing Ownership:** Optionally Convertible Debentures enable to achieve wide dispersal of equity ownership in small lots pursuant to conversion.
- **Marketability:** The marketability of the issue will become significantly easier, and issue expenses can be expected to come down with the amounts raised becoming more.

(b) Investor

- **Assured Interest:** Investor gets assured interest during gestation periods of the project, and starts receiving dividends once the project is functional and they choose to convert their debentures. Thereby, it brings down the effective gestation period at the investor's end to zero.
- **Secured Investment:** The investment is secured against the assets of the Company, as against Company deposits which are unsecured.
- **Capital Gains:** There is a possibility of Capital Gains associated with conversion, which compensates for the lower interest rate on debentures.

(b) Government

- Debentures helped in mobilizing significant resources from the public and help in spreading the Equity Investors, thereby reducing the pressure on Financial Institutions (which are managed by Government) for their resources.
- By making suitable tax amendments, benefits are extended to promote these instruments, to :-
  (i) safeguard the funds of Financial Institutions,
  (ii) encouraging more equity participation, which will also require a higher compliance under Corporate Laws, whereby organisations can be monitored more effectively.

Disadvantages of OCD:

(a) Issuer

- Ability to match the projected cash inflows and outflows by altering the terms and timing of conversion is diluted, and becomes a function of performance of the Company and hence its market price.

- ❖ The Company is not assured of hefty share premiums based on its past performance and an assured conversion of debentures.
- ❖ Planning of capital structure becomes difficult in view of the uncertainties associated with conversion.

(b) Investor: There are many regulatory requirements to be complied with for conversion.

Deep Discount Bonds (DDBs)

Deep Discount Bond is a form of zero-interest bonds, which are sold at a discounted value (i.e. below par) and on maturity, the face value is paid to investors. A bond that sells at a significant discount from par value and has no coupon rate or lower coupon rate than the prevailing rates of fixed-income securities with a similar risk profile. They are designed to meet the long term funds requirements of the issuer and investors who are not looking for immediate return and can be sold with a long maturity of 25-30 years at a deep discount on the face value of debentures.

Example: Bond of a face value of ₹1Lakh may be issued for ₹5,000 for a maturity value of ₹1,00,000 after 20 Years.

Periodic Redemption: Issuing Company may also give options for redemption at periodical intervals such as 5 Years or 10 Years etc.

No Interest: There is no interest payment during the lock-in / holding period.

Market Trade: These bonds can be traded in the market. Hence, the investor can also sell the bonds in stock market and realize the difference between initial investment and market price.

6.4 ROLLING SETTLEMENT, CLEARING HOUSE OPERATIONS

Rolling Settlement:

Settlement refers to the process in which traders who have made purchases make payments while those who have sold shares, deliver them. The exchange ensures that buyers receive their shares and the sellers receive payment for the same. The process of settlement is managed by stock exchanges through Clearing Houses.

SEBI introduced a new settlement cycle known as the 'rolling settlement cycle'.

A Rolling Settlement is the settlement cycle of the Stock Exchange, where all trades outstanding at the end of the day have to be settled, i.e. the buyer has to make payments for securities purchased and seller has to deliver the securities sold.

Example: In case of T + 1 Settlement, transactions entered on a day should be settled within the next working day. In case of T + 2 Settlement, settlement should be made within two working days from the date of transaction. In India the rolling settlement process was Trading Day (T) +5 but now it is T+3, made effective from April 2002 i.e all transactions to be settled within 3 working days.

Process of Rolling Settlement

1.	Trading	Day of Trading	T
2.	Clearing	Confirmation of Custodial Delivery Generation	T+1 T+1
3.	Settlement	Securities & Funds Pay in Securities & Funds Pay-out	T+2 T+2

Benefits of Rolling Settlement:

(a) In rolling settlements, payments are quicker than in weekly settlements. Thus, investors benefit from increased liquidity,

(b) It keeps cash and forward markets separate,

(c) Rolling settlements provide for a higher degree of safety,

(d) From an investor's perspective, rolling settlement reduces delays. This also reduces the tendency for price trends to get exaggerated. Hence, investors not only get a better price but can also act at their leisure.

International Scenario: Internationally, most developed countries follow the rolling settlement system. For instance, both the US and the UK follow a rolling settlement (T+3) system, while the German stock exchanges follow a (T+2) settlement cycle.

Clearing House Operations (CHO):

Clearing House is a body either owned by or independently associated with an Exchange and charged with the function of ensuring the financial integrity of each trade. Orders entered into by Members are cleared by means of the Clearing House. Clearing Houses provide a range of services related to the Guarantee of Contracts, Clearance and Settlement of Trades, and Management of risk for their Members and Associated Exchanges.

Role of CHO:

(a) It ensures adherence to the system and procedures for smooth trading.

(b) It minimizes credit risks by being a counter party to all trades.

(c) It involves daily accounting of all gains or losses.

(d) It ensures delivery of payment for assets on the maturity dates for all outstanding contracts.

(e) It monitors the maintenance of speculation margins.

Working of CHO:

(a) The clearinghouse acts as the medium of transaction between the buyer and the seller. Every contract between a buyer and a seller is substituted by two contracts so that clearing house becomes the buyer to every seller and the seller to every buyer.

Example: In a transaction where P sells futures to R, R is replaced by the clearing house and the risk taken by P becomes insignificant. Similarly, the credit risk of R is taken over by the clearing house; thus, the credit risk is now assumed by the clearing house rather than by individuals.

(b) The credit risk of the clearing house is minimized by collecting Margins depending upon the volatility of the instrument and adjusted everyday for price movements.

6.5 DEMATERIALISATION, REMATERIALISATION

Dematerialisation:

Dematerialisation is the process of converting physical certificates to an equivalent number of securities in electronic form and credited into the investor's account with his / her Depository Participant. In simple terms, it refers to paperless trading. Dematerialised shares do not have any distinctive numbers. These shares are fungible, which means that all the holdings of a particular security will be identical and interchangeable.

Process of Dematerialisation:

In order to dematerialise physical securities one has to fill in a DRF (Demat Request Form) which is available with the DP and submit the same along with physical certificates that are to be dematerialised. Separate DRF has to be filled for each ISIN. The complete process of dematerialisation is outlined below:

- Surrender certificates for dematerialisation to your DP.
- DP intimates to the Depository regarding the request through the system.
- DP submits the certificates to the registrar of the Issuer Company.
- Registrar confirms the dematerialisation request from depository.

- ❖ After dematerialising the certificates, Registrar updates accounts and informs depository regarding completion of dematerialisation.
- ❖ Depository updates its accounts and informs the DP.
- ❖ DP updates the demat account of the investor.

Scheme:

(a) The Shareholder does not have a certificate to claim ownership of shares in a company. His interest is reflected by way of entries in the books of depository (an intermediary agent who maintains the share accounts of the shareholders)

(b) This is similar to bank account, where the account holder, and not the banker, is the true owner of the money value of sum indicated against his name in the bank's books.

Depository Participant:

(a) A Depository is an organization, which holds securities of investors in electronic form at the request of the investor through a registered Depository Participant. Example: National Depository Securities Limited (NSDL), Central Depository Securities Limited (CSDL).

(b) It also provides services related to transactions in securities.

(c) A Depository Participant (DP) is an agent of the depository registered with SEBI through which it interfaces with the Investor.

Advantages: The advantages of holding securities in demat form are —

Investor's View Point	Issuer-Company's View Point
(a) It is speedier and avoids delay in transfers.	(a) Savings in printing certificates, postage expenses.
(b) Avoids lot of paper work.	(b) Stamp duty waiver.
(c) Saves on stamp duty.	(c) Easy monitoring of buying/selling patterns in securities, increasing ability to spot takeover attempts and attempts at price rigging.

Rematerialisation:

Rematerialisation is the process by which a Client/ Shareholder can get his electronic holdings converted into physical certificates.

Features of Rematerialisation:

(a) A client can rematerialise his dematerialised holdings at any point of time.

(b) The rematerialisation process is completed within 30 days.

(c) The securities sent for rematerialisation cannot be traded.

Process of Rematerialisation:

The process is called rematerialisation. If one wishes to get back his securities in the physical form he has to fill in the RRF (Remat Request Form) and request his DP for rematerialisation of the balances in his securities account. The process of rematerialisation is outlined below:

- ❖ Make a request for rematerialisation.
- ❖ Depository participant intimates depository regarding the request through the system.
- ❖ Depository confirms rematerialisation request to the registrar.
- ❖ Registrar updates accounts and prints certificates.
- ❖ Depository updates accounts and downloads details to depository participant.
- ❖ Registrar dispatches certificates to investor.

6.6 DEPOSITORY SYSTEM

A depository is an organisation which holds securities (like shares, debentures, bonds, government securities, mutual fund units etc.) of investors in electronic form at the request of the investors through a registered Depository Participant. It also provides services related to transactions in securities. At present two Depositories viz. National Securities Depository Limited (NSDL) and Central Depository Services (India) Limited (CDSL) are registered with SEBI.

The increase in the volume of activity on stock exchanges with the advent of on-screen trading coupled with operational inefficiencies of the former settlement and clearing system led to the emergence of a new system called the depository system. The SEBI mandated compulsory trading and settlement of select securities in dematerialized form.

Need for Setting-up a Depository in India:

The need was realized in the 1990s due to various reasons as under:

- A lot of time was consumed in the process of allotment and transfer of shares
- Increase in volume of transactions
- Large scale irregularities in the securities scam of 1992 exposed the limitations of the prevailing settlement system
- Problems associated with dealing in physical shares, such as
  - ✓ problems of theft, fake and/or forged transfers,
  - ✓ share transfer delays particularly due to signature mismatches; and
  - ✓ paper work involved in buying, selling, and transfer leading to costs of handling, storage, transportation, and other back office costs.

To overcome these problems, the Government of India, in 1996, enacted the Depositories Act, 1996 to start depository services in India.

Trading of securities held in Physical and Dematerialised form- Difference

Aspect	Trading of Physical Shares	Trading of Dematerialised Shares
Actual Delivery	Actual Delivery of Share to be exchanged.	No Actual Delivery of shares is needed.
Open Delivery	Open Delivery can be kept.	Not possible to keep Delivery Open.
Time	Processing Time is long.	Processing Time is less.
Stamp Charges	Stamp Charges @0.5% are levied for transfer.	No Stamp Charges are required for transfer.
Sales Transactions	For sales transaction, no charges other than brokerage are levied.	Sales transactions are also charged.
Registration	For buy transaction, document is to be sent to company for Registration.	No need to send the document to the company for Registration.

Depository Process:

There are four parties in a demat transaction: the customer, the depository participant (DP), the depository, and the share registrar and transfer agent (R&T). A Depository Participant (DP) is an agent of the depository through which it interfaces with the investor and provides depository services. Public financial institutions, scheduled commercial banks, foreign banks operating in India with the approval of the Reserve Bank of India, state financial corporations, custodians, stock-brokers, clearing corporations /clearing houses, NBFCs and Registrar to an Issue or Share Transfer Agent complying with the requirements prescribed by SEBI can be registered as DP. Banking services can be availed through a branch whereas depository services can be availed through a DP. The investor

has to enter into an agreement with the DP after which he is issued a client account number or client ID number. PAN Card is now mandatory to operate a demat account.

To become a qualified Depository Participant, a SEBI registered DP shall fulfill the following:

- DP shall have net worth of ₹50 crore or more;
- DP shall be either a clearing bank or clearing member of any of the clearing corporations;
- DP shall have appropriate arrangements for receipt and remittance of money with a designated Authorised Dealer (AD) Category - I bank;
- DP shall demonstrate that it has systems and procedures to comply with the FATF Standards, Prevention of Money Laundering (PML) Act, Rules and SEBI circulars issued from time to time; and
- DP shall obtain prior approval of SEBI before commencing the activities relating to opening of accounts of QFI.

Note: The eligibility criteria for qualified Depository Participant as per SEBI circulars vide Cir/IMD/ DF/14/2011 and Cir/IMD/FII&C/3/2012 dated August 9, 2011 and January 13, 2012.

As per the available statistics at BSE and NSE, 99.9% transactions take place in dematerialised mode only. Therefore, in view of the convenience of trading in dematerialised mode, it is advisable to have a beneficial owner (BO) account for trading at the exchanges.

However to facilitate trading by small investors (Maximum 500 shares, irrespective of their value) in physical mode the stock exchanges provide an additional trading window, which gives one time facility for small investors to sell physical shares which are in compulsory demat list. The buyer of these shares has to demat such shares before further selling.

Merits and Demerits of Depository system of recording shares and trading in shares and securities:

(A) Advantages:

1) **Immediate Transfer and Registration:** In the depository environment, once the securities are credited to the investors account on payout, he becomes the legal owner of the securities, without any requirement to register with the Company's Registrar. Securities are held in a safe and convenient manner.

2) **Short Settlement cycle:** The exclusive demat segments follow rolling settlement cycle of T + 2, i.e. the settlement of trades will be on the 2nd working day from the trade day. This will enable faster turnover of stock, faster disbursement of non-cash corporate benefits like rights, bonus, etc. and also more liquidity with the investor.

3) **Low Transaction Cost:**

   (a) **No Stamp Duty:** No stamp duty attached to any kind of securities in the depository. This waiver extends to Equity Shares, Debt Instruments and Units of Mutual Funds, thereby lowering the transaction cost / charges.

   (b) **Lower Operating Cost:** Depository System provides the benefit of dealing in dematerialized securities and hence reduces the cost of back office cost of handling paper and also eliminates the risk of introducing the Broker.

4) **Reporting:** Depository System facilitates obtaining periodic status reports to investors on their holdings and transactions, leading to better controls.

5) **Elimination of bad deliveries:** In a depository environment, once holdings of an investor are dematerialized, the question of bad delivery does not arise, i.e. they cannot be held "under objection".

6) **Elimination of Risks:** The risk of theft of stocks, mutilation of certificates, loss of certificates during movements, etc. does not arise in case of dealing in Securities through Depository System.

7) **Single Point Interface:**

(a) Depository System eliminates the cumbersome procedure in connection with change of address or transmission of demat shares. Investors have to only inform their Depository Participant (DP) with all relevant documents and the required changes are effected in the database of all the companies, where the investor is a registered holder of securities.

(b) There is automatic credit into the demat account of shares, arising out of bonus / split / consolidation/ merger etc.

(c) There is ease in portfolio monitoring, since statement of account gives a consolidated position of investments in all instruments.

(B) Disadvantages:

1) **System Failure:** Input control, process control and output control apply equally to the dematerialization process as they do to any computerized environment. Unforeseen Errors and Frauds, on the part of the individuals entrusted with protecting data integrity, could lead to chaos and Heavy Financial Losses.

2) **Additional record keeping:** In built provisions for rematerialisation exist to take care of the needs of individuals who wish to hold securities in physical form. Companies will invariably need to maintain records on a continuous basis for securities held in physical form. Periodical reconciliation between DEMAT segment and physical segment becomes necessary.

3) **Additional Costs:** For transacting business, investors have to deal not only with brokers but also with Depository Participant which thus adding to the list of intermediaries. A onetime fee is levied by the Depository Participant which small investors consider to be an avoidable cost.

4) **Fraud:** Dematerialization is not a remedy for all ills. Unlawful transfers by individuals against whom insolvency proceedings are pending or transfers by attorney holders with specific or limited powers are possible as in any physical transaction.

6.7 INITIAL PUBLIC OFFER (IPO)/FOLLOW ON PUBLIC OFFER (FPO); BOOK BUILDING

Initial Public Offer (IPO):

An initial public offering (IPO) or stock market launch is a type of public offering where shares of stock in a company are sold to the general public, on a securities exchange, for the first time. Through this process, a private company transforms into a public company. It is an offering of either a fresh issue of securities or an offer for sale of existing securities, or both by an unlisted company for the first time to the public. Initial public offerings are used by companies to raise expansion capital, to possibly monetize the investments of early private investors, and to become publicly traded enterprises. A company selling shares is never required to repay the capital to its public investors. After the IPO, when shares trade freely in the open market, money passes between public investors. Although an IPO offers many advantages, there are also significant disadvantages. Chief among these are the costs associated with the process, and the requirement to disclose certain information that could prove helpful to competitors, or create difficulties with vendors. Details of the proposed offering are disclosed to potential purchasers in the form of a lengthy document known as a prospectus. Most companies undertaking an IPO do so with the assistance of an investment banking firm acting in the capacity of an underwriter. Underwriters provide a valuable service, which includes help with correctly assessing the value of shares (share price), and establishing a public market for shares (initial sale). Alternative methods such as the dutch auction have also been explored. In terms of size and public participation, the most notable example of this method is the Google IPO. China has recently emerged as a major IPO market, with several of the largest IPOs taking place in that country.

The SEBI has laid down eligibility norms for entities raising funds through an IPO and an FPO. The entry norms for making an IPO of equity shares or any other security which may be converted into or exchanged with equity shares at a later date are as follows:

- ✓ Entry Norm I- Profitability Route
- ✓ Entry Norm II- QIB Route
- ✓ Entry Norm III- Appraisal Route

However, the SEBI has exempted the following entities from entry norms:

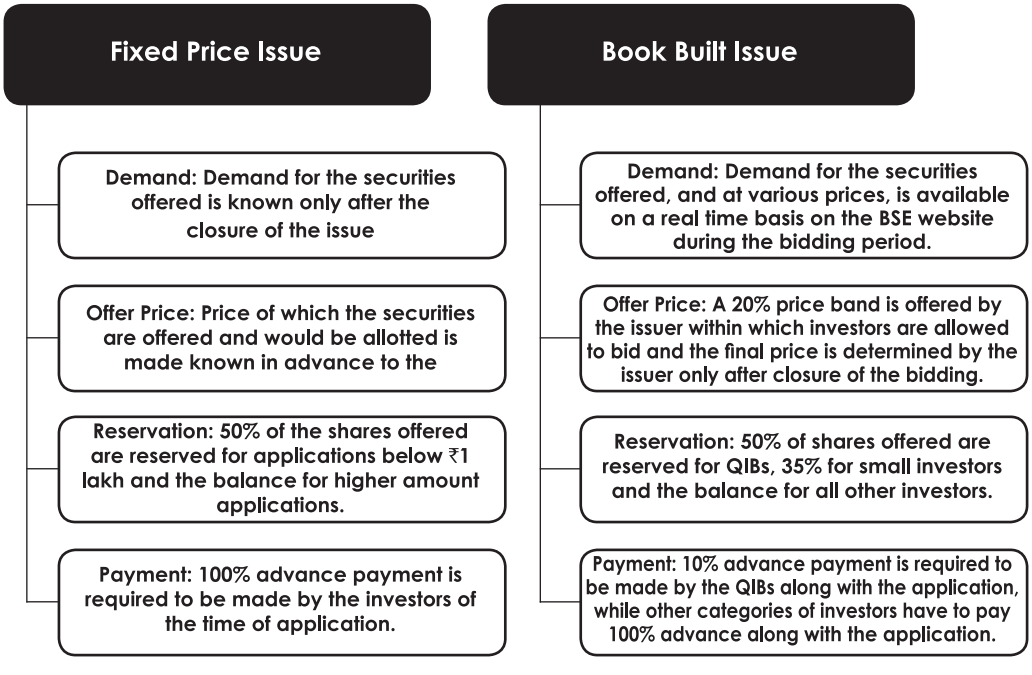
- Private sector banks.
- Public sector banks.
- An infrastructure company whose project has been appraised by a PFI or IDFC or IL&FS or a bank which was earlier a PFI and not less than 5 per cent of the project cost is financed by any of these institutions.
- Rights issue by a listed company.

A company cannot make a public or rights issue of debt instruments unless it fulfills the following two conditions: credit rating of not less than investment grade is obtained from not less than two SEBI registered credit rating agencies and it should not be in the list of willful defaulters of the Reserve Bank. Moreover, it should not have defaulted payment of interest or repayment of principal, if any, for a period of more than six months.

The IPO process in India consists of the following steps:

- Appointment of merchant banker and other intermediaries
- Registration of offer document
- Marketing of the issue
- Post- issue activities

Allotment to various investor categories:



Follow On Public Offer (FPO):

A follow-on offering (often but incorrectly called secondary offering) is an offer of sale of securities by a listed company. A follow-on offering can be either of two types (or a mixture of both): dilutive and non-dilutive. A secondary offering is an offering of securities by a shareholder of the company (as opposed to the company itself, which is a primary offering). A follow on offering is preceded by release of prospectus similar to IPO: a Follow-on Public Offer (FPO).

For example, Google's initial public offering (IPO) included both a primary offering (issuance of Google stock by Google) and a secondary offering (sale of Google stock held by shareholders, including the founders).

In the case of the dilutive offering, the company's board of directors agrees to increase the share float for the purpose of selling more equity in the company. This new inflow of cash might be used to pay off some debt or used for needed company expansion. When new shares are created and then sold by the company, the number of shares outstanding increases and this causes dilution of earnings on a per share basis. Usually the gain of cash inflow from the sale is strategic and is considered positive for the longer term goals of the company and its shareholders. Some owners of the stock however may not view the event as favorably over a more short term valuation horizon.

One example of a type of follow-on offering is an at-the-market offering (ATM offering), which is sometimes called a controlled equity distribution. In an ATM offering, exchange-listed companies incrementally sell newly issued shares into the secondary trading market through a designated broker- dealer at prevailing market prices. The issuing company is able to raise capital on an as-needed basis with the option to refrain from offering shares if unsatisfied with the available price on a particular day.

The non-dilutive type of follow-on offering is when privately held shares are offered for sale by company directors or other insiders (such as venture capitalists) who may be looking to diversify their holdings. Because no new shares are created, the offering is not dilutive to existing shareholders, but the proceeds from the sale do not benefit the company in any way. Usually however, the increase in available shares allows more institutions to take non-trivial positions in the company.

As with an IPO, the investment banks who are serving as underwriters of the follow-on offering will often be offered the use of a green shoe or over-allotment option by the selling company.

A non-dilutive offering is also called a secondary market offering. Follow on Public offering is different from initial public offering.

- ❖ IPO is made when company seeks to raise capital via public investment while FPO is subsequent public contribution.
- ❖ First issue of shares by the company is made through IPO when company first becoming a publicly traded company on a national exchange while Follow on Public Offering is the public issue of shares for an already listed company.

SEBI has introduced fast track issues (FTI) in order to enable well-established and compliant listed companies satisfying certain specific entry norms/conditions to raise equity through follow-on and rights issues. These norms reduce the process of issue and thereby the time period thus enabling issuers a quick access to primary capital market. Such companies can proceed with follow-on public offers (FPOs)/right issues by filing a copy of Red Herring Prospectus (RHP)/prospectus with the registrar of companies (RoC) or the letter of offer with designated stock exchange (SE), SEBI and stock exchanges. Moreover, such companies are not required to file draft offer document for SEBI comments and to stock exchanges as the relevant information is already in the public domain.

Book Building:

Book-building means a process by which a demand for the securities proposed to be issued by a body corporate is elicited and built up and the price for such securities is assessed for the determination of the quantum of such securities to be issued by means of notice/ circular / advertisement/ document or information memoranda or offer document. It is a mechanism where, during the period for which the book for the offer is open, the bids are collected from investors at various prices, which are within the price band specified by the issuer. The process is directed towards both the institutional as well as the retail investors. The issue price is determined after the bid closure based on the demand generated in the process.

The book-building system is part of Initial Public Offer (IPO) of Indian Capital Market. It was introduced by SEBI on recommendations of Mr. Y.H. Malegam in October 1995. It is most practical, fast and efficient management of Mega Issues. Book Building involves sale of securities to the public and the institutional bidders on the basis of predetermined price range.

- ❖ Book Building is a price discovery mechanism and is becoming increasingly popular as a method of issuing capital. The idea behind this process is to find a better price for the issue.
- ❖ The issue price is not determined in advance. Book Building is a process wherein the issue price of a security is determined by the demand and supply forces in the capital market.

- ❖ Book building is a process used for marketing a public offer of equity shares of a company and is a common practice in most developed countries.
- ❖ Book building is called so because it refers to the collection of bids from investors, which is based on an indicative price range. The issue price is fixed after the bid closing date. The various bids received from the investors are recorded in a book that is why the process is called Book Building.
- ❖ Unlike international markets, India has a large number of retail investors who actively participate in Initial Public Offer (IPOs) by companies. Internationally, the most active investors are the mutual funds and other institutional investors, hence the entire issue is book built. But in India, 25 per cent of the issue has to be offered to the general public. Here there are two options with the company.
- ❖ An issuer company may make an issue of securities to the public through a prospectus in the following manner :
- ✓ 100% of the net offer to the public through the book building process, or
- ✓ 75% of the net offer to the public through the book building process and 25% at the price determined through the book building.

Book Building Process:

1. The issuer company shall appoint an eligible Merchant Banker(s) as book runner(s) and their name(s) shall be mentioned in the draft prospectus submitted to SEBI.
2. The issuer company shall enter into an agreement with one or more of the Stock Exchange(s) which have the requisite system of online offer of securities.
3. The draft prospectus shall be filed with SEBI by the Lead Merchant Banker as per the SEBI Regulations containing all the disclosures except that of price and the number of securities to be offered to the public.
4.
   (a) The Book Runner(s)/syndicate members shall appoint brokers of the exchange, who are registered with SEBI, for the purpose of accepting bids, applications and placing orders with the company and ensure that the brokers so appointed are financially capable of honouring their commitments arising out of defaults of their clients/investors, if any.

   (b) The brokers so appointed, accepting applications and application monies, shall be considered as 'bidding/collection centres.

   (c) The brokers so appointed, shall collect the money from his/their client for every order placed by him/ them and in case the client/investor fails to pay for shares allocated as per the Regulations, the broker shall pay such amount.

   (d) The company shall pay to the broker(s) a commission/fee for the services rendered by him/ them.

   (e) The Red herring prospectus shall disclose, either the floor price of the securities offered through it or a price band along with the range within which the price can move, if any. However, the issuer may not disclose the floor price or price band in the red herring prospectus if the same is disclosed in case of an IPO, at least two working days before the opening of the bid and in case of an FPO, at least one working day before the opening of the bid, by way of an announcement in all the newspapers in which the pre-issue advertisement was released by the issuer or the merchant banker.

   (f) In case the red herring prospectus discloses the price band, the lead book runner shall ensure compliance with the following conditions:

      (i) The cap of the price band should not be more than 20% of the floor of the band; i.e., cap of the price band shall be less than or equal to 120% of the floor of the price band.

      (ii) The price band can be revised during the bidding period in which case the maximum revision on either side shall not exceed 20% i.e., floor of the price band can move up or down to the extent of 20% of floor of the price band disclosed in the red herring prospectus and the cap of the revised price band will be fixed in accordance with clause (i) above.

      (iii) Any revision in the price band shall be widely disseminated by informing the stock exchanges, by

issuing press release and also indicating the change on the relevant website and the terminals of the syndicate members.

(iv) In case the price band is revised, the bidding period shall be extended for a further period of three days, subject to the total bidding period not exceeding thirteen days.

5. The issuer company shall after receiving the final observations, if any, on the offer document from SEBI make an advertisement in an English National daily with wide circulation, one Hindi National newspaper and Regional language newspaper with wide circulation at the place where the registered office of the Issuer company is situated.

6. Bids shall be open for at least 3 working days and not more than 7 working days, which may be extended to a maximum of 10 working days in case the price band is revised.

7. RIIs may bid at 'cut-off' price instead of their writing the specific bid prices in the bid forms.

8. Once the final price is determined, all those bidders whose bids have been found to be successful shall become entitled for allotment of securities.

9. The broker may collect an amount to the extent of 100% of the application money as margin money from the clients/investors before he places an order on their behalf.

10. Additional Disclosures:

(a) The particulars of syndicate members, brokers, registrars, bankers to the issue, etc.

(b) Statement to be given under the 'basis for issue price'

'The issue price has been determined by the Issuer in consultation with the Book Runner(s), on the basis of assessment of market demand for the offered securities by way of book-building.'

(c) The following accounting ratios shall be given under the basis for issue price for each of the accounting periods for which the financial information is given:

(i) EPS, pre-issue, for the last three years.

(ii) P/E pre-issue.

(iii) Average return on net worth in the last three years.

(iv) Comparison of all the accounting ratios of the issuer company as mentioned above with the industry average and with the accounting ratios of the peer group.

11. On determination of the entitlement under clause 6 , the information regarding the same (i.e., the number of securities to which the investor becomes entitled) shall be intimated immediately to the investors.

12. The final prospectus containing all disclosures as per SEBI Guidelines including the price and the number of securities proposed to be issued shall be filed with the ROC.

13. The investors who had not participated in the bidding process or have not received intimation of entitlement of securities under clause 8 may also make an application.

14. In case an issuer company makes an issue of 100% of the net offer to public through 100% Book Building process:

- 50% of shares offered are reserved for QIBs, not less than 35% for small investors and the balance (not less than 15%) for all other investors (i.e., non-institutional investors).

Provided that, 50% of the issue size shall be mandatorily allotted to the QIBs in case of compulsorily book built issues, failing which the full subscription monies shall be refunded.

In case the book built issues are made pursuant to the requirement of mandatory allocation of 60% to QIBs in terms of Rule 19(2)(b) of Securities Contract (Regulation) Rules, 1957, the respective figures are 30% for RIIs and 10% for NIIs.

15. The company, Lead Manager/Book Runner shall announce the pay-in day and intimate the same to brokers and stock exchange. It shall be responsibility of the broker to deposit the amount in the Escrow Account to the extent of allocation to his clients on the pay-in date.

16. On receipt of the basis of allocation data, the brokers shall immediately intimate the fact of allocation to their client/applicant.
17. The broker shall refund the margin money collected earlier, within 3days of receipt of basis of allocation, to the applicants who did not receive allocation.
18. The brokers shall give details of the amount received from each client/investor and the names of clients/ investors who have not paid the application money to Registrar/Book Runner and to the exchange.
19. Trading shall commence within 6 days from the closure of the issue failing which interest @ 15% p.a. shall be paid to the investors.

Advantages of Book Building:

1. The book building process helps in discovery of price & demand.
2. The costs of the public issue are much reduced.
3. The time taken for the completion of the entire process is much less than that in the normal public issue.
4. In book building, the demand for the share is known before the issue closes. Infact, if there is not much demand, the issue may be deferred.
5. It inspires investors' confidence leading to a large investor universe.
6. Issuers can choose investors by quality.
7. The issue price is market determined.

Disadvantages of Book Building:

1. There is a possibility of price rigging on listing as promoters may try to bail out syndicate members.
2. The book building system works very efficiently in matured market conditions. But, such conditions are not commonly found in practice.
3. It is appropriate for the mega issues only.
4. The company should be fundamentally strong & well known to the investors without it book building process will be unsuccessful.

Recent Example: Recent example of a book building process in Indian context is the IPO of Reliance Power. The issue was made through 100 % book building process. The price band for the book building process was between ₹405 and ₹450 with ₹20 discount for retail investors.

Reverse Book Building:

It is method of buy-back of securities. It is an efficient price discovery mechanism adopted when the company aims to buy the Shares from the public and other Shareholders. This is generally done when the company wishes to delist itself from the trading exchanges.

Process for Reverse Book Building:

- ❖ The acquiring company secures board and shareholders' approval to delist the shares.
- ❖ The acquirer shall appoint a designated BRLM to execute the process.
- ❖ The BRLM decides the floor price and the dates for inviting bids from the shareholders. The floor price shall not be less than the following:

  (a) where the equity shares are frequently traded in all the recognised stock exchanges where they are listed, the average of the weekly high and low of the closing prices of the equity shares of the company during the 26 weeks or 2 weeks preceding the date on which the recognised stock exchanges were notified of the board meeting in which the delisting proposal was considered, whichever is higher, as quoted on the recognised stock exchange where the equity shares of the company are most frequently traded;

  (b) where the equity shares of the company are infrequently traded in all or some of the recognised stock exchanges, the floor price shall be determined by the BRLM taking into account the following factors:

(i) the highest price paid by the promoter for acquisitions, if any, of equity shares of the class sought to be delisted, including by way of allotment in a public or rights issue or preferential allotment, during the 26 weeks period prior to the date on which the recognised stock exchanges were notified of the board meeting in which the delisting proposal was considered and after that date upto the date of the public announcement; and, (ii) other parameters including return on net worth, book value of the shares of the company, earning per share, price earning multiple vis-a-vis the industry average.

- The acquiring company shall, upon receipt of in principle approval for delisting from the recognised stock exchange, make a public announcement in at least one English national daily with wide circulation, one Hindi national daily with wide circulation, and one regional language newspaper of the region where the concerned recognised stock exchange is located.
- Before making the public announcement, the acquiring company shall open an escrow account and deposit therein the total estimated amount of consideration calculated on the basis of floor price and number of equity shares outstanding with public shareholders. The escrow account shall consist of either cash deposited with a scheduled commercial bank, or a bank guarantee in favour of the merchant banker, or a combination of both.
- The acquiring company shall despatch the letter of offer to the public shareholders of equity shares, not later than 45 working days from the date of the public announcement, so as to reach them at least 5 working days before the opening of the bidding period. The letter of offer shall be sent to all public shareholders holding equity shares of the class sought to be delisted whose names appear on the register of the company or depository as on the date specified in the public announcement.
- The date of opening of the offer shall not be later than 55 working days from the date of the public announcement. The offer shall remain open for a minimum period of three working days and a maximum period of five working days, during which the public shareholders may tender their bids.
- Bidding will be done only in the electronic form and through the stock exchanges trading mechanism.
- The holders of physical equity shares may send their bidding form together with the share certificate and transfer deed to the trading member appointed for the purpose, who shall immediately after entering their bids on the system send them to the company or the share transfer agent for confirming their genuineness. The company or the share transfer agent shall deliver the certificates which are found to be genuine to the merchant banker, who shall not make it over to promoter unless the bids in respect thereof are accepted and payment made. The bids in respect of the certificates which are found to be not genuine shall be deleted from the system.
- The BRLM will give the list of trading members who are eligible to participate in the reverse book building process to the stock exchange.
- Bids will be placed through trading members at the bidding centres, whom the public shareholders may approach for placing bids on the on-line electronic system and will have to be made at or above the floor price.
- There is no cap on the bid price and revision of bids is possible. The shareholders may withdraw or revise their bids upwards not later than one day before the closure of the bidding period. Downward revision of bids is not permitted.
- The acquiring company shall not be bound to accept the equity shares at the offer price determined by the book building process. Where the acquiring company decides not to accept the offer price so determined,
  - ✓ the company shall not acquire any equity shares tendered pursuant to the offer and the equity shares deposited or pledged by a shareholder shall be returned or released to him within ten working days of closure of the bidding period;
  - ✓ the company shall not make the final application to the exchange for delisting of the equity shares;
  - ✓ the promoter may close the escrow account;
  - ✓ in a case where the public shareholding at the opening of the bidding period was less than the minimum level of public shareholding required under the listing agreement, the acquiring company shall ensure that the public shareholding shall be brought up to such minimum level within a period of six months from the date of closure of the bidding.

- Within eight working days of closure of the offer, the BRLM shall make a public announcement in the same newspapers in which the public announcement was made regarding:
  - ✓ the success of the offer along with the final price accepted by the acquirer; or
  - ✓ the failure of the offer
  - ✓ rejection of the final price discovered by the promoters.
- Where, pursuant to acceptance of equity shares tendered in terms of these regulations, the equity shares are delisted, any remaining public shareholder holding such equity shares may tender his shares to the promoter upto a period of at least one year from the date of delisting and, in such a case, the promoter shall accept the shares tendered at the same final price at which the earlier acceptance of shares was made. The payment of consideration for shares accepted shall be made out of the balance amount lying in the escrow account.

The reverse book building route is a difficult and costly process. Price discovery is a problem in case of small companies as their shares are thinly traded, making it difficult to delist through the reverse book building route. Unless the shares are delisted, the small companies have to pay all listing charges.

6.8 AUCTION & INSIDER TRADING

Auction

The various auction methods in securities market are:

1. **Yield Based Auction:** A yield based auction is generally conducted when a new Government security is issued. Investors bid in yield terms up to two decimal places (for example, 8.19 per cent, 8.20 per cent, etc.). Bids are arranged in ascending order and the cut-off yield is arrived at the yield corresponding to the notified amount of the auction. The cut-off yield is taken as the coupon rate for the security. Successful bidders are those who have bid at or below the cut-off yield. Bids which are higher than the cut-off yield are rejected.
2. **Price Based Auction:** A price based auction is conducted when Government of India re-issues securities issued earlier. Bidders quote in terms of price per ₹100 of face value of the security (e.g., ₹102, ₹101, ₹100, ₹99, etc., per ₹100). Bids are arranged in descending order and the successful bidders are those who have bid at or above the cut-off price. Bids which are below the cut- off price are rejected. Depending upon the method of allocation to successful bidders, auction could be classified as **Uniform Price** based and **Multiple Price** based.

   (i) Uniform Price Based or Dutch Auction: All the successful bidders are required to pay for the allotted quantity of securities at the same rate, i.e., at the auction cut-off rate, irrespective of the rate quoted by them. This method is followed in the case of 91 days treasury bills only.

   (ii) Multiple Price Based or French Auction: All bids equal to or above the cut-off price are accepted.

   However, the successful bidders are required to pay for the allotted quantity of securities at the respective price/yield at which they have bid. This method is followed in the case of 364 days treasury bills and is valid only for competitive bidders. An investor may bid in an auction under either of the following categories:

   - ✓ **Competitive Bidding:** In a competitive bidding, an investor bids at a specific price / yield and is allotted securities if the price / yield quoted is within the cut-off price / yield. Competitive bids are made by well informed investors such as banks, financial institutions, primary dealers, mutual funds, and insurance companies. The minimum bid amount is ₹10,000 and in multiples of ₹10,000 thereafter. Multiple bidding is also allowed, i.e., an investor may put in several bids at various price/ yield levels.
   - ✓ **Non-Competitive Bidding:** With a view to providing retail investors, who may lack skill and knowledge to participate in the auction directly, an opportunity to participate in the auction process, the scheme of non-competitive bidding in dated securities was introduced in January 2002. Non-competitive bidding is open to individuals, HUFs, RRBs, co-operative banks, firms, companies, corporate bodies,

institutions, provident funds, and trusts. Under the scheme, eligible investors apply for a certain amount of securities in an auction without mentioning a specific price / yield. Such bidders are allotted securities at the weighted average price / yield of the auction. The participants in non-competitive bidding are, however, required to hold a gilt account with a bank or PD. Regional Rural Banks and co-operative banks which hold SGL and Current Account with the RBI can also participate under the scheme of non-competitive bidding without holding a gilt account. The minimum amount and the maximum amount for a single bid is ₹10,000 and ₹2 crore respectively in the case of an auction of dated securities.

Insider Trading

Insider Trading is the use of confidential information about a business gained through employment in a company or a stock brokerage, to buy and/or sell stocks and bonds based on the private knowledge that the value will go up or down.

It is buying or selling or dealing in securities of a Listed company by Director, Member of Management, an Employee or any other person such as Internal or Statutory Auditor, Agent, Advisor, Analyst Consultant etc. who have knowledge of material, 'inside' information not available to general public.

Illegal: Dealing in securities by an insider is illegal when it is predicated upon utilization of inside information to profit at the expense of other investors who do not have access to such investment information. It is prohibited and is considered as an offence as per SEBI (Insider Trading) Regulations,1992.

Punishable: Insider trading is an unethical practice resorted by those in power, causing huge losses to common investors thus driving them away from capital market, and hence punishable.

Two decades have passed since the SEBI (Prohibition of Insider Trading) Regulations, 1992 were notified which was framed to deter the practice of insider trading in the securities of listed companies. Since then there have been several amendments to the Regulations and judicial paradigm through case laws have also evolved in India. In fact, world over, the regulatory focus is shifting towards containing the rising menace of insider trading effectively. To ensure that the regulatory framework dealing with insider trading in India is further strengthened, SEBI seeks review of the extant Insider Trading Regulatory regime in India.

The Securities and Exchange Board of India (Prohibition of Insider Trading) Regulations 1992 requires that a person who is connected with a listed company and is in possession of any unpublished price sensitive information likely to materially affect the price of securities of company, shall not:

(i) On his behalf or on behalf of any other person deal in securities or

(ii) Communicate such information to any other person, who while in possession of such information shall not deal in securities.

Accordingly, SEBI has constituted a High Level Committee under the Chairmanship of Hon'ble Justice Mr. N. K. Sodhi, retired Chief Justice of Karnataka High Court and Former Presiding officer of the Securities Appellate Tribunal, for reviewing the SEBI (Prohibition of Insider Trading) Regulations, 1992.

With a moto to strengthen the insider trading regulations further in India SEBI decided to review the existing regulations of Insider Trading hence and formed a committee under Chairmanship of Hon'ble Justice N. K. Sodhi. The committee formed by SEBI after several discussions has proposed a new regulation in place of the existing regulations. Based on their recommendation and proposal the new regulations have been approved by SEBI in its Board meeting held on November 19, 2014. Finally SEBI (Prohibition of Insider Trading) Regulations 2015 has been notified in January 2015 and has been made effective from May 2015. It is expected that the new regulations will strengthen the laws of insider trading within India as well as beyond the national boundaries, will provide clarity in definitions and concepts, and help to carry out transactions lawfully. The very recent is the SEBI (Prohibition of Insider Trading) Regulations 2015. The objective of this amendment is to strengthen the legal framework of insider trading. Those recent changes relating to insider trading are to strengthen the legal and enforcement framework, aligning insider trading norms with international practices, clarity in some definitions and concepts and lastly facilitating legitimate business transactions.

6.9 CREDIT RATING – OBJECTIVES, SOURCES, PROCESS, CREDIT RATING AGENCIES IN INDIA

Credit Rating is the assessment of a borrower's credit quality. It is the assessment carried out from the viewpoint of credit-risk evaluation on a specific date, on the quality of a-

- Specific debt-security issued, or
- Obligation undertaken by an enterprise (Term Loans, etc.)

Areas of Assessment: Assessment is done on the:-

- **Ability:** Financial Strength,
- **Willingness:** Integrity and Attitude, of the obligant to meet principal and interest payments on the rated debt instrument in a timely manner.

Need for Credit Rating: A Firm has to ascertain the credit rating of prospective customers, to ascertain how much and how long can credit be extended. Credit can be granted only to a customer who is reliably sound. This decision would involve analysis of the financial status of the party, his reputation and previous record of meeting commitments.

Feature: Ratings are expressed in alphabetical or alphanumeric symbols, enabling the investor to differentiate between debt instruments based on their underlying credit quality.

Credit Rating do not measure the following-

1) **Investment Recommendation:** Credit Rating does not make any recommendation on whether to invest or not.
2) **Investment Decision:** They do not take into account the aspects that influence an investment decision.
3) **Issue Price:** Credit Rating does not evaluate the reasonableness of the issue price, possibilities for capital gains or liquidity in the secondary market.
4) **Risk of Prepayment:** Ratings do not take into account the risk of prepayment by issuer, or interest or exchange risks.
5) **Statutory Compliance:** Credit Rating does not imply that there is absolute compliance of statutory requirements in relation to Audit, Taxation, etc. by-the issuing company.

Objectives:

1) To maintain investors' confidence.
2) To protect the interest of investors.
3) To provide low cost and reliable information to the investors in debt securities.
4) To act as a tool for marketing of debt securities.
5) To improve a healthy discipline on borrowers.
6) To help merchant bankers, financial intermediaries and regulatory authorities in discharging their functions related to the issue of debt securities.
7) To provide greater financial and accounting information of the issuers of securities to the investors.
8) To facilitate and formulate public guidelines on institutional investment.
9) To reduce interest costs for highly rated companies.
10) To motivate savers to invest in debt securities for the development of trade and industry.

Benefits:

Guidance to Investors: To provide guidance to investors / creditors in determining a credit risk associated with a debt instrument / credit obligation.

(a) Current Opinion on Credit Risk: Credit Rating is based on the relative capability and willingness of the issuer of the instrument to service the debt obligations (both principal and interest) as per the terms of the contract. Thus, it acts as an indicator of the current opinion of the credit risk and can be changed from time to time.

(b) Relative Ranking: Credit Rating ranks the fixed income investment based on the probability of it (Investment/ Instrument) defaulting, in comparison with other rated instruments.

Limitations:

(a) Rating Changes: Rating given to instruments can change over a period of time. They have to be kept under rating watch. Downgrading of an instrument may not be timely enough to help investors.

(b) Industry Specific rather than Company Specific: Downgrades are linked to industry rather than company performance. Agencies give importance to macro aspects and not to micro ones; over react to existing conditions which come from optimistic / pessimistic views arising out of up / down turns.

(c) Cost -Benefit of Rating: Ratings being mandatory, it becomes a must for entities rather than carrying out Cost Benefit Analysis of obtaining such, ratings. Rating should be optional and the entity should be free to decide on the issue of obtaining a credit rating.

(d) Conflict of Interest: The rating agency collects fees from the entity it rates leading to a conflict of interest. Rating market being competitive there is a possibility of such conflict entering into the rating system especially in a case where the rating agencies get their revenues from a single service or group.

(e) Transparency: Greater transparency in the rating process should exist an example being the disclosure of assumptions leading to a specific public rating.

Process of Credit Rating:

The steps involved in the Credit Rating are:

1) Rating Request: The Customer (prospective issuer of Debt Instrument) makes a formal request to the Rating Agency. The request spells out the terms of the rating assignment and contains analysis of the issues viz. historical performance, competitive position, business risk profile, business strategies, financial policies and evaluation of outlook for performance. Information requirements are met through various sources like references, reviews, experience, etc.

2) Formation of Rating Team: The Credit Rating Agency forms a team, whose composition is based on the expertise and skills required for evaluating the business of the Issuer.

3) Initial Analysis: On the basis of the information gathered, the analysts submit the report to the Rating team. The authenticity and validity of the information submitted influences the credit rating activity.

4) Evaluation by Rating Committee: Rating Committee is the final authority for assigning ratings. The rating team makes a brief presentation about the issuers' business and the management. All the issues identified during discussions stage are analysed.

5) Actual Rating: Rating is assigned and all the issues, which influence the rating, are clearly spelt out.

6) Communication to Issuer: Assigned rating together with the key issues is communicated to the issuer's top management for acceptance. The ratings, which are not accepted, are either rejected or reviewed. The rejected ratings are not disclosed and complete confidentiality is maintained.

7) Review of Rating: If the rating is not acceptable to the issuer, he has a right to appeal for a review of the rating. These reviews are usually taken up, only if the issuer provides fresh inputs on the issues that were considered for assigning the rating. Issuer's response is presented to the Rating Committee. If the inputs are convincing, the Committee can revise the initial rating decision.

8) Surveillance / Monitoring: Credit Rating Agency monitors the accepted ratings over the tenure of the rated instrument. Ratings are reviewed every year, unless warranted earlier. During this course, the initial rating could be retained, upgraded or downgraded.

Credit Rating Symbols in India:

Credit rating agencies generally use symbols to express the creditworthiness rather than give marks or descriptive credit opinion. Rating symbols indicate relative creditworthiness of securities within a defined frame of reference. A simple alphanumeric symbol is normally used to convey a credit rating. The credit rating agencies of India assign the following ratings to the companies:

1. AAA- Highest Safety
2. AA- High Safety

3. A-Adequate Safety
4. BBB- Moderate Safety
5. BB- Inadequate Safety
6. B- High Risk
7. C- Substantial Risk
8. D- Default Risk

Various Credit Rating Agencies in India:

There are five credit rating agencies registered with the SEBI. They are outlined as follows:

1. **CRISIL Limited (Formerly the Credit Rating Information Services of India Limited) :-**
   - **(a)** CRISIL is the oldest rating agency originally promoted by ICICI.
   - **(b)** **Services Offered:** CRISIL offers a comprehensive range of integrated product and service offerings - real time news, analyzed data, opinion and expert advice - to enable investors, issuers, policy makers de-risk their business and financial decision making, take informed investment decisions and develop workable solutions.
   - **(c)** **Risk Standardisation:** CRISIL helps to understand, measure and standardise risks - financial and credit risks, price and market risks, exchange and liquidity risks, operational, strategic and regulatory risks.
2. **ICRA Limited (Formerly Investment Information and Credit Rating Agency of India)** –
   - **(a)** ICRA is an independent and professional Company, providing investment information and credit rating services.
   - **(b)** **Activities:** ICRA executes assignments in credit ratings, equity grading, and mandated studies spanning diverse, industrial sectors. ICRA has broad based its services to the corporate and financial sectors, both in India and overseas and offers its services under three banners namely- Rating Services, Information Services, Advisory Services.
3. **CARE (Credit Analysis and Research Limited)** –
   - **(a)** CARE is equipped to rate all types of debt instruments like Commercial Paper, Fixed Deposit, Bonds, Debentures and Structured Obligations.
   - **(b)** **Services:** CARE's Information and Advisory services group prepares credit reports on specific requests from banks or business partners, conducts sector studies and provides advisory services in the areas of financial restructuring, valuation and credit appraisal systems.
4. **Fitch Ratings India Private Limited:** Fitch Rating India was formerly known as DCR India- Duff and Phelps Credit Rating Co. Fitch Ratings, USA and DCR India merged to form a new entity called Fitch India. Fitch India is a 100% subsidiary of Fitch Ratings, USA and is the wholly owned foreign operator in India. Fitch is the only international rating agency with a presence on the ground in India. Fitch Rating India rates corporates, banks, financial institutions, structured deals, securitized paper, global infrastructure and project finance, public finance, SMEs, asset management companies, and insurance companies.
5. **Brickwork Ratings:** It is the fifth agency in the ratings business which commenced its activities from September 24, 2008. It rates IPOs, perpetual bonds of banks, non-convertible debenture issues, and certificate of deposits.
6. **ONICRA**- The full form is ONIDA Individual Credit Rating agency of India Ltd. The headquarter in Gurgaon, Delhi. It was established in 1993. It makes assessment of the credit worthiness of individuals who seek trade credit.

Study Note - 7

COMMODITY EXCHANGE

This Study Note includes

7.1 Commodity Exchange
7.2 Commodity Exchange in India
7.3 Indian Commodity Market Regulatory Framework
7.4 Unresolved Issues and Future Prospects
7.5 Intruments available for Trading
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7.10 Commodity Futures and Its Mechanism
7.11 Commonly Used Terms in Commodity Market

7.1 COMMODITY EXCHANGE

A **commodities exchange** is an exchange where various commodities and derivatives products are traded. Most commodity markets across the world trade in agricultural products and other raw materials (like wheat, barley, sugar, maize, cotton, cocoa, coffee, milk products, pork bellies, oil, metals, etc.) and contracts based on them. These contracts can include spot, forwards, futures and options on futures. Other sophisticated products may include interest rates, environmental instruments, swaps, or ocean freight contracts.

Commodities exchanges usually trade futures contracts on commodities, such as trading contracts to receive something, say corn, in a certain month. A farmer raising corn can sell a future contract on his corn, which will not be harvested for several months, and guarantee the price he will be paid when he delivers; a breakfast cereal producer buys the contract now and guarantees the price will not go up when it is delivered. This protects the farmer from price drops and the buyer from price rises.

Speculators and investors also buy and sell the futures contracts in attempt to make a profit and provide liquidity to the system. However, due to the financial leverage provided to traders by the exchange, commodity futures traders face a substantial risk.

A commodity exchange is considered to be essentially public because anybody may trade through its member firms. The commodity exchange itself regulates the trading practices of its members while prices on a commodity exchange are determined by supply and demand.

A commodity exchange provides the rules, procedures, and physical for commodity trading, oversees trading practices, and gathers and disseminates marketplace information. Commodity exchange transactions take place on the commodity exchange floor, in what is called a pit, and must be effected within certain time limits.

History

- Commodity exchanges are one of the oldest forms of commerce. In early economies, people realized that it was useful to talk about general categories of goods, instead of specific products. For example, if a farmer borrowed money and promised to pay back the loan with a cow later, it would be easier to set up the deal

if it could be any cow, not a particular cow. If "that cow" could be replaced by "any equivalent cow," the cow became a commodity.

Once this concept was understood, it was natural to create venues for buying and selling commodities, either immediately or for future delivery. These exchanges formed in large cities with active economies, like London, Amsterdam, New York, and Chicago.

Users of Commodity Exchanges

- The main users of commodity exchanges are hedgers and speculators. A hedger is someone who is taking a risk based on the price of a commodity. For example, a power plant might produce power using coal, and sell this power at a fixed price. If coal rose in price, they could be forced to sell at a loss. This producer might buy coal futures in order to profit from those futures if coal prices rose. When a financial transaction leads to a profit that offsets a business loss (or a loss that offsets a business profit), it is known as a hedge. A speculator is simply betting on the direction of prices, without having an underlying business interest.

Definition of Commodity

In economics, a **commodity** is a marketable item produced to satisfy wants or needs. Economic commodities comprise goods and services.

The more specific meaning of the term *commodity* is applied to goods only. It is used to describe a class of goods for which there is demand, but which is supplied without qualitative differentiation across a market. Commodity has full or partial fungibility; that is, the market treats its instances as equivalent or nearly so with no regard to who produced them. "From the taste of wheat it is not possible to tell who produced it, a Russian serf, a French peasant or an English capitalist." Petroleum and copper are other examples of such commodities, their supply and demand being a part of one universal market. Items such as stereo systems, on the other hand, have many aspects of product differentiation, such as the brand, the user interface and the perceived quality. The demand for one type of stereo may be much larger than demand for another.

In contrast, one of the characteristics of a commodity good is that its price is determined as a function of its market as a whole. Well-established physical commodities have actively traded spot and derivative markets. Generally, these are basic resources and agricultural products such as iron ore, crude oil, coal, salt, sugar, tea, coffee beans, soybeans, aluminum, copper, rice, wheat, gold, silver, palladium, and platinum. Soft commodities are goods that are grown, while hard commodities are the ones that are extracted through mining.

There is another important class of energy commodities which includes electricity, gas, coal and oil. Electricity has the particular characteristic that it is usually uneconomical to store; hence, electricity must be consumed as soon as it is produced.

Global commodities trading company

This is a list of giant commodities trading companies who operate worldwide.

(a) Vitol

(b) Glencore International AG

(c) Trafigura

(d) Cargill

(e) Archer Daniels Midland

(f) Gunvor (company)

(g) Mercuria Energy Group

(h) Noble Group

(i) Louis Dreyfus Group

(j) Bunge Limited

(k) Wilmar International

(l) Olam International

Global Commodity Exchanges

The following are the list of global commodity exchanges-

(a) New York Mercantile Exchange (NYMEX)

(b) London Metal Exchange (LME)

(c) Chicago Board of Trade (CBOT)

(d) New York Board of Trade (NYBOT)

(e) Kansas Board of Trade

(f) Winnipeg Commodity Exchange, Manitoba

(g) Dalian Commodity Exchange, China

(h) Bursa Malaysia Derivatives exchange

(i) Singapore Commodity Exchange (SICOM)

(j) Chicago Mercantile Exchange (CME), US

(k) Tokyo Commodity Exchange (TOCOM)

(l) Shanghai Futures Exchange

(m) Sydney Futures Exchange

(n) London International Financial Futures and Options Exchange (LIFFE)

(o) Dubai Gold & Commodity Exchange (DGCX)

(p) Dubai Mercantile Exchange (DME)



Global Commodities Market

7.2 COMMODITIES EXCHANGES IN INDIA

History of Commodity Market in India

The history of organized commodity derivatives in India goes back to the nineteenth century when Cotton Trade Association started futures trading in 1875, about a decade after they started in Chicago. Over the time derivatives market developed in several commodities in India. Following Cotton, derivatives trading started in oilseed in Bombay(1900), raw jute and jute goods in Calcutta (1912), Wheat in Hapur (1913) and Bullion in Bombay (1920).

However many feared that derivatives fuelled unnecessary speculation and were detrimental to the healthy functioning of the market for the underlying commodities, resulting in to banning of commodity options trading and cash settlement of commodities futures after independence in 1952. The parliament passed the Forward Contracts (Regulation) Act, 1952, which regulated contracts in Commodities all over India. The act prohibited options trading in Goods along with cash settlement of forward trades, rendering a crushing blow to the commodity derivatives market. Under the act only those associations/exchanges, which are granted reorganization from the Government, are allowed to organize forward trading in regulated commodities. The act envisages three tier regulations:

(i) Exchange which organizes forward trading in commodities can regulate trading on day-to-day basis;

(ii) Forward Markets Commission provides regulatory oversight under the powers delegated to it by the central Government.

(iii) The Central Government- Department of Consumer Affairs, Ministry of Consumer Affairs, Food and Public Distribution- to be the ultimate regulatory authority.

After Liberalization and Globalization in 1990, the Government set up a committee (1993) to examine the role of futures trading. The Committee (headed by Prof. K.N.Kabra) recommended allowing futures trading in 17 commodity groups. It also recommended strengthening Forward Markets Commission, and certain amendments to Forward Contracts (Regulation) Act 1952, particularly allowing option trading in goods and registration of brokers with Forward Markets Commission. The Government accepted most of these recommendations and futures' trading was permitted in all recommended commodities. It is timely decision since internationally the commodity cycle is on upswing and the next decade being touched as the decade of Commodities. Commodity exchange in India plays an important role where the prices of any commodity are not fixed, in an organized way.

Commodity exchanges in India play a crucial role in India's economic development and growth. If price of any commodity is not fixed then commodity exchanges determines the price of that particular commodity in an organized way. The price is determined examining right from grassroots level and it goes through producers, retail investors and even end-users. Commodity exchanges have brought Indian buyers and seller in an equal importance to trade and to do business swiftly.

Commodity Market in India – Present Position

Today, commodity exchanges are purely speculative in nature. Before discovering the price, they reach to the producers, end users, and even the retail investors, at a grassroots level. It brings a price transparency and risk management in the vital market. By Exchange rules and by law, no one can bid under a higher bid, and no one can offer to sell higher than someone else's lower offer. That keeps the market as efficient as possible, and keeps the traders on their toes to make sure no one gets the purchase or sale before they do. Since 2002, the commodities future market in India has experienced an unexpected boom in terms of modern exchanges, number of commodities allowed for derivatives trading as well as the value of futures trading in commodities, which crossed $ 1 trillion mark in 2006. In India there are 25 recognized future exchanges, of which there are four national level multi-commodity exchanges. After a gap of almost three decades, Government of India has allowed forward transactions in commodities through Online Commodity Exchanges, a modification of traditional business known as Adhat and Vayda Vyapar to facilitate better risk coverage and delivery of commodities.

THE FOUR EXCHANGES ARE:

(i) National Commodity & Derivatives Exchange Limited (NCDEX)

(ii) Multi Commodity Exchange of India Limited (MCX)

(iii) National Multi- Commodity Exchange of India Limited (NMCEIL)

(iv) Indian Commodity Exchange Limited (ICEX)

There are other regional commodity exchanges situated in different parts of India.

National Level Commodity Exchanges in India

(i) National Multi Commodity Exchange of India Ltd. (NMCEIL)

NMCE is the first demutualised electronic commodity exchange of India granted the National exchange on Govt. of India and operational since 26th Nov, 2002.

Promoters of NMCE are, Central warehousing corporation (CWC), National Agricultural Cooperative Marketing Federation of India (NAFED), Gujarat Agro-Industries Corporation Limited (GAICL), Gujarat state agricultural Marketing Board (GSAMB), National Institute of Agricultural Marketing (NIAM) and Neptune Overseas Ltd. (NOL). Main equity holders are PNB.

The Head Office of NMCE is located in Ahmedabad. There are various commodity trades on NMCE Platform including Agro and non-agro commodities.

(ii) National Commodity & Derivatives Exchange Limited (NCDEX)

National Commodity & Derivatives Exchange Limited (NCDEX) is a professionally managed online multi commodity exchange promoted by ICICI Bank Limited (ICICI Bank), Life Insurance Corporation of India (LIC), National Bank for Agriculture and Rural Development (NABARD) and National Stock Exchange of India Limited (NSE). Punjab National Bank (PNB), CRISIL Limited (formerly the Credit Rating Information Services of India Limited), Indian Farmers Fertilizer Cooperative Limited (IFFCO) and Canara Bank by subscribing to the equity shares have joined the initial promoters as shareholders of the Exchange. NCDEX is the only commodity exchange in the country promoted by national level institutions. This unique parentage enables it to offer a bouquet of benefits, which are currently in short supply in the commodity markets. The institutional promoters of NCDEX are prominent players in their respective fields and bring with them institutional building experience, trust, nationwide reach, technology and risk management skills.

NCDEX is a public limited company incorporated on April 23, 2003 under the Companies Act, 1956. It obtained its Certificate for Commencement of Business on May 9, 2003. It has commenced its operations on December 15, 2003.

(iii) Multi-Commodity Exchange of India Limited (MCX)

MCX an independent and demutualised multi commodity exchange has permanent recognition from Government of India for facilitating online trading, clearing and settlement operations for commodity futures markets across the country. Key shareholders of MCX are Financial Technologies (India) Ltd., State Bank of India, NABARD, NSE, HDFC Bank, State Bank of Indore, State Bank of Hyderabad, State Bank of Saurashtra, SBI Life Insurance Co. Ltd., Union Bank of India, Bank of India, Bank of Baroda, Canara Bank, Corporation Bank.

Headquartered in Mumbai, MCX is led by an expert management team with deep domain knowledge of the commodity futures markets. Through the integration of dedicated resources, robust technology and scalable infrastructure, since inception MCX has recorded many first to its credit.

Inaugurated in November 2003 by Shri Mukesh Ambani, Chairman & Managing Director, Reliance Industries Ltd, MCX offers futures trading in the following commodity categories: Agri Commodities, Bullion, Metals- Ferrous & Non-ferrous, Pulses, Oils & Oilseeds, Energy, Plantations, Spices and other soft commodities.

(iv) Indian Commodity Exchange Limited (ICEL)

Indian Commodity Exchange Limited is latest commodity exchange of India Started Function from 27 Nov, 09. It is a screen based on-line derivatives exchange for commodities and has established a reliable, time-tested, and a transparent trading platform. It is also in the process of putting in place robust assaying and warehousing facilities in order to facilitate deliveries. It is jointly promoted by Reliance Exchange Next Infrastructure Limited and MMTC limited, Indiabulls Financial Services Ltd., KRIBHCO, Indian Potash Ltd., and IDFC among others, as its partners.

This exchange is ideally positioned to tap the huge scope for increasing the depth and size of commodities' market and fill in the structural gaps existing in the Indian market. We have head office located in Mumbai and have regional offices spread across the country which covers agri belt, with a vision to encourage participation of farmers, traders and actual users to hedge their positions against the wide price fluctuations.

Unique Features of National Level Commodity Exchanges

The unique features of national level commodity exchanges are:

- They are demutualized, meaning thereby that they are run professionally and there is separation of management from ownership. The independent management does not have any trading interest in the commodities dealt with on the exchange.
- They provide online platforms or screen based trading as distinct from the open-out-cry systems (ring trading) seen on conventional exchanges. This ensures transparency in operations as everyone has access to the same information.
- They allow trading in a number of commodities and are hence multi-commodity exchanges.
- They are national level exchanges which facilitate trading from anywhere in the country. This corollary of being an online exchange.

Indian Commodity Market- set for paradigm shift

(i) Four licenses recently issued by Govt. of India to set- up National online Multi Commodity Exchanges – to ensure a transparent price discovery and risk management mechanism;

(ii) List of commodities for futures trade – increased from 11 in 1990 to over 100 in 2003;

(iii) Reforms with regards to sale, storage and movement of commodities initiated;

(iv) Shift from administered pricing to free market pricing- WTO regime;

(v) Overseas hedging has been allowed in metals;

(vi) Petro-products marketing companies have been allowed to hedge prices;

(vii) Institutionalization of agriculture.

Why are Commodity Derivatives Required?

India is among the top-5 producers of most of the commodities, in addition to being a major consumer of bullion and energy products. Agriculture contributes about 22% to the GDP of the Indian economy. It employees around 57% of the labor force on a total of 163 million hectares of land. Agriculture sector is an important factor in achieving a GDP growth of 8-10%. All this indicates that India can be promoted as a major center for trading of commodity derivatives.

It is unfortunate that the policies of FMC during the most of 1950s to 1980s suppressed the very markets it was supposed to encourage and nurture to grow with times. It was a mistake other emerging economies of the world would want to avoid. However, it is not in India alone that derivatives were suspected of creating too much speculation that would be to the detriment of the healthy growth of the markets and the farmers. Such suspicions might normally arise due to a misunderstanding of the characteristics and role of derivative product.

It is important to understand why commodity derivatives are required and the role they can play in risk management. It is common knowledge that prices of commodities, metals, shares and currencies fluctuate over time. The possibility of adverse price changes in future creates risk for businesses. Derivatives are used to reduce or eliminate price risk arising from unforeseen price changes. A derivative is a financial contract whose price depends on, or is derived from, the price of another asset. Two important derivatives are futures and options.

(i) Commodity Futures Contracts: A futures contract is an agreement for buying or selling a commodity for a predetermined delivery price at a specific future time. Futures are standardized contracts that are traded on

organized futures exchanges that ensure performance of the contracts and thus remove the default risk. The commodity futures have existed since the Chicago Board of Trade (CBOT, www. cbot.com) was established in 1948 to bring farmers and merchants together. The major function of futures markets is to transfer price risk from hedgers to speculators. For example, suppose a farmer is expecting his crop of wheat to be ready in two months time, but is worried that the price of wheat may decline in this period. In order to minimize his risk, he can enter into a futures contract to sell his crop in two months' time at a price determined now. This way he is able to hedge his risk arising from a possible adverse change in the price of his commodity.

(ii) Commodity Options contracts: Like futures, options are also financial instruments used for hedging and speculation. The commodity option holder has the right, but not the obligation, to buy (or sell) a specific quantity of a commodity at a specified price on or before a specified date. Option contracts involve two parties – the seller of the option writes the option in favour of the buyer (holder) who pays a certain premium to the seller as a price for the option. There are two types of commodity options: a 'call' option gives the holder a right to buy a commodity at an agreed price, while a 'put' option gives the holder a right to sell a commodity at an agreed price on or before a specified date (called expiry date).

The option holder will exercise the option only if it is beneficial to him; otherwise he will let the option lapse. For example, suppose a farmer buys a put option to sell 100 Quintals of wheat at a price of ₹ 1250 per quintal and pays a 'premium' of ₹ 25 per quintal (or a total of ₹2500). If the price of wheat declines to say ₹1000 before expiry, the farmer will exercise his option and sell his wheat at the agreed price of ₹ 1250 per quintal. However, if the market price of wheat increases to say ₹ 1500 per quintal, it would be advantageous for the farmer to sell it directly in the open market at the spot price, rather than exercise his option to sell at ₹ 1250 per quintal.

Futures and options trading therefore helps in hedging the price risk and also provide investment opportunity to speculators who are willing to assume risk for a possible return. Further, futures trading and the ensuing discovery of price can help farmers in deciding which crops to grow. They can also help in building a competitive edge and enable businesses to smoothen their earnings because non- hedging of the risk would increase the volatility of their quarterly earnings. Thus futures and options markets perform important functions that cannot be ignored in modern business environment. At the same time, it is true that too much speculative activity in essential commodities would destabilize the markets and therefore, these markets are normally regulated as per the laws of the country.

Commodity Exchange in India - Characteristics

- **There is no value-adding process performed on commodity items.** A unit of one type of commodity is broadly interchangeable with another unit. This allows the units to be traded on exchanges without prior inspection.
- **Commodities are produced "naturally" which means that each commodity is subject to unique supply factors.** For example, the production of coffee is affected by the weather, while that of copper is affected by availability of ore. The supply of oil is subject to a great deal of disruptions including wars, geopolitical uncertainty, accidents, or transport issues.
- **Commodities are subject to cycles in demand from both intermediate players and end users.** High prices usually lead to a boost in resource investments causing excess supply in the future which eventually pushes down commodity prices.
- **Commodities from different groups can often exhibit negative correlation at any point of time.** For example, the prices of wheat and aluminum can move in the opposite direction as they are affected by a different set of factors.
- **Commodity prices are positively correlated with growth measures,** although there may be a significant lag between a pickup in industrial production and commodity prices.
- **Commodities generally exhibit positive correlation with inflation indicators.** In particular, commodities tend to react to an early stage of inflation as raw material price appreciation generally tends to precede, and quite often exceed consumer price inflation growth. While true over the very long term, the relationship between inflation and commodity prices has been considerably weaker over the last 10 years, which has been characterized by disinflation/low inflation.

The above characteristics may not be true for all commodities taken individually; however they are true for diversified indices of industrial commodities and agricultural commodities.

Commodity Market - Participants

There are two basic types of participants in commodities markets–hedgers and speculators. Hedgers seek to minimize and manage price risk, while speculators take on risk in the hope of making a profit.

As an example of a hedger, you might be a large corn farmer wanting to sell your product at the highest possible price. However, unpredictable weather may create risk, as well as excess supply that could drive prices down. You could take a short position in corn futures, and if prices fall, you could then buy back the futures at a lower price than you previously had sold them. This would help you offset the loss from your cash crop and help minimize your risk. Of course, if prices rose, you'd lose money on the futures transaction, but the idea is to use futures as a hedge.

A speculator—including individual investors and professionals such as hedge funds or managed futures traders, could take the opposite side of the hedger's futures transaction. That participant would bear the risk that prices are going to rise in hopes of generating a profit on the long futures position. Most likely, this type of speculator has no actual stake in the business, other than futures trading. A commercial food producer in need of the raw product (a breakfast cereal processor, for example) may also take the other side of the short hedger's trade to offset the risk of paying higher prices for the commodity.

If the price of corn rises, the commercial food producer could still capture a profit from the futures position, even though he'd be paying more for the actual corn.

An individual trader who commits his or her own capital to act as speculator on a particular exchange provide market liquidity by constantly buying and selling throughout the trading session and are viewed as important participants in the market by shouldering risk. While the term local has been used to designate those trading in the open-outcry markets, this era of electronic trading is making the phrase a little obsolete. However, their function as liquidity providers is equally important in electronic markets.

Fundamental Factors

There are various fundamental factors that drive the commodity markets. These fundamentals may be different for different commodities based on its characteristics. There are certain important fundamentals that apply to all commodities either directly or indirectly.

(a) Demand & supply

Demand and supply are basic factors that affect the movement of any commodity prices. The law of demand and supply is same for equity as well as commodity markets. However demand and supply of all commodities vary during different time periods depending upon seasons, domestic and global conditions and various other major factors influencing its characteristics.

(b) Demand Curve

It is refined form of demand analysis. Demand curve in a laymen's term is a graphical representation of demand over a period of time. Price is represented on y-axis and demand on the x-axis. The graph is a line graph representing demand at particular prices over a period of time. It gives a clear understanding of the demand situation over a period of time at various price levels.

(c) Global and domestic economy

Economic scenario significantly affects the prices of a commodity. Demand and supply of any commodity has a direct relationship with economic condition in the state. Depending upon the nature of the commodity, global and domestic economic scenarios affect the commodity prices. For e.g.; Steel prices highly depend on global economic factors as this is a globally and massively used commodity. However as far as a commodity like Kapas (cotton beans) is concerned global factors affect less when compared to domestic factors.

(d) Economic growth

Economic growth of the world as well as the domestic economy is an important fundamental that will affect the demand and supply positions in a country. If the country is growing at a fast rate the consumption level will also

be at a higher rate. This will increase the demand on one hand but supply may not increase at the same rate as it takes time to set up new industries and increase production. This drives the commodity prices of all major commodities.

(e) Inflation

Commodities are considered as hedge against inflation because unlike equity, commodity prices move in direction of inflation. With increase in inflation the prices of major commodities tend to increase and it is true the other way as well.

(f) Geo-political concerns

Political factors have a direct as well as indirect effect on commodity prices. For example if we take the case of Potato when one year back it was barred from trading on the exchanges. However at time political factors can have positive effects as well.

(g) Major Economic Indicators

The Gross Domestic Product, Industrial Production, Purchasing Managers Index ,Durable Goods, Housing data, Unemployment Data, Retail Sales, Producer Price Index , Consumer Price Index, Interest Rate, Consumer Confidence Index etc.

(h) Extra-ordinary events

There may be certain extra-ordinary factors that do not occur very frequent. Wars, natural calamities, depression etc. are such events that affect the commodity prices in a dramatic way.

(i) Speculation

Speculators bring information into system at times fake or over hyped in-order to trigger the price movement in a particular direction. Speculators are though a part of technical analysis but it is important in the matter of fact that speculation may be of some fundamental factors. However they are an important part of the market's price discovery mechanism.

Benefits of Commodity Trading

The world is witnessing a new trend wherein developing countries like India, China, Brazil & other emerging markets are driving the global economy with their rising domestic consumption patterns. This sustained increase in consumption has led to investment analysts realizing the growth potential of a new asset class namely Commodities.

Commodities have also evolved as an asset class with the development of various commodity future indices. The performance of commodities as an asset class is usually measured by the returns on a commodity index, such as the Rogers International Commodity Index (RICI), which tracks the return in 36 different commodity products. In the last 9 years, the RICI Index has given compounded annualized returns of **18.31%** as compared to **17.22%** returns given by BSE SENSEX

(a) Strong Performance Track Record: The table alongside reflects positive performance of RICI Index during falling & rising market phases. In fact, the RICI INDEX has outperformed all other indices since 1999.

Indices	Falling Market	Flat Market	Rising Market	Year to Date	Since 1999
	(2000-2001)	2002	(2003-2007)		(1999-till date)
SENSEX	-34.55%	4.04%	490.68%	-17.32%	443.94%
MSCI Emerging Markets	-28.06%	-8.55%	249.98%	*3.23%	274.04%
MSCI APAC ex-Japan	-27.57%	-8.12%	181.81%	-7.09%	162.32%
MSCI WORLD	-22.13%	-21.00%	73.74%	-4.02%	31.50%
RICI INDEX	13.50%	33.26%	109.90%	20.16%	454.83%

Note: RICI Index - The Rogers International Commodity Index is acting as a proxy for commodity asset class. All above returns are in INR and in absolute terms (Source: Bloomberg as on 23rd April 2008)

(b) Portfolio Diversification: Adding commodities to your investment portfolio helps you take advantage of the benefit of diversification. In a diversified portfolio, assets do not move in sync with each other, as commodities exhibit low/ negative correlation with respect to equity and bonds. Low/ negative correlation means commodities

can play an important role in portfolio diversification by reducing overall portfolio risk. This should improve the consistency of returns over time.

Correlation Coefficient	1999	2000	2001	2002	2003	2004	2005	2006	2007
Equity	-0.04	-0.08	-0.16	0.06	0.002	-0.08	0.13	0.21	0.09
Bond	0.14	0.09	-0.12	-0.04	-0.02	-0.07	0.01	0.03	-0.02

Correlation coefficients of RICI Index (Commodities) with respect to Equities and Bonds

Note: CRISIL Fund-dx which tracks debt mutual fund returns has been used to represent bond asset class, while BSE Sensex has been used to represent equity asset class (Source: Bloomberg & CRISIL Investment Manager)

(c) Inflation Hedge: Commodities tend to react to changing economic fundamentals in ways that are different from traditional financial assets. For example, commodities are one of the few asset classes that tend to benefit from rising inflation. As demand for goods and services increases, the price of those goods and services usually rises as well, so do the prices of the commodities that are used to produce those goods and services. Since commodity prices usually rise when inflation is accelerating, investing in commodities may provide portfolios with a hedge against inflation. As shown in the table overleaf, commodity has a positive sensitivity to inflation as compared to asset classes like stocks and bonds.

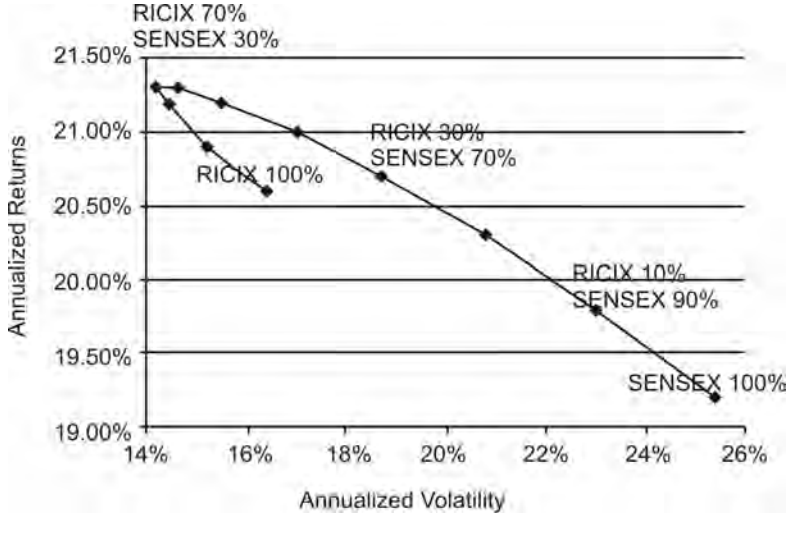
Inflation Sensitivity

	Stocks	Bonds	Commodity
Monthly	-0.10	-0.10	0.09
Quarterly	-0.19	-0.30	0.28
Semi-Annually	-0.04	-0.53	0.43
Annually	-0.02	-0.03	0.49

Stocks: S&P500, Bonds : Lehman Aggregate Bond Index, Rogers International Commodity Index Date 31.12.1999 - 31.12. 2007, Source: Mirae Asset MAPS

(d) Role of Commodities in Optimizing Portfolio Returns

An exposure to commodities in your portfolio can help you optimize its returns considerably. The graph below indicates how with a prudent mix of commodity and SENSEX stocks in a portfolio, one could enhance portfolio returns while at the same time reducing the volatility of investments.



(Source: Bloomberg, data calculated from 1st Jan 1999 to 11th Apr 2008)

7.3 INDIAN COMMODITY MARKET – REGULATORY FRAMEWORK

Need for Regulation

The need for regulation arises on account of the fact that the benefits of futures markets accrue in competitive conditions. Proper regulation is needed to create competitive conditions. In the absence of regulation, unscrupulous participants could use these leveraged contracts for manipulating prices. This could have undesirable influence on the spot prices, thereby affecting interests of society at large.

Regulation is also needed to ensure that the market has appropriate risk management system. In the absence of such a system, a major default could create a chain reaction. The resultant financial crisis in a futures market could create systematic risk. Regulation is also needed to ensure fairness and transparency in trading, clearing, settlement and management of the exchange so as to protect and promote the interest of various stakeholders, particularly non-member users of the market.

After independence, the Constitution of India brought the subject of "Stock Exchanges and futures markets" in the Union list. As a result, the responsibility for regulation of commodity futures markets devolved on Govt. of India. A Bill on forward contracts was referred to an expert committee headed by Prof. A.D.Shroff and Select Committees of two successive Parliaments and finally in December 1952 Forward Contracts (Regulation) Act, 1952, was enacted. The Act provided for 3-tier regulatory system;

(a) An association recognized by the Government of India on the recommendation of Forward Markets Commission,

(b) The Forward Markets Commission (it was set up in September 1953) and

(c) The Central Government.

Forward Contracts (Regulation) Rules were notified by the Central Government in July,1954.

The Act divides the commodities into 3 categories with reference to extent of regulation, viz.:

(a) The commodities in which futures trading can be organized under the auspices of recognized association.

(b) The Commodities in which futures trading is prohibited.

(c) Those commodities which have neither been regulated for being traded under the recognized association nor prohibited are referred as Free Commodities and the association organized in such free commodities is required to obtain the Certificate of Registration from the Forward Markets Commission.

Forward Markets Commission (FMC)

Forward Markets Commission (FMC) headquartered at Mumbai, is a regulatory authority which is under by the Ministry of Consumer Affairs, Food and Public Distribution, Govt. of India. It is a statutory body set up in 1953 under the Forward Contracts (Regulation) Act, 1952.

Forward Markets Commission provides regulatory oversight in order to ensure financial integrity (i.e. to prevent systematic risk of default by one major operator or group of operators), market integrity (i.e. to ensure that futures prices are truly aligned with the prospective demand and supply conditions) and to protect and promote interest of customers/ non-members. It prescribes the following regulatory measures:

1. Limit on net open position as on the close of the trading hours. Sometimes limit is also imposed on intra-day net open position. The limit is imposed operator-wise, and in some cases, also member- wise.

2. Circuit-filters or limit on price fluctuations to allow cooling of market in the event of abrupt upswing or downswing in prices.

3. Special margin deposit to be collected on outstanding purchases or sales when price moves up or down sharply above or below the previous day closing price. By making further purchases/sales relatively costly, the price rise or fall is sobered down. This measure is imposed only on the request of the exchange.

4. Circuit breakers or minimum/maximum prices: These are prescribed to prevent futures prices from falling below as rising above not warranted by prospective supply and demand factors. This measure is also imposed on the request of the exchanges.

5. Skipping trading in certain derivatives of the contract, closing the market for a specified period and even closing out the contract: These extreme measures are taken only in emergency situations.

Besides these regulatory measures, the FC(R) Act provides that a client's position cannot be appropriated by the member of the exchange, except when a written consent is taken within three days time. The FMC is persuading increasing number of exchanges to switch over to electronic trading, clearing and settlement, which is more customer-friendly. The FMC has also prescribed simultaneous reporting system for the exchanges following open out-cry system. These steps facilitate audit trail and make it difficult for the members to indulge in malpractices like trading ahead of clients, etc. The FMC has also mandated all the exchanges following open outcry system to display at a prominent place in exchange premises, the name, address, telephone number of the officer of the commission who can be contacted for any grievance. The website of the commission also has a provision for the customers to make complaint and send comments and suggestions to the FMC. Officers of the FMC have been instructed to meet the members and clients on a random basis, whenever they visit exchanges, to ascertain the situation on the ground, instead of merely attending meetings of the board of directors and holding discussions with the office-bearers.

Forward Market Commission of India

The Forward Markets Commission is a regulatory body for commodity markets in India. The forward contracts in commodities are regulated as per F.C.(R) Act, 1952 by this body. Inherent objective is to achieve price stability by means of price discovery and risk management. The Commission also collects information regarding the trading conditions in respect of goods to which any of provisions of Act is made applicable. It also advises Central Government regarding recognition of associations.

Functions of Forward market commission of India

(a) To advice the Central Government in respect of the recognition or withdrawal of recognition from any association. It also advices government about any other matter arising out of the administration of this act.

(b) Second function of the act includes the task of keeping forward market s under observation and take necessary actions. The actions taken should be according to powers given to the commission by the "Forward Contract Regulation Act".

(c) To collect information regarding the trading conditions in respect of goods (to which any of the provisions of this Act is made applicable) including information regarding supply, demand and prices. And publish information whenever the Commission thinks it necessary, It also performs the task of submitting to the Central Government periodical reports on the operation of this Act and on the working of forward markets relating to such goods.

(d) To make recommendations generally with a view to improving the organization and working of forward markets

(e) To undertake the inspection of the accounts and other documents of [any recognized association or registered association or any member of such association] whenever it considers it necessary.

(f) To perform such specified duties and exercise assigned powers by the "Forward Contract Regulation

Act".

Powers of Forward market commission

(1) The Commission shall, in the performance of its functions, have all the powers of a civil court under the Code of Civil Procedure, 1908 (5 of 1908), while trying a suit in respect of the following matters, namely:

   (a) Summoning and enforcing the attendance of any person and examining him on oath.

   (b) Requiring the discovery and production of any document.

(c) Receiving evidence on affidavits.

(d) Requisitioning any public record or copy thereof from any office.

(e) Any other matters which may be prescribed.

(2) The Commission shall have the power to require any person, subject to any privilege which may be claimed by that person under any law for the time being in force, to furnish information on such points or matters as in the opinion of the Commission may be useful for, or relevant to any matter under the consideration of the Commission and any person so required shall be deemed to be legally bound to furnish such information within the meaning of Sec. 176 of the Indian Penal code, 1860 (45 of 1860).

(3) The Commission shall be deemed to be a civil court and when any offence described in Sections. 175, 178, 179, 180 or Sec. 228 of the Indian Penal Code, 1860 (45 of 1860), is committed in the view or presence of the Commission, the Commission may, after recording the facts constituting the offence and the statement of the accused as provided for in the Code of Criminal Procedure, 1898 (5 of 1898)11[11] forward the case to a Magistrate having jurisdiction to try the same and the Magistrate to whom any such case is forwarded shall proceed to hear the complaint against the accused as if the case had been forwarded to him under Section 482 of the said Code12[12].

(4) Any proceeding before the Commission shall be deemed to be a judicial proceeding within the meaning of Sections. 193 and 228 of the Indian Penal Code, 1860.

Regulatory measures taken by FMC

(1) **Illegal contracts**

Following are the scenarios, in which the contracts are termed as illegal contracts,

(a) Forward Contracts in the permitted commodities, i.e., commodities notified under S.15 of the Forward Contracts (Regulation) Act, 1952, which are entered into other than: (a) between the members of the recognized Association or (b) through or (c) with any such members.

(b) Forward contracts in prohibited commodities, which are described under section 17 of forward contract act.

(c) Forward Contracts in the commodities in which such contracts have been prohibited.

(2) **Measures against Illegal Forward Trading**

(a) The role of Forward Markets Commission is to communicate the information relating to offences under the Act to the police authorities and assist such authorities in their work such as accompanying the police in conducting searches for documents etc.

(b) The offences under the Act are technical in nature and it is difficult to prove the charges in accordance with the rules of evidence contained in the Evidence Act. So, the Forward Markets Commission periodically conducts training programs, Seminars, Workshops etc. for the benefit of Police Officers/ Prosecutors and also Judicial Magistrates First Class/Metropolitan Magistrates.

(3) **Rules governing illegal Forward Contracts**

(a) Owner of a place which is used for performing illegal forward contracts, with the knowledge of such owner.

(b) A person who, without permission of the Central Government, organizes illegal forward contract.

(c) Any person who willfully misrepresents or induces any person to believe that he is a member of a recognized association or that forward contract can be performed through him.

(d) Any person who is not a member of a recognized association canvasses, advertises or touts in any business connected with forward contracts in contravention of the Forward Contracts (Regulation) Act, 1952.

(e) Any person who joins, gathers, or assists in gathering at any place other than the place of business specified in the bye-laws of the recognized associations for making bids or offers or for entering into illegal forward contracts.

(f) Any person who makes publishes or circulates any statement or information, which is false and which he knows to be false, affecting or tending to affect the course of business in forward contracts in permitted commodities.

Important development and regulatory steps taken by FMC

The Forward Markets Commission is committed towards the development of institutional capability of the commodity market. The Commission has taken several steps in this direction, which include sensitizing policy makers and all other co traders improving the efficiency of all the participants in the marketing chain by organizing awareness programs, workshops, subject specific consultancies, study tours, lectures, etc., members.

FMC has set itself an ambitious target for reaching out to various market segments and grass roots level participants. FMC solicits active collaboration with Universities, Educational Institutions and other organizations desiring to spread awareness about Futures Trading in commodities.

The developmental measures also include the price dissemination among the farmers through APMCs (spot market regulators).

The commodities that is suitable for Forward Contract

All the commodities are not suitable for futures trading and for conducting futures trading. For being suitable for futures trading the market for commodity should be competitive, i.e., there should be large demand for and supply of the commodity - no individual or group of persons acting in concert should be in a position to influence the demand or supply, and consequently the price substantially. There should be fluctuations in price. The market for the commodity should be free from substantial government control. The commodity should have long shelf-life and be capable of standardisation and gradation.

With the issue of the Notifications dated 1.4.2003 futures trading is not prohibited in any commodity. Futures trading can be conducted in any commodity subject to the approval /recognition of the Government of India. 91 commodities are in the regulated list i.e. these commodities have been notified under section 15 of the Forward Contracts (Regulation) Act. Forward trading in these commodities can be conducted only between, with, or through members of recognized associations. The commodities other than those listed under Section 15 are conventionally referred to as 'Free' commodities. Forward trading in these commodities can be organized by any association after obtaining a certificate of Registration from Forward Markets Commission.

Limitations and Future of FMC

This section presents limitations, various issues and challenges present in FMC and what the future of FMC is going to be.

(1) Limitations of FMC

Following are the limitations of FMCs

(a) Option trading prohibited

(b) Functions as a Government department with limited autonomy with respect to:

(i) Recognition / de-recognition of exchanges

(ii) Regulation of intermediaries

(iii) Financial and administrative autonomy.

(c) Market expansion has put heavy pressure on the FMC's coping capacity

(2) Issues and Challenges

(a) **Strengthening of and Autonomy for the Regulator**

Currently, the commission is an arm functioning under the Ministry of Consumer Affairs and it looks after the working of futures exchanges also. Unlike India's autonomous stock market regulator, the commodities regulator i.e. Forward Market Commission (FMC), is controlled by the Consumer Affairs Ministry and needs to seek government permission for many decisions. As per the latest news, the Forward Market Commission will be given autonomy through an ordinance to strengthen the legal and regulatory framework with stiffer punishment for violators and stringent provisions for preventing misuse of insider information. According to FMC chairman B C Khatua, strengthening the regulator would likely enable banks and financial institutions to enter commodities bourses and deepen trading. The changes would also help the introduction of options trading in commodities. The strength of the FMC would be raised from the present four members to nine, including a Chairman and upto three whole-time members.

(b) **Increasing the breadth and depth of the market**

For increasing breadth and depth of market, there is necessity of participation of farmers/ aggregators and other hedgers as well as participation of banks and mutual funds.

(c) **Improving the Governance of Exchanges and Intermediaries**

Possible way to improve this can be stricter enforcement of legal and regulatory provisions and improvement in competencies and transparency.

(d) **Standardisation of contract designs and quality parameters across the market**

There is a need for standardization of contract designs and quality control parameters are to be fixed across the market to maintain uniformity.

(e) **Removal of interstate tariff and non-tariff barriers –Market integration**

For market integration, there is a need for revisiting the tariffs – inter-state as well as the non- tariff barriers, which are divergently in existence at different states in India. There is a need for rationalization to facilitate the participants and allow seamless flow of transactions.

(f) **Capacity Building: FMC, Exchanges, Warehouses**

Imbibing quality improvement in services through building of qualitative infrastructure for increasing the capacity of an organization which would facilitate working together with the stakeholders.

(g) **R & D in Commodity market governance and structural issues**

Research and Development activities in commodity market shall strengthen the quality of services, improve the degree of transparency. Expansion of markets, innovations are possible through R&D in this economic spectrum.

(h) **Sensitizations of policy makers / opinion makers with respect to the benefits of the commodity futures market**

Increasing financial literacy, propagating the benefits of commodity futures market amongst the stakeholders/participants is one of the major objectives which will facilitate to sensitize the policy makers/ opinion makers.

(3) **Way Forward**

The followings are under implementation:

(a) Amendment of Forward Contracts (Regulation) Act, 1952.

(b) A progressive FDI policy for the Commodity Exchanges.

(c) Greater and urgent action on governance issues including storage, quality and delivery related issues.

(d) Dissemination of commodity prices (futures and spot) through ticker boards. (Provision of ₹ 100 million in 2007-08.)

(e) A massive awareness campaign among the stake holders including farmers.

(f) Programs for capacity building across the value chain. – ₹ 25 mn budgeted

(g) Efforts are on to promote Aggregators for direct participation of the farmers in the market.

(h) Hope to see a well regulated, strong, efficient and transparent commodity futures market in India within 2 to 3 years time.

7.4 UNRESOLVED ISSUES AND FUTURE PROSPECTS

Unresolved Issues

Even though the commodity derivatives market has made good progress in the last few years, the real issues facing the future of the market have not been resolved. Agreed, the number of commodities allowed for derivative trading have increased, the volume and the value of business has zoomed, but the objectives of setting up commodity derivative exchanges may not be achieved and the growth rates witnessed may not be sustainable unless these real issues are sorted out as soon as possible. Some of the main unresolved issues are discussed below.

(a) **Commodity Options:** Trading in commodity options contracts has been banned since 1952. The market for commodity derivatives cannot be called complete without the presence of this important derivative. Both futures and options are necessary for the healthy growth of the market. While futures contracts help a participant (say a farmer) to hedge against downside price movements, it does not allow him to reap the benefits of an increase in prices. No doubt there is an immediate need to bring about the necessary legal and regulatory changes to introduce commodity options trading in the country. The matter is said to be under the active consideration of the government and the options trading may be introduced in the near future.

(b) **The Warehousing and Standardization:** For commodity derivatives market to work efficiently, it is necessary to have a sophisticated, cost-effective, reliable convenient warehousing system in the country. The Habibullah (2003) task force admitted, "A sophisticated warehousing industry has yet to come about". Further, independent labs or quality testing centers should be set up in each region to certify the quality, grade and quantity of commodities so that they are appropriately standardized and there are no shocks waiting for the ultimate buyer who takes the physical delivery. Warehouses also need to be conveniently located. Central Warehousing Corporation of India (CWC: www.fieo.com) is operating 500 Warehouses across the country with a storage capacity of 10.4 million tonnes. This is obviously not adequate for a vast country. To resolve the problem, a Gramin Bhandaran Yojana (Rural Warehousing Plan) has been introduced to construct new and expand the existing rural godowns. Large scale privatization of state warehouses is also being examined.

(c) **Cash versus Physical Settlement:** It is probably due to the inefficiencies in the present warehousing system that only about 1% to 5% of the total commodity derivatives trades in the country are settled in physical delivery. Therefore the warehousing problem obviously has to be handled on a war footing, as a good delivery system is the backbone of any commodity trade. A particularly difficult problem in cash settlement of commodity derivative contracts is that at present, under the Forward Contracts (Regulation) Act 1952, cash settlement of outstanding contracts at maturity is not allowed. In other words, all outstanding contracts at maturity should be settled in physical delivery. To avoid this, participants square off their positions before maturity. So, in practice, most contracts are settled in cash but before maturity. There is a need to modify the law to bring it closer to the widespread practice and save the participants from unnecessary hassles.

(d) **The Regulator:** As the market activity pick-up and the volumes rise, the market wil definitely need a strong and independent regular, similar to the Securities and Exchange Board of India (SEBI) that regulates the securities markets. Unlike SEBI which is an independent body, the Forwards Markets Commission (FMC) is under the Department of Consumer Affairs (Ministry of Consumer Affairs, Food and Public Distribution) and

depends on it for funds. It is imperative that the Government should grant more powers to the FMC to ensure an orderly development of the commodity markets. The SEBI and FMC also need to work closely with each other due to the inter-relationship between the two markets.

(e) Lack of Economy of Scale: There are too many (4 national level and 26 regional) commodity exchanges. Though over 80 commodities are allowed for derivatives trading, in practice derivatives are popular for only a few commodities. Again, most of the trade takes place only on a few exchanges. All this splits volumes and makes some exchanges unviable. This problem can possibly be addressed by consolidating some exchanges. Also, the question of convergence of securities and commodities derivatives markets has been debated for a long time now. The Government of India has announced its intention to integrate the two markets. It is felt that convergence of these derivative markets would bring in economies of scale and scope without having to duplicate the efforts, thereby giving a boost to the growth of commodity derivatives market. It would also help in resolving some of the issues concerning regulation of the derivative markets. However, this would necessitate complete coordination among various regulating authorities such as Reserve Bank of India, Forward Markets commission, the Securities and Exchange Board of India, and the Department of Company affairs etc.

(f) Tax and Legal bottlenecks: There are at present restrictions on the movement of certain goods from one state to another. These need to be removed so that a truly national market could develop for commodities and derivatives. Also, regulatory changes are required to bring about uniformity in octroi and sales taxes etc. VAT has been introduced in the country in 2005, but has not yet been uniformly implemented by all states.

India is one of the top producers of a large number of commodities, and also has a long history of trading in commodities and related derivatives. The commodities derivatives market has seen ups and downs, but seem to have finally arrived now. There is a great need and vast scope of commodity derivative market in India provided the mistakes of the past are not repeated and the Government promptly addresses the serious problems facing the market. Among issues that need immediate resolution are those related to introduction commodity options, warehousing, cash settlement at maturity and standardization.

Future Prospects

With the gradual withdrawal of the Govt. from various sectors in the post liberalization era, the need has been left that various operators in the commodities market be provided with a mechanism to hedge and transfer their risk. India's obligation under WTO to open agriculture sector to world trade require future trade in a wide variety of primary commodities and their product to enable divers market functionaries to cope with the price volatility prevailing n the world markets.

Following are some of applications, which can utilize the power of the commodity market and create a win-win situation for all the involved parties:-

- Regulatory approval/permission to FIIs to trading in the commodity market.
- Active Involvement of mutual fund industry of India.
- Permission to Banks for acting as Aggregators and traders.
- Active involvement of small Regional stock exchanges.
- Newer Avenues for trading in Foreign Derivatives Exchanges.
- Convergence of variance market.
- Amendment of the commodities Act and Implementers of VAT.
- Introduction of option contract.

7.5 INSTRUMENTS AVAILABLE FOR TRADING

In recent years, derivatives have become increasingly popular due to their applications for hedging, speculation and arbitrage.

While futures and options are now actively traded on many exchanges, forward contracts are popular on the OTC market.

While at the moment only commodity futures trade on the NCDEX, eventually, as the market grows, we also have commodity options being traded.

Forward Contracts

A forward contract is an agreement to buy or sell an asset on a specified date for a specified price.

One of the parties to the contract assumes a long position and agrees to buy the underlying asset on a certain specified future date for a certain specified price. The other party assumes a short position and agrees to sell the asset on the same date for the same price. Other contract details like delivery date, price and quantity are negotiated bilaterally by the parties to the contract. The forward contracts are normally traded outside the exchanges.

The salient features of forward contracts are:

- They are bilateral contracts and hence exposed to counter-party risk.
- Each contract is custom designed, and hence is unique in terms of contract size, expiration date and the asset type and quality.
- The contract price is generally not available in public domain.
- On the expiration date, the contract has to be settled by delivery of the asset.
- If the party wishes to reverse the contract, it has to compulsorily go to the same counterparty, which often results in high prices being charged.

However forward contracts in certain markets have become much standardized, as in the case of foreign exchange, thereby reducing transaction costs and increasing transactions volume. This process of standardization reaches its limit in the organized futures market.

Futures Market

Futures markets were designed to solve the problems that exist in forward markets. A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a certain price. But unlike forward contracts, the futures contracts are standardized and exchange traded. To facilitate liquidity in the futures contracts, the exchange species certain standard features of the contract. It is a standardized contract with standard underlying instrument, a standard quantity and quality of the underlying instrument that can be delivered, (or which can be used for reference purposes in settlement) and a standard timing of such settlement. A futures contract may be offset prior to maturity by entering into an equal and opposite transaction. More than 99% of futures transactions are offset this way.

The standardized items in a futures contract are:

- Quantity of the underlying
- Quality of the underlying
- The date and the month of delivery
- The units of price quotation and minimum price change
- Location of settlement

Spot price: The price at which an asset trades in the spot market.

Futures price: The price at which the futures contract trades in the futures market.

Margin Requirements

(i) Initial Margin

The amount that must be deposited in the margin account at the time a futures contract is first entered

into is known as initial margin.

Initial margin based on "Value at Risk" Model (VaR) to estimate worst loss that can happen for a time horizon 99% confidence level SPAN® is the system used for margin calculation. Volatility is one of the inputs to the SPAN calculations EWMA/ J.P. Morgan Risk Metrics methodology for calculation of volatility will be adopted. Similar procedure is followed in most international exchanges like CBOT, CME, NYMEX, NYBOT, TOCOM, LME, LIFFE.

(ii) Marking- to- market Margin

In the futures market, at the end of each trading day, the margin account is adjusted to reflect the investor's gain or loss depending upon the futures closing price. This is called marking-to-market.

All open positions will be marked-to-market at the daily settlement price at the end of the day Client has to bring mark-to-market (MTM) margin to be through funds transfer the next day.

(iii) Maintenance margin

This is somewhat lower than the initial margin. This is set to ensure that the balance in the margin account never becomes negative. If the balance in the margin account falls below the maintenance margin, the investor receives a margin call and is expected to top up the margin account to the initial margin level before trading commences on the next day.

Options

Options are fundamentally different from forward and futures contracts. An option gives the holder of the option the right to do something. The holder does not have to exercise this right. In contrast, in a forward or futures contract, the two parties have committed themselves to doing something.

Whereas it costs nothing (except margin requirements) to enter into a futures contract, the purchase of an option requires an up-front payment.

There are two basic types of options, call options and put options.

Call option: A call option gives the holder the right but not the obligation to buy an asset by a certain date for a certain price.

Put option: A put option gives the holder the right but not the obligation to sell an asset by a certain date for a certain price.

Comparative Analysis of Commodity And Equity Markets

Factors	Commodity Markets	Equity Markets
Percentage Returns	Gold gives 10-15 %returns on the conservative Basis	Returns in the range of 15-20 % on annual basis.
Initial Margins	Lower in the range of 4-5-6%	Higher in the range of 25-40%
Arbitrage Opportunities	Exists on 1-2 month contracts. There is a small difference in prices, but in case of commodities, which it is in large tonnage makes a huge difference.	Significant Arbitrage Opportunities exists.
Price Movements	Price movements are purely based on the supply and demand.	Prices movements based on the expectation of future performance.

Price Changes	Price changes are due to policy changes, changes in tariff and duties.	Price changes can also be due to Corporate actions, Dividend announcements, Bonus shares / Stock splits.
Future Predictability	Predictability of future prices is not in the control due to factors like Failure of Monsoon and Formation of El-ninos at Pacific.	Predictability of futures performance is reasonably high, which is supplemented by the History of management performance.
Volatility	Lower Volatility	Higher Volatility
Securities Transaction Act Application	Securities Transaction Act is not applicable to commodity futures trading.	Securities Transaction Act is applicable to equity markets trading.

7.6 PARTICIPANTS OF COMMODITY MARKET

Participants who trade in the derivatives market can be classified under the following three broad categories:

- Hedgers
- Speculators
- Arbitrageurs

(1) Hedgers

A Hedger can be farmers, manufacturers, importers and exporter. A hedger buys or sells in the futures market to secure the future price of a commodity intended to be sold at a later date in the cash market. This helps protect against price risks.

The holders of the long position in futures contracts (buyers of the commodity), are trying to secure as low a price as possible. The short holders of the contract (sellers of the commodity) will want to secure as high a price as possible. The commodity contract, however, provides a definite price certainty for both parties, which reduces the risks associated with price volatility. By means of futures contracts, Hedging can also be used as a means to lock in an acceptable price margin between the cost of the raw material and the retail cost of the final product sold.

Someone going long in a securities future contract now can hedge against rising equity prices in three months. If at the time of the contract's expiration the equity price has risen, the investor's contract can be closed out at the higher price. The opposite could happen as well: a hedger could go short in a contract today to hedge against declining stock prices in the future.

(2) Speculators

Other commodity market participants, however, do not aim to minimize risk but rather to benefit from the inherently risky nature of the commodity market. These are the speculators, and they aim to profit from the very price change that hedgers are protecting themselves against. A hedger would want to minimize their risk no matter what they're investing in, while speculators want to increase their risk and therefore maximize their profits. In the commodity market, a speculator buying a contract low in order to sell high in the future would most likely be buying that contract from a hedger selling a contract low in anticipation of declining prices in the future.

Unlike the hedger, the speculator does not actually seek to own the commodity in question. Rather, he or she will enter the market seeking profits by off-setting rising and declining prices through the buying and selling of contracts.

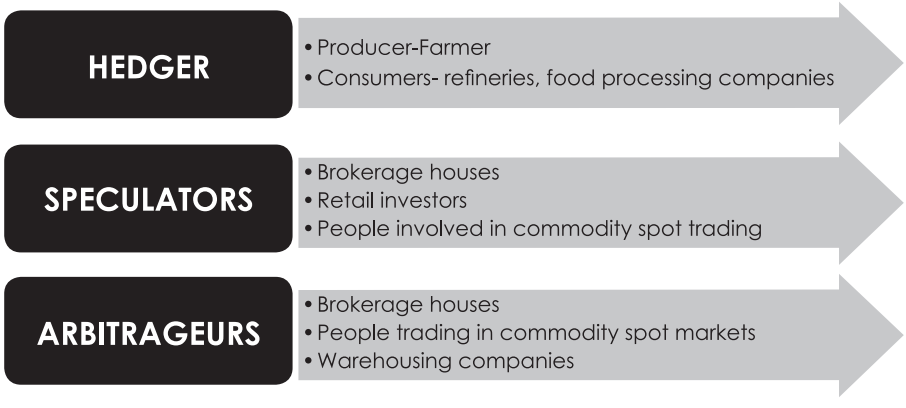
	Long	**Short**
Hedger	Secure a price now to protect against future rising prices	Secure a price now to protect against future declining prices
Speculator	Secure a price now in anticipation of rising prices	Secure a price now in anticipation of declining prices

(3) Arbitrageurs

A central idea in modern economics is the law of one price. This states that in a competitive market, if two assets are equivalent from the point of view of risk and return, they should sell at the same price. If the price of the same asset is different in two markets, there will be operators who will buy in the market where the asset sells cheap and sell in the market where it is costly. This activity termed as arbitrage, involves the simultaneous purchase and sale of the same or essentially similar security in two different markets for advantageously different prices. The buying cheap and selling expensive continues till prices in the two markets reach equilibrium. Hence, arbitrage helps to equalize prices and restore market efficiency.

Since the cash and futures price tend to move in the same direction as they both react to the same supply/ demand factors, the difference between the underlying price and futures price is called as basis. Basis is more stable and predictable than the movement of the prices of the underlying or the Futures price. Thus, arbitrageur would predict the basis and accordingly take positions in the cash and future markets.

EXHIBIT 3.9.1 Participants of Commodity Market



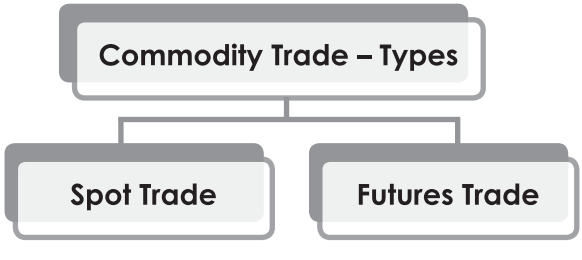
7.7 HOW THE COMMODITY MARKET WORKS

Working Procedure

The futures market is a centralized market place for buyers and sellers from around the world who meet and enter into commodity futures contracts. Pricing mostly is based on an open cry system, or bids and offers that can be matched electronically. The commodity contract will state the price that will be paid and the date of delivery. Almost all futures contracts end without the actual physical delivery of the commodity.

There are two kinds of trades in commodities.

Commodity Trade – Types



The first is the spot trade, in which one pays cash and carries away the goods.

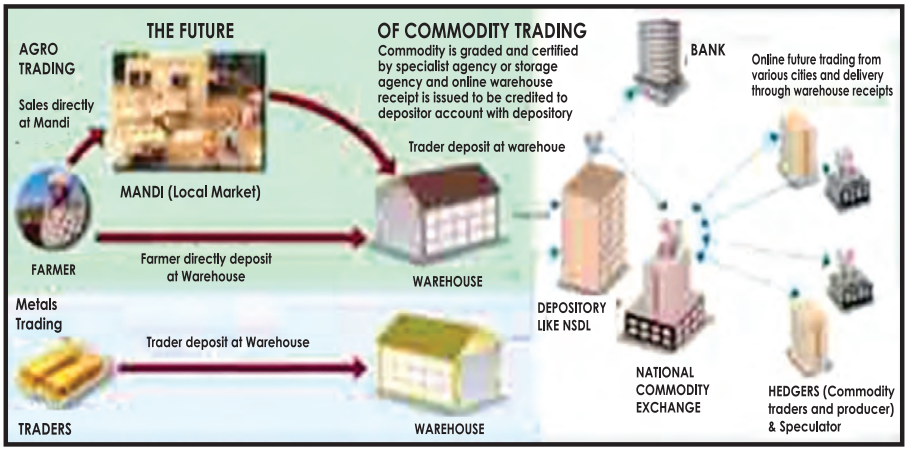
The second is futures trade. The underpinning for futures is the warehouse receipt. A person deposits certain amount of say, goods X in a warehouse and gets a warehouse receipt which allows him to ask for physical delivery of the goods from the warehouse but someone trading in commodity futures need not necessarily posses such a receipt to strike a deal. A person can buy or sale a commodity future on an exchange based on his expectation of where the price will go.

Futures have something called an expiry date, by when the buyer or seller either closes (square off) his account or give/take delivery of the commodity. The broker maintains an account of all dealing parties in which the daily profit or loss due to changes in the futures price is recorded. Squiring off is done by taking an opposite contract so that the net outstanding is nil.

For commodity futures to work, the seller should be able to deposit the commodity at warehouse nearest to him and collect the warehouse receipt. The buyer should be able to take physical delivery at a location of his choice on presenting the warehouse receipt. But at present in India very few warehouses provide delivery for specific commodities.

Following diagram gives a fair idea about working of the commodity market

Working of the Commodity Market



7.8 CLEARING HOUSE OPERATIONS

Introduction

Exchange-traded derivatives (ETD) are those derivatives products that are traded in stock Exchanges. Clearing House acts as an intermediary to all related transactions, and takes Initial margin from both sides of the trade to act as a guarantee.

Clearing House protects the financial integrity of markets by serving as the counterparty to every transaction and virtually eliminating credit risk. It is responsible for settling trading accounts, clearing trades, collecting and maintaining collateral funds, regulating delivery and reporting trading data. The financial integrity of futures and options markets depends on the robustness of their arrangements for clearing and settling trades.

General Aspects of Clearing House

A derivatives clearing house may be a department within the exchange for which it clears or an independent legal entity. If organized as an independent legal entity, the clearing house is typically owned by the exchange for

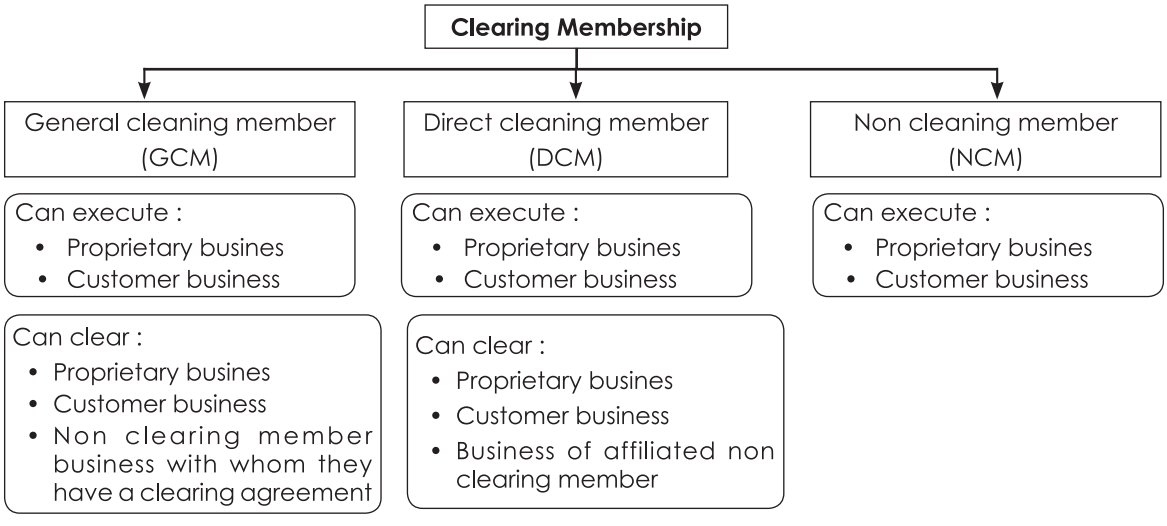
which it clears or by its clearing members. Historically, a derivatives exchange was typically owned by its members (primarily brokers, banks, investment companies and insurance companies). The members were also generally the exchange's largest users.

When a trade is executed, Clearing House stands between the buyer and seller as counterparty of both contractual partners. The Clearing House enables the parties of the transaction to make further decisions fully independent of each other and limit counterparty risks to a single contractual partner.

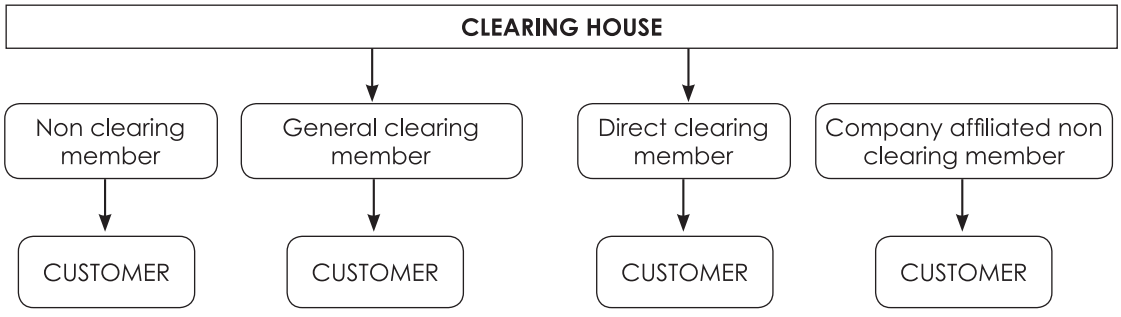
Clearing Structure

The derivatives clearing house restricts direct participation in the clearing process to the most creditworthy subset of the exchange's members; these are those clearing members that have a principal relationship with the clearing house in its capacity as central counterparty for all contracts submitted and accepted for clearing. Market participants that are not clearing members must establish an account relationship directly or through another party (a non-clearing broker) with a clearing member to effect settlement. Generally, there is no contractual relationship between the derivatives clearing house and these non clearing member market participants.

A General Clearing Member (GCM) may settle its own transactions, those of its customers, as well as those of market participants which do not hold a clearing license (Non Clearing Members–NCM). A Direct Clearing Member (DCM) is entitled to clear only its own transactions, those of its customers, and those of its corporate affiliates which do not hold a clearing license.



If a market participant does not itself hold a Clearing License, it must clear its transactions via a GCM or a company-affiliated DCM. In such cases, the contractual party of the Non-Clearing Member (NCM) will not be the clearing house, but rather the GCM or company-affiliated DCM, which in turn is the contractual party of the Clearing House.



Each Clearing Member is obliged to demand from its customers and NCMs margin amounts which are at least as high as the levels that result from the clearing house method of calculation.

Clearing and Settlement

Most futures contracts do not lead to the actual physical delivery of the underlying asset. The settlement is done by closing out open positions, physical delivery or cash settlement. All these settlement functions are taken care of by an entity called clearinghouse or clearing corporation. National Securities Clearing Corporation Limited (NSCCL) undertakes clearing of trades executed on the NCDEX. The settlement guarantee fund is maintained and managed by NCDEX.

(1) Clearing

Clearing of trades that take place on an exchange happens through the exchange clearing house. A clearing house is a system by which exchanges guarantee the faithful compliance of all trade commitments undertaken on the trading floor or electronically over the electronic trading systems. The main task of the clearing house is to keep track of all the transactions that take place during a day so that the net position of each of its members can be calculated. It guarantees the performance of the parties to each transaction.

Typically it is responsible for the following:

- Effecting timely settlement.
- Trade registration and follow up.
- Control of the evolution of open interest.
- Financial clearing of the payment flow.
- Physical settlement (by delivery) or financial settlement (by price difference) of contracts.
- Administration of financial guarantees demanded by the participants.

The clearing house has a number of members, who are mostly financial institutions responsible for the clearing and settlement of commodities traded on the exchange. The margin accounts for the clearing house members are adjusted for gains and losses at the end of each day (in the same way as the individual traders keep margin accounts with the broker).

Clearing Mechanism

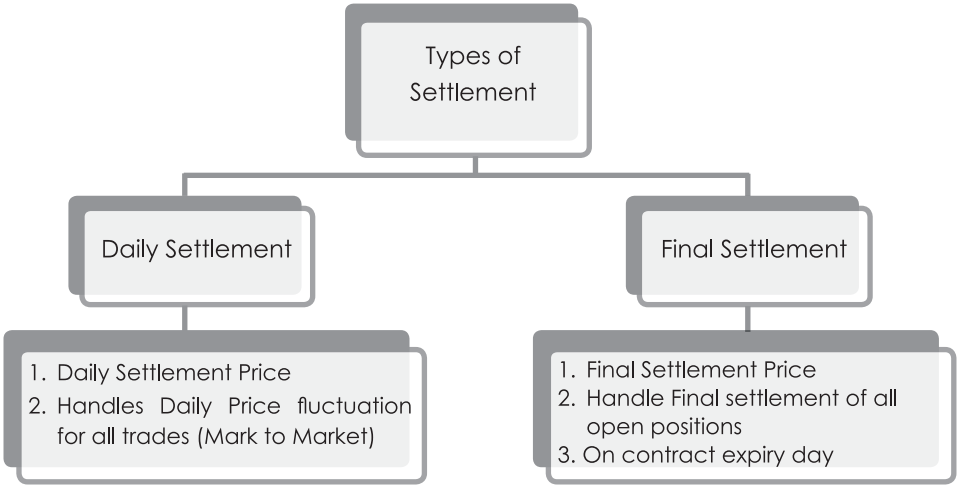
Only clearing members including professional clearing members (PCMs) are entitled to clear and settle contracts through the clearing house.

The clearing mechanism essentially involves working out open positions and obligations of clearing members. This position is considered for exposure and daily margin purposes. The open positions of PCMs are arrived at by aggregating the open positions of all the TCMs clearing through him, in contracts in which they have traded. A TCM's open position is arrived at by the summation of his clients' open positions, in the contracts in which they have traded. Client positions are netted at the level of individual client and grossed across all clients, at the member level without any set-offs between clients. Proprietary positions are netted at member level without any set-offs between client and proprietary positions.

(2) Settlement

Futures contracts have two types of settlements, the MTM settlement which happens on a continuous basis at the end of each day, and the final settlement which happens on the last trading day of the futures contract.

- Daily settlement price: Daily settlement price is the consensus closing price as arrived after closing session of the relevant futures contract for the trading day. However, in the absence of trading for a contract during closing session, daily settlement price is computed as per the methods prescribed by the exchange from time to time.
- Final settlement price: Final settlement price is the closing price of the underlying commodity on the last trading day of the futures contract. All open positions in a futures contract cease to exist after its expiration day.



Settlement mechanism

Settlement of commodity futures contracts is a little different from settlement of financial futures which are mostly cash settled. The possibility of physical settlement makes the process a little more complicated.

7.9 RISK MANAGEMENT

Overview

As a central counterparty to its clearing members, a derivatives clearing house assumes a variety of risks which must be managed. More specifically, the clearing house must have adequate risk management measures in place to cover

(A) Default of a clearing member

(B) Default of a settlement bank, and

(C) Number of other risks.

(A) Defaults of Clearing Members

The defaults of clearing members on their outstanding contracts may expose the clearing house to principal (delivery) risk, replacement cost risk and liquidity risk.

Principal Risk

Can occur if contracts are settled through delivery of the underlying commodity or instrument. For example, if a commodity or underlying instrument is delivered prior to receipt of payment, the deliverer risks looses its full value. If payment is made prior to delivery, the payer risks looses the full value of the payment.

Replacement Cost Risk

The clearing house has an obligation to the clearing member on the other side of the contract, so that it must take a position identical to that on which the clearing member has defaulted. However, as time passes after the default, market prices will tend to move away from the level that existed at the time the defaulting clearing member last posted margin to cover its obligations under the contract. As a result, the obligations of the clearing house may fluctuate from the time of the default until the clearing house covers and closes out the position.

Liquidity Risk

Clearing house must fulfill its payment obligations without delay even if one or more members default or their performance of their settlement obligations is delayed. This is particularly critical because, owing to the central counterparty's central position, any doubts about its ability to conclude settlement may create systemic disturbances.

(B) Settlement Bank Failures

If clearing houses effect money settlements through private settlement banks, they are exposed to the risk of settlement bank failure. Such failures could expose a clearing house to both credit risk and liquidity risk.

(C) Other Risks to which the Derivatives Clearing Houses may be exposed

(i) Market Risk:

A clearing house may be subject to market risk if it accepts securities as margin. Clearing houses usually address this market risk by discounting the value of non-domestic currencies and securities posted as margin (i.e. by subjecting them to "haircuts") and by marking them to market daily.

(ii) Currency Exchange Risk

If the clearing house accepts non-domestic currency as margin or if it clears contracts that are denominated and settled in a non-domestic currency, but that are collateralized with domestic currency or assets denominated in domestic currency. Clearing houses usually address this risk by subjecting non- domestic currency and assets

denominated in non-domestic currency to haircuts and by marking all

(iii) Operational risk:

Any operational problem that delays settlement or prevents the clearing house from resolving a default could increase counterparty exposures. In addition, an operational breakdown might prevent a clearing house from monitoring its exposures.

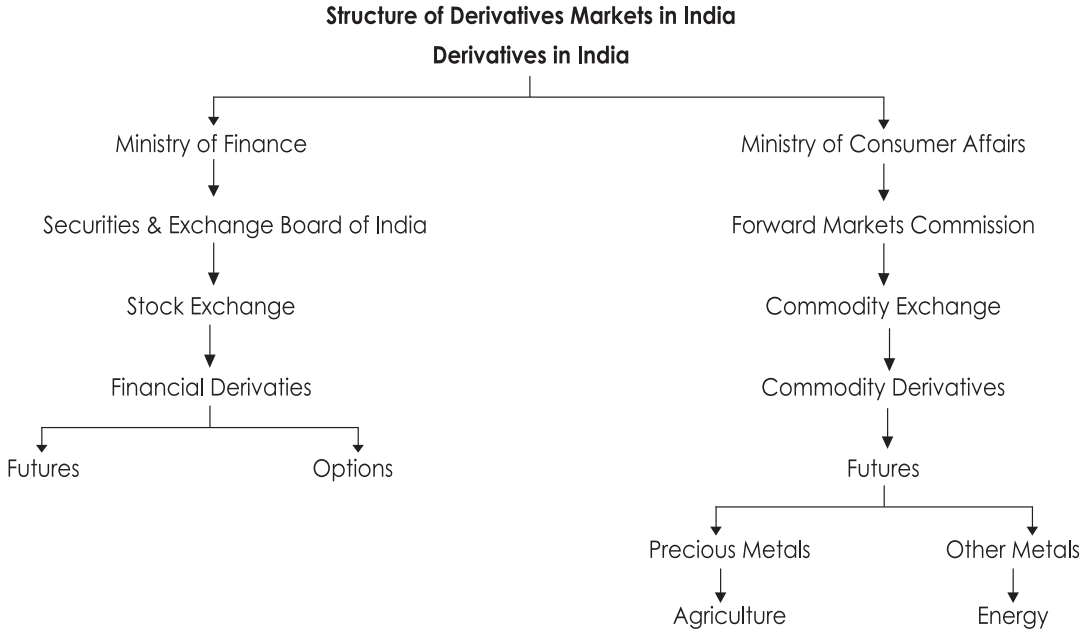
(iv) Legal risks:

The enforceability of netting arrangements, the ability to realize a defaulting member's assets, the finality of payments and securities transfers, the enforceability of the clearing house's internal rules and the general legal framework applicable in the jurisdiction in which the clearing house operates must be subject to a high degree of legal certainty.

7.10 COMMODITY FUTURES AND ITS MECHANISM

A commodity may be defined as an article, a product or material that is bought and sold. It can be classified as every kind of movable property, except Actionable Claims, Money& Securities.

The general understanding about the commodity trading futures market is that it is very complex and difficult to analyze the market. However on the other hand it is not so! Infact there are a few basic facts that people need to know of which will change their perception about what the commodity trading futures market is and how they work. The basic knowledge is that the commodity trading futures market or the exchange market as it is known is a public marketplace where the sale or purchase of commodities takes place. These sales and purchases are done at an agreed price so that commodities are delivered at a specified date. The broker is a person who needs to do the purchase or sales of the commodities. The broker is also a part of the organized exchange and the deal is completed according to the terms and conditions as given in the standardized futures contract. The main thing that distinguishes the futures commodity trading market and a commodity market where commodities are bought and sold is that the futures market works with the help of contract agreements that follow a standard procedure. These agreements are responsible for delivery of a particular commodity at an amount as specified for a future month. It does not include the immediate transfer of commodities ownership. In short the buying and selling in the commodity trading futures market does not need the buyer or the seller to be the owner of the particular commodity that they are trading for. With futures the main concern is receiving the delivery or making the delivery of the commodity, however the futures should not be bought or sold during the month of delivery. The previous sale also can be cancelled at any time with respect to the equal offsetting sale. If the sale is cancelled before the commodities delivery month then the trade cancels out completely. In this case the commodity is not received by the buyer or delivered by the seller. In reality there is only a very small percentage very specifically less than 2% of the total of all futures commodity trading contracts that are settled or entered into through the deliveries. A larger part shows that there is a lot of cancellation of deliveries of commodities even before the delivery month in the manner that is described above. This forms the basic mechanics or the functioning of the commodity trading futures market. Subscription is easy as you can subscribe either by Cheque Deposit, Online Money Transfer, Cash Deposit or Credit Card Payment.



7.16.1 To qualify as a commodity for futures trading, an article or a product has to meet some basic characteristics:

(i) The product must not have gone through any complicated manufacturing activity, except for certain basic processing such as mining, cropping, etc. In other words, the product must be in a basic, raw, unprocessed state. There are of course some exceptions to this rule. For example, metals, which are refined from metal ores, and sugar, which is processed from sugarcane.

(ii) The product has to be fairly standardized, which means that there cannot be much differentiation in a product based on its quality. For example, there are different varieties of crude oil. Though these different varieties of crude oil can be treated as different commodities and traded as separate contracts, there can be a standardization of the commodities for futures contract based on the largest traded variety of crude oil. This would ensure a fair representation of the commodity for futures trading. This would also ensure adequate liquidity for the commodity futures being traded, thus ensuring price discovery mechanism.

(iii) A major consideration while buying the product is its price. Fundamental forces of market demand and supply for the commodity determine the commodity prices.

(iv) Usually, many competing sellers of the product will be there in the market. Their presence is required to ensure widespread trading activity in the physical commodity market.

(v) The product should have adequate shelf life since the delivery of a commodity through a futures contract is usually deferred to a later date (also known as expiry of the futures contract).

Objectives of Commodity Futures

- Hedging with the objective of transferring risk related to the possession of physical assets through any adverse moments in price. Liquidity and Price discovery to ensure base minimum volume in trading of a commodity through market information and demand supply factors that facilitates a regular and authentic price discovery mechanism.
- Maintaining buffer stock and better allocation of resources as it augments reduction in inventory requirement and thus the exposure to risks related with price fluctuation declines. Resources can thus be diversified for investments.
- Price stabilization along with balancing demand and supply position. Futures trading leads to predictability

in assessing the domestic prices, which maintains stability, thus safeguarding against any short term adverse price movements. Liquidity in Contracts of the commodities traded also ensures in maintaining the equilibrium between demand and supply.

- Flexibility, certainty and transparency in purchasing commodities facilitate bank financing.

  Predictability in prices of commodity would lead to stability, which in turn would eliminate the risks associated with running the business of trading commodities. This would make funding easier and less stringent for banks to commodity market players.

Benefits of Commodity Futures Markets

The primary objectives of any futures exchange are authentic price discovery and an efficient price risk management. The beneficiaries include those who trade in the commodities being offered in the exchange as well as those who have nothing to do with futures trading. It is because of price discovery and risk management through the existence of futures exchanges that a lot of businesses and services are able to function smoothly.

(a) Price Discovery:- Based on inputs regarding specific market information, the demand and supply equilibrium, weather forecasts, expert views and comments, inflation rates, Government policies, market dynamics, hopes and fears, buyers and sellers conduct trading at futures exchanges. This transforms in to continuous price discovery mechanism. The execution of trade between buyers and sellers leads to assessment of fair value of a particular commodity that is immediately disseminated on the trading terminal.

(b) Price Risk Management: - Hedging is the most common method of price risk management. It is strategy of offering price risk that is inherent in spot market by taking an equal but opposite position in the futures market. Futures markets are used as a mode by hedgers to protect their business from adverse price change. This could dent the profitability of their business. Hedging benefits who are involved in trading of commodities like farmers, processors, merchandisers, manufacturers, exporters, importers etc.

(c) Import- Export competitiveness: - The exporters can hedge their price risk and improve their competitiveness by making use of futures market. A majority of traders which are involved in physical trade internationally intend to buy forwards. The purchases made from the physical market might expose them to the risk of price risk resulting to losses. The existence of futures market would allow the exporters to hedge their proposed purchase by temporarily substituting for actual purchase till the time is ripe to buy in physical market. In the absence of futures market it will be meticulous, time consuming and costly physical transactions.

(d) Predictable Pricing: - The demand for certain commodities is highly price elastic. The manufacturers have to ensure that the prices should be stable in order to protect their market share with the free entry of imports. Futures contracts will enable predictability in domestic prices. The manufacturers can, as a result, smooth out the influence of changes in their input prices very easily. With no futures market, the manufacturer can be caught between severe short-term price movements of oils and necessity to maintain price stability, which could only be possible through sufficient financial reserves that could otherwise be utilized for making other profitable investments.

(e) Benefits for farmers/Agriculturalists: - Price instability has a direct bearing on farmers in the absence of futures market. There would be no need to have large reserves to cover against unfavorable price fluctuations. This would reduce the risk premiums associated with the marketing or processing margins enabling more returns on produce. Storing more and being more active in the markets. The price information accessible to the farmers determines the extent to which traders/processors increase price to them. Since one of the objectives of futures exchange is to make available these prices as far as possible, it is very likely to benefit the farmers. Also, due to the time lag between planning and production, the market-determined price information disseminated by futures exchanges would be crucial for their production decisions.

(f) Credit accessibility: - The absence of proper risk management tools would attract the marketing and processing of commodities to high-risk exposure making it risky business activity to fund. Even a small movement in prices can eat up a huge proportion of capital owned by traders, at times making it virtually impossible to pay-back the loan. There is a high degree of reluctance among banks to fund commodity traders, especially those who do not manage price risks. If in case they do, the interest rate is likely to be high and terms and conditions very stringent. This possesses a huge obstacle in the smooth functioning and competition of commodities market. Hedging, which is possible through futures markets, would cut down the discount rate in commodity lending.

(g) Improved product quality: - The existence of warehouses for facilitating delivery with grading facilities

along with other related benefits provides a very strong reason to upgrade and enhance the quality of the commodity to grade that is acceptable by the exchange. It ensures uniform standardization of commodity trade, including the terms of quality standard: the quality certificates that are issued by the exchange-certified warehouses have the potential to become the norm for physical trade.

(h) **Commodities as an asset class for diversification of portfolio risk:-** Commodities have historically an inverse correlation of daily returns as compared to equities. The skewness of daily returns favors commodities, thereby indicating that in a given time period commodities have a greater probability of providing positive returns as compared to equities. Another aspect to be noted is that the "sharpe ratio" of a portfolio consisting of different asset classes is higher in the case of a portfolio consisting of commodities as well as equities. Thus, an Investor can effectively minimize the portfolio risk arising due to price fluctuations in other asset classes by including commodities in the portfolio.

(i) **Commodity derivatives markets are extremely transparent** in the sense that the manipulation of prices of a commodity is extremely difficult due to globalisation of economies, thereby providing for prices benchmarked across different countries and continents. For example, gold, silver, crude oil, natural gas, etc. are international commodities, whose prices in India are indicative of the global situation.

(j) **An option for high net worth investors:** With the rapid spread of derivatives trading in commodities, the commodities route too has become an option for high net worth and savvy investors to consider in their overall asset allocation.

(k) **Useful to the producer:** Commodity trade is useful to the producer because he can get an idea of the price likely to prevail on a future date and therefore can decide between various competing commodities, the best that suits him.

(l) **Useful for the consumer:** Commodity trade is useful for the consumer because he gets an idea of the price at which the commodity would be available at a future point of time. He can do proper costing/ financial planning and also cover his purchases by making forward contracts. Predictable pricing and transparency is an added advantage.

What Makes Commodity Trading Attractive?

- A good low-risk portfolio diversifier
- A highly liquid asset class, acting as a counterweight to stocks, bonds and real estate.
- Less volatile, compared with, equities and bonds.
- Investors can leverage their investments and multiply potential earnings.
- Better risk-adjusted returns.
- A good hedge against any downturn in equities or bonds as there is little correlation with equity and bond markets.
- High co-relation with changes in inflation.
- No securities transaction tax levied.

Differences—Commodity and Financial Futures

Apart from the difference in the underlying assets, financial futures and commodity futures are substantially different from each other in the following respects:

(a) Valuation

Financial futures are easier to understand as the cost of carry model for its valuation applies. The argument of arbitrage also holds because of the absence of convenience yield in financial futures. Financial futures involve financial instruments which do not have consumption value. The consumption value makes valuation of futures contracts on commodities difficult.

(b) Delivery and Settlement

The provisions of delivery are applicable equally to commodities and financial futures. In case of financial futures delivery of underlying assets is prompt and hassle free, and so is its settlement. Further, there are no costs of transportation, storage, or insurance, etc. involved in financial futures. For futures on financial assets the price adjustment on account of discrepancy in quality of what was contracted and what is being delivered, is not required. Quality of underlying asset is immaterial in case of financial products, whereas there is ample scope of

controversy over quality in case of commodity futures. In case of futures on indices or intangibles the underlying is non-deliverable and futures contracts on them are necessarily cash settled.

(c) Contract Features and Life

Commodity futures are governed by seasons and perishable nature of the underlying asset. The delivery is linked to the availability, and therefore contracts specifications have to consider physical characteristics of the underlying assets. Futures contracts on commodities normally do not exceed 90 days, while there is no such limitation on the financial futures. Financial futures can have much longer life, though generally maturity of many financial futures is kept at 90 days.

(d) Supply and Consumption Patterns

In case of financial products, such as stocks, indices, and foreign exchange, the supply can be considered as unlimited and independent of weather and seasons. The supply in case of financial products does not suffer from vagaries of nature. The supply of commodities depends upon factors on which we do not have any control. The total supply is dependent upon weather, storage capacity, shelf life, etc. Further, the supply of most commodities (agricultural products) is confined to the harvesting period, while the consumption is uniform throughout the year. Deterioration in value of commodities with time is another phenomenon that does not affect futures on financial products.

(f) Futures Contract on Commodities

Futures contract on commodities have same features as any other futures contract on financial asset. Significant differences arise in the commodity futures in two areas—extremely elaborate description of the quality attributes of the commodity, and procedure for settlement by delivery, deliverable quality, place of delivery, etc. Such complexities do not arise in case of futures contracts on financial assets.

Futures contracts on commodities have specific quality requirements. The price needs to be adjusted for the difference in the quality specified in the contract and the quality being delivered. For example, there is significant difference in the price of basmati rice and ordinary rice. What is deliverable against a futures contract needs to be specified. Besides, the exchange also has to provide for reasonable time for both the buyer and the seller to arrange for giving/taking delivery of the underlying asset. Usually futures contract on commodities provide for delivery notice period when parties are required to disclose the intentions of settlement by delivery.

Futures contracts on commodities can be settled in any of the three ways described in the earlier chapter, i.e. by physical delivery, by cash settlement, or by closing out. Settlement by closing out or by cash has the same form in commodities as is in financial assets. However, unlike futures contracts on financial assets the settlement of futures on commodity by delivery requires special mention. Settlement of commodity futures by delivery is cumbersome. Financial assets are either non-deliverable (as an index) or do not have quality/ time limitations.

In case of settlement by delivery the exchange has to provide for ascertainment of the quality and price adjustment, location of the delivery, adjustment of taxes and freight, the delivery logic at the option of the seller or buyer or both, and assignment. All these issues are dealt extensively in the specification of the futures contract. This makes the task of designing of the futures contract more onerous.

Assignment refers to the matching of short and long positions. For example, if the delivery is at the option of the seller the exchange has to find a willing buyer and devise rules for assigning delivery to a specific buyer. If the delivery logic is compulsory (all open positions at the expiry of futures contract are to be settled by delivery) the problem of assignment does not arise as for each short position there is a matching long position.

Pricing Commodity Futures

The relationship between futures prices and the price of the underlying asset is explained. There are several important differences between a forward contract. These are :

- A forward contract is intended for physical delivery of commodity while most of the futures contracts are settled without physical delivery.
- No margins are involved in forward contracts
- There is no daily settlement of forward contracts
- Forward contracts are usually customized contracts whereas futures contracts are standardized contracts traded on an exchange

It is easier to examine the relationship between forward price and spot price. The study of futures prices becomes

rather complex on account of the aforesaid factors, apart from the aspect of tax and transaction costs. However, it is observed that the forward price for a contract with a certain delivery date is the same as the futures price for a contract with the same delivery date, when the interest rate is constant and same for all maturities. It can be assumed that the analysis for forward prices is equally applicable to futures prices, especially for short maturity contracts.

Again, interest is usually compounded on a yearly or half-yearly basis. However, in case of derivatives, interest is compounded continuously or on a daily basis. We know that if a sum of money A is invested for n years @ r % per annum, it will become $A (1 + r)^n$ at the end of the period. If compounded m times per annum, the amount will become $A (1 + r/m)^{mn}$. Thus, ₹ 100 @ 10% per annum becomes ₹110 and if compounded daily or 365 times in a year (m), the terminal value is ₹ 110.52.

Continuous compounding means that m tends to infinity, and mathematically the terminal value for continuous compounding is given by $Ae^{r n}$, where e is the mathematical constant 2.71828. For A = 100, r = 0.1 and n = 1, the terminal value is $100e^{0.1}$ which is 110.52, the same (up to 2 decimals) as worked out by daily compounding. We can use the formula Aer n , instead of the formula for daily compounding, to compute the terminal value of a sum of money continuously compounded @ r % for n years. By implication, the formula for discounting continuously is $Ae^{-r n}$

From the foregoing, we obtain –

$Ae^{rn} = A (1 + r_m/m)^{mn}$ where r is the continuously compounded rate and r_m the equivalent rate of interest with compounding m times per annum.

or $e^r = (1 + m/m)^m$ (deleting power of n from both sides)

Hence, $r = m \log (1 + r_m /m)$, and

$r_m = m (e^{r/m}-1)^m$

These equations can be used to convert a rate where the compounding frequency is m times per annum to a continuously compounded rate and vice-versa.

The risk free interest rate in futures market often referred to hereafter, is also known as the **repo rate.** A repo or repurchase agreement, is an agreement where the owner of securities agrees to sell them to another party and buy them back at a slightly higher price later. The difference in price is the interest earned by the other party. The repo involves very little risk to either party, because if the borrower (seller) does not keep his promise to repurchase, the lender can retain the securities. Likewise, the borrower does not have to really part with securities to raise funds, and can repossess the securities under the agreement.

1. Forward Contract on No-Income Securities

The forward price for a no-income security like non-dividend paying stocks or discount bonds is the terminal value of present price of the asset after a certain time interval (maturity period of contract) at risk-free rate of interest compounded continuously. This is given by Aern as seen in preceding paragraph.

Hence,

$$F=Se^{r(T-t)} \qquad (1)$$

where, F is the forward price of security

S the price of the underlying asset in the contract

r the risk-free rate of interest

T time when the forward contract matures (in years)

t current time (in years)

It is easy to see that when forward price F is equal to terminal value of spot price S (the right hand side in Eq. 1), there is no **arbitrage opportunity.**

However, if forward price $F > S e^{r(T-t)}$ an investor can borrow S rupees for a time T - t at risk-free interest rate r, buy the asset and take a short position in the forward contract. At time T, the asset is sold and the moneys used to repay the loan and yield a profit of $F - S e^{r(T-t)}$.Thus, the value of long forward contract f is $F - S e^{r(T-t)}$

Suppose F is less than $S e^{r(T-t)}$,then the investor can take a long position and short the asset. The sale yields

a cash inflow of S that can be invested at a rate r for a period T - t. At time T, the asset is bought under the forward contract, and a profit of [$S e^{r(T-t)}$ -F] is realized, which is the value of the forward contract.

Now, consider the following two portfolios,

Portfolio A: one long forward contract on the security plus an amount of cash equal to $Ke^{-r(T-t)}$, where K is the delivery price

Portfolio B: one unit of security

In portfolio A, the cash, invested at rate r, will grow to an amount K, at time T - ($K e^{-r(T-t)} \times e^{r(T-t)}$) i. e. $K \times 1/e^{r(T-t)} \times e^{r(T-t)} = K$). It can be used to pay for the security at the maturity of the forward contract. Both portfolios will thus have one unit of security at time T. If the value of forward contract is f, then it follows that -

$f + K e^{-r(T-t)} = S$ (forward contract + cash = one unit of security)

Hence, $f = S - K e^{-r(T-t)}$ (2)

At time t when the forward contract is made, the forward price F and delivery price are the same. The value of contract f is therefore zero. Substituting K by F and taking f as zero in Eq. 2 gives,

$F = S e^{r(T-t)}$ which is the same as Eq. 1

2. Forward Contract on Income Bearing Security

Examples of securities that provide predictable cash income are stocks paying known dividends and coupon interest bearing bonds. If I is the present value at risk free rate r, of income to be received during the life of the contract, then from Eq. 1 above,

$F=(S-I)e^{r(T-t)}$ (3)

Also, if $F>(S-I)e^{r(T-t)}$,then $f=F-(S- I) e^{r(T-t)}$ (4)

And if $F<(S-I)e^{r(T-t)}$,then $f=(S-I)e^{r(T-t)}-F$

The same arguments as in preceding paragraph (Eq. 2) help to arrive at the equation for f vide Eq. 4 above. The portfolio B in this case consists of one unit of security plus cash amount `I' (present value of cash flows) borrowed at the risk free rate.

3. Forward Contracts on Security with Known Dividend Yield

A known dividend yield means that the income can be expressed as a percentage of the value of security S. Hence, we can substitute the present value of cash flows I in Eq. 3 and 4 with an annual rate q. In portfolio B, we will have $S \times e^{q(T-t)}$ units of security, so that when all the income is reinvested at q%, we get one unit of security at time T. Equation 3 and 4 is modified as:

$F = Se^{(r-q)(T-t)}$ and

$F = Se^{(T-t)} - Ke^{-r(T-t)}$

If dividend yield varies during the life of the contract, then q is taken as the average dividend yield.

4. General Result

The value of a forward contract at the time it is first entered into is zero. Later, it may have a positive or negative value. A general equation applicable to all forward contracts, that gives the value of a long forward contract 'f', in terms of originally negotiated price K and the current forward price F is -

$f = (F-K)e^{-r(T-t)}$

5. Futures on Commodities

On the basis of findings of empirical studies, the equations for forward price in relation to spot price developed in the foregoing are deemed to apply for futures prices as well.

(i) Investment Assets

Here one has to make a distinction between commodities that are held by a significant number of investors solely as investment assets, like gold and silver, and other commodities that are primarily held for consumption. A person plots his put our savings in real estate, or gold and silver in anticipation of appreciation in value with passage of time, though the asset does not yield any income while it is held. Investment assets are hence

like no-income securities if storage cost is zero, and the forward or futures price is given by Eq. 1 (Like forward contract on no-income security Pp. 242)

$F = Se^{r(T-t)}$

In practice, there is indeed a storage cost, and the spot price of security S can be considered as S + U, where U represents the present value of storage cost. The equation for F stands modified to

$F = (S+U)\ e^{r(T-t)}$

(ii) Consumption Assets

For commodities that are held for consumption purposes such as agricultural commodities or base metals, which are used as raw materials by processors and manufacturers, the arbitrage arguments leading to Eq. 4.1 do not apply when the futures price is less than the spot price.

First, consider the case when $F > (S + U)\ e^{r(T-t)}$. An arbitrageur, in this situation, would borrow an amount of S + U at rate r% to purchase one unit of commodity and pay storage cost, and sell a futures contract on one unit of commodity. At time T, it would yield a profit of $F - (S + U)\ e^{r(T-t)}$. It is known, though, that the situation cannot hold for a long time because the arbitrage opportunity leads to an increase in spot price S (due to buying) and progressive decrease in F (due to selling of contracts).

Now consider that $F < (S + U)\ e^{r(T-t)}$

An arbitrageur, in this case, should sell the commodity now in such a way that he realizes the amount S + U, which implies that he is paid for the storage cost. This is usually not possible. In case of investment assets, like gold or silver, an arbitrageur can sell the commodity, save on storage costs, and invest the money at rate r %; and buy the contract at time T with the money, making a profit from the inequality. But in case of consumption commodities, individuals and companies do not hold inventory as an investment but for future consumption purposes. They are reluctant to sell the commodity and buy futures contract because futures contract is no substitute for commodity for the purposes of production of goods. Theoretically, therefore, the inequality $F < (S + U)\ e^{r(T-t)}$ will hold for a long time. For S to go down an additional supply is required and if that does not happen because holders do not shed inventory or sellers restrict supply to the spot market due to low prices, the inequality remains. The benefit to the users of the commodity by holding the inventory in such a situation arise from the ability to keep production running or to profit from temporary local shortages.

6. The Cost of Carry

The futures price is related to the spot price by the cost of carry, which is the storage cost plus the interest cost 'r' on the money locked in the asset (interest paid on loan) less the income (dividend) earned on the asset. For no-income stock, the cost of carry is r because there are no storage costs and no income is earned; for a stock index, it is r - q since income is earned @q%; it is r-r for a currency (r is risk free foreign interest rate);for a commodity, it is r+u, where u is the storage cost as a percentage of S.

For an **investment asset,** the futures price is $F = Se^{c(T-t)}$, substituting c for r in Eq. 1, where c is the cost of carry as a percentage of S.

For a **consumption asset,** the futures price is $F - S\ e^{(c-Y)(T-t)}$, where **y** is the convenience yield.

When the futures price is higher than the spot price, the market is said to be **'contango',** which means that futures prices are determined only by the cost of carry. The difference between two futures prices is referred as the 'spread'. It is called intra-commodity spread when the difference is between futures prices for the same commodity for two different maturities. It is called inter- commodity spread when the difference relates to futures prices of two different commodities like wheat and soya bean. It is inter-market spread, when the difference is between futures prices in two different markets.

7. Futures Price and Expected Future Spot Price

We have derived the formulae for determining the futures price for different types of assets (no- income assets, income bearing assets and known income or dividend yielding assets). The futures price of investment

assets and consumption assets in the context of these formulae have also been examined. It is now time to address the question whether futures price is equal to the expected future spot price. Keynes and Hick advanced a theory that if hedgers tend to hold short positions and speculators tend to hold long positions, the futures price will be less than the expected spot price. It is argued that speculators need to be rewarded for the risks they bear. If hedgers are long and speculators short in future, the futures price will be higher than the future spot price; once again for the same reason that speculators need to be compensated.

Risk in Futures Position

Consider the case of a speculator who takes a long position in the hope that the future spot price of the asset will be higher than the futures price at maturity. It could be viewed as if the speculator invests the present value of the futures price into a risk free investment at time t while simultaneously taking a long futures position. The proceeds of the investment are used to buy the asset on maturity and it is sold in the market immediately at the market price (future spot price). The cash flows to the speculator are:

Time t: - $F e^{-r(T-t)}$ (negative sign indicates cash outflow)

Time T: + S (future spot price)

The present value of the investment is

$F e^{-r(T-t)} + S_e e^{-k(T-t)}$

where, S_e is the expected future spot value

'k' the discount rate, i.e. the rate of return required by the investor.

Theoretically, the futures price converges to the spot price at maturity of the contract because if it were higher, an arbitrageur would sell the futures contract during delivery period, buy the asset at spot price and make delivery. Arbitrage would lead to fall in futures price until it equals the spot price.

Thus, theoretically, the investment opportunities in securities market have zero net present value. Hence, the present value of the long position taken by speculator above is zero. Hences

$F e^{-r(T-t)} + S e^{-k(T-t)} = 0$

The required rate of return k depends on the market risk or systematic risk of the investment. Systematic risk arises from a correlation between returns from the investment and returns from the stock market as a whole. The systematic risk in futures market is generally higher than the stock market because of high leverage. An investor has to invest only 10% to 15% of the contract value as margin to trade in futures market. In other words, $k > r$ and therefore $F < S_e$

By implication, the futures price should generally move upwards as the maturity of contract approaches (by the theory of convergence) to equal S_e and a trader should over a long period of time make profits by consistently holding long futures positions.

8. Option Contracts

Option contracts are an alternative to futures contracts for dealing with the risk due to adverse price movements. There are two types of options: call, and put, and the pay-off from each, for the holder and the seller have also been examined. Also, that the market value of an option is the sum of its intrinsic value and the time value. The minimum value of an option is zero; it cannot be negative. A call option with a strike price of ₹100 becomes worthless if the asset price declines to ₹80, because the holder will simply not exercise the option. Hence, the intrinsic value of the option, i.e. (Spot price - strike price) - ₹ 80 - ₹ 100 = 0. In fact, the actual value may be positive, although the intrinsic value is zero, because of the time value if there is a long time for the expiry of contract and the chance that the asset price may go up before expiry date (Option contract is discussed thoroughly in Unit 10).

Hedging with Commodity Futures-Example

Hedging strategy with futures revolves around compensating anticipated losses in the spot market with the equivalent gains in the futures market. This is done by taking a position on the futures market that is opposite to the position in the spot market.

Long and Short Positions

When a party holds the underlying asset he is said to be long on the spot market. For example, a jeweller holding gold or silver is long on the underlying asset. A wheat farmer is long on wheat when he sows the crop.

Similarly, a party that requires the underlying asset in future is said to be short on the underlying. For example, a tea exporter who needs stock of tea to execute the pending orders, is short on tea, the underlying commodity/asset. A wheat flour mill needing wheat in future is short on wheat.

Similarly, in the futures market if one buys a futures contract he is said to be long and the one who sells the futures contract is said to be short.

To execute a hedge the following steps are taken.

1. One who is long on the asset, goes short on the futures market, and the one who is short on underlying, goes long in the futures market.
2. At an appropriate time one can neutralize the position in the futures market, i.e. go long on futures if one was originally short and go short on futures if one was originally long, and receive/pay the difference of prices.
3. Sell or buy the underlying asset in the physical market at prevailing price.

Short Hedge

A short hedge means a short position in futures. It is used by those who are long on the underlying asset. In order to hedge the long position on asset one would require taking short position in the futures market.

For example, consider a sugar mill in Uttar Pradesh. It is expected to produce 100 MT of sugar in the month of April. The current price today (the month of February) is ₹ 22 per kg. April futures contract in sugar due on 20th April is trading at ₹ 25 per kg. The sugar mill apprehends that the price lesser than

₹ 25 per kg will prevail in April due to excessive supply then. How can the sugar mill hedge its position against the anticipated decline in sugar prices in April?

To execute the hedging strategy the sugar mill has to take the opposite position in the futures market. The sugar mill is long on the asset in April. Therefore, it needs to sell the futures contract today. The number of contracts that needs to be sold is dependent upon the exposure in the physical asset and the value one needs to cover. Assuming that 100% cover is desired we can find the number of contracts to be sold. Assuming each contract for sugar is for 10 MT the number of contracts to be sold is 10.

No. of contracts to be sold

= Quantity to be hedged/quantity in each futures contract

= 100 MT/10 MT = 10

The sugar mill would go short on futures in February. Prior to April, before the future contract expires, the sugar mill buys the future contract to nullify its position in the futures market. The underlying asset, i.e. sugar is sold in the spot market. The price realized by the sugar mill in two different scenarios of decline or rise in sugar prices, using the principle of convergence of price on the due date of the contract, is worked out as follows.

When the price falls to ₹22 per kg

In the futures market	Cash flow (₹ per kg)
Sold futures contract in February	+ 25.00
Bought futures contract in April	- 22.00
Gain in the futures market	+ 3.00
Price realized in the spot market	+ 22.00
Effective price realized	**₹ 25.00 per kg**

Here the loss of ₹ 3 (₹ 25 - ₹ 22) in the spot market is made up by an equal gain in the futures market.

When the price rises to ₹ 26 per kg

In the futures market	Cash flow (₹ per kg)
Sold futures contract in February	+ 25.00
Bought futures contract in April	- 26.00
Loss in the futures market	- 1.00
Price realized in the spot market	+ 26.00
Effective price realized	**₹ 25.00 per kg**

Here the gain of ₹ 1 (₹ 26 - ₹ 25) in the spot market is offset by the equal loss in the futures market.

Due to the fact that prices of sugar in the spot market and futures market must converge a fixed price of ₹ 25 per kg is realized by the sugar mill. The loss or gain in the spot market is fully compensated by gain/loss in the futures market.

Long Hedge

A long hedge is one that requires taking a long position in the futures. It is used by those who are short on the asset.

For example, consider a petrochemical plant that needs to process 10,000 barrels of oil in three months time. To hedge against the rising price the plant needs to go long on the futures contract of crude oil. The spot price of crude oil is ₹ 1,950 per barrel, while futures contract expiring three months from now is selling for ₹ 2,200 per barrel. By going long on the futures the petrochemical plant can lock-in the procurement at ₹ 2,200 per barrel. Assuming the size of one futures contract of 100 barrels, the firm buys 100 futures to cover its exposure of 10,000 barrels.

Let us examine the price that would be payable under two scenarios of rise in price to ₹ 2,400 or fall in price to ₹1,800 per barrel after three months.

Figures [in ₹/barrel)

Price after 3 months	**₹ 1,800/barrel**	**₹ 2,400/barrel**
Actual purchase price	1,800	2,400
Gain/loss on futures		
Bought futures at	2,200	2,200
Sold futures at	1,800	2,400
Profit/loss on futures	-400	+ 200
Effective Price (₹/barrel)	**2,200**	**2,200**

Here again we observe that the loss in the physical position is offset by the gain in the futures position and vice versa. This results in effective price equal to the price of futures at the time of setting up the hedge.

Example 3.3 Long Hedge

Today is 24th March. A refinery needs 1,075 barrels of crude oil in the month of September. The current price of crude oil is ₹ 3,000 per barrel. September futures contract at Multi Commodity Exchange (MCX) is trading at ₹ 3,200. The firm expects the price to go up further and beyond ₹ 3,200 in September. It has the option of buying the stock now. Alternatively it can hedge through futures contract.

(a) If the cost of capital, insurance, and storage is 15% per annum, examine if it is beneficial for the firm to buy now?

(b) Instead, if the upper limit to buying price is ₹ 3,200 what strategy can the firm adopt?

(c) If the firm decides to hedge through futures, find out the effective price it would pay for crude oil if at the time of lifting the hedge (i) the spot and futures price are ₹ 2,900 and ₹ 2,910 respectively, (ii) the spot and futures price are ₹ 3,300 and ₹ 3,315 respectively.

Solution:

(a) If cost of carry (including interest, insurance, and storage) is 15%, the fair price of the futures contract is s x e-rt = 3,000 x e-6/12 x 0.15 = ₹ 3,233.65.

It implies that the firm buys crude oil today to be used after six months it would effectively cost ₹ 3,233.65 per barrel.

(b) Since futures are trading at ₹ 3,200 it can lock-in the price of around ₹ 3,200 through a long hedge.

Under long hedge the firm would buy the futures on crude oil today and sell it six months later while simultaneously meeting the physical requirements from the market at the price prevailing at that time. Irrespective of price six months later, the firm would end up paying a price of around ₹ 3,200.

(c) If the firm adopts the strategy as mentioned in (b), the effective price to be paid by the firm in cases of rise and fall in spot values is shown below:-

Quantity of crude oil to be hedged	= 1,075 barrels
Size of one futures contract	= 100 barrels
No. of futures contracts bought 1,075/100	= 11 contracts (Rounded)
Futures price	= ₹ 3,200
Exposure in futures 3,200 x 11 x 100	= ₹ 35,20,000

Six months later the firm would unwind its futures position and buy the requirement from the spot market.

	₹	₹
Futures sold at price	2910	3315
Amount of futures sold	32,01,000	36,46,500
Gain/Loss on futures (11 contracts)	(3,19,000)	1,26,500
Spot Price	2,900	3,300
Actual Cost of buying(1075 barrels)	31,17,500	35,47,500
Effective cost of buying	34,36,500	34,21,000
Effective Price	**3,197**	**3,182**

7.11 COMMONLY USED TERMS IN COMMODITY MARKET

Actuals: - Commodities on hand ready for shipment, storage and manufacture.

Arbitrageurs: - Arbitragers are interested in making purchase and sale in different markets at the same

time to profit from price discrepancy between the two markets.

At the Market: - An order to buy or sell at the best price possible at the time an order reaches the trading pit.

At the Money: - In options, when the strike price equals the price of the underlying futures.

Basis: - Basis is the difference between the cash price of an asset and futures price of the underlying asset. Basis can be negative or positive depending on the prices prevailing in the cash and futures.

Basis grade: - Specific grade or grades named in the exchanges future contract. The other grades deliverable is subject to price of underlying futures

Baskets:- Basket options are options on portfolios of underlying assets. The underlying asset is usually a weighted average of a basket of assets. Equity index options are a form of basket options.

Bear: - A person who expects prices to go lower.

Bid:- A bid subject to immediate acceptance made on the floor of exchange to buy a definite number of futures contracts at a specific price.

Breaking:- A quick decline in price.

Bulging: - A quick increase in price.

Bull:- A person who expects prices to go higher.

Buy on Close: - To buy at the end of trading session at the price within the closing range.

Buy on opening: - To buy at the beginning of trading session at a price within the opening range.

Call: - An option that gives the buyer the right to a long position in the underlying futures at a specific price, the call writer (seller) may be assigned a short position in the underlying futures if the buyer exercises the call.

Cash commodity: - The actual physical product on which a futures contract is based. This product can include agricultural commodities, financial instruments and the cash equivalent of index futures.

Close: - The period at the end of trading session officially designated by exchange during which all transactions are considered made "at the close".

Closing price: - The price (or price range) recorded during the period designated by the exchange as the official close.

Commission house: - A concern that buys and sells actual commodities or futures contract for the accounts of customers.

Consumption Commodity: - Consumption commodities are held mainly for consumption purpose. E.g. Oil, steel

Cover: - The cancellation of the short position in any futures contract buys the purchase of an equal quantity of the same futures contract

Cross hedge: - When a cash commodity is hedged by using futures contract of other commodity.

Day orders: - Orders at a limited price which are understood to be good for the day unless expressly designated as an open order or "good till canceled" order.

Delivery: - The tender and receipt of actual commodity, or in case of agriculture commodities, warehouse receipts covering such commodity, in settlement of futures contract. Some contracts settle in cash (cash delivery). In which case open positions are marked to market on last day of contract based on cash market close.

Delivery month: - Specified month within which delivery may be made under the terms of futures contract.

Delivery notice:- A notice for a clearing member's intention to deliver a stated quantity of commodity in settlement of a short futures position.

Derivatives:- These are financial contracts, which derive their value from an underlying asset. (Underlying assets can be equity, commodity, foreign exchange, interest rates, real estate or any other asset.) Four types of derivatives are trades forward, futures, options and swaps. Derivatives can be traded either in an exchange or over the counter.

Differentials: - The premium paid for grades batter than the basis grade and the discounts allowed for the grades. These differentials are fixed by the contract terms on most exchanges.

Due Date Rate or the Final Settlement Price:- It is the price on which all outstanding positions are settled on the maturity of the contract.

Exchange: - Central market place for buyers and sellers. Standardized contracts ensure that the prices mean the same to everyone in the market. The prices in an exchange are determined in the form of a continuous auction by members who are acting on behalf of their clients, companies or themselves.

Forward contract: - It is an agreement between two parties to buy or sell an asset at a future date for price agreed upon while signing agreement. Forward contract is not traded on an exchange. This is oldest form of derivative contract. It is traded in OTC Market. Not on an exchange. Size of forward contract is customized as per the terms of agreement between buyer and seller. The contract price of forward contract is not transparent, as it is not publicly disclosed. Here valuation of open position is not calculated on a daily basis and there is no requirement of MTM.

Liquidity is the measure of frequency of trades that occur in a particular commodity forward contract is less liquid due to its customized nature. In forward contracts, counter- party risk is high due to customized & bilateral nature of the transaction.

Forward contract is not regulated by any exchange. Forward contract is generally settled by physical delivery. In this case delivery is carried out at delivery center specified in the customized bilateral agreement.

Futures Contract:- It is an agreement between two parties to buy or sell a specified and standardized quantity and quality of an asset at certain time in the future at price agreed upon at the time of entering in to contract on the futures exchange. It is entered on centralized trading platform of exchange. It is standardized in terms of quantity as specified by exchange. Contract price of futures contract is transparent as it is available on centralized trading screen of the exchange. Here valuation of Mark-to- Mark position is calculated as per the official closing price on daily basis and MTM margin requirement exists. Futures contract is more liquid as it is traded on the exchange. In futures contracts the clearing- house becomes the counter party to each transaction, which is called **novation.** Therefore, counter party risk is almost eliminated. A regulatory authority and the exchange regulate futures contract. Futures contract is generally cash settled but option of physical settlement is available. Delivery tendered in case of futures contract should be of standard quantity and quality as specified by the exchange.

Futures commission merchant: - A broker who is permitted to accept the orders to buy and sale futures contracts for the consumers.

Futures Funds: - Usually limited partnerships for investors who prefer to participate in the futures market by buying shares in a fund managed by professional traders or commodity trading advisors.

Futures Market: - It facilitates buying and selling of standardized contractual agreements (for future delivery) of underlying asset as the specific commodity and not the physical commodity itself.

The formulation of futures contract is very specific regarding the quality of the commodity, the quantity to be delivered and date for delivery. However it does not involve immediate transfer of ownership of commodity, unless resulting in delivery. Thus, in futures markets, commodities can be bought or sold irrespective of whether one has possession of the underlying commodity or not. The futures market trade in futures contracts primarily for the purpose of risk management that is hedging on commodity stocks or forward buyers and sellers. Most of these contracts are squared off before maturity and rarely end in deliveries.

Hedging:- Means taking a position in futures market that is opposite to position in the physical market with the objective of reducing or limiting risk associated with price.

In the money:- In call options when strike price is below the price of underlying futures. In put options, when the strike price is above the underlying futures. In-the-money options are the most expensive options because the premium includes intrinsic value.

Index Futures: - Futures contracts based on indexes such as the S & P 500 or Value Line Index. These are the cash settlement contracts.

Investment Commodities: - An investment commodity is generally held for investment purpose. Example- Gold, Silver

Limit: - The maximum daily price change above or below the price close in a specific futures market. Trading limits may be changed during periods of unusually high market activity.

Limit order:- An order given to a broker by a customer who has some restrictions upon its execution, such as price or time.

Liquidation: - A transaction made in reducing or closing out a long or short position, but more often used by the trade to mean a reduction or closing out of long position.

Local: - Independent trader who trades his/her own money on the floor of the exchanges. Some local act as a brokers as well, but are subject to certain rules that protect customer orders.

Long: - (1) The buying side of an open futures contract or futures option; (2) a trader whose net position in the futures or options market shows an excess of open purchases over open sales.

Margin: - Cash or equivalent posted as guarantee of fulfillment of a futures contract (not a down payment).

Margin call: - Demand for additional funds or equivalent because of adverse price movement or some other contingency.

Marked to Market: - The practice of crediting or debiting a trader's account based on daily closing prices of the futures contracts he is long or short.

Market order: - An order for immediate execution at the best available price.

Nearby: - The futures contract closest to expiration.

Net position: - The difference between the open contracts long and the open contracts short held in any commodity by any individual or group.

Offer: - An offer indicating willingness to sell at a given price (opposite of bid).

On opening: - A term used to specify execution of an order during the opening.

Open contracts: - Contracts which have been brought or sold without the transaction having been completed by subsequent sale, repurchase or actual delivery or receipt of commodity.

Open interest: - Refers to the unexpired, unexercised and outstanding number of option or future contracts held by market participants t the end of day. The number of "open contracts". It refers to unliquidated purchases or sales and never to their combined total.

Option: - It gives right but not the obligation to the option owner, to buy an underlying asset at specific price at specific time in the future.

Out-of-the money: - Option calls with the strike prices above the price of the underlying futures, and puts with strike prices below the price of the underlying futures.

Over the counter: - It is alternative trading platform, linked to network of dealers who do not physically meet but instead communicates through a network of phones & computers.

Pit: - An octagonal platform on the trading floor of an exchange, consisting of steps upon which traders and brokers stand while trading (if circular called ring).

Point: - The minimum unit in which changes in futures prices may be expressed (minimum price fluctuation may be in multiples of points).

Position: - An interest in the market in the form of open commodities.

Premium: - The amount by which a given futures contract's price or commodity's quality exceeds that of another contract or commodity (opposite of discount). In options, the price of a call or put, which the buyer initially pays to the option writer (seller).

Price limit: - The maximum fluctuation in price of futures contract permitted during one trading session, as fixed by the rules of a contract market.

Purchase and sales statement: - A statement sent by FMC to a customer when his futures option has been reduced or closed out (also called "P and S")

Put:- In options the buyer of a put has the right to continue a short position in an underlying futures contract at the strike price until the option expires; the seller(writer) of the put obligates himself to take a long position in the futures at the strike price if the buyer exercises his put.

Range: - The difference between high and low price of the futures contract during a given period.

Ratio hedging: - Hedging a cash position with futures on a less or more than one-for-one basis.

Reaction: - The downward tendency of a commodity after an advance.

Round turn: - The execution of the same customer of a purchase transaction and a sales transaction which offset each other.

Round turn commission: - The cost to the customer for executing a futures contract which is charged only when the position is liquidated.

Scalping: - For floor traders, the practice of trading in and out of contracts throughout the trading day in a hopes

for making a series of small profits.

Settlement price: - The official daily closing price of futures contract, set by the exchange for the

purpose of setting margins accounts.

Short: - (1) The selling of an option futures contract. (2) A trader whose net position in the futures market shows an excess of open sales over open purchases.

Speculator: - Speculator is an additional buyer of the commodities whenever it seems that market prices are lower than they should be.

Spot Markets:- Here commodities are physically brought or sold on a negotiated basis.

Spot price: - The price at which the spot or cash commodity is selling on the cash or spot market.

Spread: - Spread is the difference in prices of two futures contracts.

Striking price: - In options, the price at which a futures position will be established if the buyer exercises his right (also called strike or exercise price).

Swap: - It is an agreement between two parties to exchange different streams of cash flows in future according to predetermined terms.

The two commonly used swaps are:

- Interest rate swaps: These entail swapping only the interest related cash flows between the parties in the same currency.
- Currency swaps: These entail swapping both principal and interest between the parties, with the cash flows in one direction being in a different currency than those in the opposite direction.

  Other one is:

- Debt-Equity Swap- Purchase of external debt of underdeveloped countries by the investors at indigenous currency at a discounted price.

Swaptions : Swaptions are options to buy or sell a swap that will become operative at the expiry of the options. Thus a swaption is an option on a forward swap. There are two parties involved in Swaptions- Swaptions receiver and Swaptions payer.

Technical analysis (charting): - In price forecasting, the use of charts and other devices to analyze price-change patters and changes in volume and open interest to predict future market trends (opposite of fundamental analysis).

Time value: - In options the value of premium is based on the amount of time left before the contract expires and the volatility of the underlying futures contract. Time value represents the portion of the premium in excess of intrinsic value. Time value diminishes as the expiration of the options draws near and/or if the underlying futures become less volatile.

Volume of trading (or sales):- A simple addition of successive futures transactions is the volume of sales. (a transaction consists of a purchase and matching sale).

Writer: - A seller of an option who collects the premium payment from the buyer.

Section C

Security Analysis & Portfolio Managment

Study Note - 8

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

This Study Note includes

8.1 Investment – Basics and Analysis of Securities
8.2 Market Indicators, Support and Resistance Level, Patterns in Stock Price
8.3 Statistic Models, Bollinger Bands
8.4 Theories on Stock Market Movements
8.5 Portfolio Management
8.6 Markowitz Model of Risk-Return Optimization
8.7 Portfolio Management - Return and Risk Analysis
8.8 Capital Asset Pricing Model (CAPM) and its Assumptions
8.9 Arbitrage Pricing Model (APT)

8.1 INVESTMENT – BASICS AND ANALYSIS OF SECURITIES

Investment is putting money into something with the expectation that it will generate income or profit or its value will appreciate in future. The word originates in the Latin "vestis", meaning garment, and refers to the act of putting things (money or other claims to resources) into others' pockets.

The term "investment" is used differently in economics and in finance. Economists refer to a real investment (such as purchase of a machine or a house), while financial economists refer to a financial asset, such as money that is put into a bank or the financial market, which may then be used to buy a real asset.

FINANCIAL MEANING OF INVESTMENT

- Financial investment involves deployment of funds in various assets, such as Stock, Bond, Real Estate, Mortgages etc.
- Investment is the employment of funds with the aim of achieving additional income or growth in value.
- It involves the commitment of resources which have been saved or put away from current consumption with in the hope that some benefits will accrue in future. Investment involves long term commitment of funds and waiting for a reward in the future.
- From the point of view of people who invest their funds, they are the supplier of 'Capital' and in their view investment is a commitment of a person's funds to derive future income in the form of interest, dividend, rent, premiums, pension benefits or the appreciation in the value of their principal capital.
- To the financial investor, it is not important whether money is invested for a productive use or for the purchase of second hand instruments such as existing shares and stocks listed on the stock exchanges.
- Most investments are considered to be transfers of financial assets from one person to another.

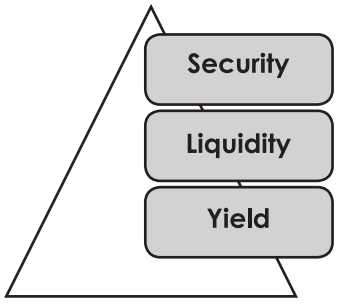
ECONOMIC MEANING OF INVESTMENT

- Economic investment means the net additions to the capital stock of the society which consists of goods and services that are used in the production of other goods and services. Addition to the capital stock means an increase in building, plants, equipment and inventories over the amount of goods and services that existed.
- The financial and economic meanings are related to each other because investment is a part of the savings of individuals which flow into the capital market either directly or through institutions, divided in 'new' and second hand capital financing. Investors as 'suppliers' and investors as 'users' of long-term funds find a meeting place in the market.

BASIC INVESTMENT OBJECTIVES

Investment triangle – three compromising objectives

Any investment decision will be influenced by three objectives – security, liquidity and yield. A best investment decision will be one, which has the best possible compromise between these three objectives.



Individually these objectives are very powerful in influencing the investors. Collectively they work against each other forcefully, as can be seen below. Hence the acclaim – 'A best investment decision will be one, which has the best possible compromise between these three objectives'.

When selecting where to invest our funds, we have to analyze and manage folowing three objectives.

❖ **Security:**

Central to any investment objective is the certainty in recovery of the principal. One can afford to lose the returns at any given point of time, but s/he can ill afford to lose the very principal itself. By identifying the importance of security, we will be able to identify and select the instrument that meets this criterion. For example, when compared with corporate bonds, we can vouch the safety of return of investment in treasury bonds as we have more faith in governments than in corporations. Hence, treasury bonds are highly secured instruments. The safest investments are usually found in the money market and include such securities as Treasury bills (T-bills), certificates of deposit (CD), commercial paper or bankers' acceptance slips; or in the fixed income (bond) market in the form of municipal and other government bonds, and in corporate bonds.

❖ **Liquidity:**

Because we may have to convert our investment back to cash or funds to meet our unexpected demands and needs, our investment should be highly liquid. They should be en cashable at short notice, without loss and without any difficulty. If they cannot come to our rescue, we may have to borrow or raise funds externally at high cost and at unfavorable terms and conditions. Such liquidity can be possible only in the case of investment, which has always-ready market and willing buyers and sellers. Such instruments of investment are called highly liquid investment. Common stock is often considered the most liquid of investments, since it can usually be sold within a day or two of the decision to sell. Bonds can also be fairly marketable, but some bonds are highly illiquid, or non-tradable, possessing a fixed term. Similarly, money market instruments may only be redeemable at the precise date at which the fixed term ends. If an investor seeks liquidity, money market assets and non-tradable bonds aren't likely to be held in his or her portfolio.

❖ **Yield:**

Yield is best described as the net return out of any investment. Hence given the level or kind of security and liquidity of the investment, the appropriate yield should encourage the investor to go for the investment. If the yield is low compared to the expectation of the investor, s/he may prefer to avoid such investment and keep the funds in the bank account or in worst case, in cash form in lockers. Hence yield is the attraction for any investment and normally deciding the right yield is the key to any investment.

Relationship:

- ❖ There is a tradeoff between risk (security) and return (yield) on the one hand and liquidity and return (yield) on the other.
- ❖ Normally, higher the risk any investment carries, the greater will be the yield to compensate the possible loss. That is why, 'fly by night' operators, offer sky high returns to their investors and naturally our gullible investors get carried away by such returns and ultimately lose their investment. Highly secured investment does not carry high coupon, as it is safe and secured.
- ❖ When the investment is illiquid, (i.e. one cannot get out of such investment at will and without any loss) the returns will be higher, as no normal investor would prefer such investment.
- ❖ These three points – security (S), liquidity (L) and yield (Y) in any investment – make an excellent triangle in our investment decision-making. Ideally, with given three points of any triangle, one can say the center of the triangle is fixed. In our investment decision too, this center – the best meeting point for S, L and Y – is important for our consideration.
- ❖ However, if any one or two of these three points are disturbed – security, liquidity and yield in any investment – the center of the triangle would be disturbed and one may have to revisit the investment decision, either

to continue the investment or exit the investment.

- ❖ All these points – security, liquidity and yield – are highly dynamic in any market and they are always subject to change and hence our investor has to periodically watch his/her investment and make appropriate decisions at the right time.
- ❖ If our investor fails to monitor her / his investment, in the worst circumstances, s/he may lose the very investment.
- ❖ Thus, we will return to our original statement - A best investment decision will be one, which has the best possible compromise between these three objectives – security, liquidity and yield.

Secondary Objectives of Investment:

- ❖ **Tax Minimization:**

An investor may pursue certain investments in order to adopt tax minimization as part of his or her investment strategy. A highly-paid executive, for example, may want to seek investments with favorable tax treatment in order to lessen his or her overall income tax burden and hence may choose investing in infrastructure bonds.

- ❖ **Convenience and Planning Horizon:**

The ease of making investments and maintaining it, besides the investment horizon of the investor, may be decisive in choosing the investment alternative by an investor.

SECURITY ANALYSIS

Security is an instrument of promissory note or a method of borrowing or lending, or a means of contributing funds needed by the corporate body or non-corporate body. Portfolio is a combination of securities with different risk-return characteristics. Security analysis is the first part of investment decision process involving the valuation and analysis of individual securities. Security Analysis is primarily concerned with the analysis of a security with a view to determine the value of the security, so that appropriate decisions may be made based on such valuation as compared with the value placed on the security in the market.

Two basic approaches of security analysis are fundamental analysis and technical analysis. Fundamental Analysis can be segregated into economic analysis, industry analysis and company analysis.

(i) Fundamental Analysis: This involves the determination of the intrinsic value of the Share based on the Company's profits and dividend expectations and it necessitates the following:

- ❖ *Economic Analysis:* It is concerned with the analysis of the overall economy, of which the entity is a part. Economic analysis is used to forecast National Income with its various components that have a bearing on the concerned industry and the company in particular.
- ❖ *Industry Analysis:* It involves analysis of the specific industry to which the company belongs as against analysis of the economy as a whole.
- ❖ *Company Analysis:* Economic and industry framework provides the investor with proper background against which shares of a particular company are purchased. Company Analysis requires the assessment of the particular company in which the investment is sought to be made. This requires careful examination of the company's quantitative and qualitative fundamentals.

(ii) Technical Analysis: Technical Analysis judges the fundamental strength or weakness of a company or an industry by examining the investor and price behavior of its security. It is the study and analysis of Security Price movements on the following assumptions —

- ❖ There is a basic trend in the share price movements.
- ❖ Such trend is repetitive.
- ❖ Share prices have little relationship with Intrinsic Value and are based more on investor psychology and perception.

The purpose is to make an in-depth analysis of the company and its relative strength with reference to other companies in the industry based on share price movement and enable the investor to decide whether he should buy or sell the securities of the company.

A detailed explanation is made hereunder:

FUNDAMENTAL ANALYSIS

Fundamental analysis is used to determine the intrinsic value of the share by examining the underlying forces that affect the well being of the economy, industry groups and companies.

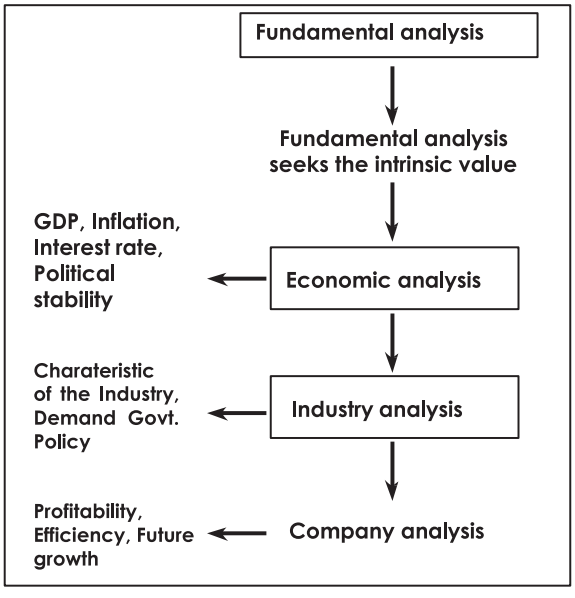
The actual value of a security, as opposed to its market price or book value is called intrinsic value. The intrinsic

value includes other variables such as brand name, trademarks, and copyrights that are often difficult to calculate and sometimes not accurately reflected in the market price. One way to look at it is that the market capitalization is the price (i.e. what investors are willing to pay for the company) and intrinsic value is the value (i.e. what the company is really worth).

The fundamental analysis of a security can be done either using top-down approach or bottom-up approach.

❖ **Top down approach**

It analyses the economy first, then the Industry and finally individual companies and hence is called a top down approach.



TOP-DOWN APPROACH OF FUNDAMENTAL ANALYSIS

✓ At the economy level, fundamental analysis focuses on economic data (such as GDP, Foreign exchange and Inflation etc.) to assess the present and future growth of the economy.

✓ At the industry level, fundamental analysis examines the supply and demand forces for the products offered.

✓ At the company level, fundamental analysis examines the financial data (such as balance sheet, income statement and cash flow statement etc.), management, business concept and competition. In order to forecast the future share price, fundamental analysts combines the economic, industry and company analysis. If the intrinsic value is lower than the current market value, fundamental analysis recommends to buy the share and to sell if vice versa is true.

❖ **Bottom up approach**

In this approach, investors focus directly on a company's value. Analysis of such information as the company's products, its competitive position and its financial status leads to an estimate of the company's earnings potential and ultimately its value in the market. The emphasis in this approach is on finding companies with good growth prospect, and making accurate earnings estimates. Thus bottom-up fundamental research is broken in two categories: *growth investing* and *value investing.*

✓ **Growth Stocks:**

It carry investors' expectation of above average future growth in earnings and above average valuations as a result of high price/earning ratios. Investors expect these stocks to perform well in future and they are willing to pay high multiples for this expected growth.

✓ **Value Stocks:** Features are that they are cheap assets and have strong balance Sheets

In many cases, bottom-up investing does not attempt to make a clear distinction between growth and value stocks. Top-down approach is a better approach.

Economic analysis

Economic analysis occupies the first place in the top down approach. When the economy is having sustainable growth, then the industry group (Sectors) and companies will get benefit and grow faster. The analysis of

macroeconomic environment is essential to understand the behavior of stock prices.

The commonly analysed macro economic factors are as follows:-

- *Gross domestic product (GDP):* GDP indicates the rate of growth of the economy. GDP represents the value of all the goods and services produced by a country in one year. A higher growth rate is more favourable to the share market.
- *Savings and investment:* The economic growth results in substantial amount of domestic savings. Stock market is a channel through which the savings of the investors are made available to the industries. The savings and investment pattern of the public affect stock market.
- *Inflation:* Along with the growth of GDP, if the inflation rate also increases, then the real rate of growth would be very little. The decreasing inflation is good for corporate sector.
- *Interest rates:* The interest rate affects the cost of financing to the firms. A decrease in interest rate implies lower cost of finance for firms and more profitability.
- *Budget:* Budget is the annual financial statement of the government, which deals with expected revenues and expenditures. A deficit budget may lead to high rate of inflation and adversely affect the cost of production. Surplus budget may result in deflation. Hence, balanced budget is highly favourable to the stock market.
- *The tax structure:* The tax structure which provides incentives for savings and investments.
- *The balance of payment:* The balance of payment is the systematic record of all money transfers between India and the rest of the world. The difference between receipts and payments may be surplus or deficit. If the deficit increases, the rupee may depreciate against other currencies. This would affect the industries, which are dealing with foreign exchange.
- Monsoon and agriculture: India is primarily an agricultural country. The importance of agriculture in Indian economy is evident. Agriculture is directly and indirectly linked with the industries. For example, Sugar, Textile and Food processing industries depend upon agriculture for raw material. Fertilizer and Tractor industries are supplying inputs to the agriculture. A good monsoon leads better harvesting; this in turn improves the performance of Indian economy.
- *Infrastructure:* Infrastructure facilities are essential for growth of Industrial and agricultural sectors. Infrastructure facilities include transport, energy, banking and communication. In India, even though Infrastructure facilities have been developed, still they are not adequate.
- *Demographic factors:* The demographic data provide details about the population by age, occupation, literacy and geographic location. This is needed to forecast the demand for the consumer goods.
- *Political stability:* A stable political system would also be necessary for a good performance of the economy. Political uncertainties and adverse change in government policy affect the industrial growth.

Techniques Used in Economic Analysis:

(A) Anticipatory Surveys:

(i) Facilitate investors to form an opinion about the future state of the economy.

(ii) Incorporate industry surveys on construction activities, expenditure on plant and machinery, levels of inventory - all having a definite bearing on economic activities.

(iii) Future spending habits of consumers are taken into account.

However, an important limitation is that the survey results do not guarantee that intentions surveyed would materialize. They are not regarded as forecasts per se, as there can be a consensus approach by the investor for exercising his opinion.

(B) Barometer/Indicator Approach: Various indicators are used to find out how the economy shall perform in the future. The indicators have been classified as under:

(i) Leading Indicators: They lead the economic activity in terms of their outcome. They relate to the time series data of the variables that reach high/low points in advance of economic activity.

(ii) Roughly Coincidental Indicators: They reach their peaks and troughs at approximately the same time as the economy.

(iii) Lagging Indicators: They are time series data of variables that lag behind in their consequences vis-à-vis the economy. They reach their turning points after the economy has reached its own already.

(iv) Diffusion/composite index: This index combines several indicators into one index to measure the magnitude of the movement of a particular set of indicators. Computation of diffusion indices are however difficult. Moreover it does not eliminate irregular movements. But this is most useful when the other indicators give conflicting signals and also since they do not measure the magnitude of change.

(C) Economic Model Building Approach: In this approach, a precise and clear relationship between dependent and independent variables is determined. GNP model building or sectoral analysis is used in practice through the use of National Accounting framework. The steps used are as follows:

(i) Hypothesize total economic demand by measuring total income (GNP) based on political stability, rate of inflation, changes in economic levels.

(ii) Forecast the GNP by estimating levels of various components viz. consumption expenditure, gross private domestic investment, government purchases of goods/services, net exports.

(iii) After forecasting individual components of GNP, add them up to obtain the forecasted GNP.

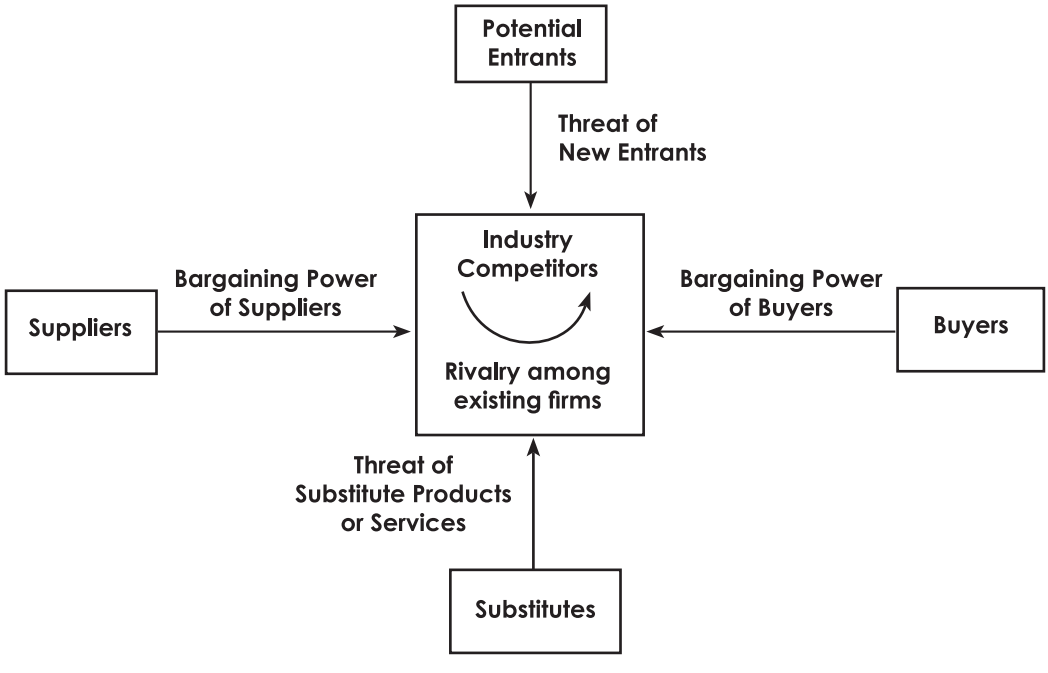
(iv) Comparison is made of total GNP thus arrived at with that from an independent agency for the forecast of GNP and then the overall forecast is tested for consistency.

(D) Gross National Product Analysis: Gross National Product (GNP) as a measure national income reflects the growth rate in economic activities and is regarded as a forecasting tool for analyzing the overall economy along with its various components during a particular period.

Industry or Sector analysis

The second step in the top-down approach of fundamental analysis of securities is Industry analysis. An industry or sector is a group of firms that have similar technological structure of production and produce similar products.

These industries are classified according to their reactions to the different phases of the business cycle. They are classified into growth, cyclical, defensive and cyclical growth industry. A market assessment tool designed to provide a business with an idea of the complexity of a particular industry. Industry analysis involves reviewing the economic, political and market factors that influence the way the industry develops. Major factors can include the power wielded by suppliers and buyers, the condition of competitors and the likelihood of new market entrants as shown below.



Thus industry analysis should take into account the following factors:-

- *Characteristics of the industry:* When the demand for industrial products is seasonal, their problems may spoil the growth prospects. If it is consumer product, the scale of production and width of the market will determine the selling and advertisement cost. The nature of industry is also an important factor for determining the scale of operation and profitability.
- *Demand and market:* If the industry is to have good prospects of profitability, the demand for the product should not be controlled by the government.
- *Government policy:* The government policy is announced in the Industrial policy resolution and subsequent announcements by the government from time to time. The government policy with regard to granting of clearances, installed capacity, price, distribution of the product and reservation of the products for small industry etc are also factors to be considered for industrial analysis.
- *Labor and other industrial problems:* The industry has to use labour of different categories and expertise. The productivity of labour as much as the capital efficiency would determine the progress of the industry. If there is a labour problem that industry should be neglected by the investor. Similarly when the industries have the problems of marketing, investors have to be careful when investing in such companies.
- *Management:* In case of new industries, investors have to carefully assess the project reports and the assessment of financial institutions in this regard. The capabilities of management will depend upon tax planning, innovation of technology, modernization etc. A good management will also insure that their shares are well distributed and liquidity of shares is assured.
- *Future prospects:* It is essential to have an overall picture of the industry and to study their problems and prospects. After a study of the past, the future prospects of the industry are to be assessed.
- When the economy expands, the performance of the industries will be better. Similarly when the economy contracts reverse will happen in the Industry. Each Industry is different from the other. Cement Industry is entirely different from Software Industry or Textile Industry in its products and process.

Techniques Used in Industry Analysis:

(i) ***Regression Analysis:*** Investor diagnoses the factors determining the demand for output of the industry through product demand analysis. The following factors affecting demand are to be considered - GNP, disposable income, per capita consumption / income, price elasticity of demand. These factors are then used to forecast demand using statistical techniques such as regression analysis and correlation.

(ii) ***Input - Output Analysis:*** It reflects the flow of goods and services through the economy, intermediate steps in production process as goods proceed from raw material stage through final consumption. This is carried out to detect changing patterns/trends indicating growth/decline of industries.

Company or Corporate analysis

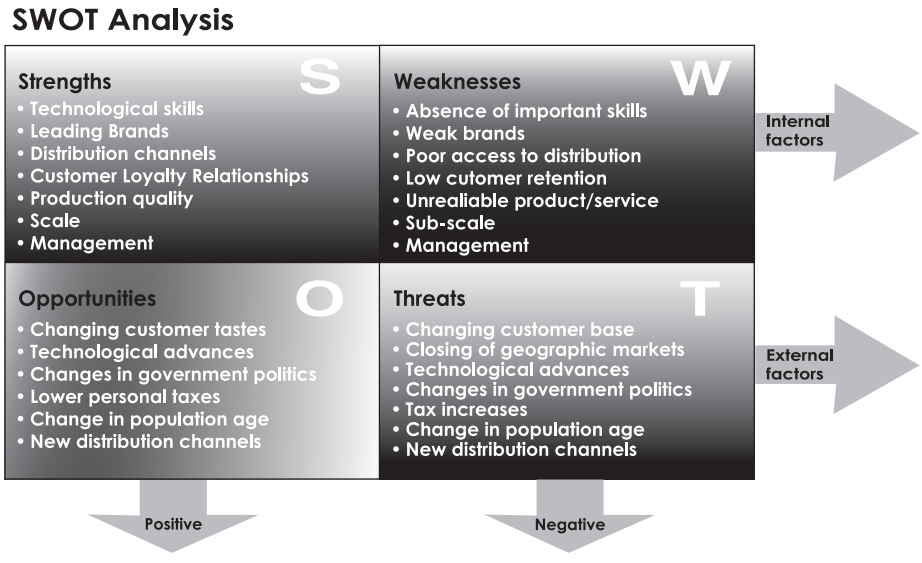
Company analysis is a study of variables that influence the future of a firm both qualitatively and quantitatively. It is a method of assessing the competitive position of a firm, its earnings and profitability, the efficiency with which it operates its financial position and its future with respect to earnings of its shareholders.

The fundamental nature of the analysis is that each share of a company has an intrinsic value which is dependent on the company's financial performance. If the market value of a share is lower than intrinsic value as evaluated by fundamental analysis, then the share is supposed to be undervalued. The basic approach is analysed through the financial statements of an organisation.

The company or corporate analysis is to be carried out to get answer for the following two questions.

1. How has the company performed in comparison with the similar company in the same Industry?
2. How has the company performed in comparison to the early years?

Before making investment decision, the business plan of the company, management, annual report, financial statements, cash flow and ratios are to be examined for better returns.



Factors considered in Company Analysis are :-

(A) Net Worth and Book Value:

(i) Computation:

Particulars	Amount (₹)
Equity Share Capital	XXX
Add: Free Reserves	XXX
Less: Accumulated Losses	(XXX)
total net Worth of Business	XXX
Book Value of Share = Total Net Worth/Number of Shares Outstanding	XX

(ii) Book Value may not be an indicator of the intrinsic worth of the share, due to the following reasons :-

- ❖ First, the market price of the share reflects the future earnings potential of the firm which may have no relationship with the value of its assets. Example: Service Sector, where intrinsic value is based more on future earning potential than on Asset Backing.
- ❖ Second, the book value is based upon the historical costs of the assets of the firm and these may be gross underestimates of the cost of the replacement or resale values of these assets.

(B) Sources and utilisation of funds:

(i) The identification of sources and uses of funds is known as Funds Flow and Cash Flow Analysis.

(ii) One of the major uses of Funds Flow Analysis is to find out whether the firm has used Short Term sources of funds to finance Long-Term Investments.

(iii) Such methods of financing increases the risk of liquidity crunch for the firm, as Long-Term Investments, because of the gestation period involved may not generate enough surplus in time to meet the short-term liabilities incurred by the firm. This increases the Credit and Default Risk of the Entity.

(C) Time Series Analysis, Common Sized Statements and Financial Ratio Analysis:

(i) Financial Statements are utilized to make Inter and Intra Firm Comparison.

(ii) The techniques that are used to do such comparative analysis are: Common-Sized Statements, and Financial Ratio Analysis.

(D) Size and Ranking:

(i) A rough idea regarding the size and ranking of the company within the economy, in general, and the industry, in particular, would help the investment manager in assessing the risk associated with the company.

(ii) It may also be useful to assess the position of the company in terms of Technical Know-how, Research and Development activity and price leadership.

(E) Growth Record:

(i) The growth in sales, net income, net capital employed and Earnings per share of the company in the past few years should be examined.

(ii) The following three growth indicators may be looked into in particular:

- ❖ Price Earnings ratio,
- ❖ Percentage Growth rate of Earnings per annum, and
- ❖ Percentage growth rate of net block.

(iii) An evaluation of future growth prospects of the company should be carefully made. This requires an analysis of-

- ❖ Existing capacities and their utilization which is indicated by the Quantitative information present in the Financials,
- ❖ Proposed expansion and diversification plans and the nature of the company's technology - which is generally indicated by Director's Reports

(iv) Growth is the single most important factor in company analysis for the purpose of investment management. A company may have a good record of profits and performance in the past; but if it does not have growth potential, its shares cannot be rated high from the investment point of view.

Techniques Used in Company Analysis:

(i) Correlation & Regression Analysis: Simple regression is used when inter relationship covers two variables. For more than two variables, multiple regression analysis is followed. Here the inter relationship between variables belonging to economy, industry and company are found out. The same is quantified using the correlation co-efficient between the variables and standard deviation of the variables.

(ii) Time Series and Trend Analysis: A Trend line or characteristic line is drawn using the method of least squares to identify and extrapolate the trend obtained based on a given Time Series.

(iii) Decision Tree Analysis: This involves the use of probability to find out the expected value arising out a given course of action. In this method various probabilities arc assigned to states of nature and the expected value of a given course of action is determined.

Fundamental Analysis Tools:

Although the raw data of the Financial Statement has some useful information, much more can be understood about the value of a stock by applying a variety of tools to the financial data.

1. Earnings per Share – EPS
2. Price to Earnings Ratio – P/E
3. Projected Earnings Growth – PEG
4. Price to Sales – P/S
5. Price to Book – P/B
6. Dividend Yield
7. Dividend Payout Ratio
8. Book v alue per share
9. Return on Equity

1. Earnings per Share

The overall earnings of a company is not in itself a useful indicator of a stock's worth. Low earnings coupled with low outstanding shares can be more valuable than high earnings with a high number of outstanding shares. Earnings per share are much more useful information than earnings by itself. Earnings per share (EPS) is calculated by dividing the net earnings by the number of outstanding shares.

$$\textbf{Earning Per Share (EPS)} = \frac{\textbf{Total Earning Available to Equity Shareholder}}{\textbf{Total No. of Equity Shares Outstanding}}$$

For example: ABC company had net earnings of ₹10 lakhs and 100,000 outstanding shares for an EPS of 10 (1,000,000/100,000 = 10). This information is useful for comparing two companies in a certain industry but should not be the deciding factor when choosing stocks.

2. Price to Earnings Ratio

The Price to Earnings Ratio (P/E) shows the relationship between stock price and company earnings. It is calculated by dividing the share price by the Earnings per Share.

P/E = Stock Price / EPS

In our example above of ABC company the EPS is 10 so if it has a price per share of ₹ 50 the P/E is 5 (50 / 10 = 5). The P/E tells you how many investors are willing to pay for that particular company's earnings. P/E's can be read in a variety of ways. A high P/E could mean that the company is overpriced or it could mean that investors expect the company to continue to grow and generate profits. A low P/E could mean that investors are wary of the company or it could indicate a company that most investors have overlooked.

Either way, further analysis is needed to determine the true value of a particular stock.

3. Projected Earnings Growth Rate - PEG Ratio

A ratio used to determine a stock's value while taking into account earnings growth. The calculation is as follows:

$$\text{PEG Ratio} = \frac{\text{Price / Earning Ratio}}{\text{Annual EPS Growth}}$$

PEG is a widely used indicator of a stock's potential value. It is favoured by many over the price/ earnings ratio because it also accounts for growth. Similar to the P/E ratio, a lower PEG means that the stock is more undervalued.

Keep in mind that the numbers used are projected and, therefore, can be less accurate. Also, there are many variations using earnings from different time periods (i.e. one year vs. five year). Be sure to know the exact definition your source is using.

4. Price to Sales Ratio

When a company has no earnings, there are other tools available to help investors judge its worth. New companies in particular often have no earnings, but that does not mean they are bad investments. The Price to Sales ratio (P/S) is a useful tool for judging new companies. It is calculated by dividing the market cap (stock price times number of outstanding shares) by total revenues. An alternate method is to divide current share price by sales per share. P/S indicates the value the market places on sales. The lower the P/S the better the value.

$$\text{PSR} = \frac{\text{Share Price}}{\text{Revenue Per share}}$$

5. Price to Book Ratio

Book value is determined by subtracting liabilities from assets. The value of a growing company will always be more than book value because of the potential for future revenue. the price to book ratio (P/B) is the value the market places on the book value of the company. It is calculated by dividing the current price per share by the book value per share (book value / number of outstanding shares). Companies with a low P/B are good value and are often sought after by long term investors who see the potential of such companies. A lower P/B ratio could mean that the stock is undervalued. However, it could also mean that something is fundamentally wrong with the company. As with most ratios, be aware that this varies by industry. this ratio also gives some idea of whether you're paying too much for what would be left if the company went bankrupt immediately. It is also known as the "price-equity ratio".

P/B = Share Price / Book Value per Share

6. Dividend Yield (Return)

Some investors are looking for stocks that can maximize dividend income. Dividend yield is useful for determining the percentage return a company pays in the form of dividends. It is calculated by dividing the annual dividend per share by the stock's price per share. Usually it is the older, well- established companies that pay a higher percentage, and these companies also usually have a more consistent dividend history than younger companies. Dividend yield is calculated as follows:

$$\text{Dividend Yield (Return)} = \frac{\text{Annual Dividend Per Share}}{\text{Market Price Per Share}}$$

Dividend yield is a way to measure how much cash flows you are getting for each rupee invested in an equity position. Investors who require a minimum stream of cash flows from their investment portfolio can secure this cash flow by investing in stocks paying relatively high, stable dividend yields.

To better explain the concept, refer to this dividend yield example: If two companies both pay annual dividends of ₹1 per share, but ABC Company's stock is trading at ₹20 while XYZ c ompany's stock is trading at ₹40, then ABC has a dividend yield of 5% while XYZ is only yielding 2.5%. Thus, assuming all other factors are equivalent, an investor looking to supplement his or her income would likely prefer ABC's stock over that of XYZ.

7. Dividend payout ratio

Dividend payout ratio is the fraction of net income a firm pays to its stockholders in dividends:

$$\text{Dividend payout ratio} = \frac{\text{Dividends}}{\text{Net Income for the same period}}$$

The part of the earnings not paid to investors is left for investment to provide for future earnings growth. Investors seeking high current income and limited capital growth prefer companies with high Dividend payout ratio. However investors seeking capital growth may prefer lower payout ratio because capital gains are taxed at a lower rate. High growth firms in early life generally have low or zero payout ratios. As they mature, they tend to return more of the earnings back to investors. Note that dividend payout ratio is calculated as DPS/EPS.

Calculated as:

$$= \frac{\text{Yearly Dividend per share}}{\text{Earning per Share}}$$

or equivalently

$$= \frac{\text{Dividends}}{\text{Net Income}}$$

The payout ratio provides an idea of how well earnings support the dividend payments. More mature companies tend to have a higher payout ratio.

8. Return on Equity

Return on equity (ROE) is a measure of how much in earnings a company generates in a time period compared to its shareholders' equity. It is typically calculated on a full-year basis (either the last financial year or the last four quarters).

Expanded Definition

When capital is tied up in a business, the owners of the capital want to see a good return on that capital. Looking at profit by itself is meaningless. I mean, if a company earns ₹1 l akh in net income, that's okay. But its great if the capital invested to earn that is only ₹2.5 Lakh (40% return) and terrible if the capital invested is ₹25 Lakh (4% return).

Return on investment measures how profitable the company is for the owner of the investment. In this case, return on equity measures how profitable the company is for the equity owners, i.e. the shareholders.

$$\text{ROE} = \frac{\text{Net Income}}{\text{Average Shareholders Equity}}$$

The "average" is taken over the time period being calculated and is equal to "the sum of the beginning equity balance and the ending equity balance, divided by two."

Return on equity is expressed as a percent and measures the return a company receives on its shareholder's equity. It is a much simpler version of return on invested capital. In general, the market is willing to pay a higher multiple for stocks with higher ROEs.

As with every ratio, ROE should be compared to the company's industry and competitors. If a company is earning 35% ROE, that may sound great, but if the industry is earning 40% on average, then the investor should find out why the company is flying lower. Contrariwise, if its competitors are earning 25%, then the company may be a high flyer. However, don't invest based on just one ratio. Compare several ratios before making a decision.

DuPont model

This breaks ROE down into several components so that one can see how changes in one area of the business changes return on equity.

ROE = (net margin) × (asset turnover) × (equity multiplier)

$$ROE = \frac{\text{net income}}{\text{revenue}} \times \frac{\text{revenue}}{\text{total assets}} \times \frac{\text{total assets}}{\text{equity}}$$

Return on equity grows, all else equal:

- ❖ the more net margin increases,
- ❖ the more revenue is generated from a firm's assets,
- ❖ The more leveraged a firm becomes.

While the first two seem fairly straight forward, the third one doesn't seem to be, but it really is. If revenue-generating assets are purchased through the use of debt (not equity), then the increased amount of net income generated by that greater amount of assets will increase the return on the fixed amount of equity.

Sustainable growth

Return on equity also ties into how much growth one can expect from a company. When a firm reinvests its net income, then it can be expected to grow. The fastest this can be expected to occur is the return on equity. This is calculated:

Sustainable growth = Retention ratio × ROE

Sustainable growth = (1 – Payout ratio) × ROE

$$\text{Sustainable growth} = \left(1 - \frac{\text{total dividend paid}}{\text{net income}}\right) \times ROE$$

A more refined definition

Common shareholders are interested in what return the company is making on their stake. to account for this, dividends paid out to preferred shareholders should be subtracted from net income before calculating ROE. So,

$$ROE = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Average Shareholders Equity}}$$

9. Book Value per Share

A measure used by owners of common shares in a firm to determine the level of safety associated with each individual share after all debts are paid accordingly.

$$\text{Book Value Per Share} = \frac{\text{Total shareholder's Equity} - \text{Preferred Equity}}{\text{Total Outstanding Shares}}$$

Should the company decide to dissolve, the book value per common share indicates the rupee value remaining for common shareholders after all assets are liquidated and all debtors are paid. In simple terms it would be the amount of money that a holder of a common share would get if a company were to liquidate.

Fundamental analysis can be used to identify companies that represent good value. Hence it is good for long term investments. Valuation techniques vary depending on the industry group. For this reason, a set of different techniques or model is required for different industry. This can get quite time consuming and limit the amount of research that can be performed. In fundamental analysis, companies should be compared against other companies in the same sector. For example, a software company (Infosys Technologies) should be compared with a software company (Wipro), and not to a bank (ICICI Bank).

Technical Analysis

Technical Analysis is the forecasting of future financial price movements based on an examination of past price movements. Like weather forecasting, technical analysis does not result in absolute predictions about the future. Instead, technical analysis can help investors anticipate what is "likely" to happen to prices over time. Technical analysis uses a wide variety of charts that show price over time.

Technical analysis is applicable to stocks, indices, commodities, futures or any tradable instrument where the price is influenced by the forces of supply and demand. Price refers to any combination of the open, high, low, or close for a given security over a specific time frame. The time frame can be based on intraday (1-minute, 5-minutes, 10-minutes, 15-minutes, 30-minutes or hourly), daily, weekly or monthly price data and last a few hours or many years. In addition, some technical analysts include volume or open interest figures with their study of price action.

The Basis of Technical Analysis

At the turn of the century, the Dow Theory laid the foundations for what was later to become modern technical analysis. Dow Theory was not presented as one complete amalgamation, but rather pieced together from the writings of Charles Dow over several years. Of the many theorems put forth by Dow, three stand out:

- Price discounts everything.
- Price Movements Are Not Totally Random.
- 'What' is more important than 'Why'.

Price Discounts Everything

Technical analysts believe that the current price fully reflects all information. Because all information is already reflected in the price, it represents the fair value, and should form the basis for analysis. After all, the market price reflects the sum knowledge of all participants, including traders, investors, portfolio managers, buy-side analysts, sell-side analysts, market strategist, technical analysts, fundamental analysts and many others. It would be folly to disagree with the price set by such an impressive array of people with impeccable credentials. Technical analysis utilizes the information captured by the price to interpret what the market is saying with the purpose of forming a view on the future.

Price Movements are not Totally Random

Most technicians agree that prices trend. However, most technicians also acknowledge that there are periods when prices do not trend. If prices were always random, it would be extremely difficult to make money using technical analysis. In his book, *Schwager on Futures: Technical Analysis*, Jack Schwager states:

"One way of viewing it is that markets may witness extended periods of random fluctuation, interspersed with shorter periods of nonrandom behavior. The goal of the chartist is to identify those periods (i.e. major trends)."



A technician believes that it is possible to identify a trend, invest or trade based on the trend and make money as the trend unfolds. Because technical analysis can be applied to many different time frames, it is possible to spot both short-term and long-term trends. The IBM chart illustrates Schwager's view on the nature of the trend. The broad trend is up, but it is also interspersed with trading ranges. In between the trading ranges are smaller up trends within the larger uptrend. The uptrend is renewed when the stock breaks above the trading range. A downtrend begins when the stock breaks below the low of the previous trading range.

"What" is more important than "Why"

In his book, *The Psychology of Technical Analysis*, Tony Plummer paraphrases Oscar Wilde by stating, "A technical analyst knows the price of everything, but the value of nothing". Technicians, as technical analysts are called, are only concerned with two things:

1. What is the current price?
2. What is the history of the price movement?

The price is the end result of the battle between the forces of supply and demand for the company's stock. The objective of analysis is to forecast the direction of the future price. By focusing on price and only price, technical analysis represents a direct approach. Fundamentalists are concerned with why the price is what it is. For technicians, the why portion of the equation is too broad and many times the fundamental reasons given are highly suspect. Technicians believe it is best to concentrate on 'what' and never mind 'why'. Why did the price go up? It is simple, more buyers (demand) than sellers (supply). After all, the value of any asset is only what someone is willing to pay for it. Who needs to know why?

General Steps to Technical Evaluation

Many technicians employ a top-down approach that begins with broad-based macro analysis. The larger parts are then broken down to base the final step on a more focused/micro perspective. Such an analysis might involve three steps:

1. Broad market analysis through the major indices such as the S&P 500, Dow Industrials, NASDAQ and NYSE Composite.
2. Sector analysis to identify the strongest and weakest groups within the broader market.
3. Individual stock analysis to identify the strongest and weakest stocks within select groups.

The beauty of technical analysis lies in its versatility. Because the principles of technical analysis are universally applicable, each of the analysis steps above can be performed using the same theoretical background. You don't need an economics degree to analyze a market index chart. You don't need to be a CPA to analyze a stock chart. Charts are charts. It does not matter if the time frame is 2 days or 2 years. It does not matter if it is a stock, market index or commodity. The technical principles of support, resistance, trend, trading range and other aspects can be applied to any chart. While this may sound easy, technical analysis is by no means easy. Success requires serious study, dedication and an open mind.

Chart Analysis

Technical analysis can be as complex or as simple as you want it. Since we are interested in buying stocks, the focus will be on spotting bullish situations.

Overall Trend: The first step is to identify the overall trend. This can be accomplished with trend lines, moving averages or peak/trough analysis. As long as the price remains above its uptrend line, selected moving averages or previous lows, the trend will be considered bullish.

Support: areas of congestion or previous lows below the current price mark support levels. A break below support would be considered bearish.

Resistance: Areas of congestion and previous highs above the current price mark the resistance levels. A break above resistance would be considered bullish.

Momentum: Momentum is usually measured with an oscillator such as MACD. If MACD is above its 9-day EMA (exponential moving average) or positive, then momentum will be considered bullish, or at least improving.

Buying/Selling Pressure: For stocks and indices with volume figures available, an indicator that uses volume is used to measure buying or selling pressure. When Chaikin Money Flow is above zero, buying pressure is dominant. Selling pressure is dominant when it is below zero.

Relative Strength: The price relative is a line formed by dividing the security by a benchmark. For stocks it is usually the price of the stock divided by the index. The plot of this line over a period of time will tell us if the stock is outperforming (rising) or under-performing (falling) the major index.

The final step is to synthesize the above analysis to ascertain the following:

- ❖ Strength of the current trend.
- ❖ Maturity or stage of current trend.
- ❖ Reward to risk ratio of a new position.
- ❖ Potential entry levels for new long position.

Top-Down Technical Analysis

For each segment (market, sector and stock), an investor would analyze long-term and short-term charts to find those that meet specific criteria. Analysis will first consider the market in general, perhaps the S&P BSE Sensex. If the broader market were considered to be in bullish mode, analysis would proceed to a selection of sector charts. Those sectors that show the most promise would be singled out for individual stock analysis. Once the sector list is narrowed to 3-4 industry groups, individual stock selection can begin. With a selection of 10-20 stock charts from each industry, a selection of 3-4 of the most promising stocks in each group can be made. How many stocks or industry groups make the final cut will depend on the strictness of the criteria set forth. Under this scenario, we would be left with 9-12 stocks from which to choose. These stocks could even be broken down further to find the 3-4 of the strongest of the strong.

Strengths of Technical Analysis

Focus on Price

If the objective is to predict the future price, then it makes sense to focus on price movements. Price movements usually precede fundamental developments. By focusing on price action, technicians are automatically focusing on the future. The market is thought of as a leading indicator and generally leads the economy by 6 to 9 months. To keep pace with the market, it makes sense to look directly at the price movements. More often than not, change is a subtle beast. Even though the market is prone to sudden knee-jerk reactions, hints usually develop before significant moves. A technician will refer to periods of accumulation as evidence of an impending advance and periods of distribution as evidence of an impending decline.

Supply, Demand, and Price Action

Many technicians use the open, high, low and close when analyzing the price action of a security. There is information to be gleaned from each bit of information. Separately, these will not be able to tell much. However, taken together, the open, high, low and close reflect forces of supply and demand.



The annotated example above shows a stock that opened with a gap up. Before the open, the number of buy orders exceeded the number of sell orders and the price was raised to attract more sellers. Demand was brisk from the start. The intraday high reflects the strength of demand (buyers). The intraday low reflects the availability of supply (sellers). The close represents the final price agreed upon by the buyers and the sellers. In this case, the close is well below the high and much closer to the low. This tells us that even though demand (buyers) was strong during the day, supply (sellers) ultimately prevailed and forced the price back down. Even after this selling pressure, the close remained above the open. By looking at price action over an extended period of time, we can see the battle between supply and demand unfold. In its most basic form, higher prices reflect increased demand and lower prices reflect increased supply.

Support/Resistance

Simple chart analysis can help identify support and resistance levels. These are usually marked by periods of congestion (trading range) where the prices move within a confined range for an extended period, telling us that the forces of supply and demand are deadlocked. When prices move out of the trading range, it signals that either supply or demand has started to get the upper hand. If prices move above the upper band of the trading range, then demand is winning. If prices move below the lower band, then supply is winning.

Pictorial Price History

Even if you are a tried and true fundamental analyst, a price chart can offer plenty of valuable information. The price chart is an easy to read historical account of a security's price movement over a period of time. Charts are much easier to read than a table of numbers. On most stock charts, volume bars are displayed at the bottom. With this historical picture, it is easy to identify the following:

- ❖ Reactions prior to and after important events.
- ❖ Past and present volatility.
- ❖ Historical volume or trading levels.
- ❖ Relative strength of a stock versus the overall market.

Assist with Entry Point

Technical analysis can help with timing a proper entry point. Some analysts use fundamental analysis to decide what to buy and technical analysis to decide when to buy. It is no secret that timing can play an important role in performance. Technical analysis can help spot demand (support) and supply (resistance) levels as well as breakouts. Simply waiting for a breakout above resistance or buying near support levels can improve returns.

It is also important to know a stock's price history. if a stock you thought was great for the last 2 years has traded flat for those two years, it would appear that stock exchange has a different opinion. If a stock has already advanced significantly, it may be prudent to wait for a pullback. Or, if the stock is trending lower, it might pay to wait for buying interest and a trend reversal.

Weaknesses of Technical Analysis Analyst Bias

Just as with fundamental analysis, technical analysis is subjective and our personal biases can be reflected in the analysis. It is important to be aware of these biases when analyzing a chart. If the analyst is a perpetual bull, then a bullish bias will overshadow the analysis. On the other hand, if the analyst is a disgruntled eternal bear, then the analysis will probably have a bearish tilt.

Open to Interpretation

Furthering the bias argument is the fact that technical analysis is open to interpretation. even though there are standards, many times two technicians will look at the same chart and paint two different scenarios or see different patterns. Both will be able to come up with logical support and resistance levels as well as key breaks to justify their position. While this can be frustrating, it should be pointed out that technical analysis is more like an art than a science, somewhat like economics. Is the cup half- empty or half-full? It is in the eye of the beholder.

Too Late

Technical analysis has been criticized for being too late. By the time the trend is identified, a substantial portion of the move has already taken place. After such a large move, the reward to risk ratio is not great. I ateness is a particular criticism of dow theory.

Always another Level

Even after a new trend has been identified, there is always another "important" level close at hand. Technicians have been accused of sitting on the fence and never taking an unqualified stance. Even if they are bullish, there is always some indicator or some level that will qualify their opinion.

Trader's Remorse

Not all technical signals and patterns work. When you begin to study technical analysis, you will come across an array of patterns and indicators with rules to match. For instance: A sell signal is given when the neckline of a head and shoulders pattern is broken. Even though this is a rule, it is not steadfast and can be subject to other factors such as volume and momentum. In that same vein, what works for one particular stock may not work for another. A 50-day moving average may work great to identify support and resistance for IBM, but a 70-day moving average may work better for Yahoo. Even though many principles of technical analysis are universal, each security will have its own idiosyncrasies.

Technical analysts consider the market to be 80% psychological and 20% logical. Fundamental analysts consider the market to be 20% psychological and 80% logical. Psychological or logical may be open for debate, but there is no questioning the current price of a security. After all, it is available for all to see and nobody doubts its legitimacy. The price set by the market reflects the sum knowledge of all participants, and we are not dealing with lightweights here. These participants have considered (discounted) everything under the sun and settled on a price to buy or sell. These are the forces of supply and demand at work. By examining price action to determine which force is prevailing, technical analysis focuses directly on the bottom line: What is the price? Where has it been? Where is it going?

Even though there are some universal principles and rules that can be applied, it must be remembered that technical analysis is more an art form than a science. As an art form, it is subject to interpretation. However, it is also flexible in its approach and each investor should use only that which suits his or her style. Developing a style takes time, effort and dedication, but the rewards can be significant.

Momentum Analysis

1. **Definition:**

   (a) Momentum measures the speed of price change and provides a leading indicator of changes in trend.

   (b) Momentum Line leads price action frequently enough to signal a potential trend reversal in the market.

2. **Momentum Line:**

   (a) **Feature:** A strongly trending market acts like a pendulum, the move is faster at the beginning with strong momentum. Then, it gradually slows down, or loses momentum, stops and reverses course.

   (b) **Indicative Value**: Momentum Line is a step ahead of the price movement. It leads the advance or decline in prices and levels off while the current price trend is still in effect. It then begins to move in the opposite direction as prices begin to level off.

   (c) **Period**: The shorter the time frame used, the more sensitive momentum becomes to short term fluctuations with more marked oscillations. Generally, 10 days or periods are used in calculating momentum.

   (d) **Example**: A 10 day momentum line fluctuates on an open scale around a zero line. When the latest Closing Price is higher than that of 10 days ago, a positive value is plotted above the zero line. If the latest close is lower than 10 days previous, a negative value is plotted.

3. **Upward and Downward Momentum**:

Upward Momentum	Downward Momentum
• When an up-trending Momentum Line begins to flatten out, it means that the new gains being achieved by the latest Closing Prices are the same as the gains 10 days earlier. The rate of Upward Momentum has levelled off even though prices may still be advancing. • When the Momentum Line begins to drop further, below the zero line, the uptrend in prices could still be in force, but the last price gains are less than those of 10 days ago. The uptrend is losing momentum.	• When the Momentum Line moves below the zero line, the latest close is now under the close of 10 days ago and a short-term downtrend is in effect. • As momentum continues to drop farther below the zero line, the downtrend gains momentum. The downtrend decelerates when the line begins to turn around. • If loss of momentum is experienced in a market at the same time as selling resistance is met or when buying power is temporarily exhausted, momentum and price peak simultaneously.

4. **Signals Under Momentum Analysis:**

   Three common signals are generated —

   (a) **Zero-line Crossings:** Although the long term price trend is still the overriding consideration, a crossing above the zero line could be a buy signal if the price trend is up, and a crossing below the zero line, a sell signal, if the price trend is down.

   (b) **Trend line Violations**: The Trend Lines on the momentum chart are broken sooner than those on the Price Chart. The value of the Momentum Indicator is that it turns sooner than the market itself, making it a leading indicator.

   (c) **Extreme Values**: One of the benefits of Oscillator Analysis is being able to determine when markets are in extreme areas. At extreme positive values, momentum implies an overbought position, at extreme negative values, an oversold position.

8.2 MARKET INDICATORS, SUPPORT AND RESISTANCE LEVEL, PATTERNS IN STOCK PRICE

Market indicators - to forecast predictive value for technical analysis

Market indicators are a series of technical indicators used by traders to predict the direction of the major financial indexes. Most market indicators are created by analyzing the number of companies that have reached new highs relative to the number that created new lows, also known as market breadth.

(A) Breadth Index:

Breadth Index covers all securities traded and also the volume of transactions to give a view of the direction of the stock market movements. It is an addition to the Dow Theory and the movement of the Dow Jones Averages.

(i) Measurement: It is computed by dividing the Net Advances or declines in the market by the number of issues traded.

(ii) Application and Inference:

- ❖ The breadth index can either support or contradict the movement of the Dow Jones averages.
- ❖ If it supports the movement of the Dow Jones Averages, this is considered sign of technical strength and if it does not support the averages, it is a sign of technical weakness i.e. a sign that the market will move in a direction opposite to the Dow Jones Averages.

(B) Volume of Transactions:

Volume represents quantities purchased and also the number of transactions entered into in the market in a given period. These provide useful clues on how the market would behave in the near future.

Application/Inference:

Price	Volume	Signal/Inference
Rising	Increasing	"Buy Behaviour Reflects an unsatisfied demand in the market"
Falling	Increasing	Bear Market – "Sell Behaviour" The prices would be expected to fall further
Rising	Decreasing	Bull Market
Falling	Decreasing	Bear Market

(C) Confidence Index:

(i) **Meaning:** Confidence Index indicates the willingness of the investors to take a chance in the market. It is the ratio of High-grade bond yields to low-grade bond yields.

(ii) **Application:** Market analysts use confidence index as a method of trading or timing the purchase and sale of stock. They are also used as a forecasting device to determine the turning points of the market.

(iii) **Inference:**

- ❖ Rising confidence index is expected to precede a rising stock market, and a fall in the index is expected to precede a drop in stock prices.
- ❖ A fall in the confidence index represents the fact that Low-Grade Bond yields are rising faster or falling more slowly than high grade yields.

(iv) **Limitations:** Confidence index is not always a leading indicator of the market. Hence, it should be used in conjunction with other market indicators.

(D) Relative Strength Analysis:

(i) **Relatively Strong Securities:** Securities with historically high average returns as compared to other securities, are securities with high relative strength.

(ii) **Theory:**

- ❖ Some securities are stronger than the other securities, due to which they rise relatively faster in the bull market or decline more slowly in a bear market, than the others.
- ❖ Investors can earn higher returns by investing in such securities because the relative strength of a security tends to remain undiminished over time.

(iii) **Measurement:** Relative strength can be measured in several ways. Ratios like security relative to its industry and security relative to the entire market can also be used to detect relative strength in a security or an industry.

(E) Odd-Lot Theory:

(i) This theory is a contrary-opinion theory. it assumes that the average person is usually wrong and that a wise course of action is to pursue strategies contrary to popular opinion.

(ii) **Application:** The odd-lot theory is used primarily to predict tops in bull markets, but also to predict reversals in individual securities.

Support Levels and Resistance Levels

The concepts of support and resistance are undoubtedly two of the most highly discussed attributes of technical analysis and they are often regarded as a subject that is complex by those who are just learning to trade. Support and resistance represent key junctures where the forces of supply and demand meet. In the financial markets, prices are driven by excessive supply (down) and demand (up). Supply is synonymous with bearish, bears and selling. Demand is synonymous with bullish, bulls and buying. As demand increases, prices advance and as supply increases, prices decline. When supply and demand are equal, prices move sideways as bulls and bears slug it out for control.

Support Levels: When the Index / Price rebounds after reaching a trough subsequently, the lowest value reached becomes the support level. A support level is a price level where the price tends to find support as it is going down. This means the price is more likely to "bounce" off this level rather than break through it. However, once the price has passed this level, by an amount exceeding some noise, it is likely to continue dropping until it finds another support level.

Resistance Levels: Represents the peak value from which the index or price goes down. A resistance level is the opposite of a support level. It is where the price tends to find resistance as it is going up. This means the price is more likely to "bounce" off this level rather than break through it. However, once the price has passed this level, by an amount exceeding some noise, it is likely that it will continue rising until it finds another resistance level.

Identifying Support and Resistance Levels

Support and resistance levels can be identified by trend lines (technical analysis). Some traders believe in using pivot point calculations. The more often a support/resistance level is "tested" (touched and bounced off by price), the more significance given to that specific level. If a price breaks past a support level, that support level often becomes a new resistance level. The opposite is true as well, if price breaks a resistance level, it will often find support at that level in the future. The development of support and resistance levels is probably the most noticeable and reoccurring event on price charts. The breaking through support/resistance levels can be triggered by fundamental changes that are above or below investor's expectations (e.g., changes in earnings, management, competition, etc.) or by self-fulfilling prophecy (investors buy as they see prices rise). The cause is not so significant as the effect: new expectations lead to new price levels. There are support/resistance levels, which are more emotional. Support levels are usually below the current price, but it is not uncommon for a security to trade at or near support. Technical analysis is not an exact science and it is sometimes difficult to set exact support levels. In addition, price movements can be volatile and dip below support briefly. Sometimes it does not seem logical to consider a support level broken if the price closes 1/8 below the established support level. For this reason, some traders and investors establish support zones. Resistance levels are usually above the current price, but it is not uncommon for a security to trade at or near resistance. In addition, price movements can be volatile and rise above resistance briefly. Sometimes it does not seem logical to consider a resistance level broken if the price closes 1/8 above the established resistance level. For this reason, some traders and investors establish resistance zones.

Support turns resistance and vice-versa

Another principle of technical analysis stipulates that support can turn into resistance and vice versa. Once the price breaks below a support level, the broken support level can turn into resistance. The break of support signals that the forces of supply have overcome the forces of demand. Therefore, if the price returns to this level, there is likely to be an increase in supply, and hence resistance. The other turn of the coin is resistance turning into support. As the price advances above resistance, it signals changes in supply and demand. The breakout above resistance proves that the forces of demand have overwhelmed the forces of supply. If the price returns to this level, there is likely to be an increase in demand and support will be found.

Applications and Market Behavior:

(a) Price Band: Price is expected to move between these two levels.

(b) Market Behavior:

- ❖ If the price approaches the resistance level, there is a selling pressure because all investors who failed to sell at the high would be keen to liquidate.
- ❖ Whenever the price approaches the support level, there is a buying pressure as all those investors who failed to buy at the lowest price would like to purchase the share.

(c) Prices outside the Support Level and Resistance Level: Breach of these levels indicates a distinct departure from status quo, and an attempt to set newer levels.

The following principles are to be applied while using support and resistance lines for trend analysis:

(i) Support and resistance lines are only approximations of the levels, prices may be expected to 'obey'. They should, therefore, be drawn using judgment, and clues from the past price behavior.

(ii) Penetration of a support or resistance line, also confirmed by an underlying price pattern, is a fairly sure indication of a strong ensuing move in the same direction. New highs are reached after a resistance line is penetrated and new lows follow penetration of a support line.

(iii) Prices are said to remain in a 'congestion zone' as long as they fluctuate in narrow ranges within a support and resistance level. The direction of breakout from a congestion zone cannot be predicted in advance.

(iv) The higher the volume accompanying the confirmation of a support or resistance level, the more its significance.

(v) The speed and extent of the previous move determines the significance of a support or resistance level. Prices penetrate support (resistance) level generally after slowing down from a previous low (high) and hovering around a level for sometime.

(vi) Support and resistance levels repeat their effectiveness time and again, even if separated by many years.

Identification of key support and resistance levels is an essential ingredient to successful technical analysis. Even though it is sometimes difficult to establish exact support and resistance levels, being aware of their existence and location can greatly enhance analysis and forecasting abilities. If a security is approaching an important support level, it can serve as an alert to be extra vigilant in looking for signs of increased buying pressure and a potential reversal. If a security is approaching a resistance level, it can act as an alert to look for signs of increased selling pressure and potential reversal. If a support or resistance level is broken, it signals that the relationship between supply and demand has changed. A resistance breakout signals that demand (bulls) has gained the upper hand and a support break signals that supply (bears) has won the battle.

Patterns in Stock Price

In the Stock Market, the index / stock price represents certain patterns over various periods of time:

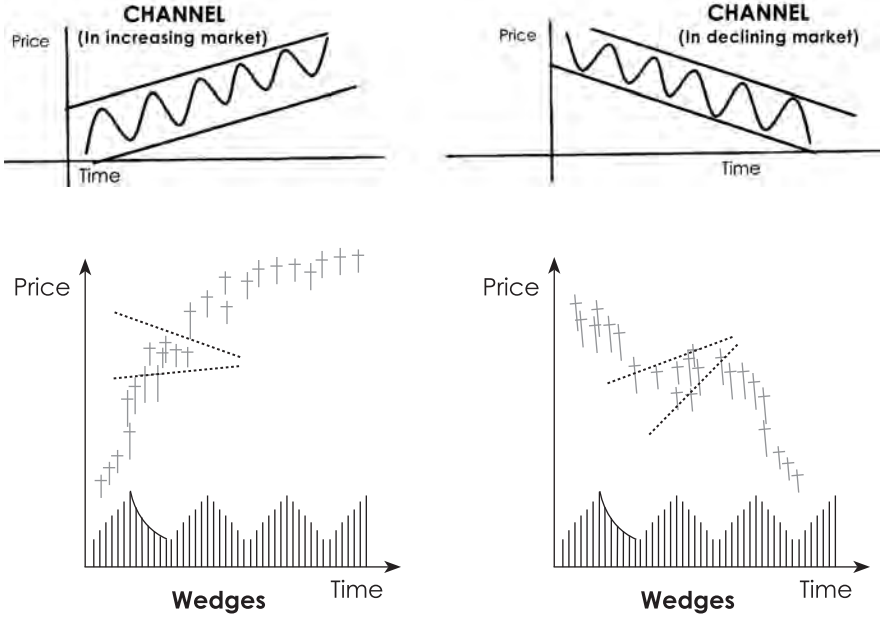
(i) Channel:

(a) A series of uniformly changing tops (Peak Prices) and bottoms (Lowest Prices) rise to a channel.

formation.

(b) A downward sloping channel would indicate declining prices and an upward sloping channel would imply rising prices.

(ii) Wedge: Wedge is formed when the tops (Resistance Levels / Peaks) and bottoms (Support Levels) change in opposite direction (that is, if the tops, are decreasing then the bottoms are increasing and vice versa), or when they are changing; in the same direction at different rates over time.



(iii) Head and Shoulders:

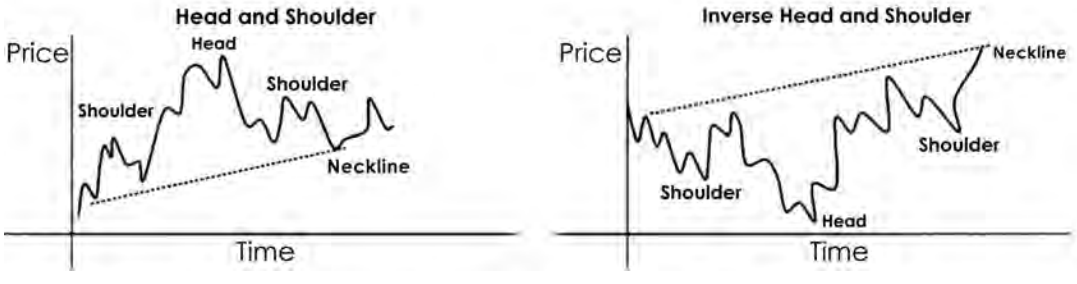
(a) Meaning: It is a price pattern which resembles a distorted drawing of a human form, with a large lump (for head) in the middle of two smaller humps (tor shoulders).

(b) Significance and Inference:

- This is the most important pattern to indicate a reversal of price trend.
- The neckline of the pattern is formed by joining points where the head and the shoulders meet. The price movement after the formation of the second shoulder signifies the direction of price movement.
- If the price goes below the neckline, then a drop in price is indicated, with the drop expected to be equal to the distance between the top of the head and the neckline.

(c) Diagrammatic Representation:

- **Head and Shoulder Top Pattern:** This formation represents bearish development, and if the price falls below the neck line (line drawn tangentially to the left and right shoulders) a price decline is expected. It is a signal to sell.
- **Inverse Head and Shoulder Pattern:** It reflects a bullish development. The price rise to above the neck line suggests price rise is imminent and a signal to purchase.



(iv) Triangle or Coil Formation: This formation represents a pattern of uncertainty and is difficult to predict which way the price will break out.

(v) Flags & Pennants Form: This form signifies a phase after which the previous price trend is likely to continue.

(vi) Double Top and Bottom:

(a) Double top form represents a bearish development, signaling that prices are expected to tall.

(b) Double bottom form represents a bullish development signaling an increase in price.

(vii) Gap:

(a) Meaning: Gap is the difference between the opening price on a trading day and the closing price of the previous trading day.

(b) Inferences: Wider the gap the stronger the signal for a continuation of the observed trend.

On a rising market, if the opening price is considerably higher than the previous closing price, it indicates that investors are willing to pay a much higher price to acquire the scrip. Similarly, a gap in a falling market is an indicator of extreme selling pressure.

8.3 STATISTIC MODELS, BOLLINGER BANDS

Statistic Models

A. Moving Averages: Moving averages are frequently plotted with prices to make buy and sell decisions. The two types of moving averages used by chartists are —

(a) Arithmetical Moving Average (AMA): An N-period Arithmetic Moving Average, at period t, is the simple average of the last N period prices including the price at period t. Under AMA, each period's values is given equal weights.

(b) Exponential Moving Average (EMA):

Exponential Moving Average assigns a smaller weight to the observation at time t and a large weight

to the Exponential Moving Average of the previous period. The weight for every observation decreases exponentially, according to a scheme specified by the exponential smoothing constant, also known as the exponent, a.

EMA at t = S_t = A X P_t + (1 - A) X S_{t-1}

Where, S_t is the exponential moving average at time t.

P_t is the Index Value as at time t.

A is the Value of the Exponent = 2 / (1 + No. of Observations)

B. Buy and Sell Signals Provided by Moving Average Analysis

(a) Buy Signal: the stock price line

- Rises through the moving average line. Moving Average Line is flattening.
- falls below moving average line which is rising.
- Which is above moving average line falls but begins to rise again before reaching the moving average line.

(b) Sell Signal: The stock price line —

- Falls through moving average line when graph of the moving average line is flattering out.
- Rises above moving average line which is falling.
- Which is below moving average line rises but begins to fall again before reaching the moving average line.

However, there are other advanced technical tools too. Some of them are named as:

- The Confidence Index
- Contrary Opinion Theories
  - ✓ Odd-Lot Theory
  - ✓ Mutual Fund Liquidity
- Oscillators
- Stochastics
- elliott Wave theory

Bollinger Bands

Bollinger Bands represent the space between two lines drawn on either side of the simple moving average. It consists of a centre line and two price channels, one above the centre line and one below. The centre line is an Exponential Moving Average, and the price channels are standard deviations of the stock the chartist is studying. The bands will expand and contract as the price action of an issue becomes volatile (expansion) or becomes bound into a tight trading pattern (contraction). Because standard deviation is a measure of volatility, Bollinger Bands adjust themselves to the market conditions. When the markets become more volatile, the bands widen (move further away from the average), and during less volatile periods, the bands contract (move closer to the average). The tightening of the bands is often used by technical traders as an early indication that the volatility is about to increase sharply.

This is one of the most popular technical analysis techniques. The closer the prices move to the upper band, the more overbought the market, and the closer the prices move to the lower band, the more oversold the market.

The purpose of Bollinger Bands is to provide a relative definition of high and low. By definition, prices are high at the upper band and low at the lower band. This definition can aid in rigorous pattern recognition and is useful in comparing price action to the action of indicators to arrive at systematic trading decisions.

Computation of Factors:

The Bollinger band formula consists of the following —

Upper Band = Moving Average (TP, n) + m X Standard Deviation (TP, n)

Lower Band = Moving Average (TP, n) – m X Standard Deviation (TP, n)

Where, n = Smoothing Period

m = Number of Standard Deviations (SD)

Standard Deviation is for the last "n" periods

TP = Typical Price = (High + Low + Closing) / 3

Features:

(a) They adapt dynamically to price expanding and contracting as volatility increases and decreases. Therefore, the bands naturally widen and narrow in sync with price action, creating a very accurate trending envelope.

(b) The technician can be relatively certain that almost all of the price data needed will be found between the two bands.

(c) A band is plotted two standard deviations away from a simple moving average. Because standard deviation is a measure of volatility, Bollinger bands adjust themselves to the market conditions.

(d) When the markets become more volatile, the bands widen (move further away from the average), and during less volatile periods, the bands contract (move closer to the average).

Market Application:

(a) Indication of Volatility: Tightening of the bands is often used by technical traders as an early indication that that the volatility is about to increase sharply.

(b) Interference of Prices around the Band: The closer the prices move to the upper band, the more overbought (purchase position more than sale position) the market, and the closer the prices move to the lower band, the more oversold (sale position more than the purchase position) the market.

(c) Larger Trend: Bollinger's Band helps in identifying the larger trend, since in the short run every price movement is volatile. Bollinger's Band presents a price channel, which are designed to encompass the trading activity around the trend.

(d) Action Based on Bollinger Band: Traders use them primarily to determine overbought and oversold levels, selling when price touches the upper Bollinger Band and buying when it hits the lower Bollinger band.

8.4 THEORIES ON STOCK MARKET MOVEMENTS

With the development in the liberalization of capital movements and the securitization of stock markets, international financial markets have become increasingly interdependent. Advanced computer technology and improved worldwide network processing of news have improved the possibilities for domestic stock markets to react promptly to new information from international markets. As a consequence, an increasing attention has been given in recent literature to the topic of international transmission of stock market returns and volatility.

Dow-Jones Theory Regarding the Behaviour of Stock Market Prices

The Dow theory is one of the oldest and most famous technical theories. It was originated by Charles Dow, who founded the Dow Jones Company and was the editor of The Wall Street Journal. Mr. Dow died in 1902. The Dow theory was developed by W.P. Hamilton and Robert Rhea (during 1900-1929 years) from the editorial written by Dow, with numerous writers have altered, extended and in some cases abridged the original Dow theory. It is the basis for many other techniques used by technical analysts.

The Dow theory is credited with having forecast the Great Crash of 1929. According to Dow, "The market is always considered as having three movement, all going at the same time. The first is the narrow movement from day to day. The second is the short swing running from two weeks to a month or more, the third is the main movement covering at least four years in duration."

(A) Movements in Share Prices: Movements in the share prices on the share market can be classified into the following three major categories —

(i) Primary Trends: The primary trend is the long range cycle that carries the entire market up or down (bull or bear markets).

- **Feature:** Primary movements indicate the basic trend in the market. However, in the short-run, some reverse trend may also be observed, but in the long-run they will end up either with a rise or fall in prices.
- **Period:** Primary movements reflect the trend of the share market, and may continue from one to three years or even more.
- **Example:** Bull Phase is one in which the succeeding highs exceed the preceding highs, and the successive lows are higher than the preceding lows. The reverse is the case in bear phase. Correct determination of such movements is the major objective of Dow- Jones theorists.

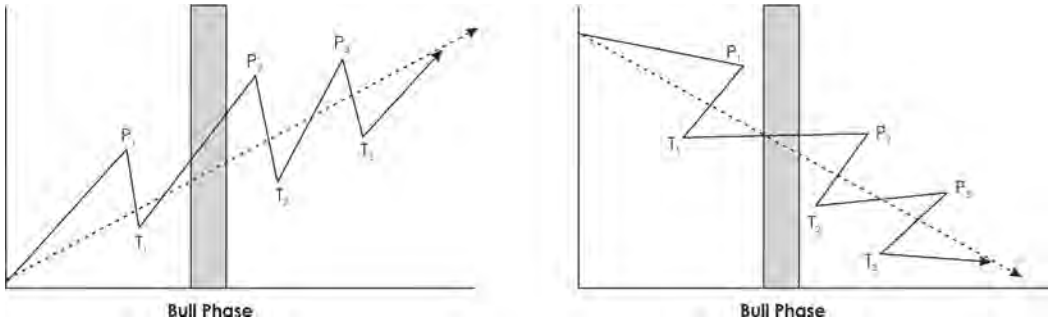
(ii) Secondary Movements (trends): The secondary trend acts as a restraining force on the primary trend. It ends to correct deviations from its general boundaries.

- **Feature:** Intervening movements in prices which last for a short period running counter to the primary trend, i.e. in case of Bull Phase in Primary Movement, after a rise in prices, there will be a fall in the prices. This fall in prices is referred to as Secondary Movement.

- **Time:** Secondary Movements are shorter in duration, ranging in a few weeks, and the extent of secondary movement (upward or downward) ranges from 33% to 66% of the primary movement.
- **Example:** In a Bull Run (Primary Movement), for a rise of 30% in the market capitalization, there will be a fall of 20% (Maximum) in Market Capitalisation.

(iii) Daily Fluctuations (minor trends): The minor trends have little analytical value, because of their short durations and variations in amplitude.

- **Feature:** These are everyday's irregular fluctuations in share prices in either direction, as a result of activities of speculators.
- **Importance:** Such fluctuations have no bearing for an investor, and hence his investment or divestment decisions, should not be guided by such fluctuations.



Note:

— Dotted lines represent primary movement in the stock prices.

— Movement in the shaded region represents "Secondary Movement". Under the Bull Phase (Primary Movement), there is a downward movement for a short span of time. Under the Bear Phase (Primary Movement), there is an upward movement, which is succeeded by a dip.

(B) Dow-Jones Averages: The Dow-Jones Theory is based upon the movement of two indices -constructed by Charles Dow, Dow Jones Industrial Average and Dow Jones Transportation Average. These averages reflect the aggregate impact of all kinds of information on the market.

(C) Benefits of Dow-Jones theory:

(a) Timing of Investment: Investor can choose the appropriate time for his investment / divestment. Investment should be made in shares when their prices have reached the lowest level, and sell them at a time when they reached the highest peak.

(b) Identification of Trend: Using Dow-Jones theory, the correct and appropriate movement in the Market Prices can be identified, and depending on the investors' preference, decisions can be taken.

(D) Criticism of the Theory:

(a) It is not a theory but an interpretation of known data. A theory should be able to explain why a phenomenon occurs. No attempt was made by Dow or his followers to explain why the two averages should be able to forecast future stock prices.

(b) It is not acceptable in its forecast. There was considerable lag between the actual turning points and those indicated by the forecast.

(c) It has poor predictive power. According to Rosenberg, the Dow Theory could not forecast the bull market which had preceded the 1929 crash. It gave bearish indication in early 1926. Of the 90 recommendations Hamilton made for a change in attitude towards the market (55% were bullish, 18% bearish and 29% doubtful) only 45 were correct. Such a result an investor may get by flipping a coin).

8.5 PORTFOLIO MANAGEMENT

A portfolio refers to a collection of investments such as stocks, shares, mutual funds, bonds, cash and so on depending on the investor's income, budget and convenient time frame.

Portfolio Management refers to the selection of securities and their continuous shifting in the Portfolio for optimizing the return for a given level of risk and maximizing the wealth of an investor.

So we can say that Portfolio Management is the art of selecting the right investment basket for the investors in terms of minimum risk and maximum return.

Types of Portfolio Management

Portfolio Management is of the following types:

- **Active Portfolio Management:** As the name suggests, in an active portfolio management service, the portfolio managers are actively involved in buying and selling of securities to ensure maximum return to individual investors.
- **Passive Portfolio Management:** In a passive portfolio management, the portfolio manager deals with a fixed portfolio designed to match the current market scenario.
- **Discretionary Portfolio Management Services:** In Discretionary portfolio management services, an individual authorizes a portfolio manager to take care of his financial needs on his behalf. The individual issues money to the portfolio manager who in turn takes care of all his investment needs, paper work, documentation, filing and so on. In discretionary portfolio management, the portfolio manager has full rights to take decisions on his client's behalf.
- **Non-Discretionary Portfolio Management Services:** In non discretionary portfolio management services, the portfolio manager can merely advise the client what is good and bad for him but the client reserves full right to take his own decisions.

Major tasks involved with Portfolio Management are as follows.

- Taking decisions about investment mix and policy
- Matching investments to objectives
- Asset allocation for individuals and institutions
- Balancing risk against performance

Objectives of Portfolio Management

The objectives of Portfolio management are —

(i) **Reduce Risk:** To reduce the risk of loss of capital / income, by investing in various types of securities and over a wide range of industries, i.e. diversification.

(ii) **Safety of Principal:** To keep the capital / principal amount intact, in terms of value and in terms of purchasing power. The capital or the principal amount invested should not erode, either in value or in terms of purchasing power. By earning return, principal amount will not erode in nominal terms, and by earning returns at a rate not lesser than the inflation rate, principal amount will be intact in present value terms too.

(iii) **Stability of Income:** To facilitate a more accurate and systematic re-investment of income, to ensure growth and stability in returns.

(iv) **Capital Growth:** to enable attainment of capital growth by reinvesting in growth securities or through purchase of growth securities.

(v) **Marketability / Liquidity:** To have an easily marketable investment portfolio, so that the investor is able to liquidate investments and take advantage of attractive opportunities in the market.

(vi) **Tax Savings:** To effectively plan for and reduce the tax burden on income, so that the investor gains maximum from his investment.

Basic Principles of Portfolio Management

There are two basic principles of Portfolio Management, viz.

A. **Effective Investment Planning:** Effective investment planning is made by taking into account —

(i) Fiscal, financial and monetary policies of the Government, and the Reserve Bank of India.

(ii) Industrial and economic environment and its impact on industry prospects in terms of prospective technological changes, competition in the market, capacity utilization by the industry and demand prospects, etc.

B. **Constant Review of investment:** The Portfolio Manager should review the investment in securities on a continuous basis, to identify more profitable avenues for selling and purchasing the investment. This review requires analysis of the following —

(i) Assessment of quality of management of the companies in which investment has already been made or is proposed to be made.

(ii) Financial and trend analysis of companies' Financial Statements, to identify sound companies with optimum capital structure and better performance and to disinvest the holding of those c ompanies whose performance is not satisfactory.

(iii) Analysis of Securities Market and its trend.

The above analysis will help the portfolio manager to arrive at a conclusion as to whether the securities already in possession should be disinvested and new securities be purchased. If so, the timing for investment or dis-investment is also revealed.

Factors Affecting Investment Decisions in Portfolio Management

Selection of Investment is based on the following criteria—

(i) **Types of Securities:** What type of securities should be chosen? Debentures. Convertible Bonds, Preference Shares, Equity Shares, Government Securities and Bonds etc.

(ii) **Proportion of Investment:** What should be the proportion of investment in Fixed Interest/ Dividend Securities and variable interest/dividends bearing securities?

(iii) **Identification of Industry:** In case investments are to be made in the Shares or Debentures of Companies, which particular industry shows potential of growth?

(iv) **Identification of Company:** After identifying industries with high growth potential, selection of the Company, in whose shares or securities investments are to be made.

(v) **Objectives of Portfolio:** If the portfolio is to have a safe and steady returns (such as Provident Funds and welfare funds), then securities with low-risk would be selected. In case of portfolios which are floated for high returns, then risk investments which carry a very high rate of return will be selected.

(vi) **Timing of purchase:**

- At what price the share is acquired for the Portfolio, depends entirely on the timing decision.
- If a person wishes to make any gains, he should buy when the shares are selling at a low price and sell when they are at a high price.

(vii) **Risk Tolerance:** Risk refers to the volatility of portfolio's value. The amount of risk the investor is willing to take on is an extremely important factor. While some people do become more risk averse as they get older; a conservative investor remains risk averse over his life-cycle. An aggressive investor generally dares to take risk throughout his life. If an investor is risk averse and he takes too much risk, he usually panic when confronted with unexpected losses and abandon their investment plans mid-stream and suffers huge losses.

8.6 MARKOWITZ MODEL OF RISK-RETURN OPTIMIZATION

A. **Propounded By:** Harry Markowitz is regarded as the father of modern portfolio theory. He propounded the Markowitz Model of Risk Return optimization.

B. **Basis:**

(i) Investors are mainly concerned with two properties of an asset — Risk and Return.

(ii) Investor can trade off between return and risk, by diversification of portfolio. To the investor, risk of an individual asset does not matter. What really matters is the contribution it makes to the investor's total risk. The tradeoff between risks and returns must be reflected in the required rates of returns on investment opportunities.

(iii) The theory focuses on balancing safety, liquidity and return depending on the preference of different investors.

C. **Application:** The model is used to address the following portfolio selection problems / questions —

(i) Finding the mean variance efficient portfolios and

(ii) Selecting one such portfolio.

D. **Assumptions of the Model:** The model has taken into account risks associated with investments using variance or standard deviation of the return. The model is based on the following assumptions —

(i) Return on an investment adequately summarises the outcome of the investment.

(ii) Investors can visualise a probability distribution of rates of return.

(iii) Investors' risk estimates are proportional to the variance of return they perceive for a security or portfolio.

(iv) Investors base their investment decisions on two criteria i.e. expected return and variance of return (Risk).

(v) Investors are risk averse. For a given expected return he prefers to take minimum risk, for a given level of risk the investor prefers to get maximum expected return.

(vi) Investors are assumed to be rational in so far as they would prefer greater returns to lesser ones given equal or smaller risk and are risk averse. Risk aversion in this context means merely that as between two investments with equal expected returns, the investment with the smaller risk would be preferred.

(vii) 'Return' could be any suitable measure of monetary inflows, but yield has been the most commonly used measure of return, in this context, so that where the standard deviation of returns is referred to we shall mean the standard deviation of yield about its expected value.

E. Diversification and Efficient Portfolio:

(i) Efficient Frontier: Markowitz developed the concept of efficient frontier. For selection of a portfolio, comparison between combinations of portfolios is essential. A portfolio is not efficient if there is another portfolio with —

- Higher expected value of return and a lower standard deviation (risk).
- Higher expected value of return and the same standard deviation (risk)
- Same expected value but a lower standard deviation (risk)

(ii) Optimum Portfolio: Investor has to select a portfolio from amongst all those represented by the efficient frontier. This will depend upon his risk-return preference. As different investors have different preferences with respect to expected return and risk, the optimal portfolio of securities will vary considerably among investors.

(iii) Diversification: Diversification is the process which combines assets that are less than perfectly positively correlated in order to reduce portfolio risk without sacrificing any portfolio returns. If an investors' portfolio is not efficient he may —

- Increase the expected value of return without increasing the risk.
- Decrease the risk without decreasing the expected value of return, or
- Obtain some combination of increase of expected return and decrease risk.

8.7 PORTFOLIO MANAGEMENT – RETURN AND RISK ANALYSIS

Expected Return of A Portfolio

A. Based on Returns of Stock:

(i) The Expected Return on a Portfolio is computed as the weighted average of the expected returns on the stocks which comprise the Portfolio. The weights reflect the proportion of the Portfolio invested in the stocks.

(ii) Expected Return can be expressed as - $E(R_P) = \sum_{i=1}^{N} W_i E[R_i]$

Where,

$E[R_p]$ = Expected return on the portfolio.

N = Number of stocks in the portfolio

= Proportion of the Portfolio Invested in Stock i, and

$E[R_i]$ = Expected Return on stock i.

B. Based on Probability of Expected Returns of the Portfolio:

(i) Expected Return is the Mean Return computed on the basis of the probability of returns expected from the portfolio as a whole.

(ii) Mathematically, it is expressed as $E(R) = \sum p_i R_i$

Where,

$E[R_p]$ = Expected return on the Portfolio.

= Probability of Return in state / condition i

= Return of the Portfolio in state / condition i

Note: Sum total of p, is 1.

Type of Risks

A. Systematic Risk: It arises out of external and uncontrollable factors, which are not specific to a security or industry to which such security belongs. It is that part of risk caused by factors that affect the price of all the securities. Systematic Risk cannot be eliminated by diversification.

(i) Market Risk:

- These are risks that are triggered due to social, political and economic events. Example: When CBDT issued a draft circular on how to treat income from trading in shares, whether as Capital Receipts or Business Receipts, the stock prices fell down sharply, across all sectors.
- These risks arise due to changes in demand and supply, expectations of the investors, information flow, investor's risk perception, etc. consequent to the social, political or economic events.

(ii) Interest Rate Risk:

- Uncertainty of future market values and extent of income in the future, due to fluctuations in the general level of interest, is known as Interest Rate Risk.
- These are risks arising due to fluctuating rates of interest and cost of corporate debt. The cost of corporate debt depends on the interest rates prevailing, maturity periods, credit worthiness of the borrowers, monetary and credit policy of RBI, etc.

(iii) Purchasing Power Risk: Purchasing Power Risk is the erosion in the value of money due to the effects of inflation.

B. Unsystematic Risk: These are risks that emanate from known and controllable factors, which are unique and/ or related to a particular security or industry. These risks can be eliminated by diversification of portfolio.

(i) Business Risk:

- It is the volatility in revenues and profits of particular Company due to its market conditions, product mix, competition, etc.
- It may arise due to external reasons or (Government policies specific to that kind of industry) internal reasons (labour efficiency, management, etc.)

(ii) Financial Risk:

- These are risks that are associated with the Capital Structure of a Company. A Company with no Debt Financing, has no financial risk. Higher the Financial Leverage, higher the Financial Risk.
- These may also arise due to short term liquidity problems, shortage in working capital due to funds tied in working capital and receivables, etc.

(iii) Default Risk: These arise due to default in meeting the financial obligations on time. Non- payment of financial dues on time increases the insolvency and bankruptcy costs.

C. Risk Involved In Investment in Government Securities [G. Sec.]:

Interest Rate Risk:

(i) Interest Rate Risk are on account of inverse relation of price and interest. These are typical of any fixed coupon security with a fixed period to maturity.

(ii) However, this risk can be completely eliminated in case an investor's investment horizon (intended period of holding) identically matches the term of security.

Re-investment Risk:

(i) Re—investment risk is the risk that the rate at which the interim cash flows are re-invested may fall thereby affecting the returns.

(ii) The most prevalent tool deployed to measure returns over a period of time is the yield-to- maturity (YTM) method which assumes that the cash flows generated during the life of a security is reinvested at the rate of YTM.

Default Risk:

(i) Default risk in the context of a Government Security is always zero.

(ii) However, these securities suffer from a small variant of default risk, i.e. maturity risk.

(iii) Maturity Risk is the risk associated with the likelihood of Government issuing a new security in place of redeeming the existing security. In case of Corporate Securities, it is referred to as Credit Risk.

Extent of Risk in Government Securities:

- Government Securities are usually referred to as risk free securities. However, these securities are subject to only one type of risk, i.e. interest rate risk.
- Subject to changes in the overall interest rate scenario, the price of these securities may appreciate or depreciate.

Components of Risk

Total Risk = Systematic Risk + Unsystematic Risk

- **Systematic Risk:** It represents that portion of Total Risk which is attributable to factors that affect the market as a whole. Beta is a measure of Systematic Risk.
- **Unsystematic Risk:** It is the residual risk or balancing figure, i.e. Total Risk Less Systematic Risk.

Measure of Risk:

Circumstances: An investor will look at the Standard deviation of an individual security as a proper measure of risk in the following circumstances —

(i) His portfolio consists of only one security.

(ii) Investor who is evaluating the diversifiable risk, i.e. a rational risk-averse investor who wants to bring down the risk associated with his portfolio.

No Return for Diversifiable Risk: While risk is analysed into diversifiable and non-diversifiable segments, the market generally does not reward for diversifiable risk, since the investor himself is expected to diversify the risk himself.

Statistical Tools, Standard Deviation & Variance

A. Statistical Tools: Statistical tools such as measures of dispersion can be used to evaluate the risk associated with returns from an investment. Measures of dispersion include Variance and Standard Deviation.

B. Standard Deviation as a Measure of Risk:

- ❖ The Standard Deviation is a measure of how each possible outcome deviates from the Expected Value. The higher the value of dispersion (i.e. Standard Deviation), the higher is the risk associated with the Portfolio and vice-versa.
- ❖ Generally, Standard Deviation of a specified security or portfolio is considered to be the Total Risk associated with that security or portfolio.
- ❖ Standard Deviation is the average or mean of deviations. Deviations are the movement in returns from the mean return. it measures the risk in absolute terms.

Mathematical Notation:

a. When Standard Deviation is taken as Total Risk

$$\sigma_s = \sigma_s \times \rho_{SM} + \sigma_s \times (1 - \rho_{SM})$$

(or) $\underbrace{\beta_{SM} \times \sigma_M}_{} + \underbrace{\sigma_S \times (1 - \rho_{SM})}_{}$

Systematic Risk + Unsystematic Risk Where

Where σ_S = Standard Deviation of the Returns from Security S

ρ_{SM} = Correlation Co-efficient between Returns from Security S and Market Portfolio

β_{SM} = Beta of Security S with reference to Market Returns

C. Variance as a Measure of Risk: Variance measures is the sum of square of deviations from the mean.

Mathematical Notation:

When Variance is taken as Total Risk

$$\sigma_S^2 = \underbrace{\beta_S^2 \times \sigma_M^2}_{} + \underbrace{\sigma_S^2 \times (1 - \rho_{SM}^2)}_{}$$

Systematic Risk + Unsystematic Risk

Where σ_s^2 = Variance of the Returns from Security S

ρ_{SM}^2 = Square of Correlation Co-efficient between Returns from Security S and Market (Co-efficient of Determination)

Note: Unsystematic Risk is computed only as the balancing figure, and not as a separate item.

Beta Measures Non-Diversifiable Risk

Type of Investor: For an investor who invests his money in a portfolio of securities, Beta is the proper measure of risk.

Non-Diversifiable Risk: Only a portfolio investor would look into eliminating the diversifiable risk and evaluate the exact extent of systematic or non-diversifiable risk.

Concept of Beta:

(i) Measure of Sensitivity: Beta of a security measures the sensitivity of the security with reference to a broad based market index like BSE Sensex, NIFTY.

(ii) Measure of Systematic Risk: Beta measures systematic risk i.e. that which affects the market as a whole and hence cannot be eliminated through diversification.

(iii) Factors: Beta is a factor of the following —

- ❖ Standard Deviation (Risk) of the Security or Portfolio,
- ❖ Standard deviation (Risk) of the Market, and
- ❖ Correlation between the Security and Market

The relationship is explained as follows —

$$\text{Beta of Security S } (\beta) = \frac{\sigma_s}{\sigma_m} \times \rho_{SM}$$

$$\downarrow \quad \downarrow$$

Movement in Security S per unit of movement in market portfolio X Extent of Correlation between Security S and Market Portfolio

(iv) **Beta = Expected Movement:** It gives the expected movement in the return of a security (or market price of the security) per unit of movement in the market portfolio return.

(v) **Inferences:**

Beta Value is	Security is
less than 1	less risky than the market portfolio
Equal to 1	As risky as the market portfolio. Normal Beta security. When security beta = 1 then if mkt. move up by 10% security will move up by 10%. If mkt. fell by 10% security also tend to fall by 10%.
more than 1	More risk than the market portfolio. Termed as Agguessive Security/High beta Security. A Security beta 2 will tend to move twice as much as the market. If market went up by 10% security tends to rise by 20%. If market fall by 10% Security tends to fall by 20%.
less than 0	Negative Beta. It indicates negative (inverse) relationship between security return and market return. If market goes up security will fall & viceversa. Normally gold is supposed to have negative beta.
Equal to 0	Means there is no systematic risk and share price has no relationship with market. Risk free security is assumed to be zero.

(vi) **Mathematical Formulae:**

- **Using Standard Deviation and Correlation:**

  $$\text{Beta of a Security } (\beta_S) = \frac{\sigma_S}{\sigma_M} \times \rho_{SM}$$

- **Using Covariance and Market Variance:**

  $$\text{Beta of a Security } (\beta_S) = \frac{Cov_{SM}}{\sigma_M}$$

- **From Basic Data:**

  $$\text{Beta of a Security } (\beta_S) = \frac{\sum R_M R_S - n\bar{R}_M \bar{R}_S}{\sum R_m^2 - nR_m^2}$$

n = No. of pairs considered (generally the number of years / months / days)

$\sum R_M R_S$ = Aggregate of Product

$\sum R_M^2$ = Aggregate of Return Square

$\overline{R}_M$ = Mean of Market Return = Aggregate of Market Returns ÷ No. of Years

$\overline{R}_S$ = Mean of Security Return = Aggregate of Security Returns ÷ No. of Years

Standard Deviation of A Portfolio Standard Deviation as a Measure of Risk:

Risk of a portfolio is not equal to the sum of its parts. This is because all securities are neither correlated with each other to the same extent or in the same manner, nor are relationship expressible in linear or arithmetic terms. c hoice of securities in a portfolio can either go about to increase the risk factor which is greater than the sum of the individual risk of securities. It can also be lower than the risk factor of the least risky security in the portfolio. Therefore, Standard Deviation of a Portfolio is not the weighted average of the standard deviation of its individual securities, since it does not consider the correlation between different such securities and a common base, i.e. market return.

Formulae:

(a) Formulae (Two Securities): Risk of Portfolio, i.e. Standard Deviation of Portfolio of A and B

$$\sigma AB = \sqrt{(\sigma A^2 \times W_A^2) + (\sigma B^2 \times W_B^2) + 2(\sigma A \times W_A \times \sigma B \times W_B \times \rho AB)}$$

(b) Formulae (Three Securities): (i) Standard Deviation of 3 securities σ STP is given by —

$$\sqrt{(\sigma P^2 \times W_P^2) + (\sigma Q^2 \times W_Q^2) + (\sigma R^2 \times W_R^2) + 2(\sigma P \times W_P \times \sigma Q \times W_Q \times \rho PQ) + 2(\sigma P \times W_P \times \sigma R \times W_R \times \rho PR) + 2(\sigma Q \times W_Q \times \sigma R \times W_R \times \rho QR)}$$

(ii) Matrix Approach:

Securities		**P**	**Q**	**R**
	Weights	**W_P**	**W_Q**	**W_R**
P	W_P	(σP^2)	(Cov_{PQ})	(Cov_{PR})
Q	W_Q	(Cov_{PQ})	(σQ^2)	(Cov_{QR})
R	W_R	(Cov_{PR})	(Cov_{QR})	(σR^2)

After plotting the values in the above matrix (which can be extended to n securities), variance can be measured as follows —

	Description
1	$W_P \times W_P \times \sigma P^2$
2	$W_P \times W_Q \times Cov_{PQ}$
3	$W_P \times W_R \times Cov_{PR}$
4	$W_Q \times W_P \times Cov_{PQ}$
5	$W_Q \times W_Q \times \sigma Q^2$
6	$W_Q \times W_R \times Cov_{QR}$
7	$W_R \times W_P \times Cov_{PR}$
8	$W_R \times W_Q \times Cov_{QR}$
9	$W_R \times W_R \times \sigma R^2$
Total	**Variance of Portfolio**

Note: The Covariance between the Securities P and Q is given by the Formula -

$$Cov_{PQ} = \beta_P \times \beta_Q \times \sigma^2_M$$

Where, σ^2_M = Variance of Market

(c) The Total Risk of the Portfolio can be split as follows (Variance Approach)-

Systematic Risk of the Portfolio = $\beta_{portfolio} \times \sigma^2_M$

Unsystematic Risk of the Portfolio = $\sigma^2_{portfolio}$ - Systematic Risk of the Portfolio

Co-efficient of Variation As A Tool to Measure Risk

Co-efficient of Variation translates the standard deviation of different probability distributions so as to compare on the basis of one particular base. It is the deviation per unit of the mean return.

The coefficient of variation for a probability distribution is the ratio of its standard deviation to its expected value.

Example: Two securities A and B have a standard deviation of 10% and 20% each. On first glance, Security B is more riskier than Security A. If mean (average) returns of Securities A and B is 10% and 30% respectively, then we can observe that A has more risk per unit of return, while B has a lower risk per unit of return.

Particulars	Security A	Security B
Standard Deviation	10%	20%
Mean Return (Average Expected Return)	10%	30%
Co-Efficient of Variation [Standard Deviation 4-Average Return]	10% ÷ 10% = 1	20% ÷ 30% = 0.67

Purpose:

Standard Deviation measures the dispersion in absolute terms. It does not provide a base for comparison. Co-efficient of variance provides a common base. i.e. extent of variance, which can be used to compare different investments.

Formula:

Co-efficient of Variation = Standard Deviation ÷ Expected NPV

Co-variance Explains the Deviation of The Return of Portfolio from its Mean Value

Covariance is an absolute measure of co-movement between two variables, i.e. the extent to which they are generally above their means or below their means at the same time.

Formula:

Covariance between M and S is computed as follows – $Cov_{MS} = \sum [D_M \times D_S] \div n$ Where, D_M represents the Deviation of Return from the Mean Return of Portfolio M. D represents the Deviation of Return from the Mean Return of Portfolio S.

Range:

Since Covariance is an absolute measure of relationship between two securities, its value will range between + ∞ to – ∞.

Correlation and Diversification

A. Correlation Co-efficient:

Correlation Co-efficient is a measure of closeness of the relationship between two random variables and is bounded by the values +1 and -1.

Formulae:

The formulae for determining the correlation coefficient are—

(i) Based on Covariance and Standard Deviation:

$$\rho_{XY} = Cov_{XY} \div (\sigma_X \times \sigma_Y)$$

(ii) Based on Probability Distribution of Future Returns:

$$\rho_{XY} = \frac{\sum [X_i - E(X_i)] \times [Y_i - E(Y_i)]}{\sigma_X \sigma_Y}$$

(iii) Based on historical realized returns

$$\rho_{XY} = \frac{n\sum X_i Y_i - \sum X_i \sum Y_i}{\sqrt{\left[n\sum X_i^2 - (\sum X_i)^2\right] - \left[n\sum Y_i^2 - (\sum Y_i)^2\right]}}$$

Valuation and Inference:

Portfolio Risk will be —

(a) Maximum when two components of a portfolio stand perfectly positively correlated.

(b) Minimum when two components of a portfolio stand perfectly negatively correlated.

B. Diversification:

Diversification refers to investing in more than one security, i.e. dividing the Portfolio into different stocks and not investing the money in one particular stock. Some of the risks associated with individual assets can be eliminated by forming Portfolio by way of spreading an investment across assets. This is called diversification.

Features:

(i) Diversification reduces risks because prices of different stocks do not move exactly together. It helps to reduce Portfolio risk by eliminating unsystematic risk for which investors are not rewarded.

(ii) Investors are rewarded for taking market risk.

(iii) Diversification averages the returns of the assets within the Portfolio, thereby it attenuates the potential highs (and lows).

(iv) Diversification among companies, industries and asset classes, protects against business risk, and financial risk.

C. Relationship Between Correlation And Diversification:

Relationship Between Securities: The level of diversification of a Portfolio depends on how the investments (in the Portfolio) react with one another. If they offset each other properly, then the value of Portfolio is well protected.

Examination of Correlation: The interaction among the investments can be determined by examining the correlation coefficient between pairs of investments.

Inference from Correlation: The relationship between Correlation and Diversification can be described as follows —

Correlation coefficient	Nature	Diversification
p = +1	Perfectly positively correlated	**(a)** Investments do not offset each other and they move in tandem. **(b)** No diversification.
p = -1	Perfectly negatively correlated	**(a)** Investments offset each other totally and they move in opposite direction. **(b)** Full diversification achieved.
p = Q	No correlation	**(a)** No predictability of movement of investments. **(b)** Not a good diversification.

A Portfolio With The Minimum Level of Risk

The following formula is used to determine the appropriate proportions that will create the minimum Variance Portfolio (containing two securities A and B —

Proportion of Investment in Security A, $W_A = \frac{\sigma_B^2 - Cov_{AB}}{\sigma_A^2 + \sigma_B^2 - 2Cov_{AB}}$

Proportion of Investment in Security B, $W_B = 1 - W_A$

Where — W_A is the Proportion of Investment in Portfolio A.

W_B is the Proportion of Investment in Portfolio B.

σ_A is the Standard Deviation of Portfolio A,

σ_B is the Standard Deviation of Portfolio B.

Cov_{AB} is the Co-variance between Portfolio A and B.

Expected Return of A Security Under Sharpe Single Index Market Model

Market Model: Market Model does not pre-suppose the existence of risk free return for the purpose of estimating return from a security. Under this model (assumption), the market risk affects the whole of return from a security, and not just the return in excess of the risk-free rate.

Formulae:

1. **Expected Return [$E(R_P)$]:** Without considering Risk Free Return

$$\rightarrow E(R_P) = \alpha_P + (\beta_P \times R_M) + e$$

Components:

Notation	Description
α_P (Alpha Intercept)	It is the return from a Security / Portfolio when Market Return is Zero. = Average Return **Less** Expected Return (Beta Adjusted Return) = $\overline{R}_P - \beta_P \times R_M$ Over a longer period, α should be Zero.
$\beta_P \times R_M$	Beta Adjusted Market Return.
e	Error Factor (with Zero Mean and constant standard deviation)

2. **Expected Return:** Considering Risk Free Return (Risk Adjusted Excess Return Approach)

$$\rightarrow E(R_P) = \alpha_P - [R \times (1 - \beta_P)] + R_F + [\beta_P (R_M - R_F)] + e$$

Components:

Notation	Description
$\alpha_P - [R \times (1 - \beta_P)]$	Risk Adjusted Excess Return (Alpha Value adjusted for Risk Rate of Return)
R_F	Risk Free Rate of Return
$[\beta_P (R_M - R_F)]$	Market Risk Premium adjusted for Beta Factor
e	Error Factor (with Zero Mean and constant standard deviation)

Computation of Beta:

- Under Market Model, computation of Beta is done using annualized returns from security and the market on a daily basis.
- Return for this purpose = (Dividend + Price Increase) ÷ Price at the beginning of the day.

Alpha

The difference between the investment's actual expected return and its fair return (as per CAPM) is known as the investment's alpha (i.e. α). It is an absolute measure, which is the return on the Portfolio in excess of the CAPM predicted return. Alpha measures the relative value addition provided by an Asset Manager compared to a market index, given a Portfolio's market risk. Alpha can also be interpreted as the deviation from the SML in the CAPM.

Features:

(i) Alpha is appropriate, when the investment represents one of the many investments held by a client.

(ii) Alpha enables to evaluate how well a Manager has performed, when accounting for the level of risk undertaken to achieve their returns.

Value:

(i) **Positive Alpha:** A positive alpha indicates that the expected return from this stock is higher than the return under CAPM, to the extent of the alpha value. Hence stocks with positive alpha should be considered as under-valued stocks and hence should be bought.

(ii) **Negative Alpha:** A negative Alpha value indicates that expected return from the stock is less than the return under CAPM, to the extent of the alpha value. Hence stocks with negative alpha should be considered as over-valued stocks and should be sold.

8.8 CAPITAL ASSET PRICING MODEL (CAPM) AND ITS ASSUMPTIONS

William F. Sharpe and John Linter developed the Capital Asset Pricing Model (CAPM). The model is based on the portfolio theory developed by Harry Markowitz. The model emphasises the risk factor in portfolio theory which is a combination of two risks, systematic risk and unsystematic risk. The model suggests that a security's return is directly related to its systematic risk which cannot be neutralized through diversification. The combination of both types of risks stated above provides the total risk. The total variance of returns is equal to market related variance plus company's specific variance. CAPM explains the behavior of security prices and provides a mechanism whereby investors could assess the impact of proposed securities in such a way that the risk premium or excess return is proportional to systematic risk, which is indicated by the beta coefficient. The model is used for analyzing the risk – return implication of holding securities.

A. Features:

(a) CAPM explains the relationship between the Expected Return, Non-Diversifiable Risk (Systematic Risk) and the valuation of securities.

(b) CAPM is based on the premise that the diversifiable risk of a security is eliminated when more and more securities are added to the Portfolio.

(c) All securities do not have same level of systematic risk and therefore, the required rate of return goes with the level of systematic risk. It considers the required rate of return of a security on the basis of its (Systematic Risk) contribution to the total risk.

(d) Systematic Risk can be measured by Beta which is a function of the following —

- ❖ Total Risk Associated with the Market Return,
- ❖ Total Risk Associated with the Individual Securities Return,
- ❖ Correlation between the two.

B. Assumptions:

(i) With reference to Investors:

- ❖ Investment goals of investors are rational. They desire higher return for any acceptable level of risk and lower risk for any desired level of return.
- ❖ Their objective is to maximize the utility of terminal wealth.
- ❖ Their choice is based on the risk and return of a security.
- ❖ They have homogenous expectations of Risk and Return over an identical time horizon.

(ii) With reference to Market:

- ❖ Information is freely and simultaneously available to all investors.
- ❖ Capital Market is not dominated by any individual investors.
- ❖ Investors can borrow and lend unlimited amount at the risk-free rate.
- ❖ No taxes, transaction costs, restrictions on short-term rates or other market imperfections.
- ❖ Total asset quantity is fixed, and all assets are marketable and divisible.

C. Formula for Computing Expected Return:

$E(R_P) = R_F + \{\beta_P \times (R_M - R_F)\}$

Where $E(R_P)$ = Expected Return on Portfolio

R_F = Risk Free Rate of Interest/ Return

β = Portfolio Beta

R_M = Expected Return on Market Portfolio

Security Market Line (SML) and Capital Market Line (CML)

A. Security Market Line (SML):

Security Market Line (SML) reflects the linear relationship between Systematic Risk and Expected Return in financial markets that result when Expected Returns and Beta Coefficients are plotted across a graph. SML is the relationship between Expected Return and Beta, on which both portfolios and individual securities lie.

Purpose:

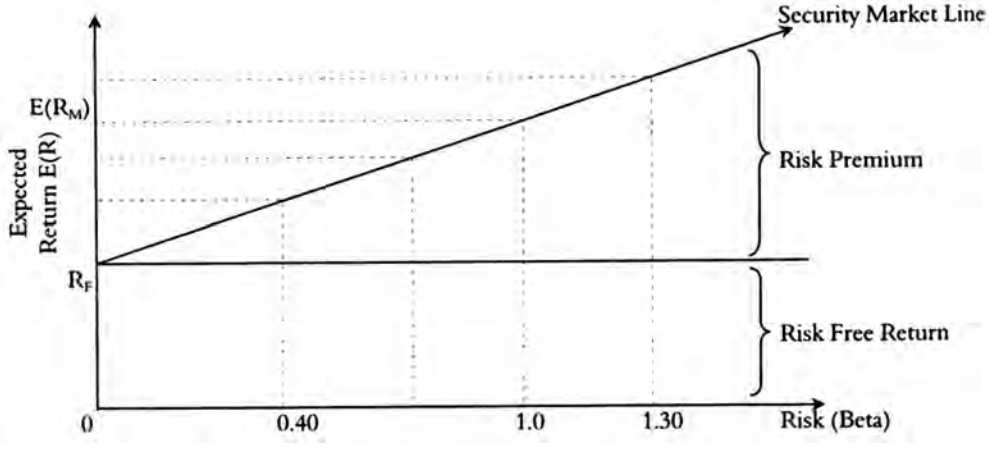
SML helps to determine if the investment is offering a return that is appropriate for its level of risk. Given its risk class, a security's return should be on the SML.

Evaluation based on SML:

Value of a security can be judged based on where the return from such security is plotted with reference to the SML as follows —

Actual Return is	Inference	Security is
Above SML	Stock is yielding a higher return than what can be expected.	Underpriced.
On SML	Stock is yielding a return equivalent to can be expected.	Correctly Priced.
Below SML	Stock is yielding a lower return than what can be expected.	Overpriced.

Graphical Representation (Security Market Line): Security Market Line expresses the basic theme of the CAPM, i.e. expected return increases linearly with risk, measured by Beta.



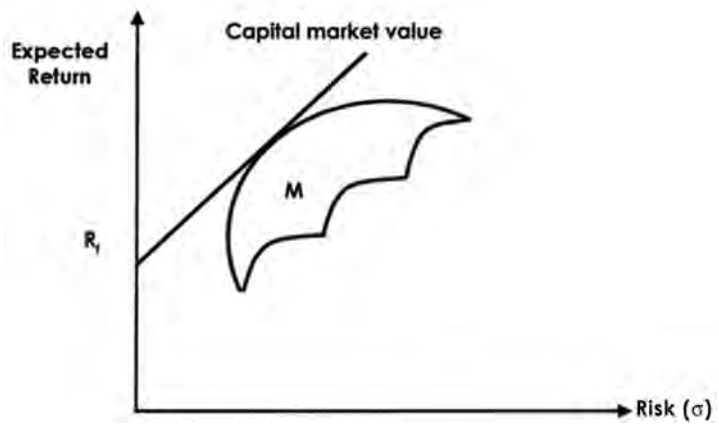
Individual Security vs. Portfolio of Securities:

(a) A major implication of CAPM is that both, an Individual Security and all the Portfolios as well be placed on the Security Market Line.

(b) This is because of an efficient market hypothesis, i.e. all securities are expected to yield returns commensurate with their riskiness, measured by Beta.

B. Capital Market Line (CML):

The Markowitz mean-variance model is modified by introducing into the analysis the concept of risk-free asset. If it is assumed that the investor has access to risk-free securities (for example, Treasury bills) in addition to the universe of risky securities, then he can construct a new set of portfolios as depicted by the line R_f. At point R_f the investor is investing all his investible fund in risk-free securities, whilst at point M he is holding an all –equity portfolio. The combination of risk-free investment and risky investments in portfolio which may be achieved by points between these two limits are termed as lending portfolios. Let us now assume that the investor can lend and borrow funds at the same risk-free interest rate. In such circumstances the efficiency boundary simply becomes the straight line drawn from R_f which is a tangent to the original risky portfolio efficiency boundary. The efficiency boundary that arises out of this assumption of the identical risk free lending and borrowing rates leads to some very important conclusions and is termed as 'Capital Market Line' (CML).



Purpose:

The Capital Market Line (CML) provides the best risk and return tradeoff for an investor. CML enables an investor to estimate the Expected Return from a Portfolio.

Feature:

(i) Portfolio is assumed to be efficient, i.e. exact replication of the market portfolio in terms of risks and rewards.

(ii) CML assumes no unsystematic risk, i.e. all the unsystematic risk is completely taken care off by proper diversification similar to that of market portfolio.

(iii) Capital Market Line estimates the return for a portfolio based on the Total Risk Route, i.e. it assumes existence of perfect correlation between the portfolio return and market return.

(iv) Individual securities does not lie on Capital Market Line. This is because they have some extent of unsystematic risk associated with their returns.

Market Price of Risk: Market Price of Risk of a Portfolio X = $(R_M - R_F) \div \sigma_M$

Where — R_M = Market Return

R_F = Risk Free Rate of Return

σ_M = Standard Deviation of the Market Portfolio.

Expected Return on Portfolio under CML Approach:

$E(R_P) = R_F + \lambda \times \sigma_P$

Where $E(R_P)$ = Expected Return on Portfolio

R_F = Risk Free Rate of Interest/ Return

λ = Market Price of Risk, i.e. Risk Premium per Unit of Market Risk

σ_P = Risk of the Portfolio (Standard Deviation)

C. Differences Between Security Market Line And Capital Market Line:

Aspect	Capital Market Line	Security Market Line
1. Risk Considered	Capital Market Line uses Standard Deviation, i.e. Total Risks across the x-axis.	Security Market Line uses Beta or Systematic Risk across the x-axis. (i.e. that part of Total Risk which is common to the whole of the market).
2. Nature of Portfolios	It uses only efficient portfolios, i.e. one which is a perfect replication of the Market Portfolio in terms of risks and rewards.	Security Market Line uses both efficient and non-efficient portfolios.
3. Combination	Every point on the Capital Market Line is a proportional combination between Risk free Rate of Return and Market Return.	It graphs all portfolios and securities which lie on and off the Capital Market Line.

D. Characteristic Line:

Characteristic Line is a graph depicting the relationship between Security' Returns and Market Index Returns. Security Characteristic Line is a time series graph. Return considered for this is the excess return, i.e. expected return over and above the Risk Free Rate of Return.

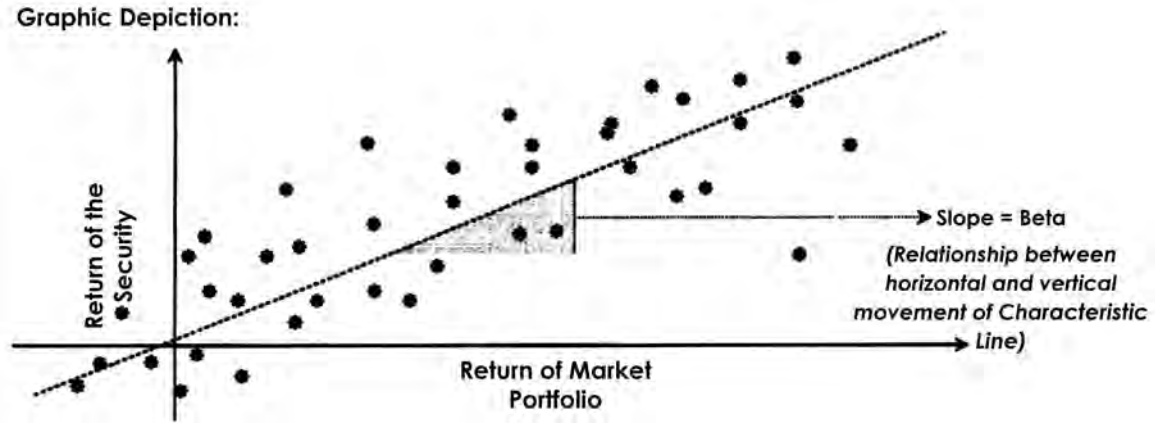
Purpose:

Security Characteristic Line is used to estimate beta and also to determine how a security return correlates to a market index return.

Beta:

Beta estimate comes from the slope estimate of the security characteristic line.

Graphic Depiction:



*represents set of return of the Security and Return of the Market at a particular point.
..... represents Characteristic Line (a line which covers most of the dots on the graph)

E. Distinguish between a Security Market Line (SML) and Characteristic Line:

Aspect	Security Market Line	Characteristic Line
Scheme	It represents the relationship between return and risk (measured in terms of systematic risk) of a security or portfolio.	It represents the relationship between the returns of two securities or a security and the market return, over a period of time.
Nature of Graph	Security Market Line is a cross-sectional graph.	Security Characteristic Line is a Time Series Graph.
Comparison	Security Market Line graphs beta versus expected return.	Characteristic Line graphs time series of Security Returns versus the Index Returns.
Utility	It is used for estimating the expected return for a security relative to its beta risk.	To estimate beta and also to determine how a security return correlates to a market index return.

Decision Making on Valuation of A Portfolio / Security

The Capita! Asset Pricing Model (CAPM) is essentially a model for determining the Intrinsic Value or Equilibrium Price of an Asset. The Equilibrium or Intrinsic Price of an Asset is determined using the Expected Return as arrived at using the CAPM. Expected Return is the minimum return that the investors require from the asset in relation to the relative systematic risk of the Asset. Price of an asset is the Present Value of the Future Cash Flows generated by the Asset as discounted by the Expected Return as determined using the CAPM.

	Situation	Inference	Action
1	CAPM Return < Estimated Return.	Undervalued Security	BUY
2	CAPM Return = Estimated Return.	Correctly Valued Security	HOLD
3	CAPM Return > Estimated Return.	Overvalued Security	SELL

Risk Return Ratio

Risk Return Ratio is the average return (in excess of the risk-free return) per unit of risk undertaken. It tends to measure the benefit of taking that extra risk. An investor would earn a return at risk-free rate, without assuming any risk. What return did he obtain for taking that extra risk, is measured by Risk-Return Ratio.

Mathematical Notation:

- **If Beta is taken as a Measurement of Risk:**

$$\text{Risk Return Ratio} = \frac{R_S - R_F}{\beta_S}$$

- **If Standard Deviation is taken as risk:**

$$\text{Risk Return Ratio} = \frac{R_S - R_F}{\sigma_S}$$

Where,

R_S = Return of Security S

R_F = Risk Free Return

β_S = Beta of Security S with reference to the Market

σ_M = Standard Deviation of Market

8.9 ARBITRAGE PRICING MODEL (APT)

Unlike the CAPM which is a Single Factor Model, the APT is a Multi Factor Model having a whole set of Beta Values - one for each Factor. Arbitrage Pricing Theory states that the expected return on an investment is dependent upon how that investment reacts to a set of individual Macro-Economic factors (degree of reaction measured by the Betas) and the risk premium associated with each of those macro - economic factors. The Arbitrage Pricing Theory developed by Ross (1976) holds that there are four factors which explain the risk premium relationship of a particular security. Several factors can be identified to have a bearing on the Return expectation of a security. Most factors such as inflation and money supply, interest rate, industrial production and personal consumption are inter- related. It seeks to identify the risk return relationship for each of the factors individually.

According to the Capital Asset Pricing Model,

Expected Return = $R_f + R_P\beta$

Where, R_f = Risk Free Rate.

R_P = Average Risk Premium considering all factors put together i.e $[R_M - R_F]$

In Arbitrage Pricing Theory,

Expected Return = $R_f + R_1\beta_1 + R_2\beta_2 + R_3\beta_3 + \ldots\ldots\ldots\ldots + R_n\beta_n$

Where, R_n is the risk premium for each of the factors in the model and β_n is the measure of sensitivity of the particular security, to each of the factors.

Hedging of Risks Using Risk Free Investments

A. Hedging using Risk free Investments to increase Risk (Increase Portfolio Value)

(i) Object: increase Beta value of the Portfolio

(ii) Action: Buy Stock and Sell Risk free Investments.

(iii) Value of Risk Free Investments to be sold to increase portfolio risk and return:

= Portfolio Value X [Desired Value of Beta – Present Beta of the Portfolio]

(iv) Reasoning:

Desired Beta is the weighted average beta of the risk-free investments and the Beta of the remaining investments. Risk-free Investments do not carry any Beta. By selling Risk-free investments and investing the same in the Portfolio, risk attached to the Portfolio increases, and thereby Portfolio Risk increases and portfolio return also increases.

Example:

Portfolio v alue is ₹1,00,000 and Beta is 1.20. Desired Beta is 2.00. Hence, the value of Risk Free Investments to be sold to increase the level of Risk is ₹80,000 [Portfolio Value ₹1,00,000 × Desired Beta 2.00 - Portfolio value ₹1,00,000 × Existing Beta 1.20]

B. Hedging using Risk free Investments to reduce Risk (Reduce Erosion in Value)

(i) Object: Reduce Beta Value of the Portfolio

(ii) Action: Sell Stock and Buy Risk free Investments.

(iii) Value of Risk Free Investments to be bought:

Portfolio Value × [Present Beta of the Portfolio - Desired Value of Beta]

(iv) Reasoning:

Risk free Investments do not carry any Beta. By selling the Portfolio stock, and buying risk-free investments, Risk attached to the Portfolio gets reduced, and thereby Portfolio Risk reduces.

Example: Portfolio value is ₹ 1,00,000 and Beta is 2.00. Desired Beta is 1.20. Hence, the value of Risk Free Investments to be bought to reduce the level of Risk is ₹ 80,000 [Portfolio Value ₹ 1,00,000 × Present Beta 2.00 - Portfolio value ₹ 1,00,000 × Desired Beta 1.20]

Computation of Project Beta

Beta of a project is the weighted average of the Beta of all the Assets and the Projects.

Project Beta: =Beta of Assets = Beta of Liabilities

Beta of Assets = Weighted Average Beta of Equity and Debt Employed in the Project

The Beta Balance Sheet:

(a) Single Project Balance Sheet (Assuming No Taxes):

Liabilities	Weight	Beta	Assets = Capital Employed	Weight	Beta
Equity [E]	W_E	β_E	Project A	1.00	β_A
Debt [D]	W_D	β_D			
Total	**1.00**	**β_A**	**Total**		β_A

→ Beta of Project A [β_A] = Weighted Average Beta of Sources of Capital

$= W_E \times \beta_E + W_D \times \beta_D$

(b) Two Project Balance Sheet:

(i) (Assuming No Taxes):-

Liabilities	Weight	Beta	Assets = Capital Employed	Weight	Beta
Equity [E]	W_E	β_E	Project A	W_A	β_A

Debt [D]	W_D	β_D	Project B	W_B	β_B
Total	**1.00**		**Total**	**1.00**	

Equal

→ Beta of Assets [β_{Asset}] = Beta of Liabilities [$\beta_{Liabilities}$]

→ Weighted Average Asset Beta = Weighted Average Beta of Sources of Capital

→ $W_A X \beta_A + W_B X \beta_B = W_E X \beta_E + W_D X \beta_D$

(ii) If Taxes are Considered: Weight of Debt will be measured as W_D X (1 - Tax Rate)

Formula: Project Beta $\beta_P = \frac{\beta_E \times Equity}{Equity + Debt(1-Tax)} + \frac{\beta_{Debt} \times Debt \times (1-Tax)}{Equity + Debt(1-Tax)}$

β_E represents the Beta of Equity of the Project.

β_{Debt} represents the Beta of Debt of the Project

Levered and Unlevered Firms, Proxy Beta

Unlevered Firm: If a Company finances its investments and projects completely with Equity (without leveraging Debt Finance), then the Company is known as an Unlevered Firm.

Levered Firm: Levered Firm is the firm whose Capital Structure includes both the components of Debt and Equity.

Proxy Beta: Proxy Beta is the beta of a Levered Firm, arrived at from the beta of an Unlevered Firm.

ILLUSTRATIONS

Illustration 1.

If the risk free rate of interest (R_f) is 10%, and expected return on market portfolio (R_m) is 15%, ascertain expected return of the portfolio if portfolio betas are — (a) 0.10 and (b) 0.30.

Solution:

1. Rule for determining Expected Return on Portfolio under CAPM

Under Capital Asset Pricing Model (CAPM) $R_p = R_f + (\beta \times (R_m - R_f)$

Notation	Particulars	Value
R_p	Expected Return on Portfolio	To be computed
R_f	Risk Free Rate of Interest/ Return	10%
β	Portfolio Beta	0.10/0.30
R_m	Expected Return on Market Portfolio	15%

2. Computation of Expected Return on Portfolio

Beta	Expected Return = $R_f + \beta \times (R_m - R_f)$
0.10	= 10% + 0.10(15%-10%)=10.5%
0.30	= 10% + 0.30(15%-10%)=11.5%

Illustration 2.

Subho has invested in four securities M, N, O and P, the particulars of which are as follows —

Securit	M	N	O	P
Amount Invested (₹)	1 ,25,000	1, 50,000	80,000	1, 45,000
Beta (β)	0.60	1.50	0.90	1.30

If RBI Bonds carries an interest rate of 8% and NIFTY yields 14%, what is the expected return on portfolio? If investment in Security O is replaced by investment in RBI Bonds, what is the corresponding change in Portfolio Beta and expected return?

Solution:

1. Computation of Expected Return on Portfolio (Under CAPM)

(a) Computation of Weighted Beta (Beta of the Portfolio)

Security	Amount Invested (₹)	Proportion of Investment to Total Investment	Beta of Investment	Weighted Beta
(1)	**(2)**	**(3) = (2) ÷ 5,00,000**	**(4)**	**(5) = (3) × (4)**
M	1,25,000	0.25	0.60	0.150
N	1,50,000	0.30	1.50	0.450
O	80,000	0.16	0.90	0.144
P	1,45,000	0.29	1.30	0.377
Total	**5,00,000**	**1.00**		**1.121**

(b) Computation of Expected Return on Portfolio

Expected Return $[E(R_p)]$ $= R_f + \beta_p X (R_m - R_f)]$

$= 8\% + [1.121 \times (14\% - 8\%)]$

$= 8\% + [1.121 \times 6\%] = 8\% + 6.726\% = 14.726\%$

1. Computation of Expected Return [Investment in O, replaced by RBI Bonds] (CAPM)

(a) Computation of Weighted Beta (Beta of the Portfolio)

Security	Amount Invested	Proportion of Investment to Total Investment	Beta of Investment	Weighted Beta
(1)	(2)	(3) = (2) 4- 5,00,000	(4)	(5) = (3) X (4)
M	1,25,000	0.25	0.60	0.150
N	1,50,000	0.30	1.50	0.450
RBI Bonds	80,000	0.16	0.00	0.000
P	1,45,000	0.29	1.30	0.377
Total	5,00,000	1.00		0.977

(b) Computation of Expected Return on Portfolio

Expected Return [E(RP)]

$= R_f + \beta_p x (R_m - R_f)]$

$= 8\% + [0.977 \times (14\% - 8\%)]$

$= 8\% + [0.977 \times 6\%] = 8\% + 5.862\% = 13.862\%$

Illustration 3.

Stocks P and Q have the following historical returns —

Year	2009	2010	2011	2012	2013
Stock P's Return (K_P)	-12.24	23.68	34.44	5.82	28.30
Stock Q's Return (K_Q)	-7.00	25.55	44.09	2.20	20.16

You are required to calculate the average rate of return for each stock during the period 2009 to 2013. Assume that someone held a Portfolio consisting of 50% of Stock P and 50% of Stock Q.

What would have been the realized rate of return on the Portfolio in each year from 2009 to 2013? What would be the average return on the Portfolio during the period? (You may assume that year ended on 31st March).

Solution:

1. Calculation of average rate of return on Portfolio during 2009-2013

Year	Stock P's Return %	Stock Q's Return %
2009	-12.24	-7.00
2010	23.68	25.55
2011	34.44	44.09
2012	5.82	2.20
2013	28.30	20.16
Total	80.00	85.00
Average rate of return	80/5 years = 16%	85/5 years =17%

2. Calculation of realized rate of return on Portfolio during 2009-2013

	Stock P			Stock Q			Total
Year	Proportion	Return	Net Return	Proportion	Return	Net Return	Net Return
1	2	3	4 = 3 x 2	5	6	7 = 5 x 6	8 = 4 + 7
2009	0.50	-12.24	-6.12	0.50	-7.00	-3.50	-9.62
2010	0.50	23.68	11.84	0.50	25.55	12.78	24.62
2011	0.50	34.44	17.22	0.50	44.09	22.05	39.27
2012	0.50	5.82	2.91	0.50	2.20	1.10	4.01
2013	0.50	28.30	14.15	0.50	20.16	10.08	24.23
			40.00			**42.51**	**82.51**

Average rate of return = ₹82.51 ÷ 5 = 16.50%

Illustration 4.

Securities X and Y have standard deviations of 3% and 9%. Nitin is having a surplus of ₹20 Lakhs for investment in these two securities. How much should he invest in each of these securities to minimize risk, if the correlation co-efficient for X and Y is — (a) -1; (b) -0.30; (c) 0; (d) 0.60

Solution:

1. Basic Values of Factors for Determination of Portfolio Risk

Standard Deviation of Security X	σ_X	3%
Standard Deviation of Security Y	σ_Y	9%
Correlation co-efficient of Securities X and Y	ρ_{XY}	-1,- 0.30, 0,0.60
Weight of Security X	W_X	a
Weight of Security Y	W_Y	1-a

2. Computation of Investment in Securities

Proportion of Investment in Security X, $W_X = \frac{\sigma Y^2 - Cov_{XY}}{\sigma X^2 + \sigma Y^2 - 2Cov_{XY}}$

Proportion of Investment in Security Y, $W_Y = 1 - W_X$

$$Cov_{XY} = \rho XY \times \sigma X \times \sigma Y$$

If r_{XY} is	Cov_{XY} is	Computation	Investment
-1	-27 (-1x3x9)	→ $W_X = [\sigma Y^2 - Cov_{XY}] \div [\sigma X^2 + \sigma Y^2 - 2Cov_{XY}]$ → $W_X = [9^2 - (-27)] \div [3^2 + 9^2 - 2 \times (-27)]$ → $W_X = [81 + 27] \div [9 + 81 + 54]$ → $W_X = 108/144 = 0.75$	0.750 in X 0.250 in Y ₹15,00,000 in X ₹5,00,000 in Y
-0.3	-8.1 (-0.3x3x9)	→ $W_X = [\sigma Y^2 - Cov_{XY}] \div [\sigma X^2 + \sigma Y^2 - 2Cov_{XY}]$ → $W_X = [9^2 - (-8.1)] \div [3^2 + 9^2 - 2 \times (-8.1)]$ → $W_X = [81 + 8.1] \div [9 + 81 + 16.2]$ → $W_X = 89.1 / 106.2 = 0.839$	0.839 in X 0.161 in Y ₹16,78,000 in X ₹3,22,000 in Y

0	0 (0 x 3 x 9)	→ $W_X = [\sigma Y^2 - Cov_{XY}] \div [\sigma X^2 + \sigma Y^2 - 2Cov_{XY}]$ → $W_X = [9^2 - 0] \div [3^2 + 9^2 - 2 \times 0]$ → $W_X = [81 - 0] \div [9 + 81 - 0]$ → $W_X = 81/90 = 0.90$	0.900 in X 0.100 inY ₹ 18,00,000 in X ₹ 2,00,000 in Y
0.60	16.2 (0.6 x 3 x 9)	→ $W_X = [\sigma Y^2 - Cov_{XY}] \div [\sigma X^2 + \sigma Y^2 - 2Cov_{XY}]$ → $W_X = [9^2 - 16.2] \div [3^2 + 9^2 - 2 \times 16.2]$ → $W_X = [81 - 16.2] \div [9 + 81 - 32.4]$ → $W_X = 64.8 / 57.60 = 1.125 > 1$ At this correlation level, risk reduction is not possible.	Reducing Risk below 3% is not possible.

Illustration 5.

An investor is considering two investment opportunities with the following risk and return characteristics.

Project	P	Q
Expected return	**15%**	**22%**
Risk	**3%**	**7%**

The investor plans to invest 80% of its available funds in share P and 20% in Q. the directors believe that the correlation co-efficient between the returns of the shares is +1.0.

Required—

(a) Calculate the returns from the proposed portfolio of shares P and Q.

(b) Calculate the risk of the portfolio;

(c) Suppose the correlation coefficient between P and Q was -1. How should the company invest its funds in order to obtain zero risk portfolio.

Solution:

1. Return of the Portfolio

Securities	Expected return	Proportion	Return from portfolio
(1)	(2)	(3)	(4) = (2) x (3)
P	15	0.8	12
Q	22	0.2	4.4
Return of the Portfolio			16.4

2. Basic Values of Factors for Determination of Portfolio Risk

Particulars	Notation	Value
Standard deviation of Security P	σ_P	3%
Standard deviation of Security Q	σ_Q	7%
Correlation co-efficient of Securities P and Q	ρ_{PQ}	+ 1
Weight of Security P	W_P	0.80
Weight of Security Q	W_Q	0.20

Risk of Portfolio i.e. Standard deviation of Portfolio of P and Q [80% : 20% Ratio]

$$\sigma PQ = \sqrt{(\sigma P^2 \times W_P^2) + (\sigma Q^2 \times W_Q^2) + 2\,(\sigma P^2 \times W_P \times \sigma Q \times W_Q \times \sigma PQ)}$$

$$= \sqrt{(3^2 \times 0.80^2) + (7^2 \times 0.20^2) + (2 \times 3 \times 0.80 \times 7 \times 0.20 \times 1)}$$

$$= \sqrt{(9 \times 0.64) + (49 \times 0.04) + (6.72)}$$

$$\text{Risk} = \sqrt{5.76 + 1.96 + 6.72}$$

$$= \sqrt{14.44} = 3.8\%$$

3. Computation of Investment in Security P and Q

$$\text{Proportion of Investment in Security P, } W_P = \frac{\sigma Q^2 - Cov_{PQ}}{\sigma P^2 + \sigma Q^2 - 2Cov_{PQ}}$$

Proportion of Investment in Security Q, $W_Q = 1 - W_P$

$$Cov_{PQ} = \rho PQ \times \sigma P \times \sigma Q$$

$$= -1 \times 3 \times 7 = -21$$

$\rightarrow W_P = [\sigma Q^2 - Cov_{PQ}] \div [\sigma P^2 + \sigma Q^2 - 2Cov_{PQ}]$

$\rightarrow W_P = [7^2 - (-21)] \div [3^2 + 7^2 - 2 \times (-21)]$

$\rightarrow W_P = [49 + 21] \div [9 + 49 + 42]$

$\rightarrow W_P = 70 / 100 = 0.70$

Proportion of Investment in Security Q, $W_Q = 1 - W_P = 1 - 0.70 = 0.30$

Illustration 6.

An investor has two portfolios known to be on minimum variance set for a population of three securities R, S and T having the weights mentioned below:

	W_R	W_S	W_T
Portfolio X	0.30	0.40	0.30
Portfolio Y	0.20	0.50	0.30

It is supposed that there are no restrictions on short sales.

(a) What would be the weight for each stock for a portfolio constructed by investing ₹6,000 in Portfolio X and ₹4,000 in Portfolio Y?

(b) Suppose the investor invests ₹5,000 out of ₹10,000 in Security R. How he will allocate the balance between security S and T to ensure that his portfolio is on minimum variance set?

Solution:

1. Investment in Individual Securities

Security	Portfolio X	Portfolio Y	Total	Weight
R	6,000 x 0.30 = 1,800	4,000 x 0.20 = 800	2,600	2,600 ÷ 10,000 = 0.26
S	6,000 x 0.40 = 2,400	4,000 x 0.50 = 2,000	4,400	4,400 ÷ 10,000 = 0.44
T	6,000 x 0.30 = 1,800	4,000 x 0.30 = 1,200	3,000	3,000 ÷ 10,000 = 0.30
	6,000	4,000	10,000	1.0000

2. Investment Strategy to Ensure Minimum Variance

Given the following equations $\rightarrow W_R = 0.50$ (₹5,000 ÷ ₹10,000)

$\rightarrow W_R + W_S + W_T = 1$

Therefore it naturally follows that

$\rightarrow W_T + W_S = 0.50$ ...(1)

A simple linear equation establishing an equation between two variables W_R and W_S or the Variables W_S and W_T in the given manner—

$$W_T = a + bW_S$$

Substituting the values of W_R & W_S from the data given (Portfolio X and Y), we get -

$$0.30 = a + b \times 0.40$$

$$0.30 = a + b \times 0.50$$

$$b = 0$$

$$a = 0.30$$

$$W_T = 0.30 - 0W_S$$

or

$$W_T + 0W_S = 0.30 \text{ ...(2)}$$

Therefore solving (1) and (2) we get $W_T = 0.30$ and $W_S = 0.20$

Conclusion: Allocation of Funds -

R = ₹ 5,000 (Given)

S = 0.20 x ₹ 10,000 = ₹ 2,000.

T= 0.30 x ₹ 10,000 = ₹ 3,000.

Alternatively,

Since the Proportion of Investment in T is 0.30 and is constant across both the Portfolio, any linear equation drawn from the Data given would result in the Weight of T being a constant 0.30.

Therefore $W_R = 0.50$ (Given), $W_T = 0.30$ (Constant), therefore $W_S = 0.20$ (W_S= 1- 0.50 - 0.30 = 0.20).

Illustration 7.

Calculate expected return and standard deviation of the following two investments "A" and "B" exclusively and also if total investment is divided one half in each.

The economic predictions are —

Economic climate	Probability of Economic climate	Returns from A%	Returns from B%
Recession (R)	0.2	12	10
Stable (S)	0.5	15	16
Expansion (E)	0.3	20	12
	1.00		

Solution:

2. Investment A and B exclusively

Economic climate	Probability	% R_A	% R_B	P × R_A	P × R_B	$R_A - \bar{R}_A$	$R_B - \bar{R}_B$	$P(R_A - \bar{R}_A)^2$	$P(R_B - \bar{R}_B)^2$
R	0.2	12	10	2.40	2.0	-3.9	-3.6	3.04	2.59
S	0.5	15	16	7.50	8.0	-0.9	2.4	0.41	2.88
E	0.3	20	12	6.0	3.6	4.1	-1.6	5.04	0.77
				15.9%	13.6%			8.49	6.24

$\bar{R}_A$ = 15.90% & $\bar{R}_B$ = 13.60%

Standard Deviation = $SD_A = \sqrt{8.49}$ = 2.91% ; Standard Deviation = $SD_B = \sqrt{6.24}$ = 2.50%

2. One half in Portfolio A and One half in B

Economic climate	Probability P	Return R %	PR	$R - \bar{R}$	$P(R - \bar{R})^2$
R	0.2	(12+10)/2 = 11	2.20	-3.75	2.8125
S	0.5	(15+16)/2 = 15.5	7.75	0.75	0.2813
E	0.3	(20+12)/2 = 16	4.80	1.25	0.4688
			14.75		3.5626

$\bar{R}_{AB}$ = 14.75%

SD or $\sigma_{(A+B)} = \sqrt{3.5636} = 1.89\%$

Hence, Expected return from the Portfolio is 14.75% and standard deviation of the Portfolio is 1.89%.

Illustration 8.

From the following information, ascertain the risk of the portfolio —

Securities	Standard Deviation	Proportion in Portfolio
A	8%	0.30
B	12%	0.50
C	6%	0.20

Correlation Co-efficient

AB = 0.50

AC = - 0.40

BC = + 0.75

Solution:

1. Formula Approach (Alternative 1)

(a) Basic Values of Factors for Determination of Portfolio Risk

Standard Deviation of Security A	σA	8%
Standard Deviation of Security B	σB	12%
Standard Deviation of Security C	σC	6%

Correlation co-efficient of Securities A and B		0.50
Correlation co-efficient of Securities A and C		-0.40
Correlation co-efficient of Securities B and C		0.75
Weight of Security A	W_A	0.30
Weight of Security B	W_B	0.50
Weight of Security C	W_C	0.20

(b) Computation of Portfolio Risk (σABC)

$$= \sqrt{(\sigma A^2 \times W_A{}^2) + (\sigma B^2 \times W_B{}^2) + (\sigma C^2 \times W_C{}^2) + 2(\sigma A \times W_A \times \sigma B \times W_B \times \rho AB) + 2(\sigma A \times W_A \times \sigma C \times W_C \times \rho AC) + 2(\sigma B \times W_B \times \sigma C \times W_C \times \rho BC)}$$

$$= \sqrt{(8^2 \times 0.3^2) + (12^2 \times 0.5^2) + (6^2 \times 0.2^2) + (2 \times 8 \times 0.3 \times 12 \times 0.5 \times 0.5) + (2 \times 8 \times 0.3 \times 6 \times 0.2 \times (-0.4)) + (2 \times 12 \times 0.5 \times 6 \times 0.2 \times 0.75)}$$

$$= \sqrt{(64 \times 0.09) + (144 \times 0.25) + (36 \times 0.04) + (36 \times 0.04) + (14.4) + (-2.304) + (10.8)}$$

$$= \sqrt{5.76 + 36 + 1.44 + 14.4 - 2.304 + 10.8}$$

$$= \sqrt{66.096}$$

$$= 8.13\%$$

2. Matrix Approach (Alternative 2)

(a) Basic Values of Factors for Determination of Portfolio Risk

Variance of Security A		σA^2	$8^2 = 64$
Variance of Security B		σB^2	$12^2 = 144$
Variance of Security C		σC^2	$6^2 = 36$
Covariance of Securities A and B	[ρAB× σA× σB]	COV_{AB}	0.50 x 8 x 12 =48
Covariance of Securities A and C	[ρAC× σA× σC]	COV_{AC}	-0.40 x 8 x 6 = - 19.2
Covariance of Securities B and C	[ρBC× σB× σC]	COV_{BC}	0.75 x 12 x 6 = 54
Weight of Security A		W_A	0.30
Weight of Security B		W_B	0.50
Weight of Security C		W_C	0.20

(b) Matrix

Securities		A	B	C
	Weights	0.30 W_A	0.50 W_B	0.20 W_C
A	0.30 W_A	64 (σA^2)	48 (Cov_{AB})	-19.2 (Cov_{AC})
B	0.50 W_B	48 (COV_{AB})	144 (σB^2)	54 (Cov_{BC})
C	0.20 W_C	-19.2 (Cov_{AC})	54 (Cov_{BC})	36 (σC^2)

(a) Computation of Portfolio Variance (σABC^2)

	Description	Computation (W X W X Cov) or (W X W X σ^2)	Product
1	$W_A \times W_A \times (\sigma A^2)$	0.30 x 0.30 x 64	5.76
2	W_A X W_B X COV_{AB}	0.30 x 0.50 x 48	7.20
3	W_A X W_C X COV_{AC}	0.30 x 0.20 x (19.2)	(1.15)
4	$W_B \times W_A \times COV_{AB}$	0.50 x 0.30 x 48	7.20
5	$W_B \times W_B \times \sigma B^2$	0.50 x 0.50 x 144	36
6	$W_B \times W_C \times COV_{BC}$	0.50 x 0.20 x 54	5.40
7	$W_C \times W_A \times COV_{AC}$	0.20 x 0.30 x (19.2)	(1.15)
8	$W_C \times W_B \times COV_{BC}$	0.20 x 0.50 x 54	5.40
9	$W_C \times W_C \times \sigma C^2$	0.20 x 0.20 x 36	1.44
	Variance of the Portfolio (σABC)		**66.10**
	Standard Deviation (Risk) of the Portfolio (σABC)		**8.13%**

Illustration 9.

Aditi is interested to construct a portfolio of Securities M and N. She has collected the following information about the proposed investment.

	M	N
Expected return	20%	25%
σ	12%	16%

Co-efficient of Correlation, (r), between M and N is 16.

Aditi wants to constitute only five portfolios of M and N as follows.

I. All funds invested in M.

II. 50% of funds in each M and N.

III. 75% of funds in M and 25% in N.

IV. 25% of funds in M and 75% in N.

V. All funds invested in N.

You are required to calculate—

(1) Expected return under different portfolios,

(2) Risk factor associated with these portfolios,

(3) Which portfolio is best from the point of view of Risk.

(4) Which portfolio is best from the point of view of Return.

Solution:

1. Expected Return under different Portfolios

Portfolio	M		N		Expected Return of Portfolio
	Probability	Return	Probability	Return	
I	1	0.20	0	0.25	1 X 0.20 + 0 x 0.25 = 20%
II	0.5	0.20	0.5	0.25	0.5 x 0.20 + 0.5 x 0.25 = 22.50%
III	0.75	0.20	0.25	0.25	0.75 x 0.20 + 0.25 x 0.25 = 21.25%
IV	0.25	0.20	0.75	0.25	0.25 x 0.20 + 0.75 x 0.25 = 23.75%
V	0	0.20	1	0.25	0 x 0.20 +1 x 0.25 = 25%

2. Risk factor associated with different Portfolios:

Portfolio	Computation	σAB
I	$= \sqrt{(\sigma M^2 \times W_M{}^2) + (\sigma N^2 \times W_N{}^2) + 2(\sigma M \times W_M \times \sigma N \times W_N \times \rho MN)}$ $= \sqrt{(12^2 \times 1^2) + (16^2 \times 1^2) + (2 \times 12 \times 1 \times 16 \times 0 \times 0.14)}$ $= \sqrt{144} = 12\%$	12%
II	$= \sqrt{(\sigma M^2 \times W_M{}^2) + (\sigma N^2 \times W_N{}^2) + 2(\sigma M \times W_M \times \sigma N \times W_N \times \rho MN)}$ $= \sqrt{(12^2 \times 0.50^2) + (16^2 \times 0.50^2) + (2 \times 12 \times 0.50 \times 16 \times 0.50 \times 0.16)}$ $= \sqrt{36 + 64 + 15.36} = \sqrt{115.36} = 10.74\%$	10.74%
III	$= \sqrt{(\sigma M^2 \times W_M{}^2) + (\sigma N^2 \times W_N{}^2) + 2(\sigma M \times W_M \times \sigma N \times W_N \times \rho MN)}$ $= \sqrt{(12^2 \times 0.75^2) + (16^2 \times 0.25^2) + (2 \times 12 \times 0.75 \times 16 \times 0.25 \times 0.16)}$ $= \sqrt{81 + 16 + 11.52} = \sqrt{108.52} = 10.42\%$	10.42%
IV	$= \sqrt{(\sigma M^2 \times W_M{}^2) + (\sigma N^2 \times W_N{}^2) + 2(\sigma M \times W_M \times \sigma N \times W_N \times \rho MN)}$ $= \sqrt{(12^2 \times 0.25^2) + (16^2 \times 0.75^2) + (2 \times 12 \times 0.25 \times 16 \times 0.75 \times 0.16)}$ $= \sqrt{9 + 144 + 11.52} = \sqrt{164.52} = 12.38\%$	12.83%
V	$= \sqrt{(\sigma M^2 \times W_M{}^2) + (\sigma N^2 \times W_N{}^2) + 2(\sigma M \times W_M \times \sigma N \times W_N \times \rho MN)}$ $= \sqrt{(12^2 \times 0^2) + (16^2 \times 1^2) + (2 \times 12 \times 0 \times 16 \times 1 \times 0.16)}$ $= \sqrt{256} = 16\%$	16%

3. Best Portfolio from the point of view of risk:

The Best Portfolio from the point of view of risk is the one which has the least risk factor i.e., 10.42%. Portfolio III [i.e., 75% of funds invested in M and 25% in N].

4. Best Portfolio from the point of return:

Portfolio V [i.e., 100% funds invested in the security, N] is the best from the point of return. This Portfolio will earn a return of 25%.

Illustration 10.

An investor holds two equity shares A and B in equal proportion with the following risk and return characteristics:

$e(R_A)$	28%
σA	30%
$e(R_B)$	24%
σB	26%

The returns of these securities have a positive correlation of 0.7. You are required to calculate the portfolio return and risk. Further, suppose that the investor wants to reduce the portfolio risk (σ_p) to 17 per cent. How much should the correlation coefficient be to bring the portfolio risk to the desired level?

Solution:

Basic Data

Notation	Particulars	Value
ρAB	Correlation co-efficient of Portfolio with market	0.7
σA	Standard Deviation of Share A	30%
σB	Standard Deviation of Share B	26%
σP	Risk of the Portfolio	17%
$E(R_A)$	Return of the equity share A	28%
$E(R_B)$	Return of the equity share B	24%

1. Computation of Expected Return

Expected Return $[E(R_P)]$ = Proportion of A X $E(R_A)$ + Proportion of B × $E(R_B)$

= 28(0.5) + 24(0.5) = 14 + 12 = 26%

2. Computation of Portfolio Risk

$$\sigma p = \sqrt{(\sigma A^2 \times W_A{}^2) + (\sigma B^2 \times W_B{}^2) + 2(\sigma A \times W_A \times \sigma B \times W_B \times \rho AB)}$$

$$= \sqrt{(30^2 \times 0.50^2) + (26^2 \times 0.50^2) + (2 \times 30 \times 0.50 \times 26 \times 0.50 \times 0.70)}$$

$$= \sqrt{225 + 169 + 273} = \sqrt{667} = 25.83\%$$

3. Correlation Co — efficient

If the investor desires the portfolio standard deviation to be 17 per cent, the correlation coefficient will be as computed below:

$$\sigma p = \sqrt{(\sigma A^2 \times W_A{}^2) + (\sigma B^2 \times W_B{}^2) + 2(\sigma A \times W_A \times \sigma B \times W_B \times \rho AB)}$$

$$= \sqrt{(30^2 \times 0.50^2) + (26^2 \times 0.50^2) + (2 \times 30 \times 0.50 \times 26 \times 0.50 \times CorAB)}$$

$(17)^2 = (30)^2(0.5)^2 + (26)^2(0.5)^2 + 2(0.5)(0.5)(30)(26)\ Cor_{AB}$

$289 = 225 + 169 + 390\ Cor_{AB}$

$Cor_{AB} = -105.25/390 = -0.269$

Illustration 11.

From the following information, ascertain the Market Price (X) of Risk of the portfolio -

Market Return (R_m)	Standard Deviation on Market Return (σ_m)	Return on Government Bonds (R_f)	Standard Deviation of the Portfolio (σ_p)
18%	6%	6%	08%
20%	8%	7%	04%
22%	9%	8%	12%

Also, determine the expected return for each of the above cases.

Solution:

1. **Formulae for Expected Return and Market Price of Risk**

   Expected Return on Portfolio $R_p = R_f + \lambda \times \sigma_P$

   Market Price of Risk of Portfolio $\lambda = (R_m - R_f) / \sigma_M$

2. **Expected Return and Market Price of Risk**

Market Return (R_m)	Std. Deviation on Market Return (σ_m)	Return on Government Bonds (R_f)	Std. Deviation of Portfolio (σ_p)	Market Price of Risk (λ)	Expected Return (R_p) = [$R_f + \lambda \times \sigma_p$]
(1)	(2)	(3)	(4)	(5) = [(1) - (3)]/(2)	(6) = (3) + (5)×(4)
18%	6%	6%	8%	2 [(18-6)/6]	22% [6% + 2 x 8%]
20%	8%	7%	4%	1.625 [(20-7)/8]	13.50% [7% + 1.625 x 4%]
22%	9%	8%	12%	1.556 [(22-8)/9]	26.67% [8% + 1.556 x 12%]

Illustration 12.

X Co. Ltd., invested on 1.4.2010 in certain equity shares as below:

Name of Co.	No. of shares	Cost (₹)
D Ltd.	1,000 (₹ 10 each)	20,000
G Ltd.	500 (₹1 each)	15,000

In September, 2010,10% dividend was paid out by D Ltd. and in October, 2010, 30% dividend paid out by G Ltd. On 31.3.2011 market quotations showed a value of ₹ 22 and ₹ 29 per share for D Ltd. and G Ltd. respectively.

On 1.4.2011, investment advisors indicate (a) that the dividends from D Ltd. and G Ltd. for the year ending 31.3.2012 are likely to be 20% and 35%, respectively and (b) that the probabilities of market quotations on 31.3.2012 are as given below:

Probability factor	Price/ share of D Ltd.	Price/ share of G Ltd.
0.2	22	29
0.5	25	31
0.3	28	33

You are required to—

(a) Calculate the average return from the portfolio for the year ended 31.3.2011:

(b) Calculate the expected average return from the portfolio for the year 2011-12; and

(c) Advise X Co. Ltd., of the comparative risk in the two investments by calculating the standard deviation in each case.

Solution:

1. Calculation of return on Portfolio for 2010-2011 (Calculation in ₹/ share)

Particulars	D	G
1. Market value by 31.03.11	22	29
2.. Cost of investment	20	30
3. Gain / loss	2	(1)
4. Dividend received during the year Capital gain / loss by 31.03.11	1	0.3
5. Yield [(3) + (4)]	3	(0.7)
6. % return [(5) ÷ (2)] x 100	15	(2.33)
7. Weight in the Portfolio [20 : 15]	57	43
Weighted average return = (57 x 15%) - (43 x- 2.33%) = 7.55%		

2. Calculation of Expected Return for 2011-12

Particulars	D	G
1. Expected dividend	2	0.35
2. Capital gain by 31.03.12		
• (22 x 0.2) + (25 x 0.5) + (28 x 0.3)-22 = (25.3-22)	3.3	
• (29 x 0.2) + (31 x 0.5) + (33 x 0.3)-29 = (31.2-29)		2.2
3. Yield[(1) + (2)]	5.3	2.55
4. Market value 01. 04.11	22	29
5. % return [(3) ÷ (4)]	24.09 %	8.79 %
6. Weight in Portfolio (1,000 x 22) : (500 x 29)	45	29
Weighted Average (Expected) Return = 13.38%		

3. Standard deviation of D Ltd.

Expected Market Value	Expected Gain	Expected Dividend	Expected Yield	D [(4) -5.3]	D^2	Probability	PD^2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
22	0	2	2	- 3.3	10.89	0.2	2.17
25	3	2	5	- 0.3	0.09	0.5	0.05
28	6	2	8	2.7	7.29	0.3	2.19
							4.41

Standard deviation = $\sqrt{PD^2} = \sqrt{4.41} = 2.1$

4. Standard deviation of G Ltd.

Expected Market Value	Expected Gain	Expected Dividend	Expected Yield	D [(4) – 2.55]	D^2	Probability	PD^2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
29	0	0.35	0.35	- 2.2	4.84	0.2	0.97
31	2	0.35	2.35	- 0.2	0.04	0.5	0.02
33	4	0.35	4.35	1.8	3.24	0.3	0.97
							1.96
Standard deviation = $\sqrt{PD^2}$ = $\sqrt{1.96}$ = 1.4							

Share of company D Ltd. is more risky as the S.D. is more that of company G Ltd.

Illustration 13.

The historical rates of return of two securities over the past ten years are given.

Calculate the Covariance and the Correlation coefficient of the two securities;

Years	1	2	3	4	5	6	7	8	9	10
Security A : (Return %)	12	8	7	14	16	15	18	20	16	22
Security B: (Return %)	20	22	24	18	15	20	24	25	24	18

Solution:

1. Computation of Factors

	Return of		Deviation from Mean		Variance of		Covariance of
Year	SecurityA (R_1)	SecurityB (R_2)	SA ($R_1 - \bar{R}_1$) (D_1)	SB ($R_2 - \bar{R}_2$) (D_2)	(D_1^2)	(D_2^2)	R_1 & R_2 [D_1 X D_2]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	12	20	-2.8	-1	7.84	1	2.8
2	8	22	-6.8	1	46.24	1	-6.8
3	7	24	-7.8	3	60.84	9	-23.4
4	14	18	-0.8	-3	0.64	9	2.4
5	16	15	1.2	-6	1.44	36	-7.2
6	15	20	0.2	-1	0.04	1	-0.2
7	18	24	3.2	3	10.24	9	9.6
8	20	25	5.2	4	27.04	16	20.8
9	16	24	1.2	3	1.44	9	3.6
10	22	18	7.2	-3	51.84	9	-21.6
	$\sum R_1$=148	$\sum R_2$ = 210			207.6	100	-20

	Security A	Security B
Mean	$\bar{R}_1 = \sum R_1 \div n$ $= 148 \div 10 = 14.8$	$\bar{R}_2 = \sum R_2 \div n$ $= 210 \div 10 = 21$
Variance	$\sigma_A^2 = \sum D_1^2 \div n = 207.6 / 10 = 20.76$	$\sigma_B^2 = \sum D_2^2 \div n = 100 / 10 = 10$
Standard Deviation	$\sigma_A = \sqrt{20.76} = 4.55$	$\sigma_B = \sqrt{10} = 3.162$

2. Covariance and Correlation:

Combination	Security A and B
Covariance	$Cov_{AB} = \sum [D_1 \times D_2] \div n = -20 \div 10 = -2$
Correlation	$\rho_{AB} = Cov_{AB} / (\sigma_A \times \sigma_B)$ $= -2 / (4.55 \times 3.162) = -0.1390$

Illustration 14.

The distribution of return of security "P" and the market portfolio "Q" is given below:

Probability	Return %	
	P	Q
0.30	30	-10
0.40	20	20
0.30	0	35

You are required to calculate the expected return of security "P" and the market portfolio "Q", the covariance between the market portfolio and security and beta for the security,

Solution:

1. Expected Return and Risks of Security P						
Scenario	**Probability (P)**	**Return (R)%**	**Expected Return %**	**Deviation (D)%**	**D2**	**Variance (P x D2)**
(1)	(2)	(3)	(4) = (2) X (3)	(5) = (3)- - 2X4)	(6)	(7) = (2)X(6)
1	0.30	30	9	13	169	50.7
2	0.40	20	8	3	9	3.6
3	0.30	0	0	(17)	289	86.7
			17.00%			**141**

Expected Return on Security P = 17.00%

Risk on Security (P) = $\sigma_P = \sqrt{Variance} = \sqrt{141} = 11.87\%$

2. Expected Return and Risks of Market Portfolio Q

Scenario	Probability (P)	Return (R)%	Expected Return%	Deviation (D)%	D^2	Variance (P X D^2)
(1)	(2)	(3)	(4) = (2) X (3)	(5)= (3)- ∑(4)	(6)	(7) = (2)X(6)
1	0.30	(10)	(3)	(25.5)	650.25	195.075
2	0.40	20	8	4.5	20.25	8.1
3	0.30	35	10.5	19.5	380.25	114.07
			15.50%			**317.245**

Expected Return on Market Portfolio Q = 15.50%

Risk on Security (Q) = $\sigma_Q = \sqrt{\text{Variance}} = \sqrt{317.24} = 17.81\%$

3. Computation of Covariance of Securities P and Market Portfolio Q

Scenario	Probability (P)	Deviation (D_P) from Mean for P%	Deviation (D_Q) from Mean for Q%	Deviation Product (D_{PQ}) = D_P X D_Q	Covariance (P X D_{PQ})
(1)	(2)	(3)	(4)	(5) = (3) x (4)	(6) = (2) x (5)
1	0.30	13	(25.5)	(331.5)	(99.45)
2	0.40	3	4.5	13.5	5.4
3	0.30	(17)	19.5	(331.5)	(99.45)
					(193.5)

Covariance of Securities P and Market Portfolio Q [Cov_{PQ}] = (193.5)

Beta = $Cov_{PQ} \div \sigma_P^2$ = -193.5 ÷ 317.245 = - 0.6099

Illustration 15.

A Study by a Mutual Fund has revealed the following data in respect of the three securities:

Security	σ (%)	Correlation with Index, ρ_{sm}
P	20	0.66
Q	18	0.95
R	12	0.75

The Standard Deviation of the Market Portfolio (BSE Sensex) is observed to be 18%.

1. What is the sensitivity of returns of each stock with respect to the market?
2. What are the Co-variances among the various stocks?
3. What would be the risk of portfolio consisting of all the three stocks equally?
4. What is the beta of the portfolio consisting of equal investment in each stock?
5. What is the total systematic and unsystematic risk of the portfolio in (4)?

Solution:

1. Sensitivity

Security		P	Q	R
Standard Deviation	[A]	20.00	18.00	12.00
Correlation to Market Portfolio	[B]	0.66	0.95	0.75
Beta (Sensitivity) = [A] X [B] / σ_M		**0.73**	**0.95**	**0.50**

2. Covariance between the securities

Covariance of Returns between the securities P and Q = $Cov_{PQ} = \beta_P \times \beta_Q \times \sigma_M^2$

Securities		P	Q	R
	Beta	0.73	0.95	0.50
P	0.73	—	0.73 × 0.95× 324	0.73 × 0.50 × 324
Q	0.95	0.73 × 0.95× 324	—	0.50 × 0.95 × 324
R	0.50	0.73 × 0.50 × 324	0.50 × 0.95 × 324	—

Covariance Between	Computation
P and Q	$\beta_P \times \beta_Q \times \sigma^2_M = 0.73 \times 0.95 \times 324 = 224.69$
P and R	$\beta_P \times \beta_R \times \sigma^2_M = 0.73 \times 0.50 \times 324 = 118.26$
Q and R	$\beta_P \times \beta_R \times \sigma^2_M = 0.95 \times 0.50 \times 324 = 153.90$

3. Risk of the Portfolio consisting of Equal Investment in each stock

Matrix

Securities		P	Q	R
	Weights	1/3 W_P	1/3 W_Q	1/3 W_R
P	1/3 W_P	400 (σP^2)	224.69 (Cov_{PQ})	118.26 (Cov_{PR})
Q	1/3 W_Q	224.69 (Cov_{PQ})	324 (σQ^2)	153.90 (Cov_{QR})
R	1/3 W_R	118.26 (Cov_{PR})	153.90 (Cov_{QR})	144 (σR^2)

Computation of Portfolio Variance (σPQR^2)

	Description	Computation (W × W × Cov) or (W × W × σ^2)	Product
1	$W_P \times W_P \times \sigma P^2$	1/3 x 1/3 x 400	44.44
2	$W_P \times W_Q \times Cov_{PQ}$	1/3 x 1/3 x 224.69	24.97
3	$W_P \times W_R \times Cov_{PR}$	1/3 x 1/3 x 118.26	13.14
4	$W_Q \times W_P \times Cov_{PQ}$	1/3 x 1/3 x 224.69	24.97
5	$W_Q \times W_Q \times \sigma Q^2$	1/3 x 1/3 x 324	36.00
6	$W_Q \times W_R \times Cov_{QR}$	1/3 x 1/3 x 153.90	17.10
7	$W_R \times W_P \times Cov_{PR}$	1/3 x 1/3 x 118.26	13.14
8	$W_R \times W_Q \times Cov_{QR}$	1/3 x 1/3 x 153.90	17.10
9	$W_R \times W_R \times \sigma R^2$	1/3 x 1/3 x 144	16
	Variance of the Portfolio (σPQR^2)		**206.86**
	Standard Deviation (Risk) of the Portfolio (σPQR)		**14.38%**

4. Beta of the Portfolio consisting of equal investment in each stock

Security	P	Q	R
(a) Beta	0.73	0.95	0.50
(b) Weight	1/3	1/3	1/3
(c) Product	0.243	0.317	0.167

Portfolio Beta = 0.243+0.317+0.167 = 0.727

5. Systematic and Unsystematic Risk of the Portfolio

Total Risk = Systematic Risk + Unsystematic Risk

Variance Approach - Total Risk of the Portfolio = Variance of the Portfolio = 206.86

Systematic Risk = $\beta^2_P \times \sigma^2_M$ = 0.727 x 0.727 x 324 = 171.24

Unsystematic Risk = 206.86 – 171.24 = 35.62

Illustration 16.

The rates of return on the Security of Company A and Market portfolio for 10 periods are given below:

Period	Return of Security A (%)	Return on Market portfolio (%)
1	18	22
2	20	20
3	24	18
4	26	16
5	18	20
6	-5	8
7	17	-6
8	19	5
9	-7	6
10	20	11

(a) What is the beta of Security A?

(b) What is the characteristic line for security A?

Solution:

1. Computation of Beta of Security

	Return of		Deviation from Mean		Variance of		Covariance of
Period	**Mkt. (R_M)**	**A (R_A)**	**Mkt. ($R_M - \bar{R}_M$) (D_M)**	**A ($R_A - \bar{R}_A$) (D_A)**	**Mkt. (D_M^2)**	**A (D_A^2)**	**R_M & R_A [$D_M \times D_A$]**
(1)	**(2)**	**(3)**	**(4) [(2)-12]**	**(5) [(3)-15]**	**(6) $(4)^2$**	**(7) $(5)^2$**	**(8) (4) × (5)**
1	22	18	10	3	100	9	30
2	20	20	8	5	64	25	40
3	18	24	6	9	36	81	54
4	16	26	4	11	16	121	44
5	20	18	8	3	64	9	24
6	8	-5	-4	-20	16	400	80
7	-6	17	-18	2	324	4	-36
8	5	19	-7	4	49	16	-28
9	6	-7	-6	-22	36	484	132
10	11	20	-1	5	1	25	-5
	120	**150**			**706**	**1174**	**335**

	Market Portfolio	Shares of Company A
Mean	$\bar{R}_M = \sum R_M \div n$ $= 120 \div 10$ $= 12$	$\bar{R}_A = \sum R_A \div n$ $= 150 \div 10$ $= 15$
Variance	$\sigma_M^2 = \sum D_M^2 \div n$ $= 706 \div 10$ $= 70.6$	$\sigma_A^2 = \sum D_A^2 \div n$ $= 1174 \div 10$ $= 117.4$
Standard Deviation	$\sigma_M = \sqrt{70.6} = 8.40$	$\sigma_A = \sqrt{117.4} = 8.40$

Covariance and Correlation:

Combination	Market and A
Covariance	$Cov_{MA} = \sum [D_M \times D_A] \div n$ $= 335 \div 10 = 33.5$
Beta β	$\beta = Cov_{MA} \div \sigma_M^2$ $= 33.5 \div 70.6 = 0.4745$

2. Computation of Characteristic Line for Security A

Particulars	Value
$y = \bar{R}_A$	15
β	0.4745
$x = \bar{R}_M$ (Expected Return on Market Index)	12

Characteristic Line for Security A = $y = \alpha + \beta x$,

$15 = \alpha + 0.4745 \times 12$

$\alpha = 15 - (0.4745 \times 12) = 9.306\%$

Characteristic line for Security A = $9.306 + 0.4745\ R_M$

Note: It is assumed that rates of return for market portfolio and the security given in the question are returns in excess of risk free rate of return.

Illustration 17.

Investor's Weekly, a news magazine on the happenings at Cloudy Street, publishes the following information in its July edition for Security D - Equilibrium Return = 20%, Market Portfolio Return = 20%, 6% Treasury Bills (₹100) at ₹120. Covariance of the Security with the market portfolio is 225% and correlation is 0.85. Determine risk (of Market Portfolio) and security risk.

Solution:

1. Computation of Beta of the Security:

(a) Computation of Risk Free Return

Risk Free Rate = Coupon Payment ÷ Current Market Price

= [₹100 x 6%] ÷ ₹120 = ₹6 ÷ ₹120 = 5%

(b) Computation of Beta

Assuming Equilibrium Return = CAPM Return,

$20\% = R_F + \beta_D \times (R_M - R_F)$

Or, $20\% = 5\% + \beta_D$ x (20% - 5%)

Or, $\beta_D = 1$

2. Computation of Market Risk

$$\beta_D = \frac{Cov_{DM}}{\sigma_M^2}$$

Or, $1 = 225\% \div \sigma_M^2$

Or, $\sigma_M = 15\%$ (market risk)

3. Computation of Security Risk

$$\beta_D = \frac{\sigma_D}{\sigma_M} \times \rho_{DM}$$

Or, $1 = [\sigma_D/15\%] \times 0.85$

Or, $\sigma_D = 15\% \div 0.85 = 17.65\%$

Illustration 18.

(a) Calculate the market sensitivity index, and the expected return on the Portfolio from the following data:

Standard deviation of an asset	4.5%
Market standard deviation	4.0%
Risk - free rate of return	15.0%
Expected return on market Portfolio	17.0%
Correlation coefficient of Portfolio with market	0.89

(b) What will be the expected return on the Portfolio? If Portfolio beta is 0.5 and the risk free return is 10%.

Solution:

(1) Basic Data for computation of Expected Return

Notation	Particulars	Case (a)	Case(b)
σ_P	Standard Deviation of asset	4.5%	4.5%
σ_M	Market Standard Deviation	4.0%	4.0%
ρ_{MP}	Correlation co-efficient of portfolio with market	0.89	0.89
R_F	Risk free rate of return	15%	10%
R_M	Expected return on market Portfolio	17%	17%
β_P	Portfolio Beta	To be ascertained	0.5

(2) Computation of Expected Return

	Case (a)	Case (b)
Portfolio Beta $\beta_P = \sigma_P \div \sigma_M \times \rho_{MP}$	$4.5 \div 4 \times 0.89 = 1.001$	0.5
Expected Return = $R_F + \beta_P \times (R_M - R_F)$	0.15 + [1.001 x (0.17 - 0.15)] = 17.002%	0.10 +[0.5x(0.17 - 0.10)] = 13.5%

Illustration 19.

The Beta Co-efficient of Moon Light Ltd is 1.40. The Company has been maintaining 8% rate of growth in dividends and earnings. The last dividend paid was ₹4 per share. Return on Government Securities is 12%. Return on Market Portfolio is 18%. The Current Market Price of one share of Moon Light Ltd is ₹32.00.

Required —

1. What will be the equilibrium price per share of Moon Light Ltd?
2. Would you advise purchasing the share?

Solution:

1. Required Rate of Return on Shares of Moon Light Ltd

(Based on Capital Asset Pricing Model)

Expected Return = $R_f + \beta$ of Security X (Rm - Rf)

R_f =Risk Free Return =12%

β = Beta of Security (Moon Light Ltd) = 1.40

R_m = Return on Market Portfolio =18%

Expected Return = 12% + 1.40 x (18% - 12%) = 20.4%

2. Expected Market Price of Shares of Moon Light Ltd

(Based on Dividend Growth Model)

Expected Return = $D_1/P_0 + G$

D_1 = Dividend at end of Year 1 = Last Years Dividend X (1 + Growth Rate)

= ₹ 4 x (1 + 8%) = ₹ 4 X 1.08 = ₹ 4.32

P_0 = Price at Year Beginning = **To be determined (Expected Price)**

G = Growth Rate in Dividends

20.4 = (₹4.32 ÷ Expected Price) + Growth rate of 8%

Or, 20.4% - 8% = ₹4.32 ÷ Expected Price

Or, Expected Price = ₹4.32 ÷ 12.4 = ₹34.83

3. Evaluation of Shares of Moon Light Ltd

Actual Market Price ₹32.00

Expected Market Price ₹34.83

Inference Shares of Moon Light Ltd. is underpriced.

Decision Moon Light Ltd. should be purchased.

Illustration 20.

The risk free return is 8 per cent and the return on market portfolio is 14 per cent. If the last dividend on Share 'A' was ₹2.00 and assuming that its dividend and earnings are expected to grow at the constant rate of 5 per cent. The beta of share 'A' is 2.50. Compute the intrinsic value of share A.

Solution:

Basic Data

Notation	Particulars	Value
β_A	Beta of Share	2.5
R_M	Market Return	14%
R_F	Risk Free Rate of Return	8%
R	Growth rate of Dividends	5%
D_0	Last Year's dividend	`2

1. Computation of Expected Return

Expected Return $[E(R_A)] = R_F + [\beta_A \times (R_M - R_F)]$

$= 0.08 + [2.5 \times (0.14 - 0.08)]$

$= 0.08 + 2.5 (0.14 - 0.08) = 0.08 + 0.15 = 0.23$

i.e., $K_e = 23\%$

2. Intrinsic Value of share $= D1 \div (K_e - g) = D_0 \times (1+ g) \div (K_e - g)$

$= 2 \times (1+0.05) \div (0.23 - 0.05) =$ ₹ 11.67

The Intrinsic Value of share A is ₹ 11.67.

Illustration 21.

An investor holds two stocks X and Y. An analyst prepared ex-ante probability distribution for the possible Economic scenarios and the conditional returns for the two stocks and the market index as shown below:

Economic Scenario	Probability	Conditional Returns %		
		X	Y	Market
Growth	0.40	25	20	18
Stagnation	0.30	10	15	13
Recession	0.30	-5	-8	-3

The risk free rate during the next year is expected to be around 9%. Determine whether the investor should liquidate his holdings in stocks X and Y or on the contrary make fresh investments in them. CAPM assumptions are holding true.

Solution:

1. Computation of Expected Returns

Scenario	Prob. P	Return X R_X	Mean P × R_X	Return Y R_Y	Mean P × R_Y	Market Return R_M	Mean P × R_M
Growth	0.4	25	10	20	8.0	18	7.2
Stagnation	0.3	10	3	15	4.5	13	3.9
Recession	0.3	-5	-1.5	-8	-2.4	-3	-0.9
Estimated Returns			**11.5**		**10.1**		**10.2**

2. Computation of Standard Deviation of R_M

R_M	$D_M=R_M$ - 10.2	D_M^2	P	PD_M^2
18	7.8	60.84	0.4	24.34
13	2.8	7.84	0.3	2.35
-3	-13.2	174.24	0.3	52.27
Market Variance				**78.96**

Standard Deviation of the Market = $\sqrt{78.96}$ = 8.89%

3. Computation of Standard Deviation and Covariance of R_X

R_X	$D_X = R_X$ - 11.5	D_X^2	P	PD_X^2	D_X X D_M	P D_X X D_M
25	13.5	182.25	0.4	72.900	105.3	42.12
10	-1.5	2.25	0.3	0.675	-4.2	-1.26
-5	-16.5	272.25	0.3	81.675	217.8	65.34
				155.25		**106.20**

Standard Deviation of Security X = $\sqrt{155.25}$ = 12.46%

Covariance with the market = 106.20

4. Computation of Standard Deviation and Covariance of R_Y

R_Y	$D_Y = R_Y$ - 10.1	D_y^2	P	PD_y^2	D_Y X D_M	P D_Y X D_M
20	9.9	98.01	0.4	39.204	77.22	30.89
15	4.9	24.01	0.3	7.203	13.72	4.12
-8	-18.1	327.61	0.3	98.283	238.92	71.68
				144.69		**106.69**

Standard Deviation of Security Y = $\sqrt{144.69}$ = 12.03%

Covariance with the market = 106.69

5. Computation of CAPM Return

A. Beta = Covariance / Variance of the Market

1. Beta of Security X = 106.20/ 78.96 = 1.34
2. Beta of Security Y = 106.69/ 78.96 = 1.35

B. Under CAPM, Equilibrium Return = $R_f + \beta (R_m - R_f)$

Expected Return of Security X = 9% + 1.34 (10.2 - 9) = 10.61%

Expected Return of Security Y = 9% + 1.35 (10.2 - 9) = 10.62%

6. Conclusion and Recommendation

Particulars	Security X	Security Y
Estimated Returns	11.50	10.10
Expected Return under CAPM	10.61	10.62
Estimated Return vs. Expected Returns	Expected Return is Lower. Stock X is underpriced.	Expected Return is Higher. Stock Y is over priced.
Recommendation	**Buy /Hold**	**Sell**

Illustration 22.

Sanjiv is contemplating buying / selling the shares of Companies M, N and O. He already holds some shares in each of these Companies. He has the following data in his hand to aid him in his decision —

- Return on NIFTY 16%
- ₹ 500 Treasury Bonds, whose returns are considered risk free, earns its owners a return of ₹35
- Company M has a Beta Factor of 0.95 and investment therein yields a return of 13.5%
- Company N, which is traded at ₹1,200 per shares, earns its investors a sum of ₹246. It has a beta factor of 1.5.
- Company O, price of which is ₹450 has a beta factor of 0.6. Historical data shows that annual share price increase of the Company is around 8%. Last dividend declared was ₹12 per share. Dividend payout is expected to double in the next year.

Sanjiv seeks your guidance on the course of action.

Solution:

1. Market Return (R_M) and Risk Free Return (R_F)

(a) Market Return = Return on NIFTY = 16%

(b) Risk Free Return = Return on Treasury Bonds = Return in ₹/Face Value = ₹35/₹500 =7%

2. Evaluation of Company M

Particulars	Value
Estimated Return (Given) (R_M) **[A]**	13.5%
Expected Return under CAPM [$E(R_M)$] $E(R_M) = R_F + \beta_M$ X ($R_M - R_F$) = 7% + 0.95 X (16% - 7%) **[B]**	15.55%
Estimated Return [A] vs. Expected Return under CAPM [B]	[B] is Higher
Inference	Stock gives lesser than what is should give
Conclusion [Expected Return is higher than Estimated Return] Share is	Overpriced
Recommendation	**SELL**

3. Evaluation of Company N

Particulars		Value
Estimated Return (Given)		₹246
Market Price (Given)		₹1200
Estimated Return (in %) (R_N) [Estimated Return ₹246/Market Price ₹1200]	**[A]**	20.50%
Expected Return under CAPM [$E(R_N)$] $E(R_N) = R_F + \beta_N$ X ($R_M - R_F$) = 7% + 1.50 X (16% - 7%)	**[B]**	20.50%
Estimated Return [A] vs. Expected Return under CAPM [B]		Equal
Inference		Stock is giving exactly what it should give
Conclusion [Expected Return is **EQUAL** To Estimated Return] Share is		Correctly priced
Recommendation		**HOLD**

4. Evaluation of Company O

Particulars		Value
Capital Appreciation Expected (Market Price of ₹450 x 8%)		₹36
Estimated Dividend Payout (Previous Year's Dividend of ₹12 x 2 Times)		₹24
Total Estimated Return for the year		₹60
Estimated Return (in %) (R_O) [Estimated Return ₹60/Market Price ₹450]	**[A]**	13.33%
Expected Return under CAPM [$E(R_B)$] $E(R_O) = R_F + \beta_O$ X ($R_M - R_F$) = 7% + 0.60 X (16% - 7%)	**[B]**	12.40%
Estimated Return [A] vs. Expected Return under CAPM [B]		[B] is lower
Inference		Stock gives more than what it should give
Conclusion [Expected Return is **LOWER** than Estimated Return] Share is		**Underpriced**
Recommendation		**BUY**

Illustration 23.

Good Luck Ltd., has been enjoying a substantial net cash inflow, and until the surplus funds are needed to meet tax and dividend payments, and to finance further capital expenditure in several months time, they have been invested in a small portfolio of short-term equity investments.

Details of the portfolio, which consists of shares in four UK listed companies, are as follows.

Company	Number of shares held	Beta equity coefficient	Market price per share (₹)	Latest Dividend yield (%)	Expected return on equity in the next year %
A Ltd.	60,000	1.20	4.29	6.10	19.50
B Ltd.	80,000	2.30	2.92	3.40	24.00
C Ltd.	1,00,000	0.85	2.17	5.70	17.50
D Ltd.	1,25,000	1.28	3.14	3.30	23.00

The current market return is 19% a year and the Risk free rate is 11% a year.

Required:

1. On the basis of the data given, calculate the risk of Good Luck Ltd's short term investment portfolio relative to that of the market.
2. Recommend, with reasons, whether Good Luck Ltd., should change the composition of its portfolio.

Solution:

(1) Computation of Weighed Beta

Security	No. of shares held	MPS (₹)	Market value of investments	Proportion	Beta	Portfolio Beta
[1]	[2]	[3]	[4]	[5]	[6]	[7] = [5] x [6]
A	60,000	4.29	2,57,400	2,57,400 ÷ 11,00,500 = 0.2339	1.20	0.28068
B	80,000	2.92	2,33,600	2,33,600 ÷ 11,00,500 = 0.2123	2.30	0.48829
C	1,00,000	2.17	2,17,000	2,17,000 ÷ 11,00,500 = 0.1972	0.85	0.16762
D	1,25,000	3.14	3,92,500	3,92,500 ÷ 11,00,500 = 0.3567	1.28	0.45658
			11,00,500	**1**	**5.63**	**1.393166**

(2) Comparison with Return under CAPM and Recommended changes in Composition

Security	Valuation under CAPM = $R_F + [\beta X (R_M - R_F)]$	Expected K_e in the next year %	Evaluation	Strategy
A	11% + 1.20 (19% - 11%) = 20.60	19.50	Overpriced	Sell
B	11% + 2.30 (19% - 11%) = 29.40	24.00	Overpriced	Sell
C	11% + 0.85 (19% - 11%) = 17.80	17.50	Overpriced	Sell
D	11% + 1.28 (19% - 11%) = 21.24	23.00	Under priced	Buy

Illustration 24.

Share of Sharee Limited has a beta factor of 1.8. The NIFTY has yielded a return of 17.5%. 6.75% ₹100 Treasury Bills are traded at ₹108. Ascertain —

(a) Expected Return on Shares of Sharee Ltd under CAPM.

(b) Alpha Factor of Shares of Sharee Ltd if the past 5 Years actual returns on shares of Sharee Ltd are — 23.4%; 27.2%; 26.6%; 24.3% and 28.5%.

Solution:

1. Expected Return on Shares of Sharee Ltd [$E(R_S)$] (Under CAPM)

(a) Computation of Risk Free Return (R_P)

Particulars	Value
Face Value of Treasury Bills	₹100
Return on Face Value (in %)	6.75%
Return on Treasury Bills (in Value) [₹100 x 6.75%]	₹6.75
Trading Price of Treasury Bills	₹108
Risk Free Return (R_F) as per Market Expectations [Actual Return ₹6.75/Market Price ₹108]	6.25%

(b) Expected Return [$E(R_S)$]

$E(R_S)$	$R_F + [\beta_V X (R_M - R_F)]$		
Risk Free Return	R_F	6.25%	[As per Working Note 1(a)]
Return on Market Portfolio	R_M	17.5%	[Return on NIFTY]
Beta Factor	β_V	1.80	[Given]

$E(R_S) = R_F + [\beta_V \text{ X } (R_M - R_F)]$

$= 6.25\% + [1.80 \text{ X } (17.5\% - 6.25\%)]$

$= 6.25\% + [1.80 \text{ X } 11.25\%] = 6.25\% + 20.25 = 26.5\%$

2. Value of Alpha (α_V) for Return on Shares of Sharee Ltd [$E(R_S)$]

Year	Actual Return	Abnormal Return [AR_S]
(1)	(2)	(3) = (2) – $E(R_S)$
1	23.4	23.4% – 26.50% = (3.10%)
2	27.2	27.2% – 26.50% = 0.70%
3	26.6	26.6% – 26.50% = 0.10%
4	24.3	24.3% – 26.50% = (2.20%)
5	28.5	28.5% – 26.50% = 2.00%
Total		(2.50%)

$\propto V = \sum AR_S \div n$ = (2.50%) ÷ 5 Years = (0.50%)

Inference: Alpha is negative. Therefore, expected return will be less than return under CAPM to the extent of 0.50%.

Illustration 25.

Returns on two portfolios, B and L, for the past 4 years are —

Year	1	2	3	4
Portfolio B	13.00%	13.50%	12.50%	14.00%
Portfolio L	14.35%	11.75%	13.60%	12.90%

Beta factor of the two portfolios are 1.3 and 1.2 respectively. If the market portfolio fetches 12% return and RBI Bonds, which are considered risk free, yield 5% return, which of the above two portfolios will an investor prefer?

Solution:

1. Computation of Expected Rate of Return under CAPM

$E(R_X)$ $R_F + [\beta_X \text{ X } (R_M - R_F)]$ [Expected Return on Portfolio X]

Risk Free Return R_F 5% [Treasury Bills]

Return on Market Portfolio R_M 12% [Given]

Expected Return on	Portfolio B	Portfolio L
Beta Factor	1.30	1.20
Expected Return	$E(R_B)$ = $R_F + [\beta_B \text{ X } (R_M - R_F)]$ = 5% + [1.30 x (12% - 5%)] = 5% + [1.30 x 7%] = 5% + 9.1% = **14.10%**	$E(R_L)$ = $R_F + [\beta_L \text{ X } (R_M - R_F)]$ = 5% + [1.20 x (12% - 5%)] = 5% + [1.20 x 7%] = 5% + 8.4% = **13.40%**

2. Computation of Alpha Factors

Year	Portfolio B		Portfolio L	
	Actual Return	Abnormal Return [AR_B]	Actual Return	Abnormal Return [AR_L]
(1)	(2)	(3) = (2)-$E(R_B)$	(4)	(5) = (4)-$E(R_L)$

1	13.00%	13.00% - 14.10% = (1.10%)	14.35%	14.35% - 13.40% = 0.95%
2	13.50%	13.50%- 14.10% = (0.60%)	11.75%	11.75% - 13.40% = (1.65%)
3	12.50%	12.50% -14. 10% = (1.60%)	13.60%	13.60% - 13.40% = 0.20%
4	14.00%	14.00% -14. 10% = (0.10%)	12.90%	12.90% - 13.40% = (0.50%)
		(3.40%)		**(1.00%)**

Alpha Factor:

Portfolio B $\propto_B$ = $\sum AR_B \div n$= ((3.40%) ÷ 4 Years = (0.85%)

Portfolio L $\propto_L$ = $\sum AR_L \div n$= ((1.00%) ÷ 4 Years = (0.25%)

3. Expected Return adjusted for Alpha

Alpha Adjusted Return = Return under CAPM + $\propto$

Portfolio B = $E(R_B) + \alpha_B$ = 14.10% - 0.85% = 13.25%

Portfolio L = $E(R_L) + \alpha_L$ = 13.40% - 0.25% = 13.15%

Conclusion: The Alpha for Security B is higher than L, indicating its better performance relative to L. Hence, an investor should prefer Portfolio B.

Illustration 26.

Portfolio B, a fully diversified portfolio, has a standard deviation of 6%. The NIFTY has yields a return of 16.5%, with a standard deviation of 4%. Ascertain the expected return of Portfolio B under the following three cases —

(a) 5.80% ₹100 Central Government guaranteed RBI Bonds is traded at ₹116;

(b) Market's Attitude towards risk is 3.5;

(c) Risk Free Return is 8%.

Solution:

Expected Return on Portfolio R_P = $R_F + \lambda X \sigma_p$
= $(R_M - R_F) \div \sigma_M$

Particulars	Case 1	Case 2	Case 3
Risk Free Return [R_F]	5% [Note 1]	2.5% [Note 2]	8% [Given]
Market's Attitude towards Risk (λ) = $(R_M - R_F) \div \sigma_M$	2.875 [16.50% - 5%]/4%	3.5 [Given]	2.125 [16.50% - 8%]/4%
Expected Return [R_P] = R_F (+ λ x σ_p)	**22.25%** [5% + (2.875 x 6%)]	**23.50%** [2.5% + (3.5 X 6%)]	**20.75%** [8% + (2.125 x 6%)]

Note:

1. Risk Free Return [Case 1]:

(a)	Return on RBI Bonds = 5.80% on Face Value of ₹100	₹5.80
(b)	Ruling Market Price of the Bond	₹116
(c)	Rate of Return on Market Price (₹5.80/ ₹116)	5%

2. Risk Free Return [Case 2]:

Market's Attitude towards Risk (λ) = $(R_M - R_F) \div \sigma_M = 3.5$

$(R_M - R_F) = \lambda \times \sigma_M$

$R_F = R_M - \lambda \times \sigma_M$

Therefore, R_F = 16.50% - (3.5 x 4%) = 16.50% - 14% = 2.50%

Illustration 27.

Stock P has a Beta of 1.50 and a market expectation of 15% return. For Stock Q, it is 0.80 and 12.5% respectively. If the risk free rate is 6% and the market risk premium is 7%, evaluate whether these two stocks are priced correctly? If these two stocks to be regarded as correctly priced, what should the risk free rate and market risk premium be?

Solution:

1. Expected Return [E(R)] under CAPM

Expected Return of Stock X [$E(R_x)$]	$= R_F + \beta_x$ X $[E(R_M) - R_F]$	
Risk Free Return [R_F]	= 6%	
Risk Premium [$E(R_M) - R_F$]	= 7%	
Beta of Stock P[β_P]	= 1.50	
Beta of Stock Q[β_Q]	= 0.80	
Stock P [$E(R_P)$]	$= R_F + \beta_P \times [E(R_M) - R_F]$	
	= 6% + 1.50 x 7% = 6% + 10.50%	= 16.50%
Stock Q [$E(R_Q)$]	$= R_F + \beta_Q$ X $[E(R_M) - R_F]$	
	= 6% + 0.80 x 7% = 6% + 5.60%	= 11.60%

2. Evaluation of Market Price

Particulars	Stock P	Stock Q
Expected Return (Market) **[A]**	15.00%	12.50%
Expected Return under CAPM **[B]**	16.50%	11.60%
Market Expectations [A] vs. CAPM Return [B]	[B] is Higher	[B] is Lower
Inference	Stock P gives lesser return than what it should give	Stock Q gives higher return than what it should give
Conclusion	Stock P is **Overvalued**	Stock P is **Undervalued**
Recommendation	**SELL**	**BUY**

3. Determination of Risk Free Return

Alternative 1

Let, Risk free return = R_F

Market Risk Premium = RP

For security P, under CAPM

15% = R_F + 1.5 X RP

RF = 15 – 1.5 RP (1)

For security Q, Under CAPM

12.5 = R_F + 0.80 RP

R_F = 12.5 – 0.80 RP (2)

R_F determined under equation (1) and equation (2) should be equal. Therefore,

15 – 1.5 RP = 12.5 – 0.80 RP

15 – 12.5 = 1.5 RP – 0.80 RP

2.5 = 0.7 RP

RP = 2.5/0.7 = 3.57%

Using RP = 3.57%, in equation (1)

R_F = 15 – 1.5 X 3.57

= 9.64%

Alternative 2:

Rule: If the stocks are correctly priced, then the Risk - Return Ratio should be the same i.e.,

$(R_P – R_F \div \beta_P) = (R_Q – R_F \div \beta_Q)$

$$\frac{15 – R_F}{1.5} = \frac{12.5 – R_F}{0.80}$$

$1.5(12.5 - R_F) = 0.80 (15 – R_F)$

$18.75 – 1.5\ R_F = 12 – 0.80\ R_F$

$18.75 – 12 = 1.5\ R_F – 0.80\ R_F$

$6.75 = 0.7\ R_F$

R_F = 9.64%

Market Risk Premium = $(R_P – R_F) \div \beta_P$

= (15 – 9.64) ÷ 1.5

= 3.57%

Illustration 28.

Following are the information on two Portfolios, D and G —

Particulars	Portfolio D	Portfolio G
Elimination of Unsystematic Risk (Diversifiable Risk) Variance[σ^2]	Complete 6.66	Partial 14.96

The Sensex has returned an average of 16.25% on the investment in the past years. The expected appreciation in return is 3% on the previous year's return. The variance of the return on Sensex is measured at 2.96.

7% ₹1,000 Government Guaranteed Bonds are traded at ₹1,094. The covariance between Portfolio G and the Market is 4.96. Ascertain the expected return on Portfolio D and G.

Solution:

1. Evaluation of Portfolio and Determination of Return Measuring Model

Particulars	Portfolio D	Portfolio G
Elimination of Unsystematic Risk	Complete	Partial
Nature of Portfolio	Efficient	Inefficient
Expected Return can be based on	Capital Market Line	Capital Asset Pricing Model
Expected Return of the Portfolio [$E(R_P)$]	$E(R_D) = RF + \lambda\sigma_D$	$E(R_G) = R_F + \beta_G$ X [$E(R_M)$-R_F)]

2. Expected Return of Portfolio D (Capital Market Line Model)

Expected Return $E(R_D)$ = Risk Free Return (R_F) + [Market Price of Risk(λ) X Risk of Portfolio D(σ_D)]

$E(R_D)$ = 6.40% + (6.01 x 2.58%) = 6.40% + 15.51% = **21.91%**

(a) Risk Free Return (R_F)

Particulars		Value
Actual Return on RBI Bonds	7% on Face Value of ₹1,000	₹70
Ruling Market Price of the Bond	Actual Return ₹70 ÷ Ruling Market Price ₹1,094	₹1,094
Market's Risk Free Return		6.40%

(b) Market Price of Risk (λ) = Expected Market Risk Premium ÷ Risk of Market Returns

= $[E(R_M) - E(R_F)] \div \sigma_M$

Particulars			Value
Add:	Past Average Market Return Increase in Market Return	[3% of Past Average Return 16.25% = 3% X 16.25%]	16.25% .49%
Less:	Expected Market Return Risk Free Return	[$E(R_M)$ [R_F]	16.74% 6.40%
Expected Market Risk Premium		**[A]**	10.34%
Variance on Market Return [σ_M^2]			2.96
Standard Deviation [σ_M] = $\sqrt{2.96}$		**[B]**	1.72%
Market Price of Risk [λ]		**[A] ÷ [B]**	6.01

(c) Risk of Portfolio D [σ_D] = $\sqrt{}$ Variance of Portfolio D = $\sqrt{6.66}$ = **2.58%**

3. Expected Return of Portfolio G

(Capital Asset Pricing Model)

Expected Return $E(R_G)$=Risk Free Return (R_F) **Plus** Portfolio Beta β_G X[Expected Market Return $E(R_M)$ **Less** Risk Free Return (R_F)]

$E(R_D)$ = 6.40% + [1.68 x (16.74% - 6.40%)]

= 6.40% + [1.68 x 10.34%]

= 6.40% + 17.37% = **23.77%**

(a) Risk Free Return (R_F) = 6.40% [From 1 Above]

(b) Expected Market Return [$E(R_M)$] = 16.74% [From 1 Above]

(c) Beta of Portfolio G (β_G):

= Covariance of Portfolio G and Market [Cov_{BM}] ÷ Variance of Market Return [σ_M^2]

= 4.96 ÷ 2.96 = 1.68

Illustration 29.

Mr. Q owns a portfolio with the following characteristics —

	Security A	Security B	Risk Free Security
Factor 1 Sensitivity	0.80	1.50	0
Factor 2 Sensitivity	0.60	1.20	0
Expected Return	20%	25%	15%

It is assumed that security returns are generated by a two-factor model —

1. If Mr. Q has ₹1,00,000 to invest and sells short ₹50,000 of Security B and purchases ₹1,50,000 of Security A what is the sensitivity of Mr. Q portfolio to the two factors?
2. If Mr. Q borrows ₹1,00,000 at the risk free rate and invests the amount he borrows along with the original amount of ₹1,00,000 in Security A and B in the same proportion as described in Part 1, what is the sensitivity of the portfolio to the two factors?
3. What is the expected return premium of Factor 2?

Solution:

1. Sale of Security B and Investment in Security A

Security	Portfolio Value (Weights)	Sensitivity (Factor 1)	Product (Factor 1)	Sensitivity (Factor 2)	Product (Factor 2)
A (Invested)	1,50,000	0.80	1,20,000	0.60	90,000
B (Sold)	(50,000)	1.50	(75,000)	1.20	(60,000)
	1,00,000		**45,000**		**30,000**

Portfolio Sensitivity (Product ÷ Weights) for -

(a) Factor 1 = 45,000 ÷ 1,00,000 = **0.45**

(b) Factor 2 = 30,000 ÷ 1,00,000 = **0.30**

2. Borrowing at Risk Free Return, Investment in Security A and Security B

Security	Portfolio Value (Weights)	Sensitivity (Factor 1)	Product (Factor 1)	Sensitivity (Factor 2)	Product (Factor 2)
A (Invested)	3,00,000	0.80	2,40,000	0.60	1,80,000
B (Invested)	(1,00,000)	1.50	(1,50,000)	1.20	(1,20,000)
Risk Free (Sold)	(1,00,000)	0.00	NIL	0.00	—
	1,00,000		**90,000**		**60,000**

Portfolio Sensitivity (Product ÷ Weights) for —

(a) Factor 1 = 90,000 ÷ 1,00,000 = **0.90**

(b) Factor 2 = 60,000 ÷1,00,000 = **0.60**

(It is assumed that Portfolio Sensitivity = Weighted Average Sensitivity of Individual Securities comprising the portfolio)

3. Return Premium of Factor 2

Since security returns are generated by a two factor model, it assumed that the model is linear equation in two variables —

Where,

$R_s = R_F + \beta_{F1} X + \beta_{F2} Y$,

Where, R_s = Return of the Security S

R_F = Risk Free Return

β_{F1} = Factor 1 Sensitivity

β_{F2} = Factor 2 Sensitivity

X = Return Premium for Factor 1

Y = Return Premium for Factor 2

Therefore,

$R_A = 20\% = 15\% + 0.8x + 0.6y \quad \Rightarrow 0.8x + 0.6y = 5$

$R_B = 25\% = 15\% + 1.5x + 1.2y \quad \Rightarrow 1.5x + 1.2y = 10$

From First Equation $x = \frac{5 - 0.6y}{0.8} = 6.25 - 0.75y$

Substituting for X in second equation

1.5 X (6.25 - 0.75y) + 1.2y =10

$\Rightarrow$ 9.375 - 1.125y + 1.2y =10

$\Rightarrow$ 0.625 = 0.075y $\Rightarrow$ y = 0.625 ÷ 0.075 = **8.33%.**

Therefore, Expected Return Premium for Factor 2 is **8.33%.**

Illustration 30.

The total market value of the equity share of Dharam Company is ₹60,00,000 and the total value of the debt is ₹40,00,000. The treasurer estimate that the beta of the stocks is currently 1.5 and that the expected risk premium on the market is 12 per cent. The Treasury bill rate is 10 per cent.

Required—

(a) What is the beta of the Company's existing Portfolio of assets?

(b) Estimate the Company's Cost of Capital and the discount rate for an expansion of the company's present business.

Solution:

(1) Beta of Company's existing Portfolio of assets

Notation	Particulars	Value
β_E	Beta of Equity	1.5
β_D	Beta of Debt (since company's debt capital is risk less, its Beta is Zero)	0
E	Value of Equity	60,00,000
D	Value of Debt	40,00,000
β_A	Beta of company assets	To be ascertained
R_M-R_F	Risk Premium	12%
R_F	Risk Free Rate of Return	10%

D+E = Total value of the Company

= Value of Debt + Value of Equity

= 40,00,000 + 60,00,000 = ₹1,00,00,000

$\Rightarrow B_A = \{\beta_E \text{ X Equity} \div [\text{Equity + Debt x}(1 - \text{Tax})]\} + \{\beta_D \text{ X Debt } (1\text{-Tax}) \div [\text{Equity + Debt x } (1 - \text{Tax})]\}$

= [1.5 x ₹60 lakhs/₹100 lakhs] + [0 x ₹40 lakhs/ ₹100 lakhs]

= 0.9 + 0 = **0.9**

(2) Estimation of Company's Cost of Capital

Cost of Capital = K_e

= $R_F + [\beta_p \text{ X Risk Premium}]$

= 10 + (0.9x12) = 10 +10.8 = 20.8%

(3) Discount Rate for an expansion of the company's present business

- In case of expansion plan, 20.8% can be used as discount factor.
- In case of diversification plan, a different discount factor would be used depending on its risk profile.

Illustration 31.

You can choose to invest in two shares, A and B.

	E(R)	(σ)
A	10%	10%
B	15%	20%

The correlation between the returns on the two shares is 0.15. Your portfolio consists of 100 A shares and 50 B shares. The current price of A is 50 and the current price of B is 100. Calculate the expected return and standard deviation of the portfolio.

Solution:

The total value of your A shares is 100 x 50 = 5000. The total value of your B shares is 50 x 100 = 5000. Your total wealth is the sum of these values, 10000. The fraction of your wealth invested in the each share, or portfolio weights, is a half for each asset:

$$W_1 = W_A = 5000/10000 = 1/2$$

$$W_2 = W_2 = 5000/10000 = 1/2$$

Covariance between A and B (σ_{12}) = ρ_{12} x σ_1 x σ_2 = 0.15 x 10 x 20 = 30

The expected return and standard deviation of the portfolio is

$E(\tilde{R}_p)$ = W_1 $E(\tilde{R}_1)$+ W_2 $E(\tilde{R}_2)$=(1/2 x 10%)+(1/2 x 15%) = 12.5%

$\sigma^2(\tilde{R}_p) = W_1^2\sigma_1^2 + W_2^2\sigma_2^2 + 2w_1w_2\sigma_1\sigma_2\rho_{12}$

$= 0.5^2. 0.1^2 + 0.5^2. 0.2^2 + 2.0.5.0.5.0.1.0.2.0.15$

$= 0.014$

Therefore, $\sigma(\tilde{R}_p) = \sqrt{\sigma^2(\tilde{R}_p)} = 11.83\%$

Illustration 32.

The expected return of Stock X has the following distribution:

Demand for the company's products	Probability (p_i)	Rate of return (r_i) (%)
Weak	0.2	(15)
Average	0.5	26
Strong	0.3	40

Calculate the stock's expected return, standard deviation and coefficient of variation.

Solution:

Expected return ($\bar{r}$) = $\sum p_i r_i$ = [(0.2)(-15%) + (0.5)(26%) + (0.3)(40%)] = 22%.

Variance of return (σ^2) =$\sum(r_i - \bar{r})^2 p_i$ = [(-15-22)^2(0.2) + (26-22)^2(0.5) +(40 - 22)^2(0.3)] = 379

Standard deviation of return ($\sigma = \sqrt{379} = 19.47\%$.

Coefficient of variation (CV) = $\frac{19.47\%}{22\%}$ = 0.885.

Illustration 33.

An individual has invested ₹ 70,000 in a stock that has a beta of 0.7 and has invested ₹ 80,000 in a stock with a beta of 1.5. If these are the only two investments in her portfolio, what is her portfolio's beta?

Solution:

Total Investment 70,000 + 80,000 = 1,50,000

Portfolio's beta = [(₹70,000/₹1,50,000)(0.7)] + [(₹80,000/₹1,50,000)(1.5)]

= (0.47 x 0.70) + (0.53 x 1.5) = 1.12

Illustration 34.

Security A has an expected return of 20 percent and a standard deviation of 30 percent. Security B has an expected return of 26 percent and a standard deviation of 60 percent. If the correlation between A and B is 0.5, what is the expected return and standard deviation of a portfolio comprising of 40 percent of Security A and 60 percent of Security B?

Solution:

The expected portfolio return is given by

$$\hat{r}_P = W_A \hat{r}_A + (1 - W_A)\ \hat{r}_B$$

$$= 0.4(0.2)+0.6(0.26) \qquad = 0.235 \qquad = 23.6\%$$

The portfolio standard deviation is given by

$$\sigma_p = \sqrt{w_A^2\sigma_A^2 + [1-w_A]^2\sigma_B^2 + 2w_A[1-w_A]\rho_{AB}\sigma_A\sigma_B}$$

$$= \sqrt{0.4^2(0.3^2) + 0.6^2(0.6^2) + 2(0.4)(0.6)(0.5)(0.3)(0.6)} = 0.4326$$

Illustration 35.

The standard deviations of the returns of two securities are 5% and 10%, with expected returns of 8% and 12% respectively. A portfolio is invested with 40% in the first security and 60% in the second security. Calculate the expected return and standard deviation of the portfolio assuming that the correlation coefficients between the returns of the securities are (1) 1.0 (2) 0 and (3) −1.0.

Solution:

(1) When correlation coefficient between the returns of the securities is 1.0

The expected portfolio return is given by

$$\hat{r}_P = W_1 \hat{r}_1 + W_2 \hat{r}_2$$

$$= 0.4(0.8\%)+0.6(0.12\%) \qquad = 10.4\%$$

The portfolio standard deviation is given by

$$\sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w\,w_2\,\rho_{12}\sigma_1\sigma_2}$$

$$= \sqrt{0.4^2(5\%^2) + 0.6^2(10\%^2) + 2(0.4)(0.6)(1)(5\%)(10\%)} \qquad = 8\%$$

When the correlation is 1, the expected return is 10.4% and the standard deviation of returns is 8.0%.

(2) When correlation coefficient between the returns of the securities is 0

The expected portfolio return is given by

$$\hat{r}_P = W_1 \hat{r}_1 + W_2 \hat{r}_2$$

$$= 0.4(0.8\%)+0.6(0.12\%) \qquad = 10.4\%$$

The portfolio standard deviation is given by

$$\sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w\,w_2\,\rho_{12}\sigma_1\sigma_2}$$

$$= \sqrt{0.4^2(5\%^2) + 0.6^2(10\%^2) + 2(0.4)(0.6)(0)(5\%)(10\%)} \qquad = 6.3\%$$

When the correlation is zero, the expected return is 10.4% and the standard deviation of returns is 6.3%.

(3) When correlation coefficient between the returns of the securities is - 1.0

The expected portfolio return is given by

$\hat{r}_P = W_1 \hat{r}_1 + W_2 \hat{r}_2$

$= 0.4(0.8\%)+0.6(0.12\%) \quad = 10.4\%$

The portfolio standard deviation is given by

$$\sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w w_2 \rho_{12}\sigma_1\sigma_2}$$

$$= \sqrt{0.4^2(5\%^2) + 0.6^2(10\%^2) + 2(0.4)(0.6)(-1)(5\%)(10\%)} \qquad = 4\%$$

When the correlation is -1, the expected return is 10.4% and the standard deviation of returns is 4.0%.

Illustration 36.

Calculate mean returns and standard deviation of returns for the following individual stocks.

YEAR	STOCK-X(%)	STOCK-Y (%)
2011	12.40	-19.00
2012	7.20	-23.40
2013	8.00	27.60
2014	4.80	-10.60
2015	0.40	19.00

Solution:

Table showing the necessary calculations

YEAR	RETURN(Xi)	RETURN(Yi)	$(Xi-\bar{X})^2$	$(Yi-\bar{Y})^2$
2011	12.40	-19.00	34.11	314
2012	7.20	-23.40	0.41	489.29
2013	8.00	27.60	2.07	834.05
2014	4.80	-10.60	3.10	86.86
2015	0.40	19.00	37.95	411.28
	32.80	-6.40	77.64	2135.48

Mean return from stock X = $\Sigma Xi/n$ =32.80/5 = 6.56%

Mean return from stock Y = $\Sigma Yi/n$ =-6.40/5 = -1.28%

$\sigma x^2 = \Sigma(Xi-\bar{X})^2/n-1$ =77.64/4 =19.41

$\sigma y^2 = \Sigma(Yi-\bar{Y})2/n-1$ =2135.48/4 =533.87

Standard deviation of returns from stock X (σx) =$\sqrt{19.41}$=4.41%

Standard deviation of returns from stock Y (σy) =$\sqrt{533.87}$ =23.11%

Illustration 37.

On the basis of the results from illustration 36, find out the portfolio return and portfolio risk assuming that

(i) weights are equal in both the stocks

(ii) weights are not given

Solution:

(i) Table showing the necessary calculations for covariance

YEAR	$(Xi-\bar{X})$	$(Yi-\bar{Y})$	$(Xi-\bar{X})(Yi-\bar{Y})$
2011	5.84	-17.72	-103.48
2012	0.64	-22.12	-14.16
2013	1.44	28.88	41.59
2014	-1.76	-9.32	16.40
2015	-6.16	20.28	-124.92
			-184.57

$W_x = 0.5 \quad W_y = 0.5$

Covariance (x,y) $= \Sigma(Xi-\bar{X})(Yi-\bar{Y}) / (n-1)$

$= -184.57/4 = -46.14$

Portfolio return (Rp) $= W_x \bar{X} + W_y \bar{Y}$

$= 1/2*6.56 + 1/2*(-1.28)$

$= 3.28-0.64 = 2.64\%$

Variance of return $(\sigma p^2) = w_x^2\sigma_x^2 + w_y^2\sigma_y^2 + 2w_x w_y \sigma_{xy}$

$= (0.5)^2(19.41) + (0.5)^2(533.87) + [2*0.5*0.5*(-46.14)]$

$= 4.85 + 133.47 - 23.07 = 115.25$

Portfolio risk (σp) is given by the Standard Deviation of return $= \sqrt{115.25} = 10.74\%$

(ii) Correlation coefficient $(\rho_{xy}) = \sigma_{xy} / \sigma_x\sigma_y$

$= -46.14/ (4.41*23.11) = -0.45$

$W_x = \sigma y^2 - \sigma_x\sigma_y\rho_{xy} / (\sigma x^2 + \sigma y^2 - 2\sigma_x\sigma_y\rho_{xy})$

$= (533.87-[4.41*23.11*(-0.45)])/(19.41+533.87-[2*4.41*23.11*(-0.45)]) = 0.90$

$W_y = 1 - W_x = 1 - 0.90 = 0.10$

$R_p = W_x \bar{X} + W_y \bar{Y}$

$= 0.90*6.56 + 0.10*(-1.28)$

$= 5.904 - 0.128 = 5.78\%$

$\sigma p^2 = W_x^2\sigma_x^2 + W_y^2\sigma_y^2 + 2W_x W_y \sigma_{xy}$

$= (0.90)2*19.41 + (0.10)2*533.87 + 2*0.90*0.10*(-46.14)$

$= 15.72 + 5.3387 - 8.3052 = 12.7535$

$\sigma p = \sqrt{12.7535} = 3.57\%$

EXERCISES

Short – Answer Type Questions:

1. State the basic difference between fundamental analysis and technical analysis.
2. What do you mean by leading, lagging and coincident indicators? Give an example of each.
3. What do you mean by 'support' and 'resistance' level?
4. Write a brief note on momentum analysis?
5. Differentiate 'systematic risk' from 'unsystematic risk' of investment.
6. Distinguish capital market line from security market line.
7. Is levered beta different from unlevered beta? Explain.

Long – Answer Type Questions:

8. Discuss the basic objectives of investment.
9. Explain how fundamental analysis on a company's share may be conducted and discuss the tools to be used for company analysis for the same.
10. Describe Dow Theory of technical analysis.
11. Discuss the capital asset pricing model clearly stating its assumptions. Explain how Arbitrage Pricing Theory differs from CAPM.
12. From the following information, ascertain the risk of the portfolio —

Securities	Standard Deviation	Proportion in Portfolio
a	2%	0.30
B	10%	0.20
c	8%	0.20
d	12%	0.30

Correlation Co-efficient of pairs of different pairs of securities are

aB - 0.60	Bc - 0.20
ac 0.40	Bd - 0.50
ad 0.30	cd 0.60

13. An investor estimates return on shares in two different companies under four different scenarios as under —

Scenario	Probability of its happening	Return on Security G	Return on Security H
1	0.20	12%	10%
2	0.30	15%	20%
3	0.40	19%	25%
4	0.10	25%	35%

(a) ascertain expected rate of return if the investor invests of all his funds in Security G alone, or in Security H alone?
(b) determine the preferred security based on return?
(c) ascertain the risk associated with each of the security?
(d) If the investor invests 40% in Security G & 60% in Security H, what is the expected return and the associated risk?

14. Given below the information on market rates of Returns and data from two companies P and Q.

	Year 2011	Year 2012	Year 2013
Market (%)	11.0	13.0	6.0
Company P (%)	13.0	11.5	9.8
Company Q (%)	11.0	10.5	9.5

Determine the beta coefficients of the Shares of Company P and Company Q.

15. From the following information pertaining to returns of Security D and the market for the past 4 Years,ascertain the value of Beta (β) of Security D —

Year	1	2	3	4
Security D	14%	15%	18%	22%
Market	9%	12%	15%	18%

16. An investor is seeking the price to pay for a security, whose standard deviation is 5.00%. the correlation coefficient for the security with the market is 0.80 and the market standard deviation is 4.40%. The return from Government securities is 5.20% and from the market portfolio is 9.80%. The investor knows that, by calculating the required return, he can then determine the price to pay for the security. What is the required return on security?

Section D

Financial Risk Managment

Study Note - 9

FINANCIAL RISKS

This Study Note includes

9.1 Concept of Risk and Risk Management

9.2 Operational Risk

9.3 Financial Risk – Meaning and Nature

– Market Risk

– Foreign Investent Risk

– Credit Risk

– Liquidity Risk

– Asset Backed Risk

9.4 Financial Risk Identification based on the Balance Sheet Information

9.1 CONCEPT OF RISK AND RISK MANAGEMENT

CIMA's official terminology defines 'risk' as a condition in which there exists a quantifiable dispersion in the possible outcomes from an activity, while 'uncertainty' as the inability to predict the outcomes from an activity. So, though the two terms 'risk' and 'uncertainty' are often used interchangeably, going by above definition risk is calculable but uncertainty is not. In the context of corporate world, risk can be defined as an event or possibility of an event which can impair corporate earnings or cash flows over short / medium / long term horizon and hence thwart value maximization objective of the firm. In short, the potential for future returns to vary from expected returns is risk involved in a course of action. Therefore, managing risks properly is an essential pre-requisite to survival of a business.

CIMA further classifies risks faced by a business into four broad types – operational risk, financial risk, environmental risk and reputation risk. 'Operational risk' arises out of activities carried out within an organization, while 'financial risk' is an outcome of financial transactions undertaken by the organization with the outside world. But both these types of risk are firm-specific in nature, and are accentuated by external factors like impact of legislative changes, economic fluctuations, natural disasters, social unrest etc. which together are clubbed under 'environmental risk'. The failure of an organization to address concerns and expectations of the regulators, competitors, and other stakeholders and society at large may result into loss of reputation of the business, popularly known as 'reputation risk'. Each of these risks has its own specificity demanding a separate treatment, yet it is next to impossible for any organization to give equal attention to all the risks it faces. Moreover, risk cannot and should not be eliminated / avoided altogether. There is hardly any activity which is devoid of risk, and there exists a fundamental relationship between risk and return - the greater the risk involved, the greater the possibility of earning higher return. So, an organization must be pro-active in managing and undertaking reasonable and well understood risks to earn returns; rather than ignoring and avoiding risks.

'Risk management' has been defined by CIMA as the process of understanding and managing the risks that an organization is inevitable subject to in attempting to achieve its corporate objectives. Implied by the definition are the four basic steps of risk management – risk identification, risk quantification, risk treatment and monitoring risk treatment. 'Risk identification' involves identifying risk exposures of an organization, understanding their relevance in terms of their impact on survival of the business and prioritizing them, and determining an appropriate level of risk tolerance for the business. Once a thorough understanding of risk has grown in the first step, the next step is to quantify risk in terms of probability of loss and quantum of loss. After quantification, specific strategies are adopted to mitigate or treat risk in order of priority. Finally, feedback on impact of risk mitigation is obtained to determine

whether any modification of the risk management system is needed. This means that taken actions should be continuously monitored and controlled to check up their results, compare them to the plan and introduce modification if it is required. Risk monitoring enables the company to forecast the level of risk and prepare the company's actions in future. Thus, risk management is a continuous process.

Risk treatment / mitigation strategies include different scenarios of actions that are prepared for each type of risk. The company can use a variety of risk management tools, both traditional (e.g. insurance) and modern ones (e.g. risk diversification, derivatives etc.), that should be tailored to company's unique situation and needs. The selection of risk mitigation strategies depend on how risk manager perceives risk. If he views risk as a threat or hazard, then he would always try to adopt strategies that would reduce, if not eliminate the possibility of occurrence of risk event. But if he perceives risk as an opportunity to earn returns, then he would adopt risk mitigation strategies that would minimize the loss and maximize the profit potential. Likewise, insurance is a risk sharing strategy wherein the party originally exposed to risk retains a portion of risk, and transfers the balance to other party who is willing to seek the opportunity lying behind risk. On the other hand, diversification is a method of reducing risk where a combination of similar assets is selected to offset the movements of each other, while hedging involves combining an asset with its derivative to reduce risk by way of offsetting movements in the two instruments. For instance, when investing in a stock it is possible to buy an option to sell that stock at a defined price at some point in the future. The combined portfolio of stock and option is now much less likely to move below a given value.

A key issue in both diversification and hedging is the correlation between assets, the benefits increasing with lower correlation. However this is not an observable quantity, since the future return on any asset can never be known with complete certainty. This was a serious issue in the Late-2000s recession when assets that had previously had small or even negative correlations suddenly started moving in the same direction causing severe financial stress to market participants who had believed that their diversification would protect them against any plausible market conditions, including funds that had been explicitly set up to avoid being affected in this way.

Diversification, however, has costs. Correlations must be identified and understood, and since they are not constant it may be necessary to rebalance the portfolio which incurs transaction costs due to buying and selling of assets. There is also the risk that as an investor or fund manager diversifies his ability to monitor and understand, the assets may decline leading to the possibility of losses due to poor decisions or unforeseen correlations.

9.2 OPERATIONAL RISK

An operational risk is defined as a risk incurred by an organization's internal activities. Operational risk is the broad discipline focusing on the risks arising from the people, systems and processes through which a company operates. It can also include other classes of risk, such as fraud, legal risks, physical or environmental risks.

A widely used definition of operational risk is the one contained in the Basel II regulations. This definition states that operational risk is the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events. What it means is that it is a form of risk that summarizes the risks a company or firm undertakes when it attempts to operate within a given field or industry. Operational risk is the risk that is not inherent in financial, systematic or market-wide risk. It is the risk remaining after determining financing and systematic risk, and includes risks resulting from breakdowns in internal procedures, people and systems.

Examples of operational risk losses include: internal frauds (insider trading, misappropriation of assets) or external frauds like theft, natural disasters like terrorism or system related failures like M&A related disruption and other technological breakdowns. However, operational risk is harder to quantify and model than market and credit risks.

Assessing Operational Risk

Operational risk management differs from other types of risk, because it is not used to generate profit (e.g. credit risk is exploited by lending institutions to create profit, market risk is exploited by traders and fund managers, and insurance risk is exploited by insurers). They all, however, manage operational risk to keep losses within their risk appetite - the amount of risk they are prepared to accept in pursuit of their objectives. What this means in practical terms is that organizations accept that their people, processes and systems are imperfect, and that losses will arise from errors and ineffective operations. The size of the loss they are prepared to accept, because the cost

of correcting the errors or improving the systems is disproportionate to the benefit they will receive, determines their appetite for operational risk. However, it can be mitigated to some extent by way of internal control and insurance.

9.3 FINANCIAL RISK – MEANING AND NATURE

Financial risk can best be thought of as the variability in earnings or cash flows and market values caused by unpredictable changes in commodity prices, security prices, interest rates and exchange rates, or due to non-fulfillment of obligations by counterparties in financial transactions. Financial risk caused by unfavorable movements of market prices of financial variables is referred to as market risk, while that arising due to non-fulfillment of contractual obligations is known as credit risk, and liquidity risk.

MARKET RISK

Market risk or price risk is the risk of uncertain movements and adverse fluctuations in the financial market variables like security prices, commodity prices, interest rates and exchange rates. Price is a market determined measure of value. A buyer's intention is to pay the least possible price for the security or commodity it wants to sell and hence fears a potential rise in prices at the time of purchase. On the other hand, a seller's intention is to sell the security or commodity for the highest possible price and fears a potential fall in prices at the time of sale. Thus, the possibility of not realizing the desired price is known as price risk.

In short, the possibility for an investor to experience losses due to factors that affect the overall performance of the financial markets is market risk. The risk that a major natural disaster will cause a decline in the market as a whole is an example of market risk, other examples of market risk are recessions, political turmoil, changes in interest rates and terrorist attacks, credit policy etc.

Market risk is the risk of losses in positions arising from movements in market prices. Some market risks include:

- Equity risk, the risk that stock prices or stock indices values and/or their implied volatility may change.
- Interest rate risk, the risk that interest rates (e.g. Libor, Euribor, etc.) may fluctuate.
- Currency risk, the risk of fluctuations in foreign exchange rates (e.g. EUR/USD, EUR/GBP, etc.).
- Commodity risk, the risk that commodity prices (e.g. corn, copper, crude oil, etc.) may change adversely.

Assessing and Mitigating Market Risk

- As with other forms of risk, the potential loss amount due to market risk may be measured in a number of ways or conventions. Traditionally, one convention is to use Value at Risk (VaR). The conventions of using Value at risk are well established and accepted in the short-term risk management practice. However, it contains a number of limiting assumptions that constrain its accuracy. The first assumption is that the composition of the portfolio measured remains unchanged over the specified period. Over short time horizons, this limiting assumption is often regarded as reasonable. However, over longer time horizons, many of the positions in the portfolio may have been changed. The Value at Risk of the unchanged portfolio is no longer relevant.
- The Variance Covariance and Historical Simulation approach to calculate Value at Risk also assumes that historical correlations are stable and will not change in the future or breakdown under times of market stress.
- In addition, care has to be taken regarding the intervening cash flow, embedded options, changes in floating rate interest rates of the financial positions in the portfolio. They cannot be ignored if their impact can be large.
- Market risk cannot be eliminated through diversification, though it can be hedged against.
- Financial risk, market risk, and even inflation risk, can at least partially be moderated by diversification. The returns from different assets are highly unlikely to be perfectly correlated and the correlation may sometimes be negative. However, share prices are driven by many factors, such as the general health of the economy which will increase the correlation and reduce the benefit of diversification. If one constructs a portfolio

by including a wide variety of equities, it will tend to exhibit the same risk and return characteristics as the market as a whole, which many investors see as an attractive prospect. However, history shows that even over substantial periods of time there is a wide range of returns that an index fund may experience; so an index fund by itself is not "fully diversified". Greater diversification can be obtained by diversifying across asset classes; for instance a portfolio of many bonds and many equities can be constructed in order to further narrow the dispersion of possible portfolio outcomes.

FOREIGN INVESTMENT RISK

Foreign Investment Risk is associated with investment in foreign securities and assessing foreign investment risk means looking closely at what is happening in the country of origin of security. The general economy of that country will have some impact on the future business operations of the issuer. If there is evidence that the economy is about to enter some sort of downturn, care must be taken to determine how much impact that change would have on the value of the investment opportunity. The investor can determine if the shift in the economy will last long enough to have a detrimental effect on the investment, and if there is a good chance the investment would rebound and earn a significant profit once the economy recovers.

Along with the present and future state of the economy, evaluating foreign investment risk also involves considering the degree of political risk associated with the holding. Political shifts could undermine confidence in the issuer in some cases. At other times, a new political regime could also mean changes in foreign exchange rates that negatively impact the value of the asset, or even shifts in foreign withholding taxes in the country of origin or the home country of the investor. Understanding what could happen, and how that could impact the returns generated by the acquired asset, will make it much easier to determine if the foreign investment risk is worth it, or if going with a different investment opportunity would be a better decision.

Example:

- Changes in currency exchange rates: When the exchange rate between the foreign currency of an international investment and the U.S. dollar changes, it can increase or reduce your investment return. How does this work? Foreign companies trade and pay dividends in the currency of their local market. When you receive dividend or sell your international investment, you will need to convert the cash you received into U.S. dollars. During a period when the foreign currency is strong compared to the U.S. dollar, this strength increases your investment return because your foreign earnings translate into more dollars. If the foreign currency weakens compared to the U.S. dollar, this weakness reduces your investment return because your earnings translate into fewer dollars. In addition to exchange rates, you should be aware that some countries may impose foreign currency controls that restrict or delay you from moving currency out of a country.
- Dramatic changes in market value: Foreign markets, like all markets, can experience dramatic changes in market value. *One way to reduce the impact of these price changes is to invest for the long term and try to ride out sharp upswings and downturns in the market.* Individual investors frequently lose money when they try to "time" the market in the United States and are even less likely to succeed in a foreign market. When you "time" the market, you have to make two astute decisions - deciding when to get out before prices fall and when to get back in before prices rise again.
- Political, economic and social events: It is difficult for investors to understand all the political, economic, and social factors that influence foreign markets. These factors provide diversification, but they also contribute to the risk of international investing.
- Lack of liquidity: Foreign markets may have lower trading volumes and fewer listed companies. They may only be open a few hours a day. Some countries restrict the amount or type of stocks that foreign investors may purchase. You may have to pay premium prices to buy a foreign security and have difficulty finding a buyer when you want to sell.
- Less information: Many foreign companies do not provide investors with the same type of information as U.S. public companies. It may be difficult to locate up-to-date information, and the information the company publishes may not be in English.

- Reliance on foreign legal remedies: If you have a problem with your investment, you may not be able to sue the company in the United States. Even if you sue successfully in a U.S. court, you may not be able to collect on a U.S. judgment against a foreign company. You may have to rely on whatever legal remedies are available in the company's home country.
- Different market operations: Foreign markets often operate differently from the major U.S. trading markets. For example, there may be different periods for clearance and settlement of securities transactions. Some foreign markets may not report stock trades as quickly as U.S. markets. Rules providing for the safekeeping of shares held by custodian banks or depositories may not be as well developed in some foreign markets, with the risk that your shares may not be protected if the custodian has credit problems or fails.

CREDIT RISK

Credit risk refers to the risk that an obligor will default, either wilfully or due to incapacity on any type of debt by failing to make payments which it is obligated to do. The risk is primarily that of the lender and includes lost principal and interest, disruption to cash flows, and increased collection costs. The loss may be complete or partial and can arise in a number of circumstances. For example:

- A consumer may fail to make a payment due on a mortgage loan, credit card, line of credit, or other loan
- A company is unable to repay amounts secured by a fixed or floating charge over the assets of the company
- A business or consumer does not pay a trade invoice when due
- A business does not pay an employee's earned wages when due
- A business or government bond issuer does not make a payment on a coupon or principal payment when due
- An insolvent insurance company does not pay a policy obligation
- An insolvent bank won't return funds to a depositor
- A government grants bankruptcy protection to an insolvent consumer or business

To reduce the lender's credit risk, the lender may perform a credit check on the prospective borrower, may require the borrower to take out appropriate insurance, such as mortgage insurance or seek security or guarantees of third parties, besides other possible strategies. In general, the higher the risk, the higher will be the interest rate that the debtor will be asked to pay on the debt.

Types of Credit Risk

Credit risk can be classified in the following way:

- Credit default risk - The risk of loss arising from a debtor being unlikely to pay its loan obligations in full or the debtor is more than 90 days past due on any material credit obligation; default risk may impact all credit-sensitive transactions, including loans, securities and derivatives.
- Counterparty risk – The risk of loss arising from non performance of counterparty in trading activities such as buying and selling of commodities, securities, derivatives and foreign exchange transactions. If inability to perform contractual obligations in such trading activities is communicated before the settlement date of the transaction, then counterparty risk is in the form of pre-settlement risk, while if one of the counterparty defaults on its obligations on the settlement date, the counterparty risk is in the form of settlement risk.
- Concentration risk - The risk associated with any single exposure or group of exposures with the potential to produce large enough losses to threaten a lender's core operations. It may arise in the form of single name concentration or industry concentration.
- Country risk - The risk of loss arising from sovereign state freezing foreign currency payments (transfer/conversion risk) or when it defaults on its obligations (sovereign risk).

Assessing and Mitigating Credit Risk

Significant resources and sophisticated programs are used to analyze and manage risk. Some companies run a credit risk department whose job is to assess the financial health of their customers, and extend credit (or not) accordingly. They may use in house programs to advice on avoiding, reducing and transferring risk. They also use third party provided intelligence. Companies like Standard & Poor's, Moody's, Fitch Ratings, and Dun and Bradstreet provide such information for a fee. Most lenders employ their own models (credit scorecards) to rank potential and existing customers according to risk, and then apply appropriate strategies. With products such as unsecured personal loans or mortgages, lenders charge a higher price for higher risk customers and vice versa. With revolving products such as credit cards and overdrafts, risk is controlled through the setting of credit limits. Some products also require security, most commonly in the form of property.

Credit scoring models also form part of the framework used by banks or lending institutions to grant credit to clients. For corporate and commercial borrowers, these models generally have qualitative and quantitative sections outlining various aspects of the risk including, but not limited to, operating experience, management expertise, asset quality, and leverage and liquidity ratios, respectively. Once this information has been fully reviewed by credit officers and credit committees, the lender provides the funds subject to the terms and conditions presented within the contract (as outlined above).

LIQUIDITY RISK

In finance, liquidity risk is the risk that a given security or asset cannot be traded quickly enough in the market at the desired price to prevent a loss (or make the required profit). This kind of liquidity risk is more commonly known as '*market liquidity risk*' as it reflects the inability to sell an asset due to lack of liquidity in the market. Another type of liquidity risk is '*funding liquidity risk*' which refers to the inability of a firm in meeting its contractual liabilities / obligations as and when they fall due thereby making it difficult for the firm to roll over its funds at reasonable cost.

Example:

Market Liquidity risk generally arises when a business or individual with immediate cash needs, holds a valuable asset that it cannot trade or sell at market value due to a lack of buyers, or due to an inefficient where it is difficult to bring buyers and sellers together.

For example, consider a $1,000,000 home with no buyers. The home obviously has value, but due to market conditions at the time, there may be no interested buyers. In better economic times when market conditions improve and demand increases, the house may sell for well above that price. However, due to the home owner's need of cash to meet near term financial demands, the owner may be unable to wait and have no other choice but to sell the house in an illiquid market at a significant loss. Hence, the market liquidity risk of holding this asset.

Causes of Liquidity Risk

Market liquidity risk arises from situations in which a party interested in trading an asset cannot do it because nobody in the market wants to trade for that asset. Liquidity risk becomes particularly important to parties who are about to hold or currently hold an asset, since it affects their ability to trade.

Manifestation of liquidity risk is very different from a drop of price to zero. In case of a drop of an asset's price to zero, the market is saying that the asset is worthless. However, if one party cannot find another party interested in trading the asset, this can potentially be only a problem of the market participants with finding each other. This is why liquidity risk is usually found to be higher in emerging markets or low-volume, less-structured markets.

On the other hand, funding liquidity risk is a financial risk due to uncertain liquidity. An institution might lose liquidity if its credit rating falls, it experiences sudden unexpected cash outflows, or some other event causes counterparties to avoid trading with or lending to the institution. A firm is also exposed to liquidity risk if markets on which it depends are subject to loss of liquidity.

Relationship between Funding and Market Liquidity Risks and between Liquidity Risk and other types of risks

Market and funding liquidity risks compound each other as it is difficult to sell when other investors face funding problems and it is difficult to get funding when the collateral is hard to sell. Liquidity risk also tends to compound

other risks. If a trading organization has a position in an illiquid asset, its limited ability to liquidate that position at short notice will compound its market risk. Suppose a firm has offsetting cash flows with two different counterparties on a given day. If the counterparty that owes it a payment defaults, the firm will have to raise cash from other sources to make its payment. Should it be unable to do so, it too will default. Here, liquidity risk is compounding credit risk.

Assessing and Mitigating Liquidity Risk

A position can be hedged against market risk but still entail liquidity risk. This is true in the above credit risk example—the two payments are offsetting, so they entail credit risk but not market risk. Accordingly, liquidity risk has to be managed in addition to market, credit and other risks. Because of its tendency to compound other risks, it is difficult or impossible to isolate liquidity risk. In all but the most simple of circumstances, comprehensive metrics of liquidity risk do not exist. Certain techniques of asset-liability management can be applied to assessing liquidity risk. A simple test for liquidity risk is to look at future net cash flows on a day-by-day basis. Any day that has a sizeable negative net cash flow is of concern. Such an analysis can be supplemented with stress testing. Look at net cash flows on a day-to-day basis assuming that an important counterparty defaults.

Analyses such as these cannot easily take into account contingent cash flows, such as cash flows from derivatives or mortgage-backed securities. If an organization's cash flows are largely contingent, liquidity risk may be assessed using some form of scenario analysis. A general approach using scenario analysis might entail the following high-level steps:

- Construct multiple scenarios for market movements and defaults over a given period of time.
- Assess day-to-day cash flows under each scenario.

Because components of balance sheets differ so significantly from one organization to the next, there is little standardization in how such analyses are implemented.

Regulators are primarily concerned about systemic and implications of liquidity risk.

ASSET-BACKED RISK

It is the risk that the changes in values of one or more assets that support an asset-backed security will significantly impact the value of the supported security. This kind of risk especially arises in securitisation transactions whereby cash flows due on assets/receivables are pooled together to issue securities, the servicing of which is backed by the cash flows on such underlying assets. The factors that may cause changes in values of assets backing the securities include interest rate, term modification, and prepayment risk.

Prepayment Risk: Prepayment is the event that a borrower prepays the loan prior to the scheduled repayment date. Prepayment takes place when the borrowers can benefit from it, for example, when the borrowers can refinance the loan at a lower interest rate from another lender. Prepayments result in loss of future interest collections because the loan is paid back pre-maturely and can be harmful to the loan-backed securities, especially for long term securities. A second, and maybe more important consequence of prepayments, is the impudence of un-scheduled prepayment of principal that will be distributed among the securities according to the priority of payments, reducing the outstanding principal amount, and thereby affecting their weighted average life. If an investor is concerned about a shortening of the term we speak about contraction risk and the opposite would be the extension risk, the risk that the weighted average life of the security is extended. In some circumstances, it will be borrowers with good credit quality that prepay and the credit quality pool backing securities will deteriorate as a result. Other circumstances will lead to the opposite situation.

Example:

Let's assume Company XYZ is in the business of making auto loans. When it makes a loan, it gives cash to the borrower and the borrower agrees to repay that amount with interest.

But if Company XYZ wants to make more loans, it may find itself needing cash to do so. This is where asset-backed securities come in.

Company XYZ can sell its auto loans to special purpose vehicle (SPV) ABC Investments. As a result, Company XYZ receives cash to make more loans, and it transfers those auto loans from its balance sheet to ABC's balance sheet.

ABC Investments may group these auto loans into tranches--groups of loans that may have common characteristics such as maturity or delinquency risk. ABC then issues a security similar to a bond that essentially keeps an administrative fee for itself and then "forwards" the remaining proceeds from the auto loans to the investors.

The asset-backed securities trade on various exchanges, similar to any other security. Public ABS offerings must satisfy securities markets' requirements including providing regular financial disclosures to investors. Ratings agencies may assign a rating to the securities based largely on the probability that the underlying expected cash flows will materialize. In some cases, the ABS will receive higher credit ratings than the issuer has for itself; this is a reflection of the risk associated with the certainty of the ABS's underlying cash flows.

Why it Matters: Asset-backed securities have several important benefits. Primarily, they give lenders a way to obtain cash for more lending, and they offer investors a way to invest in a diversified group of income-producing assets.

The ABS market is not always as overvalued as the markets for other income-producing securities such as corporate bonds or Treasuries. For this reason, investors must carefully examine the features and underlying assets of a particular ABS before investing.

Note that the ABS are subject to prepayment risk; that is, if any of the borrowers pay their car loans off early, this reduces the cash flows ultimately going to the ABS investors.

9.4 FINANCIAL RISK IDENTIFICATION BASED ON THE BALANCE SHEET INFORMATION

The exposure to risk in modern economy is constantly growing. All enterprises have to take up different types of risks. The potential of identifying financial risk based on the balance sheet information is of immense importance.

Modern society is often described as "the society of risk", which means that the social production of wealth is accompanied by the social production of risk . Therefore, enterprises operating in such environment, are forced to take up different types of risk, in order to develop themselves and increase their effectiveness. Thus their exposure to risk is constantly growing.

There is a huge variety of corporate risks that are analyzed and classified taking into account different types of criteria. One of the most important types of corporate risk is financial risk.

There are many risk assessment methods – one of them is financial analysis, that can be used both at the stage of risk analysis and risk monitoring. Financial analysis is a financial management tool that uses different sources of information concerning company's past and current activities as well as its present and future financial situation. The most important sources of information used in the financial analysis are financial statements provided by the accounting system, translating a company's diverse activities into a set of objective numbers that inform about the company's performance, problems and prospects. Financial data included in the financial statements can be used to identify the types of risk and their factors, to recognize the reasons and consequences of the corporate risk, to analyze the results of risk management tools and to forecast the level of risk in future.

It is worth mentioning that analysis of the financial risk can be prepared for internal purposes of the company and also for the external parties – that is any stakeholders that are interested in assessing the financial situation of the company (current and future) – these are mainly shareholders and potential investors, including creditors thinking about providing capital to the company. Risk analysis for this group of the statement users is a little bit different than for company's internal purposes – as they are interested in the overall company's risk to estimate risk premium included in the expected rate of return on investment made in the company.

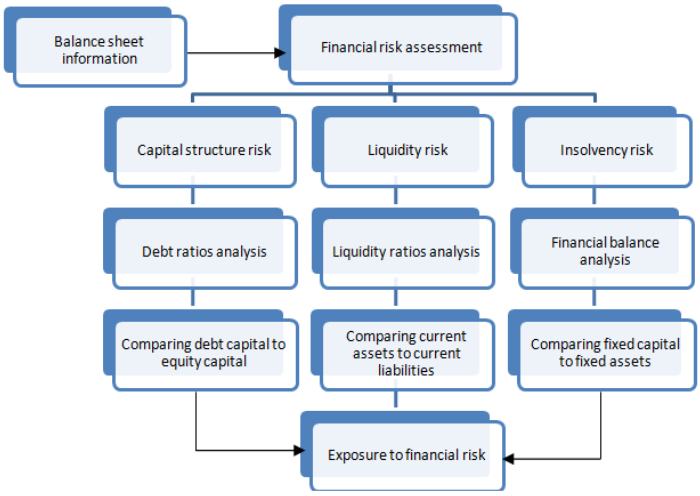
USING BALANCE SHEET INFORMATION TO ASSESS THE FINANCIAL RISK

The first element of the financial statement is the balance sheet presenting the company's financial position at a single point of time, including company's assets and the liability and equity claims against those assets. Basic elements of the balance sheet are presented in table 1.

Capital	Assets
Equity capital:	**Fixed assets:**
1. Common stock	1. Intangible assets
2. Additional paid-in capital	2. Net plant and equipment
3. Retained profit	3. Long-term accounts receivable
	4. Long-term investment
Debt capital:	**Current assets:**
1. Long-term debt capital	1. Inventory
2. Current liabilities	2. Accounts receivable
	3. Short-term investment

Table 1: General Model of a Balance Sheet

By using balance sheet information the three components of the financial risk can be identified and analyzed: capital structure risk, liquidity risk and insolvency risk.



Financial Risk- its Components and Identification based on the Balance Sheet Information

To analyze the capital structure risk one should calculate the D/E ratio (debt-to-equity ratio) comparing debt to equity capital used by the company to finance its assets. D/E ratio is one of the most important indebtedness ratios showing the financial leverage used by the company. The higher this ratio is, the higher financial risk connected with using debt capital by the company. The optimal value for this ratio is described as 1 till 3 – in this situation the company can use all the advantages of the debt capital (mainly tax shield) without too high risk of financial distress. Obviously, in real world each company should look for its optimal value taking into account its characteristics and unique situation – this problem is connected with searching for the optimal capital structure.

When more detailed information on capital structure is needed there can be calculated additional ratios, such as:

- debt to assets ratio (D/A) showing the part of the company's assets financed by debt capital;
- equity to assets ratio showing part of the assets that belongs to the shareholders;
- retained profit to assets ratio showing part of the assets financed by the internal equity capital generated by the company itself, thus showing its independence from external sources of finance;
- long-term debt capital to assets – showing part of the assets financed by long-term debt capital;
- long-term debt capital to equity – showing the level of financial leverage taking into account only long-term debt;
- interest-bearing liabilities to equity – showing the level of financial leverage taking into account only debt capital whose usage is connected with interest payments;
- long-term debt capital to total debt showing the structure of the company's liabilities.

More detailed ratios describing company's capital structure can be constructed when needed.

The second element of the financial risk analysis is connected with liquidity. The basic analysis of the company's liquidity risk can be conducted by the usage of liquidity ratios based on the balance sheet information. There are three basic liquidity ratios: current, quick and cash ratio.

Current ratio equals to current assets divided by current liabilities and indicates the amount of current assets available to meet all of the maturing obligations listed under current liabilities. The optimal value for this ratio is between 1.5-2.0 - this means that below 1.5 the company may have problems with paying its current obligations on time, and in the opposite situation, when it is higher than 2.0 - this may lead to lower efficiency due to excess cash balances, slow paying receivables or obsolete inventory (over liquidity).

Second liquidity ratio is more conservative as it takes into account current assets excluding inventory as the least liquid part of them. The general standard for quick ratio is 1 to 1 between current assets without inventory and current liabilities.

Similar information is provided by the cash ratio, in which cash is divided by current liabilities. As these ratios are calculated by the usage of balance sheet information, their results are static, and the data are valid only for the balance sheet day. To analyze the dynamic changes in the liquidity risk, the managers can use the cash flow statement and the cash sufficiency ratios (cash coverage ratios).

In addition to liquidity ratios, in order to assess the liquidity risk of the company, the level of net working capital can be calculated and analyzed. Net working capital is defined as part of the company's current assets financed by the fixed capital and it can be calculated as the difference between current assets and current liabilities. Net working capital can be compared to total assets indicating the percentage of assets that a company carries as net working capital. The main role of the net working capital in the company is the additional liquidity reserve and it is considered as one of the most important aspects of the company's strength. The higher level of net working capital, the lower liquidity risk due to a stronger liquidity condition, however the problem of the company's efficiency should be taken into consideration as well, as higher level of net working capital is connected with higher cost of capital. So after some point, further increase in net working capital becomes ineffective.

The third element of the financial risk assessment is connected with long-term stability and financial balance of the company. It is recognized that the company keeps financial balance, if its long-term assets are financed by long-term sources of finance, and short-term assets by short-term sources of funds. Otherwise, company looses its financial balance, which may lead to financial instability and problems with long-term solvency of the company that may result in bankruptcy.

To analyze the financial balance of the company, two golden rules can be used. According to the first rule (I), fixed assets should be covered by equity capital; only in this situation the financial balance is maintained. Second rule (II) is less restrictive, as according to it, fixed assets may be financed by fixed capital including equity capital together with long-term debt capital. If at least, the second golden rule (II) is maintained, the company keeps financial balance and its insolvency risk is very low. Otherwise the risk of potential bankruptcy is significant.

EXERCISES

Short – Answer Type Questions

1. What do you mean by the terms 'risk' and 'risk management'?
2. What are the basic steps in risk management?
3. State the basic difference between 'hedging' and 'diversification'.
4. Differentiate 'operational risk' from 'financial risk'.

Long – Answer Type Questions

5. What do you understand by 'market risk'? What are its basic types? How would you assess and mitigate market risk? Is foreign investment risk a part of market risk? Explain.
6. Briefly discuss 'credit risk' and explain how one can assess and mitigate such risk. Does 'asset backed risk' have any relation with credit risk? Explain why asset backed risk is also a matter of concern while managing risk.
7. Write a brief note on 'liquidity risk' and examine its relationship with the other types of risks.
8. Discuss how a risk manager can identify financial risks faced by a firm from the balance sheet information.

Study Note - 10

FINANCIAL DERIVATIVES-INSTRUMENTS FOR RISK MANAGMENT

This Study Note includes

10.1 Forward & Futures
- **Meaning and Difference between Forwards and Future,**
- **Stock Futures,**
- **Hedging through futures and benefits of Future Market,**
- **Components of Future Price,**
- **Index based Futures,**
- **Margins in the derivatives market**

10.2 Options
- **Meaning, Types of Options (Call & Put),**
- **Put-Call Parity theory,**
- **Determination of Option Premium,**
- **Strategies in Options market – spread, bull spread, butterfly spread,**
- **Combination, Straddle, Strangle, Strips and Straps,**
- **Valuation of Options using-Option Equivalent, Stock Equivalent,**
- **Binomial tree approach, Risk neutral and Black-Scholes Model**

10.3 Swaps and Swaptions
- **Meaning, Types, Features, benefits of Swaps, Interest Rate Swaps**

10.4 Interest Rate Deriatives
- **Meaning, Interest Rate Caps, Interest Rate Collars, Forward Rate Agreements**

10.1 FORWARD & FUTURES

Introduction

Derivatives can be seen as bets based on the behaviour of the underlying basic assets. A derivative can also be regarded as a kind of asset, the ownership of which entitles the holder to receive from the seller a cash payment or possibly a series of cash payments at some point in the future, depending in some pre-specified way on the behaviour of the underlying assets over the relevant time interval. In some instances, instead of a 'cash' payment another asset might be delivered. For example, a basic stock option allows the holder to purchase shares at some point in the future for a pre-specified price. In general an option is a derivative with a specified payoff function that can depend on the prices of one or more underlying assets. It will have specific dates when it can be exercised, that is, when the owner of the option can demand payment, based on the value of the payoff function.

Derivatives are used for a variety of purposes. They can be used to reduce risk by allowing the investor to hedge an investment or exposure, and hence function as a sort of insurance policy against adverse market movements. For example, if a firm needs a particular commodity, such as petroleum, on a regular basis, then they can guard against a rise in the price of oil by purchasing a call option. If the price of oil remains low, then the option is not exercised and the oil is bought at the current price in the market, while if the price rises above the strike, then the option is exercised to buy oil at a below-market value.

Derivatives can also be used to gain extra leverage for specialized market speculation. In other words, if an investor has reason to believe that the market is going to move in a particular way, then a larger profit per dollar invested can be made by buying suitable derivatives, rather than the underlying asset. But similarly, if the investment

decision is wrong, the investor runs the risk of making a correspondingly larger loss.

Derivatives: Meaning, Benefits and Outcomes

The Securities Contracts (Regulation) Act of 1956 defines the word "derivative" includes as —

(A) a security derived from a debt instrument, share, loan, whether secured or unsecured, risk instrument or contract for differences or any other form of security;

(B) a contract which derives its value from the prices, or index of prices, of underlying securities;]

Financial derivatives are instruments whose value depends, or derives from, one or more underlying financial assets. The underlying assets include financial securities, security indexes, reference rates, and some combination of them.

The most common types of derivatives are forwards, futures, swaps and options.

These basic instruments can be combined to create numerous more complex derivatives. Also, financial derivatives exist in two forms: exchange-listed and OTC (over-the-counter). Exchange-listed derivative products are composed of financial futures and options while OTC derivative products include financial swaps and forwards, as well as some financial options.

One of the most important functions of financial derivatives is risk management; it is already widely recognized by most market participants. Recent publicity of losses in derivative transactions casts some doubt on the soundness of using derivatives. However, many have realized that properly managed derivatives are a key to keeping many economic/financial systems competitive, and losses mostly result from speculation and other factors not directly related to derivatives. Better understanding of financial derivatives' uses is necessary and important to keep derivative markets growing and healthy.

Benefits of Using Financial Derivatives

The general benefits of using financial derivatives are as follows:

1. A prudent use of financial derivatives can provide a new mechanism to manage or reduce various business risks at low transaction costs.
2. The innovative use of financial derivatives can greatly help end-users on cut their financing cost.
3. Financial derivatives can provide more access to financial markets, especially to unfamiliar ones at lower costs. Put another way, they can create more complete markets to investors.
4. Financial derivative instruments play an important role in asset management due to their lower transaction costs relative to the spot market instruments.
5. The users of financial derivatives can expect to be offered opportunities on taking advantage of asymmetries in tax and regulatory requirements across different countries, markets or securities.
6. Financial derivatives can be used to speculate and make profits by assuming certain risks, probably with suitable degree.

Derivatives: Types

The most common types of derivatives are forwards, futures, swaps and options.

Forward Contract: It is an agreement to buy or sell an asset at a certain future time for a certain price. It can be contrasted with a spot contract, which is an agreement to buy or sell an asset today. A forward contract is traded in the over-the-counter market—usually between two financial institutions or between a financial institution and one of its clients.

Future Contracts: Unlike forward contracts, futures contracts are normally traded on an exchange. To make trading possible, the exchange specifies certain standardized features of the contract. As the two parties to the contract do not necessarily know each other, the exchange also provides a mechanism that gives the two parties a guarantee that the contract will be honored.

Option Contracts: Options are traded both on exchanges and in the over-the-counter market. There are two types of options. A call option gives the holder the right to buy the underlying asset by a certain date for a certain price. A put option gives the holder the right to sell the underlying asset by a certain date for a certain price.

Swap: It is an agreement between counterparties to make periodic payments, based on a specified financial asset, to each other for a specified period.

Other types of derivatives are:

Warrants: Longer-dated options are called warrants and are generally traded over-the-counter.

LEAPS: The acronym LEAPS means Long-Term Equity Anticipation Securities. These are options having a maturity of upto three years.

Baskets: Basket options are options on portfolios of underlying assets. The underlying asset is usually a moving average of a basket of assets. Equity index options are a form of basket options.

Swaptions: Swaptions are options to buy or sell a swap that will become operative at the expiry of the options.

Forward Contract and Futures Contacts

A futures contract is a contract between two parties to exchange assets or services at a specified time in the future at a price agreed upon at the time of the contract. In most conventionally traded futures contracts, one party agrees to deliver a commodity or security at some time in the future, in return for an agreement from the other party to pay an agreed upon price on delivery. The former is the seller of the futures contract, while the latter is the buyer.

Difference between Forward and Futures Contract

Forwards	Futures
It is a privately negotiated contract.	It is an exchange traded contract.
Forward contracts are non-standardized contract.	Future Contracts are standardized contracts.
Settlement dates can be set by the parties.	Fixed settlement dates as declared by the Exchange.
It involves high counter party risk.	Almost no counter party risk.

Valuing Futures and Forward Contracts

This chapter explores the pricing of futures contracts on a number of different assets - perishable commodities, storable commodities and financial assets - by setting up the basic arbitrage relationship between the futures contract and the underlying asset. It also examines the effects of transactions costs and trading restrictions on this relationship and on futures prices. Finally, the chapter reviews some of the evidence on the pricing of futures contracts.

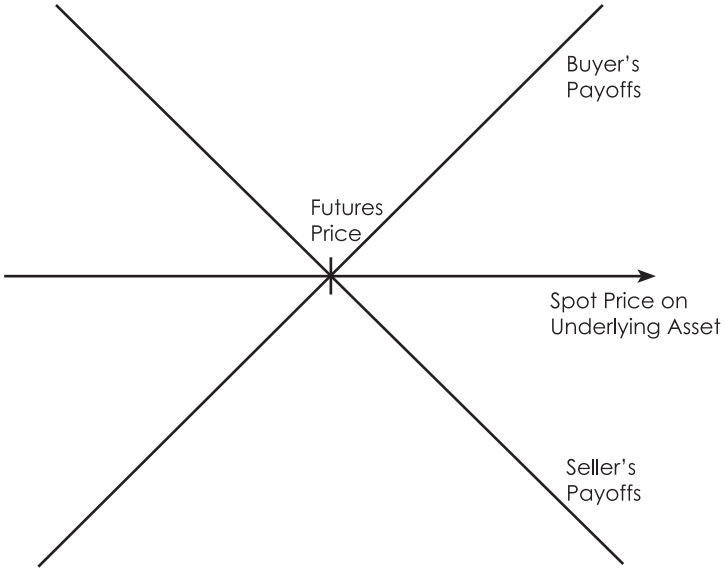
Futures, Forward and Option contracts

Futures, forward and option contracts are all viewed as derivative contracts because they derive their value from an underlying asset. There are however some key differences in the workings of these contracts.

How a Futures contract works

There are two parties to every futures contract - the seller of the contract, who agrees to deliver the asset at the specified time in the future, and the buyer of the contract, who agrees to pay a fixed price and take delivery of the asset.

Cash Flows on Futures Contracts



While a futures contract may be used by a buyer or seller to hedge other positions in the same asset, price changes in the asset after the futures contract agreement is made provide gains to one party at the expense of the other. If the price of the underlying asset increases after the agreement is made, the buyer gains at the expense of the seller. If the price of the asset drops, the seller gains at the expense of the buyer.

Futures versus Forward contracts

While futures and forward contracts are similar in terms of their final results, a forward contract does not require that the parties to the contract settle up until the expiration of the contract. Settling up usually involves the loser (i.e., the party that guessed wrong on the direction of the price) paying the winner the difference between the contract price and the actual price. In a futures contract, the differences is settled every period, with the winner's account being credited with the difference, while the loser's account is reduced. This process is called **marking to the market**. While the net settlement is the same under the two approaches, the timing of the settlements is different and can lead to different prices for the two types of contracts . The difference is illustrated in the following example, using a futures contract in gold.

Example: Futures versus Forward Contracts - Gold Futures Contract

Assume that the spot price of gold is $400, and that a three-period futures contract on gold has a price of $415. The following table summarizes the cash flow to the buyer and seller of this contract on a futures and forward contract over the next 3 time periods, as the price of the gold futures contract changes.

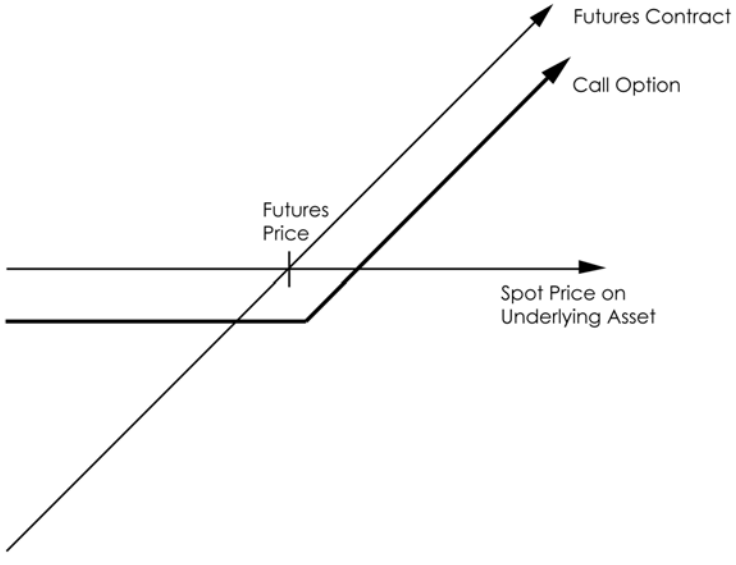
Time Period	Gold Futures contract	Buyer's c F: Forward	Seller's c F: Forward	Buyer's c F: Futures	Seller's c F: Futures
1	$420	$0	$0	$5	-$5
2	$430	$0	$0	$10	-$10
3	$425	$10	-$10	-$5	$5
Net		$10	-$10	$10	-$10

The net cash flow from the seller to the buyer is $10 in both cases, but the timing of the cash flows is different. On the forward contract, the settlement occurs at maturity. On the futures contract, the profits or losses are recorded each period.

Futures and Forward contracts versus Option contracts

While the difference between a futures and a forward contract may be subtle, the difference between these contracts and option contracts is much greater. In an options contract, the buyer is not obligated to fulfill his side of the bargain, which is to buy the asset at the agreed upon strike price in the case of a call option and to sell the asset at the strike price in the case of a put option. Consequently the buyer of an option will exercise the option only if it is in his or her best interests to do so, (i.e., if the asset price exceeds the strike price in a call option and vice versa in a put option). The buyer of the option, of course, pays for this privilege up front. In a futures contract, both the buyer and the seller are obligated to fulfill their sides of the agreement. Consequently, the buyer does not gain an advantage over the seller and should not have to pay an upfront price for the futures contract itself. Figure summarizes the differences in payoffs on the two types of contracts in a payoff diagram.

Buying a Futures Contract versus Buying a Call Option



Futures contracts: Features and advantages

A futures contract is an agreement between two parties. In a traded futures contract, an exchange acts as an intermediary and guarantor, and also standardizes and regulates how the contract is created and traded.



In this section, we will examine some of the **institutional features** of traded futures contracts.

1. Standardization

Traded futures contracts are standardized to ensure that contracts can be easily traded and priced. The standardization occurs at a number of levels.

(a) Asset Quality and Description: The type of asset that can be covered by the contract is clearly defined. For instance, a lumber futures contract traded on the Chicago Mercantile Exchange allows for the delivery of 110,000 board feet of lumber per contract. A treasury bond futures contract traded on the Chicago Board of Trade requires the delivery of bonds with a face value of $100,000 with a maturity of greater than 15 years.

(b) **Asset Quantity:** Each traded futures contract on an asset provides for the delivery of a specified quantity of the asset. For instance, a gold futures contract traded on the Chicago Board of trade requires the delivery of 100 ounces of gold atthe contracts expiration.The purpose of the standardization is to ensure that the futures contracts on an asset are perfect substitutes for each other. This allows for liquidity and also allows parties to a futures contract to get out of positions easily.

2. Price Limits

Futures exchanges generally impose 'price movement limits' on most futures contracts. For instance, the daily price movement limit on orange juice futures contract on the New York Board of Trade is 5 cents per pound or $750 per contract (which covers 15,000 pounds). If the price of the contract drops or increases by the amount of the price limit, trading is generally suspended for the day, though the exchange reserves the discretion to reopen trading in the contract later in the day. The rationale for introducing price limits is to prevent panic buying and selling on an asset, based upon faulty information or rumors, and to prevent overreaction to real information. By allowing investors more time to react to extreme information, it is argued, the price reaction will be more rational and reasoned.

3. Marking to Market

One of the unique features of futures contracts is that the positions of both buyers and sellers of the contracts are adjusted every day for the change in the market price of that day. In other words, the profits or losses associated with price movements are credited or debited from an investor's account even if he or she does not trade. This process is called marking to market.

4. Margin requirements for trading

In a futures agreement, there is no payment made by the buyer to the seller, nor does the seller have to show proof of physical ownership of the asset at the time of the agreement. In order to ensure, however, that the parties to the futures contract fulfill their sides of the agreement, they are required to deposit funds in a margin account. The amount that has to be deposited at the time of the contract is called the initial margin. As prices move subsequently, the contracts are marked to market, and the profits or losses are posted to the investor's account. The investor is allowed to withdraw any funds in the margin account in excess of the initial margin.

Advantages of trading in a Futures Market

(i) Quick and low cost transactions

(a) Futures contract can be created quickly at low cost

(b) The cost involved is insignificant as compared to the value of the underlying asset

(ii) Price Discovery Function

The pricing of futures contracts incorporates a set of information based on which buyers/sellers or producers/ consumers can get a fair idea of demand and supply of the stock/commodity and consequently the futures spot price. This is known as the 'price discovery function' of the futures.

(iii) Advantages to Informed Individuals

Individuals who have superior information can operate in futures market and impart efficiency to the stock/ commodity's price determination process.

(iv) Protection

Index futures contracts are used as hedging tools by investors.

(v) Flexibility

With index futures, one can increase or decrease exposure to large capitalization stocks with a single trade, thereby saving huge transaction costs, time etc. by avoiding placing number of orders to buy stocks individually. It takes only one trade to participate.

(vi) Integrity

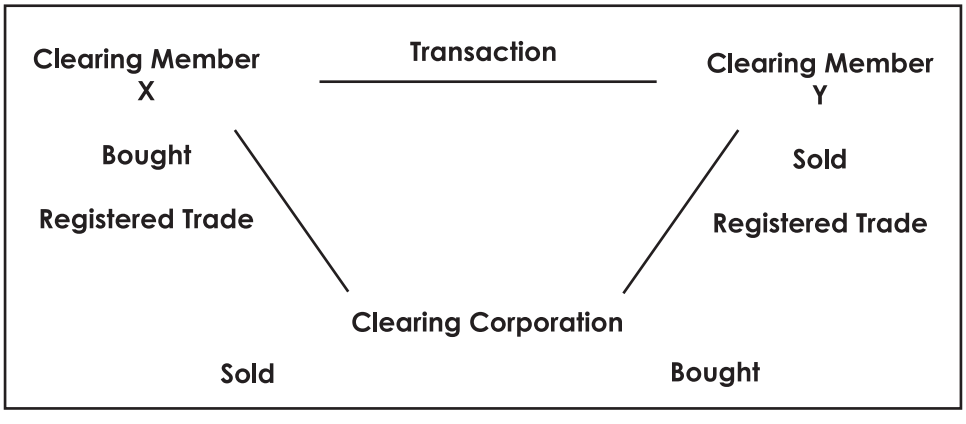
A key element of exchange-traded futures is that parties to the contract are not exposed to the risk of counterparty default. Futures exchanges have perfected systems of margins to protect market participants.

(vii) Leverage

A futures contract can be entered into by deploying just 10% of the total value of the contract, thereby providing the buyer/seller the huge leverage.

Margins in Futures Contracts

Futures positions held overnight are "cleared" by Clearing Corporation (CC). The CC becomes the seller to every buyer and the buyer to every seller: in other words, the "central counterparty".



In theory, the CC is not exposed to market movements, as it has an equal number of offsetting positions. It does, however, require a deposit of funds from each buyer and seller in the event that they won't meet their obligations; namely to pay out profit or loss on positions. This deposit, known as the margin (specifically called as initial margin) represents the potential loss on the position based on the maximum expected overnight movement in price.

Why margins are collected?

We have seen above that the clearing corporation of the stock exchange acts as a legal counterparty to every transaction effected in the derivatives segment. Thus, if the party who loses fails to pay up, the exchange is legally bound to effect payments to the party who has made profits. To ensure that it can meet these commitments, the exchange levies margins on players in the Derivatives segment. Margin is the commitment money paid by both the buyer and the seller based on the volatility in any derivative security trading in the market. The loss may or may not occur but the margin so calculated should be deposited. The formula applied is 3.5 times daily volatility in case of stock futures and 3 times daily volatility in case of index futures. Volatilities are updated on the exchange website every day and can be reviewed by players. Secondly, the very advantage of futures over forwards is the availability of the counter party guarantee in the case of futures. In order to ensure that every deal is honored and every market participant gets his profits on schedule, levying margins is important.

Initial margin and Maintenance margin

Index futures contract are usually subject to two types of margins i.e.

(i) Initial margin

(ii) Maintenance Margin

(i) Initial margin

Margin is money deposited by both the buyer and the seller to assure the integrity of the contract. Initial margin is the amount of money, which a buyer or a seller must deposit in his account whenever he establishes a futures position. Minimum margins are set by the Exchange and are usually about 10% of the total value of the contract.

The computation of an initial margin is done using the concept of Value-at-Risk (VAR). The initial margin deposit is represents the likely loss that a buyer or seller of the futures contract may incur on his position with a 99% confidence and over a period of say 2 days. The clause 'with a 99% confidence' and 'over a period 2 days' is to be interpreted as that number such that the actual position loss over 2 days is expected to exceed the number only 2% of the time. The range of price movements is determined taking into account the historic volatility of the underlying contract.

Several popular methods are used to compute initial margins. They include the SPAN (a grid simulation method used by many exchanges), STANS (a Monte Carlo simulation based methodology), and TIMS (earlier used and now used by few other exchanges like the Bursa Malaysia).

(ii) Maintenance Margin

Maintenance margin is the minimum margin required to hold a position. We can call it a sub-limit within initial margin limit. Maintenance margin is normally 75% to 80% of the initial margin. Maintenance margin should be sufficient to support the daily settlement process called "mark-to-market", where by losses that have already occurred are collected. Initial margin, on the other hand seeks to safeguard against potential losses on outstanding positions. In case maintenance margin is not met, the investor is advised to deposit cash to make up for the shortfall. If the investor does not respond, then the broker closes out the investor's position by entering a reverse trade in the investor's account.

If the customer elects to liquidate open positions in order to meet a maintenance margin call, such liquidations are completed immediately. Any profits over the margin requirement can be withdrawn or used for other futures contracts.

Note: Initial margin is deposited when a trade is opened, and refunded when it's closed. Maintenance margin is the lower bound for the acceptable level of margin. Touching the maintenance margin level triggers a margin call.

Nowadays, most brokers do not permit maintenance margin facility. Absence of maintenance margin facility, means, even if a single rupee fall in the stock price would trigger a margin call, as the margin account would get depleted. This is represented by 0% maintenance margin. Obviously maintenance margin cannot theoretically exceed initial margin limit.

Example:

Assume Sandip has opened a buy position in 2 contracts of SAIL at a futures price of ₹1000. Each contract of SAIL equals 100 shares. Thus the total value of the contract = 2 x 100 x 1000 = ₹ 2,00,000. If the initial margin limit is 10%, then Sandip has to deposit ₹ 20,000 as initial margin. Now assume that the maintenance margin is 8% of the contract value (80% of initial margin level) then the broker would keep ₹16,000 as a benchmark for deciding whether a margin call has to be made. If the margin account balance falls below ₹ 16,000 on any day, margin call would be made. In such as a scenario, Sandip has to fill up his margin account back to initial margin level of ₹20,000. We can see change in margin account in the table for various price levels of SAIL.

Table

Opening Balance	20000	20000	20000	20000	20000	20000	20000
New Price next day	975	985	995	1000	1005	1015	1025
Change in Margin A/c	-5000	-3000	-1000	0	+1000	+3000	+5000
Margin A/c Balance	+ 15000	+ 17000	+ 19000	+ 20000	+ 21000	+ 23000	+ 25000
Below Maintenance Margin?	Yes	Yes	No	No	No	No	No
Margin Call?	Yes	Yes	No	No	No	No	No

Opening price =1000; Change = 2 × 100 × (Change in the price); Maintenance margin limit = 8000

Example:

Let us use the above example but examine for various levels of maintenance margin, how margin calls get triggered. For a percentage of maintenance margin we must first know the trigger level, i.e. that level of margin a/c balance which will trigger a margin call. This is generally equal to the value of the contract multiplied by the maintenance margin level except for 0%, when no such facility is provided. Absence of maintenance margin facility is represented by 0% meaning even a rupee fall in the price would trigger a margin call.

Table

Maintenance Margin Limit	0%	3%	5%	8%	10%
Trigger level	20000	6000	10000	16000	0
Opening Balance	20000	20000	20000	20000	20000
New Price next day	999	965	970	1000	952
Change in Margin A/c	-200	-7000	-6000	0	-9600
Margin A/c Balance	+19800	+13000	+14000	+20000	+10400
Below Maintenance Margin?	Yes	No	No	No	No
Margin Call?	Yes	No	No	No	No

Opening price = 1000; Change in Margin A/c = 2 × 100 × (Change in the price)

Marking to Market

Once a future is bought / sold and a contract is issued, its value with respect to market price of futures fluctuates on a daily basis. This renders the owner liable to adverse changes in value, and creates a credit risk to the exchange. If the daily fluctuations are large then we have a worse situation to handle.

To minimize this risk, the exchange demands that contract owners pay what is known as margin. The amount of margin changes each day, involving movements of cash handled by the exchange's clearing house.

At the end of every trading day, the contract is marked to its closing market price of the futures contract. If the closing price of futures contract is not given, one can use the closing prices of the underlying for this purpose. If the trader is on the winning side of a deal, his contract increases in value that day, and the exchange becomes liable to the trader, and his margin account is credited with the differential amount. On the other hand, if he is on the losing side, he may face a "margin call," from the exchange

/ broker, depending on the fall in margin account balance and in this case he is liable to the exchange for the difference. In this way, each account is credited or debited according to the settlement price on a daily basis. This is known as Marking to Market.

Whenever the margin account is short of the required amount, margin call is made and the buyer or seller is expected to fill up the account up to the initial margin level. And whenever the margin account is above the initial margin limit, then the buyer/seller can theoretically withdraw the entire amount above the initial margin limit on a daily basis. Though, the terms of withdrawal may differ for various clients in practice, based on his/her credit worthiness, past performance, and relationship with the broker.

Concept:

All futures contracts are marked to the market daily; that is, all profits and losses on a contract are credited and debited to each investor's account every trading day. Almost all (95%+) futures contracts are settled by offset rather than delivery; that is, holders liquidate a position by arranging an offsetting transaction.

Example:

Consider Ram, who is optimistic on price rise of RIL, purchasing one futures contract of RIL when futures traded at ₹1000. Anand being pessimistic believed RIL prices going forward would fall and hence he sold one contract of RIL at the same futures price. Each contract entailed 100 shares of the underlying equity shares of RIL. Initial margin of 10% was applicable for both Ram and Anand. Both had a facility of maintenance margin of 8%. Rules force both

of them to withdraw 50% of the excess over initial margin. Margin calls whenever made are promptly paid by both. Let us examine the process of marking to market under the applicable conditions explained. Assume next three days the prices of RIL were 980, 960, and 1015 respectively.

Table

Date & Price	**Ram [Long 1]**		**Anand [Short 1]**	
Maintenance Margin Limit	= 8% of value of Contract = 8000		= 8% of value of Contract = 8000	
Amount in ₹	**Details**	**Amount**	**Details**	**Amount**
Day I				
Opening Balance		0		0
+ Initial Margin Paid	10% of (1x100x1000)	10,000	10% of (1x100x1000)	10,000
+ Profit/Loss Today [Price 980]	1 contract* (980-1000)x100 shares/contract	(2,000)	1contracts*(1000-980)x100 shares/contract	2,000
Closing Balance		8,000		12,000
	No margin call because the balance is not below maintenance margin limit		Balance before withdrawals	12,000
	Since account balance is below initial margin limit of 10000, no withdrawals permitted		Profit Withdrawn: Half of (12,000 -10,000)	1,000
Closing Balance		8,000		11,000
Amount in ₹	**Details**	**Amount**	**Details**	**Amount**
Day 2				
+ Profit/Loss Today [Price 960]	1 contract * (960-980)x100 shares/contract	(2,000)	1contracts * (980-960)x100 shares/contract	2,000
	Balance before margin call	6,000	Balance before withdrawal	13,000
Margin Call Paid:	To bring balance back to initial margin (since Balance < maintenance margin of 8,000)	4,000	Profit Withdrawn Half of (13,000 -10,000)	1,500
Closing Balance		10,000		11,500
Amount in ₹	**Details**	**Amount**	**Details**	**Amount**
Day 3				
+Profit/Loss Today[Price1015]	1 contract *(1015-960) x100 shares/contract	5,500	1contract* (960-1015)x100 shares/contract	(5,500)
	Balance before withdrawals	15,500	Balance before Margin Call	6,000
Profit Withdrawn:	Half of (15,500-10,000)	2,750	Margin Call Paid To bring Balance back to initial margin (since Balance < maintenance margin of 8000)	4,000
Closing Balance		12,750		10,000

Ram's Gain = (12750 - 10000) + 2750 - 4000 = ₹1500

Or 1 x 100 x (1015 - 1000) = ₹1500

Anand's Gain = (10000 - 10000) + 2500 - 4000 = - ₹1500

Or 1 x 100 x (1000 - 1015) = - ₹1500

Variation margin

If a margin call is made additional money is deposited by the trader/investor, to bring the account to the level of initial margin. This amount is called as the variation margin. In short variation margin is the amount needed to restore the initial margin once a margin call has been issued. The variation margin may change depending on how far the margin account has fallen below the maintenance margin level.

Concept

Initial margin is the amount a buyer or seller of futures contracts pay initially. Maintenance margin is the lower bound for the acceptable level of margin i.e. level up to which the buyer or seller would not be required to replenish his margin account, owing to movement in price. Once the margin account balance goes below the maintenance margin level, a margin call is triggered. Variation margin is the amount needed to restore the margin account back to the initial margin level once a margin call has been issued. The variation margin may change depending on how far the margin account has fallen below the maintenance margin level.

Price Limits: effects on Liquidity

The logic of price limits is that they act as a brake on the market and prevent panic buying or selling. Implicit in their use is the assumption that trading can sometimes exacerbate volatility and cause prices to swing to unjustifiably high or low levels. The problem with price limits, however, is that they do not discriminate between rational price movements (caused by shifts in the underlying demand or supply of a commodity) and irrational ones. Consequently, price limits can limit liquidity when investors need it the most and slow down the process of price adjustment.

An interesting way to frame the question on price limits is to ask whether you would be willing to pay more or less for an asset that has price limits associated with trading than for an asset without those price limits. The tradeoff between lower volatility (from restrictions on trading) and less liquidity will determine how you answer the question.]

Pricing of Futures Contracts

Most futures contracts can be priced on the basis of arbitrage, i.e., a price or range of prices can be derived at which investors will not be able to create positions involving the futures contract and the underlying asset that make riskless profits with no initial investment. The following sections examine the pricing relationships for a number of futures contracts.

(a) Perishable Commodities

Perishable commodities offer the exception to the rule that futures contracts are priced on the basis of arbitrage, since the commodity has to be storable for arbitrage to be feasible. On a perishable futures contract, the futures price will be influenced by:

(i) the expected spot price of the underlying commodity:

If the spot price on the underlying commodity is expected to increase before the expiration of the futures contract, the futures prices will be greater than the current spot price of the commodity. If the spot price is expected to decrease, the futures price will be lower than the spot price.

(ii) any risk premium associated taking the futures position:

Since there is a buyer and a seller on a futures contract, the size and the direction of the risk premium will be vary from case to case and will depend upon whether the buyer is viewed as providing a service to the seller or vice versa. In an agricultural futures contract, where farmers or producers are the primary sellers of futures contracts and individual investors are the buyers, it can be argued that the latter are providing a service to the former and thus should be rewarded. In this scenario, the futures price will be lower than the expected spot price.

Futures price = Spot Price - Expected Risk Premium

In this type of relationship between futures and spot prices, prices are said to exhibit 'normal backwardation'.

In a futures contract, where buyers of the futures contract are industrial users (a good example would be Hershey's, a chocolate manufacturer, buying sugar futures to lock in favorable prices) and the sellers are individual investors, the buyers are being provided the service and the sellers could demand a reward, leading to a risk premium that is positive. In this case, the futures price will be greater than the expected spot price (assuming flat expectations) and futures prices are said to exhibit 'normal contango'.

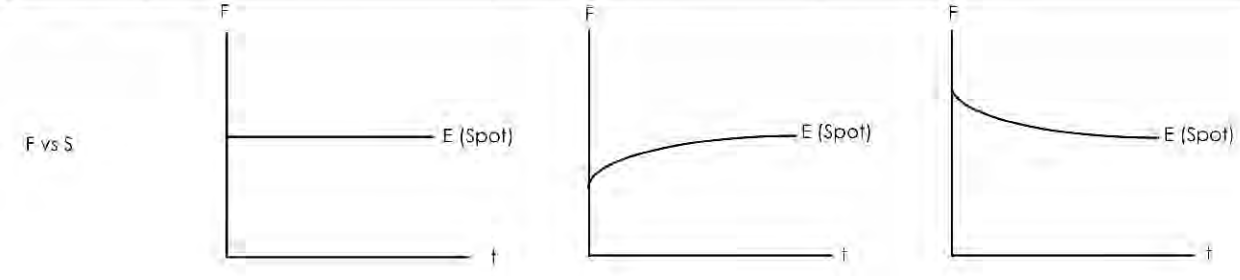
In most modern commodity futures markets, neither sellers nor buyers are likely to be dominated by users or producers, and the net benefit can accrue to either buyers or sellers and there is no a priori reason to believe that risk premiums have to be positive or negative. In fact, if buyers and sellers are both speculating on the price, rather than hedging output or input needs, the net benefit can be zero, leading to a zero risk premium. In such a case the futures price should be equal to the expected spot price.

These three possible scenarios for the futures price, relative to the expected spot price, are graphed in Figure below. The empirical evidence from commodity futures markets is mixed. An early study by Houthaker found that futures prices for commodities were generally lower than the expected spot prices, a finding that is consistent with a 'normal backwardation'. Telser and Gray, however, report contradictory evidence from the wheat and corn futures markets.

Futures on Perishable Commodities

$F = E(S_t)$ + Risk premium

	Expectations Hypothesis	Normal Backwardation	Normal Contango
Assumptions	1. Investors are risk-neutral	1. Hedgers are net short 2. Speculators are not long	1. Hedgers are net long 2. Speculators are net short
Futures price	$F = E(S_t)$	$F < E(S_t)$	$F > E(S_t)$



(b) Storable commodities

The distinction between storable and perishable goods is that storable goods can be acquired at the spot price and stored till the expiration of the futures contract, which is the practical equivalent of buying a futures contract and taking delivery at expiration. Since the two approaches provide the same result, in terms of having possession of the commodity at expiration, the futures contract, if priced right, should cost the same as a strategy of buying and storing the commodity. The two additional costs of the latter strategy are as follows.

(i) Since the commodity has to be acquired now, rather than at expiration, there is an added financing cost associated with borrowing the funds needed for the acquisition now.

Added Interest Cost = (Spot price) $[(1 + \text{Interest Rate})^{\text{Life of Futures contract}} - 1]$

(ii) If there is a storage cost associated with storing the commodity until the expiration of the futures contract, this cost has to be reflected in the strategy as well. In addition, there may be a benefit to having physical ownership of the commodity. This benefit is called the convenience yield and will reduce the futures price. The net storage cost is defined to be the difference between the total storage cost and the convenience yield.

If F is the futures contract price, S is the spot price, r is the annualized interest rate, t is the life of the futures contract and k is the net annual storage costs (as a percentage of the spot price) for the commodity, the two equivalent strategies and their costs can be written as follows.

Strategy 1: Buy the futures contract. Take delivery at expiration. Pay $F.

Strategy 2: Borrow the spot price (S) of the commodity and buy the commodity. Pay the additional costs.

(a) Interest cost = $S[(1+ r)^t -1]$

(b) Cost of storage, net of convenience yield = S k t If the two strategies have the same costs,

$= S[(1+ r)^t -1] + Skt$

F*

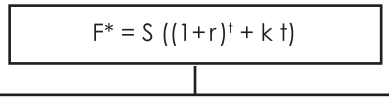
$= S[(1+ r)^t + kt]$

This is the basic arbitrage relationship between futures and spot prices. Any deviation from this arbitrage relationship should provide an opportunity for arbitrage, i.e., a strategy with no risk and no initial investment, and for positive profits. These arbitrage opportunities are described in Figure .

This arbitrage is based upon several assumptions. First, investors are assumed to borrow and lend at the same rate, which is the riskless rate. Second, when the futures contract is over priced, it is assumed that the seller of the futures contract (the arbitrageur) can sell short on the commodity and that he can recover, from the owner of the commodity, the storage costs that are saved as a consequence. To the extent that these assumptions are unrealistic, the bounds on prices within which arbitrage is not feasible expand. Assume, for instance, that the rate of borrowing is r_b and the rate of lending is r_a, and that short seller cannot recover any of the saved storage costs and has to pay a transactions cost of t_s. The futures price will then fall within a bound.

$$(S- t_s)(1+ r_a)^t < F^* < S((1+ r_b)^t + kt)$$

If the futures price falls outside this bound, there is a possibility of arbitrage and this is illustrated after below figure.



If F > F* If F < F*

Time	Action	Cashflows	Action	Cashflows
Now:	1. Sell futures contract	0	1. Buy futures contract	0
	2. Borrow spot price at riskfree r	S	2. Sell short stocks in the index	S
	3. Buy spot commodity	-S	3. Lend money at riskfree rate	-S
At t:	1. Collect dividends on stocks	$S((1+y)^t-1$	1. Collect on loan	$S(1+r)^t$
	2. Delivery on futures contract	F	2. Take delivery of futures contract	-F
	3. Pay back loan	-S(1+r)t	3. Return borrowed stocks; Collect storage costs	+Skt
NCF =		**$F-S((1+r)^t - kt) > 0$**		**$S((1+r)^t + kt) - F > 0$**

Key intputs :

F* = Theoritical futures price
F = Actual futures price
S = Spot price of commodity
r = Riskless rate of interest (annualized)
t = Time of expiration on the futures contract
k = Annualized carrying cost, net of convenience yield (as % of spot price)

Key assumptions:

1. The investor can lend and borrow at the riskless rate.
2. There are no transactions costs associated with buying or selling short the commodity.
3. The short seller can collect all storage costs saved because of the short selling.

Storable Commodity Futures: Pricing and arbitrage

Modified Assumptions

1. Investor can borrow at r_b ($r_b > r$) and lend at r_a ($r_a < r$).
2. The transactions costs associated with selling short is t_s (where t_s is the dollar transactions cost).
3. The short seller does not collect any of the storage costs saved by the short selling.

$$F_h^* = S((1+r_b)^t + k\,t)$$
$$F_1^* = (S-t_s)\,(1+r_a)^t$$

If $F > F_h^*$ | If $F < F_1^*$

Time	Action	Cashflows	Action	Cashflows
Now:	1. Sell futures contract	0	1. Buy futures contract	0
	2. Borrow spot price at r_b	S	2. Sell short on commodity	S
	3. Buy spot commodity	-S	3. Lend money at r_a	$-(S - t_s)$
At t:	1. Collect commodity from storage	- Skt	1. Collect on loan	$(S-t_s)(1+r_a)^t$
	2. Delivery on futures contract	F	2. Take delivery of futures contract	-F
	3. Pay back loan	$-S(1+r_b)^t$	3. Return borrowed stocks;	
			Collect storage costs	0
NCF =		**$F-S((1+r_b)^t - kt) > 0$**		**$(S-t_s)(1+r_a)^t - F > 0$**

F_h = Upper limit for arbitrage bound on futures prices

F_1 = Lower limit for arbitrage bound on futures prices

Stock Futures, Index Futures and Currency Futures

Stock Future: Stock Futures are financial contracts where the underlying asset is an individual stock. Stock Future contract is an agreement to buy or sell a specified quantity of underlying equity share for a future date at a price agreed upon between the buyer and seller. The contracts have standardized specifications like market lot, expiry day, unit of price quotation, tick size and method of settlement. Presently, stock futures are settled in cash. The final settlement price is the closing price of the underlying stock.

Index Futures: Futures on stock indices have become an important and growing part of most financial markets. Today, you can buy or sell futures on the Dow Jones, the S&P 500, the NASDAQ and the Value Line indices.

An index future entitles the buyer to any appreciation in the index over and above the index futures price and the seller to any depreciation in the index from the same benchmark. To evaluate the arbitrage pricing of an index future, consider the following strategies.

Strategy 1: Sell short on the stocks in the index for the duration of the index futures contract. Invest the proceeds at the riskless rate. (This strategy requires that the owners of the index be compensated for the dividends they would have received on the stocks.)

Strategy 2: Sell the index futures contract. Both strategies require the same initial investment, have the same risk and should provide the same proceeds. Again, if S is the spot price of the index, F is the futures prices, y is the annualized dividend yield on the stock and r is the riskless rate, the cash flows from the two contracts at expiration can be written.

$$F^* = S\,(1 + r - y)^t$$

If the futures price deviates from this arbitrage price, there should be an opportunity from arbitrage.

This is illustrated in Figure below.

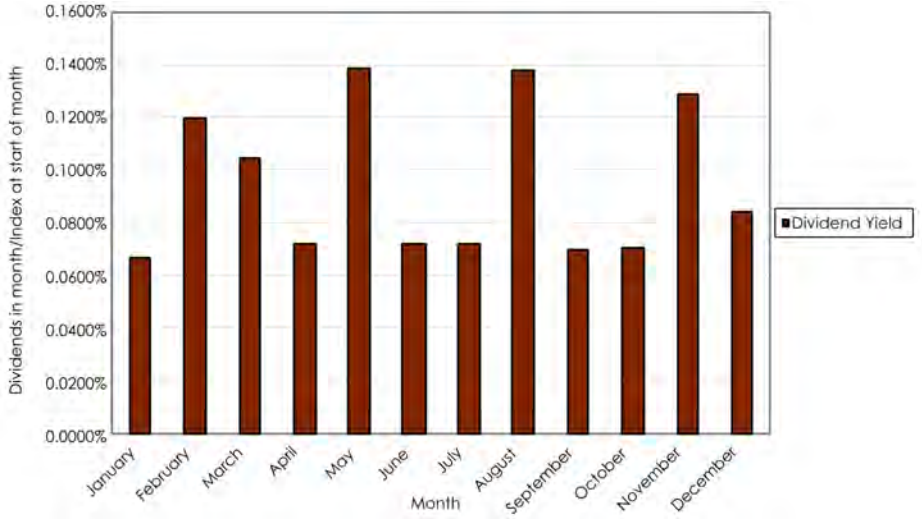
This arbitrage is conditioned on several assumptions. First, it, like the commodity futures arbitrage, assumes that investors can lend and borrow at the riskless rate. Second, it ignores transactions costs on both buying stock and selling short on stocks. Third, it assumes that the dividends paid on the stocks in the index are known with certainty at the start of the period. If these assumptions are unrealistic, the index futures arbitrage will be feasible only if prices fall outside a band, the size of which will depend upon the seriousness of the violations in the assumptions.

Assume that investors can borrow money at rb and lend money at ra and that the transactions costs of buying stock is tc and selling short is ts. The band within which the futures price must stay can be written as:

$$(S-t_s)(1+r_a-y)^t < F^* < (S+t_c)(1+r_b-y)^t$$

The arbitrage that is possible if the futures price strays outside this band is illustrated in Figure below.

In practice, one of the issues that you have to factor in is the seasonality of dividends since the dividends paid by stocks tend to be higher in some months than others. Figure below graphs out dividends paid as a percent of the S&P 500 index on U.S. stocks in 2000 by month of the year.



Dividend Yields by Month of Year - 2000 Thus Dividend Yields seem to peak in February, May, august & November.

$$F^* = S\,(1+r-y)^t$$

If F > F*

Action	Cashflows
1. Sell futures contract	0
2. Borrow spot price of index at riskfree r	S
3. Buy stocks in inded	-S
1. Collect dividends on stocks	$S((1+y)^t-1$
2. Delivery on futures contract	F
3. Pay back loan	$-S(1+r)t$
	$F-S(1+r-y)^t > 0$

If F < F*

Action	Cashflows
1. Buy futures contract	0
2. Sell short stocks in the index	S
3. Lend money at riskfree rate	-S
1. Collect on loan	$S(1+r)^t$
2. Take delivery of futures contract	-F
3. Return borrowed stocks;	$-S[(1+y)^t-1]$
	$S(1+r-y)^t -F > 0$

Outputs :

F* = Theoritical futures price
F = Actual futures price
S = Spot level of index
r = Riskless rate of interest (annualized)
t = Time of expiration on the futures contract
y = Dividend yield over lifetime of futures contract as % of current index level

Assumptions

1. The investor can lend and borrow at the riskless rate.
2. There are no transactions costs associated with buying or selling short stocks.
3. Dividends are known with certainty.

Stock Index Futures: Pricing and Arbitrage

Assumptions

Investor can borrow at r_b ($r_b > r$) and lend at r_a ($r_a < r$).

Transactions cost associated with selling short is t_s (where t_s is the dollar transactions cost) and the transactions cost associated with buying the stock t_c.

$$F_h^* = (S+t_c)\ (1+r_b-y)^t$$
$$F_l^* = (S+t_s)\ (1+r_a-y)^t$$

If $F > F_h^*$

Action	Cashflows
1. Sell futures contract	0
2. Borrow spot price at r_b	$S + t_c$
3. Buy stocks in inded	$-S-t_c$
1. Collect dividends on stocks	$S((1+y)^t-1)$
2. Delivery on futures contract	F
3. Pay back loan	$-(S+t_c)\ (1+r_b)^t$
	$F-(S+t_c)\ (1+r_b-y)^t > 0$

If $F < F_l^*$

Action	Cashflows
1. Buy futures contract	0
2. Sell short stocks in the index	$S - t_s$
3. Lend money at r_a	$-(S - t_s)$
1. Collect on loan	$(S-t_s)(1+r_a)^t$
2. Take delivery of futures contract	-F
3. Return borrowed stocks;	$-S[(1+y)^t-1]$
	$(S+t_s)\ (1+r_a-y)^t - F > 0$

F_h = Uper limit for arbitrage bound on futures prices

F_l = Lower limit for arbitrage bound on futures prices

Stock Index Future: Pricing and Arbritage with modified assumptions

(a) Treasury Bond Futures

The treasury bond futures traded on the CBOT require the delivery of any government bond with a maturity greater than fifteen years, with a no-call feature for at least the first fifteen years. Since bonds of different maturities and coupons will have different prices, the CBOT has a procedure for adjusting the price of the bond for its characteristics. The conversion factor itself is fairly simple to compute and is based upon the value of the bond on the first day of the delivery month, with the assumption that the interest rate for all maturities equals 8% per annum (with semi-annual compounding). The following example calculates the conversion factor for a 9% coupon bond with 18 years to maturity.

Example: Calculation Conversion Factors for t. Bond futures

Consider a 9% coupon bond with 20 years to maturity. Working in terms of a $100 face value of the bond, the value of the bond can be written as follows, using the interest rate of 8%.

$$\text{PV of Bond} = \sum_{t=0.5}^{t=20} \frac{4.50}{(1.08)^t} + \frac{100}{(1.08)^{20}} = \$111.55$$

The conversion factor for this bond is 109.90. Generally speaking, the conversion factor will increase as the coupon rate increases and with the maturity of the delivered bond.

The Delivery Option and the Wild c ard Play

This feature of treasury bond futures, i.e., that any one of a menu of treasury bonds can be delivered to fulfill the obligation on the bond, provides an advantage to the seller of the futures contract. Naturally, the cheapest bond on the menu, after adjusting for the conversion factor, will be delivered. This delivery option has to be priced into the futures contract.

There is an additional option embedded in treasury bond futures contracts that arises from the fact that the T. Bond futures market closes at 2 p.m., whereas the bonds themselves continue trading until 4 p.m.

The seller does not have to notify the clearing house until 8 p.m. about his intention to deliver. If bond prices decline after 2 p.m., the seller can notify the clearing house of intention to deliver the cheapest bond that day. If not, the seller can wait for the next day. This option is called the wild card play.

Valuing a t.Bond Futures Contract

The valuation of a treasury bond futures contract follows the same lines as the valuation of a stock index future, with the coupons of the treasury bond replacing the dividend yield of the stock index. The theoretical value of a futures contract should be –

$$F^* = (S\text{-}PVC)(1+ r)^t$$

where,

F* = Theoretical futures price for Treasury Bond futures contract

S = Spot price of Treasury bond

PVC = Present Value of coupons during life of futures contract

r = Riskfree interest rate corresponding to futures life

t = Life of the futures contract

If the futures price deviates from this theoretical price, there should be the opportunity for arbitrage. These arbitrage opportunities are illustrated in Figure below.

This valuation ignores the two options described above - the option to deliver the cheapest-to-deliver bond and the option to have a wild card play. These give an advantage to the seller of the futures contract and should be priced into the futures contract. One way to build this into the valuation is to use the cheapest deliverable bond to calculate both the current spot price and the present value of the coupons. Once the futures price is estimated, it can be divided by the conversion factor to arrive at the standardized futures price.

$F^* = (S - PVC)\ (1 + r)^t$

If F > F* | If F < F*

Time	Action	Cashflows	Action	Cashflows
Now:	1. Sell futures contract	0	1. Buy futures contract	0
	2. Borrow spot price of index at riskfree r	S	2. Sell short stocks in the index	S
	3. Buy treasury bond	-S	3. Lend money at riskfree rate	-S
Till t:	1. Collect coupons on bonds; Invest	$PVC(1+r)^t$	1. Collect on loan	$S(1+r)^t$
	2. Delivery on futures contract	F	2. Take delivery of futures contract	-F
	3. Pay back loan	$-S(1+r)^t$	3. Return borrowed bond;	
			Pay foregone coupons w/interest	$-PVC(1+r)^t$
NCF =		**$F-(S-PVC)(1+r)^t > 0$**		**$(S-PVC)(1+r)^t - F > 0$**

Outputs :

F* = Theoritical futures price
F = Actual futures price
S = Spot level of treasury bond
r = Riskless rate of interest (annualized)
t = Time of expiration on the futures contract
PVC = Present Value of Coupons on Bond during life of futures contract

Key assumptions

1. The investor can lend and borrow at the riskless rate.
2. There are no transactions costs associated with buying or selling short bonds.

Treasury Bond Futures: Pricing and Arbitrage

Currency Futures:

In a currency futures contract, you enter into a contract to buy a foreign currency at a price fixed today. To see how spot and futures currency prices are related, note that holding the foreign currency enables the investor to earn the risk-free interest rate (R_f) prevailing in that country while the domestic currency earn the domestic risk free rate (R_d). Since investors can buy currency at spot rates and assuming that there are no restrictions on investing at the risk free rate, we can derive the relationship between the spot and futures prices. Interest rate parity relates the differential between futures and spot prices to interest rates in the domestic and foreign market.

$$\frac{\text{Futures Price}_{d,f}}{\text{Spot Price}_{d,f}} = \frac{(1+R_d)}{(1+R_f)}$$

where Futures $\text{Price}_{d,f}$ is the number of units of the domestic currency that will be received for a unit of the foreign currency in a forward contract and Spot $\text{Price}_{d,f}$ is the number of units of the domestic currency that will be received for a unit of the same foreign currency in a spot contract. For instance, assume that the one-year interest rate in the United States is 5% and the one-year interest rate in Germany is 4%. Furthermore, assume that the spot exchange rate is $0.65 per Deutsche Mark. The one-year futures price, based upon interest rate parity, should be as follows:

$$\frac{\text{Futures Price}_{d,f}}{\$\ 0.65} = \frac{(1.05)}{(1.04)}$$

resulting in a futures price of $0.65625 per Deutsche Mark.

Why does this have to be the futures price? If the futures price were greater than $0.65625, say $0.67, an investor could take advantage of the mispricing by selling the futures contract, completely hedging against risk and ending up with a return greater than the risk free rate. When a riskless position yields a return that exceeds the risk free rate, it is called an **arbitrage position**. The actions the investor would need to take are summarized in Table below, with the cash flows associated with each action in brackets next to the action.

Table: arbitrage when currency futures contracts are mispriced

Forward Rate Mispricing	Actions to take today	Actions at expiration of futures contract
If futures price > $0.65625 e.g. $0.67	1. Sell a futures contract at $0.67 per Deutsche Mark. ($0.00) 2. Borrow the spot price in the U.S. domestic markets @ 5%. (+$0.65) 3. Convert the dollars into Deutsche Marks at spot price. (-$0.65/+1 DM) 4. Invest Deustche Marks in the German market @ 4%. (-1 DM)	1. Collect on Deutsche Mark investment. (+1.04 DM) 2. Convert into dollars at futures price. (-1.04 DM/ +$0.6968) 3. Repay dollar borrowing with interest. (-$0.6825) **Profit = $0.6968 - $0.6825 = $ 0.0143**
If futures price < $0.65625 e.g. $0.64	1.Buy a futures price at $0.64 per Deutsche Mark. ($0.00) 2.Borrow the spot rate in the German market @4%. (+1 DM) 3.Convert the Deutsche Marks into Dollars at spot rate. (-1 DM/+$0.65) 4.Invest dollars in the U.S. market @ 5%. (-$0.65)	1.Collect on Dollar investment. (+$0.6825) 2.Convert into dollars at futures price. (-$0.6825/1.0664 DM) 3.Repay DM borrowing with interest. (1.04 DM) **Profit = 1.0664-1.04 = 0.0264 DM**

The first arbitrage of given Table results in a riskless profit of $0.0143, with no initial investment. The process of arbitrage will push down futures price towards the equilibrium price.

If the futures price were lower than $0.65625, the actions would be reversed, with the same final conclusion. Investors would be able to take no risk, invest no money and still end up with a positive cash flow at expiration. In the second arbitrage of given Table, we lay out the actions that would lead to a riskless profit of 0.0164 DM.

Effects of special Features in Futures Contracts

The arbitrage relationship provides a measure of the determinants of futures prices on a wide range of assets. There are however some special features that affect futures prices. One is the fact that futures contracts require marking to the market, while forward contracts do not. Another is the existence of trading restrictions, such as price limits on futures contracts. The following section examines the pricing effects of each of these special features.

(a) Futures versus Forward Contracts

As described earlier in this section, futures contracts require marking to market while forward contracts do not. If interest rates are constant and the same for all maturities, there should be no difference between the value of a futures contract and the value of an equivalent forward contract. When interest rates vary unpredictably, forward prices can be different from futures prices. This is because of the reinvestment assumptions that have to be made for intermediate profits and losses on a futures contract, and the borrowing and lending rates assumptions that have to be made for intermediate losses and profits, respectively. The effect of this interest rate induced volatility on futures prices will depend upon the relationship between spot prices and interest rates. If they move in opposite directions (as is the case with stock indices and treasury bonds), the interest rate risk will make futures prices greater than forward prices. If they move together (as is the case with some real assets), the interest rate risk can actually counter price risk and make futures prices less than forward prices. In most real world scenarios, and in empirical studies, the difference between futures and forward prices is fairly small and can be ignored.

There is another difference between futures and forward contracts that can cause their prices to deviate and it relates to credit risk. Since the futures exchange essentially guarantees traded futures contracts, there is relatively little credit risk. Essentially, the exchange has to default for buyers or sellers of contracts to not be paid. Forward contracts are between individual buyers and sellers. Consequently, there is potential for significant default risk which has to be taken into account when valuing a forward contract.

(b) Trading restrictions

The existence of price limits and margin requirements on futures contract are generally ignored in the valuation and arbitrage conditions described in this chapter. It is however possible that these restrictions on trading, if onerous enough, could impact value. The existence of price limits, for instance, has two effects. One is that it might reduce the volatility in prices, by protecting against market overreaction to information and thus make futures contracts more valuable. The other is that it makes futures contracts less liquid and this may make them less valuable. The net effect could be positive, negative or neutral.

The value of a futures contract is derived from the value of the underlying asset. The opportunity for arbitrage will create a strong linkage between the futures and spot prices; and the actual relationship will depend upon the level of interest rates, the cost of storing the underlying asset and any yield that can be made by holding the asset. In addition the institutional characteristics of the futures markets, such as price limits and 'marking to market', as well as delivery options, can affect the futures price.

In theory, we make the unrealistic assumption that a person who sells short (i.e. borrows somebody else's property and sells it now) will be able to collect the storage costs saved by the short sales from the other party to the transaction.

Application of Derivatives in various sectors/types of Industries

Derivatives as a hedging tool in asset/liability management are very attractive, though it has been controversial recently. Asset/liability management is of greatest interest to depository intermediaries, contractual intermediaries, and multinational corporations. Commercial banks and thrift institutions are depository intermediaries because their sources of loanable funds consist of deposits received from businesses, households, and the government.

Life insurance companies, the best known contractual intermediaries, enter into contracts with their customers to promote savings and/or financial protection against loss of life. Compared to traditional portfolio adjustment methods, hedging by using financial derivatives has particular strengths, including high speed, lower transaction costs, and no increased credit risk in management of (interest rate) risks (Morris and Merfeld, 1988). A survey on the typical use of financial derivatives by these institutions is placed for the following sectors/industries:

(i) Use of Financial Derivatives by Commercial Banks

(ii) Use of Financial Derivatives by Thrift Institutions

(iii) Use of Financial Derivatives by Life Insurance Companies

(iv) Implications of Financing Agriculture by Using Derivatives

Major players in derivatives markets

Hedgers

A hedger holds a position in the cash market and is worried about fall in the value of his portfolio. He would take an opposite position in the futures market to protect against fall in value of his portfolio. Against his view if the market rises, his portfolio value increases to compensate for fall in futures value.

Speculators

Speculators as such make guess about the movement of stock prices. They undertake buy or sell transactions in the cash/future markets accordingly. Speculators accept the risk passed on by a hedger, in anticipation of making a profit. Speculators provide depth and liquidity to the futures market and in their absence the price protection sought by the hedger would be very costly.

Concept

Hedgers buy or sell futures contracts in order to offset the risk in some other position. They want to reduce the risk of adverse price fluctuations. Hedgers forego some potential profits to eliminate part of the risk.

Speculators buy or sell futures contracts in an attempt to earn a return. They are willing to assume the risk of price; fluctuations, hoping to profit from them.

Spreaders

Spreaders, as the term indicates, work on spreads that are observed and believed to be 'non-aligned' i.e. beyond their normal difference. They use future spreads to speculate and earn profit a low level of risk.

Arbitrageurs

Arbitrageurs try to identify deviations in futures prices from their fair (theoretical) values in order to obtain a risk free rate of return. Though deviations persist, arbitrage is not free, nor is it perfectly risks less. Arbitrage involves transaction costs, brokerage costs, bid-ask spreads between the purchase and sales price and most importantly, impact cost.

Scalpers

Scalping means, resorting to large number of quick trades and make small profits. Scalpers hold positions only for minutes and attempt to profit from either very small price changes or the bid-ask spread. They trade in using their skills in short term movement of prices. They are constantly alert to market news or big order flow of buy/sell in that stock and trade on them. They prefer those counters where the day's volume would be high. They operate on very low transaction costs and they make money by doing hundreds of transactions in a day. Many scalpers disregard economic or company fundamentals and even technical indicators. Their only benchmark is the price movement and momentum, over a few minutes. They immensely help liquidity in the market.

Day traders

Day traders enter into futures positions and liquidate their positions by the end of the day. Day traders often use proprietary models to estimate which way they believe prices will move. They normally do not disclose what their

trades are based upon. They take a far sighted approach in contrast to scalpers. They close their position before the end of trading session, ensuring that he has no position overnight.

Position traders

Position traders maintain positions in a contract for longer than a day. They believe on market rumours and they hold their positions till a significant movement takes place. This period could be many weeks or months.

The risks associated with Derivative Use

Derivatives can reduce or transfer the risks in underlying cash instruments, but they might also introduce new built-in risks. Opinions differ in whether using derivatives increase more risk to the whole financial system, which is often called system risk. The concern about the system risk is heightened by the global market linkages that have been created by the use of derivatives. Separate studies by the Group of Thirty and the Bank of England suggest that derivative products do not introduce new risks into the financial system (Wood and Shaw, 1994).

However, it is generally agreed upon that there are some new risks associated with derivatives to individual users. The major risks include credit risk, market risk, legal risk and operational risk (GAO, 1994). Credit risk is the exposure to the possibility of financial loss resulting from a counterparty's failure to meet its financial obligations. It usually exists in OTC derivatives. Clearing houses function to eliminate the credit risk for both buyers and sellers in exchanged-run transactions. Market risk is the exposure to the possibility of financial loss resulting from unfavorable movements in interest rate and currency rates as well as equity and commodity prices. Market risk is more involved in speculation than in hedging. Legal risk is the exposure to the possibility of financial loss resulting from an action by a court or by a regulatory or legislative body that invalidates a derivative contract or prior derivative transactions. Legal risk is associated primarily with OTC contracts in the US, particularly with swaps. Operations risk is the exposure to the possibility of financial loss resulting from inadequate systems, management failure, faulty controls, fraud, or human error. Operation risk may compound the effect of other risks.

Hedging through Futures

Hedge means to protect or lock in a value. In order to perform a hedge we need two assets. We need another asset to protect the one which we are holding and for which we are trying to create a hedge.

The behaviour of the two assets is the key in deciding the hedge. The asset chosen to hedge the existing asset can be positively correlated with the existing asset or it can be negatively correlated. If the asset chosen for the purpose of hedging is positively correlated with our existing asset then we sell the asset else we buy that asset. The reason being when the asset prices fall, both the assets would lose value. In such a scenario, the asset which we have sold would give gains thereby offsetting the loss in the existing asset. On the same lines, when asset prices rise, the asset used for hedging would lose value, since we have sold them and again it would offset the gains of the existing asset. Thus in both the scenarios, both the assets put together gives us net zero gains. In other words the existing asset retains its original value i.e. original value is locked.

Table

Economic Event	Actual Asset	Desired Hedge exposure
Asset prices fall	Loss	Gain
Asset prices rise	Gain	Loss

Hedging is adopted when we believe that the existing assets are likely to lose value and our intention is to protect the existing value. In other words we expect the unfavourable event to occur. What happens if the original view (i.e. unfavourable event) does not materialize? The hedge does not provide any benefit; it simply locks in a value that existed when the hedge was initiated. Therefore hedge is not adopted if unfavourable event is not expected to happen. Hedging is not aimed to make gains or reduce losses; it is aimed at locking a value of a commodity, stock or portfolio.

The goal of a hedge transaction is to create a position that, once added to an investor's portfolio will offset the price risk of another. A hedge can be so constructed that one can have partial protection say to the extent of 50% or 75% etc. In that case we would have only that much protection and in an unfavourable situation we would be losing 50% or 25% respectively.

1. Hedging while having stocks in the portfolio

If a Fund Manager, wishes to hedge a stock or portfolio position with stock futures or index futures, the basic hedging strategy would be to take an equal and opposite position in the futures market. The second pertinent point is to know the extent of hedging required. If 100% hedging is required then, the desired futures position (value) would equal the portfolio or stock position already held; else proportionate value of futures would be sold. Then the last valid point to be remembered is to account for beta of the stock or portfolio that is being hedged. If the stock is hedged using same stock futures, then the beta is irrelevant as both would have same beta. However, if the portfolio/stock is hedged using index futures then beta is relevant, because the portfolio/stock may have beta less or more than that of market (index futures represents market as a whole). In order to ensure the portfolio position is perfectly hedged it is essential to sell beta times the value of index futures position. Here we say that beta is the hedge ratio. A point to note here would be that, if the market rallies, the opportunity to gain from it will be lost but the portfolio can be protected from a market sell-off, which was the original intent.

Example

Consider Amit, a portfolio manager managing a portfolio (beta 1.5) whose current market value of ₹ 67.50 Crores. It is expected that the markets are likely to correct downwards and hedging needs to be adopted using NIFTY index futures. Currently index futures are quoted at 4500 with each contract underlies 100 units. Let us examine a situation when markets correct 10% down and also a possibility market trend upwards by 10% against the belief of Amit. Let us assume that Amit hedged 100% of his portfolio.

Each NIFTY index contract is worth ₹ 4,500 × 100 = ₹ 4,50,000.

Value of the portfolio is = ₹ 67.50 Crores

Value of Index Futures required to be hedged = Beta times value of portfolio

= 1.5 × 67.50 Crores = ₹101.25 Crores

Number of NIFTY index contracts to be sold (Since we hold (bought) assets, hedging using other asset should be opposite i.e. sell) = 101.25 Crores /450000 = 2250

Table

	Market Rise	Portfolio Gain	Index Futures	Net Gain /Loss
Pessimistic	-10%	1.5 times 10% i.e. 15% fall in portfolio value -10.125 Crores	10% gain in futures; since we have sold +10.125 Crores	Nil
Optimistic	+10%	1.5 times 10% i.e. 15% gain in Portfolio value +10.125 Crores	10% loss in futures; since we have sold -10.125 Crores	Nil

Had Amit hedged only 50% of his portfolio value, the net gain or loss would not be nil. He would have got only 50% of protection in case of market fall. Thus when market falls by 10%, against his loss of ₹10.125 Crores, he would have gained only ½ of 10.125 Crores in the futures market, since he would have hedged only 50%.

2. Hedging while having money in the account

Having money in the account and not investing in stocks, owing to absence of enough research inputs would not make sense, especially if it is known that the market is likely to rally. In such cases it is prudent to buy Index Futures and participate in the rally and liquidate the futures position, once the rally is over or stocks are ready to be purchased. Another advantage is for buying futures; only around 10% of the total value would be deposited as margin, enabling the fund/ person to deploy the balance to earn money market returns. Had the market not rallied he would have bought the stocks cheaper than originally decided.

Example

Consider Samik, a portfolio manager who have been informed that there is an inflow of ₹100 Crores in his new scheme launched this month. While his research department is busy in preparation of final list of stocks that can be bought as part of his portfolio, it is learnt that further one month would pass before the final stock list is provided

to Samik. Meanwhile Samik learns that market is set to rally in the next one month. By parking money in cash and money market instruments for one month is not going to help him in a big way as returns are going to be far less as compared to market returns. The best thing Samik can do is to buy Index futures now and ride the rally and sell off at the end of month. By the end of month research department would have prepared the final list. Though the stocks in general would have inched up, the gains from futures would have compensated sufficiently.

Stock index futures allow investors to hedge systematic (market) risk. This is desirable for investors attempting to earn the unique part of a stock's return while avoiding market risk. The futures contract helps to protect the portfolio against market fluctuations. Speculators buy or sell futures contracts in an attempt to earn a return. They are willing to assume the risk of price fluctuations, hoping to profit from them.

3. To modify systematic risk

A fund manager can decrease or increase the systematic risk (market risk) of the portfolio by selling or buying appropriate number of index futures, so that the following equation is satisfied:

Original Portfolio Value x Original Beta ± Futures Position = Original Portfolio Value x Desired Beta

Selling Futures position reduces the overall systematic risk and vice versa.

Consider the same example of Amit, discussed under (1) above. The portfolio beta is 1.5 and the current market value is ₹ 67.50 Crores. Since the markets are expected to correct downwards and in such a situation if Amit wants to reduce beta of his portfolio, he can do so by adding another asset whose beta is lower and have a combined portfolio with lower beta, which will protect him from market fall. Let us assume that Amit wants to reduce the beta to 1.00. Two strategies can be adopted.

(a) Amit can stay in cash (beta = 0) say to the extent of 20%, by selling the stocks. But in times of sudden fall in the market opportunity to sell is seldom available.

(b) Amit can use NIFTY index futures just enough to bring the overall beta to the desired level. Amit would sell index futures to achieve this objective. The following equation would have to be satisfied.

Original Portfolio Value x Original β – Futures Position = Original Portfolio Value x Desired β

67.50 Crores x 1.5 - X = 67.50 Crores x 1.0 X = 33.75 Crores

This means Amit would sell NIFTY index futures worth ₹ 33.75 Crores, by selling 33.75 Crores / 4.5 lakhs = 750 Contracts

Table

	Market Rise	Portfolio Gain	Index Futures	Net Gain /Loss
Pessimistic	-10%	1.5 times 10% i.e. 15% fall in portfolio value -10.125 Crores	10% gain in futures; since we have sold +3.375 Crores	-6.75 Crores*
Optimistic	+10%	1.5 times 10% i.e. 15% gain in portfolio value + 10.125 Crores	10% loss in futures; since we have sold -3.375 Crores	+6.75 Crores*

*Had Amit's portfolio beta was 1, then his ₹ 67.50 Crore portfolio would have lost just 10%, with the market fall of 10% and vice versa. A higher beta portfolio has been swiftly turned to the desired beta level by selling appropriate index futures.

Example

A high net worth individual (SRI) is holding the following portfolio in ₹ Crores:

Table

Investment in diversified equity shares	80.00
Cash and Bank Balances	20.00
Total	100.00

The Beta of the portfolio is 1.2. The index future is selling at 5500 level. The SRI wants to decrease the beta of the portfolio, for he believes that the market would go down from the current level. How many index futures he should buy/sell so that the beta is decreased to 0.80? One index future consists of 100 units.

Solution:

One can decrease or increase the systematic risk (market risk) of the asset/portfolio by selling or buying appropriate number of index futures, so that the following equation is satisfied:

Original Portfolio Value x Original Beta ± Futures Position = Original Portfolio Value x Desired Beta

In this case since beta has to decrease the SRI would go short (sell - by selling Nifty or index futures, we are decreasing the market risk - thus beta overall would fall) the appropriate number of index futures. The formula to calculate the number of contracts can be given by:

$$(\beta^*-\beta)\ \frac{\text{Portfolio Value}}{\text{Value of each futures contract}}$$

The portfolio value given is = ₹ 100 Crores, β = 1.2 and β* = 0.8 (desired) and each future contract is = 5500 x 100 = ₹ 5, 50,000. Substituting we get, number of contracts for the desired beta of 0.8 as:

$$(0.8 - 1.2)\ \frac{100\ \text{Crores}}{550000} = -727 \text{ contracts}$$

Alternative Solution:

We can use the formula:

Equity Value of Portfolio x Original Beta ± Futures Position = Total Portfolio Value x Desired Beta 80 Crores × 1.2 - 5500 x 100 × N = 100 Crores × 0.8

N = -290 Contracts

Answers are different because we have assumed that beta of only the equity portion of the total is 1.2, unlike in the first method we have used beta of 1.2 for entire portfolio of 100 Crores.

Concept

Futures market plays a vital role of price discovery. Apart from this main function, market players use futures market for variety of purpose:

(i) To hedge their portfolio value

(ii) To hedge against fall in specific stock price

(iii) To gain by buying futures ahead of stock purchase or to trade directions

(iv) To speculate

(v) To arbitrage

(vi) To modify market risk of their portfolio

Hedge ratio

A hedger has to decide the number of futures contracts that provide the best hedge for his/her risk profile. The hedge ratio allows the hedger to determine the number of contracts that must be employed in order to minimize the risk of the combined cash-futures position. We can define hedge ratio "as the number of futures contracts to hold for a given position in the underlying asset".

Hr = Futures Position + Underlying asset position.

As explained earlier, for a perfect hedge, in case of a stock/portfolio position hedged with an index futures position, the hedge ratio is the beta of stock or portfolio. Else, if it is hedged using stock futures position, the hedge ratio is one. If the hedger wants to hedge his stock/portfolio position partially, then the hedge ratio would be less than one. On the hand if his future hedge position is more than that of his current position, we say that the hedge ratio is more than one.

Also β by definition:

$$\beta = \frac{\sigma_{SM}}{\sigma_M^2}$$

We can assume index futures as proxy for markets. We denote index futures as 'F'. Therefore, we have,

$$\beta = \frac{\sigma_{SF}}{\sigma_F^2}$$

$$= \frac{\rho_{SF}\sigma_S\sigma_F}{\sigma_F^2}$$

$$= \frac{\rho_{SF} \cdot \sigma_F}{\sigma_F}$$

= Correlation of underlying with market (i.e. index futures) x proportion of standard deviation of underlying and market.

Example

Consider Sumit holding an equity portfolio of ₹ 50 Crores. His portfolio beta is 1.2. He has decided to hedge his portfolio using NIFTY index futures. For various scenarios hedge ratio (as shown in column 2 i.e. Value of futures / Value of underlying) would change as given in the table.

Table

Future s Sold	$\frac{\text{Value of Futures}}{\text{Value of Underlying}}$	% Hedge Adopted	Remarks
₹ 60 Crores	1.2	100%	Hedge Ratio = Beta of Portfolio
₹ 30 Crores	0.6	50%	Hedge Ratio ≠ Beta of Portfolio
₹ 120 Crores	2.4	200%	Hedge Ratio ≠ Beta of Portfolio

Cross Hedge

Cross Hedge refers to hedging a position in a Stock in the Cash Market, by taking an opposite position in the Futures Market (Derivative Market) in a different stock or index. Cross Hedge concept applies, when the stock to be hedged does not have a Futures Market.

Inherent Risk: Basis Risk is inherent in a Cross Hedge, i.e. Spot Price of the Commodity and the Futures Price do not converge, because the Commodity for Futures and the Commodity in the Stock market are not the same.

Example: Anu is holding 1000 Shares of KK Software Solutions Ltd, which she wants to sell. She wants to hedge her position by buying KKS Futures. However, KK Software is not traded in the Futures Market. To hedge her position, she can buy Infosys Futures or Wipro Futures or Software Index Futures.

Cross-Hedge ratio: Cross-Hedge Ratio is the same as Hedge Ratio. However, the futures price considered is not of the corresponding stock's future price, but a closely related index or stock.

Hedge Ratio $= \frac{\sigma_S}{\sigma_F} \times \rho_{FS}$

Where

σ_s = Standard Deviation of Change in Spot Price of the Asset to be hedged (Eg: KK Software Solutions)

σ_F = Standard Deviation of Change in Futures Price of the Underlying Asset (Eg: Wipro Futures, Infosys Futures etc.)

ρ_{FS} = Correlation between Change in Spot Price of the Asset to be hedged and Futures Price of the Underlying Asset

No. of Futures Contract to be Traded:

$$\text{No. of Futures Contracts} = \text{Hedge Ratio} \times \frac{\text{Units of Spot Position requiring Hedging}}{\text{No. of Units underlying one Futures Contract}}$$

In the given example, if the Hedge Ratio is 1.2, and Anu wants to cross hedge her position using Software Index Futures (each Index Future contract has 100 Units), then number of contracts required is –

$$= 1.20 \times \frac{\text{Shares of KK Software Solution Ltd. (1,000)}}{\text{No. of Units in Software Index Future (100)}} = 1.20 \times \frac{1{,}000}{100} = 12 \text{ Contracts}$$

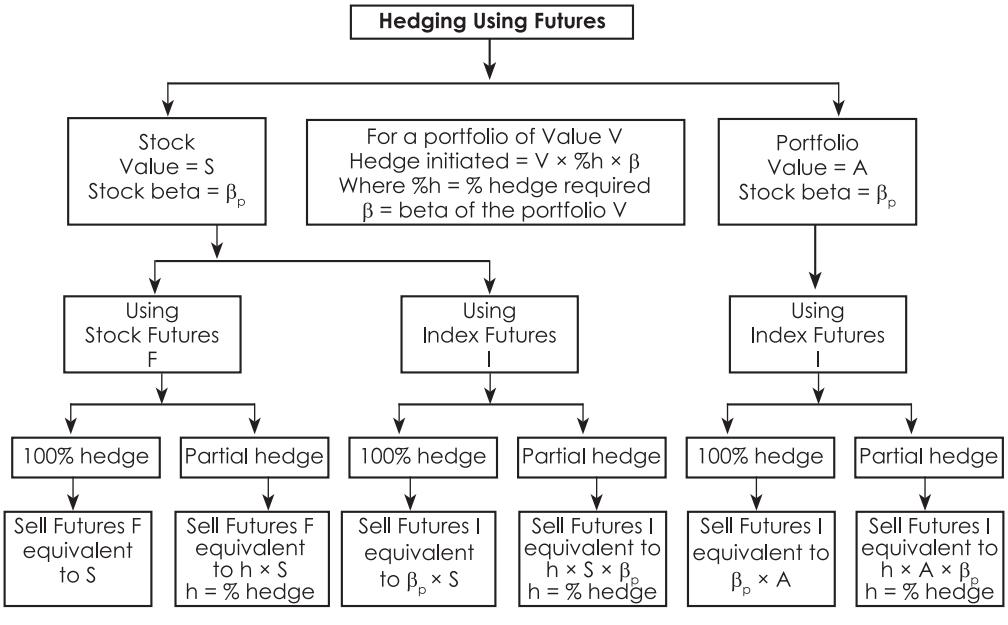
Choice of Appropriate Cross Hedge Futures: In case of alternatives in the Futures Market in a Cross Hedge Situation, the appropriate Futures Contract should be chosen based on the extent of correlation between the asset's price movements and the underlying asset's futures price movements. Higher the correlation, better the choice.

Perfect Hedge and Imperfect Hedge

Perfect Hedge: Perfect Hedge is one which completely eliminates the risk. At the time of taking an opposite position in Derivatives Market, Perfect Hedge would mean covering the risk involved in the Cash Market Position completely, i.e. 100%.

Imperfect Hedge: When the position in cash market is not completely hedged or not hedged to 100%, then such hedge is called Imperfect Hedge.

Hedge using futures



Hedging strategies

A wide range of hedging strategies are available to hedge funds. For example:

- selling short - selling shares without owning them, hoping to buy them back at a future date at a lower price in the expectation that their price will drop.
- using arbitrage - seeking to exploit pricing inefficiencies between related securities - for example can be long convertible bonds and short the underlying issuer's equity.

- trading options or derivatives - contracts whose values are based on the performance of any underlying financial asset, index or other investment.
- investing in anticipation of a specific event - merger transaction, hostile takeover, spin-off, exiting of bankruptcy proceedings, etc.
- investing in deeply discounted securities - of companies about to enter or exit financial distress or bankruptcy, often below liquidation value.
- Many of the strategies used by hedge funds benefit from being non-correlated to the direction of equity markets

Stack Hedging and strip Hedging

For longer-term hedging programmes, such as a two year loan with three-monthly rollover dates, more complicated strategies can be adopted, such as Stack Hedging and Strip Hedging.

(i) With a Stack Hedge, the total number of contracts needed to hedge the loan is purchased for the month of the first rollover date. At that date, the remaining number of contracts necessary is purchased for the next rollover date, and so on.

(ii) A Strip Hedge, on the other hand, treats each three-month segment of the loan as separate entity, and Futures Contracts are purchased for each rollover date at the outset of the loan.

Forward Interest rate arrangement

(a) Forward Interest Rate arrangement are contracts entered into between two parties, whereby one party will pay / charge interest at a fixed rate on the amount borrowed / lent.

(b) Forward Interest Rate Agreements will freeze today, for the rate of interest payable / receivable on a loan / deposit to be made at a later point in time.

Example: On 01.04.2013, A Ltd enters into a Forward Rate Agreement with Bombay Bank for borrowing loan of ₹1,000 Crores at 10% p.a. in July 2014.

Advantages: It helps a borrower in eliminating interest rate risks associated with borrowing or investing funds. Adverse movements in the interest rates will not affect or alter the interest receipt / liability of the investor/ borrower.

Situation: Forward Interest Rate Arrangements can be entered into for —

(a) an existing loan — for making interest payments at agreed rates from a future period; or

(b) a prospective loan — to be taken at a later point in time.

Appropriate Interest Rate

From a given set of data on interest rates applicable for bonds with different maturity periods, how can one compute the appropriate interest rate for an intervening period- compute Forward interest rates, from interest rates on securities with different maturity periods.

Rates for Future Periods: Forward Rates are the rates of interest implied for a specific period in time in the future. These rates are implied from the prevailing interest rates for instruments with different maturity periods.

Rate available today = Basis for Computation: This is the rate at which an investor would earn interest on his investments for a period starting on a later date, if the rates available today for different periods would hold good.

Mathematical Notation:

Forward Interest Rate = $\frac{R_2T_2 - R_1T_1}{T_2 - T_1}$

Where, R_2 = Rate of Interest for the Longer Time Period

R_1 = Rate of Interest for the Shorter Time Period

T_2 = Longer Time Period

T_1 = Shorter Time Period

Example: On 01.04.2013, 1-year Government Bonds carry an interest rate of 10%, 2 Year Government Bonds carry an interest rate of 11%, and 3-Year Government Bonds carry an interest rate of 13% All the Bonds have a face value of ₹ 10 Lakhs.

(a) Comparison of 1 Year Bond and 2 Year Bond:

- Sum of ₹10 Lakh invested in one year bond would fetch ₹ 1,00,000 for Year 1. Sum of ₹10,00,000 invested today in 2 Year bond will fetch ₹ 1,10,000 p.a. for the next two years.
- ₹ 10,00,000 invested in 2 Year bond will fetch ₹ 2,20,000 totally. Therefore, the incremental interest for the second year is ₹ 1,20,000 (Cumulative Interest on a Two Year Bond ₹ 2,20,000 Less Interest for a One Year Bond ₹1,00,000)
- Therefore, interest rate expected for Year 2 for an investment of ₹10 Lakh is ₹1,20,000 or 12%
- Therefore, Forward Interest Rate for an One Year investment as at 01.04.2014 is 12%

$$\frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.11x2 - 0.10x1}{2 - 1} = (0.22 - 0.10) \div 1 = 0.12 \div 1 = 0.12 \text{ or } 12\%$$

(b) Comparison of 1 Year Bond and 3-Year Bond:

- ₹ 10 Lakhs invested in one year bond would fetch ₹1,00,000 for Year 1. Sum of ₹ 10,00,000 invested today in 3-Year bond will fetch ₹ 1,30,000 p.a. for the next three years.
- ₹ 10,00,000 invested in 3-Year bond will fetch ₹ 3,90,000 totally. Therefore, the incremental interest for the second and third year is ₹ 2,90,000 (Cumulative Interest on a 3-Year Bond ₹3,90,000 Less Interest for a One Year Bond ₹1,00,000)
- Therefore, interest rate expected for Year 2 and 3 for an investment of ₹10 Lakhs is ₹ 2,90,000 or ₹ 1,45,000 per annum i.e. 14.50% p.a.
- Therefore, Forward Interest Rate for a Two-Year investment as at 01.04.2013 is 14.50%

$$\frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.13x3 - 0.10x1}{3 - 1} = (0.39 - 0.10) \div 2 = 0.29 \div 2 = 0.145 \text{ or } 14.5\%$$

ILLUSTRATIONS

Illustration 1.

Deep is planning to invest ₹ 25,00,000 in Bank Deposits for one year. All the banks offer an interest rate of 12% p.a. for 12 month deposits. Deep has enquired deposit application forms of 4 banks, particulars of which are as fellows—

- Bank M: Interest will be credited at half-yearly basis.
- Bank N: Interest will be credited at quarterly rests.
- Bank O: Interest will be credited at monthly rests.
- Bank P: Interest will be credited at weekly rests.

If Deep cares for every extra rupee, which Bank will be prefer? What should be the minimum rate Bank N should offer to attract Deep's deposit?

If Bank M agrees to credit interest at continuous compounding basis, what will be return for Deep?

Solution:

1. Computation of Factors

Compounding at	Amount (A) at the end of the period
Annual Interval / Rests	$A = P \times (1 + r)^n$
Less than Annual Interval / Rests	$A = P \times (1 + r/m)^{nxm}$

Where A = Amount received at the end of the period (1 Year or 12 Months)

P = Amount be compounded i.e. amount invested at the beginning ₹25 Lakhs

r = Rate of Interest per annum (12% or 0.12)

n = Number of Years = 1 Year

m = Number of Compounding in a year = (2 or 4 or 12 or 52)

2. Computation of Amount Receivable by Deep

Banks	Method of Compounding	No. of compounding in an Year (m)	Amount Received
M	Half Yearly	2 Half Years	$A = P \times (1 + r/m)^{nxm}$ $= ₹\ 25,00,000 \times (1 + 0.12/2)^2$ $= ₹\ 25,00,000 \times (1 + 0.06)^2$ $= ₹\ 25,00,000 \times (1.06)^2$ $= ₹\ 25,00,000 \times 1.1236$ $= ₹\ 28,09,000$
N	Quarterly	4 Quarters	$A = P \times (1 + r/m)^{nXm}$ $= ₹\ 25,00,000 \times (1 + 0.12/4)^4$ $= ₹\ 25,00,000 \times (1 + 0.03)^4$ $= ₹\ 25,00,000 \times (1.03)^4$ $= ₹\ 25,00,000 \times 1.12551$ $= ₹\ 28,13,775$

O	Monthly	12 Months	$A = P \times (1 + r/m)^{nXm}$ $= ₹\ 25,00,000 \times (1+ 0.12/12)^{12}$ $= ₹\ 25,00,000 \times (1 + 0.01)^{12}$ $= ₹\ 25,00,000 \times (1.01)^{12}$ $= ₹\ 25,00,000 \times 1.126825$ $= ₹\ 28,17,063$
P	Weekly	52 Weeks	$A = P \times (1 + r/m)^{nxm}$ $= ₹\ 25,00,000 \times (1+0.12/52)^{52}$ $= ₹\ 25,00,000 \times (1+0.002307)^{52}$ $= ₹\ 25,00,000 \times (1.002307)^{52}$ $= ₹\ 25,00,000 \times 1.1273$ $= ₹\ 28,18,250$

Evaluation: Deep will prefer Bank P, as it offers the maximum return on investment.

3. Change in Interest Rate offered by Bank N

Minimum rate offered by Bank N should yield the maximum of the above four returns i.e. ₹ 28,18,250.

If Minimum Rate is N, then

$A = P \times (1 + r/m)^{nXm}$

⇨ $28,18,250 = 25,00,000\ (1+r/4)^4$

⇨ $(1+r/4)^4 = 22,54,600 \div 25,00,000$

⇨ $1+r/4 = \sqrt[4]{1.1273}$

⇨ $1+r/4 = 1.03041$

⇨ $r/4 = 1.03041-1$

⇨ $r = 0.03041 \times 4$

$= 0.12164$ or 12.164%

Therefore, Bank N should offer deposits (at half yearly rests) at 12.164% to attract Deep's Deposit.

4. Continuous Compounding by Bank M

If Bank M offers continuous compounding facility, then amount received at the end of the year will be

$A = P \times e^{rXt}$

Where, P = Amount invested at the beginning of the period = ₹25,00,000

E = Exponential Value (i.e. = 2.71828)

r = Rate of Interest = 12% or 0.12

t = No. of Years i.e. Period/Year = 1 Year

$A = ₹\ 25,00,000 \times e^{0.12 \times 1}$

$= ₹\ 25,00,000 \times 1.1275$

$= ₹28,18,750$

Illustration 2.

Tripti has two investment opportunities, M and N, carrying an yield of 15% p.a. The tenor of both these investments is 3 Years.

M offers continuous compounding facility, whereas N offers yield on the basis of monthly compounding. Which offer will Tripti opt for?

If continuous compounding facility comes at a price of ₹ 180 p.a. per Lakh of deposit (chargeable at the end of the period), what will be the position?

At what price, will Tripti be indifferent to Continuous Compounding Facility and Monthly Compounding?

Solution:

1. Return on Investment

Particulars	Investment M	Investment N
Investment (assumed)	₹ 20,00,000	₹ 20,00,000
Amount receivable on Maturity (A)	A = $P \times e^{rxt}$ = ₹ 20,00,000 × $e^{0.15\times3}$ = ₹ 20,00,000 × $e^{0.45}$ = ₹ 20,00,000 × 1.5683 = ₹ 31,36,600	A = $P \times (1 + r/m)^{nxm}$ = ₹ 20,00,000 × $(1 + 0.15/12)^{3x12}$ = ₹ 20,00,000 × $(1 + 0.0125)^{36}$ = ₹ 20,00,000 × $(1.0125)^{36}$ = ₹ 20,00,000 × 1.563944 = ₹ 31,27,888
Charges payable at ₹180 p.a. per Lakh	20 × ₹ 180 p.a. × 3 Years = ₹ 10,800	NIL
Net Amount Receivable upon Maturity	₹ 31,36,600 - ₹ 10,800 = ₹ 31,25,800	₹ 31,27,888 - ₹ NIL = ₹ 31,27,888

2. Evaluation of Investments

Case A (No charges for Continuous Compounding): Investment M is preferable, as it offers a higher return on maturity.

Case B (Charges for Continuous Compounding): Investment N is preferable, as amount receivable is higher than net amount receivable in Investment M.

3. Indifference Point

Tripti will be indifferent to Investment M and N, if

Amount Receivable under Maturity in Investment N	=	Amount Receivable under Maturity in Investment M	**Less**	Charges for Continuous Compounding

⇨ ₹ 31,27,888 = ₹ 31,36,600 **Less** Charges

⇨ Charges = ₹ 31,36,600 **Less** ₹ 31,27,888 = ₹ **8,712**

⇨ Charges per Lakh per Annum = ₹ 8,712 ÷ (3 Years × 20)

= ₹ 8,712 ÷ 60

= ₹ **145.20**

Conclusion: The price payable for Investment M is ₹ 145.20 per Lakh per annum for Tripti to be indifferent to both the investment alternatives.

Illustration 3.

Theoretical Forward Price — No Dividends, No Carrying Cost Compute the theoretical forward price of the following securities for 1 month, 3 months and 6 months —

Securities of	DD Ltd.	EE Ltd.	FF Ltd.
Spot Price [S_o]	₹160	₹ 2,600	₹ 600

You may assume a risk free interest rate of 9% p.a and 12% p.a.

Solution:

1. Theoretical Forward Price

Theoretical Forward Price of Security X [F_x] = $S_x \times e^{rt}$

Where, S_x = Current Spot Price of Security X

r = Rate of Interest

t = Period in Years

2. Forward Price of Securities of the Companies

(a) DD Ltd.

Period (t)	**r** = 9% p.a. **or 0.09**	**r** = **12%** p.a. **or 0.12**
1 Month or 1/12 Year i.e. 0.0833	F_A = ₹160 × $e^{0.09 \times 0.0833}$ = ₹160 × $e^{0.0075}$ = ₹160 × 1.007528 = ₹161.20	F_A = ₹160 × $e^{0.12 \times 0.0833}$ = ₹160 × $e^{0.01}$ = ₹160 × 1.01005 = ₹161.608
3 Months or 3/12 Year i.e. 0.25	F_A = ₹160 × $e^{0.09 \times 0.25}$ = ₹160 × $e^{0.0225}$ = ₹160 × 1.022755 = ₹163.641	F_A = ₹160 × $e^{0.12 \times 0.25}$ = ₹160 × $e^{0.03}$ = ₹160 × 1.030456 = ₹164.873
6 Months or 6/12 i.e. 0.50	F_A = ₹160 × $e^{0.09 \times 0.50}$ = ₹160 × $e^{0.045}$ = ₹160 × 1.046028 = ₹167.3645	F_A = ₹160 × $e^{0.12 \times 0.50}$ = ₹160 × $e^{0.06}$ = ₹160 × 1.061837 = ₹169.8939

(b) EE Ltd.

Period (t)	**r** = 9% p.a. **or 0.09**	**r** = **12% p.a. or 0.12**
1 Month or 1/12 Year i.e. 0.0833	F_A = ₹2,600 × $e^{0.09 \times 0.0833}$ = ₹2,600 × $e^{0.0075}$ = ₹2,600 × 1.007528 = ₹2,619.573	F_A = ₹2,600 × $e^{0.12 \times 0.0833}$ = ₹2,600 × $e^{0.01}$ = ₹2,600 × 1.01005 = ₹2,626.13
3 Months or 3/12 Year i.e. 0.25	F_A = ₹2,600 × $e^{0.09 \times 0.25}$ = ₹2,600 × $e^{0.0225}$ = ₹2,600 × 1.022755 = ₹2,659.163	F_A = ₹2600 × $e^{0.12 \times 0.25}$ = ₹2600 × $e^{0.03}$ = ₹2600 × 1.030456 = ₹2,679.186
6 Months or 6/12 i.e. 0.50	F_A = ₹2,600 × $e^{009 \times 0'50}$ = ₹2,600 × e^{0045} = ₹2,600 × 1.046028 = ₹2,719.673	F_A = ₹2,600 × $e^{0.12 \times 0.50}$ = ₹2,600 × $e^{0.06}$ = ₹2,600 × 1.061837 = ₹2,760.776

(c) FF Ltd.

Period (t)	r = 9% p.a. **or 0.09**	r = **12% p.a. or 0.12**
1 Month or 1/12 Year i.e. 0.0833	F_A = ₹600 × $e^{0.09\times0.0833}$ = ₹600 × $e^{0.0075}$ = ₹600 × 1.007528 = ₹604.517	F_A = ₹600 × $e^{0.12\times0.0833}$ = ₹600 × $e^{0.01}$ = ₹600 × 1.01005 = ₹606.03
3 Months or 3/12 Year i.e. 0.25	F_A = ₹600 X $e^{0.09\times0.25}$ = ₹600 × $e^{0.0225}$ = ₹600 × 1.022755 = ₹613.653	F_A = ₹600 × $e^{0.12\times0.25}$ = ₹600 × $e^{0.03}$ = ₹600 × 1.030456 = ₹618.274
6 Months or 6/12 i.e. 0.50	F_A = ₹600 X $e^{0.09\times0.50}$ = ₹600 X $e^{0.045}$ = ₹600 × 1.046028 = ₹627.617	F_A = ₹600 X $e^{0.12\times0.50}$ = ₹600 × $e^{0.06}$ = ₹600 × 1.061837 = ₹637.102

Illustration 4.

Shares of Sandeep Ltd are being quoted at ₹600 . 3-Months Futures Contract Rate is ₹636 per share for a lot size of 500 shares. If the Sandeep Ltd is not expected to distribute any dividend in the interim, risk free rate of return is 9%, what is the recommended course of action for a trader in shares?

If the 3-Months Futures Contract Rate is ₹ 600, what should be the action?

Solution:

1. Computation of Theoretical Forward Rate [TFP]

Particulars	Value
Spot Price [S_x]	₹600
Risk Free Interest Rate [r]	9% or 0.09
Period [t]	3 Mths or 3/12 Yrs i.e. 0.25
Theoretical Forward Rate [TFP_X] = $S_x \times e^{rt}$ = ₹600 × $e^{0.09 \times 0.25}$ = ₹600 × $e^{0.0225}$ = ₹600 × 1.022755	₹613.653

2. Evaluation and Suggested Course of Action

Particulars	Case A	Case B
3-Months Futures Contract Rate [AFP_X]	₹636	₹600
TFP_x Vs. AFP_x	AFP_X is Higher	AFP_X is Lower
Valuation in Futures Market	Overvalued	Undervalued
Action	Buy Spot. Sell Future.	Sell Spot. Buy Future.

Illustration 5.

Compute the theoretical forward price of the following securities for 2 month, 3 months and 4 months—

Securities of	A Ltd.	B Ltd.	D Ltd.
Spot Price [So]	₹4,550	₹360	₹900
Dividend Expected	₹50	₹20	₹50
Dividend Receivable in	2 Months	3 Months	4 Months
6 Month's Futures Contract Rate	₹4600	₹390	₹920

You may assume a risk free interest rate of 9% p.a.

What action should follow to benefit from futures contract?

Solution:

Securities of	A Ltd.	B Ltd.	D Ltd.
Spot Price [S_x]	₹4,550	₹360	₹900
Dividend Expected [D_F]	₹50	₹20	₹50
Dividend Receivable in [t]	2 Months or 1/6 Year or 0.1667	3 Months or Year or 0.25	4 Months or 1/3 year or 0.333
Risk Free Interest Rate [r]	9% or 0.09	9% or 0.09	9% or 0.09
Present Value of Dividend [D_P]	DF X e^{-rt} or DF ÷ e^{rt} = ₹50 ÷ $e^{0.09 \times 0.1667}$ = ₹50 ÷ $e^{0.015}$ = ₹50 ÷ 1.01511 = ₹49.256	DF x e^{-rt} or DF ÷ e^{rt} = ₹ 20 ÷ $e^{0.09 \times 0.25}$ = ₹ 20 ÷ $e^{0.0225}$ = ₹20 ÷1.022755 = ₹19.555	DF X e^{-rt} or DF ÷ e^{rt} = ₹50 ÷ $e^{0.09 \times 0.3333}$ = ₹50 ÷ $e^{0.03}$ = ₹50 ÷1.030455 = ₹48.522
Adjusted Spot Price [S_{Adj}] = S_x - D_P	₹4550 - ₹49.256 = ₹4500.744	₹360-₹19.555 = ₹340.445	₹900 - ₹48.522 = ₹851.478
Theoretical Forward Price [TFP_X]	= 4500.744 x $e^{0.09 \times 0.50}$ = 4500.744 x $e^{0.045}$ = 4500.744 x 1.04603 = ₹4707.91	= 340.445 x $e^{0.09 \times 0.50}$ = 340.445 x $e^{0.045}$ = 340.445 x 1.04603 = ₹356.312	= 851.478 x $e^{0.09 \times 0.50}$ = 851.478 x $e^{0.045}$ = 851.478 x 1.04603 = ₹890.672
6 Months Futures Contract Rate [AFP_X]	₹4600	₹390	₹900
TFP_x Vs. AFP_x	AFP_x is Lower	AFP_X is Higher	AFP_X is Higher
Valuation in Futures Market	Undervalued	Overvalued	Overvalued
Recommended Action	Sell Spot. Buy Future.	Buy Spot. Sell Future.	Buy Spot. Sell Future.

Illustration 6.

A four month European call option on a dividend paying stock is currently selling for ₹5. The stock price is ₹66, the strike price is ₹60, and a dividend of ₹0.80 is expected in one month. The risk free interest rate is 12% per annum for all maturities. Do you have arbitrage?

Solution:

Particulars	Amount
Spot Price [S_x]	₹66
Dividend Expected [D_F]	₹0.80
Dividend Receivable in [t]	1 Month or 1/12 Year or 0.0833
Risk Free Interest Rate [r]	12% or 0.12
Present Value of Dividend [D_P]	D_F X e^{-rt} or D_F ÷ e^{rt} = ₹0.80 ÷ $e^{0.12 \times 1/12}$ = ₹0.80 ÷ $e^{0.01}$ = ₹0.80 ÷ 1.01005 = ₹0.7920
Adjusted Spot Price [S_{Adj}] = S_x - D_P	₹66 - ₹0.7920 = ₹65.208
Theoretical Forward Price [TFP_X] = S_{Adj} × e^{rt}	= 65.208 × $e^{0.12 \times 4 \div 12}$ = 65.208 × $e^{0.04}$ = 65.208 x 1.0408 = ₹67.868

Conclusion: Since the Theoretical Forward Price is different from the Stock Price, Arbitrage exists.

Illustration 7.

The price of Compact Stock of a face value of ₹10 on 31st December, 2013 was ₹414 and the futures price on the same stock on the same date i.e., 31st December, 2013 for March, 2014 was ₹444.

Other features of the contract and the related information are as follows:

- Time to expiration 3 months (0.25 year)
- Annual dividend on the stock of 30% payable before 31.3.2014.
- Borrowing Rate is 20 % p.a.

Based on the above information, calculate future price for compact stock on 31st December, 2013. Please also explain whether any arbitrage opportunity exists.

Solution:

Securities of	Genpact
Spot Price [S_x]	₹414
Expected rate of Dividend [y]	30% or 0.30
Borrowing Rate	20%
Tenor / Time Period [t] in Years	3 Months or 0.25 Year
Present Value of Dividend	= (30% × 10) × $e^{-0.20\times0.25}$ = (30% × 10) ÷ 1.05127 = 3 ÷ 1.05127 = 2.8537
Adjusted Spot Price [Spot Price- Present Value of Dividend] [AS_X]	= 414 - 2.8537 = ₹411.1463
Theoretical Forward Price [TFP_X] $TFP_X = AS_X \times e^{(r-y)xt}$	= ₹411.1463 x $e^{0.20x0.25}$ = ₹411.1463 × $e^{0.05}$ = ₹411.1463 × 1.05127 = ₹432.23
3-Months Futures Contract Rate [AFP_X]	₹ 444
TFP_x Vs. AFP_x	AFP_X is Higher
Inference	AFP_X is overvalued
Recommended Action	Buy Spot. Sell Future.

2. Cash Flows to Gain on the Arbitrage Opportunity

Activity Flow:

(a) Borrow ₹414 for a period of 3 months at the rate of 20% p.a.

(b) Buy the Stock at ₹414 at T_0

(c) Receive the Dividend at the time of 3 months [₹10 × 30% = ₹3].

(d) Sell the Index Futures at the Forward Price at the end of 3 months [₹444].

(e) Repay the amount of Loan with Interest at the end of the period.

Cash Flows arising out of the Activities to gain on the Arbitrage.

Sl. No.	Particulars	₹
(a)	Borrow for a period of 3 months and Buy Stock at T_o	₹ 414
(b)	Receive the Dividend at the end of 3 months	3
(c)	Sell the Futures at the Forward Price at the end of 3 months	444
(d)	Repay the amount of borrowing together with Interest = [414 × $e^{0.20\times0.25}$]	(435.23)
(e)	**Net Cash Inflow [(b + c) - d]**	**11.77**

Illustration 8.

Super Polycarbons Ltd. has the following information about LDPE and HDPE Granules (raw material used for Manufacturing Plastic Films, Polyfilms and Plastic Sheets –

Stock Item	LDPE Granules	HDPE Granules
Current Market Price i.e. Spot Price [So]	₹75 per kg	₹85 per kg
Carrying Cost	4% p.a. [continuous compounding]	₹100 per Quintal per quarter (payable after 2 months)
3-Month's Futures Contract Rate (500 Kgs)	₹38,500	₹44,600

Risk free interest rate is at 12% p.a. Advise Super Polycarbons on the course of action to be taken?

Solution:

1. Evaluation of Futures Contract Option for LDPE Granules

Inventory / Commodity	LDPE Granules
Spot Price [S_X]	₹75 per kg
Storage Costs [rate] [c]	4% or 0.04
Tenor / Time Period [t] in Years	3 Months or 0.25 Year
Risk Free Interest Rate [r]	12% or 0.12
Theoretical Forward Price [TFP_X] per kg $TFP_X = S_x \times e^{(r+c)\times t}$ $= ₹75 \times e^{(0.12 + 0.04) \times 0.25}$ $= ₹75 \times e^{0.16 \times 0.25} = ₹75 \times e^{0.04} = ₹75 \times 1.0408$	₹78.06
TFP_X per lot size of 500 kg [500 Kgs × ₹78.06 per kg]	₹39,030
3-Months Futures Contract Rate [AFP_X]	₹38,500
TFP_x Vs. AFP_x	AFP_X is Lower
Valuation in Futures Market	Undervalued
Recommended Action	Buy Future. Sell Spot.

2. Evaluation of Futures Contract Option for HDPE Granules

Inventory / Commodity	LDPE Granules
Spot Price [S_x]	₹85 per kg or ₹42,500 per Lot of 500 Kgs
Storage Costs [rate] [C] (payable after 2 months)	₹100 per Quintal (i.e. 100 kgs) per quarter or ₹500 per lot of 500 Kgs
Tenor / Time Period [t] in Years	2 Months or 0.1667 Year
Risk Free Interest Rate [r]	12% or 0.12
Present Value of Storage Costs [C_P] $C_F = e^{-rt}$ or $C_F \div e^{rt}$ $= ₹500 \div e^{0.12 \times 0.16667} = ₹500 \div e^{0.02} = ₹500 \div 1.0202$	₹490.10
Adjusted Current Spot Price of HDPE Granules S_{Adj} [Spot Price ₹42,500 + Present Value of Storage Costs C_P ₹ 490.10]	₹42,990.10

Theoretical Forward Price [TFP_X] per kg $TFP_X = S_{Adj} \times e^{rXt}$ $= ₹42,990.10 \text{ x} e^{0.12 \times 0.25}$ $= ₹42,990.10 \text{ x } e^{0.03} = ₹42,990.10 \times 1.03045$	₹44,299.15
3-Months Futures Contract Rate [AFP_X]	₹44,600
TFP_x Vs. AFP_x	AFP_x is Higher
Valuation in Futures Market	Overvalued
Recommended Action	Buy Spot. Sell Future.

Illustration 9.

The following data relates to DCB Ltd's share prices:

Current price per share	₹170
Price per share in the futures market - 6 months	₹190

It is possible to borrow money in the market for securities transactions at the rate of 12 % p.a.

Required—

(a) Calculate the theoretical minimum price of 6 month-futures contract.

(b) Explain if any arbitraging opportunities exist.

Solution:

1. Theoretical Futures Price

Particulars	Value
6-months Futures Price	₹190
Current Stock Price [S_x]	₹170
Borrowing Rate (r)	12% or 0.12
Time (in years)	6/12 = 0.5 year
Theoretical Futures Price [F_x]	$= S_x \times e^{rt}$ $= ₹170 \times e^{0.12 \times 0.5}$ $= ₹170 \times e^{0.06}$ $= ₹170 \times 1.0618$ $= ₹180.506$

Inference: Since the Theoretical Futures Price is less than the Expected Futures Price, the recommended action would be to sell in the Futures Market.

2. Cash Flows to gain from Arbitrage Opportunity Activity Flow:

1. Arbitrageur can borrow the amount required to buy the Shares at the current Market Price i.e. ₹170 at the rate of 12% p.a. for 6 months.
    1. Enter into a Futures Contract to sell Shares at the rate of ₹190.
    2. On the expiry date, sell the shares at the 6-month Futures rate of ₹190.
    3. Pay the amount of Borrowing together with Interest i.e. [$170 \times e^{0.12 \times 0.5}$] **₹180.506.**

Particulars	Time	₹
1. Borrow at the rate of 12% for 6 months	T_0	170
2. Enter into a Futures Contract to sell Shares.	T_0	-

3. On the Expiry Date, sell the shares at 6-month Forward Rate.	T_1	190
4. Repay the amount of Borrowing together with Interest [170 × $e^{0.12\times0.5}$]= [170×1.0618]	T_1	180.506
5. Net Gain made [(3) - (4)]	T_1	9.494

Illustration 10.

(Cross Hedge)

Given the following information—

BSE Index 50,000

Value of Portfolio ₹1,01,00,000

Risk Free Interest Rate 9% p.a.

Dividend Yield on Index 6% p.a.

Beta of Portfolio 2.0

We assume that a futures contract on the BSE index with 4 months maturity is used to hedge the value of portfolio over next 3 months. One future contract is for delivery of 50 times the index. Based on the information, Calculate — (a) Price of future contract, (b) The gain on short futures position if index turns out to be 45,000 in 3 months.

Solution:

1. Computation of Price of Futures Contract

Securities of	R Ltd.
Spot Price [S_x]	₹50,000
Dividend Yield Expected [y]	6% or 0.06
Tenor / Time Period [t] in Years	4 Months or 0.3333 Year
Risk Free Interest Rate [r]	9% or 0.09
Price of Futures Contract [TFP_X] $TFP_X = S_X \times e^{(r-y)xt}$	= ₹ 50,000 × $e^{(0.09 - 0.06)x0.3333}$ = ₹ 50,000 × $e^{0.03 \times 0.3333}$ = ₹ 50,000 × $e^{0.01}$ = ₹ 50,000 × 1.0101 = ₹ **50,505**

Therefore, price of the Futures Contract is ₹ 50,505 or ₹ 50,500 (Approx)

2. Gain on Short Futures Position

(a) Computation of No. of Contracts to be entered into:

Particulars	Value
Portfolio Value	₹ 101,00,000
4-Month's Futures Price per Unit of BSE Index	₹ 50,500
No. of Units per BSE Index Futures Contract	50
Value per BSE Index Futures Contract [50 Units × ₹50,500 per Unit]	₹ 25,25,000
No. of Contract to be entered [Portfolio Value × Beta of Portfolio w.r.t Index ÷ Value per BSE Index Futures Contract] = [₹101,00,000 × 2.0 ÷ ₹25,25,000]	8 Contracts

(b) Computation of Gain on Short Futures Position

Particulars	Value
Position	SELL
Contracted Sale Price per Unit of BSE Index Less: Index Position in 3-Months	₹ 50,500 ₹ 45,000

Gain per Unit of BSE Index Future	₹ 5,500
No. of Units per Contract	50
Gain per Contract [₹5,500 × 50 Units]	₹ 2,75,000
No. of Contract entered into	8
Total Gain [8 Contracts X ₹2,75,000 per Contract]	22,00,000

Total Gain on Short Futures Position in 3 Months is ₹ 22,00,000.

Illustration 11. Hedging of Risks - Futures Rate Available vs. Future Rate not Avaliable

Fashion Ltd. manufactures cruiser bikes for export to Americana and Europe. It requires a special type alloy called "Fecal", made up of Iron, Aluminum and Copper. Fecal is sold at ₹230 per kg in the spot market. If Fashion Ltd. has a requirement of 6 tonnes in 6 months time, and the 6-Months Future Contract rate is ₹2.42 Lakhs per tonne. Carrying cost is 5% p.a. If the interest rate is 10%, should the Company opt for Futures Contract?

Case A: If the Company does opt for Futures Contract for buying 6 Tonnes of Fecal, what will be the effect if —

(a) Spot Rate at the end of 6 months is ₹2,55,000 per tonne?

(b) Spot Rate at the end of 6 months is ₹2,35,000 per tonne?

Has the Company gained or lost? If the Company has lost, is it proper to conclude that Futures Contract has failed to save the company from loss, and therefore need not be resorted to?

Case B: What will be the course of action and effect of such action in the above two cases, if —

(a) There is no Futures Market for Fecal;

(b) Hedge ratio for Fecal with the Metal Index is 0.9 i.e. Beta of Fecal with Metal Index is 0.90 (i.e. beta for change in values)

(c) Each Metal Index contract is equivalent to 500 Kgs of Fecal.

(d) 6-Months' Metal Index Future is 4800 points. [Assume futures contract are divisible]

If in Case A, Fashion Ltd. wants to cash in on an arbitrage opportunity, what should it do?

Solution:

1. Computation of Theoretical Forward Price [TFP_X]

$FP_X = S_X \times e^{(r+c)xt}$

Where, S_x = Current Spot Price = ₹230 per kg or ₹2,30,000 per tonne

r = Rate of Interest per annum = 10% p.a. or 0.10

c = Carrying cost (rate per annum) = 5% p.a. or 0.05

t = Period of Futures Contract in Years = 6 Months or 0.50 Years

TFP_X = ₹2,30,000 x $e^{(0.10 + 0.05) \times 0.50}$

= ₹2,30,000 x $e^{0.15 \times 0..05}$

= ₹2,30,000 x $e^{0.075}$

= ₹2,30,000 x 1.0779

= **₹2,47,917**

2. Evaluation of Futures Contract Proposal

- Theoretical Futures Price ₹2,47,917 is greater than Actual Futures Price ₹2,42,000.
- Therefore, the Company should go in for futures for buying 6 Tonnes of Fecal.
- Theoretically the Company stands to gain ₹5,917 per tonne based on Theoretical Futures Price.
- Company can freeze its loss (based on current spot price of ₹2.30 Lakhs per tonne) to ₹10,000 per tonne.

3. Effect of Futures Contract Proposal — Based on Actual Spot Rate 6-Months Later

Particulars	Situation A	Situation B
Spot Rate (6-Months later) is (per tonne)	₹2.55 Lakhs	₹2.35 Lakhs
Actual Futures Price is (per tonne)	₹2.42 Lakhs	₹2.42 Lakhs
6—Months' Future Price vs. Spot Rate [S_1]	AFP is lower.	AFP is higher.
Based on Actual Spot Rate on the date of exercise (i.e. 6 Months later), buying 6 tonnes at ₹2.42 Lakhs per tonne	Gain of ₹ 13,000 per tonne.	Loss of ₹7,000 per tonne

Conclusion:

- Futures contract **does not eliminate loss.** It **only eliminates uncertainty** associated with price. It is only a guarantee that the contractee will not gain or lose beyond a particular level (level determined by the Future Price) with reference to the current spot price.
- As a hedging tool, it freezes (fixes) the price and thereby mitigates the risk associated with price. The maximum gain or loss is known the day on which futures contract is entered into. One need not wait for the actual delivery or exercise day to know the rate.
- Therefore, it is inappropriate to conclude that Futures Contract should not be resorted to since it has failed to save the Company from loss.

4. No Future Rate Available

(a) Basis and Suggested Course of Action

- Since Fecal is not traded in the Futures Market, Fashion Ltd. can resort to **Cross Hedge** i.e. entering into a Futures Contract in a related index/commodity (whose prices move in tandem with Fecal).
- Since the Metal Index moves in tandem with the price of Fecal, Fashion Ltd. should enter into a Futures Contract in Metal Index opposite to its position in Fecal's Cash Market i.e. it requires 6 Tonnes of Fecal six months hence (Going Long), therefore, it should sell 6-Months Future Contract for Metal Index (Going Short).
- **Course of Action:** Sell Metal Index Futures. Buy Fecal Stock in Cash Market (to be executed Six Months hence).

(b) Activity Flow

Activity	Time	Description
Contract	Now	Enter into 6-Months' Futures Contract for Selling 10.80 Metal Index Futures
Settle Futures Contract	6-Months Later	Settle 6-Month's Future Metal Index liability by pocketing (gain) or paying (loss) the price difference. Gain (₹) = No. of Contracts × No. of Fecal Units per Contract × Gain in Metal Index Points Loss (₹) = No. of Contracts × No. of Fecal Units per Contract × Loss in Metal Index Points
Buy	6-Months Later	Buy Six Tonnes at prevailing spot price. [Prevailing Spot Price = Spot Price at the beginning of Futures Contract ± Gain/ Loss in settlement of Metal Index Futures]

Working Note: Contract Determination

Number of Metal Index Futures to be sold

$$= \text{Hedge Ratio} \times \frac{\text{Units of Spot Position requiring hedging}}{\text{No. of Units underlying one Futures Contract}}$$

$$= \text{Hedge Ratio [Beta of changes in Price of Fecal w.r.t. metal Index} \times \frac{\text{Quality of Fecal required by Fashion}}{\text{Quantity of fecal equivalent of one Futures Contract of Metal Index}}$$

= 0.90 × 6 Tonnes ÷ 0.50 Tonne = 0.90 × 12 = 10.80 Futures Contracts

(c) Cash Flow

Price in Spot Market 6- Months later is ₹2.55 Lakhs

Particulars	Value
Value per Kg six months later [₹2,55,000 ÷ 1,000 Kgs]	₹255
Less: Value per Kg at the beginning	₹230
Appreciation / (Depreciation) in Price per Kg. of Fecal	₹25
Hedge Ratio (i.e. Beta Value of movement in Fecal w.r.t to Metal Index Futures)	0.90
Appreciation in Metal Index [per metal index futures] [Appreciation in Fecal Price ÷ Hedge Ratio] = 25 ÷ 0.90 = 27.778 Points i.e. Metal Index would have appreciated by 27.778 points to 4,827.778 Points (4,800 + 27.778)	27.778 Points
Gain on Settlement of Metal Index Futures [No. of Contracts X No. of Fecal Units per Contract X Gain in Metal Index Points] = 10.80 × 500 Kgs. × ₹27.778 **[This is the Cash Inflow for Fashion Ltd]**	₹1,50,000
Cash Outflow => For Purchase of 6 Tonnes of Fecal ₹2.55 Lakhs per tonne × 6 Tonnes = ₹15,30,000 = Spot Price at the Beginning + Gain on Settlement of Metal Index Futures = ₹2,30,000 × 6 Tonnes + ₹1,50,000 = ₹13,80,000 + ₹1,50,000	₹15,30,000
Net Outflow for Fashion Ltd. = ₹15,30,000 - ₹1,50,000	₹13,80,000

Price in Spot Market 6-Months later is ₹2.35 Lakhs

Particulars	Value
Value per Kg six months later [₹2,35,000 ÷ 1,000 Kgs]	₹235
Less: Value per Kg at the beginning	₹230
Appreciation / (Depreciation) in Price per Kg. of Fecal	₹5
Hedge Ratio (i.e. Beta Value of movement in Fecal w.r.t to Metal Index Futures)	0.90
Appreciation in Metal Index [per metal index futures] = Appreciation in Fecal Price ÷ Hedge Ratio = 5 ÷ 0.90 = 5.556 Points i.e. Metal Index would have appreciated by 5.556 points to 4805.556 Points (4800 + 5.556)	5.556 Points
Gain on Settlement of Metal Index Futures [No. of Contracts X No. of Fecal Units per Contract × Gain in Metal Index Points] = 10.80 × 500 Kgs. × ₹5.556 **[This is the Cash Inflow for Fashion Ltd.]**	₹30,000
Cash Outflow => For Purchase of 6 Tonnes of Fecal ₹2.35 Lakhs per tonne × 6 Tonnes = ₹14,10,000 = Spot Price at the Beginning + Gain on Settlement of Metal Index Futures = ₹2,30,000 × 6 Tonnes + ₹30,000 = ₹13,80,000 + ₹30,000	₹14,10,000
Net Outflow for Fashion Ltd. = ₹14,10,000 - ₹30,000	₹13,80,000

5. Arbitrage Opportunity

- **Position:** Theoretical Futures Price (₹2,47,917) ≠ Actual Futures Price (₹2,42,000)
- **AFP vs. TFP:** To benefit from the opportunity, Fashion Ltd. should Buy Future and Sell Spot.
- **Profit:** = Sale Value (Spot Price) **Less** Purchase Cost (Present Value of Future Price)

  = [₹2,30,000 × 6 Tonne] **Less** [₹2,42,000 per tonne × 6 Tonnes ÷ e^{rt}]

  = ₹ 13,80,000 **Less** [₹14,52,000 ÷ $e^{(0.10+0.05)\times 0.5}$]

  = ₹13,80,000 **Less** [₹14,52,000 ÷ $e^{0.15 \times 0.5}$]

  = ₹13,80,000 **Less** [₹14,52,000 ÷ $e^{0.075}$]

  = ₹13,80,000 **Less** [₹14,52,000 ÷ 1.07788]

  = ₹13,80,000 **Less** ₹13,47,089

  = **₹32,911.**

Illustration 12. Hedging of Risks - Futures Rate Not Available - Choice of Cross Hedge.

Bharat Investments Ltd is long on 25,000 Shares of Trinayan Earthmoving Equipments Ltd (TEEL). Its shares are currently quoted at ₹180 per share. Bharat fears fall in prices of TEEL. It therefore wants to hedge its risk under the Futures Contract route. However, future rate is not available for TEEL. Therefore, Bharat is looking for cross hedge and the following particulars are made available –

Related Index	NIFTY	Infrastructure Index	Iron and Steel Index	Bank Index
Beta of TEEL with Related Index	0.8	1.1	1.3	1.0
Correlation of TEEL with Related Index	0.6	0.8	0.6	0.3
No. of Units of TEEL underlying every Futures Contract of Index	1000	500	1000	1250

Bharat contemplating taking a cross hedge in either Iron and Steel Index, because it has the highest Beta value, consequently requiring less no. of Futures Contract, or Bank Index as it has the perfect Beta Value.

Advise Bharat.

Solution:

1. Choice of Index for Cross Hedge

(a) Basis / Reasoning:

- **Object of Hedging:** Hedging through Futures Contract is done to mitigate or eliminate price related risks. The object is to eliminate uncertainty about the future price movements and freeze the impact of price movement at a particular point.
- **Relevance of Beta Value:**
  - (i) Beta value is the sensitivity of the stock to be hedged (TEEL) to the changes in value of the indices. It is an indication of volatility of the stock with reference to the movement in index.
  - (ii) It is also equal to the number of units of Index Future required to hedge one unit of the stock.
  - (iii) High Beta or Low Beta value is not the sole factor determining the choice of a cross hedge. If however, transaction costs are high, and a low beta index may be preferred.
- **Correlation:** Choice of the perfect cross hedge should be based on the correlation between the price of the stock to be hedged and the index used as a cross hedge. Higher the correlation with the index, better the index for cross hedging.
- **Beta vs. Correlation:**
  - (i) An Index which is highly correlated with the stock to be hedged should be preferred over an index with a lower correlation.
  - (ii) Where two indexes carry the same Beta Index, one with the higher correlation should be preferred.
  - (iii) Where two index carry the same correlation, index with a lower Beta may be preferred.

(b) Evaluation of Different Indices

Related Index [I]	NIFTY	Infrastructure Index	Iron and Steel Index	Bank Index
Beta of TEEL [β_{TL}]	0.8	1.1	1.3	1.0
Correlation of TEEL [ρ_{TL}]	0.6	0.8	0.6	0.3
No. of Units of MEEL underlying every Futures Contract of Index	1000	500	1000	1250
Ranking based on Correlation [Most correlated Index]	2	1	3	4

Note: NIFTY vs. Iron and Steel Index: Though both have the same correlation, Beta w.r.t. NIFTY is nearer to 1 than beta w.r.t. to Iron and Steel Index. Therefore, NIFTY edges over Iron and Steel Index.

Conclusion: Therefore, Prtivi Investments should prefer to cross hedge using Infrastructure Index.

2. Course of Action

1. **Basis:** Pritvi is long in the cash market i.e. buy in the cash market. Therefore, it should take the opposite position in the Futures Market of Infrastructure Index.
2. **Activity:** It should sell Infrastructure Index Futures. Therefore it should enter into Futures Contract for selling Infrastructure Index Futures after a specified period.
3. **No. of Contracts:** No. of Infrastructure Contracts to be sold

$$= \text{Hedge Ratio} \times \frac{\text{Units of Spot Position requiring hedging}}{\text{Units in one Futures Contract of Infra Index}}$$

$$= \text{Hedge Ratio [Beta of changes in Price of Fecal w.r.t. metal Index} \times \frac{\text{Units of TEEL required by Trinayan}}{\text{Units in one Future Contract of Infra Index}}$$

$$= 1.10 \text{ X } 25000 \text{ Units} \div 1000 \text{ Units}$$

$$= 1.10 \text{ x } 25 = 27.5 \text{ Futures Contracts}$$

Bharat should sell 27.5 Infrastructure Index Futures.

Illustration 13. Perfect vs. Imperfect Cross Hedge.

Emilee Trading Company has a beta of 0.80 with BSE 200. Each BSE 200 Futures contract is worth 100 units. Ranbir anticipates a bearish market for the next three months and has gone short on shares of 25,000 Shares of ETC in the spot market. ETC Shares are traded at ₹100.3-Months' Future BSE 200 is quoted at 12,500.

Required —

1. No. of BSE 200 Futures Contract to be taken by Ranbir if he wants to hedge price risk to the extent of — (a) 60%, (b) 100%, (c) 125%.
2. If price of ETC falls or increases by 20% in the spot market, how is Ranbir protected in the above three cases?
3. If price of ETC falls by 30% in the spot market and BSE 200 is quoted at 12,000 on the same day, what is Ranbir's position in Case 1(b) above? What is the inference drawn in this case with reference to cross hedging?

Solution:

Course of Action: Ranbir is short in the Spot Market, therefore he should go long in the Futures Market

i.e. Buy BSE 200 Futures. Sell Spot (already sold). Buy Future.

1. Computation of No. of Contracts to be taken

Factors: Hedge Ratio (Beta of ETC w.r.t. BSE 200) 0.80

Units of Spot Position to be hedged 25,000 Shares of ETC

Units per BSE 500 Futures Contract 100 Units

BSE 200 Futures Contracts for 100% Coverage **200** [0.80 X 25,000 Shares ÷ 100 Units]

Particulars	Case A	Case B	Case C
Risk Coverage Desired [A]	60%	100%	125%
BSE 200 Futures Contracts Required for 100% Coverage [B]	200	200	200
BSE 200 Futures Contract Required to be taken for the desired Risk Coverage [A × B]	120 Contracts [200 × 60%]	200 Contracts [200 × 100%]	250 Contracts [200 × 125%]

2. Price of ETC Falls by 20% — Protection for Ranbir

(a) Change in BSE 200 Index Points

Particulars	Case A
Market Price per Share of ETS in the beginning	₹100
Depreciation in % per Share of ETS	20%
Depreciation in Value per Share of ETS [₹100 × 20%]	₹20
Hedge Ratio (i.e. Beta Value of movement in ETS w.r.t to BSE 200]	0.80
Depreciation in BSE 200 Index [per metal index futures] [Depreciation in ETC Price ÷ Hedge Ratio] = 20 ÷ 0.80 = 25 Points i.e. BSE 200 Index would have depreciated by 25 Points to 12,475 Points (12,500 - 25)	25 Points
Effect: Since BSE 200 Index has depreciated, Ranbir should buy the Nifty at a higher price than the ruling price. Therefore, Ranbir would pay cash to settle the loss arising out of contract.	Loss

(b) Cash Flow on Cross Hedge

Particulars		Case A	Case B	Case C
Extent of Risk Coverage	[A]	60%	100%	125%
No. of Contracts	[B]	120	200	250
Loss on Settlement of BSE 200 Index Futures per unit of BSE 200 Future = 25 Points or ₹25	[C]	₹25	₹25	₹25
Total Loss on Settlement of BSE 200 Index Futures = [No. of Contracts [B] × No. of Units per BSE Futures 100 × Gain in BSE 200 Index Points [C] This is the Cash Outflow for Ranbir]	[D]	₹3,00,000 [120 × 25 × 100]	₹5,00,000 [200 × 25 × 100]	₹6,25,000 [250 × 25 × 100]
Cash Inflow => For Sale of 25,000 Shares of ETS in Spot Market = 25,000 Shares × ₹100 = ₹25,00,000 = Spot Price at the end + [Loss on settlement of Futures Contract ÷ Extent of Risk Hedged] = 25,000 Shares × ₹80 per Share + [D ÷ A]	[E]	₹25,00,000 [20 Lakhs + (3 Lakhs ÷ 60%)]	₹25,00,000 [20 Lakhs + (5 Lakhs ÷100%)]	₹25,00,000 [20 Lakhs + (6.25 Lakhs ÷125%)]
Net Inflow for Ranbir Ltd [Cash Inflow on Spot Sale of Shares Less Cash Outflow on Future Buy of BSE 200 Index] [E - D]	[F]	₹22 Lakhs [25 L - 3 L]	₹20 Lakhs [25L - 5L]	₹18.75 Lakhs [25 L - 6.25 L]

Alternative

Particulars	Case A	Case B	Case C
Actual Sale Value [Sale at Spot] [T_0]	₹25,00,000	₹25,00,000	₹25,00,000
Less: Sale Value if sold 6-Months later [T_6] [25,000 Shares × ₹80 per share]	₹20,00,000	₹20,00,000	₹20,00,000
Gain / (Loss) due to sale at T_0	₹5,00,000	₹5,00,000	₹5,00,000
Less: Loss in settlement of settlement of BSE Futures' Buy Contract [Entered into to hedge price risk]	(₹3,00,000)	(₹5,00,000)	(₹6,25,000)
Net Gain to Ranbir	₹2,00,000	—	—
Net Loss to Ranbir	—	—	₹1,25,000

3. Price of ETC Rises by 20% — Protection for Ranbir

(a) Change in BSE 200 Index Points

Particulars	Case A
Market Price per Share of ETS in the beginning	₹100
Appreciation in % per Share of ETS	20%
Appreciation in Value per Share of ETS [₹100 × 20%]	₹20.
Hedge Ratio (i.e. Beta Value of movement in ETS w.r.t to BSE 200]	0.80
Appreciation in BSE 500 Index [per futures contract] [Appreciation in ETC Price ÷ Hedge Ratio] = 20 ÷ 0.80 = 25 Points i.e. BSE 200 Index would have appreciated by 25 Points to 12,525 Points (12,500 + 25)	25 Points
Effect: Since BSE 200 Index has appreciated, Ranbir would buy the Nifty at a lower price than the ruling price. Therefore, Ranbir would receive cash to settle the gain in his favour arising out of contract	Gain

(b) Cash Flow on Cross Hedge

Particulars	Case A	CaseB	Case C
Extent of Risk Coverage **[A]**	60%	100%	125%
No. of Contracts **[B]**	120	200	250
Gain on Settlement of BSE 200 Index Futures per Contract per Share of ETS = 25 Points or ₹25 **[C]**	₹25	₹25	₹25
Total Gain on settlement of BSE 200 Index Futures = [No. of Contracts [B] × No. of Units per BSE 200 Index 100 X Gain in BSE 200 Index Points [C] [This is Cash Inflow for Ranbir] **[D]**	₹3,00,000 [120 × 25 × 100]	₹5,00,000 [200 × 25 × 100]	₹6,25,000 [250 × 25 × 100]
Cash Inflow: For Sale of 25,000 Shares of ETC in Spot Market = 25,000 Shares × ₹100 = ₹25,00,000 = Spot Price at the end + [Gain on settlement of Futures Contract ÷ Extent of Risk Hedged] = 25,000 Shares × ₹120 per Share - [D ÷ A] **[E]**	₹25,00,000 [30 Lakhs-(3 Lakhs ÷ 60%)]	₹25,00,000 [30 Lakhs - (5 Lakhs ÷ 100%)]	₹25,00,000 [30 Lakhs - (6.25 Lakhs ÷ 125%)]
Net Inflow for Ranbir Ltd [Cash Inflow on Spot Sale of Shares Add Cash Inflow on Future Buy of BSE 200 Index] **[F]**	₹28 Lakhs [25 L + 3 L]	₹30 Lakhs [25 L + 5 L]	₹31.25 Lakhs [25 L + 6.25 L]

Alternative

Particulars	Case A	Case B	Case C
Actual Sale Value [Sale at Spot] **[T_0]**	₹25,00,000	₹25,00,000	₹25,00,000
Less: Sale Value if sold 6-Months later [T_6] [25,000 Shares × ₹ 120 per share]	₹30,00,000	₹30,00,000	₹30,00,000
Gain / (Loss) due to sale at T_0	**(₹5,00,000)**	**(₹5,00,000)**	**(₹5,00,000)**
Loss due to sale at T_0	**₹5,00,000**	**₹5,00,000**	**₹5,00,000**
Less: Loss hedged due to Cross Hedge in 6-Months' BSE Futures [Gain in settlement of BSE Futures' Buy Contract]	(₹3,00,000)	(₹5,00,000)	(₹6,25,000)
Net Loss to Ranbir	**₹2,00,000**	—	—
Net Gain to Ranbir	—	—	**₹1,25,000**

4. Price of ETC Falls by 30% — Protection for Ranbir

(a) Change in BSE 200 Index Points

Particulars	Value
3-Months' Futures Index	12,500
Less: Actual Index as at T6	(12,000)
Depreciation / Fall in BSE 200 Index	500 Points
Effect: Since BSE 200 Index has depreciated, **Ranbir** should buy the BSE 200 at a higher price than the ruling price. Therefore, **Ranbir** would pay cash to settle the loss arising out of contract.	Loss

(b) Cash Flow on Cross Hedge

Particulars		Value
Extent of Risk Coverage	**[A]**	100%
No. of Contracts	**[B]**	200
Loss on Settlement of BSE 200 Index Futures per unit of BSE 200 Index Future = 500 Points or ₹500	**[C]**	₹500
Total Loss on Settlement of BSE 200 Index Futures = [No. of Contracts [B] × No. of Units per BSE 200 Index Futures 100 × Fall in BSE 200 Index Points **[This is the Cash Outflow for Ranbir]**	**[C]** **[D]**	**₹100 Lakhs** [200 × ₹500 × 100]
Cash Inflow For Sale of 25,000 Shares of ETS in Spot Market = 25,000 Shares × ₹100 = **₹25,00,000**	**[E]**	**₹25 Lakhs**
Net Outflow for Ranbir Ltd [Cash Inflow on Spot Sale of Shares **Less** Cash Outflow on Future Buy of BSE 200 Index]	**[F = D - E]**	**₹75 Lakhs** [100L-25L]

Alternatively

Particulars	Case B
Actual Sale Value [Sale at Spot] [T_0]	₹25.00 Lakhs
Less: Sale Value if sold 6-Months later [T_6] [25,000 Shares × ₹70 per share]	₹ 17.50 Lakhs
Gain / (Loss) due to sale at T_0	**₹7.50 Lakhs**
Less: Loss in settlement of settlement of BSE Futures' Buy Contract [Entered into to hedge price risk]	(₹100.00 Lakhs)
Net Loss to Ranbir	**₹92.50 Lakhs**

Inference:

- Cross Hedge will not yield the desired result if the actual performance of the Index with reference to the price of the share does not match up to the past performance i.e. correlation value.
- A correlation of 0.90 means that only 90% to the total variance in ETC's stock price change is explained by BSE 200 Index and is equivalent to Market Risk. The balance of 10% is unique risk.
- Hedging can offset only the market risk and not the unique risk. Therefore, given a ETC's Beta of 1.1 with reference to BSE Index, the price of ETC will not always move 1.1 times the BSE Index change. There is a 10% possibility that there will be a more than/ less than proportionate change (proportion is 1.1).
- Under such circumstances (wherein the change in Derivative Instrument i.e. BSE 200 Index and the Underlying Stock i.e. price of ETC, is not proportional), cross hedge can backfire and the investor may lose more than he had hedged for.

Illustration 14.

The February Pepper future traded at 16.80, the February 18.00 call at 0.45 and the February 18.00 put at 0.58. Both are options on the February future. Find out whether any arbitrage opportunity exists.

Solution:

(a) Cost of future = ₹16.80

(b) Cost of Pepper = Present Value of Exercise Price + Value of Call -Value of Put

= ₹18 + ₹0.45 – ₹0.58 = ₹ **17.87**

(c) **Conclusion:** Since there is difference between Spot Price and Futures Price, Arbitrage opportunity exists.

Illustration 15. Stock Index-Futures

A portfolio manager owns 3 stocks

Stock	Shares owned	Stock price (₹)	Beta
1	2 lakh	800	1.1
2	4 lakhs	600	1.2
3	6 lakhs	200	1.3

The spot Nifty Index is at 2700 and futures price is 2704. Use stock index futures to (a) decrease the portfolio beta to 0.8 and (b) increase the portfolio beta to 1.5. Assume the index factor is ₹100. Find out the number of contracts to be bought or sold of stock index futures.

Solution:

1. Computation of Existing Portfolio Beta

Security	Market Value of security (₹ Lakhs)	Proportion	Beta of the security	Weighted Beta
1	1,600	4/13	1.1	0.34
2	2,400	6/13	1.2	0.55
3	1,200	3/13	1.3	0.30
	5,200			1.19

Value per Futures Contract

= Index Price per Unit × Lot Size per Futures Contract

= ₹2700 × 100 = ₹ **2,70,000**

2. Activity to Reduce Portfolio Beta to 0.8

(a) **Object:** Reduce Portfolio Beta

(b) **Activity:** Sell Index Futures

- Beta of Existing Portfolio = β_1 = 1.19
  - Desired Beta of the New Portfolio = β_N = 0.8
  - Contract Size = 100 Units
  - Value per Futures Contract in NIFTY = V_F = ₹ 2,700 × 100 = ₹ 2,70,000
  - Value of the Portfolio = V_P = ₹ 5,200 Lakhs
  - No. of Futures Contract to be sold:

- = Portfolio Value × $\frac{\text{[Beta of the Portfolio – Desired Value of Beta]}}{\text{Value of a Futures Contract}}$

$= V_P \times \frac{\beta_1 - \beta_N}{V_F}$

= ₹ 5,200 Lakhs × [(1.19-0.8) ÷ ₹2,70,000] = **751** Contracts

3. Activity to increase the Portfolio Beta to 1.5

(a) **Object:** Increase Portfolio Beta

(b) **Activity:** Buy Index Futures

- Beta of Existing Portfolio = β_1 = 1.19
- Desired Beta of the New Portfolio = β_N = 1.5
- Value per Futures Contract in NIFTY = V_F = ₹ 2,700 × 100 = **₹2,70,000**
- Value of the Portfolio = V_P = ₹5,200 Lakhs
- No. of Futures Contract to be sold:

= Portfolio Value × $\frac{\text{[Desired Value of Beta – Beta of the Portfolio]}}{\text{Value of a Futures Contract}}$

$= V_P \times \frac{\beta_1 - \beta_N}{V_F}$

= ₹5,200 Lakhs × [(1.50 - 1.19) ÷ ₹2,70,000] = **597 Contracts**.

Illustration 16. Hedging with Index Futures

A unit trust wants to hedge its portfolios of shares worth ₹10 million using the BSE-SENSEX index futures. The contract size is 100 times the index. The index is currently quoted at 6,840. The beta of the portfolio is 0.8. The beta of the index may be taken as 1. What is the number of contracts to be traded?

Solution:

- Beta of Portfolio = β_1 = 0.8
- Beta of Index = β_N = 1
- Value per Futures Contract = V_F = ₹ 6,840 × 100 = ₹6.84 Lakhs
- Value of the Portfolio = V_P = ₹100 Lakhs
- Hedge Ratio = Beta of the Portfolio ÷ Beta of the Index
  = 0.8 ÷ 1 = 0.8
- No. of Futures Contract to be traded:

= Portfolio Value × $\frac{\text{Hedge Ratio}}{\text{Value of a Futures Contract}}$

$= V_P \times \frac{\text{Hedge Ratio}}{V_F}$

= ₹100 Lakhs × [0.8 ÷ ₹6.84 Lakhs] = 11.70 i.e. 12 Contracts

Illustration 17.

Which position on the index future gives a speculator, a complete hedge against the following transactions:

(a) The share of Yes Limited is going to rise. He has a long position on the cash market of ₹100 Lakhs on the Yes Limited. The beta of the Yes Limited is 1.25.

(b) The share of No Limited is going to depreciate. He has a short position on the cash market of ₹50 Lakhs on the No Limited. The beta of the No Limited is 0.90.

(c) The share of Fair Limited is going to stagnant. He has a short position on the cash market of ₹40 Lakhs of the Fair Limited. The beta of the Fair Limited is 0.75.

Solution:

1. Value to be traded in Futures [Index Value] = Hedge Ratio × Amount of Portfolio

2. Principles for deciding the Position on Index Futures [Opposite Position in relation to Stock]

Expectation on Stock Price	Action in Stock Market	Position in Index Futures
Rise	Buy / Long	Sell/Short
Fall	Sell/Short	Buy/Long

3. Position on the Index Futures

Sl. No.	Co.	Trend	Amount (₹)	Beta / Hedge Ratio	Index Value (₹)	Position
(a)	Yes Ltd.	Rise	100 Lakhs	1.25	1,25,00,000 [100 Lakhs × 1.25]	Short
(b)	No Ltd.	Depreciate	50 Lakhs	0.90	45,00,000 [50 Lakhs × 0.90]	Long
(c)	Fair Ltd.	Stagnant	40 Lakhs	0.75	30,00,000 [40 Lakhs × 0.75]	Long

Illustration 18.

Fill up the blanks in the following matrix —

Case	Portfolio Value	Existing Beta	Outlook	Activity	Desired Beta	No. of Futures Contracts
M	?	1.20	Bullish	?	1.8	90
N	₹3,60,00,000	?	?	Buy Index Futures	2.3	45
O	₹2,00,00,000	1.60	?	?	1.2	?
P	₹6,40,00,000	1.10	Bullish	?	?	48
Q	₹2,50,00,000	1.40	Bearish	?	1	?
R	₹5,00,00,000	?	Bearish	Sell Index Futures	1.25	45

S&P index is quoted at 4000 and the lot size is 100.

Solution:

Case	Portfolio Value	Existing Beta	Outlook	Activity	Desired Beta	No. of Futures Contracts
M	₹6,00,00,000	1.20	Bullish	Buy Index Futures	1.8	90
N	₹3,60,00,000	1.80	Bullish	Buy Index Futures	2.3	45
O	₹2,00,00,000	1.60	Bearish	Sell Index Futures	1.2	20
P	₹6,40,00,000	1.10	Bullish	Buy Index Futures	1.4	48
Q	₹2,50,00,000	1.40	Bearish	Sell Index Futures	1	25
R	₹5,00,00,000	1.61	Bearish	Sell Index Futures	1.25	45

Value per Futures Contract = Index Price per Unit × Lot Size per Futures Contract

= ₹4000 × 100 = **₹4 Lakhs**

1. **Case M**

(a) Inference: Outlook is Bullish and the desired Beta is more than the existing Beta. Therefore, Index Futures Contract **should be bought.**

(b) Number of Futures Contract = Portfolio Value × $\frac{\text{Desired Value of Beta - Beta of the Portfolio}}{\text{Value of a Futures Contract}}$

⇨ $N_F = V_P \times \frac{\beta_N - \beta_E}{V_F}$

⇨ 90 = V_P × (1.80 - 1.20) / ₹4 Lakhs

⇨ 0.60 V_P = 90 × ₹4 Lakhs

⇨ V_P = ₹3.6 Crores ÷ 0.60 = **₹600 Lakhs.**

2. Case N

(a) Inference: Activity is to Buy Index Futures. Therefore, outlook is **Bullish.** Therefore, existing Beta should be lower.

(b) Number of Futures Contract = Portfolio Value × $\frac{\text{Desired Value of Beta - Beta of the Portfolio}}{\text{Value of a Futures Contract}}$

⇨ $N_F = V_P \times \frac{\beta_N - \beta_E}{V_F}$

⇨ 45 = ₹ 3.60 Cr. × (2.30 - β_E)

⇨ 45 x ₹4 Lakhs = ₹3.60 Cr. × (2.30 - β_E)

⇨ 2.30 - β_E = ₹1.80 Crores ÷ ₹3.60 Crores

⇨ 2.30 - β_E = 0.50

⇨ β_E = 2.30 - 0.50 = **1.80**

3. Case O

(a) Inference: Desired Beta is lower than existing Beta. Therefore, **outlook is bearish** and apt activity is to **sell index futures.**

(b) Number of Futures Contract = Portfolio Value × $\frac{\text{[Beta of the Portfolio - Desired Value of Beta]}}{\text{Value of a Futures Contract}}$

⇨ $N_F = V_P \times \frac{\beta_E - \beta_N}{V_F}$

⇨ N_F = ₹ 2.00 Cr. × (1.60 - 1.20)/₹4 Lakhs

⇨ N_F = ₹ 2.00 Cr. × 0.40/₹4 Lakhs

⇨ N_F = ₹80 Lakhs/ ₹4 Lakhs = **20 Contracts**

4. Case P

(a) Inference: Desired Beta is higher than existing Beta. Therefore, **outlook is bullish** and apt activity is to **buy index futures.**

(b) Number of Futures Contract = Portfolio Value × $\frac{\text{[Desired Value of Beta - Beta of the Portfolio}}{\text{Value of a Futures Contract}}$

⇨ $N_F = V_P \times \frac{\beta_N - \beta_E}{V_F}$

⇨ 48 = ₹6.40 Cr. × (β_N - 1.10) / ₹4 Lakhs

⇨ 48 = 160 × (β_N -1.10)

⇨ 48/160 = β_N -1.10

⇨ 0.30 = β_N -1.10

⇨ β_N = 1.10 + 0.30 = **1.40**

5. Case Q

(a) Inference: Desired Beta is lower than existing Beta and outlook is bearish. Therefore, apt activity is to **sell index futures.**

(b) Number of Futures Contract = Portfolio Value × $\frac{\text{[Beta of the Portfolio – Desired Value of Beta]}}{\text{Value of a Futures Contract}}$

⇨ $N_F = V_P \times \frac{\beta_E - \beta_N}{V_F}$

⇨ N_F = ₹2.50 Cr. × (1.40 - 1.00) / ₹4 Lakhs

⇨ N_F = ₹2.50 Cr. × 0.40 / ₹4 Lakhs

⇨ N_F = ₹1 Cr. / ₹4 Lakhs = **25 Contracts**

6. Case R

(a) Inference: Outlook is bearish and the activity is to sell Index Futures. Therefore, Existing Beta should be higher than desired Beta.

(b) Number of Futures Contract = Portfolio Value × $\frac{\text{[Beta of the Portfolio – Desired Value of Beta]}}{\text{Value of a Futures Contract}}$

⇨ $N_F = V_P \times \frac{\beta_E - \beta_N}{V_F}$

⇨ 45 = ₹5 Cr. × (β_E - 1.25) / ₹4 Lakhs

⇨ 45 = 125 × (β_E -1.25)

⇨ β_E -1.25 = 45/ 125

⇨ β_E -1.25 = 0.36

⇨ β_E = 0.36 + 1.25 = **1.61.**

10.2 OPTIONS

An option is a contractual agreement that gives the option buyer the right, but not the obligation, to purchase (in the case of a call option) or to sell (in the case of a put option) a specified instrument at a specified price at any time of the option buyer's choosing by or before a fixed date in the future. Upon exercise of the right by the option holder, an option seller is obliged to deliver the specified instrument at the specified price.

For stock options, the amount is usually 100 shares. Each option contract has a buyer, called the holder, and a seller, known as the writer. If the option contract is exercised, the writer is responsible for fulfilling the terms of the contract by delivering the shares to the appropriate party. In the case of a security that cannot be delivered such as an index, the contract is settled in cash. For the holder, the potential loss is limited to the price paid to acquire the option. When an option is not exercised, it expires. No shares change hands and the money spent to purchase the option is lost. For the buyer, the upside is unlimited. Option contracts, like stocks, are therefore said to have an asymmetrical payoff pattern. For the writer, the potential loss is unlimited unless the contract is covered, meaning that the writer already owns the security underlying the option. Option contracts are most frequently as either leverage or protection. As leverage, options allow the holder to control equity in a limited capacity for a fraction of what the shares would cost. The difference can be invested elsewhere until the option is exercised. As protection, options can guard against price fluctuations in the near term because they provide the right acquire the underlying stock at a fixed price for a limited time. Risk is limited to the option premium (except when writing options for a security that is not already owned). However, the costs of trading options (including both commissions and the bid/ask spread) is higher on a percentage basis than trading the underlying stock. In addition, options are very complex and require a great deal of observation and maintenance.

Features of Options

The important features of options contracts are as follows:

- The buyer has the right to buy or sell the asset.
- To acquire the right of an option, the buyer of the option must pay a price to the seller. This is called the option price or the premium.
- The exercise price is also called the fixed price, strike price or just the strike and is determined at the beginning of the transaction. It is the fixed price at which the holder of the call or put can buy or sell the underlying asset.
- Exercising is using this right the option grants you to buy or sell the underlying asset. The seller may have a potential commitment to buy or sell the asset if the buyer exercises his right on the option.
- The expiration date is the final date that the option holder has to exercise his right to buy or sell the underlying asset.
- Time to expiration is the amount of time from the purchase of the option until the expiration date. At expiration, the call holder will pay the exercise price and receive the underlying securities (or an equivalent cash settlement) if the option expires in the money. (We will discuss the degrees of moneyness later in this session.) The call seller will deliver the securities at the exercise price and receive the cash value of those securities or receive equivalent cash settlement in lieu of delivering the securities.
- Defaults on options work the same way as they do with forward contracts. Defaults on over-the counter option transactions are based on counterparties, while exchange-traded options use a clearing house.
- Option Premium is the consideration for the Writer of the option, for assuming or taking up the liability to perform. It is the price to be paid by the Holder, irrespective of whether the option is exercised or not.

Differentiate Options from Forward Contracts and Futures Contracts:

Aspect	Forward Contracts	Futures Contracts	Option Contracts
Trading Place	No specific place. Can be traded like any commodity.	Traded on Stock Exchanges.	Traded on Stock Exchanges.
Settlement/ Cash Flow	At the time of delivery of asset, i.e. at the end of the contract period.	Profit / Loss is settled on a daily basis based on movement in Current Futures Price.	Option writer collects premium at the inception of the contract.
Closure of Contract	Delivery is must.	• Physical Delivery • Payment of price differential • Taking an opposite position, and cancelling out the contract.	• Physical Delivery • Payment of price differential • Taking an opposite position, and canceling out the contract.
Price Fixation	Negotiated between parties to the contract.	Determined by the market forces i.e. based on Demand and Supply.	Exercise Price / Strike Price fixed by the Stock Exchange. Premium is market determined.
Nature	Contracts are not standardized. These are customized.	Contracts are standardized.	Contracts are standardized.
Obligation to Perform	Both parties are under obligation to perform.	Both parties are under obligation to perform.	Only the Writer / Seller of the option is under obligation to perform.
Timing	Contracts can be entered into for any period at any time.	Exchange would fix the expiry date. Contracts can be entered into any time for periods upto the expiry date for that contract.	Exchange would fix the expiry date. Contracts can be entered into any time for periods upto the expiry date for that contract.
Guarantee of Performance	Performance is not guaranteed. There is liquidity risk.	Stock Exchange will ensure performance. There is little or no liquidity risk.	Stock Exchange will ensure performance. There is little no liquidity risk.

Options: Advantages and Disadvantages

Feature	Advantage	Disadvantage	Effect on Holder/Writer
Cost	Options are an inexpensive way to gain access to the underlying investment without having to buy stock	As a form of insurance, an option contract may expire worthless. This risk increases the greater the extent to which the option is out of the money and the shorter the time until expiration.	Holder may be disadvantaged due to expiry. Writer would be advantaged as s/he need not make delivery once the option has expired.
Leverage	Options enable investors to stump up less money and obtain additional gain.	Investors should realize that options' leverage can impact performance on the down side as well.	Writers of naked calls are exposed to unlimited risk.
Marketability	Option terms trade on an exchange and as such are standardized.	Regulatory intervention can prevent exercise which may not be desirable.	Both parties to an options transaction benefit from standardized and enforceable terms.

Hedging	Options may be used to limit losses.	The investor may end up being incorrect as to the direction and timing of a stock's price and may implement a less than perfect hedge.	Both the holder and the writer may be (dis)advantaged depending upon which side of the trade they assume and the ultimate direction of the underlying security.
Return enhancement	Options may be used to enhance a portfolio's return.	The investor may end up being incorrect as to the direction and timing of a stock's price, rendering the attempt at enhanced portfolio return worthless.	Both the holder and the writer may be (dis)advantaged depending upon which side of the trade they assume and the ultimate direction of the underlying security.
Diversification	One can replicate an actual stock portfolio with the options on those very stocks.	Diversification cannot eliminate systematic risk.	
Regulation	Terms of listed options are regulated.	Restrictions upon exercise may occur by regulatory fiat (OCC, SEC, court, other regulatory agency).	While in some cases necessary, regulatory fiat can disrupt what may be a profitable trade, affecting holder and writer alike.

Terms Used in Relation t o Options Contract:

(a) Strike price / Exercise price:

Strike Price / Exercise Price is the price at which the option can be exercised i.e. the price at which the underlying asset can be bought or sold on the expiry date (European Option) or before the expiry date (in case of American Option). Strike Price / Exercise Price is fixed by the Stock Exchange, and not by the Writer or Holder of an option. The Stock Exchange fixes a series of prices spaced at appropriate price intervals for an underlying asset. An investor can choose his preferred Strike Price from such a range of prices.

Example: Strike Price for December 2012 Options Contract on Shares of Wipro expiring on 27.12.2012 will be — ₹1900, ₹1925, ₹1950, ₹1975, ₹2000 etc. An investor can choose to buy an option with an Exercise Price of ₹1900, while another might choose ₹1950.

(b) Premium

Premium is the price at which the options contracts for an asset with a given expiry date and strike price is traded. It is paid by the Buyer to the Writer / Seller of the option. The writer keeps the premium whether or not the option is exercised. It is the consideration paid to the Writer / Seller for undertaking to deliver / buy the underlying security, if the option is exercised. Option Premium is market determined, i.e. based on the demand for the options with a given strike price. Premium payable on an Options Contract depends upon various factors like Strike Price, Expiry Date etc.

Option Premium consists of two components — (i) Intrinsic Value; and (ii) Time Value

(c) Expiry Date:

It is the last day (in the case of American style) or the only day (in the case of European style) on which an option may be exercised. Generally, Options contract on any security is traded based on its strike price and the expiry date.

Example: In November 2012, the following options on TCS Shares can be traded —

- 2012 December TCS Series of Options Contract with Strike Prices of ₹ 1900, ₹ 1925, ₹ 1950, ₹ 1975, ₹ 2000 etc.
- 2013 January TCS Series of Options Contract with Strike Prices ₹ 1,950, ₹ 1,975, ₹ 2000,₹ 2025, ₹ 2050 etc.

(d) Contract size:

Contract size is the number of units of the underlying asset covered by an options contract. Contract size is fixed by the Exchange.

Example: 100 Shares of Wipro, 200 Kgs of Wheat, etc.

"in-the-Money", "At-the-Money", and "Out-of-Money", with reference to Options:

(a) These terms describe the position of options contract from the trader's perspective (both Buyer and Seller of an option).

(i) **in the Money:** It is a situation, when exercising the option would be advantageous and result in gain or profit to the option holder.

(ii) **At the Money:** Exercise of option in this position, would neither result in a gain or loss to the option holder. At this stage the Current Market Price (CMP) and the Exercise Price (EP) are equal.

(iii) **Out of Money:** Exercise of option in this situation would result in a loss to the Option Holder.

(b) Call Option and put Option: An option-holder will exercise his option, only when it is advantageous to exercise it, based on the Strike Price and the Market Price on the date of expiry. Action on Options are as follows based on the market price on the date of expiry –

situation	Call Option		put Option	
	position	Action	position	Action
CMP < EP	Out of Money	Lapse. Buying at EP will not be advantageous. Do not exercise the Option.	In the Money	Exercise. Selling at EP would be advantageous. Exercise the Option.
CMP = EP	At the Money	Indifference Point.	At the Money	Indifference Point.
CMP > EP	In the Money	Exercise. Buying at EP would be advantageous. Exercise the Option.	Out of Money	Lapse. Selling at EP will not be advantageous. Do not exercise the Option.

Note: CMP = Current Market Price on Exercise / Expiry Date; EP = Exercise Price

Types of Options:

Option contracts may be classified into two types i.e. based on nature of activity and exercising the option.

(a) Based on nature of Activity:

Call Option	Put Option
Option which gives the holder the **right to BUY** an asset, but not an obligation to buy.	Option which gives the holder the **right to SELL** an asset, but not an obligation to sell.
Call Option will be exercised only when the Exercise Price is lower than the Market Price. [Only then it will be advantageous to the Holder]	Put Option will be exercised only when the Exercise Price is higher than the Market Price. [Only then it will be advantageous to the Holder]
Seller / Writer is under an obligation to sell the underlying asset if the Buyer exercises his option to buy the shares/ stock.	Seller/Writer is under an obligation to buy the underlying asset if the Buyer exercises his option to sell his shares/ stock.

Based on Exercising the Option:

American Option	European Option
Option under which holder can exercise his right at any time before expiry date.	Option under which holder can exercise his right only on the expiry date.

Buying a Call Option (Long Call)

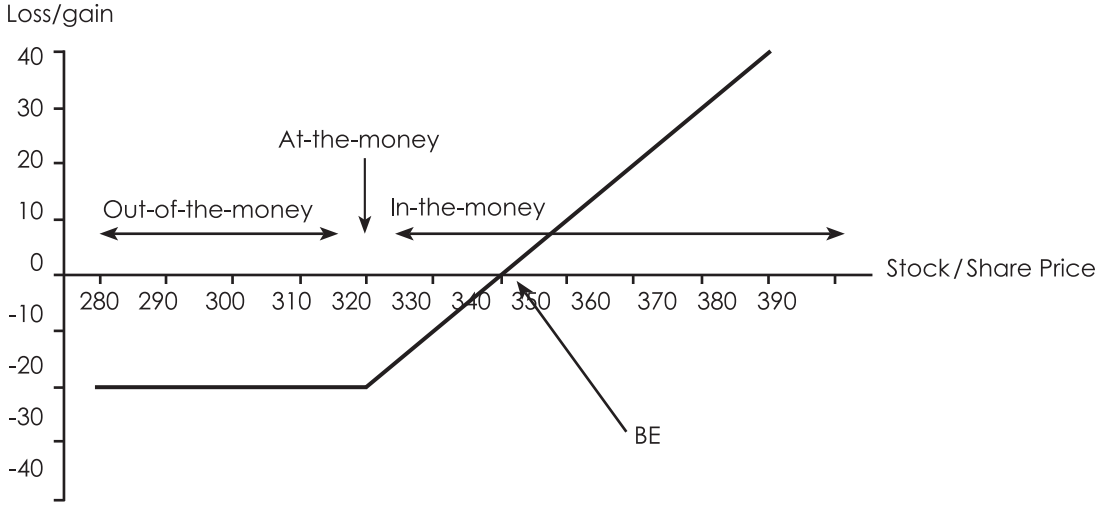
A call option provides the holder the right, but not the obligation, to buy a certain security at a specified price on a specified date. 'Call' means to redeem or effect a claim. If an investor expects the 'company A' share to rise from the present price of ₹ 320, he can buy a call option on 'company A',

e.g. with a strike price of ₹ 320. This call option gives the investor the right, but not the obligation, to buy 100 'company A' shares at a price of ₹ 320 at any time up to the expiry date. Each option contract is normally of 100 underlying shares.

With an option premium of 20 per underlying share and a price of 360 upon the expiry of the call option, the investor's capital gain may be calculated as follows:

Expiration gain: (360-320) x 100	₹ 4,000
Option premium: 20 x 100	₹ 2,000
Net gain (4,000 - 2,000)	**₹ 2,000**

If the expiry price is 310 instead, the gain upon expiration is 0, meaning that the investor has suffered a loss of ₹2,000 – or in other words, the option premium or the price of the option.



The figure shows the potential capital gain and loss upon expiry of the call option. Note that the loss is limited to the premium, which has already been paid, whereas the capital gain is unlimited. The figure also shows the payoff for a call option when the option is 'in-', 'at-' or 'out-of-the-money'. A call option is said to be at-the-money when the strike price equals the price of the underlying asset. If the price is less than or above the strike price, the call option is out-of the money and in the money, respectively. The figure also shows that the investor will break even (BE) at a price level of 340.

Investment in options can achieve considerable capital gains. Let us presume once more that the price of the share increases from 320 to 360. If you invest in the share, your investment will yield a percentage gain of:

(360-320) / 320 = 12.5%

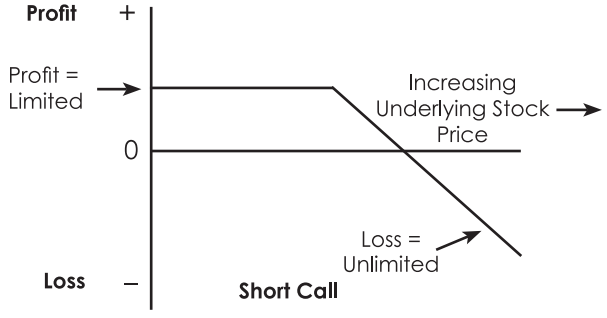
Now compare this with a corresponding investment in the above call option with a strike price of 320 and has a premium of 20. Here the yield amounts to:

(40-20) / 20 = 100%

Writing or selling a Call Option (short Call):

Writing or Selling a Call Option is when you give the buyer of the call option the right to buy a stock from you at a certain price by a certain date. In other words, the seller (also known as the writer) of the call option can be forced to sell a stock at the strike price. The seller of the call receives the premium that the buyer of the call option pays. If the seller of the call owns the underlying stock, then it is called "writing a covered call." If the seller of the call does NOT own the underlying stock, then it is called "writing a naked call." Obviously, in this instance it is "naked" because the seller does not own the underlying stock. The best way to understand the writing of a call is to read the following example.

Example of Writing / selling a Call Option:



It's January 1st and Mr. Pessimist owns 100 shares of GOOG stock that he bought 5 years ago at ₹100. The stock is now at ₹600 but Mr. Pessimist thinks that the price of GOOG is going to stay the same or drop in the next month, but he wants to continue to own the stock for the long term. At the same time, Mr. Bull just read an article on GOOG and thinks GOOG is going to go up ₹20 in the next few weeks because GOOG is about to have a press release saying they expect their China traffic to be very strong for the year.

Mr. Pessimist gets a quote on the January ₹610 call on GOOG and sees the price at bid ₹5.00 and ask ₹5.10. He places an order to SELL 1 GOOG January ₹610 call as a market order. Mr. Bull also places a market order to BUY the very same GOOG option contract. Mr. Pessimist's order immediately gets filled at ₹5.00 so he receives ₹500 (remember each option contract covers 100 shares but is priced on a per share basis) in his account for selling the call option. Mr. Bull immediately gets filled at ₹5.10 and pays ₹510 for the GOOG January ₹610 call. The market maker gets the ₹10 spread.

Once the trade is made, Mr. Pessimist hopes that GOOG stays below ₹610 until the third Friday in January. Meanwhile, Mr. Bull is hoping that GOOG closes well above ₹610 by the third Friday in January. If GOOG closes at ₹610 or below then the call option will expire worthless and Mr. Pessimist profits the

₹500 he received for writing / selling the call; and Mr. Bull loses his ₹510. If GOOG closes at ₹620, then Mr. Bull would exercise the call option and buy the 100 shares of GOOG from Mr. Pessimist at ₹610. Mr. Pessimist has now received ₹500 for writing the call option, but he has also lost ₹1000 because he had to sell a stock that was worth ₹620 for ₹610. Mr. Bull would be happy in that he spent ₹510, but he made

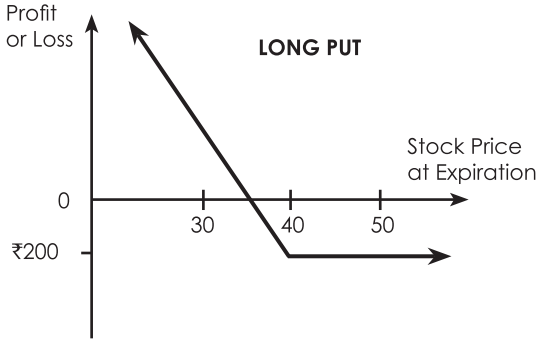
₹1000 on the stock because he ended up paying ₹610 for a stock that was worth ₹620.

I noted earlier that 35% of option buyers lose money and that 65% of option sellers make money. There is a very simple explanation for this fact. Since stock prices can move in 3 directions (up/down/ sideways) it follows reason that only 1/3 of the time will the stock move in the direction that the buyer of the stock or the buyer of the put wants. Therefore, 2/3 of the time the seller of the option is the one making the money!

To think of this another way, think of option trading as the turtle and the hare story. Option buyers are the rabbits that are generally looking for a quick move in stock prices, and the option sellers/writers are the turtles that are looking to make a few dollars each day.

Buying a put (Long put)

An investor is said to be long a put option when he has purchased a put option and currently owns the put. The term "going long" refers to buying a security, and applies to being long a stock, long a call, and long a put. When you are long a put you are hoping that the price of the underlying stock or index falls below the strike price of the put option. When the stock price is above the strike price, the long put option is "out of the money." When the stock price is at the strike price, the long put option is "at the money." And when the stock price is below the strike price, the long put option is "in the money."



Being long a put option is the opposite of being "short a put." The person that buys the put option has a long position, but the person that sold or wrote the put is "short a put."

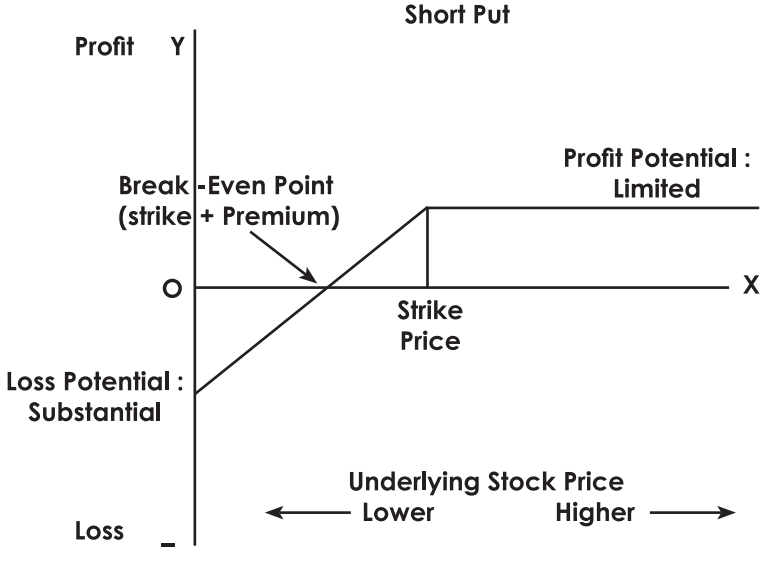
The person that is "long a put" wants the stock price to fall to ₹ 0 so that his profit is maximized. The person that is sold or wrote the put and is "short a put" wants the stock price to stay at or go above the strike price so that the put option expires worthless.

Writing a put (short put)

Going short by writing a put is generally considered more risky than going long since you're obligated to honor your side of the contract should the holder decide to exercise. In general, you would choose this strategy because you believe the stock's price will rise above the strike price, leaving the option without any value at expiration and you with the premium.

A more conservative reason to sell a put is if you have a target price at which you'd like to buy shares of a stock. Should the option be exercised, you'll be forced to pay for the stock. The premium you received will reduce your net price paid on those shares.

For example, say you write a put with a strike price of ₹35 and a premium of ₹2. If the stock's price drops to ₹31, you'll likely be assigned the option. You'll have to pay ₹3,500 for the shares, but the ₹200 you received at the outset means your net price for the shares is ₹3,300, or ₹33 per share. If the stock's price rises again in the future, you could realize considerable gains.



In the graph shown here, the vertical (Y-axis) represents profit and loss, while the horizontal (X-axis) shows the price of the underlying stock. The blue line shows your potential profit or loss given the price of the underlying.

Determination of Option premium:

The factors on which the level of premium depend are —

(a) Exercise price: Exercise Price or Strike Price refers to the price at which the contract is agreed upon.

When buying an Option, an investor can choose from a set of Strike Prices, for which Options can be bought/ sold. Based on Strike Price chosen, the Option Premium will vary as follows —

Exercise Price	Call Option Premium is —	Put Option Premium is —
High	**LOW.** As the Exercise Price goes up, the value of Option (i.e. CMP **Less** EP) goes down. Therefore, it becomes less valuable.	**HIGH.** As the Exercise Price goes up, the value of Option (i.e. EP **Less** CMP) goes up. Therefore, it becomes more valuable. The value of obligation to perform is also high from holder's perspective.

Low	**HIGH.** As the Exercise Price goes down, the value of Option (i.e. CMP **Less** EP) goes up. Therefore, it becomes more valuable. Value of obligation to perform is also high from holder's perspective.	**LOW.** As the Exercise Price goes up, the value of Option (i.e. EP **Less** CMP) goes down. Therefore, it becomes less valuable.

Current price of the Underlying Asset: Other things remaining constant, if the current market price of the asset goes up, value of the call option increases (since the possibility of exercising the call also increases) and put option decreases. If the Current Market Price decreases, value of put option increases (as the possibility of exercising the put option also increases), and value of call option decreases.

(c) Maturity or Expiry Date: Longer the time to maturity, higher the period of uncertainty, and hence higher the Option Premium. Therefore, an option with 3 months to maturity will have a higher premium than an option with 1 month to maturity.

(d) Volatility of stock prices: Volatility of stock price in the spot market (Cash Market) also contributes to premium. Higher volatility would mean prices hitting the extremes, and the buyer of option would exercise his option, which would result in a higher obligation on the part of the seller of the option. Therefore, the values of both calls and puts increase as volatility increases. Greater the volatility, higher will be the premium, and vice-versa.

(e) Interest Rate Movement: As interest rates increases, the expected return required by the investors on the stock also increases. Therefore, the present value of the future returns decreases. If the interest rate decreases, the expectations also go down.

(f) Market Factors:

(i) Liquidity in the market i.e. extent of money available for investment.

(ii) Dividend expectations i.e. if a large dividend is expected from a stock, the call option will be priced less, since dividend when declared and distributed, the prices will fall down. When cash market prices fall, the value of a call option also goes down.

"Intrinsic Value of an Option" And "time Value of an Option":

Intrinsic value and time value are two of the primary determinants of an option's price. Intrinsic value can be defined as the amount by which the strike price of an option is in-the-money. It is actually the portion of an option's price that is not lost due to the passage of time. The following equations will allow you to calculate the intrinsic value of call and put options:

- **Call Options**: Intrinsic value = Underlying Stock's Current Price - Call Strike Price Time Value = Call Premium - Intrinsic Value
- **Put Options**: Intrinsic value = Put Strike Price - Underlying Stock's Current Price Time Value = Put Premium - Intrinsic Value

ATM and OTM options don't have any intrinsic value because they do not have any real value. You are simply buying time value, which decreases as an option approaches expiration. The intrinsic value of an option is not dependent on the time left until expiration. It is simply an option's minimum value; it tells you the minimum amount an option is worth. Time value is the amount by which the price of an option exceeds its intrinsic value. Also referred to as extrinsic value, time value decays over time. In other words, the time value of an option is directly related to how much time an option has until expiration. The more time an option has until expiration, the greater the option's chance of ending up in-the-money. Time value has a snowball effect. If you have ever bought options, you may have noticed that at a certain point close to expiration, the market seems to stop moving anywhere. That's because option prices are exponential-the closer you get to expiration, the more money you're going to lose if the market doesn't move. On the expiration day, all an option is worth is its intrinsic value. It's either in-the-money, or it isn't.

Example: Let's use the table below to calculate the intrinsic value and time value of a few call options.

PRICE OF IBM = 106			
CALL STRIKE PRICE	**JAN**	**APRIL**	**JULY**
75	6	3 /87	8
80	2	3	7/84
85	3/8	19/16	2

If the current market price of IBM is 106, use the table to calculate the intrinsic value and time value of a few call option premiums.

1. **Strike Price = 75**

   Intrinsic value = Underlying price - Strike price = ₹81 - ₹75 = ₹6

   Time value = Call premium - Intrinsic value = ₹ 7 - ₹6 = ₹ 1

2. **Strike Price = 80**

   Intrinsic value = Underlying price - Strike price = ₹81 - ₹80 = ₹1

   Time value = Call premium - Intrinsic value = ₹3 7/8 - ₹1 = ₹2 7/8

3. **Strike Price = 85**

   Intrinsic value = Underlying price - Strike price = ₹81 - ₹85 = - ₹4 = Zero Intrinsic Value

   Time value = Call premium - Intrinsic value = ₹1 9/16 - ₹0 = ₹1 9/16 = All Time Value

Intrinsic value = Underlying price - Strike price = ₹81 - ₹85 = - ₹4 = Zero Intrinsic Value Time value = Call premium - Intrinsic value = ₹1 9/16 - ₹0 = ₹1 9/16 = All Time Value

The intrinsic value of an option is the same regardless of how much time is left until expiration. However, since theoretically an option with 3 months till expiration has a better chance of ending up in-the- money than an option expiring in the present month, it is worth more because of the time value component. That's why an OTM option consists of nothing but time value and the more out-of-the- money an option is, the less it costs (i.e. OTM options are cheap, and get even cheaper further out). To many traders, this looks good because of the inexpensive price one has to lay out in order to buy such an option. However, the probability that an extremely OTM option will turn profitable is really quite slim. The following table helps to demonstrate the chance an option has of turning a profit by expiration.

PRICE OF IBM = 106				
STRIKE	**JAN**	**Intrinsic**	**Value Time**	**Value**
65	17	16	1	
70	13	11	2	
75	10	6	4	
80	6	1	5	
85	3	0	3	

With the price of IBM at 81, a January 85 call would cost ₹3. The breakeven of a long call is equal to the strike price plus the option premium. In this case, IBM would have to be at 83 in order for the trade to breakeven (80 + 3 = 83). If you were to buy a January 65 call and pay ₹17 for it, IBM would only have to be at ₹82 in order to break even (65 + 17 = 82). As you can see, the further out an OTM option is, the less chance it has of turning a profit.

The deeper in-the-money an option is, the less time value and more intrinsic value it has. That's because the option has more real value and you pay less for time. Therefore, the option moves more like the underlying asset. This very important concept helps to describe the delta of an option. Understanding delta is the key to creating delta neutral strategies, one of the main approaches to non-directional Optionetics trading. One of the reasons it's important to know the minimum value of an option is to confirm how much real value and how much time value you are paying for in a premium. Since you can exercise an American style call or put anytime you want, its price should not be less than its intrinsic value. If an option's price is less than its exercise value, an investor could buy the call and exercise it, making a guaranteed arbitrage profit before commissions.

EXPECTATION, REWARD AND RISK OF BUYER AND WRITER OF A CALL OPTION

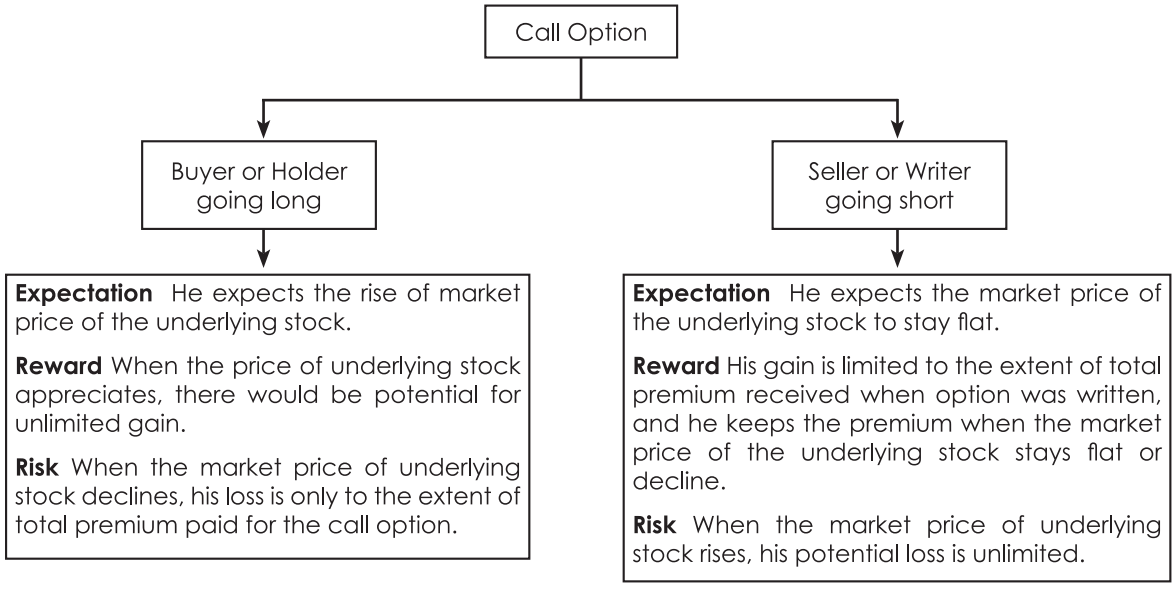
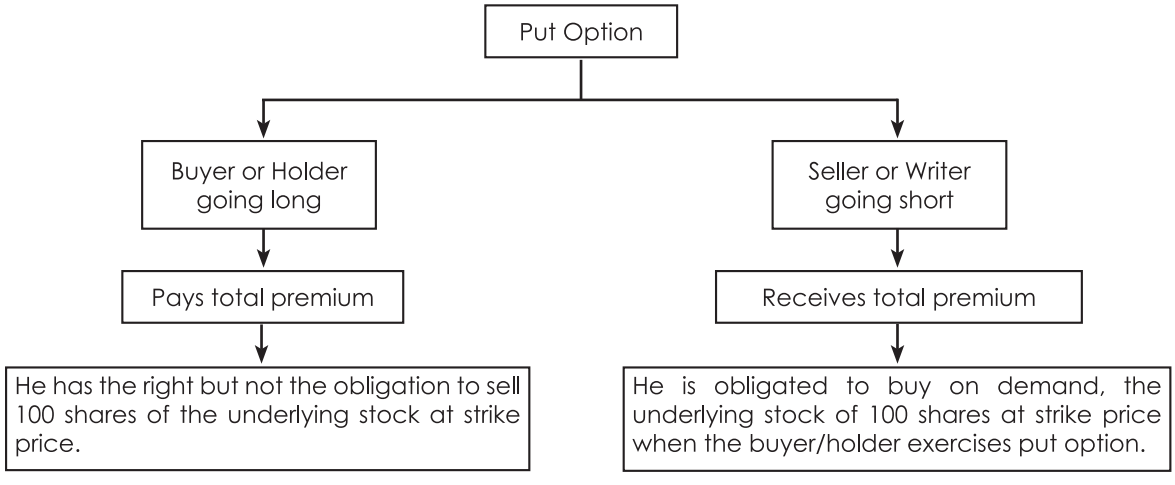


Figure : RIGHTS AND OBLIGATIONS OF THE HOLDER AND WRITER OF A PUT OPTION



Option Strategies

Covered Option: It is an option that is combined with an offsetting position in the underlying stock. Covered Option implies that, in case of Call Options, the Seller has the underlying stock in their possession, which can be transferred at the time of expiry, in case of Put Option, the Seller has sold the shares in the Cash Market.

(a) Covered Calls:

- Here the Seller / Writer of a Call Option owns the underlying stock.
- If the option is exercised by the Option Holder, the Seller would simply deliver the stock he already owns, and receives the sale price of the stock equal to the Strike Price.

(b) Covered puts:

- Here the Seller / Writer of a Put Option has sold the stock in the Cash Market (obtained under Stock Lending Scheme or his own stock)

- If the option is exercised by the Option Holder, the seller would buy the stock and at the Exercise Price, and delivers it back to the person from whom he had borrowed the Stock under Stock Lending Scheme. If he had sold his own stock earlier, his portfolio would once again include the stock bought under the Put Option.

Naked Options: It is an option that is not combined with an offsetting position in the underlying stock. When the investor (writer of a Call and writer of a Put), does not have any stock in his hand or is not short (sell position) in the cash market, at the time of entering into options contract, it is called Uncovered Options.

(a) Uncovered Calls:

- Here the Seller / Writer of the Call Option, does not own the underlying stock.
- If the price of the underlying asset rises, the Call Writer has no protection, and would be required to buy in the open market, and deliver the asset to the Option Holder.
- If the Call Writer does not own the stock, and the option is exercised, the potential loss on his head is unlimited.

(b) Uncovered puts:

- Here the Writer / Seller of the Put Option, does not sell the underlying asset in the Cash Market (either his own stock or borrowed under Stock Lending).
- If the price of the underlying asset falls, the Put Writer will not have any protection but to buy the stock at a very high price.

Spread strategy

In options trading, an option spread is created by the simultaneous purchase and sale of options of the same class on the same underlying security but with different strike prices and/or expiration dates.

Any spread that is constructed using calls can be referred to as a call spread. Similarly, put spreads are spreads created using put options.

Option buyers can consider using spreads to reduce the net cost of entering a trade. Naked option sellers can use spreads instead to lower margin requirements so as to free up buying power while simultaneously putting a cap on the maximum loss potential.

Vertical, Horizontal & Diagonal spreads

The three basic classes of spreads are the vertical spread, the horizontal spread and the diagonal spread. They are categorized by the relationships between the strike price and expiration dates of the options involved.

Vertical spreads are constructed using options of the same class, same underlying security, same expiration month, but at different strike prices.

Horizontal or calendar spreads are constructed using options of the same underlying security, same strike prices but with different expiration dates.

Diagonal spreads are created using options of the same underlying security but different strike prices and expiration dates.

Bull spread- its variants:

Bull Spread is the act of buying and selling options with different strike prices with the same expiry dates. Call Option purchased has a Lower Exercise Price than Call Option written. Similarly, put Option Purchased has a Higher Exercise Price than Put Option sold.

Basis:

(a) Investor expects that the price of the underlying asset will rise, i.e. outlook is bullish.

(b) Investor does not want to take undue risks on such expectation.

Types: There are two types of Bull Spreads, Bull Call Spread and Bull Put Spread

Areas	Bull Call Spread	Bull Put Spread
Situation	Buy and Write a Call Option, with different exercise prices, but same expiry date.	Buy and Write a Put Option, with different Exercise Prices, but same expiry date.
Condition	Exercise Price of Call Option bought is **LOWER** than Exercise Price of Call Option sold.	Exercise Price of Put Option bought is **HIGHER** than Exercise Price of Put Option sold.
Maximum Profit	Ability to make Profit is limited to the difference between the Exercise Prices, and difference between the Option Premium.	Maximum Gain is limited to difference between the premium collected and paid.
Maximum Loss	Loss is limited to difference between the premium paid and collected.	Maximum Loss is limited to the difference between the Exercise Prices, and difference between the Option Premium.

Bear spread and its variants- When an investor will choose to enter into a Bear spread:

Bear Spread is the act of buying and selling options with different strike prices with the same expiry dates. Call Option purchased has a higher Exercise Price than Call Option written. Similarly, Put Option Purchased has a lower exercise price than Put Option sold.

Condition prevalent and Outlook:

(a) Investor expects that the price of the underlying asset will fall i.e. outlook is bearish.

(b) Investor does not want to take undue risks on such expectation, by entering into sale contracts.

Types: There are two types of Bear Spreads, Bear Call Spread and Bear Put Spread —

Areas	Bear Call spread	Bear put spread
Situation	Buy and Write a Call Option, with different exercise prices, but same expiry date.	Buy and Write a Put Option, with different Exercise Prices, but same expiry date.
Condition	Exercise Price of Call Option bought is **HiGHER** than Exercise Price of Call Option sold.	Exercise Price of Put Option bought is **LOWER** than Exercise Price of Put Option sold.
Maximum Profit	Maximum Gain is limited to difference between the premium collected and paid.	Ability to make Profit is limited to the difference between the Exercise Prices, and difference between the Option Premium.
Maximum Loss	Maximum Loss is limited to the difference between the Exercise Prices, and difference between the Option Premium.	Loss is limited to difference between the premium paid and collected.

Note: Both Bull Spread and Bear Spread are similar to the extent of act of buying and writing an option for different strike prices. However, the difference lies in the exercise price of options bought and sold. In Bull Call Spread, Options bought has a lower exercise price. In a Bear Call Spread, Options sold has a higher exercise price. Likewise for other variants of Bull Spread and Bear Spread.

Butterfly Spread

Butterfly Spread is an option strategy which combines a Bull Spread and Bear Spread and involves three different strike prices.

Butterfly spread is taken up if investors are of the view that the underlying security is not highly volatile and there is not going to be a substantial rise or fall in its prices.

Features:

(a) Risk: Risk is limited.

(b) Profit: Profits are limited and can be realised if the stock prices closes at expiry date, at the strike price of the written options.

(c) Costs: Commission Costs are high.

(d) Strike prices:

- It involves three Strike Prices wherein 2 positions are taken in one strike price and 1 transaction each is taken up at a higher strike price and the lower strike price.
- The lower two Strike Prices are used in the Bull Spread, and the higher Strike Price is used in the Bear Spread.

Conditions: The Three Exercise Prices should satisfy the following conditions — $(EP_1 + EP_3) \div 2 = EP_2$

Where EP_1, EP_2 and EP_3 represent the three Exercise Prices.

Types: There are two types of Butterfly Spread viz. Long and Short Butterfly Spread

Basis	Long Butterfly Spread	Short Butterfly Spread
Strategy	It is created by Buying one option at each of the Outside Exercise Prices and Selling two options at the inside Exercise Price (EP_2).	It is created by selling one option at each of the outside Exercise Prices (EP, and EP_3) and buying two options at the inside Exercise Price (EP_2).
Profit	It would lead to Profit if the Price of the underlying asset remains close to the Strike Price at which the two calls were sold.	The short butterfly strategy would lead to profit if the price of the underlying asset moves far away from the exercise price at which the two calls were bought.

Box spread (Long Box)

The box spread, or long box, is a common **arbitrage strategy** that involves buying a **bull call spread** together with the corresponding **bear put spread**, with both vertical spreads having the same strike prices and expiration dates. The long box is used when the spreads are underpriced in relation to their expiration values.

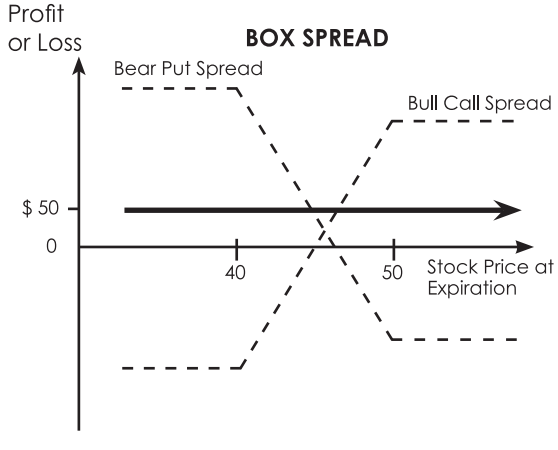
Box spread Construction

Buy	1	ITM	Call
Sell	1	OTM	Call
Buy	1	ITM	Put
Sell	1	OTM	Put

Essentially, the arbitrager is simply buying and selling equivalent spreads and as long as the price paid for the box is significantly below the combined expiration value of the spreads, a riskless profit can be locked in immediately.

Expiration Value of Box = Higher Strike Price - Lower Strike Price

Risk-free Profit = Expiration Value of Box - Net Premium Paid



Box Spread Payoff Diagram

Example

Suppose XYZ stock is trading at ₹45 in June and the following prices are available:

- JUL 40 put - ₹1.50
- JUL 50 put - ₹6
- JUL 40 call - ₹6
- JUL 50 call - ₹1

Buying the bull call spread involves purchasing the JUL 40 call for ₹600 and selling the JUL 50 call for ₹100. The bull call spread costs: ₹600 - ₹100 = ₹500

Buying the bear put spread involves purchasing the JUL 50 put for ₹600 and selling the JUL 40 put for ₹150. The bear put spread costs: ₹600 - ₹150 = ₹450

The total cost of the box spread is: ₹500 + ₹450 = ₹950

The expiration value of the box is computed to be: (₹50 - ₹40) x 100 = ₹1000.

Since the total cost of the box spread is less than its expiration value, a riskfree arbitrage is possible with the long box strategy. It can be observed that the expiration value of the box spread is indeed the difference between the strike prices of the options involved.

If XYZ remain unchanged at ₹45, then the JUL 40 put and the JUL 50 call expire worthless while both the JUL 40 call and the JUL 50 put expires in-the-money with ₹500 intrinsic value each. So the total value of the box at expiration is: ₹500 + ₹500 = ₹1000.

Suppose, on expiration in July, XYZ stock rallies to ₹50, then only the JUL 40 call expires in-the-money with ₹1000 in intrinsic value. So the box is still worth ₹1000 at expiration.

What happens when XYZ stock plummets to ₹40? A similar situation happens but this time it is the JUL 50 put that expires in-the-money with ₹1000 in intrinsic value while all the other options expire worthless. Still, the box is worth ₹1000.

As the trader had paid only ₹950 for the entire box, his profit comes to ₹50.

Note: While we have covered the use of this strategy with reference to stock options, the box spread is equally applicable using ETF options, index options as well as options on futures.

The box spread is profitable when the component spreads are underpriced. Conversely, when the box is overpriced, you can sell the box for a profit. This strategy is known as a short box.

Combination trading strategy- its variants:

Combination is a Trading Strategy that involves taking a position in both calls and puts on the same stock.

Types:

(a) **Straddle:** Straddle involves buying a call and put with the same strike price and same expiry date.

(b) **Strangle:** Strangle involves buying a put and call with the different strike price and same expiry date.

(c) **Strips:** Strip involves selling one call and two puts with the same strike price and same expiry date.

(d) **Straps:** Strap involves selling two calls and one put with the same strike price and same expiry date.

Straddle:

In trading, there are numerous sophisticated trading strategies designed to help traders succeed regardless of whether the market moves up or down. Some of the more sophisticated strategies, such as iron condors and iron butterflies, are legendary in the world of options. They require a complex buying and selling of multiple options at various strike prices. The end result is to make sure a trader is able to profit no matter where the underlying price of the stock, currency or commodity ends up. However, one of the least sophisticated option strategies can accomplish the same market neutral objective with a lot less hassle - and it's effective. The strategy is known as a straddle. It only requires the purchase or sale of one put and one call in order to become activated. In this article, we'll take a look at different the types of straddles and the benefits and pitfalls of each.

Types of straddles

A straddle is a strategy that is accomplished by holding an equal number of puts and calls with the same strike price and expiration dates. The following are the two types of straddle positions.

- *Long Straddle* - The long straddle is designed around the purchase of a put and a call at the exact same strike price and expiration date. The long straddle is meant to take advantage of the market price change by exploiting increased volatility. Regardless of which direction the market's price moves, a long straddle position will have you positioned to take advantage of it.
- *Short Straddle* - The short straddle requires the trader to sell both a put and a call option at the same strike price and expiration date. By selling the options, a trader is able to collect the premium as a profit. A trader only thrives when a short straddle is in a market with little or no volatility. The opportunity to profit will be based 100% on the market's lack of ability to move up or down. If the market develops a bias either way, then the total premium collected is at jeopardy.

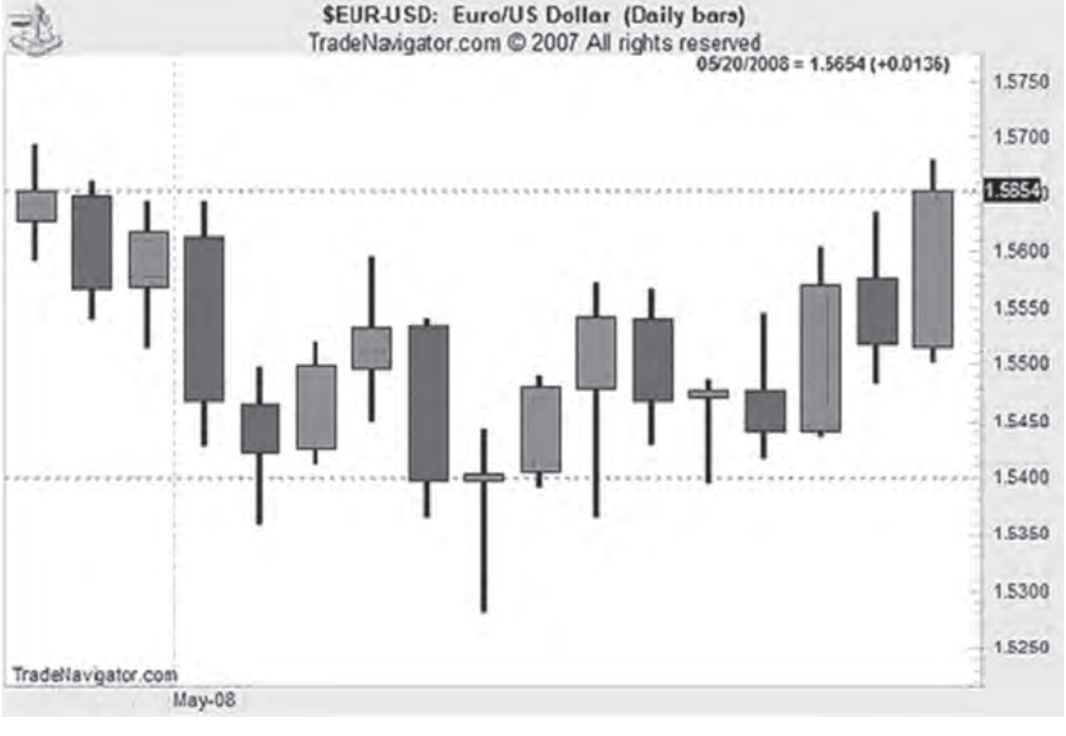
The success or failure of any straddle is based on the natural limitations that options inherently have along with the market's overall momentum.

The Long straddle

A long straddle is specially designed to assist a trader to catch profits no matter where the market decides to go. There are three directions a market may move: up, down or sideways. When the market is moving sideways, it's difficult to know whether it will break to the upside or downside. To successfully prepare for the market's breakout, there is one of two choices available:

1. The trader can pick a side and *hopes* that the market breaks in that direction.
2. The trader can hedge his or her bets and pick both sides simultaneously. That's where the long straddle comes in.

By purchasing a put and a call, the trader is able to catch the market's move regardless of its direction. If the market moves up, the call is there; if the market moves down, the put is there. In Figure below, we look at a 17-day snapshot of the euro market. This snapshot finds the euro stuck between ₹1.5660 and ₹1.54.



Source: Traden Avigator.Com

While the market looks like it may breakthrough the ₹1.5660 price, there is no guarantee that it will. Based on this uncertainty, purchasing a straddle will allow us to catch the market if it breaks to the upside or if it heads back down to the ₹1.54 level. This allows the trader to avoid any surprises.

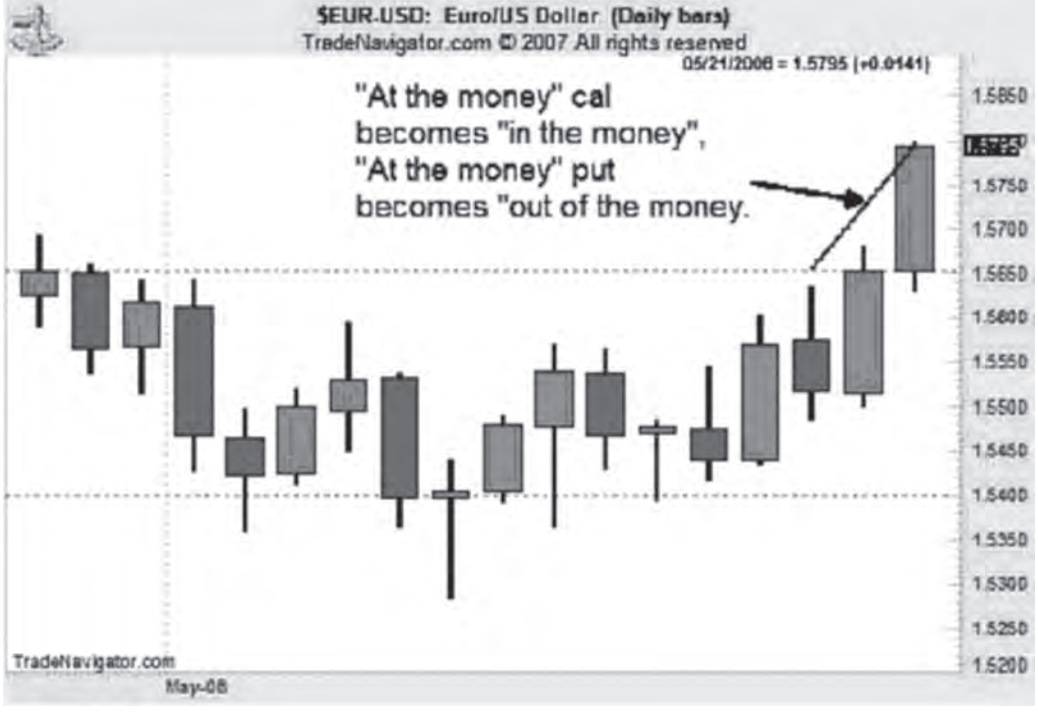
Drawbacks to the Long straddle

The following are the three key drawbacks to the long straddle.

- Expense
- Risk of loss
- Lack of volatility

The rule of thumb when it comes to purchasing options is that in-the-money and at-the-money options are more expensive than out-of-the-money options. Each at-the-money option can be worth a few thousand dollars. So while the original intent is to be able to catch the market's move, the cost to do so may not match the amount at risk.

In Figure below we see that the market breaks to the upside, straight through ₹1.5660.



Source: Traden Avigator.Com

This leads us to the second problem: risk of loss. While our call at ₹1.5660 has now moved in the money and increased in value in the process, the ₹1.5660 put has now decreased in value because it has now moved farther out of the money. How quickly a trader can exit the losing side of straddle will have a significant impact on what the overall profitable outcome of the straddle can be. If the option losses mount quicker than the option gains or the market fails to move enough to make up for the losses, the overall trade will be a loser.

The final drawback deals with the inherent makeup of options. All options are comprised of the following two values.

- Time Value - The time value comes from how far away the option is from expiring.
- Intrinsic Value - The intrinsic value comes from the option's strike price being out, in, or at the money.

If the market lacks volatility and does not move up or down, both the put and call option will lose value every day. This will go on until the market either definitively chooses a direction or the options expire worthless.

The short straddle

The short straddle's strength is also its drawback. Instead of purchasing a put and a call, a put and a call are sold in order to generate income from the premiums. The thousands that were spent by the put and call buyers actually fill your account. This can be a great boon for any trader. The downside, however, is that when you sell an option you expose yourself to unlimited risk.

As long as the market does not move up or down in price, the short straddle trader is perfectly fine. The optimum profitable scenario involves the erosion of both the time value and the intrinsic value of the put and call options. In the event that the market does pick a direction, the trader not only has to pay for any losses that accrue, but he or she must also give back the premium he has collected. The only recourse that short straddle traders have is to buy back the options that they sold when the value justifies doing so. This can occur anytime during the life cycle of a trade. If this is not done, the only choice is to hold on until expiration.

When straddles Work Best

The option straddle works best when it meets at least one of these three criteria:

- The market is in a sideways pattern.
- There is pending news, earnings or another announcement.
- Analysts have extensive predictions on a particular announcement.

Analysts can have tremendous impact on how the market reacts before an announcement is ever made. Prior to any earnings decision or governmental announcement analysts, do their best to predict what the exact value of the announcement will be. Analysts may make estimates weeks in advance of the actual announcement, which inadvertently forces the market to move up or down. Whether the prediction is right or wrong is secondary to how the market reacts and whether your straddle will be profitable. After the actual numbers are released, the market has one of two ways to react: The analysts' prediction can add either to or decrease the momentum of the actual price once the announcement is made. In other words, it will proceed in the direction of what the analyst predicted or it will show signs of fatigue. A properly created straddle, short or long, can successfully take advantage of just this type of market scenario. The difficulty occurs in knowing when to use a short or a long straddle. This can only be determined when the market will move counter to the news and when the news will simply add to the momentum of the market's direction.

Strangle strategy:

A strangle is an investment strategy involving the purchase or sale of particular option derivatives that allows the holder to profit based on how much the price of the underlying security moves, with relatively minimal exposure to the direction of price movement. The purchase of particular option derivatives is known as a long strangle, while the sale of the option derivatives is known as a short strangle.

The long strangle, also known as buy strangle or simply "strangle", is a neutral strategy in options trading that involve the simultaneous buying of a slightly out-of-the-money put and a slightly out-of-the-money call of the same underlying stock and expiration date.

Long strangle Construction

Long Strangle Construction			
Buy	1	OTM	Call
Buy	1	OTM	Put

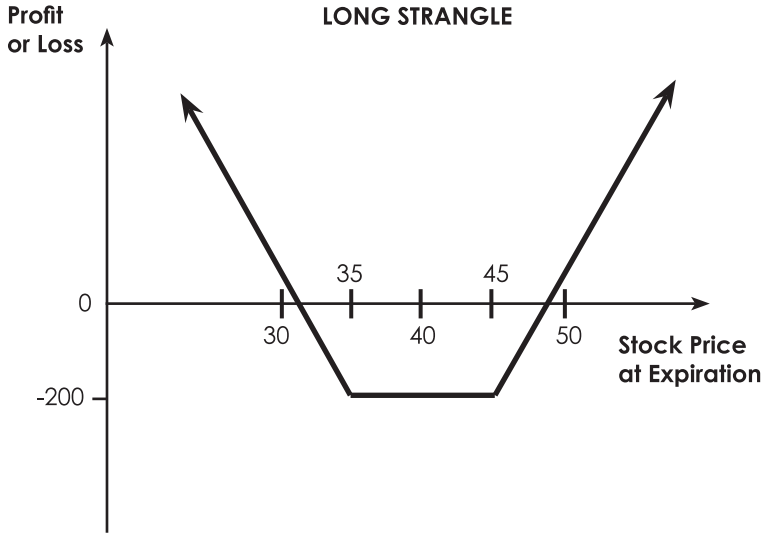
The long options strangle is an unlimited profit, limited risk strategy that is taken when the options trader thinks that the underlying stock will experience significant volatility in the near term. Long strangles are debit spreads as a net debit is taken to enter the trade.

Large gains for the long strangle option strategy is attainable when the underlying stock price makes a very strong move either upwards or downwards at expiration.

The formula for calculating profit is given below:

- Maximum Profit = Unlimited
- Profit Achieved When Price of Underlying > Strike Price of Long Call + Net Premium Paid OR Price of Underlying < Strike Price of Long Put - Net Premium Paid

- Profit = Price of Underlying - Strike Price of Long Call - Net Premium Paid OR Strike Price of Long Put - Price of Underlying - Net Premium Paid



Long Strangle Payoff Diagram

Limited Risk

Maximum loss for the long strangle options strategy is hit when the underlying stock price on expiration date is trading between the strike prices of the options bought. At this price, both options expire worthless and the options trader loses the entire initial debit taken to enter the trade.

The formula for calculating maximum loss is given below:

- Max Loss = Net Premium Paid + Commissions Paid
- Max Loss Occurs When Price of Underlying is in between Strike Price of Long Call and Strike Price of Long Put

Breakeven point(s)

There are 2 break-even points for the long strangle position. The breakeven points can be calculated using the following formulae.

- Upper Breakeven Point = Strike Price of Long Call + Net Premium Paid
- Lower Breakeven Point = Strike Price of Long Put - Net Premium Paid

Example

Suppose XYZ stock is trading at ₹40 in June. An options trader executes a long strangle by buying a JUL 35 put for ₹100 and a JUL 45 call for ₹100. The net debit taken to enter the trade is ₹200, which is also his maximum possible loss.

If XYZ stock rallies and is trading at ₹50 on expiration in July, the JUL 35 put will expire worthless but the JUL 45 call expires in the money and has an intrinsic value of ₹500. Subtracting the initial debit of ₹200, the options trader's profit comes to ₹300.

On expiration in July, if XYZ stock is still trading at ₹40, both the JUL 35 put and the JUL 45 call expire worthless and the options trader suffers a maximum loss which is equal to the initial debit of ₹200 taken to enter the trade.

Note: While we have covered the use of this strategy with reference to stock options, the long strangle is equally applicable using ETF options, index options as well as options on futures.

The converse strategy to the long strangle is the short strangle. Short strangle spreads are used when little movement is expected of the underlying stock price.

Strip

The strip is a modified, more bearish version of the common straddle. It involves buying a number of at-the-money calls and twice the number of puts of the same underlying stock, striking price and expiration date.

Strip Construction

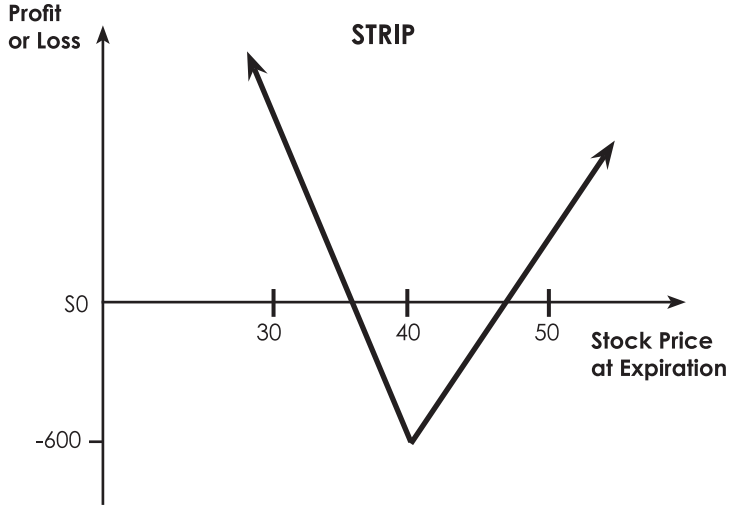
Buy	1	ATM	Call
Buy	2	ATM	Puts

Strips are unlimited profit, limited risk options trading strategies that are used when the options trader thinks that the underlying stock price will experience significant volatility in the near term and is more likely to plunge downwards instead of rallying.

Large profit is attainable with the strip strategy when the underlying stock price makes a strong move either upwards or downwards at expiration, with greater gains to be made with a downward move.

The formula for calculating profit is given below:

- Maximum Profit = Unlimited
- Profit Achieved When Price of Underlying > Strike Price of Calls/Puts + Net Premium Paid OR Price of Underlying < Strike Price of Calls/Puts - (Net Premium Paid/2)
- Profit = Price of Underlying - Strike Price of Calls - Net Premium Paid OR 2 x (Strike Price of Puts - Price of Underlying) - Net Premium Paid



Strip Payoff Diagram

Limited Risk

Maximum loss for the strip occurs when the underlying stock price on expiration date is trading at the strike price of the call and put options purchased. At this price, all the options expire worthless and the options trader loses the entire initial debit taken to enter the trade.

The formula for calculating maximum loss is given below:

- Max Loss = Net Premium Paid + Commissions Paid
- Max Loss Occurs When Price of Underlying = Strike Price of Calls/Puts

Breakeven point(s)

There are 2 break-even points for the strip position. The breakeven points can be calculated using the following formulae.

- Upper Breakeven Point = Strike Price of Calls/Puts + Net Premium Paid
- Lower Breakeven Point = Strike Price of Calls/Puts - (Net Premium Paid/2)

Example

Suppose XYZ stock is trading at ₹40 in June. An options trader implements a strip by buying two JUL 40 puts for ₹400 and a JUL 40 call for ₹200. The net debit taken to enter the trade is ₹600, which is also his maximum possible loss.

If XYZ stock is trading at ₹50 on expiration in July, the JUL 40 puts will expire worthless but the JUL 40 call expires in the money and has an intrinsic value of ₹1000. Subtracting the initial debit of ₹600, the strip's profit comes to ₹400.

If XYZ stock price plunges to ₹30 on expiration in July, the JUL 40 call will expire worthless but the two JUL 40 puts will expire in-the-money and possess intrinsic value of ₹1000 each. Subtracting the initial debit of ₹600, the strip's profit comes to ₹1400.

On expiration in July, if XYZ stock is still trading at ₹40, both the JUL 40 puts and the JUL 40 call expire worthless and the strip suffers its maximum loss which is equal to the initial debit of ₹600 taken to enter the trade.

Strap

The strap is a modified, more bullish version of the common straddle. It involves buying a number of at-the-money puts and twice the number of calls of the same underlying stock, striking price and expiration date.

Strap Construction

Buy	2	ATM	Calls
Buy	1	ATM	Put

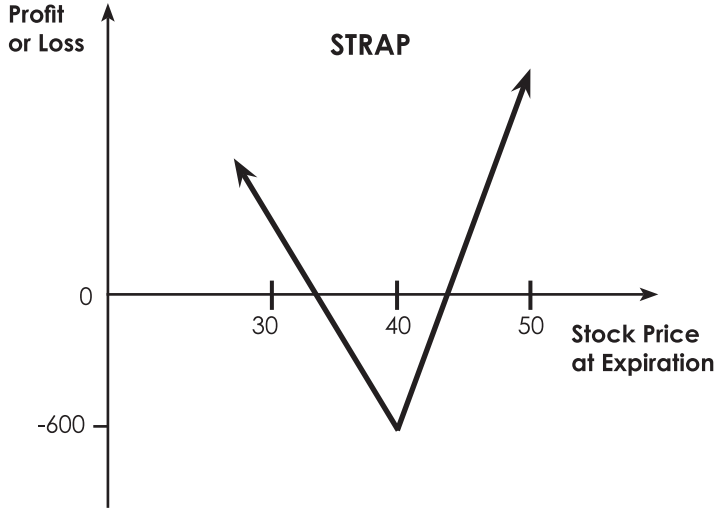
Straps are unlimited profit, limited risk options trading strategies that are used when the options trader thinks that the underlying stock price will experience significant volatility in the near term and is more likely to rally upwards instead of plunging downwards.

Unlimited Profit Potential

Large profit is attainable with the strap strategy when the underlying stock price makes a strong move either upwards or downwards at expiration, with greater gains to be made with an upward move.

The formula for calculating profit is given below:

- Maximum Profit = Unlimited
- Profit Achieved When Price of Underlying > Strike Price of Calls/Puts + (Net Premium Paid/2) OR Price of Underlying < Strike Price of Calls/Puts - Net Premium Paid
- Profit = 2 x (Price of Underlying - Strike Price of Calls) - Net Premium Paid OR Strike Price of Puts - Price of Underlying - Net Premium Paid



Strap Payoff Diagram

Limited Risk

Maximum loss for the strap occurs when the underlying stock price on expiration date is trading at the strike price of the call and put options purchased. At this price, all the options expire worthless and the options trader loses the entire initial debit taken to enter the trade.

The formula for calculating maximum loss is given below:

- Max Loss = Net Premium Paid + Commissions Paid
- Max Loss Occurs When Price of Underlying = Strike Price of Calls/Puts

Breakeven point(s)

There are 2 break-even points for the strap position. The breakeven points can be calculated using the following formulae.

- Upper Breakeven Point = Strike Price of Calls/Puts + (Net Premium Paid/2)
- Lower Breakeven Point = Strike Price of Calls/Puts - Net Premium Paid

Example

Suppose XYZ stock is trading at ₹40 in June. An options trader implements a strap by buying two JUL 40 calls for ₹400 and a JUL 40 put for ₹200. The net debit taken to enter the trade is ₹600, which is also his maximum possible loss.

If XYZ stock price plunges to ₹30 on expiration in July, the JUL 40 calls will expire worthless but the JUL 40 put will expire in-the-money and possess intrinsic value of ₹1000. Subtracting the initial debit of ₹600, the strap's profit comes to ₹400.

If XYZ stock is trading at ₹50 on expiration in July, the JUL 40 put will expire worthless but the two JUL 40 calls expires in the money and has an intrinsic value of ₹1000 each. Subtracting the initial debit of ₹600, the strap's profit comes to ₹1400.

On expiration in July, if XYZ stock is still trading at ₹40, both the JUL 40 put and the JUL 40 calls expire worthless and the strap suffers its maximum loss which is equal to the initial debit of ₹600 taken to enter the trade.

Put-Call Parity Theory :

Put-Call Parity is the relationship between the price of an European Call Option and the price of the European Put Option, when they have the same strike price and maturity date, namely that a portfolio of long a call option and short a put option is equivalent to (and hence has the same value as) a single forward contract at this strike price and expiry. This is because if the price at expiry is above the strike price, the call will be exercised, while if it is below, the put will be exercised, and thus in either case one unit of the asset will be purchased for the strike price, exactly as in a forward contract.

The validity of this relationship requires that certain assumptions be satisfied; these are specified and the relationship derived below. In practice transaction costs and financing costs (leverage) mean this relationship will not exactly hold, but in liquid markets the relationship is close to exact.

Theory:

C + PV of EP = SP + P

Where, C = Price of a Call Option, i.e. Call Option Premium

EP = Exercise Price

SP = Current Stock Price

P = Price of a Put Option, i.e. Put Option Premium

Significance and Application: When options are priced such that the Put-Call Parity does not hold good, then there is scope for arbitrage, by investing in risk free investments or borrowing at risk free rate.

Option Valuation

The term option valuation is used to convey two meanings:

(i) The value of the option at the time of its maturity. It is the amount that the option buyer receives from the option writer on exercising the option

(ii) The value of the option at the time of its writing. This is also referred to as option premium or option price. The three major methods of option valuation are as follows :

1. Binomial Method
2. Risk Neutral Method
3. Black-Scholes Model

Binomial tree approach to valuing or pricing an option:

This model assumes that the underlying asset can have only two values at the time of maturity of an option. One will be higher than the strike price and the other will be lower than the strike price.

The option premium calculated under this method provides risk-free rate of return, at either of the two prices, on the investment made by option –writer. (in case the option writer uses borrowed funds, the return at risk free rate will be provided on borrowed funds.)

Factors Considered: Following are the factors considered in valuing / pricing an option under the Binomial Tree Approach —

(a) Current Spot Price of the underlying asset,

(b) Exercise Price under the Options Contract,

(c) Set of Expected Future Spot Prices — one above the Exercise Price and one below the Exercise Price,

(d) Risk Free Rate of Return,

(e) Period to Expiry.

Value of an Option: (a) Formula Method:

$$= \frac{C_u\left[\frac{f-d}{u-d}\right]+C_d\left[\frac{u-f}{u-d}\right]}{f}$$

$$= \text{Present Value of } C_u \times \left[\frac{f-d}{u-d}\right] + C_d \times \left[\frac{u-f}{u-d}\right]$$

= Present Value of [{ Value of option at Upper Price × Probability of Upper Price } + { Value of option at Lower Price × Probability of Lower Price }]

Where,

Notation	Factor
SP_0	Spot Price
EP	Exercise Price
FP_1	Expected Future Spot Price — Lower Limit [FP_1]
FP_2	Expected Future Spot Price — Higher Limit [FP_2]
C_d	Value of Option at Lower Limit [Call = 0, Put = EP - FP_1]

Notation	Factor

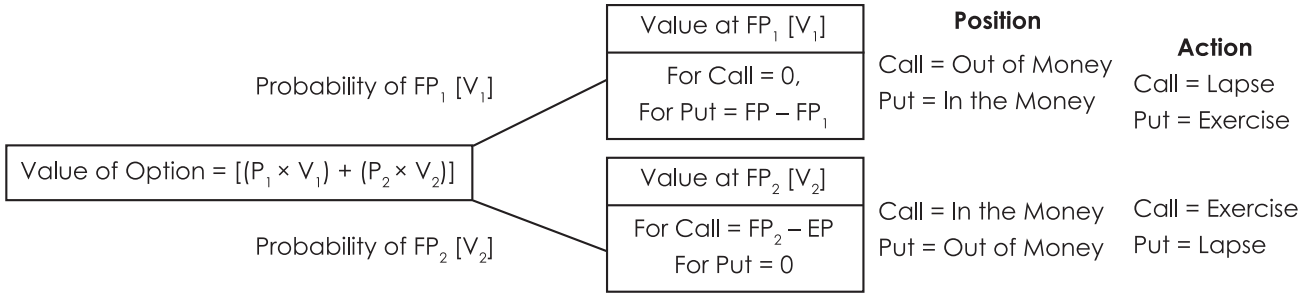
C_u	Value of Call at Upper Limit [Call = FP_2 – EP, Put = 0]
d	Extent of Lower Limit of Future Spot Price [FP_1] on Current Price [SP_0] [$FP_1 \div SP_0$]
u	Extent of Upper Limit of Future Spot Price [FP_2] on Current Price [SP_0] [FP_2 -j- SP_0]
r	Risk Free Rate of Return
t	Tenor of Options Contract [in Years]
f	Future Value Factor [Continuous Compounding Factor] = e^{rt}

(b) Delta Method:

Value of Call = Options Delta × $[SP_0 – (FP_1 \times e^{-rt})]$

$$= \frac{C_u - C_d}{FP_2 - FP_1} \times \left[SP_0 - (FP_1 \times e^{-rt})\right]$$

Binomial Tree:



Value of Option = Present Value of $[(P_1 \times V_1)+(P_2 \times V_2)]$

$= e^{-rt} \times [(P_1 \times V_1)+(P_2 \times V_2)]$

Risk n eutral Valuation approach to pricing options :

This method provides an alternative way of obtaining same results as those of Binomial Model. The following steps are required :

Step	Description
1	**Identification of Probability:** Ascertain the probability of upper limit and lower limit of Future Spot Price (FP), by equating the present value of expected Future Spot Price to the Current Spot Price (S_0).
2	**Nominal Value of an Option:** Apply the probabilities so identified on the value of the option at the two Future Spot Prices, to get the expected value of option on expiry.
3	**Present Value:** Discount the expected value of option (nominal value) to present value to identify the value of an option.

Basis for Risk n eutral Valuation Approach: Valuation of options is based on arbitrage possibilities and is therefore independent of risk preferences. Therefore, value of options should be the same for any set of risk preferences.

Factors Considered:

(a) Current Spot Price (SP_0),

(b) Expected Future Spot Prices (FP_1 and FP_2),

(c) Exercise Price (EP),

(d) Risk Free Rate of Return, and

(e) Period to Expiry.

Approach:

(a) Identification of Probability of Lower Price Limit (P_1) or Upper Price Limit (P_2) by solving the following equation—

SP_0 = Present Value of $[P_1 \times FP_1 + P_2 \times FP_2]$, where $P_1 + P_2 = 1$

$= e^{-rt} \times [P_1 \times FP_1 + P_2 \times FP_2]$

$e^{rt} \times SP_0 = P_1 \times FP_1 + P_2 \times FP_2$

(b) Value of Option = PV of [(Value at $FP_1 \times P_1$) + (Value at $FP_2 \times P_2$)]

Note: Value of Option, under Binomial Model and the Risk Neutral Valuation Model will be the same.

Black and scholes Model of option valuation:

Pricing Model: Under the BSM Model of Option Pricing, value of an option is the difference between the expected benefit from acquiring a stock and the present value of the exercise price.

Development of BsM Model:

(a) Stage i: Value of Option of a Riskless stock

Basic Formula: [On the assumption that the stock is virtually riskless]

(i) Value of Call on Expiry = Pay Off on Expiry = Spot Price on Expiry Date **Less** Exercise Price, i.e. [FP - EP] [Assumption → Stock is virtually risk free]

(ii) Value of Call Today = Present Value of (FP - EP) or e^{-rt} (FP - EP)

(iii) Future Spot Price (FP) = Future Value of Current Spot Price (compounded continuously at Risk Free Rate) = $SP_0 \times e^{rt}$

(iv) **Value of Call Today:**

Call $= e^{-rt}$ (FP-EP)

$\Rightarrow$ $= e^{-rt}$ (SP_0 X e^{rt} - EP)

$= (e^{-rt} \text{ X } SP_0 \text{ X } e^{rt}) - (e^{-rt} \text{ X EP})$

$= SP_0 - (e^{-rt} \text{ X EP})$, i.e. Current Stock Price **Less** PV of Exercise Price

(b) Stage ii: introduction of probability Factor and Risk Factors:

To the above basic formula (containing two components), probabilities are assigned as follows:

- For SP_0 = Probability that the stock price will move at the risk free rate, i.e. Future Spot Price is a factor of Current Stock Price and Risk Free Rate of Return, or the extent to which Risk Free Rate affects the Future Spot Price.
- For Present Value of Exercise Price = Probability that the option will be exercised due to uncertainty in the stock price movement.

Modified Formula: $P_1 \times SP_0$ Less $P_2 \times EP \times e^{-rt}$

Where, P_1 = Probability of Stock Price moving in accordance with Risk Free Rate.

P_2 = Probability that the option will be exercised and strike price paid.

(c) Stage III: Calculation of Probability Factor:

P_1 and P_2 Standard Normal Distribution Table Value of a variable which is a function of time period of option, i.e. period to expiry(t), risk associated with the stock return (σ), current Stock Price (SP_0) and Exercise Price (EP).

P_1 is denoted by $N(D_1)$ and P2 is denoted by $N(D_2)$

Modified Formula: $N(D_1)$ X SP_0 **Less** $N(D_2)$ X EP X e^{-rt}

(d) Computation of Variables for Probability:

(i) D_1 (Variable Attached with Movement in Stock Price)

$$= \frac{Ln(SP_0/EP) + \left[(r + 0.50\sigma^2) \times t\right]}{\sigma\sqrt{t}}$$

(ii) D_2 (Variable Attached with Exercise of Option)

$$= \frac{Ln(SP_0 / EP) + [(r - 0.50\sigma^2) \times t]}{\sigma\sqrt{t}} \text{ ; or}$$

$$= D_1 - \sigma\sqrt{t}$$

Note: "Ln" refers to Natural Logarithm.

Assumptions of the Black and Scholes Model:

(a) Rates of return on a share / stock are lognormally distributed.

(b) Value of the share and the risk free rate are constant during the life of the option.

(c) Market is efficient and there are no transaction costs and taxes.

(d) No dividends are paid on the share during the life of the option.

(e) No restrictions or penalties for short selling.

(f) Option can be exercised only on the Expiry Date (i.e. options are all European Options).

The Greeks

In options trading, you may notice the use of certain greek alphabets when describing risks associated with various positions. They are known as "the greeks" and we shall discuss the four most commonly used ones. They are delta, gamma, theta and vega.

Delta:

Delta of a Stock Option is the ratio of the change in the price of the stock option to the change in the price of the underlying stock. It measures the sensitivity of Options Price to the movement in the prices of the underlying asset.

Deltas of Call Option and put Option:

(a) Delta of a Call Option is always positive.

(b) Delta of a Put Option is always negative.

Formula:

$$\text{Delta}(\Delta) = \frac{\text{Change in Option Price i.e. Option Premium}}{\text{Change in Stock Price}} = \frac{\text{Closing Option Price} - \text{Opening Option Price}}{\text{Closing Stock Price} - \text{Opening Stock Price}}$$

Example: On 01.12.2012, when the trade opens, the stock price of Amitech Castings is ₹ 240. It rises to ₹ 250. The December 2012 Call Option on Amitech Castings started at ₹ 20. It moved to ₹ 23.

Delta of Call Options of Amitech Castings is computed as under —

$$\text{Delta}(\Delta) = \frac{\text{Closing Option Price} - \text{Opening Option Price}}{\text{Closing Stock Price} - \text{Opening Stock Price}} = \frac{23 - 20}{250 - 240} = \frac{3.00}{10.00} = 0.30$$

Application: Value of Delta is the number of units of the underlying stock which an investor should hold for each option sold in order to create a riskless hedge.

Delta Hedging:

Creating a Riskless Hedge using Options and Underlying Stock, is called Delta Hedging.

Rebalancing: Since Delta changes, the investor's position remains delta hedged (or delta neutral) for only a relatively short period. The hedge should be adjusted periodically. This is called re-balancing.

Delta Values:

Option position is	Value of Delta
In the Money [Extreme beneficial CMP]	Almost Equal to ± 1 [Never beyond than ± 1]
At the Money	Approximately equal to ± 0.50
Out of Money [Extreme beneficial CMP]	Near to Zero.

Gamma :

The gamma of an option is defined as the rate of change of the option's delta with respect to the price of the underlying, when all else remains the same. It's the second partial derivative of the option price with respect to the underlying price. In other words, gamma is the rate at which delta will change. The delta captures the extent of change and the gamma measures the pace of the change. It is also called a**s Curvature.**

Gamma is also called as the Second Derivative of an Option Premium since it measures the sensitivity of Delta, which is the first measure of sensitivity of Option's Price to Market Price of the Underlying Asset.

Evaluation based on Gamma Values:

(a) If Gamma is small, delta changes slowly, and re-balancing act (i.e. adjustments to keep a portfolio delta neutral) needs not be done on a frequent basis.

(b) If Gamma value is high, delta is highly sensitive to the price of the underlying asset. This situation requires the re-balancing to be done on a frequent basis.

Vega or Lambda:

Vega of the option measures the sensitivity of option price with respect to the volatility of the price of the underlying asset. It considers both movement in price and also decrease in period to expiry of an option. It is calculated as change in the option premium for a unit change in the volatility of the price of the underlying asset. For both call and put options, Vega lies between zero and infinity. Vega is maximum for at the money options with long term to expiration. High Vega reflects the higher chances of an option going "In-the-money" at any point in time during the currency of the contract. So options with high Vega are attractive to the option buyer Vega is positive for Option Buyer and negative for Option Seller

Theta:

Theta measures the sensitivity of the option's price with respect to its time to expiry i.e. Time Value of an Option. It measures the change of the price of the option with the passage of time. It is also referred to as the time decay of the stock or portfolio. Theta Values for both the Call and the Put Option lies between Zero and the Total Value of the Option. It will be positive or negative based on the nature of the investor (holder or writer). Value of Theta is generally measured on per day basis, and therefore, value of Theta would vary for every trading day, based on the movement in Stock Prices. When Option Contract approaches the expiry date, option tends to become less valuable. Since the Stock Price and the option price move in tandem, the value of theta remains same or uniform towards the end of the options contract.

Rho

Rho is the last and the least used Greek. Rho helps us to understand the change in option premium, which are not linked to the underlying stock movement. For instance, interest rates changes may cause a change in option premium.

Rho indicates the change in option value for a one percentage change in the interest rate.

Example: a Rho of 1.50 indicates the option's theoretical value will increase by 1.50 if the interest rate is decreased by 1%.

An increase in interest rates increases the value of calls and decreases the value of puts. A decrease in interest rates decreases the value of calls and increases the value of puts. The range of the Rho Value also depends on the position that a person holds in the Option. Long calls and short puts have positive Rho. Short calls and long puts have negative Rho.

Illustration 19.

Kiran, who trades in shares in the spot market, follows the rule "When prices are rising — Buy; When prices are falling — Sell". She ensures that her portfolio is intact at the end of every three months, even if she buys or sells in between.

She is a first timer to the options market and wishes to apply the above rule in the options market, where she understands that buy equates to call option and sell equals put option. For a three-month horizon, the following information is available for 5 securities (of which Kiran holds sufficient quantities):-

Scrip	Spot price (₹)	Outlook	Exercise price (₹)
Greaves Cotton Ltd	345	Increase by 15%	400
NDTV	395	Increase by 10%	430
Punj Lloyd	260	Decrease by 5%	250
ITC Ltd	160	Increase by 5%	170
TCS Ltd	1120	Decrease by 10%	1000

If the expectations translates into actual, and Kiran follows her spot market rule in options market as well, how much she would have earned in the options market? You may assume that she will deal only in 100 units of scrip at a time and exercises her option, come what may.

What would have been the position if she had opted for options, not based on spot market rules, but based on option market rules i.e. Exercise Price > Expected Price = Put Option; Expected Price > Exercise Price = Call Option?

What is the lesson to be learnt? Ignore transaction costs, time value of money and cost of options.

Solution:

Choice of Option — spot Market Rules

(a) Choice of Option and Expected price

Scrip	Expectation for the next 3 Months	Option Chosen	Spot Price (₹)	Expected Price after 3 Months (₹)
Greaves	Increase by 15%	Call	345	345 + 15% = 397
NDTV	Increase by 10%	Call	395	395 + 10% = 434
Punj Loyd	Decrease by 5%	Put	260	260-5% = 247
ITC Ltd	Increase by 5%	Call	160	160 + 5% = 168
TCS Ltd	Decrease by 10%	Put	1,120	1,120-10% = 1,008

(b) Gain / Loss Statement on Options Contracts

Scrip	3- Month' Spot Price (₹)	Strike Price (₹)	Option Chosen	Action	No. of Scrips	Gain/Loss[Sale Value less Buy cost] (₹)
Greaves	397	400	Call	Buy under option at Strike Price. Sell spot at Spot Price.	100	**Loss (300)** [100 x (397 - 400)]
NDTV	434	430	Call	Buy under option at Strike Price. Sell spot at Spot Price.	100	**Gain 400** [100 x (434 - 430)]
Punj Lloyd	247	250	Put	Buy spot at Spot Price. Sell under option at Strike Price.	100	**Gain ₹300** [100 x (250 - 247)]
ITC Ltd	168	170	Call	Buy under option at Strike Price. Sell spot at Spot Price.	100	**Loss (200)** [100 x (168 - 170)]
TCS Ltd	1,008	1,000	Put	Buy spot at Spot Price. Sell under option at Strike Price.	100	**Loss (800)** [100 x (1000-1008)]
						Loss (600)

Note: If Kiran had chosen not to exercise the option for loss inflicting scrips, she would have earned ₹1300.

2. Choice of Option — Option Market Rules

(a) Choice of Option and Expected price

Scrip	Spot Price (₹)	Expectation for the next 3 Months	Expected Price after 3 Months [EP] (₹)	Strike Price [SP] (₹)	EPvs.SP [Higher]	Option Chosen
Greaves	345	Increase by 15%	340 + 15% = 397	400	SP	Put
NDTV	395	Increase by 10%	400 + 10%= 434	430	EP	Call
Punj Lloyd	260	Decrease by 5%	260-5% = 247	250	SP	Put
ITC Ltd	160	Increase by 5%	160 + 5% = 168	170	SP	Put
TCS Ltd	1,120	Decrease by 10%	1,120-10% = 1,008	1,000	EP	Call

(b) Gain / Loss statement on Options Contracts

Scrip	3-Months' Spot Price (₹)	Strike Price (₹)	Option Chosen	Action	No. of Scrips	Gain / Loss [Sale Value Less Buy Cost] (₹)
Greaves	397	400	Put	Buy spot at Spot Price. Sell under option at Strike Price.	100	**300** [100 x (400- 397)]
NDTV	434	430	Call	Buy under option at Strike Price. Sell spot at Spot Price.	100	**400** [100 x (434 - 430)]
Punj Lloyd	247	250	Put	Buy spot at Spot Price. Sell under option at Strike Price.	100	**300** [100 x (250 - 247)]
ITC Ltd	168	170	Put	Buy spot at Spot Price. Sell under option at Strike Price.	100	**200** [100 x (170 - 168)]
TCS Ltd	1,008	1,000	Call	Buy under option at Strike Price. Sell spot at Spot Price.	100	**800** [100 x (1008 - 1000)]
						Gain 2,000

Inference:

(a) In the cash market, movement in the prices is relevant. In the options market, the expected price on the date of expiry and the strike price are relevant.

(b) Gain or loss under options is based on the Exercise Price and the spot price on the date of expiry and not on the basis of direction of movement in strike price.

(c) In a rising market, buying a Call Option may still not yield return if the expected spot price is less than the exercise price. Call options and put options can be bought both under a bearish market as well as a bullish market.

Illustration 20.

Sundar Ramalingam had entered into 5 Put Options and 5 Call Options in different securities, the particulars of which are given below, along with their exercise price and actual market price on the date of exercise —

Call Options		
Security	**Exercise Price (₹)**	**Actual Market Price (₹)**
P	**370**	**376**
Q	**450**	**444**
R	**1790**	**1700**
S	**135**	**140**
T	**953**	**953**

Put Options		
Security	**Exercise Price (₹)**	**Actual Market Price (₹)**
A	**118**	**122**
B	**758**	**758**
C	**350**	**340**
D	**65**	**69**
E	**230**	**220**

What is his position on the date of exercise and what would he do?

Solution:

1. Put Options [Right to Sell]

Security	Exercise Price (EP) (₹)	Actual Market Price (AMP) (₹)	AMP vs. EP [Higher]	Position	Action
A	118	122	AMP	Out of Money	Lapse
B	758	758	Equal	At the Money	No Action
C	350	340	EP	In the Money	Exercise
D	65	69	AMP	Out of Money	Lapse
E	230	220	EP	In the Money	Exercise

2. Call Option [Right to Buy]					
Security	**Exercise Price (EP) (₹)**	**Actual Market Price (AMP) (₹)**	**AMP vs. EP [Higher]**	**Position**	**Action**
P	370	376	AMP	In the Money	Exercise
Q	450	444	EP	Out of Money	Lapse
R	1790	1700	EP	Out of Money	Lapse
S	135	140	AMP	In the Money	Exercise
T	953	953	Equal	At the Money	No Action

Illustration 21.

Given the following: Amount (₹)

Strike price	200
Current stock price	185
Risk free rate of interest	5% p.a

(a) Calculate the theoretical minimum price of a European put option after 6 months.

(b) If European put option price is ₹5 , then how can an arbitrageur make profit.

Solution:

1. Computation of Theoretical Minimum Price

Particulars	Value
Exercise price	₹200
Current Stock Price	₹185
Risk Free Rate of Return (r)	5% or 0.05
Time (in years)	6 ÷ 12 = 0.5
Theoretical Minimum Price	= Present Value of Exercise Price - Current Stock Price = 200 x e^{-rt} – 185 = 200 + $e^{0.05\times0.5}$ – 185 = (200 ÷ 1.02532) – 185 = 195.0611 – 185 = 10.0611

Inference: Since the Value of Put Option is more than the price of the Put Option, it is under priced and the recommended action will be to Buy the Put Option.

2. Cash Flows to make Profit for the Arbitrageur Activity Flow:

1. Arbitrageur can borrow the amount required to buy the Put Option and Stock at the rate of 5% p.a. for 6 months.
2. Buy Put Option.
3. Take the opposite position and buy stock at spot price.
4. At the end of six months, exercise the Put option and realise the receipts.
5. Pay the amount of Borrowing together with Interest.

Particulars	Time	₹
1. Borrow at the rate of 5% for 6 months [185+5]	T_0	190
2. Buy Put Option	T_0	(5)
3. Buy Stock at Spot Price	T_0	(185)
4. Exercise the Put Option and realise the Sale Proceeds	T_1	200
5. Repay the amount of Borrowing together with Interest [190 $e^{0.05\times0.5}$] = [190 × 1.02532]	T_1	194.81
6. Net Gain made [(4) - (5)]	T_1	**5.19**

Note: The amount of gain is the minimum amount and will increase with every increase in Spot Price as on the Exercise Date.

Illustration 22.

Stock of Swarup Air Cargo Ltd is currently quoted at ₹112. Ascertain the Time Value and Intrinsic Value of Option from the following particulars available in relation to derivatives market —

Put Options		
Situation	**Exercise Price (₹)**	**Premium (₹)**
A	**98**	**10**
B	**103**	**11**
C	**109**	**11**
D	**112**	**11**
E	**116**	**12**
F	**120**	**12**
G	**124**	**13**
H	**128**	**13**

Call Options		
Situation	**Exercise Price (₹)**	**Premium (₹)**
A	**125**	**9**
B	**122**	**10**
C	**119**	**10**
D	**115**	**11**
E	**112**	**11**
F	**109**	**11**
G	**106**	**12**
H	**103**	**12**

Solution:

1. Put Options [Right to Sell]

Situation	Exercise Price (EP) (₹)	Current Market Price (CMP) (₹)	Premium (₹)	Intrinsic Value [Maximum of (EP-CMP), 0] (₹)	Time Value [Maximum of (Premium - Intrinsic Value), 0] (₹)
(1)	**(2)**	**(3)**	**(4)**	**(5) = Max [(2)-(3), 0]**	**(6) = Max [(4)-(5), 0]**
A	98	112	10	0	10
B	103	112	11	0	11
C	109	112	11	0	11
D	112	112	11	0	11
E	116	112	12	4	8
F	120	112	12	8	4
G	124	112	13	12	1
H	128	112	13	16	0

2. Call Options [Right to Buy]

Situation	Exercise Price (EP) (₹)	Current Market Price (CMP) (₹)	Premium	Intrinsic Value [Maximum of (CMP-EP),0] (₹)	Time Value [Maximum of (Premium - Intrinsic Value), 0] (₹)
(1)	(2)	(3)	(4)	(5) = Max [(3)-(2), 0]	(6) = Max [(4)-(5), 0]
A	125	112	9	0	9
B	122	112	10	0	10
C	119	112	10	0	10
D	115	112	11	0	11
E	112	112	11	0	11
F	109	112	11	3	8
G	106	112	12	6	6
H	103	112	12	9	3

Illustration 23.

Determine the value of option , both call and put, on expiry for the stock of Nirmal Spice Foods (NSF) Ltd. from the following information-

- Exercise Price - ₹510
- Spot Price on Exercise Date Ranges between ₹495 and ₹525, with interval of ₹5.

Also state what will be the action on the above range of prices for both the options.

Solution:

1. Call Option (Right to Buy)

Situation	Exercise Price (EP) (₹)	Spot Price on Expiry Date (SP_E) (₹)	Value of Call [Maximum of (SP_E - EP), 0] (₹)	Action
(1)	(2)	(3)	(4) = Max [(3)- (2), 0]	(5)
A	510	495	495 - 510 = - 15 → 0	Lapse
B	510	500	500 - 510 = - 10 → 0	Lapse
C	510	505	505 - 510 = - 5 → 0	Lapse
D	510	510	510 - 510 = 0 → 0	Lapse
E	510	515	515 - 510 = 5 → 5	Exercise
F	510	520	520 - 510 = 10 → 10	Exercise
G	510	525	525 - 510 = 15 → 15	Exercise

2. Put Option (Right to Sell)

Situation	Exercise Price (EP) (₹)	Spot Price on Expiry Date (SP_E) (₹)	Value of Put [Maximum of (EP - SP_E), 0] (₹)	Action
(1)	(2)	(3)	(4) = Max [(2)-(3), 0]	(5)
A	510	495	510 - 495 = 15 → 15	Exercise
B	510	500	510 - 500 = 10 → 10	Exercise
C	510	505	510 - 505 = 5 → 5	Exercise
D	510	510	510 - 510 = 0 → 0	Lapse
E	510	515	510 - 515 = -5 → 0	Lapse
F	₹510	₹520	₹510-₹520 = -10 → ₹0	Lapse
G	₹510	₹525	₹510-₹525 = -15 → ₹0	Lapse

Illustration 24.

CMC Ltd. shares are presently quoted at ₹100.3-Month's call option carries a premium of ₹15 for a strike price of ₹120, and 3-Month's put option carries a premium of ₹20 for a strike price of ₹120.

If the spot price on the expiry date is in the range of ₹90 to ₹160, with intervals of ₹5, prepare Net Pay-Off Graph for both Call Option and Put Option, from both the buyer's perspective and the option writer's perspective.

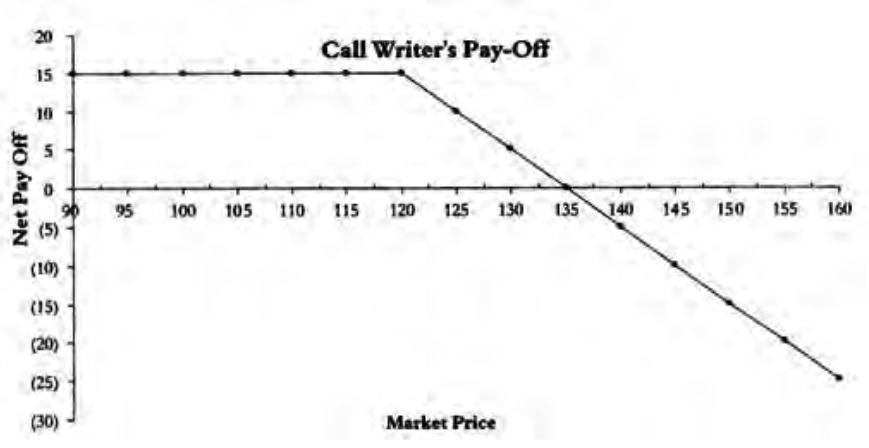
Solution:

1. Net Pay-Off [Call Option] = Buyer and Writer of Call Option

Spot Price on Expiry Date (SP_E) (₹)	Exercise Price (EP) (₹)	Value of Call [Gross Profit] [Maximum of (SP_E - EP), 0] (₹)	Action	Option Premium (₹)	Net Pay-Off [Call Holder] (₹)	Net Pay-Off [Call Writer] (₹)
(1)	(2)	(3) = Max[(I)-(2),0]	(4)	(5)	(6) = (3)-(5)	(7) = (5)-(3)
90	120	90 - 120 = - 30 → 0	Lapse	15	0 -15 = (15)	15 - 0 = 15
95	120	95 - 120 = - 25 → 0	Lapse	15	0 -15 = (15)	15 - 0 = 15
100	120	100 - 120 = - 20 → 0	Lapse	15	0 -15 = (15)	15 - 0 = 15
105	120	105 -120 = -15 → 0	Lapse	15	0-15 = (15)	15 - 0 = 15
110	120	110 -120 = -10 → 0	Lapse	15	0 -15 = (15)	15 - 0 = 15
115	120	115 -120 = -5 → 0	Lapse	15	0 -15 = (15)	15 - 0 = 15
120	120	120 -120 = 0 → 0	Lapse	15	0 -15 = (15)	15 - 0 = 15
125	120	125 -120 = 5 → 5	Exercise	15	5 -15 = (10)	15 - 5 = 10
130	120	130 -120 = 10 → 10	Exercise	15	10 -15 = (5)	15 -10 = 5
135	120	135 -120=15 → 15	Exercise	15	15 -15 = 0	15 -15 = 0
140	120	140 - 120 = 20 → 20	Exercise	15	20 -15 = 5	15 -20 = (5)
145	120	145 - 120 = 25 → 25	Exercise	15	25 -15 = 10	15 -25 = (10)
150	120	150 -120 = 30 → 30	Exercise	15	30 -15 = 15	15 - 30 = (15)
155	120	155 - 120 = 35 → 35	Exercise	15	35 -15 = 20	15 - 35 = (20)
160	120	160 - 120 = 40 → 40	Exercise	15	40 -15 = 25	15 - 40 = (25)

2. Pay-Off Graph [Call Option]





3. Net Pay-Off [Put Option] = Buyer and Writer of Put Option

Spot Price on Expiry Date (SP_E) (₹)	Exercise Price (EP) (₹)	Value of Call [Gross Profit] [Maximum of (EP-SP_E), 0] (₹)	(₹)	Action	Option Premium (₹)	Net Pay-Off [Call Holder] (₹)	Net Pay-Off [Call Writer] (₹)
(1)	(2)	(3) = Max [(2)	-(1),0]	(4)	(5)	(6) = (3) - (5)	(7) =(5) - (3)
90	120	120 - 90 - 30	→ 30	Exercise	20	30 - 20= 10	20 - 30 = (10)
95	120	120 - 95 = 25	→ 2 5	Exercise	20	25-20= 5	20 - 25 = (5)
100	120	120 - 100 = 20	→ 2 0	Exercise	20	20-20= 0	20 - 20 = 0
105	120	120-105 = 15	→ 15	Exercise	20	15-20 = (5)	20 -15 = 5
110	120	120-110= 10	→ 10	Exercise	20	10-20 = (10)	20 -10 = 10
115	120	120-115 = 5	→ 5	Exercise	20	5-20 = (15)	20 - 5 = 15
120	120	120 - 120 = 0	→ 0	Lapse	20	0-20 = (20)	20 - 0 = 20
125	120	120 - 125 = -5	→ 0	Lapse	20	0-20 = (20)	20 - 0 = 20
130	120	120-130 = -10	→ 0	Lapse	20	0-20 = (20)	20 - 0= 20
135	120	120-135 = -15	→ 0	Lapse	20	0-20 = (20)	20 - 0= 20
140	120	120 - 140 = -20	→ 0	Lapse	20	0-20 = (20)	20 - 0= 20
145	120	120 - 145 = -25	→ 0	Lapse	20	0-20 = (20)	20 - 0= 20
150	120	120-150 = -30	→ 0	Lapse	20	0-20 = (20)	20 - 0= 20
155	120	120-155 = -35	→ 0	Lapse	20	0-20 = (20)	20 - 0= 20
160	120	120 -160 = -40	→ 0	Lapse	20	0-20 = (20)	20 - 0= 20

4. Pay-off Graph [Put Option]

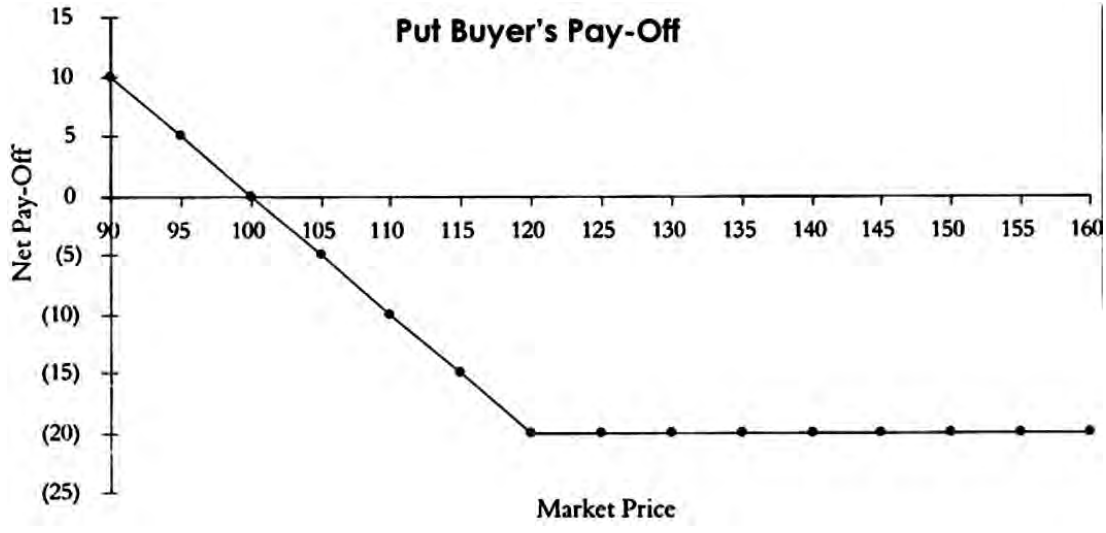




Illustration 25.

Fill up the blanks in the following "Break Even Price" table —

Case	Option	Party	Exercise Price (₹)	Premium (₹)	Market Price (₹)
1	Call	Buyer	?	20	160
2	?	Seller	2000	300	1700
3	?	Buyer	50	10	40
4	?	Seller	80	10	90
5	Put	Buyer	?	50	250
6	?	Seller	320	50	370
7	Call	Buyer	680	100	?
8	Call	Seller	?	80	580
9	Put	Buyer	1200	?	1020
10	Put	Seller	?	330	1870

Solution:

Case	Option	Party	Exercise Price (₹)	Premium (₹)	Market Price (₹)	Reason / Computation (₹)
1	Call	Buyer	140	20	160	Call →MP = EP + Premium, for Pay Off to be "0". → 160 - 20 = 140
2	Put	Seller	2000	300	1700	2000 - 300 =1700 → MP = EP - Premium. Therefore, it is a Put Option
3	Put	Buyer	50	10	40	50 – 10 = 40 → MP = EP - Premium. Therefore , it is a Put Option.
4	Call	Seller	80	10	90	80 + 10 = 90 → MP = EP + Premium. Therefore, it is a Call Option.
5	Put	Buyer	300	50	250	Put Option → MP = EP - Premium. → EP = MP + Premium = 250 - 50 = 300
6	Call	Seller	320	50	370	320 + 50 = 370 → MP = EP + Premium. Therefore, it is a Call Option.
7	Call	Buyer	680	100	780	Call → MP = EP + Premium, for Pay Off to be "0". 680 + 100 = 780
8	Call	Seller	500	80	580	Call → MP = EP + Premium, for Pay Off to be "0". → EP = MP - Premium → 580 - 80 = 500.
9	Put	Buyer	1200	180	1020.	Put → MP = EP - Premium, for Pay Off to be "0". → Premium = EP - MP → 1200 - 1020 = 180.
10	Put	Seller	2200	330	1870	Put → MP = EP - Premium, for Pay Off to be "0". → EP = MP + Premium → 1870 - 330 = 2,200.

Illustration 26.

Fill up the blanks in the following table —

Case	Option	Exercise Price (EP) (₹)	Premium (₹)	Holder's Maximum Loss (₹)	Holder's Maximum Gain (₹)	Writer's Maximum Loss (₹)	Writer's Maximum Gain (₹)	Break Even Price (₹)
1	Call	520	75	?	?	?	?	?
2	Put	700	140	?	?	?	?	?
3	Put	?	?	4	16	16	4	?
4	Call	?	?	200	?	Unlimited	?	1725
5	?	350	70	70	280	280	70	280
6	?	80	?	12	Unlimited	?	12	?
7	?	?	?	?	?	Unlimited	18	138
8	?	?	?	?	?	592	148	592
9	Call	240	40	40	Unlimited	Unlimited	40	280
10	Put	900	?	180	?	?	?	?

Solution:

Case	Option	Exercise Price (EP) (₹)	Premium (₹)	Holder's Maximum Loss (₹)	Holder's Maximum Gain (₹)	Writer's Maximum Loss (₹)	Writer's Maximum Gain (₹)	Break Even Price (₹)
1	Call	520	75	75	Unlimited	Unlimited	75	595
2	Put	700	140	140	560	560	140	560
3	Put	20	4	4	16	16	4	16
4	Call	1525	200	200	Unlimited	Unlimited	200	1725
5	Put	350	70	70	280	280	70	280
6	Call	80	12	12	Unlimited	Unlimited	12	92
7	Call	120	18	18	Unlimited	Unlimited	18	138
8	Put	740	148	148	592	592	148	592
9	Call	240	40	40	Unlimited	Unlimited	40	280
10	Put	900	180	180	720	720	180	720

General Rules:

1. All Cases, Option Holder's Maximum Loss = Option Writer's Maximum Gain = Amount of Premium
2. If Option Type = Call, then—
   - Holder's Maximum Gain = Writer's Maximum Loss = Unlimited [Conversely, if Holder's Maximum Gain = Writer's Maximum Loss = Unlimited, then the nature of the option is Call]
   - Break Even Price (No Profit No Loss Situation) = Exercise Price Plus Premium
3. If Option Type = Put, then —
   - Holder's Maximum Gain = Writer's Maximum Loss = Exercise Price Less Premium = Break Even Price [Conversely, if Holder's Maximum Gain = Writer's Maximum Loss = Break Even Price, then nature of the option is Put]
   - Break Even Price (No Profit No Loss Situation) = Exercise Price Less Premium

Illustration 27.

A put and a call option each have an expiration date 6 months hence and an exercise price of ₹9.

The interest rate for the 6 month period is 3 per cent.

(a) If the put has a market price of ₹2 and share is worth ₹10 per share, what is the value of the call?

(b) If the put has a market price of ₹1 and the call ₹4, what is the value of the share per share?

(c) If the call has a market value of ₹5 and market price of the share is ₹12 per share, what is the value of the put?

Solution:

Under Put Call Parity -

→ Value of Call + Present Value of Exercise Price = Current Spot Price + Value of Put

→ $C + EP \times e^{-rt} = SP_0 + P$

Case (a)	Case(b)	Case (c)
→ $C + EP \times e^{-rt} = SP_0 + P$	→ $C + EP \times e^{-rt} = SP_0 + P$	→ $C + EP \times e^{-rt} = SP_0 + P$
→ $C = SP_0 + P - EP \times e^{-rt}$	→ $SP_0 = C + EP \times e^{-rt} - P$	→ $P = C + EP \times e^{-rt} - SP_0$
→ $C = 10+2 - (9xe^{-0.03x(6/12)})$	→ $SP_0 = 4 + (9xe^{-0.03x(6/12)})-1$	→ $P = 5 + 9xe^{-0.03x(6/12)}-12$
→ C = 12-(9 ÷ 1.01511)	→ $SP_0 = 4 + (9 \div 1.01511)-1$	→ P = 5+8.86-12
→ C = 12 - 8.86 = 3.14	→ $SP_0 = 11.86$	→ P = 1.86
Value of Call = ₹ 3.14	**Value of Share = ₹11.86**	**Value of Put = ₹ 1.86**

Illustration 28.

Shoaib is furnished with the following information about securities of two Companies — Manju Ltd and Sanju Ltd.

1. Manju Ltd: Call option is traded at ₹85 for an exercise price of ₹700. Presently stock of Manju Ltd is traded for ₹650. Put options is available for ₹110.

2. Sanju Ltd: Put option is traded at ₹40 at an exercise price of ₹200. Presently stock of Sanju are traded at ₹180. Call options are available for ₹20.

If Shoaib has sufficient money and also holds stock in both these companies, wants to make only ascertained profit and no loss, advice him on the course of action and the resultant gain / loss.

Risk Free Interest rate may be assumed at 10% and expiry date for option is 3 Months away.

Solution:

1. Manju Ltd

(a) Computation of Theoretical Value of Put Option:

C + PV of EP of Call = CMP + P

→ ₹85 + ₹700 x $e^{-0.10 \times 0.25}$ = ₹650 + P

→ P = ₹85 + ₹700 ÷ 1.025 - ₹650

→ P = ₹85 + ₹682.73 - ₹650

= ₹**117.73**

(b) Evaluation: Theoretical Price of ₹117.73 > Actual Price of ₹110. Therefore, Put Option is undervalued.

(c) Action:

Now	3-Months Later
• Sell Call Option (Write Call) at ₹85. • Borrow ₹675 at 10% p.a. for 3 months (Cost of Buying Put at ₹110 + Cost of Stock in Spot Market ₹650 - Inflow for writing Call ₹85) • Buy Put Option at ₹110 • Buy Stock at ₹650.	**Spot Price on Expiry is more than ₹700** • **Inflow:** Call Option will be exercised by the Option Holder. Therefore, sell stock and receive for ₹700. • **Outflow:** Repay borrowal of ₹692 including interest i.e. ₹675 × $e^{0.10 \times 0.25}$ = ₹675 × 1.0253 • **Net Gain 3-Months Later:** ₹700 - ₹692 = ₹8 **Spot Price on Expiry is less than ₹700** • **Inflow:** Exercise Put Option. Sell Stock and receive ₹700. • **Outflow:** Repay borrowal of ₹692 including interest i.e. ₹675 × $e^{0.10 \times 0.25}$ = ₹675 × 1.0253 • **Net Gain 3-Months Later:** ₹700 - ₹692 = ₹8

2. Sanju Ltd

(a) Computation of Theoretical Value of Call Option:

C + PV of EP of Call = CMP + P

→ C + ₹200 × $e^{-0.10 \times 0.25}$ = ₹180 + 40

→ C = ₹220 - ₹200 × 1.0253

→ C = ₹220 - ₹195 = ₹**25**

(b) Evaluation: Theoretical Price of ₹25 > Actual Price of ₹20. Therefore, Call Option is undervalued.

(c) Action:

Now	3-Months Later
• Sell Put Option (Write Put) at ₹40. (Inflow) • Sell Stock at ₹ 180 • Buy Call Option at ₹20 • Invest ₹200 in Risk Free Investments at 10% p.a. for 3 Months (Receipt on Sale of Stock ₹180 + Receipt on Sale of Put Option ₹40 - Cost of Call Option ₹20)	**Spot Price on Expiry is more than ₹200** • **Inflow:** Realize ₹205 from Investment including interest (₹200 X $e^{0.10x0.25}$ = ₹200 X 1.0253). • **Outflow:** Call Option will be exercised. Pay ₹200 and buy stock. • **Net Gain 3-Months Later:** ₹205 - ₹200 = ₹5 • **Spot Price on Expiry is less than ₹200** • **Inflow:** Realize ₹205 from Investment including interest (₹200 X $e^{0.10 \times 0.25}$ - ₹200 x 1.0253). • **Outflow:** Put Option holder will exercise option. Pay ₹200 and buy stock. • **Net Gain 3-Months Later:** ₹205 - ₹200 = ₹5

Illustration 29.

On 19th July following are the spot rates - Spot USD / EUR 1.20000 and INR / USD 44.8000

Following are the quotes of European Options;

Currency Pair	Call/Put,	Strike Price	Premium	Expiry Date
USD/EUR	Call	1.2000	₹ 0.035	Oct. 19
USD/EUR	Put	1.2000	₹0.04	Oct.19
INR/USD	Call	44.8000	₹ 0.12	Dec. 19
INR/USD	Put	44.8000	₹ 0.04	Dec.19

(a) A Trader sells an At-The-Money Spot Straddle expiring at three months (Oct. 19). Calculate the gain or loss if three months later the spot rate is USD / EUR 1.2900.

(b) Which strategy gives a profit to the dealer if five months later (Dec. 19) expected spot rate is INR / USD 45.00. Also calculate profit for a transaction of USD 1.40 Millions.

Solution:

1. Straddle Strategy - At the Money - Profit or Loss Calculation

Straddle is an Option Strategy which involves buying / writing a call and put with the same strike price and same expiry date. A trader sells a Straddle, will be selling a Call option & a Put option with Strike Price of USD 1.2000 per EUR.

2. Computation of Net Pay-Off

Particulars	Amount
Exercise Price	₹1.2000
Spot Price as on Exercise Date	₹1.2900
Action of the Buyer of the Options	Call - Exercise Put - Lapse
Loss on Call Option to the WRITER = Strike Price - Exercise Price	₹0.0900
Total Options Premium inflow to the WRITER = ₹0.035 + ₹ 0.040	₹0.0750
Net Loss	₹0.0150

3. Increase in Prices - Strategy

As Expected Future price is higher, purchase of call option is beneficial. (Otherwise, put option may be sold).

Course of Action -

1. Contract Date: 19th July: Pay Premium for USD 14,00,000 @ ₹ 0.12 per USD = INR 1,68,000.
2. Exercise Date: 19th December: Exercise Call - Gain = 14,00,000 X ₹ (45.00 - 44.80) =INR 2,80,000.
3. Net Gain or Profit = (1) - (2) = INR 1,12,000.

Illustration 30.

Fund Managers anticipate a big move in the stock of Bikram Ltd. Anup of ABC Fund believes such change to be upwards, while Shyam of Premier Fund holds the opposite view.

From the following information made available of Bikram Ltd, explain what action will Anup and Shyam take and why?

Exercise Price	Premium for Call Option	Premium for Put Option
₹100	₹15	₹10

Solution:

A. Anup, ABC Fund Choice of Strategy:

(a) Outlook: Extreme Volatility and uncertain future. Stock of Bikram Ltd expected to appreciate i.e. Bullish on Bikram.

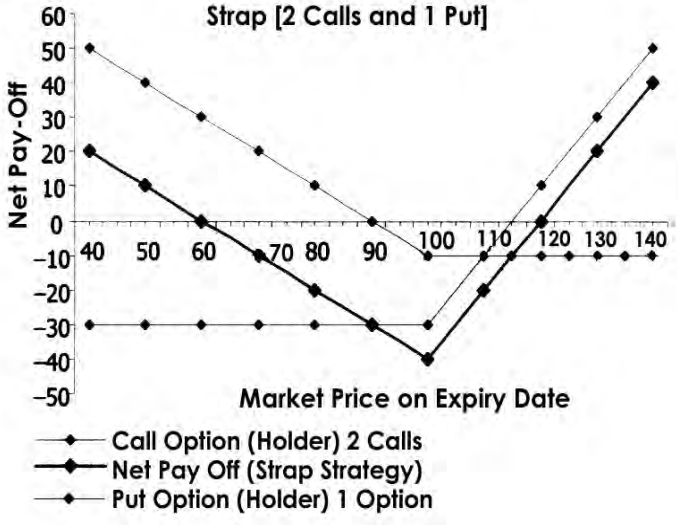
(b) Strategy: Creation of Strap i.e. Buying Two Calls, Buying One Put

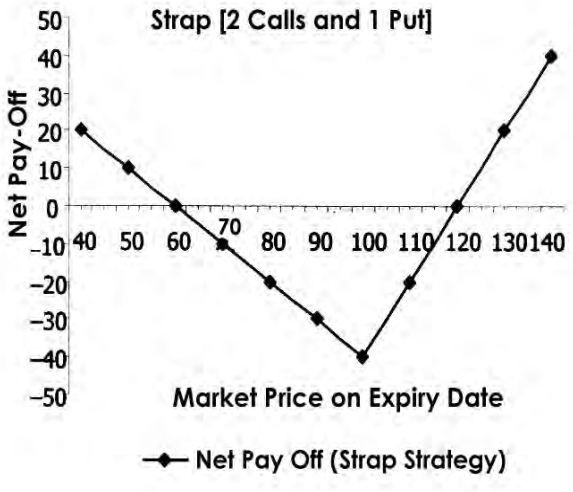
(c) Why? Increase in price is more likely than decrease, therefore two calls would yield better results. Put option is bought to cash in if stock of Bikram spirals downwards.

1. Pay off Table:

Price on Expiry Date	Call Option [2 Options]				Put Option [1 Option]				Net Pay off (₹)
	Ex. Price (₹)	Premium (₹)	Action	Payoff	Ex. Price (₹)	Premium (₹)	Action	Payoff (₹)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10) = (5) + (9)
40	100	15	Lapse	**(30)**	100	10	Exercise	**50**	**20**
50	100	15	Lapse	**(30)**	100	10	Exercise	**40**	**10**
60	100	15	Lapse	**(30)**	100	10	Exercise	**30**	**0**
70	100	15	Lapse	**(30)**	100	10	Exercise	**20**	**(10)**
80	100	15	Lapse	**(30)**	100	10	Exercise	**10**	**(20)**
90	100	15	Lapse	**(30)**	100	10	Exercise	**0**	**(30)**
100	100	15	Lapse	**(30)**	100	10	Lapse	**(10)**	**(40)**
110	100	15	Exercise	**(10)**	100	10	Lapse	**(10)**	**(20)**
120	100	15	Exercise	**10**	100	10	Lapse	**(10)**	**0**
130	100	15	Exercise	**30**	100	10	Lapse	**(10)**	**20**
140	100	15	Exercise	**50**	100	10	Lapse	**(10)**	**40**

2. Pay off Graphs:





B. Shyam, Premier Fund 1. Choice of Strategy:

(a) **Outlook:** Extreme Volatility and uncertain future. Stock of Shyam Premier Fund expected to depreciate i.e. Bearish on Shyam.

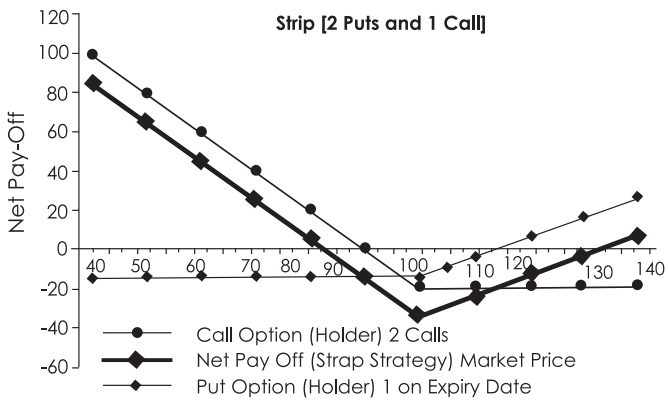
(b) **Strategy:** Creation of Strip i.e. Buying Two Puts, Buying One Call.

(c) **Why?** Decrease in price is more likely than increase; therefore two puts would yield better results as prices go down. One Call option is bought to cash in if stock of Shyam spirals upwards.

3. Pay off Table:

Price on Expiry Date	Call Option [1 Option]				Put Option [2 Options]				Net Pay off (₹)
	Ex. Price (₹)	Premium (₹)	Action	Payoff	Ex. Price (₹)	Premium (₹)	Action	Payoff (₹)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10) = (5) + (9)
40	100	15	Lapse	**(15)**	100	10	Exercise	**100**	**85**
50	100	15	Lapse	**(15)**	100	10	Exercise	**80**	**65**
60	100	15	Lapse	**(15)**	100	10	Exercise	**60**	**45**
70	100	15	Lapse	**(15)**	100	10	Exercise	**40**	**25**
80	100	15	Lapse	**(15)**	100	10	Exercise	**20**	**5**
90	100	15	Lapse	**(15)**	100	10	Exercise	**0**	**(15)**
100	100	15	Lapse	**(15)**	100	10	Lapse	**(20)**	**(35)**
110	100	15	Exercise	**(5)**	100	10	Lapse	**(20)**	**(25)**
120	100	15	Exercise	**5**	100	10	Lapse	**(20)**	**(15)**
130	100	15	Exercise	**15**	100	10	Lapse	**(20)**	**(5)**
140	100	15	Exercise	**25**	100	10	Lapse	**(20)**	**5**

4. Pay off Graphs



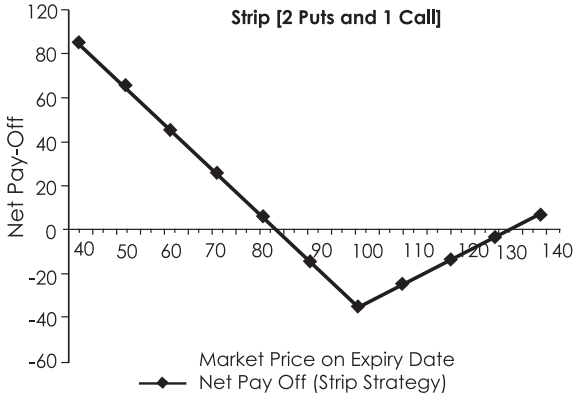


Illustration 31.

Ascertain the value of Call Options expiring one year later, of four securities from the following information—

Stock	Current Spot Price (₹)	Exercise Price (₹)	Expected Price One Year Later (₹)
X Ltd	1,020	1,050	1,100
Y Ltd	200	180	220
Z Ltd	500	510	535
D Ltd	80	80	90

Risk Free Rate may be assumed at 10% for continuous discounting. Also show in case of Security Z, how choosing the Stock Route and Option Route with Risk Free Investment will have the same wealth for an investor at the end of the year for the same cash outgo.

Solution:

1. Computation of Value of Call

Stock	Current Spot Price [SP_0] (₹)	Exercise Price [EP] (₹)	PV of EP [EP X $e^{-1x0.10}$] (₹)	Value of Call Option [SP_0 –PV of EP] (₹)
(1)	**(2)**	**(3)**	**(4)**	**(5) = (2)-(4)**
X	1,020	1050	1050 ÷ 1.1052 = 950.05	1,020 - 950.05 = 69.95
Y	200	180	180 ÷1.1052 = 162.87	200 - 162.87 = 37.13
Z	500	510	510 ÷1.1052 = 461.45	500 - 461.45 = 38.55
D	80	80	80 ÷ 1.1052 = 72.39	80 - 72.39 = 7.61

2. Case of Stock of Z Ltd

Action on Stock Route	Action on Option Plus Risk Free Return Route
Now: Buy Stock of Z at ₹500.	**Now:** • Invest Present Value (i.e. ₹461.45) of Exercise Price at Risk Free Rate of 10% (continuous compounding) • Buy Call Option at ₹38.55 (Strike Price of ₹510) • Total Cash Outgo = ₹461.45 + ₹38.55 = ₹500

1 Year Later: Net Worth = Value per Share at Expected Future Spot Rate = ₹**535**	**1 Year Later:** • Net Worth = Maturity Value of Risk Free Investment + Value of Call Option • Maturity Value of Risk Free Investment = ₹461.45 × $e^{1\times0.10}$ = ₹**510** • Value of Call Option (on Expiry) = Gain on Exercise of Option = Spot Price on Expiry Date **Less** Exercise Price = ₹535 - ₹510 = ₹**25** • **Net Worth** = ₹510 + ₹25 = ₹**535**

Illustration 32.

Ascertain the value of Options expiring one year later, for the following securities —

1. ABC Ltd (ABCL) is quoted at ₹110. At the end of 3 Months, the stock price will either be ₹100 or ₹150. Exercise price is ₹120.
2. 3-Month Options on MN Ltd (MNL) carry an exercise price of ₹350. Stock Price is expected to be ₹250 or ₹450. Presently the shares are traded for ₹380

Risk Free Rate may be assumed at 12% for continuous discounting.

Solution:

1. ABC Ltd

(a) Basic Data

Particulars	₹
Stock Price (SP_0)	110
Exercise Price (EP)	120
Expected Future Spot Price on Expiry Date	
• Future Price 1 [FP_1]	100
• Future Price 2 [FP_2]	150

(b) Computation of Option Delta:

Particulars	**FP_1**	**FP_2**
Future Spot Price	100	150
Position on Expiry Date (in comparison with Exercise Price)	Out of Money	In the Money
Action on Expiry Date	Lapse	Exercise
Value of Option on Expiry [Future Spot Price **Less** Exercise Price]	—	₹30 [150-120]

Option Delta = Change in Value of Option ÷ Change in Future Spot Price

= (₹30 - 0) ÷ (₹150 - ₹100) = ₹30/₹50 = 0.60

(c) Computation of Amount to be Invested at Risk Free Rate:

= Present Value of Lower Band of Future Spot Price i.e. FP_1

= Present Value of ₹100 discounted at 12% Continuous Compounding for a 3-Month Period

= ₹100 x e^{-rt} =₹100 ÷ e^{rt}

= ₹100 ÷ $e^{0.12\times0.25}$ = ₹100 ÷ 1.0305 = ₹97.04

(d) Value of Call [C]

= Option Delta X [Current Stock Price Less Amount to be invested at Risk Free Rate]

= 0.60 X (₹110 - ₹97.04) = 0.60 x ₹12.96 = ₹7.78

(e) Value of Put [P] (Under Put Call Parity):

→ Value of Call + Present Value of Exercise Price = Current Spot Price + Value of Put

→ $C + EP \times e^{-rt} = SP_0 + P$

→ ₹7.78 + (₹120 ÷ 1.0305) = ₹110 + P

→ P = ₹7.78 + ₹116.45 - ₹110 = ₹14.23

2. MN Limited

(a) Basic Data

Particulars	₹
Stock Price ($SP_{0)}$	380
Exercise Price (EP)	350
Expected Future Spot Price on Expiry Date	
• Future Price 1 [FP_1]	250
• Future Price 2 [FP_2]	450

(b) Computation of Option Delta

Particulars	**FP_1**	**FP_2**
Future Spot Price	250	450
Position on Expiry Date (in comparison with Exercise Price)	Out of Money	In the Money
Action on Expiry Date	Lapse	Exercise
Value of Option on Expiry [Future Spot Price Less Exercise Price]	₹0	₹100 [450 - 350]

Option Delta = Change in value of options ÷ Change in future spot Price

= (₹100 – 0) ÷ (₹450 – ₹250) = ₹100 / ₹200 = 0.50

(c) Computation of Amount to be Invested at Risk Free Rate:

= Present Value of Lower Band of Future Spot Price i.e. FP_1

= Present Value of ₹250 discounted at 12% Continuous Compounding for a 3-Month Period

= $₹250 \times e^{-rt} = ₹250 \div e^{rt}$

= $₹250 \div e^{0.12 \times 0.25}$ = ₹250 ÷ 1.0305 = ₹242.60

(d) Value of Call [C]

= Option Delta × [Current Stock Price Less Amount to be invested at Risk Free Rate]

= 0.50 × (₹380 - ₹242.60) = 0.50 x ₹137.40 = ₹68.70

(e) Value of Put [P] (Under Put Call Parity):

→ Value of Call + Present Value of Exercise Price = Current Spot Price + Value of Put

→ $C + EP \times e^{-rt} = SP_0 + P$

→ ₹68.70 + (₹350 ÷ 1.0305) = ₹380 + P

→ P = ₹68.70 + ₹339.64 - ₹380 = ₹28.34.

Illustration 33.

Soumo has ₹3,00,000 to invest in the Capital Market. He considers stock of Kraft Components Ltd, an auto mobile industry anciliary unit, to be a safe bet. KCL is currently traded at ₹200. Industry analysts say opine that KCL will either remain at ₹190 or go upto ₹250 in 6-Months time, considering the performance of the industry. Soumo views this as an opportunity and has decided to invest ₹3,00,000 to buy shares of KCL and earn a maximum of upto 25%, which is more than the risk free rate.

His actuarial friend, Rakesh, also has ₹3,00,000 to invest. However, he considers Soumo's proposition to be bit risky, Having some knowledge on options, Rakesh intends to buy calls and invest at Risk Free Rate of 12%. 6-Months option carries an Exercise Price of ₹220.

What should be the price of the call, for Rakesh 's proposition to yield the same result 6-months later (i.e. a minimum net wealth of ₹3,00,000)? How many calls should Rakesh buy?

Who would be better off at the end of 6-Months, if the actual spot price is ₹180, ₹250 and ₹300?

Solution:

1. Basic Data

Particulars	₹
Current Stock Price (SP_0)	200
Exercise Price (EP)	220
Expected Future Spot Price on Expiry Date	
• Future Price 1 [FP_1]	190
• Future Price 2 [FP_2]	250

2. Computation of Option Delta:

Particulars	FP_1	FP_2
Future Spot Price	190	250
Position on Expiry Date (in comparison with Exercise Price of ₹220)	Out of Money	In the Money
Action on Expiry Date	Lapse	Exercise
Value of Option on Expiry [Future Spot Price **Less** Exercise Price]	₹0	₹30 [250 – 220]

Option Delta = Change in Value of Option ÷ Change in Future Spot Price

= (₹30 - ₹0) ÷ (₹250 - ₹190) = ₹30/ ₹60 = 0.50

3. Computation of Amount to be Invested at Risk Free Rate:

= Present Value of Lower Band of Future Spot Price i.e. FP_1

= Present Value of ₹190 discounted at 12% Continuous Compounding for a 6-Month Period

= ₹190 x e^{-rt} = ₹190 ÷ e^{rt}

= ₹190 ÷ $e^{0.12 \times 0.5}$

= ₹190 ÷ $e^{0.06}$

= ₹190 ÷ 1.0618 = ₹178.94

4. Value of Call [C]

= Option Delta X [Current Stock Price Less Amount to be invested at Risk Free Rate] = 0.50 x (₹200 - 178.94)

= 0.50 x ₹21.06 = ₹10.53

5. Value of Put [P] (Under Put Call Parity):

→ Value of Call + Present Value of Exercise Price = Current Spot Price + Value of Put

→ $C + EP \times e^{-rt} = SP_0 + P$

→ ₹10.53 + (₹220 ÷ 1.0618) = ₹200 + P

→ P = ₹10.53 + ₹207.20 - ₹200 = ₹17.73

6. No. of Calls to be Bought by Rakesh:

= (1 ÷ Options Delta) per share of KCL

= 1 / 0.50 = 2 per share of KCL or 5 Calls for every 3 Shares of KCL

7. No. of Shares that can be bought = ₹3,00,000 ÷ ₹200 per share (CMP) = 1,500 shares

8. Position 6-Months Later:

(a) Soumo

Particulars	Case A	Case B	Case C
Closing Net Worth = Actual Stock Price after 6 Months	₹180 × 1500 Shares = ₹2,70,000	₹250 × 1500 Shares = ₹3,75,000	₹300 × 1500 Shares = ₹4,50,000
Opening Net Worth = Purchase Price of Stock/ Initial Investment	₹200 x 1500 Shares = ₹3,00,000	₹200 × 1500 Shares = ₹3,00,000	₹200 × 1500 Shares = ₹3,00,000
Change	(₹30,000)	₹75,000	₹1,50,000
% Change	(10%) [(30)/300]	25% [75 ÷ 300]	50% [150 ÷300]
Inference	Erosion in Wealth	Increase in Wealth	Increase in Wealth

(b) Rakesh

Outflow per set of 5 Calls on KCL and Investment of ₹178.94 in Risk Free Rate per Share for 3 shares:

Particulars		Value
Outflow towards Purchase of Calls Outflow	5 Call's × ₹10.53 per Call	₹52.65
towards Investment	3 Shares of KCL × ₹178.94	₹536.82
Total Investment per set of 5 Calls and Risk Free Investment		₹589.47
Total Number of Portfolio Sets invested	₹3,00,000 ÷ ₹589.47	509 Sets
Total No. of Calls	509 Sets × 5 Calls per Set	2545 Calls
Total amount invested in Risk Free Rate	509 Sets × ₹536.82	₹2,73,241

Particulars	Case A	Case B	Case C
Actual Closing Price per Share	₹180	₹250	₹300
Esercise Price	₹220	₹220	₹220
Position	Out of Money	In the Money	In the Money
Action	Lapse	Exercise	Exercise
Value of Call before Expiry	₹0	₹30 [₹250 - ₹220]	₹80 [₹300 - ₹220]

No. of Calls	2545	2545	2545
Total Value of Calls on Expiry [6-Months later] [A]	₹NIL [2545 X ₹0]	₹76,350 [2545 X ₹30]	₹2,03,600 [2545 x ₹80]
Maturity Value of Investment [Investment ₹2,73,241 × $e^{0.12 \times 0.5}$] **[B]**	₹2,90,127 [2,73,241 x 1.0618]	₹2,90,127 [2,73,241 x 1.0618]	₹2,90,127 [2,73,241 x 1.0618]
Closing Net Worth [A + B]	₹2,90,127	₹3,66,477	₹4,93,727
Opening Investment	₹3,00,000	₹3,00,000	₹3,00,000
Change	₹(9,873)	₹66,477	₹1,93,727
% Change	(3.291)% (9,873 ÷ 3,00,000)	22.16% [66,477 ÷ 3,00,000]	64.58% [1,93,727 ÷ 3,00,000]
Inference [Ignoring Time Value of Money]	Decrease in wealth	Increase in Wealth	Increase in Wealth

Conclusion:

- Rakesh will be better off when actual market price is either ₹250 or ₹300.
- Risk is neutralized in case of Rakesh by going in for the Options.

Illustration 34.

Stock of Kamla Woodwork is currently quoted at ₹110. In three months time it could either be ₹90 or ₹135.

Ascertain the value of Call Option with an exercise price of ₹120 if the risk free rate of return is 8%.

Solution:

1. Basic Data

Factor	Notation	Value
Spot Price	SP_0	₹110
Exercise Price	EP	₹120
Expected Future Spot Price — Lower Limit [FP_1]	FP_1	₹90
Expected Future Spot Price — Higher Limit [FP_2]	FP_2	₹135
Value of Call at Lower Limit [Action = Lapse, since FP_1 < EP. Therefore Value is ₹NIL]	Cd	₹NIL
Value of Call at Upper Limit [Action = Exercise, since FP_2 > EP. Therefore Value is FP_2 - EP = ₹135 - ₹120]	Cu	₹15
Extent of Lower Limit of Future Spot Price [FP_1] on Current Price [SP_0] [FP_1 / SP_0] = ₹90/₹110	d	0.82
Extent of Upper Limit of Future Spot Price [FP_2] on Current Price [SP_0] [FP_2/ SP_0] = ₹135/₹110	u	1.227
Risk Free Rate of Return	r	8%
Tenor of Options Contract [in Years] = 3 Months/ 12 Months	t	0.25
Future Value Factor [Continuous Compounding Factor] = $e^{0.08 \times 0.25}$	f	1.0202

2. Alternative 1 [Formula Method]

$$\frac{C_u\left[\frac{f-d}{u-d}\right]+C_d\left[\frac{u-f}{u-d}\right]}{f} = \frac{₹15\times\left[\frac{1.0202-0.82}{1.27-0.82}\right]+₹0\times\left[\frac{1.227-1.0202}{1.227-0.82}\right]}{1.0202}$$

= [₹15 x (0.2002 / 0.407) + 0] / 1.0202

= ₹15 x 0.4919 ÷ 1.0202 = ₹7.23

3. Alternative 2 [Decision Tree Method] [Requires Probability Values]

(a) Computation of Probability of FP1 and FP2:

Probability of Lower Limit (FP_1) = (u - f) ÷ (u - d) = (1.227 - 1.0202) / (1.227 - 0.82)

= 0.2068 ÷ 0.407

= 0.508

Probability of Higher Limit (FP_2) =1- 0.508

= 0.492

(b) Value of Option [Future Value of Option]

Present Value of Call = Future Value X e^{-rt} or Future Value ÷ e^{rt}

= ₹7.38 ÷ 1.0202 = ₹7.23

4. Alternative 3 [Table Method or Delta Route]

Value of Call = No. of Shares per Call Option × [Current Stock Price - Present Value of Lower Limit of Future Spot Price]

= Option Delta × [SP_0 - (FP_1 × e^{-rt})]

= [(15 - 0) / (135 - 90)] × [110 - (90 ÷ 1.0202)]

= [(15/45)] × [110 - 88.22] = 0.3333 × 21.78 = ₹7.26

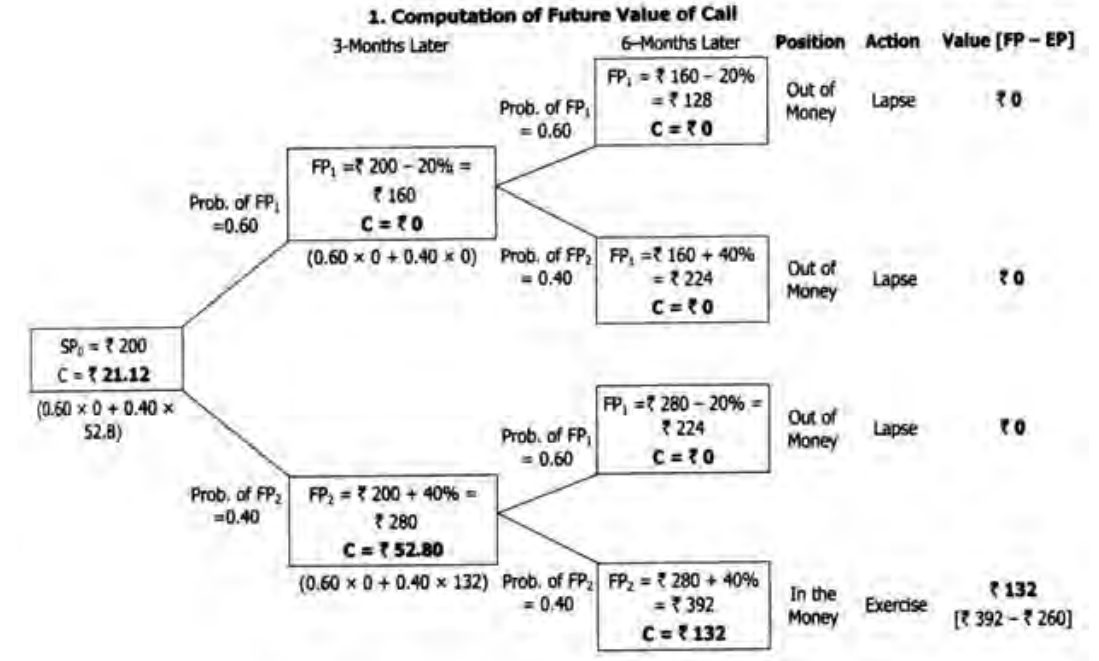
Illustration 35.

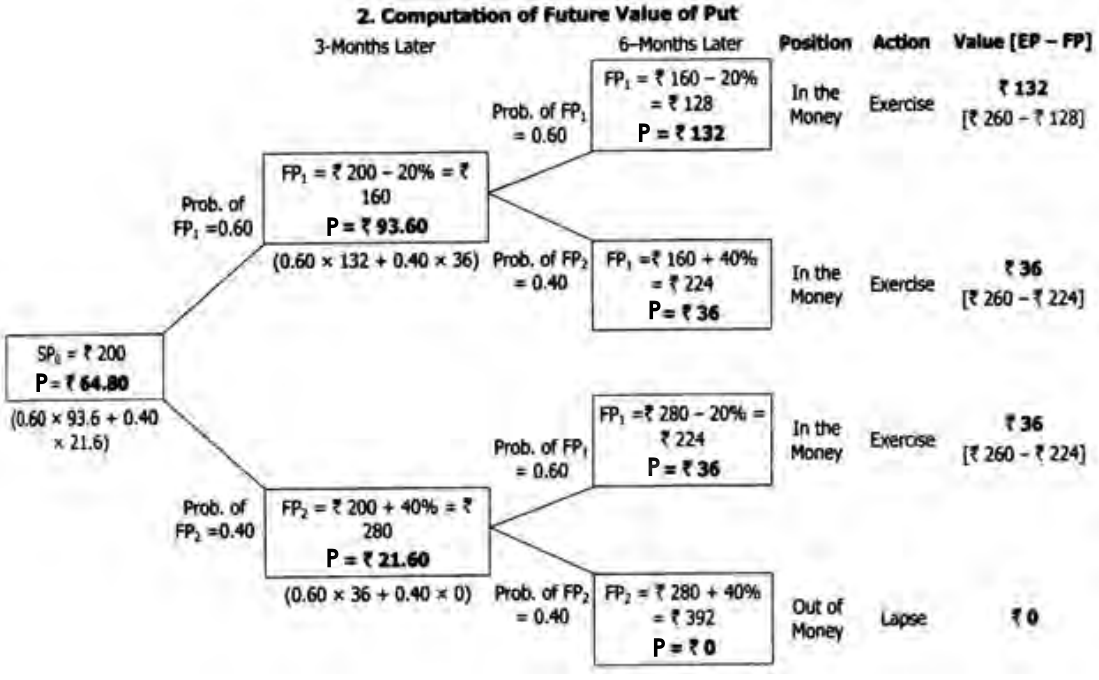
Nirmal Hydric Ltd. (NHL) is a newly listed Company. Its listing price today is ₹200. Though the industry offers much potential, there are no proven past track records.

Analysts expect the price of NHL to either to rise by 40% every half year or fall by 20% every half year (on the half yearly opening price), for the next one year, weightage being 40% for every increase and 60% for every fall.

If an One Year option carries a Exercise Price of ₹260, you required to compute the following under Binomial Model — (1) Risk Free Rate of Return, (2) Value of Call (Future Value and Present Value), (3) Value of Put (Future Value & Present Value)

Solution:





3. Computation of Risk Free Rate of Return Basic Data

Factor	Notation	Value
Spot Price	SP_0	₹200
Expected Future Spot Price — Lower Limit [FP_1]	FP_1	₹160
Expected Future Spot Price — Higher Limit [FP_1]	FP_2	₹280

Extent of Lower Limit of Future Spot Price [FP_1] on Current Price [SP_0] FP_1/SP_0 = ₹160/ ₹200	d	0.80
Extent of Upper Limit of Future Spot Price [FP_2] on Current Price [SP_0] FP_2/SP_0] = ₹280 /₹200	u	1.40
Risk Free Rate of Return	r	To be ascertained
Tenor of Options Contract [in Years]	t	0.5

(a) Probability of Lower Limit (FP_1) = 0.60

→ 0.60 = (u - f) ÷ (u - d) = (1.40 - f) / (1.40 - 0.80) = (1.40 - f) / 0.60

→0.60 × 0.60 = 1.40 - f

→f = 1.40 - 0.36 = 1.04

→e^{rt} = 1.04

→$e^{r \times 0.50}$ = 1.04 (Since per time slot = 6 Months or 0.25 Years)

(b) Computation of Risk Free Rate:

From Natural Log Table, 1.04 is the value for 0.040

→$Loge^{0.5r}$ = Log 1.04^0

→ 0.5r = 0.0392

→ r = 0.0392 ÷ 0.5 = 0.0784 or 7.84% p.a.

4. Present Value of Options

(a) Call Option: Future Value X e^{-rt}, where r = 7.84% and t = 1 Year

= ₹21.12 X $e^{-0.0784}$

= ₹21.12 ÷ $e^{0.0784}$

= ₹21.12 ÷ 1.0815

= ₹19.53

(b) Put Option: Future Value X e^{-rt}, where r = 7.84% and t = 1 Year

= ₹64.80 x $e^{-0.784}$ = ₹64.80 ÷ $e^{0.0784}$ = ₹64.80 ÷ 1.0815= ₹59.92

Under Put Call Parity = P = C + PV of EP – SP_0

= 19.53 + (260 ÷ 1.0815) - 200 = 19.53 + 240.40 - 200 = ₹59.93

Illustration 36.

A share price is currently priced ₹40, it is known that at end of one month, it will be either ₹38 or ₹ 42, the risk free interest rate is 8% per annum with continuous compounding. Find the value of a one - month European call option with a strike price of ₹39.5 with the help of Binomial and Risk Neutralization Model?

Solution:

Basic Data

Particulars	₹
Stock Price (SP_0)	40
Exercise Price (EP)	39.50
Expected Future Spot Price on Expiry Date	
• Future Price 1 [FP_1]	42
• Future Price 2 [FP_2]	38

1. Binomial Model

(a) Computation of Option Delta:

Particulars	FP_1	FP_2
Future Spot Price	42	38
Position on Expiry Date (in comparison with Exercise Price)	In the Money	Out of Money
Action on Expiry Date	Exercise	Lapse
Value of Option on Expiry [Future Spot Price **Less** Exercise Price]	₹2.50 [42 – 39.5]	0

Option Delta = Change in Value of Option ÷ Change in Future Spot Price

= (₹2.50 - ₹0) ÷ (₹42 - ₹38)

= ₹2.50 / ₹4

= **0.625**

(b) Computation of Amount to be invested at Risk Free Rate:

= Present Value of Lower Band of Future Spot Price i.e. FP_2

= Present Value of ₹38 discounted at 8% Continuous Compounding for a 1-Month Period

= ₹38 x e^{-rt}

= ₹38 ÷ $e^{0.08 \times 1/12}$

= ₹38 ÷ 1.00702

= **₹37.74**

(c) Value of Call [C]

= Option Delta X [Current Stock Price **Less** Amount to be invested at Risk Free Rate]

= 0.625 x [40 - 37.74] = **1.4125**

2. Risk Neutral Model

Particulars	Share
Current Spot Price (SP_0)	₹40
Exercise Price (EP)	₹39.50
Future Spot Price 1 (FP_1)	₹42
% Change (R_1)	(42 - 40) / 40 = 5%
Position	In the Money
Action	Exercise
Value on Expiry (V_{C1})	FP_1 - EP = ₹42 - ₹ 39.50 = ₹2.50
Future Spot Price 2 (FP_2)	₹38
% Change (R_2)	(38-40) / 40 = (5%)
Position	Out of Money
Action	Lapse
Value on Expiry (V_{C2})	₹0
Probability of FP_1 [P_1]	x
Probability of FP_2[P_2]	1-x
Probability Values	Risk Free Return = x X % Change for FP_1 + [(1 - x) X % Change for FP_2] → 0.67%= [x X 5%] + [(1-x) x (5%)] →0.67 = 0.05x + [- 0.05 + 0.05x] → 0.0067 = 0.05x-0.05 + 0.05x → 0.0067 + 0.05 = 0.10x →P_1=x = 0.0567 ÷ 0.10 = 0.567 or 57% → P_2 = 1 - x = 1 - 0.57 = 0.43 or 43%
Value of Call [Future Value]	→ (V_{C1} × P_1) + (V_{C2} x P_2) → (2.50 x 0.57) + (0 x 0.43) → ₹**1.425**
Present Value of Call [C]	Value of Call X e^{-rt} → ₹1.425 x$e^{-0.08 \times 1/12}$ → ₹1.425 ÷ $e^{0.0667}$ → ₹1.425 ÷ 1.00702 = ₹**1.42**

Illustration 37.

Trie market received rumor about XYZ Corporation's tie - up with a multinational company. This has induced the market price to move up. If the rumor is false, the XYZ Corporation's stock price will probably fall dramatically. To protect from this an investor has bought the call and put options.

He purchased one 3 months call with a strike price of ₹42 for ₹2 premium, and paid ₹1 per share premium for a 3 months put with a strike price of ₹40.

(a) Determine the Investor's position if the tie up offer bids the price of XYZ Corporation's stock up to ₹44 in 3 months.

(b) Determine the Investor's ending position, if the tie up programme fails and the price of the stocks falls to ₹35 in 3 months.

Solution:

1. Cost of call and put options

Cost of Call and Put Options = (₹2 per share Call) + (₹1 per share Put)

= ₹2 + ₹1 = ₹**3**

2. Position if Price increases to ₹43.

Particulars	Time	₹
(a) Cost of Options	T_0	3
(b) If Price increases to ₹44, Investor will not exercise the Put Option. Gain on Call [Spot Price on Expiry Date - Exercise Price = ₹44 - ₹42]	T_1	2
(c) **Net Loss due to Options [(a) - (b)]**	**T_1**	**1**

3. Position if Price falls to ₹36

Particulars	Time	₹
(a) Cost of Options	T_0	3
(b) If Price falls to ₹35, Investor will not exercise the Call Option. Gain on Put [Exercise Price - Spot price on Expiry Date = ₹40 - ₹35]	T_1	5
(c) **Net Gain due to Options [(b) - (a)]**	T_1	2

Illustration 38.

Calculate the price of a three-month European put option on a non-dividend-paying stock with a strike price of ₹ 50 when the current stock price is ₹ 50, the risk-free interest rate is 10% per annum, and the volatility is 30% per annum.

Solution:

Black and Scholes also developed formula for determining the price of a put option and the formula is as follows:

$P = Ke^{-rT}N(-d_2) - S_0N(-d_1)$

where P denotes price of the put option,

S_o is spot price of the underlying stock,

K is the strike price of the option,

T denotes time to expiration of option expressed in year,

r is the risk-free rate of interest,

$N(d_1)$ denotes the cumulative probability up to d_i (i = 1, 2) following standard normal distribution,

$d_1 = [l_n (S_0/k) + (r + \sigma^2/2)T] / \sigma\sqrt{T}$; σ is the volatility of the price of underlying stock ,

and $d_2 = d_1 - \sigma\sqrt{T}$

In the above illustration, S_o = ₹ 50, K = ₹ 50, T = 3/12= ¼= 0.25, r = 0.10, σ = 0.30,

$d_1 = [l_n (50/50) + (0.10+ 0.09 / 2)0.25] / 0.30\sqrt{0.25} = 0.2417$

$d_2 = d_1 - 0.30\sqrt{0.25} = 0.0917$

The European put price is

$50\ e^{-0.10 \times 0.25}\ N\ (-0.0917) - 50N\ (-0.2417)$

$= 50\ e^{-0.10 \times 0.25} \times 0.463 - 50 \times 0.4045$

$= 2.37$

Illustration 39.

What difference does it make to your calculations in Illustration 38 if a dividend of ₹ 1.50 is expected in two months?

Solution:

In this case we must subtract the present value of the dividend from the stock price before using Black – Scholes. Hence the appropriate value of S_o is

$$S_o = 50 - 1.50\ e^{-0.1667 \times 0.10} = 48.52$$

As before, K = ₹ 50, T= 3/12= ¼= 0.25, r = 0.10, σ = 0.30,

$d_1 = [l_n\ (48.52/50) + (0.10+ 0.09 / 2)0.25] / 0.30\sqrt{0.25} = 0.0414$

$d_2 = d_1 - 0.30\sqrt{0.25} = -0.1086$

The European put price is

$50\ e^{-0.10 \times 0.25}\ N\ (0.1086) - 48.52\ N\ (-0.0414)$

$= 50\ e^{-0.10 \times 0.25} \times 0.532 - 48.52 \times 0.4835$

$= 3.03$

Illustration 40.

Consider a European call option on a stock when there are ex-dividend dates in two months and five months. The dividend on each ex-dividend date is expected to be ₹0.50. The current share price is ₹40, the exercise price is ₹40, the stock price volatility is 30% per annum, the risk-free rate of interest is 9% per annum, and the time to maturity is six months. Find out the European call price.

Solution:

Black and Scholes developed formula for determining the price of a call option and the formula is as follows:

$C = S_0 N\ (d_1) - k\ e^{-rT}\ N\ (d_2)$

where C denotes price of the call option,

So is spot price of the underlying stock,

K is the strike price of the option,

t denotes time to expiration of option expressed in year,

r is the risk-free rate of interest,

$N\ (d_1)$ denotes the cumulative probability up to d_i (i = 1, 2) following standard normal distribution,

$d_1 = [l_n\ (S_0/k) + (r + \sigma^2 / 2)t\ ] / \sigma\sqrt{t}$; σ is the volatility of the price of underlying stock ,

and $d_2 = d_1 - \sigma\sqrt{t}$

In this case the present value of the dividend is subtracted from the stock price before using Black – Scholes. The present value of the dividends is

$$= 0.5e^{-0.1667*0.09} + 0.5e^{-0.4167*0.09} = 0.9741$$

The option price can therefore be calculated from the Black-Scholes formula with S_o = 40 – 0.9741 = 39.0259, K = 40, r = 0.09, σ = 0.3, and T = 0.5. We have

$$d_1 = \frac{\ln(39.0259 / 40) + (0.09 + 0.3^2 / 2) \times 0.5}{0.3\sqrt{0.5}} = 0.2017$$

$$d_2 = \frac{\ln(39.0259 / 40) + (0.09 - 0.3^2 / 2) \times 0.5}{0.3\sqrt{0.5}} = -0.0104$$

$N(d_1) = 0.5800$, $N(d_2) = 0.4959$

The call price is:

$39.0259 \times 0.5800 - 40e^{-0.09 \times 0.5} \times 0.4959 = 3.67$

Illustration 41.

What is the price of a European put option on a non-dividend-paying stock when the stock price is ₹69, the strike price is ₹ 70, the risk-free interest rate is 5% per annum, the volatility is 35% per annum, and the time to maturity is six months?

Solution:

In this case,

$S_0 = 69$, $K = 70$, $r = 0.05$, $\sigma = 0.35$ and $T = 0.5$

$$d_1 = \frac{\ln(69/70) + (0.05 + 0.35^2/2) \times 0.5}{0.35\sqrt{0.5}} = 0.166$$

$d_2 = d_1 - 0.35\sqrt{0.5} = -0.0809$

The price of the European put is

$70e^{-0.05\times0.5} N(0.0809) - 69 N(-0.1666)$

$= 70e^{-0.05\times0.5} \times 0.5323 - 69 \times 0.4338$

$= 6.40.$

10.3 SWAPS AND SWAPTIONS

Swaps

A swap is an agreement between two parties to exchange sequences of cash flows for a set period of time. Usually, at the time the contract is initiated, at least one of these series of cash flows is determined by a random or uncertain variable, such as an interest rate, foreign exchange rate, equity price or commodity price. Conceptually, one may view a swap as either a portfolio of forward contracts, or as a long position in one bond coupled with a short position in another bond.

Unlike most standardized options and futures contracts, swaps are not exchange-traded instruments. Instead, swaps are customized contracts that are traded in the over-the-counter (OTC) market between private parties. Firms and financial institutions dominate the swaps market, with few (if any) individuals ever participating. Because swaps occur on the OTC market, there is always the risk of a counterparty defaulting on the swap.

Swap is a combination of forwards by two counterparties. It is arranged to reap the benefits arising from the fluctuations in the market -either currency market or interest rate market or any other market for that matter.

Features of Swap :

The following are the important features of a swap:

(i) **Basically a forward:** A swap is nothing but a combination of forwards. So, it has all the properties of forward contract.

(ii) **Double coincidence of wants:** Swap requires that two parties with equal and opposite needs must come into contact with each other, i.e., rate of interest differs from market to market and within the market itself. It varies from borrowers to borrowers due to relative credit worthiness of borrowers.

(iii) **Comparative Credit Advantage:** Borrowers enjoying comparative credit advantage in floating rate debts will enter into a swap agreement to exchange floating rate interest with the borrowers enjoying comparative advantage in fixed interest rate debt, like bonds. In the bond market, lending is done at a fixed rate for a long duration, and therefore the lenders do not have the opportunity to adjust the interest rate according to the situation prevailing in the market.

(iv) **Flexibility:** In short term market, the lenders have the flexibility to adjust the floating interest rate (short term rate) according to the conditions prevailing in the market as well as the current financial position of the borrower. Hence, the short term floating interest rate is cheaper to the borrower with low credit rating when compared with fixed rate of interest.

(v) **Necessity of an Intermediary:** Swap requires the existence of two counterparties with opposite but matching needs. This has created a necessity for an intermediary to connect both the parties. By arranging swaps,

these intermediaries can earn income too. Financial companies, particularly banks, can play a key role in this innovative field by virtue of their special position in the financial market and their knowledge of the diverse needs of the customers.

(vi) **Settlements:** Though a specified principal amount is mentioned in the swap agreement; there is no exchange of principal. On the other hand, a stream of fixed rate interest is exchanged for a floating rate of interest, and thus, there are streams of cash flows rather than single payment.

(vii) **Long term agreement:** Generally, forwards are arranged for short period only. Long dated forward rate contracts are not preferred because they involve more risks like risk of default, risk of interest rate fluctuations etc. But, swaps are in the nature of long term agreement and they are just like long dated forward rate contracts. The exchange of a fixed rate for a floating rate requires a comparatively longer period.

Types of swaps

The five common types of swaps include:

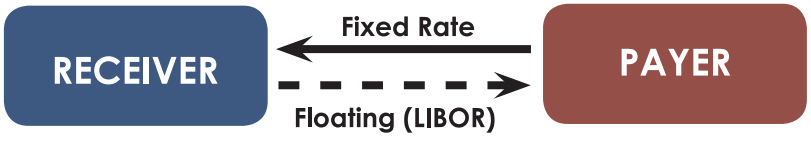
1. Interest rate swaps

Interest-rate swaps have become an integral part of the fixed-income market. These derivative contracts, which typically exchange – or swap – fixed-rate interest payments for floating-rate interest payments, are an essential tool for investors who use them to hedge, speculate, and manage risk.

This article aims to explain why swaps have become so important to the bond market. It begins with a basic definition of interest-rate swaps, outlines their characteristics and compares them with more familiar instruments, such as loans. Later, we examine the swap curve, some of the uses of swaps, and the risks associated with them.

An interest rate swap is an agreement between two parties to exchange one stream of interest payments for another, over a set period of time. Swaps are derivative contracts and trade over-the- counter.

The most commonly traded and most liquid interest rate swaps are known as "vanilla" swaps, which exchange fixed-rate payments for floating-rate payments based on LIBOR, the interest rate high- credit quality banks (AA-rated or above) charge one another for short-term financing. LIBOR, "The London Inter-Bank Offered Rate," is the benchmark for floating short-term interest rates and is set daily.) Although there are other types of interest rate swaps, such as those that trade one floating rate for another, plain vanilla swaps comprise the vast majority of the market.



By convention, each participant in a vanilla swap transaction is known by its relation to the fixed rate stream of payments. The party that elects to receive a fixed rate and pay floating is the "receiver," and the party that receives floating in exchange for fixed is the "payer." Both the receiver and the payer are known as "counterparties" in the swap transaction.

Investment and commercial banks with strong credit ratings are swap market-makers, offering both fixed and floating-rate cash flows to their clients. The counterparties in a typical swap transaction are a corporation, a bank or an investor on one side (the bank client) and an investment or commercial bank on the other side. After a bank executes a swap, it usually offsets the swap through an interdealer broker and retains a fee for setting up the original swap. If a swap transaction is large, the interdealer broker may arrange to sell it to a number of counterparties, and the risk of the swap becomes more widely dispersed. This is how banks that provide swaps routinely shed the risk, or interest-rate exposure, associated with them.

Initially, interest rate swaps helped corporations manage their floating-rate debt liabilities by allowing them to pay fixed rates, and receive floating-rate payments. In this way, corporations could lock into paying the prevailing fixed rate and receive payments that matched their floating-rate debt. (Some corporations did the opposite – paid floating and received fixed – to match their assets or liabilities.) However, because swaps reflect the market's expectations for interest rates in the future, swaps also became an attractive tool for other fixed-income market participants, including speculators, investors and banks.

As a result, the swap market has grown immensely in the past 20 years or so; the notional dollar value of outstanding interest rate swaps globally was $230 trillion at the end of 2006, according to the Bank for International Settlements.

Swap volume is termed "notional" because principal amounts, although included in total swap volume, are never actually exchanged. Only interest payments change hands in a swap, as described below.

Characteristics of Interest Rate Swaps

The "swap rate" is the fixed interest rate that the receiver demands in exchange for the uncertainty of having to pay the short-term LIBOR (floating) rate over time. At any given time, the market's forecast of what LIBOR will be in the future is reflected in the forward LIBOR curve.

At the time of the swap agreement, the total value of the swap's fixed rate flows will be equal to the value of expected floating rate payments implied by the forward LIBOR curve. As forward expectations for LIBOR change, so will the fixed rate that investors demand to enter into new swaps. Swaps are typically quoted in this fixed rate, or alternatively in the "swap spread," which is the difference between the swap rate and the U.S. Treasury bond yield (or equivalent local government bond yield for non-U.S. swaps) for the same maturity.

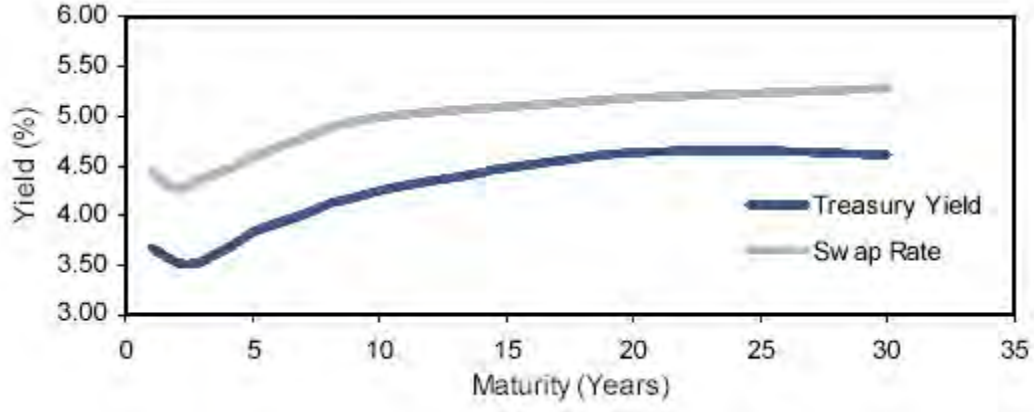
In many ways, interest rate swaps resemble other familiar forms of financial transactions, and it is helpful to think of swaps in these terms:

- **Exchanging loans**. Early interest rate swaps were literally an exchange of loans, and this model still provides an intuitive way to think about swaps. Consider two parties that have taken out loans of equal value, but one has borrowed at the prevailing fixed rate and the other at a floating rate tied to LIBOR. The two agree to exchange their loans, or swap interest rates. Since the principal is the same, there is no need to exchange it, leaving only the quarterly cash flows to be exchanged. The party that switches to paying a floating rate might demand a premium or cede a discount on the original fixed borrower's rate, depending on how interest rate expectations have changed since the original loans were taken out. The original fixed rate, plus the premium or minus the discount, would be the equivalent of a swap rate.
- **The Financed treasury note**. Receiving fixed rate payments in a swap is similar to borrowing cash at LIBOR and using the proceeds to buy a U.S. Treasury note. The buyer of the Treasury will receive fixed payments, or the "coupon" on the note, and be liable for floating LIBOR payments on the loan. The concept of a "financed Treasury" illustrates an important characteristic that swaps share with Treasuries: both have a discrete duration, or interest rate sensitivity, that depends on the maturity of the bond or contract.

The Swap Curve

The plot of swap rates across all available maturities is known as the swap curve, as shown in the chart below. Because swap rates incorporate a snapshot of the forward expectations for LIBOR and also reflect the market's perception of credit quality of these AA-rated banks, the swap curve is an extremely important interest rate benchmark.

The Swap Curve and Treasury Yield Curve



Although the swap curve is typically similar in shape to the Treasury yield curve, outright swap rates are generally higher than Treasury yields with corresponding maturities, as the chart above illustrates. This premium, or "swap spread" at any given maturity, mostly reflects the incremental credit risk associated with the banks that provide swaps compared to Treasuries, which are viewed as risk-free. While the swap spread can also be driven by short-term supply and demand fundamentals and other factors within the swap market, the overall level of swap spreads across maturities can also offer a broad reading of the creditworthiness of the major banks that provide swaps.

Because the swap curve reflects both LIBOR expectations and bank credit, then, it is a powerful indicator of conditions in the fixed income markets. In certain cases, the swap curve has supplanted the Treasury curve as the primary benchmark for pricing and trading corporate bonds, loans and mortgages.

Uses for Swaps

Interest rate swaps became an essential tool for many types of investors, as well as corporate treasurers, risk managers and banks, because they have so many potential uses. These include:

- **Portfolio management**. Interest rate swaps allow portfolio managers to add or subtract duration, adjust interest rate exposure, and offset the risks posed by interest rate volatility. By increasing or decreasing interest rate exposure in various parts of the yield curve using swaps, managers can either ramp-up or neutralize their exposure to changes in the shape of the curve, and can also express views on credit spreads. Swaps can also act as substitutes for other, less liquid fixed income instruments.

  Moreover, long-dated interest rate swaps can increase the duration of a portfolio, making them an effective tool in Liability Driven Investing, where managers aim to match the duration of assets with that of long-term liabilities.
- **Speculation**. Because swaps require little capital up front, they give fixed-income traders a way to speculate on movements in interest rates while potentially avoiding the cost of long and short positions in Treasuries. For example, to speculate that five-year rates will fall using cash in the Treasury market, a trader must invest cash or borrowed capital to buy a five-year Treasury note. Instead, the trader could "receive" fixed in a five-year swap transaction, which offers a similar speculative bet on falling rates, but does not require significant capital up front.
- **Corporate finance**. Firms with floating rate liabilities, such as loans linked to LIBOR, can enter into swaps where they pay fixed and receive floating, as noted earlier. Companies might also set up swaps to pay floating and receive fixed as a hedge against falling interest rates, or if floating rates more closely match their assets or income stream.
- **Risk management**. Banks and other financial institutions are involved in a huge number of transactions involving loans, derivatives contracts and other investments. The bulk of fixed and floating interest rate exposures typically cancel each other out, but any remaining interest rate risk can be offset with interest rate swaps.
- **Rate-locks on bond issuance**. When corporations decide to issue fixed-rate bonds, they usually lock in the current interest rate by entering into swap contracts. That gives them time to go out and find investors for the bonds. Once they actually sell the bonds, they exit the swap contracts. If rates have gone up since the decision to sell bonds, the swap contracts will be worth more, offsetting the increased financing cost.

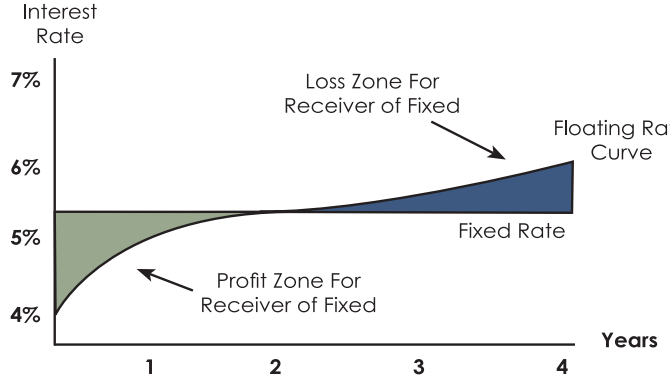
Risks associated with Interest Rate Swaps

Like most non-government fixed income investments, interest-rate swaps involve two primary risks: interest rate risk and credit risk, which is known in the swaps market as counterparty risk.

Because actual interest rate movements do not always match expectations, swaps entail interest-rate risk. Put simply, a receiver (the counterparty receiving a fixed-rate payment stream) profits if interest rates fall and loses if interest rates rise. Conversely, the payer (the counterparty paying fixed) profits if rates rise and loses if rates fall.

At the time a swap contract is put into place, it is typically considered "at the money," meaning that the total value of fixed interest-rate cash flows over the life of the swap is exactly equal to the expected value of floating interest-rate cash flows. In the example shown in the graph below, an investor has elected to receive fixed in a swap contract. If the forward LIBOR curve, or floating-rate curve, is correct, the 5.5% he receives will initially be better than the current floating 4% LIBOR rate, but after some time, his fixed 5.5% will be lower than the floating rate. At the inception of the swap, the "net present value," or sum of expected profits and losses, should add up to zero.

A Typical Swap Transaction At Inception



When an investor enters into a swap, the difference between the fixed rate payments and the expected future floating rate payments should be zero (the black zone equals the gray zone.)

When an investor enters into a swap, the difference between the fixed rate payments and the expected future floating rate payments should be zero (the black zone equals the grey zone.)

However, the forward LIBOR curve changes constantly. Over time, as interest rates implied by the curve change and as credit spreads fluctuate, the balance between the grey zone and the blue zone will shift. If interest rates fall or stay lower than expected, the "receiver" of fixed will profit (grey area will expand relative to blue). If rates rise and hold higher than expected, the "receiver" will lose (blue expands relative to grey).

If a swap becomes unprofitable or if a counterparty wishes to shed the interest rate risk of the swap, that counterparty can set up a countervailing swap – essentially a mirror image of the original swap – with a different counterparty to "cancel out" the impact of the original swap. For example, a receiver could set up a countervailing swap in which he pays the fixed rate.

Swaps are also subject to the counterparty's credit risk: the chance that the other party in the contract will default on its responsibility. Although this risk is very low – banks that deal in LIBOR and interest rate swaps generally have very high credit ratings of double-A or above – it is still higher than that of a risk- free U.S. Treasury bond.

The interest rate swaps market started decades ago as a way for corporations to manage their debt and has since grown into one of the most useful and liquid derivatives markets in the world. Vanilla swaps, which are most common and involve the exchange of floating-rate LIBOR for a fixed interest rate, are used across the fixed-income markets to manage risks, speculate, manage duration and lock in interest rates.

Because swaps are highly liquid and have built-in forward rate expectations as well as a credit component, the swap rate curve has become an important interest-rate benchmark for credit markets that in some cases has supplanted the U.S. Treasury yield curve.

2. Commodity swaps

Commodities are physical assets such as precious metals, base metals, energy stores (such as natural gas or crude oil) and food (including wheat, pork bellies, cattle, etc.). Commodity swaps were first traded in the mid-1970's, and enable producers and consumers to hedge commodity prices. Swaps involving oil prices are probably the most common; however, swaps involving weather derivatives are increasingly popular. The floating leg of a commodity swap is tied to the price of a commodity or a commodity index, while the fixed leg payments are stipulated in the contract as in an interest rate swap. It is common for a commodity swap to be settled in cash, although physical delivery is becoming increasingly common. The floating leg is typically held by a commodity consumer, who is willing to pay a fixed rate for a commodity to guarantee its price. The fixed leg is typically held by a commodity producer who agrees to pay a floating rate which is set by the market price of the underlying commodity, thereby hedging against falls in the price of the commodity. In most cases, swap rates are fixed either by commodity futures, or by estimating the commodity forward price.

There are two main types of commodity swaps:

- **Fixed-floating commodity swaps** are similar to the interest rate fixed-floating swaps except that both legs are commodity based. These are used by commodity producers and consumers to lock in commodity prices.
- **Commodity for interest swaps** are similar to equity swaps, in which a total return on the commodity is exchanged for some money market rate (plus or minus a spread).

3. Credit swaps

This is a swap contract wherein the buyer makes numerous installments of payments to the seller thus receiving a payoff if an instrument (specifically a loan or bond) goes into default. Less frequently, the credit event responsible for triggering the payoff can include a company going through bankruptcy, restructuring, or even just experiencing a downgrade in credit rating.

4. Currency swaps

A currency swap is the one in which principal and fixed rate interest payments on a loan in one currency are exchanged for the same in another currency. Akin to interest rate swaps, the currency swaps are also influenced by comparative advantage.

The currency swaps are arrangements whereby currencies are exchanged at a specified exchange rates and specified intervals. The currency swap is a derivative instrument which takes care of both, principal-only-swap and interest rate swap, together. If a company has borrowed in US$ and wants to convert it into a Rupee loan, it can do a currency swap, wherein it will receive from the bank the principal and interest in US$, and pay the bank a fixed Rupee interest rate and also freeze its principal payment for the entire tenure of the loan. Effectively, the Dollar loan becomes a Rupee loan in Indian Rupees.

5. Equity swaps

In an equity swap two parties agree to exchange future cash flows linked to the performance of a stock or stock index. One cash flow, or leg, is usually linked to a market interest rate, the other to a stock or stock index

performance. For example, party A swaps $10 million at Libor plus 5 basis points for six months with party B who agrees to pay any percentage increase in $10 million invested in the S&P500. In six months party A will owe the interest on the $10 million but this will be offset by the percentage increase in the S&P500 multiplied by $10 million. If the S&P500 falls then party A will owe the percentage fall multiplied by $10 million in addition to the interest payment.

Benefits of Swap:

The following advantages can be derived by a systematic use of swap:

1. **Borrowing at Lower Cost**:

   Swap facilitates borrowings at lower cost. It works on the principle of the theory of comparative cost as propounded by Ricardo. One borrower exchanges the comparative advantage possessed by him with the comparative advantage possessed by the other borrower. The net result is that both the parties are able to get funds at cheaper rates.

2. **Access to New Financial Markets**:

   Swap is used to have access to new financial markets for funds by exploring the comparative advantage possessed by the other party in that market. Thus, the comparative advantage possessed by parties is fully exploited through swap. Hence, funds can be obtained from the best possible source at cheaper rates.

3. **Hedging of Risk:**

   Swap can also be used to hedge risk. For instance, a company has issued fixed rate bonds. It strongly feels that the interest rate will decline in future due to some changes in the economic scene. So, to get the benefit in future from the fall in interest rate, it has to exchange the fixed rate obligation with floating rate obligation. That is to say, the company has to enter into swap agreement with a counterparty, whereby, it has to receive fixed rate interest and pay floating rate interest. The net result is that the company will have to pay only floating rate of interest. The fixed rate it has to pay is compensated by the fixed rate it receives from the counterparty. Thus, risks due to fluctuations in interest rate can be overcome through swap agreements. Similar, agreements can be entered into for currencies also.

4. **Tool to correct Asset-Liability Mismatch:**

   Swap can be profitably used to manage asset-liability mismatch. For example, a bank has acquired a fixed rate bearing asset on the one hand and a floating rate of interest bearing liability on the other hand. In case the interest rate goes up, the bank would be much affected because with the increase in interest rate, the bank has to pay more interest. This is so because, the interest payment is based on the floating rate. But, the interest receipt will not go up, since, the receipt is based on the fixed rate. Now, the asset- liability mismatch emerges. This can be conveniently managed by swap. If the bank feels that the interest rate would go up, it has to simply swap the fixed rate with the floating rate of interest. It means that the bank should find a counterparty who is willing to receive a fixed rate interest in exchange for a floating rate. Now, the receipt of fixed rate of interest by the bank is exactly matched with the payment of fixed rate interest to swap counterparty. Similarly, the receipt of floating rate of interest from the swap counterparty is exactly matched with the payment of floating interest rate on liabilities. Thus, swap is used as a tool to correct any asset- liability mismatch in interest rates in future.

5. **Additional Income:**

   By arranging swaps, financial intermediaries can earn additional income in the form of brokerage.

Role of Financial intermediaries in swap arrangements.

1. **Swap arrangements:** Non-financial Companies do not get in touch directly to arrange a swap. They each deal with a financial intermediary such a Bank or other Financial Institution.
2. **Contracts:** The Financial Institution has two separate contracts, one with either party. Generally, the parties to the Swap arrangement will not know that the Financial Institution has entered into an offsetting swap with the other beneficiary.
3. **Risk of Default:** If one of the beneficiary Company defaults, the Financial Institution still has to honour its agreement with the other Company.
4. **Compensation:** Swaps are structured to ensure that the financial institution earns around 5% on a pair of offsetting transactions. The margin of 5 basis points is partly to compensate the Financial Institution for the risk that one of the two beneficiaries will default on the swap payments.

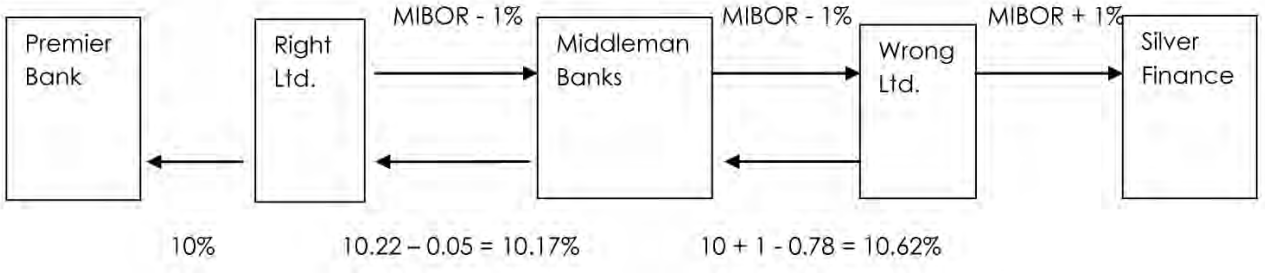
Example: From the following information given below, compute the gain to be shared between Right Ltd and Wrong Ltd in the Interest Swap arrangement

Company	Banker	Fixed Rate	Floating Rate
Right Ltd	Premier Bank	10%	MIBOR – 1%
Wrong Ltd	Sliver Finance	13%	MIBOR + 1%

Middleman Banks is the financial intermediary for a commission of 5 basis points. Net Gain shared in the ratio of 3: 2 between Right Ltd and Wrong Ltd.

Computation of Gain to be shared:

Particulars	Value
Fixed Rate for Wrong Ltd Less: Fixed Rate for Right Ltd	13.00% 10.00%
Spread in Fixed Rates [A]	**3.00%**
Floating Rate for Wrong Ltd	MIBOR + 1.00%
Less: Floating Rate for Right Ltd	MIBOR - 1.00%
Spread in Floating Rate [B]	**2.00%**
Gain [A] - [B] Less: Commission to Middleman Ltd	1.00% (0.05%)
Net Gain	**0.95%**
Share of Right Ltd [0.95% X 3 / 5]	**0.57%**
Share of Wrong Ltd [0.95% X 2 / 5]	**0.38%**



Valuing Interest Rate Swap Arrangement under Bond Valuation approach

1. **Value of Swap:** From the point of view of the floating-rate payer, a swap can be regarded as a long position (Buy Bond) in a fixed rate bond and a short position (Sell Bond) in a floating-rate bond.

   $\Rightarrow \quad V_{SWAP} = B_{FIX} - B_{FL}$

   Where, V_{SWAP} = Value of Swap

   B_{FIX} = Value of Fixed Rate Bond (corresponding to payments that are made)

   B_{FL} = Value of Floating Rate bond (corresponding to payments that are received)

2. **Value of Fixed Rate Bond:**

   (a) Value of Fixed Rate Bond is the present value of all the associated cash flows. Continuous compounding method is used to value the bond.

   (b) The appropriate discount rate will be the interest rate under Floating Rate Scheme for that period.

Example: On 01.04.2012, a 3-Month bond carries an interest rate of 10% p.a., 6-Month bond carries interest at 9% p.a., 9-Month bond carries interest at 11% and 12-Month bond carries an interest rate of 11%. Fixed Rate Bond for a period of 1 Year carries an interest rate of 12% p.a. payable on quarterly basis.

Computation of Value of Fixed Rate Bond:

Time(t)	Nature of Cash Flow	Cash Flow	Discount Rate(r)	Discount Factor [e^{-rt}]	Disc. Cash Flow
(1)	(2)	(3)	(4)	(5)	(6) = (5) × (3)
3 Months or 0.25 Years	Interest Receipt	₹3,000	10%	$e^{-0.25 \times 0.10} = e^{-0.025} = 0.9753$	₹2,926
6 Months or 0.50 Years	Interest Receipt	₹3,000	9%	$e^{-0.50 \times 0.09} = e^{-0.045} = 0.9559$	₹2,868
9 Months or 0.75 Years	Interest Receipt	₹3,000	11%	$e^{-0.75 \times 0.11} = e^{-0.083} = 0.9208$	₹2,762
12 Months or 1.00 Years	Interest and Principal	₹1,03,000	11%	$e^{-1.00 \times 0.11} = e^{-0.11} = 0.8958$	₹92,267
Value of Fixed Rate Bond					**₹1,00,823**

Note: Interest Receipt = ₹1,00,000 × 12% × 3/12 = ₹3,000

3. Value of Floating Rate Bond:

(a) Value of Floating Rate Bond is equal to the notional principal immediately after an interest payment. Hence, just before the interest payment, bond is worth the notional principal and the interest amount.

(b) Therefore, value of Floating Rate Bond is the present value of interest payment and notional principal receivable / payable at the next due date.

(c) The appropriate discount factor would be the floating rate applicable for period till the next payment date.

(d) Value = $(P + I^{\#})xe^{-r^{\#}t^{\#}}$

Where P = Notional Principal

$I^{\#}$ = Floating payment that will be made at time $t^{\#}$

$t^{\#}$ = Time determined at the last payment date

$r^{\#}$ = Swap Zero Rate (MIBOR / LIBOR Rate) for a maturity of $t^{\#}$

Example: A Floating Rate Bond, face value ₹4 lakh, will pay interest at 10% p.a. on 30.09.2012. Interest is paid on semi-annual basis. The last interest was paid on 31.03.2012. What is the value of the floating rate bond as on 30.06.2012, if as on that date a 3-month floating rate bond carries an annual interest rate of 11%?

Step	Activity
1	Computation of Annual Receivable / Payable as on the next due date i.e. 30.09.2012 = Notional Principal ₹4,00,000 + Interest ₹20,000 = ₹4,20,000. Interest = Principal ₹4,00,000 × Interest Rate 10% p. a. X Period of Interest 6 Months
2	**Ascertainment of Appropriate Discount Factor** The valuation is done as on 30.06.2012. As on that date, a 3-month Floating Rate Bond (i.e. period from the valuation date till the next interest payment date) carries an interest rate of 11%. Therefore, appropriate discount rate is 11%.
3	Computation of Present Value = Amount Receivable / Payable × e^{-rt} = ₹4,20,000 × $e^{-0.11 \times 0.25}$ = ₹4,20,000 × $e^{-0.028}$ = ₹4,20,000 × 0.972 = ₹4,08,240

Value an Interest Rate Swap arrangement under Forward Rate Agreement approach

1. Approach:

(a) Interest payable / receivable under Fixed Rate Scheme and Floating Rate Scheme at different points in time will be ascertained.

(b) Net amount payable or receivable will be computed i.e. Interest Receivable **Less** Interest Payable as on each of the future dates.

(c) The Net Amount will be discounted to present value based on appropriate discount rate.

2. **Appropriate Discount Rate:** The appropriate discount rate will be the interest rate under Floating Rate Scheme for that period i.e. for an interest receivable in 3 months, the floating rate for a 3-Month bond will be considered, for interest receivable in 6 months, floating rate for a 6-Month bond will be considered.

3. **Cash Flow under Floating Interest Rate:**

   (a) Forward Interest Rate will be computed based on Floating Interest Rates for different periods. Based on such Forward Interest Rates, interest payments will be computed.

   (b) Notional principal amount will not be considered in this approach. Only the interest payments will be considered. [Note: Under the Bond Valuation Approach, the notional principal is also considered]

Example: On 01.04.2012, a 3-Month bond carries an interest rate of 10% p.a., 6-Month bond carries interest at 9% p.a., 9-Month bond carries interest at 11% and 12-Month bond carries an interest rate of 11%. Fixed Rate Bond for a period of 1 Year carries an interest rate of 12% p.a. payable on quarterly basis.

The notional principal amount is ₹ 2,50,000.

In this case, interest rate for the second, third and fourth quarter will be computed using the following formula —

$$\text{Rate of Interest for period } T_2 - T_1 \ (T_N) = \frac{R_2T_2 - R_1T_1}{T_2 - T_1}$$

Where, R_2 = Rate of Interest for Period Ending at T_2, from today (including T_1,)

R_1, = Rate of Interest for Period Ending at T_1

Quarter Ending	Computation	Interest Rate
30.09.2012	$= \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.09 \times 0.50 - 0.10 \times 0.25}{0.50 - 0.25}$ = (0.045 - 0.025) ÷ 0.25 = 0.02 ÷ 0.25 = 0.08 or 8%	8%
31.12.2012	$= \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.11 \times 0.75 - 0.09 \times 0.50}{0.75 - 0.50}$ = (0.0825 - 0.045) ÷ 0.25 = 0.0375 ÷ 0.25 = 0.15 or 15%	15%
31.03.2013	$= \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.11 \times 1.00 - 0.11 \times 0.75}{1.00 - 0.75}$ = (0.11- 0.0825) ÷ 0.25 = 0.0275 ÷ 0.25 = 0.11 or 11%	11%

Valuation of Swap will be done as follows -Computation of Floating Interest

Time	Discount factor (e^{rt})	Interest [P x e^{rt} -P]
30.06.2012 (0.25)	$e^{0.25 \times 0.10} = e^{0.025} = 1.0253$	(2,50,000 × 1.0253 – 2,50,000) = 6,325
30.09.2012 (0.50)	$e^{0.25x0.08} = e^{0.02} = 1.0202$	(2,50,000 × 1.0202 – 2,50,000) = 5,050
31.12.2012 (0.75)	$e^{0.25x0.15} = e^{0.0375} = 1.0382$	(2,50,000 × 1.0382 - 2,50,000) = 9,550
31.03.2013 (1.00)	$e^{0.25 \times 0.11} = e^{0.0275} = 1,0279$	(2,50,000 × 1.0279 - 2,50,000) = 6,975

Time (t)	Fixed Cash Flow (Inflow)	Floating Rate	Floating Cash Flow(Outflow)	Net Cash Flow	Discount Rate (r)	Disc. Fac. (e^{-rt})	DCF
30.06.2012 (0.25)	7,500	10%	6,325	1,175	10%	$e^{-0.25 \times 0.10} = e^{-0.025} = 0.9753$	1,146
30.09.2012 (0.50)	7,500	8%	5,050	2,450	9%	$e^{-0.50 \times 0.09} = e^{-0.045} = 0.9560$	2,342
31.12.2012 (0.75)	7,500	15%	9,550	(2,050)	11%	$e^{-0.75X0.11} = e^{-0.083} = 0.9208$	(1,888)
31.03.2013(1.00)	7,500	11%	6,975	525	11%	$e^{-1.00 \times 0.11} = e^{-0.11} = 0.8958$	470
Value of Interest Rate Swap							**2,070**

Note: For computing the interest under floating rate scheme, the interest rate applicable for that quarter is considered. However, for discounting, the interest rate upto the end of that quarter (cumulative interest rate) is considered.

Valuation of Currency Swap

Currency Swaps refer to the arrangement where principal and interest payments in one currency are exchanged for such payments in another currency.

Types: Currency Swaps can categorized based on how interest rates are structured —

(a) Fixed for Fixed Currency Swap: The interest payments exchanged are payable under Fixed Rate Basis for both the contracting parties.

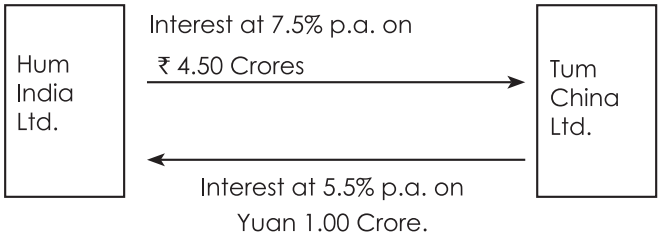
(b) Fixed for Floating Currency Swap: Interest payments exchanged are payable under Fixed Rate Basis for one party and Floating Rate basis the other party.

(c) Floating for Floating Currency Swap: Interest payments exchanged are payable under Floating Rate Basis for both the parties. However, the base for fixing the floating rates is the same for both the parties, i.e. LIBOR or MIBOR etc.

Example: Hum India Ltd wants a loan equalling Yuan 1 Crore and Tum China Ltd wants a loan of ₹ 4.50 Crores. The interest payable is 5.5% on Chinese Yuan Loans and 7.5% in Indian Rupees. The exchange rate prevailing on this day is 1 Yuan = ₹5.50. In this case, Hum India Ltd and Tum China Ltd can enter into an Swap Agreement to exchange interests cash flows as follows —

(a) Hum India Ltd will pay interest at 7.5% on a sum of ₹ 4.50 Crores to Tum China Ltd

(b) Tum China Ltd will pay interest at 5.5% on a sum of Yuan 1 Crore to Hum India Ltd



Note: The above example is a case of Fixed for Fixed Currency Swap.

Valuation of Commodity Swaps

Swap is considered as a strip of forwards, each priced at inception with zero market value in PV terms. While valuing commodity swaps,-the following factors must be considered:

(a) Institutional structure of the particular commodity market.

(b) Credit risk, capital costs and administrative costs.

(c) Variability of the futures bid or offer spread.

(d) Brokerage Fees

(e) liquidity of the underlying commodity market.

(f) Cost of hedging.

(g) Seasonal Fluctuations and its impact on the market

Generic Swap with the formulas for Fixed Interest and Floating interest rates

1. **Fixed interest payments** are calculated, assuming each month has 30 days and the quoted interest rate is based on a 360-day year.

The semiannual fixed-rate payment would be: = P × (N ÷ 360) × R Where "P" - notional principal amount; "N" - Time in days; "R" - All in Cost rate

2. **Floating-rate payments** are based on an actual/360-day count, meaning that interest payments are calculated using actual number of days elapsed since the previous payment date, based on a 360-day year.

Floating Rate Payment = P x (N_t ÷ 360) X LIBOR Where "P" - notional principal amount; N_t - Time elapsed since previous payment;

Conventions relating to Day-Count used in computation of Swaps

Nature of Payment	No. of days for computation
Fixed payments	Either actual/365 (bond equivalent) basis or on an actual/360 basis
Floating-rate payments indexed to private-sector interest rates	actual/360 day-count convention
Floating-rate payments tied to Treasury bill rates	actual/365 basis

Swaption

A **swaption** is an option on a forward start swap which provides the purchaser the right to either pay or receive a fixed rate. A buyer of a swaption who has the right to pay fixed and receive floating is said to have purchased a 'payers swaption'. Alternatively, the right to exercise into a swap whereby the buyer receives fixed and pays floating is known as a 'receivers swaption'.

Since the underlying swap can be thought of as two streams of cash flows, the right to receive fixed is the same as the right to pay floating. In this sense, swaptions are analogous to foreign exchange options where a call in one currency is identical to a put on the other currency. However, the option terminology of calls and puts is somewhat confusing for swaptions as it is not used consistently in the market. Some participants describe the right to pay fixed as a call since it provides the right to buy the swap (i.e. pay fixed). Others look at a swaption's relationship to the bond market and say that if you pay fixed you are short the bond and therefore look at this swaption as a put. To eliminate any confusion, market participants generally describe swaptions as 'payers' versus 'receivers' with respect to the fixed rate.

Swaptions can be used as hedging vehicles for fixed debt, floating debt or swaps. The primary purposes for entering into a swaption are:

- to hedge call or put positions in bond issues
- to change the tenor of an underlying swap
- to assist in the engineering of structured notes
- to change the payoff profile of the firm

Original interest arose from the issuance of bonds with embedded put features. Often, the price of the bond did not fully reflect the fair value of the embedded option and the issuer would sell a swaption to obtain a lower fixed cost of funds. This application of swaptions continues today for both bonds with call or put features.

A significant percentage of these debt issues are swapped out to obtain cheaper LIBOR funding. In these cases the issuer needs a facility to cancel the swap if the bonds are put or called. To eliminate this exposure, the companies would enter into a swaption to offset the underlying swap. This can be done two ways using either a cancelable or extendible swap.

A cancelable swap provides the right to cancel the swap at a given point in the future. An example would be a swap with a tenor of 5 years that can be cancelled after year three. This can be broken into two components. The first is a vanilla five year swap paying floating and receiving fixed. The second component is a payers swaption exercisable into a two year swap three years from today. The result is that when the original bond is called, the swaption is exercised and the cash flows for the original swap and that from the swaption offset one another. If the bond isn't called, the swaption is left to expire.

Another way to obtain a similar result is to use an extendible swap. The components are a three year pay floating / receive fixed swap and a receivers swaption whereby the holder can exercise into a two year swap, three years from today. In this case, exercising the swaption extends the swap to from three years to five years. This would be done if the bond was not called. If the bond was called, the swaption would not be exercised. Extendible and cancelable swaps are used in conjunction with related debt issues or when the user is indifferent to swaps of different tenors. In the latter case, swaptions are sold to obtain the premium which is then used to offset other financing charges.

Swaptions are also used in the engineering of structured notes in order to obtain the contingent payoff profiles requested by the investors. These can be identified in some cases where the cash flows change from fixed to floating or vice versa at some level of interest rates. By reverse engineering a structured note into all of its components, one can calculate its market price or amend the structure's payoff profile.

Finally, financial institutions or corporations may look at their balance sheet and identify contingent interest rate risk that they have or would like to have. By using swaptions, the asset / liability mix can often be altered to obtain the desired risk profile.

Types of Swaptions: Swaptions fall into 3 main categories, depending upon the exercise rights of the buyer:

(a) European Swaption	Gives the buyer right to exercise only on the maturity date of the option.
(b) American Swaption	Gives the buyer right to exercise at any time during the option period.
(c) Bermudan Swaption	Gives the buyer right to exercise on specific dates during the option period.

Example: XYZ & Co. Ltd has dues of $4 Million in another 8 years on a non-amortizing loan with ICI Bank, with instalments of 3 months @ LIBOR + 200 bps. LIBOR is currently at 7.50%. There exist wide fluctuations in the interest rates in the market. However there is an expectation of lower LIBOR in the next 3 years. After 3 years, the outlook is again uncertain. The Company is desirous of hedging its risks but is unsure whether the current rates are the optimum. The customer wants to lock in the swap rate in 3 years' time for the following 5 years and have the flexibility to benefit from a lower swap rate if swap rates fall. This is achieved by buying a 3 year option on a 5 year pay fixed at 9% swap. Explain the decision that the customer will have to face in 3 years.

Time	Course of Action
Now	(a) Customer buys a swaption (b) Customer pays floating rate
Exercise Date	(a) If 3-year swap rate is above 9%, swaption is exercised - Customer pays fixed (9%) and receives floating. (b) If 3 year swap rate is below or equal to 9% swaption does not get exercised. (c) Customer pays floating rate on loan or enters into a 5 year new fixed rate.

Features of Swaptions

1. **Constituents of Swaptions:** Fixed rate of interest, floating reference interest rate, tenor of the Interest Rate Swap, Option Period and the premium.

   Example: 6 month into 3-year swaption implies - option to enter into 3-year Interest Rate Swap, 6 months from now.

2. **Premium:**

   (a) Determined based on whether the swaption is a fixed "payer" or a "receiver" type.

   (b) A fixed-rate payer swaption gives the buyer of option an opportunity to lock into a fixed rate through an Interest Rate Swap on an agreed future date. Hence such a swaption is as a call option on a forward swap rate.

   (c) The Swaption premium is expressed as basis points. These basis points are applied to the nominal principal of the Forward Interest Rate Swap.

   (d) The premium is amortized over life of the option by the borrower if the swaption is entered into for reasons of hedging an underlying borrowing.

3. **Option Period:** "Option Period" refers to time gap between the transaction date and the expiry date.

4. **Strike Rate:** The fixed rate of interest on the swaption is called the strike rate.

5. **Settlement:**

   (a) Swaptions can be cash-settled On expiry, they are marked to market & difference is settled in cash.

   (b) Marking to market of a swaption depends on (i) Strike Rate of the swap and (ii) Relationship of the strike price to the underlying, where the underlying is the forward Interest Rate Swap.

Benefits of Swaptions

1. A Swaption is designed to give the holder the benefit of the agreed upon strike rate if the market rates are higher, with flexibility to enter into the current market swap rate if they are lower.

2. If strike rate of the swap is more favorable than prevailing market swap rate, then the swaption will be exercised and counterparties enter into an interest rate swap as per the swaption agreement.

3. A Swaption not only hedges the buyer against downside risk, it also enables the buyer to reap the upside benefits. If the swaption is not exercised by maturity, it lapses on that date.

4. It is therefore a valuable tool when a borrower has decided to do a swap but is not sure of the timing.
5. The leasing company is able to protect itself where the lessee exercises its option to extend the lease.
6. Useful to borrowers targeting an acceptable borrowing rate. By paying an upfront premium, a holder of a payer's swaption can guarantee to pay a maximum fixed rate on a swap, thereby hedging his floating-rate borrowings.
7. Useful to businesses tendering for contracts. Businesses have to decide whether to commit to borrowings in the future in their own currency in terms of a tender on a future project. This also enables them to determine the appropriate rates to be quoted in the offer.
8. Swaptions also provide protection on callable or puttable bond issues.

10.4 INTEREST RATE DERIVATIVES

A financial instrument based on an underlying financial security whose value is affected by changes in interest rates. Interest-rate derivatives are hedges used by institutional investors such as banks to combat the changes in market interest rates. Individual investors are more likely to use interest-rate derivatives as a speculative tool - they hope to profit from their guesses about which direction market interest rates will move.

Interest Rate Caps

An Interest Rate Cap is a contract that guarantees a maximum level of Libor. A Cap can be a guarantee for one particular date, known as a Caplet. A series of Caplets or Cap can extend for up to 10 years in most markets. Caps are also known as Ceilings. In return for making this guarantee, the buyer pays a PREMIUM. Caps generally guarantee a maximum level of either 3 or 6 month Libor or whatever the prevailing floating rate index is in the particular market. The clients' maximum loss on a Cap transaction is the premium.

A Cap is a series of sequentially maturing European style call options that protect the purchaser from a rise in a floating rate index, usually LIBOR, above a predetermined level. The purchaser has the right to receive a periodical cash flow equal to the difference between the market rate and the strike, effectively placing a maximum limit on interest payments on floating rate debt.

As usual with OTC options all parameters of the cap are negotiable but the bid-offer spread will widen as the cap becomes more complicated and therefore the transaction cost may increase substantially. Many participants in the market will absorb any mismatch risk between their position and a more standardised cap structure to take advantage of the cheaper cost and greater liquidity.

Features of Interest Rate Caps

(a) The buyer of an Interest Rate Cap pays premium to the seller for the right to receive the difference in interest cost (on notional principal) when a specified index of market interest rates rises above a stipulated "cap rate".

(b) The buyer has no obligation or liability if interest rates fall below the specified cap rate.

(c) Thus, a cap resembles an option which represents **a right rather than an obligation to the buyer.**

(d) Interest rate caps cover periods ranging from 1-10 years with interest rate reset and payments dates most commonly set either 3 or 6 months apart.

Constituents:

(a) Notional Principal amount

(b) Interest Rate Index - specified maturity of LIBOR

(c) A Cap rate which is equivalent to strike or, exercise price on an option and

(d) Period of agreement, including payment dates and interest rate reset dates.

Valuation of Interest Rate Cap: Amount of payment on settlement: $[(N) \times Max (0, r-r_c) \times (d_t/360)]$ N = Notional principal amount; r = LIBOR; r_c = cap rate; d_t = time gap between interest rate reset date and payment date (in days)

Settlement: If the specified market index is above the cap rate, the seller pays the buyer the difference in interest cost on the next payment date.

Interest Rate Collars- Features of Interest Rate Collars

An investment strategy that uses derivatives to hedge an investor's exposure to interest rate fluctuations. The investor purchases an interest rate ceiling for a premium, which is offset by selling an interest rate floor. This strategy protects the investor by capping the maximum interest rate paid at the collar's ceiling, but sacrifices the profitability of interest rate drops.

The buyer of an interest rate collar purchases an interest rate cap while selling a floor indexed to the same interest rate.

Determination of Floors: Borrowers with variable-rate loans buy collars to limit effective borrowing rates to a range of interest rates between maximum determined by the cap rate and a minimum fixed by the floor strike price;

Valuation in Floors: The amount of the payment due to or owed by a buyer of an interest rate collar is

(N) [Max (0, r-r_c) - Max (0, r_f - r)] (d_t/360)

Where,

N is the notional principal amount of the agreement — R_c is the cap rate

R_f is the floor rate and — D_t is the term of the index in days

Benefits: Interest rate collar is less expensive than buying a cap alone because the borrower earns premium income from the sale of the floor that offsets the cost of the cap. A zero-cost collar results when the premium earned by selling a floor exactly offsets the cap premium.

Forward Rate Agreements as an interest rate derivative

Features: Forward Rate Agreements (FRAs) are

(a) Forward Contracts on interest rates

(b) Settled in cash and are traded among the international banks in the Eurodollar market.

(c) A Forward Rate Agreement is an OTC equivalent of a Eurodollar futures contract.

(d) Normally entered into for the period corresponding to maturity period of Eurodollar time deposits.

(e) Buying an FRA is similar to selling or going short on a Eurodollar or LIBOR Futures contract.

Purpose: Banks use FRAs to crystallize the amount of interest payable on anticipated future deposits or interest revenues receivable on variable-rate loans (indexed to LIBOR).

Determination of Settlement amount: Final settlement amounts owed by the parties to an FRA are determined by the formula:

Payment = (N) (LIBOR - FR) (t/360) / [1 + LIBOR (dtm/360)]

Where,

N = Notional Principal amount of the agreement

LIBOR = value of LIBOR for the maturity specified by contract prevailing on contract settlement date

FR = Agreed-upon forward rate and

t = Maturity of the forward rate specified in days.

Settlement:

Situation	Course of action
Forward Rate > LIBOR	Buyer has to pay the decrease in interest cost i.e. FR - LIBOR
Forward Rate < LIBOR	Seller has to pay the increased interest cost i.e. LIBOR - FR

Note: The principal amount is "notional" since though it determines the amount of differential payment to be settled between the parties, actual exchange of principal never takes place.

Illustrate the structure of Forward Rate Agreements and the settlement process

Situation: Let 2 banks A and B enter into an Forward Rate Agreement containing the following clauses:

(a) A forward rate of 10% on a Eurodollar deposit with 6 months maturity.

(b) A $5 Million notional principal and

(c) Settlement in 2 months

Explanation:

(a) The above agreement is termed as 2×8 FRA - Since it fixes the interest rate for a deposit to be placed after 2 months and maturing 8 months after the date the contract is negotiated.

(b) Settlement:

- If the 6 month LIBOR is 12% on the settlement date, the seller would owe the buyer - 2% (difference between 12% and 10%) interest on $5 million for 6 months amounting to $50,000.
- But the interest on a Eurodollar deposit is paid on maturity (at the end of the term of deposit) whereas FRAs are settled on the contract maturity date (which would correspond to the date the underlying hypothetical deposit would be placed). Therefore, to make the cash payment on the FRA equivalent to the extra interest that would have been earned on a Eurodollar deposit paying 12%, the difference of $50,000 in interest costs calculated above is discounted back 6 months using the actual 6 month LIBOR of 6%.
- Hence, on contract maturity date the buyer would receive $50000/[I+0.06(180/360)]= $48,543.69

Interest Rate Futures- underlying for interest rate futures in India

Interest rate futures is standardised interest rate derivative contract traded on a stock exchange to buy or sell an interest bearing instrument at a specified future date, at a price determined at the time of the contract.

In India interest rate futures are available on NSE on

- Notional T-Bills
- Notional 10 year bonds (coupon bearing and non-coupon bearing)

Advantages of interest rate futures on the 91-day treasury bills

1. They can be used for hedging against volatile interest rates.
2. Interest rate futures on 91–day treasury bill are cash settled, as a result, investors can trade without the worry of being saddled with illiquid contracts, which could have been the case if the contracts were physically settled.
3. No securities transaction tax (STT) is levied.
4. Low margins required as compared to trading in equities and equity derivatives.
5. The new product would be traded in the currency segment of the exchange so there is no requirement of any new formalities of a new account.

Illustration 38.

On 01.04.2013, following are the interest rate quotes available on different Government of India Bonds, based on the tenor of the Bonds —

Period to Maturity	Interest Rate
1Year	9.50%
2 Years	10.25%
3 Years	11.00%
4 Years	10.75%

Calculate the forward rates of interests as at the following dates —

(a) As on 01.04.2014, 1-Year Bond, 2-Year Bond and 3-Year Bond

(b) As on 01.04.2015, 1-Year Bond and 2-Year Bond

(c) As on 01.04.2016, 1-Year Bond

Solution:

Forward Interest Rates = $\frac{R_2T_2 - R_1T_1}{T_2 - T_1}$

1. Computation of Forward Interest Rates as on 01.04.2014

Tenor of Bond	Computation	Interest Rate
1-Year	$= \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.1025\times 2 - 0.095\times 1}{2-1} = (0.2050 - 0.095) \div 1 = 0.11 \div 1 = 0.11$	11.00%
2-Year	$= \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.11\times 3 - 0.095\times 1}{3-1} = (0.330 - 0.095) \div 2 = 0.235 \div 2 = 0.1175$	11.75%
3-Year	$= \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.1075\times 4 - 0.095\times 1}{4-1} = (0.43 - 0.095) \div 3 = 0.335 \div 3 = 0.1117$	11.17%

2. Computation of Forward Interest Rates as on 01.04.2015

Tenor of Bond	Computation	Interest Rate
1-Year	$= \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.11\times 3 - 0.1025\times 2}{3-2} = (0.33 - 0.2050) \div 1 = 0.125 \div 1 = 0.125$	12.50%
2-Year	$= \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.1075\times 4 - 0.1025\times 2}{4-2} = (0.43 - 0.2050) \div 2 = 0.225 \div 2 = 0.1125$	11.25%

3. Computation of Forward Interest Rates as on 01.04.2016

Tenor of Bond	Computation	Interest Rate
1-Year	$= \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{0.1075\times 4 - 0.11\times 3}{4-3} = (0.43 - 0.33) \div 1 = 0.10 \div 1 = 0.10$	10%

Illustration 39.

Suppose a dealer Rupam quotes 'All-in-cost' for a generic swap at 8% against six month LIBOR flat. If the notional principal amount of swap is ₹5,00,000,

1. Calculate Semi-Annual fixed payment.
2. Find the first floating rate payment for (1) above if the six month period from the effective date of swap to the settlement date comprises 183 days and that the corresponding LIBOR was 6% on the effective date of swap.
3. In 2 above, if settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer?
4. Generic swap is based on 30/360 days basis.

Solution:

Computation of Factors

Factor	Notation	Value
Notional Principal	P	5,00,000
Time	N	180 days
All in Cost Rate	R	0.08

1. Computation of Semi Annual Fixed Rate Payment

Semi-Annual Fixed Rate Payment = P X (N ÷ 360) X R

= 5,00,000 x (180 ÷ 360) x 0.08 = 5,00,000 X 0.5 x 0.08 = ₹20,000/-

2. Computation of Floating Rate Payment

Floating Rate Payment = P x (N_t ÷ 360) x LIBOR

Where N_t = Period from the effective date of SWAP to the date of Settlement

= 5,00,000 x (183 ÷ 360) x 0.06 = 5,00,000 x (0.5083) x 0.06 = ₹15,250.

3. Computation of Net Amount

Net Amount to be paid by the Person Requiring Fixed Rate Payment = Fixed Rate Payment Less Floating Rating Payment = ₹20,000 - ₹15,250 = ₹4,750.

Illustration 40.

Interest Rate Swaps — Computation of Cash Flows — Gain Not Shared

Sandip Limited is planning to expand its Cotton Apparel Division, by setting up 100 Looms and installing adequate machinery in Gujrat. It expects the total cost of the project, including cost of the land, to be ₹3 Crores, repayable at the end of the third year.

Fixed Interest Rate 11.00%

Floating Interest Rate MIBOR + 2.5%

Susmita Consumer Goods Ltd (SCDL) is also on an expansion mode. It also requires ₹3 Crores, repayable at the end of the third year.

Fixed Interest Rate 10.00%

Floating Interest Rate MIBOR +1 %

Sandip anticipates a contraction in economy and therefore a reduction in interest rates, and therefore wants to opt for Floating Interest Rate. SCDL is worried about the raising inflation and wants to freeze its interest rate by option choosing Fixed Interest Rate option. Both these Companies enter into an Swap Arrangement.

If interest payments are to be made half-yearly based on interest prevailing at the beginning of the six month period, Mumbai Interbank Offer Rate (MIBOR) today is 10% and rate at the beginning of the next five half years are 9%, 9.50%, 11%, 10% and 8%, ascertain the cash flows. Who has been the biggest beneficiary?

Solution:

Note: For effecting a Swap Arrangement, choice of interest rates with the respective bankers will be based on the rate advantage to the stronger Company in different interest rate schemes. Expectation on economy or on movement of interest rates are not relevant for structuring a swap arrangement.

1. Action and Net Cost

SCDL has an advantage of 1% in Fixed Rate (10% vs. 11%) and 1.50% in Floating Rate. Therefore, SCDL enjoys a higher advantage in Floating Rate loans. Therefore SCDL will opt for Floating Rate Loans with its Bankers. Correspondingly Sandip Ltd will opt for Fixed Rate Loans with its bankers.

SCDL	**Sandip Ltd**
1. SCDL will borrow at Floating Rate. 2. Pay interest to Bankers at Floating Rate (i.e. MIBOR + 1%) 3. Will **collect from**/pay to Sandip interest amount differential i.e. Interest computed at Floating Rate (MIBOR+1%) **Less** Interest Computed at Fixed Rate of 10%. [This different constitutes the gain on account of Swap] 4. **Effective Interest Rate:** 2-3 = (MIBOR + 1%) - [(MIBOR + 1%) -Fixed Rate 10%)] = MIBOR + 1% - MIBOR - 1% + Fixed Rate 10%= **Fixed Rate 10%'**	1. Sandip will borrow at Fixed Rate. 2. Pay interest to its Bankers at Fixed Rate (i.e. 11%) 3. Will **pay to** / collect from SCDL interest amount differential i.e. Interest computed at Floating Rate to SCDL (MIBOR + 1%) **Less** Interest Computed at Fixed Rate to SCDL 10%. [This different constitutes the gain on account of Swap] 4. Effective Interest Rate: 2 + 3 = Fixed Rate to Sandip 11% + MIBOR + 1% - Fixed Rate to SCDL 10% = 11%+MIBOR + 1% - 10% = **Floating Rate MIBOR + 2%** 5. Gain due to Swap: Interest Rate Payable by Sandip without Swap **Less** Effective Interest Rate under Swap to Sandip Ltd ⇒ MIBOR + 2.50% **Less** MIBOR + 2.00% Net Gain = 0.50%

Alternatively, Net Gain can be computed as follows —

Difference in Fixed Rate	[11.00% - 10.00%]	1.00%
Less: Difference in Floating Rate	[2.50%-1%]	1.50%
Net Difference [Maximum Gain]		0.50%

[The difference measures the degree of gain]

2. Cash Flows from SCDL Perspective

Installment No.	MIBOR + 1%	Applicable Rate for Outflow to Bankers [Payable to Banker] [MIBOR + 1%]	Applicable Rate for Outflow to Sandip [Fixed Rate to SCDL]	Net Amount received from/ paid to Sandip
(1)	(2)	(3)	(4)	(5) = (3)-(4)
1	10% + 1% = 11.00%	₹16.50 Lakhs [₹3 Crores X 11% x 6/12]	₹15.00 Lakhs [₹3 Crores X 10% x 6/12]	₹1.50 Lakhs
2	9% + 1% = 10.00%	₹15.00 Lakhs [₹3 Crores X 10% X 6/12]	₹15.00 Lakhs [₹3 Crores X 10% X 6/12]	—
3	9.50% + 1% =10.50%	₹15.75 Lakhs [₹3 Crores X 10.5% X 6/12]	₹15.00 Lakhs [₹3 Crores X 10% X 6/12]	₹ 0.75 Lakhs
4	11%+ 1% = 12.00%	₹18.00 Lakhs [₹3 Crores X 12% X 6/12]	₹15.00 Lakhs [₹3 Crores X 10% x 6/12]	₹ 3.00 Lakhs
5	10%+ 1% = 11.00%	₹16.50 Lakhs [₹3 Crores X 11% X 6/12]	₹15.00 Lakhs [₹3 Crores X 10% X 6/12]	₹1.50 Lakhs
6	8% + 1% = 9.00%	₹13.50 Lakhs [₹3 Crores X 9% X 6/12]	₹15.00 Lakhs [₹3 Crores X 10% X 6/12]	(₹1.50 Lakhs)
		₹95.25 Lakhs	**₹90.00 Lakhs**	**₹5.25 Lakhs**

Summary of Cash Flow:

Total Interest Payable by SCDL = ₹95.25 Lakhs, sourced by —

1. Own Funds = ₹90.00 Lakhs [Net Cost to SCDL]
2. Inflow from Sandip = ₹5.25 Lakhs

Net Interest Cost to SCDL = Interest Payable on Fixed Rate only (gains are not shared)

3. Cash Flows from Sandip's Perspective

Installment No.	Amount Payable to Bankers [At Fixed Rate i.e. 11%]	Net Amount Paid to / Received from SCDL on account Interest Rate Swap	Total Cash Flow on Account of Interest
(1)	(2)	(3)	(4) = (2) + (3)
1	₹16.50 Lakhs [₹3 Crores X 11% X 6/12]	₹1.50 Lakhs	₹18.00 Lakhs [16.5 + 1.5]
2	₹16.50 Lakhs [₹3 Crores X 11% X 6/12]	—	₹16.50 Laklis [16.5 + 0]
3	₹16.50 Lakhs [₹3 Crores X 11% X 6/12]	₹0.75 Lakhs	₹17.25 Lakhs [16.5 + 0.75]
4	₹16.50 Lakhs [₹3 CroresX 11% X 6/12]	₹3.00 Lakhs	₹19.50 Lakhs [16.5 + 3]

5	₹16.50 Lakhs [₹3 Crores X 11% X 6/12]	₹1.50 Lakhs	₹18.00 Lakhs [16.5 + 1.5]
6	₹16.50 Lakhs [₹3 Crores x 11% x 6/12]	(₹1.50 Lakhs)	₹15.00 Lakhs [16.5-1.5]
	₹99.00 Lakhs	**₹5.25 Lakhs**	**₹104.25 Lakhs**

4. Amount Saved on Interest Outgo

Installment No.	MIBOR Rates + 2.5%	Amount Payable to Bankers [At Floating Rate]	Amount of Interest Actually Paid	Total Cash Flow on Account of Interest
(1)	**(2)**	**(3)**	**(4)**	**(5) = (3)-(4)**
1	10% + 2.50% = 12.5%	₹18.75 Lakhs [₹3 Crores X 12.5% X 6/12]	₹18.00 Lakhs [16.5 + 1.5]	₹0.75 Lakhs [18.75 -18.00]
2	9% + 2.50% = 11.5%	₹17.25 Lakhs [₹3 Crores X 11.5% X 6/12]	₹16.50 Lakhs [16.5 + 0]	₹0.75 Lakhs [17.25 -16.50]
3	9.5% + 2.5% = 12.0%	₹18.00 Lakhs [₹3 Crores X 12% X 6/12]	₹17.25 Lakhs [16.5 + 0.75]	₹0.75 Lakhs [18-17.25]
4	11%+ 2.5% = 13.5%	₹20.25 Lakhs [₹3 Crores X 13.5% X 6/12]	₹19.50 Lakhs [16.5 + 3]	₹0.75 Lakhs [20.25 -19.50]
5	10% + 2.5% = 12.5%	₹18.75 Lakhs [₹3 Crores X 12.5% X 6/12]	₹18.00 Lakhs [16.5 + 1.5]	₹0.75 Lakhs [18.75 -18]
6	8% + 2.5% = 10.5%	₹15.75 Lakhs [₹3 Crores X 10.5% X 6/12]	₹15.00 Lakhs [16.5 -1.5]	₹0.75 Lakhs [15.75 -15]
		₹108.75 Lakhs	**₹104.25 Lakhs**	**₹4.50 Lakhs**

Alternatively:

Amount Saved on Interest Outgo = Amount of Loan X Net Gain in % (Annualized) X Period in Years

= ₹3 Crores X 0.50% per annum X 3 Years

= ₹4.50 Crores

Illustration 41.

United Bankers Ltd offer the following interest rates to two of its customers for a loan of ₹100 Crores, repayable in 7 Years —

Company	Somnath Ltd	Amal IT Services Ltd
Nature of Activity	Supply and Installation of Security Systems for Home, Office, Corporate Surveillance and other Security Services and products	Providing IT support to various Airlines, Shipping Companies and Government Companies
Years in Industry	25	1.5
Market Position	Market Leaders	Market Entrants (Infant)
Rating by UBL	A++	B+
Floating Interest Rate	MIBOR - 0.50%	MIBOR + 1%
Fixed Interest Rate	10.00%	12.50%
Share in the Net Gain on account of Interest Rate Swap	60%	40%

Assuming, principal amount is repaid at the end of the seven years, what is the effective gain in percentage as well as in value for both the Companies, if they enter into an Swap Arrangement for reducing interest effect.

Also ascertain the net interest cost (in %) for both the Companies.

Solution:

Note: For effecting a Swap Arrangement, choice of interest rates with the respective bankers will be based on the rate of advantage to the stronger Company in different interest rate schemes. Expectation on economy or on movement of interest rates are not relevant for structuring a swap arrangement.

1. Action and Net Cost

Somnath has an advantage of 2.50% in Fixed Rate (10% vs. 12.50%) and 1.50% in Floating Rate. Therefore, Somnath enjoys a higher advantage in Fixed Rate loans. Therefore, Somnath Ltd will opt for Fixed Rate Loans with its Bankers. Correspondingly Amal Ltd will opt for Floating Rate Loans with its bankers.

Somnath	Amal
1. Somnath will borrow at Fixed Rate.	1. Amal will borrow at Floating Rate.
2. Pay interest to Bankers at Fixed Rate (i.e 10%) [Outflow]	2. Pay interest to its Bankers at Floating Rate (i.e. MIBOR + 1%) [Outflow]
3. Will collect from / pay to Amal interest amount differential i.e. Interest computed at Fixed Rate (10%) Less Interest Computed at Floating Rate (MIBOR - 0.50%) i.e. (10.50% - MIBOR) [Inflow]	3. Will pay to / collect from Somnath interest amount differential i.e. Interest computed at Fixed Rate to Somnath (10%) Less Interest Computed at Floating Rate to Somnath (MIBOR - 0.50%) i.e. (10.50% - MIBOR) [Outflow]
4. Will collect from Amal share in the gain on account of interest rate swap i.e. 60% of difference in the spread of Fixed Rate and Floating Rate [Inflow] [See Note]	4. Will pay to Somnath share in the gain on account of interest rate swap i.e. 60% of difference in spread of 1% i.e. 0.60% [Outflow]

Gain on Account of Interest Rate Swap:

Spread in Fixed Rate	[12.50% - 10.00%]	2.50%
Less: Difference in Floating Rate	[1% - (-0.50%)]	1.50%
Net Difference	[Maximum Gain]	1.00%
Share of Somnath in the Gain	[60% of 1%]	0.60% p.a.
Share of Amal in the Gain	[40% of 1%]	0.40% p.a.

2. Effective Interest Rate

Particulars	Somnath Ltd	Amal IT Services
Expectation on Interest Rate	Contraction	Increase
Interest Rate Scheme (Desired)	Floating Rate	Fixed Rate
Interest Rate **Less:** Share in Gain	MIBOR - 0.50% 0.60%	12.50% 0.40%
Effective Interest Rate	**MIBOR-1.10%**	**12.10%**

3. Interest Cost Saved (in ₹)

Particulars	S.omnath Ltd	Amal IT Services
Share in Gain (p.a.)	0.60%	0.40%
Amount of Loan	₹100 Crores	₹100 Crores
Interest Savings per Annum	₹60 Lakhs [₹100 Crores x 0.60%]	₹40 Lakhs [₹100 Crores X 0.40%]
Number of Years of Loan **Total Interest Savings**	7 Years **₹4.20 Crores** [7 X ₹0.60 Crore]	7 Years **₹2.80 Crores** [7 X ₹0.40 Crore]

Illustration 42.

Structure a Swap Arrangements in the following situations and also ascertain the extent of gain —

Case	Company D			Company E		
	Interest Rates		Expectation on Interest Rate	Interest Rates		Expectation on Interest Rate
	Floating	Fixed		Floating	Fixed	
1	PLR + 0.50%	12.00%	Increase	PLR + 0.50%	11.00%	Increase
2	PLR + 1.00%	11.00%	Decrease	PLR + 2.00%	12.00%	Increase
3	PLR + 1.25%	11.25%	Decrease	PLR - 0.50%	10.75%	Decrease
4	PLR -1.50%	10.00%	Increase	PLR - 0.50%	11.50%	Decrease

PLR refers to Prime Lending Rate of a Bank i.e. Benchmark Lending rate, which are altered from time to time by the Banks.

Solution:

Case	Evaluation on Interest Rates	Structure of Swap	Extent of Gain
1	• Fixed Rate Spread = 12.00% - 11.00% = 1.00% • Floating Rate Spread = 0.50% - 0.50% = 0 • Difference in Spread = 0.50% **Possibility of Gain on Swap: Yes**	E is the stronger Company (due to interest rate advantage). E has an advantage of 1% in Fixed Rate and no advantage in Floating Rate. Therefore, **E Ltd. should opt for Fixed Rate and D Ltd. opt for Floating Rate with their Bankers.**	Total Gain =1.00%
2	• Fixed Rate Spread = 12.00% - 11.00% = 1.00% • Floating Rate Spread = 2.00% - 1.00% = 1.00% • Difference in Spread = 0% **Possibility of Gain on Swap: No**	Swap arrangement will not lead to any interest advantage. Therefore, no viable swap arrangement can be structured.	Total Gain = 0
3	• Fixed Rate Spread = 11.25% - 10.75% - 0.50% • Floating Rate Spread = 1.25% - (-0.50%) = 1.75% • Difference in Spread = 1.25% **Possibility of Gain on Swap: Yes**	E is the stronger Company (due to interest rate advantage). E has an advantage of 0.50% in Fixed Rate and 1.75% advantage in Floating Rate. Therefore, **E Ltd should opt for Floating Rate and D Ltd opt for Fixed Rate with their Bankers.**	Total Gain = 1.25%
4	• Fixed Rate Spread = 11.50% - 10.00% = 1.50% • Floating Rate Spread = 1.50% - 0.50% = 1.00% • Difference in Spread = 0.50% Possibility of Gain on Swap: Yes	D is the stronger Company (due to interest rate advantage). D has an advantage of 1.50% in Fixed Rate and 1.05% advantage in Floating Rate. Therefore, **D Ltd should opt for Fixed Rate and E Ltd opt for Floating Rate with their Bankers.**	Total Gain = 0.50%

Illustration 43.

Companies X and Y face the following interest rates:

	X	Y
U.S. Dollars (floating rate)	LIBOR + 0.5%	LIBOR+ 1.0%
Canadian (fixed rate)	5.0%	6.5%

X wants to borrow U.S. Dollars at a floating rate of interest and Y wants to borrow Canadian dollars at a fixed rate of interest.

X financial institution is planning to arrange a swap and requires a 50 basis point spread.

If the swap is attractive to X and Y at 60 : 40 ratio, what rates of interest will X and Y end up paying?

Solution:

Particulars	Value
1. Difference in Floating Rates [(LIBOR + 1%) - (LIBOR + 0.5%)]	0.5%
2. Difference in Fixed Rates [6.5% - 5%]	1.5%
3. Net Difference {[(a) - (b)] in Absolute Terms}	1.0%
4. Amount paid for arrangement of Swap Option	(0.5%)
5. **Net Gain [(c) - (d)]**	**0.5%**
6. Company X's share of Gain [0.5% X 60%]	0.3%
7. Company Y's share of Gain [0.5% X 40%]	0.2%

Company X	Company Y
1. Company X will borrow at Fixed Rate.	1. Company Y will borrow at Floating Rate.
2. Pay interest to Bankers at Fixed Rate (i.e. 5.0%)	2. Pay interest to its Bankers at Floating Rate (i.e. LIBOR+1.0%)
3. Will collect from Company B interest amount differential i.e. Interest computed at Fixed Rate (5.0%) Less Interest Computed at Floating Rate of (LIBOR+0.5%) = 4.5% - LIBOR	3. Will pay interest amount differential to Company X i.e. Interest computed at Fixed Rate (5.0%) Less Interest Computed at Floating Rate of (LIBOR+0.5%) = 4.5% -LIBOR
4. Receive its share of Gain from Company Y = 0.3%	4. Pay to Company X its share of Gain = 0.2%
5. Effective Interest Rate: 2-3-4 = Fixed Rate paid by Company X - Interest Differential Received from Company Y - Share of Gain. = (5.0%) - (4.5% - LIBOR) - 0.3% = LIBOR + 0.2%	5. Pay Commission Charges to the Financial Institution for arranging Interest Rate Swaps i.e. 0.5% 6. Effective Interest Rate: 2 + 3 + 4 + 5 = Floating Rate to Company Y (LIBOR+1.0%) + Interest Differential paid to Company X (4.5% -LIBOR) + Share of Gain paid to Company X (0.25%) + Commission charges paid (0.5%) = LIBOR + 1.0 % + 4.5% - LIBOR + 0.2% + 0.5% = **6.2%**

Illustration 44.

Company PQR and DEF have been offered the following rate per annum on a $ 200 million five year loan;

Company	Fixed Rate	Floating Rate
PQR	12.0	LIBOR+ 0.1%
DEF	13.4	LIBOR + 0.6%

Company PQR requires a floating - rate loan; Company DEF requires a fixed rate loan.

Design a swap that will net a bank acting as intermediary at 0.5 percent per annum and be equally attractive to both the companies.

Solution:

Particulars	₹
(a) Difference in Floating Rates [(LIBOR + 0.1%) - (LIBOR + 0.6%)]	**0.5%**
(b) Difference in Fixed Rates [13.4% - 12%]	**1.4%**
(c) Net Difference {[(a) - (b)] in Absolute Terms}	**0.9%**
(d) Amount paid for arrangement of Swap Option	**(0.5%)**
(e) **Net Gain [(c) - (d)]**	**0.4%**
(f) Company PQR's share of Gain [0.4% X 50%]	**0.2%**
(g) Company DEF's share of Gain [0.4% X 50%]	**0.2%**

PQR is the stronger Company (due to comparative interest advantage). PQR has an advantage of 1.40% in Fixed Rate and 0.50% in Floating Rate. Therefore, PQR enjoys a higher advantage in Fixed Rate loans. Therefore. PQR will opt for Fixed Rate Loans with its Bankers. Correspondingly DEF Ltd will opt for Floating Rate Loans with its bankers.

Company PQR	Company DEF
1. Company PQR will borrow at Fixed Rate.	1. Company DEF will borrow at Floating Rate.
2. Pay interest to Bankers at Fixed Rate (i.e. 12.0%)	2. Pay interest to its Bankers at Floating Rate (i.e. LIBOR + 0.6%)
3. Will **collect from** Company DEF interest amount differential i.e. Interest computed at Fixed Rate (12.0%) **Less** Interest Computed at Floating Rate of (LIBOR + 0.1%) = 11.9% -LIBOR	3. Will **pay to** Company PQR interest amount differential i.e. Interest computed at Fixed Rate (12.0%) **Less** Interest Computed at Floating Rate of (LIBOR + 0.1%) = 11.9% - LIBOR
4. Receive share of Gain from Company DEF (0.2%)	4. Pay to Company PQR its share of Gain = 0.2%
5. **Effective Interest Rate: 2-3** = 12.0% - (11.90% - LIBOR) -0.2% = **LIBOR - 0.1%**	5. Pay Commission Charges to the Financial Institution for arranging Interest Rate Swaps i.e. 0.5%
	6. **Effective Interest Rate: 2 + 3 + 4+5**
	= Floating Rate to Company DEF (LIBOR + 0.6%) + Interest Differential paid to Company PQR (11.9% - LIBOR) + Commission charges paid for arranging Swaps + Share of gain paid to Company PQR
	= LIBOR + 0.60 % + 11.9% - LIBOR + 0.5% + 0.2%
	= **13.2%**

Illustration 45.

Consider that a bank sells a 3 x 6 FRA worth $3,00,00,000. The agreed rate with the buyer is 5.5 percent. There are actually 92 days in the three-month FRA period. Assume that three months from today the settlement rate is 4-7/8 percent. Determine how much the FRA is worth and whom pays who i.e. whether the buyer pays the seller or seller pays the buyer. Had the settlement rate been 6-1/8 percent, what is the answer?

Solution:

A seller of a FRA would benefit if the settlement rate is lower than the agreed rate. Since the settlement rate is less than the agreement rate, the buyer pays the seller the absolute value of the FRA. The payoff of the FRA is:

$$\text{Payoff} = \text{Notional Amount} \times \frac{(\text{Reference Rate} - \text{Fixed Rate})}{1 + \text{Reference Rate} \times \alpha} \times (\alpha \text{ is the day count function})$$

$$= 3,00,00,000 \times \frac{(0.04875 - 0.055) \times 92/360}{1 + 0.04875 \times 92/360}$$

= 4,7326.39

Hence, Payoff is $ 4,7326.39

Had the settlement rate been 6.125%, since the settlement rate is greater than the agreement rate, the seller pays the buyer the absolute value of the FRA. The absolute value of the FRA is:

$$= 3,00,00,000 \times \frac{(0.06125 - 0.055) \times 92/360}{1 + 0.06125 \times 92/360}$$

= 4,7178.20.

Hence, Payoff $ 4,7178.20.

Illustration 46.

On January 25, a European Bank wants USD 100 million of 6-month deposit. However, it is offered USD 100 million of 9-month deposit at the bank's bid rate. At the current market, the other rates are these:

	Cash		FRA		
	Bid	**Ask**		**Bid**	**Ask**
6 Months	10.4375	10.5625	6 x 9	10.48	10.58
9 Months	10.5625	10.6875			

Should the bank take the 9-month deposit? Explain with calculations and payoff.

Solution:

The bank wants a six month deposit of $100 million. Therefore it can be construed that it would have funds of $100 million at the end of six months so as to repay the six month deposit if it was available.

However, only nine month deposit is available, meaning that it would have the obligation to repay after nine months. Thus the bank would have funds to lend for three months starting 6 months today for the period of three months. Thus the bank can sell 6x9 FRA thereby converting the 9-month deposit to a 6-month deposit. That is, the bank sells off (lends) the last 3-month in the FRA market. Days from January 25 to September 25 (9-month deposit) = 273 days. Days from June 25 to September 25 (6 X 9 FRA) = 92 days

The interest that would be paid at the end of nine months to the depositor is:

$100 million x (0.105625) x (273/360) = USD 8,009,895.83.

Interest earned on lending for 6-month in the interbank market, then another 3-month at the FRA rate is:

$ 100,000,000 x [(1+0.104375 x (181/360)) x (1+0.1048 x (92/360)) - 1] = $ 8,066,511.50.

Thus there is a net profit of $ 56,615.67 at the end of nine months. In this scenario, profit is possible, but arbitrage is not possible.

Illustration 47.

MNC rolls over a $25 million loan priced at LIBOR on a three-month basis. The company feels that interest rates are rising and that rates will be higher at the next roll-over date in three months. Suppose the current LIBOR is 5.4375%. Explain how MNC can use FRA at 6% offered by a bank to reduce its interest rate risk on this loan. In three months, if interest rates have risen to 6.25%, how much will MNC receive/pay on its FRA? Assume the three month period as 90 days.

Solution:

MNC can use 3 x 6 FRA, if it expects that the rates would be higher at the next roll-over of three months, starting three months from today. In other words MNC would buy 3x6 FRA @ 6%, clearly with a view that higher rate would prevail on the settlement date i.e. 3 months from now.

Now if on the settlement date, the rate is 6.25%, then MNC's decision to buy 3x6 FRA has been proved right and it would receive the present value of the interest differentials on the loan amount i.e. it would receive:

$$\text{Payoff} = \text{Notional Amount} \times \frac{(\text{ReferenceRate} - \text{FixedRate})}{1+\text{ReferenceRate}\times\alpha} \times (\alpha \text{ is the day count function})$$

$$= \$2,50,00,000 \times \frac{(0.0625 - 0.0600)\times 90/360}{1+0.0625\times 90/360} = \$15,385$$

Illustration 48.

Company A has outstanding debt on which it currently pays fixed rate of interest at 9.5%. The company intends to refinance the debt with a floating rate interest. The best floating rate it can obtain is LIBOR + 2%. However, it does not want to pay more than LIBOR. Another company B is looking for a loan at a fixed rate of interest to finance its exports. The best rate it can obtain is 13.5%, but it cannot afford to pay more than 12%. However, one bank has agreed to offer finance at a floating rate of LIBOR + 2%. Citibank is in the process of arranging an interest rate swap between these two companies.

a. With a schematic diagram, show how the swap deal can be structured,

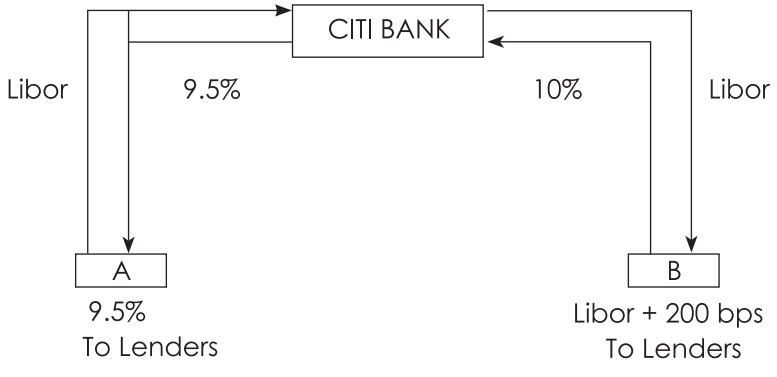
b. What are the interest savings by each company?

c. How much would Citi bank receive?

Solution:

First let us tabulate the details to find the quality of spread differential:

		Cost of Funds to Company A and B	
	Objective	**Fixed rate**	**Floating rate**
Company A	Floating	9.50% p.a.	Libor + 200bp
Company B	Fixed	13.50% p.a.	Libor + 200bp
Differential		400 bps	0bps



The differential between the two markets = 400 bps - 0 = 400 bps. A total of 400 bps needs to be shared between A, B and Citi bank. Since A cannot afford to pay more than Libor, it needs 200 bps benefits out of the total 400 bps (Libor +2% - Libor). Similarly B cannot pay more than 12% as against the existing available fixed rate funding of 13.5%, it requires 150 bps benefits out of 400 bps. The balance 50 bps would be shared / charged by the Citi bank.

The swap can therefore be structured as follows:

Firm	Paid to Bank	Received from Bank	Paid to market	Net Cost	Savings
A	Libor	9.5%	9.5%	Libor	(Libor +2%) - (Libor) = 200bps
B	10%	Libor	Libor +200bps	12%	(13.5-12.0)= 150bps

Company A gets floating rate funds at Libor as against Libor + 2%, thereby getting an advantage of 200 bps, Company B gets fixed rate funds at 12% as against 13.5%, thereby getting an advantage of 150 bps and finally Citi bank gets 50 bps commission.

Illustration 49.

Company X wishes to borrow U.S. dollars at a fixed rate of interest. Company Y wishes to borrow Japanese yen at a fixed rate of interest. The amount required by the two companies are roughly the same at the current exchange rate. The companies have quoted the following interest rates:

	Yen	Dollars
Company X	6.0%	9.6%
Company Y	7.5%	10.0%

Design a swap that will net a bank, acting as an intermediary, 50 basis points per annum. Make the swap appear equally attractive to the two companies.

Solution:

Let x be the spread in the yen market (in this case 150 basis points) and let y be the spread in the dollar market (40 basis points). The total gain available is x-y = 110 basis points. The bank will take 50 basis points, so that leaves 60 basis points to be split equally between x and y. Therefore, x must end up paying 9.3% in dollars and y must end up paying 7.2% in yen. One way to accomplish this is as follows:

X	Pay 6% in yen to outside lenders
	Pay 9.3% in dollars to the bank in the swap
	Receive 6% in yen from the bank in the swap
Total	**9.3% in dollars**
Y	Pay 10% in dollars to outside lenders
	Pay 7.2% in yen to the bank in the swap
	Receive 10% in dollars from the bank in the swap
Total	**7.2% in yen**

Note that the bank's profits of 50 basis points come from receiving 7.2% and paying 6% in yen (thereby gaining 120 basis points in yen) while receiving 9.3% and paying 10% in dollars (thus losing 70 basis points in dollars). Also, the final exchange of principal will expose X and, Y to exchange rate risk, but not the bank.

Illustration 50.

Amit Company has borrowed $200 million on floating basis for 3 years. The interest rates are reset every year. The spread over LIBOR is 25 bps. The company buys a 3 year cap on a 1-year LIBOR with a strike rate of 9% and having a face value of $200 million. The cap carries a premium of 2% of face value or $4 million. Current 1 year LIBOR is 9%. If the LIBOR at the end of 1, 2 and 3 years are 9.5%, 8.5% and 10%, what is the cash flow from cap each year? Amortize premium equally over three years.

Solution:

The strike rate of the cap is Libor which is currently 9%. Since the spread over Libor is 25 bps, the interest rate applicable on the borrowing would be 9.75%, 8.75% & 10.25% respectively for the three years. Thus the interest payable in amount terms over three years would be: $1,95,00,000, $1,75,00,000 and $2,05,00,000 respectively. Now, the premium paid for buying this cap is $ 4 million. As given in the problem equal amortization would involve $13,33,333 each year. The seller of the cap would part with the difference whenever Libor is above the strike price. Therefore we can construct the cash flow table as follows:

(Amount in $)

Time	Cash Flow - Loan	Amortization of premium	Cash Flow from Cap	Total
0	+20,00,00,000	—	—	+20,00,00,000
1	-1,95,00,000	-13,33,333	+10,00,000	-1,98,33,333
2	-1,75,00,000	-13,33,333	—	-1,88,33,333
3	-2,05,00,000	-13,33,333	+20,00,000	-1,98,33,333
3	-20,00,00,000	—	—	-20,00,00,000

Illustration 51.

A fund manager Mr. Adittya deposited $200 million on floating basis for 3 years, which pay LIBOR + 50 bps. The interest rates are reset every year. The company buys a 3 year floor on a 1-year LIBOR with a strike rate of 8% and having a face value of $200 million. The floor carries a premium of 1.5% of face value or $3 million. Current 1 year LIBOR is 8.60%. If the LIBOR at the end of 1, 2 and 3 years are 7.5%, 9% and 7%, what is the cash flow from floor each year? Amortize premium equally over three years.

Solution:

The strike rate of the floor is Libor which is currently 8.6%. The interest rate applicable on the deposit would be Libor + 50 bps i.e. 50 bps over 7.5%, 9% & 7% respectively for the three years. Thus the interest payable in amount terms over three years would be: $1,60,00,000, $1,90,00,000 and $1,50,00,000 respectively. Now, the premium paid for buying this floor is $ 3 million. As given in the problem equal amortization would involve $10,00,000 each year. The seller of the floor would part with the difference whenever the Libor is below the strike price of 8%. Therefore we can construct the cash flow table as follows:

(Amount in $)

Time	Cash Flow - Deposit	Amortization of Premium	Cash Flow from Floor	Total
0	-20,00,00,000	—	—	-20,00,00,000
1	+1,60,00,000	-10,00,000	+10,00,000	+1,60,00,000
2	+1,90,00,000	-10,00,000	—	+1,80,00,000
3	+1,50,00,000	-10,00,000	+20,00,000	+1,60,00,000
3	+20,00,00,000	—	—	+20,00,00,000

Illustration 52.

DY has purchased ₹400 million cap (i.e., call options on interest rates) of 9 percent at a premium of 0.65 percent of face value. ₹400 million floor (i.e., put options on interest rates) of 4 percent is also available at premium of 0.69 percent of face value.

(a) If interest rates rise to 10 percent, what is the amount received by DY? What are the net savings after deducting the premium?

(b) If DY also purchases a floor, what are the net savings if interest rates rise to 11 percent? What are the net savings if interest rates fall to 3 percent?

(c) If, instead, DY sells (writes) the floor, what are the net savings if interest rates rise to 11 percent? What if they fall to 3 percent?

(d) What amount of floors should it sell in order to compensate for its purchases of caps, given the above premiums?

Solution:

(a) Premium for purchasing the cap = 0.0065 x ₹400 million = ₹26,00,000. If interest rates rise to 10 percent, cap purchasers receive ₹ 400 million x 0.01 = ₹40,00,000. The net savings is ₹14,00,000.

(b) If DY also purchases the floor: Premium = 0.0069 x ₹400 million = ₹27,60,000, and the total premium = ₹27,60,000 + ₹ 26,00,000 = ₹53,60,000.

If interest rates rise to 11 percent, cap purchasers receive 0.02 x ₹400 million = ₹80,00,000 and the net savings = ₹80,00,000 - ₹53,60,000 = ₹26,40,000.

If interest rates fall to 3 percent, floor purchaser receive 0.01 x ₹400 million = ₹40,00,000 and the net savings =₹ 40,00,000 - ₹53,60,000 = - ₹ 13,60,000.

(c) If DY sells the floor, it receives net ₹27,60,000 minus the cost of the cap of ₹26,00,000 = + ₹160,000.

If interest rates rise to 11 percent, cap purchasers receive 0.02 x ₹400 million = ₹80,00,000. The net the net savings = ₹80,00,000 + ₹ 1,60,000 = ₹81,60,000.

If interest rates fall to 3 percent, floor purchasers receive 0.01 x ₹400 million = ₹40,00,000. The net savings to DY = ₹-40,00,000 + 1,60,000 = - ₹38,40,000.

(d) DY needs to sell: X × 0.0069 = ₹26,00,000, or X = ₹37,68,11,594 worth of 4 percent floors.

Illustration 53.

Suppose Shampa just signed a purchase and sale agreement on a new home and you have six weeks to obtain a mortgage. Interest rates have been falling, so fixed-rate loans are now very attractive. Shampa could lock in a fixed rate of 7% (annual percentage rate) for 30 years. On the other hand, rates are falling, so Shampa is thinking about a 30-year variable-rate loan, which is currently at 4.5% and which is tied to the six-month Treasury bill rate. A final mortgage option is a variable-rate loan that begins at 5% and cannot fall below 3% but that can increase by only as much as 2% per year up to a maximum of 11%.

(a) If you wanted to take advantage of a possible fall in rates but not assume the risk that rates would increase dramatically, which financing plan would you choose?

(b) What is the interest rate cap in this example?

(c) What is the interest rate floor in this example?

(d) How is an interest rate cap like buying insurance? How is she paying for this insurance?

Solution:

(a) You would take the plan that begins with a variable rate of 5% and can't go above 11%.

(b) Cap =11%.

(c) Floor = 3%.

(d) An interest rate cap is like buying insurance because you still benefit from falling rates, but you will never have to pay an interest rate above 11%. You pay for that with a higher initial variable rate of 5% versus 4.5%.

Study Note - 11

FINANCIAL RISK MANAGEMENT IN INTERNATIONAL OPERATIONS

This Study Note includes

11.1 Foreign Exchange Market
11.2 Foreign Exchange Rate Management
11.3 Parity Conditions in International Finance
11.4 Exchange Rate Risk Management
11.5 Foreign Investment Analysis
11.6 Sources of Foreign Currency
11.7 Foreign Investment in India

International finance (also referred to as **international monetary economics** or **international macroeconomics**) is the branch of financial economics broadly concerned with monetary and macroeconomic interrelations between two or more countries. International finance examines the dynamics of the global financial system, international monetary systems, balance of payments, exchange rates, foreign direct investment, and how these topics relate to international trade.

Sometimes referred to as multinational finance, international finance is additionally concerned with matters of international financial management. Investors and multinational corporations must assess and manage international risks such as political risk and foreign exchange risk, including transaction exposure, economic exposure, and translation exposure.

Some examples of key concepts within international finance are the Mundell–Fleming model, the optimum currency area theory, purchasing power parity, interest rate parity, and the international Fisher effect. Whereas the study of international trade makes use of mostly microeconomic concepts, international finance research investigates predominantly macroeconomic concepts.

11.1 FOREIGN EXCHANGE MARKET

The **Foreign Exchange Market** (**Forex**, **FX**, or **currency market**) is a form of exchange for the global decentralized trading of international currencies. Financial centers around the world function as anchors of trading between a wide range of buyers and sellers around the clock, with the exception of weekends. The foreign exchange market determines the relative values of different currencies. The foreign exchange market assists international trade and investment by enabling currency conversion. For example, it permits a business in the United States to import goods from the European Union member states, especially Euro zone members, and pay Euros, even though its income is in United States dollars. It also supports direct speculation in the value of currencies, and the carry trade, speculation based on the interest rate differential between two currencies.

The foreign exchange market is unique because of the following characteristics:

- its huge trading volume representing the largest asset class in the world leading to high liquidity;
- its geographical dispersion;
- its continuous operation: 24 hours a day except weekends, i.e., trading from 20:15 GMT on Sunday until 22:00 GMT Friday;
- the variety of factors that affect exchange rates;
- the low margins of relative profit compared with other markets of fixed income; and
- the use of leverage to enhance profit and loss margins and with respect to account size.

Sectors: The Foreign Exchange Market has the following major sectors:

(a) Spot Market,

(b) Forward and Futures Market, and

(c) Currency Options Market.

Functions of the Foreign Exchange Market

The foreign exchange market merely a part of the money market in the financial centers is a place where foreign currencies are bought and sold. The buyers and sellers of claims on foreign money and the intermediaries together constitute a foreign exchange market. It is not restricted to any given country or a geographical area.

Thus, the foreign exchange market is the market for a national currency (foreign money) anywhere in the world, as the financial centers of the world are united in a single market.

The foreign exchange market performs the following important functions:

(i) to effect transfer of purchasing power between countries- transfer function;

(ii) to provide credit for foreign trade - credit function; and

(iii) to furnish facilities for hedging foreign exchange risks - hedging function.

(i) Transfer Function:

The basic function of the foreign exchange market is to facilitate the conversion of one currency into another, i.e., to accomplish transfers of purchasing power between two countries. This transfer of purchasing power is effected through a variety of credit instruments, such as telegraphic transfers, bank drafts and foreign bills.

In performing the transfer function, the foreign exchange market carries out payments internationally by clearing debts in both directions simultaneously, analogous to domestic clearings.

(ii) Credit Function:

Another function of the foreign exchange market is to provide credit, both national and international so as to promote foreign trade. Obviously, when foreign bills of exchange are used in international payments, a credit for about 3 months, till their maturity, is required.

(iii) Hedging Function:

A third function of the foreign exchange market is to hedge foreign exchange risks. In a free exchange market when exchange rates, i.e., the price of one currency in terms of another currency change, there may be a gain or loss to the party concerned. Under this condition, a person or a firm undertakes exchange risk to a large extent if there are huge amounts of net claims or net liabilities which are to be met in foreign money.

Participants in Foreign Exchange Market

The following are the financial market participants :

1. Commercial companies

An important part of this market comes from the financial activities of companies seeking foreign exchange to pay for goods or services. Commercial companies often trade fairly small amounts compared to those of banks or speculators, and their trades often have little short term impact on market rates. Nevertheless, trade flows are an important factor in the long-term direction of a currency's exchange rate. Some multinational companies can have an unpredictable impact when very large positions are covered due to exposures that are not widely known by other market participants.

2. Central banks

National central banks play an important role in the foreign exchange markets. They try to control the money supply, inflation, and/or interest rates and often have official or unofficial target rates for their currencies. They can use their often substantial foreign exchange reserves to stabilize the market. Nevertheless, the

effectiveness of central bank "stabilizing speculation" is doubtful because central banks do not go bankrupt if they make large losses, like other traders would, and there is no convincing evidence that they do make a profit trading.

3. Hedge funds as speculators

About 70% to 90%of the foreign exchange transactions are speculative. In other words, the person or institution that buys or sells the currency has no plan to actually take delivery of the currency in the end; rather, they are solely speculating on the movement of that particular currency. Hedge funds have gained a reputation for aggressive currency speculation since 1996. They control billions of dollars of equity and may borrow billions more, and thus may overwhelm intervention by central banks to support almost any currency, if the economic fundamentals are in the hedge funds' favor.

4. Investment management firms

Investment management firms (who typically manage large accounts on behalf of customers such as pension funds and endowments) use the foreign exchange market to facilitate transactions in foreign securities. For example, an investment manager holding an international equity portfolio needs to purchase and sell several pairs of foreign currencies to pay for foreign securities purchases.

Some investment management firms also have more speculative specialist currency overlay operations, which manage clients' currency exposures with the aim of generating profits as well as limiting risk. While the number of this type of specialist firms is quite small, many have a large value of assets under management and, hence, can generate large trades.

5. Retail foreign exchange traders

Individual Retail speculative traders constitute a growing segment of this market with the advent of retail foreign exchange platforms, both in size and importance. Currently, they participate indirectly through brokers or banks. There are two main types of retail FX brokers offering the opportunity for speculative currency trading: brokers and dealers or market makers. Brokers serve as an agent of the customer in the broader FX market, by seeking the best price in the market for a retail order and dealing on behalf of the retail customer. They charge a commission or mark-up in addition to the price obtained in the market. Dealers or market makers, by contrast, typically act as principal in the transaction versus the retail customer, and quote a price they are willing to deal at.

6. Non-bank Foreign Exchange Companies

Non-bank foreign exchange companies offer currency exchange and international payments to private individuals and companies. These are also known as foreign exchange brokers but are distinct in that they do not offer speculative trading but rather currency exchange with payments (i.e., there is usually a physical delivery of currency to a bank account).

These companies' selling point is usually that they will offer better exchange rates or cheaper payments than the customer's bank. These companies differ from Money Transfer/Remittance Companies in that they generally offer higher-value services.

7. Money transfer/remittance companies and bureaux de change

Money transfer companies/remittance companies perform high-volume low-value transfers generally by economic migrants back to their home country. The four largest markets receiving foreign remittances are India, China, Mexico and the Philippines. The largest and best known provider is Western Union with 345,000 agents globally followed by UAE Exchange.

Bureaux de change or currency transfer companies provide low value foreign exchange services for travelers. These are typically located at airports and stations or at tourist locations and allow physical notes to be exchanged from one currency to another. They access the foreign exchange markets via banks or non bank foreign exchange companies.

Different Terms Used in a Foreign Exchange Market

1. Exchange Rate	It is the price of one currency quoted in terms of another currency.
2. Spot Rate	It is the exchange rate applicable for an immediate settlement, i.e. the exchange rate prevailing now.
3. Forward Rate	It is the exchange rate contracted today for exchange of currencies at a future date.
4. Direct Quote	It refers to the expression of exchange rate where one unit of foreign currency is expressed in terms of number of units of local / domestic currency. **Example** $1 = ₹40.00 [in India]
5. Indirect Quote	It refers to quoting per unit of Local / Domestic Currency in terms of number of u n i t s of Foreign Currency. **Example**: ₹1 = $0.025.
6. Two Way Quote	Two Way Quote refers to quoting Exchange Rates by an Exchange Dealer in terms of Buying (Bid) Rate and Selling (Ask) Rate.
7. Bid Rate	Bid Rate is the price at which the Exchange Dealer will buy currency. It is also called as Buy Rate. [It is the rate at which a Customer can sell a Foreign Currency]
8. Offer Rate	Offer Rate is the rate at which the Exchange Dealer will sell currency. It is also called as Sell Rate or Ask Rate. [It is the rate at which a Customer can Buy a Foreign Currency]
9. American Quote	It refers to quoting per unit of any currency in terms of American Dollars.
10. European Quote	It refers to quoting per unit of American Dollars in terms of any other currency an indirect quotation whereby the value of foreign currency is stated as per unit measure of the U.S Dollar.

11.2 FOREIGN EXCHANGE RATE MANAGMENT

A foreign **exchange rate**, which is also called a forex rate or currency rate, represents the value of a specific currency compared to that of another country. For example, an interbank exchange rate of 91 Japanese yen (JPY, ¥) to the United States dollar (US$) means that ¥91 will be exchanged for each US$1 or that US$1 will be exchanged for each ¥91. Exchange rates are determined in the foreign exchange market, which is open to a wide range of different types of buyers and sellers where currency trading is continuous: 24 hours a day except weekends.

Currency rates are applicable only on currency pairs. The currency listed on the left is called the reference (or base) currency while the one listed to the right is the quote (or term) currency.

Exchange rates are always written in the form of quotations. A quotation reflects the number of quote currencies that can be bought by using a single unit of reference currency.

Foreign Exchange Rates – Determinants

1. **Interest Rate Differentials:** Higher rate of interest for an investment in a particular currency can push up the demand for that currency, which will increase the exchange rate in favour of that currency.
2. **Inflation Rate Differentials:** Different countries' have differing inflation rates, and as a result, purchasing power of one currency may depreciate faster than currency of some other country. This contributes to movement in exchange rate.
3. **Government Policies:** Government may impose restriction on currency transactions. Through RBI, the Government, may also buy or sell currencies in huge quantity to adjust the prevailing exchange rates.
4. **Market Expectations:** Expectations on changes in Government, changes in taxation policies, foreign trade, inflation, etc. contribute to demand for foreign currencies, thereby affecting the exchange rates.
5. **Investment Opportunities:** Increase in investment opportunities in one country leads to influx of foreign currency funds to that country. Such huge inflow will amount to huge supply of that currency, thereby bringing down the exchange rate.

6. **Speculations:** Speculators and Treasury Managers influence movement in exchange rates by buying and selling foreign currencies with expectations of gains by exploiting market inefficiencies. The quantum of their operations affects the exchange rates.

Equilibrium Exchange Rate

Equilibrium Exchange Rate is the one that balances the value of nation's imports and exports. It is based on the flow of goods and services. Equilibrium Exchange Rate is also called as Trade Approach or Elasticity's Approach to determination of exchange rate.

If the value of the nation's imports exceeds the value of the nation's exports, then domestic currency will depreciate against the importing currency. Import requires payment in Forex and therefore importers will sell home currency to buy foreign currency, pushing up the demand and price of the foreign currency. Since Foreign Currency appreciates, the nation's exports become cheaper to Foreign Countries. Imports become more expensive to domestic residents. This results in increase in exports and fall in imports, until trade is balanced. For above purposes, exchange rate should be market determined and not Government fixed.

The speed of adjustment depends on how responsive or elastic imports and exports are to Exchange Rate changes. Hence, this approach to exchange rate determination is called Elasticity Approach. If the nation is at or near full employment, a larger depreciation of home currency is essential, to shift domestic resources to the production of more exports. If the nation has huge amount of unemployed resources, then the production should look out for import substitutes, to bring about an realignment in the exchange rates. Government policies may be required to reduce domestic expenditure, and to release domestic resources to produce more exports and import substitutes, and thus allow the elasticities approach to operate.

Elasticities Approach stresses on trade and flow of goods and services to determine exchange rate. This theory explains the determination of exchange rate in the long run.

Bid-Ask Rate

The bid price is the highest price that someone is willing to pay for buying an asset at that moment. The foreign exchange market is nothing more than an ongoing auction to buy and sell. Just as with any auction, buyers place bids.

The asking price is the lowest price at which someone is willing to sell at that moment. Think of it as when you sell a house or other item, you are "asking" a certain price for it. Sellers place asking prices.

Therefore, if you are interested in buying dollars, you should look at the asking price of a seller. You would have a buyer matched with a seller and the trade could be executed.

Likewise, if you are interested in selling dollars, you should look at the bid price since of a buyer. Again, you'd have a buyer matched with a seller and the trade could get executed.

The bids and offers come from "limit" orders placed by buyers and sellers. For instance, assume that a rupee has a bid of $50 and an asking price of $50.30. If you place a limit order to buy 100 rupees at $50.10 that means your order could only get executed if you pay $50.10 or less. The bid would be raised to $50.10. The new quote would be bidding $50.10 and asking $50.30. You are now the highest bidder and get posted to the board.

Likewise, if someone placed a limit order to sell at $50.20 that means they will only sell their rupees if they can get that price or higher. The new quote would be bid $50.10 and asking $50.20. They are now the lowest offer so get posted to the board.

Spread

Spread is the difference between the dealer's Ask Rate and Bid Rate.

If the exchange rate is expected to be stable, the spread will be narrow. If the exchange rate is volatile, the spread will be wider.

Where volume of transactions is very high, the Bid-Offer Spread will be very low. In case of a thinly-traded currency, the spread will be wider.

Example: USD ₹40.00 - ₹40.25. Spread is ₹0.25 (Ask Rate **Less** Bid Rate]

Computation of forward Rates of a Currency based on rate of appreciation or depreciation or from swap points

Nature of Appreciation	Forward Rate is Ascertained By
Foreign Currency is appreciating	Multiply the value of home currency by (1+ Appreciation Percentage)
Foreign Currency is depreciating	Multiply the value of home currency by (1 - Depreciation Percentage)
Home Currency is appreciating	Divide the value of home currency by (1 + Appreciation Percentage)
Home Currency is depreciating	Divide the value of home currency by (1 - Depreciation Percentage)

1. Premium / Depreciation in Percentage

Example: In the spot market USD 1 = ₹40, if in the forward market (1 Year) —

If Dollar is appreciating by 10%, then USD 1 = ₹40 × (1 + 10%) = ₹40 × 1.1 = ₹44.00

If Dollar is depreciating by 10%, then USD 1 = ₹40 × (1 - 10%) = ₹40 × 0.9 = ₹36.00

If Rupee is appreciating by 10%, thenUSD 1 = ₹40 ÷ (1 + 10%) = ₹40 ÷ 1.1 = ₹36.36

If Rupee is depreciating by 10%, then USD 1 = ₹40 ÷(1 - 10%) = ₹40 ÷ 0.9 = ₹44.44

Note: Home Currency Depreciation Rate ≠ Foreign Currency Appreciation Rate. Home Currency Appreciation Rate ≠ Foreign Currency Appreciation Rate.

From Swap Points: Forward Rates are ascertained based on the nature of spread of Swap Points (in case of a Two Way Quote) –

Nature of Spread	Forward Rate is Ascertained By
Spread is Positive (i.e. Swap Points are increasing)	Add the Swap Points to the Spot Rate.
Spread is Negative (i.e. Swap Points are decreasing)	Reduce the Swap Points from the Spot Rate.

Swap Points are movement in Exchange Rate expressed in absolute terms, i.e. in value terms.

Note: Spread = Ask Swap **Less** Bid Swap

Example:

Spot Rate	Swap Points	Forward Bid Rate	Forward Ask Rate
USD 1 = ₹40/₹41	0.50 - 0.60	₹40 + 0.50 = ₹40.50	₹41 + 0.60 = ₹41.60
USD 1 = ₹40 /₹41	0.80 – 0.70	₹40 - 0.80 = ₹39.20	₹41 - 0.70 = ₹40.30

Ascertaining the Appreciation and Depreciation in the case of a Currency Appreciation:

Currency is said to have appreciated if its value has increased, i.e. an investor is required to pay more for purchasing that currency.

Example: USD 1 = ₹40 becomes USD 1 = ₹42. Here the value of USD has increased. An investor is required to pay more Rupees to acquire one USD.

Premium Quote: A currency is said to be at Premium, if it is appreciating relative to another currency. In the above example, USD is quoted at Premium.

Depreciation:

Currency is said to have depreciated if its value has decreased, i.e. an investor is required to pay less for purchasing that currency.

Example: USD 1 = ₹41 becomes USD 1 = ₹39. Here the value of USD has decreased. An investor is required to pay lesser amount in Rupees in acquire one USD.

Discount Quote: A Currency is said to be quoted at Discount, if it is depreciating relative to another currency. In

the above example, USD is quoted at Discount.

Currency at premium or at discount?

Rule for ascertaining whether quoted at Premium / Discount [Based on Forward Rates]:

Foreign Currency is Expressed	Premium	Discount
Under Direct Quote	Forward Rate > Spot Rate	Forward Rate < Spot Rate
Under Indirect Quote	Forward Rate < Spot Rate	Forward Rate > Spot Rate

Forward Rates are Quoted in Terms of Swap Points:

Foreign Currency is Expressed	Premium	Discount
Under Direct Quote	Swap Points are increasing	Swap Points are decreasing
Under Indirect Quote	Swap Points are decreasing	Swap Points are increasing

Computation of Annualized Appreciation / Depreciation:

(a) For Direct Quotes: $\frac{(\text{Forward Rate} - \text{Spot Rate})}{\text{Spot Rate}} \times 100 \times \frac{\text{12 Months or 365 Days}}{\text{Period of Quote}}$

Positive Result = Appreciation in %; Negative Result = Depreciation in %

(b) For Indirect Quotes: $\frac{(\text{Spot Rate} - \text{Forward Rate})}{\text{Forward Rate}} \times 100 \times \frac{\text{12 Months or 365 Days}}{\text{Period of Quote}}$

Positive Result = Appreciation in %; Negative Result = Depreciation in %

Cross Rate

Cross Rate denotes an exchange rate that does not involve the home currency. It is an exchange rate between the currencies of two countries that are not quoted against each other, but are quoted against one common currency.

Example: From an Indian perspective, USD per GBP, FFr. Per Euro are cross rates.

Benefits: When a Foreign Currency (A) is not traded locally, or no exchange rates are available in terms of the local currency, but only in terms of some other Foreign Currency (B) and Currency B is traded locally, then Exchange Rate for Currency A can be obtained in terms of Local Currency.

Example: Exchange Rate for Peso is not available in terms of Rupee. However, quote for Peso is available per Euro (Euro 1 = Peso 17.50). Euro is traded in India at ₹57.50. Therefore, Rupee per Unit of Peso can be ascertained as follows —

Rupees/Peso = Rupee/Euro × Euro/Peso

= Rupee/Euro × [1 / (Peso/Euro)]

= ₹57.50 × (1 ÷ Peso 17.50 per Euro) = ₹57.50 x 0.0571 = ₹3.2833 per Peso.

Cross Currency using Two Way Quotes: In case of Two Way Quotes, Exchange Rate between two currencies A and B, using C should be determined as follows —

(a) Bid Rate (A per unit of B) = Bid Rate of A per unit of C × Bid Rate of C per unit B
= Bid A/C + Bid C/B

(b) Ask Rate (A per unit of B) = Ask Rate of A per unit of C × Ask Rate of C per unit B
= Ask A/C + Ask C/B

Rule for Ascertaining Bid from Ask Rates (Where Currencies are expressed in Direct Quote and Indirect Quote):

(a)	Bid Rate (A per Unit of B)	= 1 ÷ Ask Rate (B per Unit of A)
		= 1 ÷ Ask B/A
(b)	Ask Rate (A per Unit of B)	= 1 ÷ Bid Rate (B per Unit of A)
		= 1 ÷ Bid B/A

Arbitrage Operations

Business operation involving the purchase of foreign exchange, gold, financial securities, or commodities in one market and their almost simultaneous sale in another market, in order to profit from price differentials existing between the markets is known as arbitrage. Opportunities for arbitrage may keep recurring because of the working of market forces. Arbitrage generally tends to eliminate price differentials between markets. Whereas in less developed countries arbitrage can consist of the buying and selling of commodities in different villages within the country, in highly developed countries the term is generally used to refer to international operations involving foreign-exchange rates, short-term interest rates, prices of gold, and prices of securities.

Currency Arbitrage

A forex strategy in which a currency trader takes advantage of different spreads offered by brokers for a particular currency pair by making trades. Different spreads for a currency pair imply disparities between the bid and ask prices. Currency arbitrage involves buying and selling currency pairs from different brokers to take advantage of this disparity.

Currency arbitrage involves the exploitation of the differences in quotes rather than movements in the exchange rates of the currencies in the currency pair. Forex traders typically practice two-currency arbitrage, in which the differences between the spreads of two currencies are exploited. Traders can also practice three-currency arbitrage, also known as triangular arbitrage, which is a more complex strategy. Due to the use of computers and high-speed trading systems, large traders often catch differences in currency pair quotes and close the gap quickly.

In today's global economy, a multinational company must deal with currencies of the countries in which it operates. Currency arbitrage , or simultaneous purchase and sale of currencies in different markets, offers opportunities for advantageous movement of money from one currency to another.

For example, converting £1,000 to U.S. Dollars with an exchange rate of $ 1.60 to £1 will yield $ 1,600. Another way of making the conversion is to first change the British Pound to Japanese Yen and then convert the Yen to U.S. Dollars using the current exchange rates of £1 = ¥175 and $1 = ¥ 105. The dollar amount is

(£1,000 x ¥ 175)/¥105 = $1,666.67

This example demonstrates the advantage of converting British money first to Japanese Yen and then to dollars.

Two Point and Three Point Arbitrage

Exchange rate arbitrage is the practice of taking advantage of inconsistent exchange rates in different markets by selling in one market and simultaneously buying in another. Arbitrageurs do not take risks or, at least, it is not their intention to do so. In other words, they endeavour to maintain closed positions at all times. Rates of profit on arbitrage operations are necessarily low in competitive, well-informed markets, but since transactions are usually very large, absolute profits may also be large from successful arbitrage. Arbitrage performs the function for a market system of bringing prices in one market into line with those in other markets.

There are two types of arbitrage of relevance to forex markets: exchange rate arbitrage and interest rate arbitrage. In exchange rate arbitrage, advantage is taken of differentials in the price of a currency in different markets. Exchange rate arbitrage transactions may be classified in terms of the number of markets involved. Thus, we may have two-point and three-point arbitrage depending on whether it involves two or more exchange centres (two-point arbitrage or multiple- point arbitrage).

Two-point arbitrage

Two-point arbitrage concerns two currencies in two geographically separated markets. For example, let the spot exchange rate be £1 = $1.55 in London and £1 = $1.60 in New York. Here we are quoting both exchange rates against sterling. That is, we are quoting GBP/USD. This is the indirect quotation of sterling and the direct quotation of the dollar. Remember that the expression Currency A/Currency B gives you the amount of Currency B that exchanges for one unit of Currency A. In practice, most exchange rates are quoted against the US dollar. If we were to do this, we would quote:

In London: USD/GBP £0.645

In New York: USD/GBP £0.625.

Thus, in relative terms, sterling is undervalued in London and overvalued in New York. Provided that capital was free to flow between the two centres, arbitrageurs would attempt to exploit, and hence profit from the differential by selling dollars for pounds in London and reselling the pounds in New York. Assume the arbitrageur sold $1 million in London. For this, he would have received £645,161.29. Selling this in New York would have returned him £1,032,258.06 - a profit of 5 cents per £1. The sale of dollars in London would have strengthened sterling and pushed the value of the pound above $1.55. At the same time, the sale of sterling in New York would have caused sterling to weaken there, pushing its value below $1.60. The action of arbitrageurs would bring the rates of exchange in the two centres together.

In practice, the rates wouldn't come exactly into line because of the existence of transactions costs, but the rates should move to being 'transactions costs close'. There is another simplification in the above example since no regard is paid to the existence of bid and offer rates of exchange. In the real world, the rates may have been something like:

London: GBP/USD Bid 1.5495 Offer 1.5505

New York: GBP/USD Bid 1.5995 Offer 1.6005

Selling dollars in London, the arbitrageur would have been quoted the offer rate of 1.5505 and, thus, would have received £644,953.24. Buying dollars in New York, the arbitrageur would have been quoted the bid rate of 1.5995 and would have received £1,031,602.71. That is, the profits would have been lower because of the bid-offer spread.

Three-point (triangular) arbitrage

Exchange rates may be externally consistent but internally inconsistent. That is, exchange rates among different currencies may be mutually inconsistent. Arbitrageurs will then attempt to profit from these inconsistencies and in the process will eliminate discrepancies and establish mutually consistent cross- exchange rates. A cross-exchange rate is simply the price of a second currency expressed in terms of a third or an exchange rate calculated from two other rates. For example, the rate of the Euro against the Swedish krona derived as the cross rate from US$ - Krona and US$ against the Euro.

Example : Imagine you are a British arbitrageur, holding sterling, in the following example:

Actual exchange rates

GBP/USD £1 = $ 1.5715-721 USD/JPY $1 = ¥ 106.090-120 GBP/JPY £1 = ¥ 176.720-831

Start with £1,000,000.

(a) List the steps you need to take to make a profit.

(b) Calculate the rate of profit you will make.

Solution :

Implied cross rates are £1 = ¥ 176.720-831. Thus, in the actual market, sterling is overpriced in relation to yen and we must sell sterling for yen.

Thus:

Step A: Use £ to buy yen; Step B: Use yen to buy $; Step C: Use $ to buy £

Step B: Sell £ for yen; market-maker buys the foreign currency (¥) at the bid rate of ¥176.720. This gives ¥176,720,000.

Step C: Sell ¥ for $; market-maker sells dollars at the offer rate of ¥106.120. This gives $1,665,284.58

Step D: Sell $ for £. The market-maker buys dollars at the higher rate of $1.5721, which gives £1,059,273.95 or a profit of 5.9%.

This is, of course, a ridiculously high rate of profit, since it could be made in a matter of moments. In practice, rates only have to get slightly out of line before the arbitrageurs step in.

11.3 PARITY CONDITIONS IN INTERNATIONAL FINANCE

Managers of multinational firms, international investors, importers and exporters, and government officials must deal with these fundamental issues:

- Are changes in exchange rates predictable?
- How are exchange rates related to interest rates?
- What, at least theoretically, is the "proper" exchange rate?

To answer these questions we need to first understand the economic fundamentals of international finance, known as parity conditions.

Parity Conditions provide an intuitive explanation of the movement of prices and interest rates in different markets in relation to exchange rates.

The derivation of these conditions requires the assumption of Perfect Capital Markets (PCM).

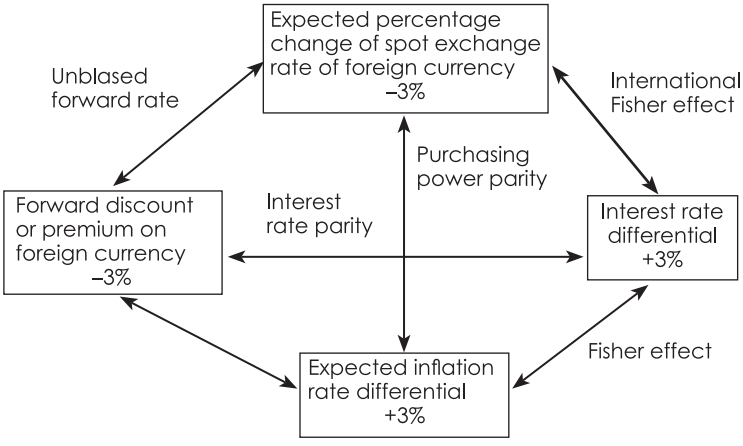
- no transaction costs
- no taxes
- complete certainty

Note – Parity Conditions are expected to hold in the long-run, but not always in the short term.

We shall now examine a simple yet elegant set of equilibrium (or parity) conditions that should apply to product prices, interest rates, and spot and forward exchange rates if the markets are not impeded. These parity conditions provide the foundation for much of the theory and practice of international finance.

In competitive markets, characterized by numerous buyers and sellers having low-cost access to information, exchange-adjusted prices of identical tradeable goods and financial assets must be within transactions costs of equality worldwide. This idea, referred to as the **law of one price**, is enforced by international arbitrageurs who follow the profit-guaranteeing dictum of "buy low, sell high" and prevent all but trivial deviations from equality. Similarly, in the absence of market imperfections, risk-adjusted expected returns on financial assets in different markets should be equal.

Five key theoretical economic relationships, which are depicted in the following figure, result from these arbitrage activities. This framework emphasizes the links among prices, spot exchange rates, interest rates, and forward exchange rates. According to the diagram, if inflation in, say, France is expected to exceed inflation in the United States by 3 percent for the coming year, then the French franc should decline in value by about 3 percent relative to the dollar. By the same token, the one-year forward French franc should sell at a 3 percent discount relative to the U.S. dollar. Similarly, one-year interest rates in France should be about 3 percent higher than one-year interest rates on securities of comparable risk in the United States.



Purchasing Power Parity (PPP) Theory

The first original reference of PPP Theory was made by David Ricardo. However, Gustav Cassel popularized this theory in 1918. According to PPP theory, when exchange rates are of a fluctuating nature, the rate of exchange between two currencies in the long run will be fixed by their respective purchasing powers in their own nations.

Foreign currency is demanded by the people because it has some purchasing power in its own nation. Also domestic currency has a certain purchasing power, because it can buy some amount of goods/ services in the domestic economy. Thus, when home currency is exchanged for any foreign currency, in fact the domestic purchasing power is being exchanged for the purchasing power of that foreign currency. This exchange of the purchasing power takes place at some specified rate where purchasing of two currencies nations gets equalized. Thus, the relative purchasing power of the two currencies determines the exchange rate. The exchange rate under this theory is in equilibrium when their domestic purchasing powers at that rate of exchanges are equivalent e.g., Suppose certain bundle of goods/ services in U.S.A. costs U.S. $ 10 and the same bundle in India costs, ₹ 450/- then the exchange rate between Indian Rupee and U.S. Dollar is $1 = ₹ 45. Because this is the exchange rate at which the parity between the purchasing power of two nations is maintained. A change in the purchasing power of any currency will reflect in the exchange rates also. Hence under this theory the external value of the currency depends on the domestic purchasing power of that currency relative to that of another currency.

In short, what this means is that a bundle of goods should cost the same in Canada and the United States once you take the exchange rate into account.

Purchasing Power Parity and Baseball Bats

First suppose that one U.S. Dollar (USD) is currently selling for ten Mexican Pesos (MXN) on the exchange rate market. In the United States wooden baseball bats sell for $40 while in Mexico they sell for 150 pesos. Since 1 USD = 10 MXN, then the bat costs $40 USD if we buy it in the U.S. but only 15 USD if we buy it in Mexico. Clearly there's an advantage of buying the bat in Mexico, so consumers are much better off going to Mexico to buy their bats. If consumers decide to do this, we should expect to see three things happen:

1. American consumers desire Mexico Pesos in order to buy baseball bats in Mexico. So they go to an exchange rate office and sell their American Dollars and buy Mexican Pesos. This will cause the Mexican Peso to become more valuable relative to the U.S. Dollar.
2. The demand for baseball bats sold in the United States decreases, so the price American retailers charge goes down.
3. The demand for baseball bats sold in Mexico increases, so the price Mexican retailers charge goes up.

Eventually these three factors should cause the exchange rates and the prices in the two countries to change such that we have purchasing power parity. If the U.S. Dollar declines in value to 1 USD = 8 MXN, the price of baseball bats in the United States goes down to $30 each and the price of baseball bats in Mexico goes up to 240 pesos each, we will have purchasing power parity. This is because a consumer can spend $30 in the United States

for a baseball bat, or he can take his $30, exchange it for 240 pesos (since 1 USD = 8 MXN) and buy a baseball bat in Mexico and be no better off.

Purchasing Power Parity and the Long Run

Purchasing-power parity theory tells us that price differentials between countries are not sustainable in the long run as market forces will equalize prices between countries and change exchange rates in doing so. You might think that my example of consumers crossing the border to buy baseball bats is unrealistic as the expense of the longer trip would wipe out any savings you get from buying the bat for a lower price. However it is not unrealistic to imagine an individual or company buying hundreds or thousands of the bats in Mexico then shipping them to the United States for sale. It is also not unrealistic to imagine a store like Walmart purchasing bats from the lower cost manufacturer in Mexico instead of the higher cost manufacturer in Mexico. In the long run having different prices in the United States and Mexico is not sustainable because an individual or company will be able to gain an arbitrage profit by buying the good cheaply in one market and selling it for a higher price in the other market.

Since the price for any one good should be equal across markets, the price for any combination or basket of goods should be equalized.

Mathematical Equation:

$$\Rightarrow \frac{\text{Forward Rate}}{\text{Spot Rate}} = \frac{(1+ \text{ Inflation Rate in Home Country})}{(1+ \text{ Inflation Rate in Foreign Country})}$$

$$\Rightarrow \text{Forward Rate} = \text{Spot Rate} \times \frac{(1+ \text{ Inflation Rate in Home Country})}{(1+ \text{ Inflation Rate in Foreign Country})}$$

Inferences Drawn out of Inflation Rate Differentials: If Home Country Inflation Rate is –

Greater than Foreign Country Inflation Rate	Lower than Foreign Country Inflation Rate
Foreign Currency should be traded at Premium	Foreign Currency should be traded at Discount.

Criticism of Purchasing Power Parity (PPP) Theory

1. **Limitations of the Price Index** : As seen above in the relative version the PPP theory uses the price index in order to measure the changes in the equilibrium rate of exchange. However, price indices suffer from various limitations and thus theory too.
2. **Neglect of the demand / supply Approach** : The theory fails to explain the demand for as well as the supply of foreign exchange. The PPP theory proves to be unsatisfactory due to this negligence. Because in actual practice the exchange rate is determined according to the market forces such as the demand for and supply of foreign currency.
3. **Unrealistic Approach** : Since the PPP theory uses price indices which itself proves to be unrealistic. The reason for this is that the quality of goods and services included in the indices differs from nation to nation. Thus, any comparison without due significance for the quality proves to be unrealistic.
4. **Unrealistic Assumptions** : It is yet another valid criticism that the PPP theory is based on the unrealistic assumptions such as absence of transport cost. Also it wrongly assumes that there is an absence of any barriers to the international trade.
5. **Neglects Impact of International Capital Flow** : The PPP theory neglects the impact of the international capital movements on the foreign exchange market. International capital flows may cause fluctuations in the existing exchange rate.
6. **Rare Occurrence** : According to critics, the PPP theory is in contrast to the Practical approach. Because, the rate of exchange between any two currencies based on the domestic price ratios is a very rare occurrence.

Despite these criticisms the theory focuses on the following major points.

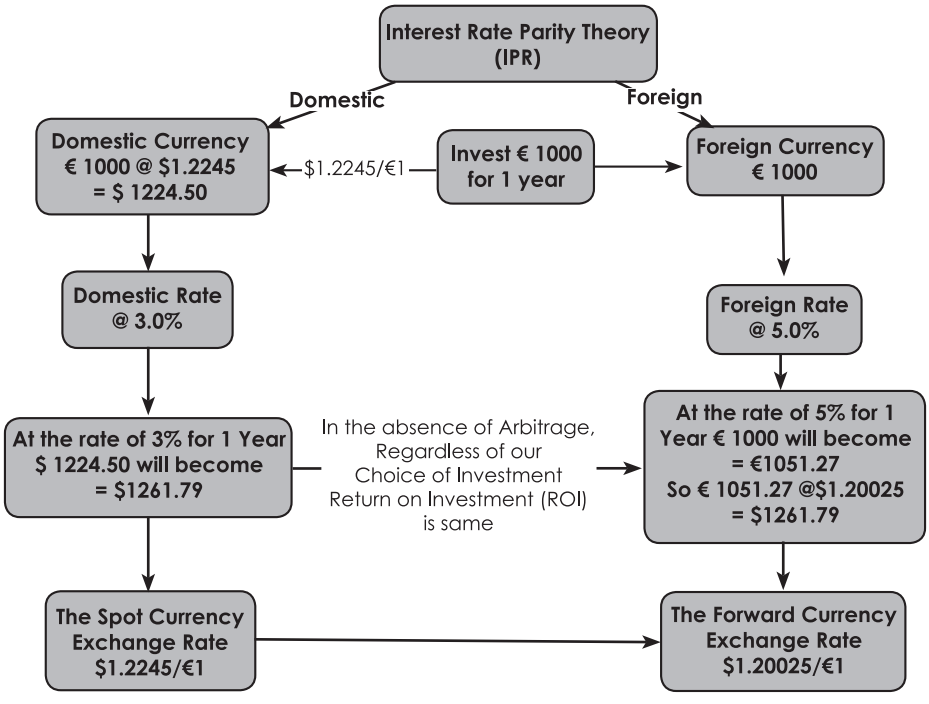
1. It tries to establish relationship between domestic price level and the exchange rates.
2. The theory explains the nature of trade as well as considers the BOP (Balance of Payments) of a nation.

Interest Rate Parity

Interest Rate Parity (IPR) theory is used to analyze the relationship between the spot rate and a corresponding forward (future) rate of currencies.

The IPR theory states interest rate differentials between two different currencies will be reflected in the premium or discount for the forward exchange rate on the foreign currency if there is **no arbitrage** - the activity of buying shares or currency in one financial market and selling it at a profit in another.

The theory further states size of the forward premium or discount on a foreign currency should be equal to the interest rate differentials between the countries in comparison.



Examples

For our illustration purpose consider investing € 1000 for 1 year.

We'll consider two investment cases viz:

Case I: Domestic Investment

In the U.S.A., consider the spot exchange rate of $1.2245/€ 1.

So we can exchange our € 1000 @ $1.2245 = $1224.50

Now we can invest $1224.50 @ 3.0% for 1 year which yields **$1261.79** at the end of the year.

Case II: Foreign Investment

Likewise we can invest € 1000 in a foreign European market, say at the rate of 5.0% for 1 year.

But we buy forward 1 year to lock in the future exchange rate at

$1.20025/€ 1 since we need to convert our € 1000 back to the domestic currency, i.e. the U.S. Dollar.

So € 1000 @ of 5.0% for 1 year = € 1051.27

Then we can convert € 1051.27 @ $1.20025 = **$1261.79**

Thus, in the absence of **arbitrage**, the Return on Investment (ROI) is same regardless of our choice of investment method.

Mathematical Equation:

Exchange Rate Differential = Interest Rate Differential

$$\Rightarrow \frac{\text{Forward Rate}}{\text{Spot Rate}} = \frac{(1+\text{ Interest Rate in Home Country})}{(1+\text{ Interest Rate in Foreign Country})}$$

$$\Rightarrow \text{Forward Rate} = \text{Spot rate} \times \frac{(1+\text{Interest Rate in Home Country})}{(1+\text{Interest Rate in Foreign Country})}$$

Greater than Foreign Currency Interest Rate	Lower than Foreign Currency Interest Rate
Foreign Currency should be traded at Premium	Foreign Currency should be traded at Discount.

Types of Interest Rate Parity

There are two types of IRP **:**

1. Covered Interest Rate Parity (CIRP)

Covered Interest Rate theory states that exchange rate forward premiums (discounts) offset interest rate differentials between two sovereigns.

In another words, covered interest rate theory holds that interest rate differentials between two countries are offset by the spot/forward currency premiums as otherwise investors could earn a pure arbitrage profit.

Covered Interest Rate Examples

Assume Google Inc., the U.S. based multi-national company, needs to pay it's European employees in Euro in a month's time.

Google Inc. can achieve this in several ways viz:

- Buy Euro forward 30 days to lock in the exchange rate. Then Google can invest in dollars for 30 days until it must convert dollars to Euro in a month. This is called covering because now Google Inc. has no exchange rate fluctuation risk.
- Convert dollars to Euro today at spot exchange rate. Invest Euro in a European bond (in Euro) for 30 days (equivalently loan out Euro for 30 days) then pay it's obligation in Euro at the end of the month.

Under this model Google Inc. is sure of the interest rate that it will earn, so it may convert fewer dollars to Euro today as it's Euro will grow via interest earned.

This is also called covering because by converting dollars to Euro at the spot, the risk of exchange rate fluctuation is eliminated.

2. Uncovered Interest Rate Parity (UIP)

Uncovered Interest Rate theory states that expected appreciation (depreciation) of a currency is offset by lower (higher) interest.

Uncovered Interest Rate Example

In the above example of covered interest rate, the other method that Google Inc. can implement is:

- Google Inc. can also invest the money in dollars today and change it for Euro at the end of the month.

This method is uncovered because the exchange rate risks persist in this transaction.

Covered Interest Rate Vs. Uncovered Interest Rate

Recent empirical research has identified that uncovered interest rate parity does not hold, although violations are not as large as previously thought and seems to be currency rather than time horizon dependent.

In contrast, covered interest rate parity is well established in recent decades amongst the OECD economies for short-term instruments. Any apparent deviations are credited to transaction costs.

Implications of Interest Rate Parity Theory

If IRP theory holds then arbitrage is not possible. No matter whether an investor invests in domestic country or foreign country, the rate of return will be the same as if an investor invested in the home country when measured in domestic currency.

If domestic interest rates are less than foreign interest rates, foreign currency must trade at a forward discount to offset any benefit of higher interest rates in foreign country to prevent arbitrage.

If foreign currency does not trade at a forward discount or if the forward discount is not large enough to offset the interest rate advantage of foreign country, arbitrage opportunity exists for domestic investors. So domestic investors can benefit by investing in the foreign market.

If domestic interest rates are more than foreign interest rates, foreign currency must trade at a forward premium to offset any benefit of higher interest rates in domestic country to prevent arbitrage.

If foreign currency does not trade at a forward premium or if the forward premium is not large enough to offset the interest rate advantage of domestic country, arbitrage opportunity exists for foreign investors. So foreign investors can benefit by investing in the domestic market.

Limitations of Interest Rate Parity Model

In recent years the interest rate parity model has shown little proof of working.

In many cases, countries with higher interest rates often experience currency appreciation due to higher demands and higher yields and has nothing to do with risk-less arbitrage.

Fisher Effect

Interest rates and inflation are objects of financial fascination around the world. The Fisher effect is a theory about the relationship between the two, basically stating that when one rises, so does the other.

The **Fisher Effect** is an economic hypothesis stating that the real interest rate is equal to the nominal rate minus the expected rate of inflation. It states that, in response to a change in the money supply, the nominal interest rate changes in tandem with changes in the inflation rate in the long run. For example, if monetary policy were to cause inflation to increase by 5 percentage points, the nominal interest rate in the economy would eventually also increase by 5 percentage points.

In order to understand the Fisher effect, it's crucial to understand the concepts of nominal and real interest rates.

In the late 1930s, U.S. economist Irving Fisher wrote a paper which posited that a country's interest rate level rises and falls in direct relation to its inflation rates. Fisher mathematically expressed this theory in the following way:

R Nominal = R Real + R Inflation

The equation states that a country's current (nominal) interest rate is equal to a real interest rate adjusted for the rate of inflation. In this sense, Fisher conceived of interest rates, as the prices of lending, being adjusted for inflation in the same manner that prices of goods and services are adjusted for inflation. For instance, if a country's nominal interest rate is six percent and its inflation rate is two percent, the country's real interest rate is four percent (6% - 2% = 4%).

In simple terms: an increase in inflation will result in an increase in the nominal interest rate. For example, if the real interest rate is held at a constant 5.5% and inflation increased from 2% to 3%, the Fisher Effect indicates that the nominal interest rate would have to increase from 7.5% (5.5% real rate + 2% inflation rate) to 8.5% (5.5% real rate + 3% inflation rate).

The *Fisher effect* is an important tool by which lenders can gauge whether or not they are making money on a granted loan. Unless the rate charged is above and beyond the economy's inflation rate, a lender will not profit from the interest. Moreover, according to Fisher's theory, even if a loan is granted at no interest, a lending party would need to charge at least the inflation rate in order to retain purchasing power upon repayment.

International Fisher Effect

In foreign exchange terminology, the International Fisher Effect is based on the idea that a country with a higher interest rate will have a higher rate of inflation which, in turn, could cause its currency to depreciate. In theoretical terms, this relationship is expressed as an equality between the expected percentage exchange rate change and the difference between the two countries' interest rates, divided by one plus the second country's interest rate. Because the divisor approximates 1, the expected percent exchange rate change roughly equals the interest rate differential.

It is based on present and future risk-free nominal interest rates rather than pure inflation, and is used to predict and understand present and future spot currency price movements. In order for this model to work in its purest form, it is assumed that the risk-free aspects of capital must be allowed to free flow between nations that comprise a particular currency pair.

International Fisher Effect Example:

Putting the International Fisher Effect or IFE into practice would mean that exchange rates change should be based on nominal interest rate differentials and independent of inflation rates. An example of using the IFE to forecast exchange rate shifts would be if the U.S. nominal interest rate was at 1%, but the Australian rate was at 3%, then the Aussie would be expected to rise by 2% against the U.S. Dollar.

Fisher Effect Background

The decision to use a pure interest rate model rather than an inflation model or some combination stems from the assumption by Fisher that real interest rates are not affected by changes in expected inflation rates because both will become equalized over time through market arbitrage; inflation is embedded within the interest rate and factored into market projections for a currency price. It is assumed that spot currency prices will naturally achieve parity with perfect ordering markets. This is known as the Fisher Effect and not to be confused with the International Fisher Effect.

Fisher believed the pure interest rate model was more of a leading indicator that predicts future spot currency prices 12 months in the future. The minor problem with this assumption is that we can't ever know with certainty over time the spot price or the exact interest rate. This is known as uncovered interest parity. The question for modern studies is: does the International Fisher Effect work now that currencies are allowed to free float. From the 1930s to the 1970s we didn't have an answer because nations controlled their currency price for economic and trade purposes. This begs the question: has credence been given to a model that hasn't really been fully tested? Yet the vast majority of studies only concentrated on one nation and compared that nation to the United States currency.

The Fisher Effect Vs. The IFE

The Fisher Effect model says nominal interest rates reflect the real rate of return and expected rate of inflation. So the difference between real and nominal rates of interest is determined by expected rates of inflation. The approximate nominal rate of return = real rate of return plus the expected rate of inflation. For example, if the real rate of return is 3.5% and expected inflation is 5.4 % then the approximate nominal rate of return is 0.035 + 0.054.= 0.089 or 8.9%. The precise formula is (1 + nominal rate) = (1 + real rate) x (1 + inflation rate), which would equal 9.1% in this example. The IFE takes this example one step further to assume appreciation or depreciation of currency prices is proportionally related to differences in nominal rates of interest. Nominal interest rates would automatically reflect differences in inflation by a purchasing power parity or no-arbitrage system.

The IFE in Action

For example, suppose the GBP/USD spot exchange rate is 1.5339 and the current interest rate in the U.S. is 5% and 7% in Great Britain. The IFE predicts that the country with the higher nominal interest rate (GBP in this case) will see its currency depreciate. The expected future spot rate is calculated by multiplying the spot rate by a ratio of the foreign interest rate to domestic interest rate: (1.5339 X (1.07/1.05) = 1.5631. The IFE expects the GBP/USD to appreciate to 1.5631 and the USD/GBP to depreciate to 0.6398 so that investors in either currency will achieve the same average return i.e. an investor in USD will earn a lower interest rate of 5% but will also gain from appreciation of the USD.

For the shorter term, the IFE is generally unreliable because of the numerous short-term factors that affect exchange rates and the predictions of nominal rates and inflation. Longer-term International Fisher Effects have proven a bit better, but not by very much. Exchange rates eventually offset interest rate differentials, but prediction errors often occur. Remember that we are trying to predict the spot rate in the future. IFE fails particularly when the costs of borrowing or expected returns differ, or when purchasing power parity fails. This is defined when the cost of goods can't be exchanged in each nation on a one-for-one basis after adjusting for exchange rate changes and inflation.

Today, we don't normally see the big interest rate changes we have seen in the past. One point or even half point nominal interest rate changes rarely occur. Instead, the focus for central bankers in the modern day is not an interest rate target, but rather an inflation target where interest rates are determined by the expected rate of inflation. Central bankers focus on their nation's Consumer Price Index (CPI) to measure prices and adjust interest rates according to prices in an economy. To do otherwise may cause an economy to fall into deflation or stop a growing economy from further growth. The Fisher models may not be practical to implement in your daily currency trades, but their usefulness lies in their ability to illustrate the expected relationship between interest rates, inflation and exchange rates.

Interest Rate Arbitrage

Opportunities for interest arbitrage arise when the money rates differ among countries. Gold arbitrage and securities arbitrage operate in principle very much like commodity arbitrage in the domestic market, except that in the two former cases exchange rates are important, either because funds must be remitted abroad for the operation or because the proceeds must be brought home at the end of the operation.

Covered Interest Arbitrage

An arbitrage transaction that takes advantage of any instance when the forward premium or forward discount between two currencies does not equal the interest rate differential. When this occurs, arbitrageurs can use covered interest arbitrage to generate profits until the relationships return to equilibrium. This may be done by buying / selling one currency in the spot market and simultaneously selling / buying it in the forward market and using the sale proceeds to invest in an asset denominated in the spot currency; when the asset matures, the proceeds are used to fulfill the purchase and the arbitrage transaction concludes with a riskfree profit.

Steps in Covered Interest Arbitrage:

(a) Identify Future Spot Price based on Interest Rate Parity Theory.

(b) Compare Future Spot Price with Forward Rate available for the period.

(c) If Future Spot Price > Forward Rate, i.e. Forward Rate is Undervalued, **Buy Forward. Sell Spot.**

Action	Time	Activity
Borrow	Now	Borrow in Foreign Currency at its Borrowing Rate.
Contract	Now	Enter into Forward Contract for buying Foreign Currency at the maturity date.
Convert	Now	Sell Foreign Currency at Spot Rate and realize the proceeds in Home Currency.
Invest	Now	Invest the Home Currency available in Home Currency Deposits.
Realize	Maturity	Realize the maturity value of Home Currency Deposits.

Honour	Maturity	Honour the Forward Contract for buying Foreign Currency at Forward Rates using the Home Currency Deposit proceeds.
Repay	Maturity	Repay the Foreign Currency Liability using the Foreign Currency bought.
Gain	Maturity	Foreign Currency Bought **Less** Foreign Currency Settled.

(d) If Future Spot Price < Forward Rate i.e. Forward Rate is Overvalued. **Sell Forward. Buy Spot.**

Action	**Time**	**Activity**
Borrow	Now	Borrow in Home Currency at its Borrowing Rate.
Contract	Now	Enter into Forward Contract for selling Foreign Currency at the Maturity date.
Convert	Now	Buy Foreign Currency at Spot Rate, using the amount borrowed.
Invest	Now	Invest the Foreign Currency available in Foreign Currency Deposits.
Realize	Maturity	Realize the maturity value of Foreign Currency Deposits.
Honour	Maturity	Honour the Forward Contract for selling the maturity proceeds of Foreign Currency Deposits at Forward Contract Rates to realize Home Currency.
Repay	Maturity	Repay the Home Currency Liability using the proceeds of Forward Sale.
Gain	Maturity	Home Currency Proceeds on Forward Contract Sale **Less** Home Currency Liability Paid including interest.

11.4 EXCHANGE RATE RISK MANAGEMENT

Foreign exchange risk is the level of uncertainty that a company must manage for changes in foreign exchange rates, that will adversely affect the money the company receives for goods and services over a period of time.

For example, a company sells goods to a foreign company. They ship the goods today, but will not receive payment for several days, weeks or months. During this grace period, the exchange rates fluctuate. At the time of settlement, when the foreign company pays the domestic company for the goods, the rates may have traveled to a level that is less than what the company contemplated. As a result, the company may suffer a loss or the profits may erode.

To minimize or manage the risk, companies enter into contracts to buy foreign currency at a specified rate. This allows the companies to minimize the uncertainty of the rates, so that they can price their products accordingly.

A common definition of exchange rate risk relates to the effect of unexpected exchange rate changes on the value of the firm (Madura, 1989). In particular, it is defined as the possible direct loss (as a result of an unhedged exposure) or indirect loss in the firm's cash flows, assets and liabilities, net profit and, in turn, its stock market value from an exchange rate movement. To manage the exchange rate risk inherent in every multinational firm's operations, a firm needs to determine the specific type of current risk exposure, the hedging strategy and the available instruments to deal with these currency risks.

Multinational firms are participants in currency markets by virtue of their international transactions. To measure the impact of exchange rate movements on a firm that is involved in foreign-currency denominated operations, i.e., the implied value-at-risk (VaR) from exchange rate moves, we need to identify the type of risks that the firm is exposed to and the amount of risk encountered (Hakala and Wystup, 2002).

Types of Exchange Rate Risk

The three main types of exchange rate risk are-

1. **Transaction risk**, which is basically cash flow risk and deals with the effect of exchange rate moves on

transactional account exposure related to receivables (export contracts), payables (import contracts) or repatriation of dividends. An exchange rate change in the currency of denomination of any such contract will result in a direct transaction exchange rate risk to the firm;

2. **Translation risk**, which is basically balance sheet exchange rate risk and relates exchange rate moves to the valuation of a foreign subsidiary and, in turn, to the consolidation of a foreign subsidiary to the parent company's balance sheet. Translation risk for a foreign subsidiary is usually measured by the exposure of net assets (assets less liabilities) to potential exchange rate moves. In consolidating financial statements, the translation could be done either at the end-of-the-period exchange rate or at the average exchange rate of the period, depending on the accounting regulations affecting the parent company. Thus, while income statements are usually translated at the average exchange rate over the period, balance sheet exposures of foreign subsidiaries are often translated at the prevailing current exchange rate at the time of consolidation; and

3. **Economic risk**, which reflects basically the risk to the firm's present value of future operating cash flows from exchange rate movements. In essence, economic risk concerns the effect of exchange rate changes on revenues (domestic sales and exports) and operating expenses (cost of domestic inputs and imports). Economic risk is usually applied to the present value of future cash flow operations of a firm's parent company and foreign subsidiaries. Identification of the various types of currency risk, along with their measurement, is essential to develop a strategy for managing currency risk.

Measurement of Exchange Rate Risk

After defining the types of exchange rate risk that a firm is exposed to, a crucial aspect of a firm's exchange rate risk management decisions is the measurement of these risks. Measuring currency risk may prove difficult, at least with regards to translation and economic risk. At present, a widely-used method is the value-at-risk (VaR) model. Broadly, value at risk is defined as the maximum loss for a given exposure over a given time horizon with z% confidence.

The VaR methodology can be used to measure a variety of types of risk, helping firms in their risk management. However, the VaR does not define what happens to the exposure for the (100 – z) % point of confidence, i.e., the worst case scenario.

Since the VaR model does not define the maximum loss with 100% confidence, firms often set operational limits, such as nominal amounts or stop loss orders, in addition to VaR limits, to reach the highest possible coverage.

Value-at-Risk calculation

The VaR measure of exchange rate risk is used by firms to estimate the riskiness of a foreign exchange position resulting from a firm's activities, including the foreign exchange position of its treasury, over a certain time period under normal conditions (Holton, 2003). The VaR calculation depends on 3 parameters:

- The holding period, i.e., the length of time over which the foreign exchange position is planned to be held. The typical holding period is 1 day.
- The confidence level at which the estimate is planned to be made. The usual confidence levels are 99% and 95%.
- The unit of currency to be used for the denomination of the VaR.

Assuming a holding period of x days and a confidence level of y%, the VaR measures what will be the maximum loss (i.e., the decrease in the market value of a foreign exchange position) over x days, if the x-days period is not one of the (100-y)% x-days periods that are the worst under normal conditions. Thus, if the foreign exchange position has a 1-day VaR of $10 million at the 99% confidence level, the firm should expect that, with a probability of 99%, the value of this position will decrease by no more than $10 million during 1 day, provided that usual conditions will prevail over that 1 day. In other words, the firm should expect that the value of its foreign exchange rate position will decrease by no more than $10 million on 99 out of 100 usual trading days, or by more than $10 million on 1 out of every 100 usual trading days.

To calculate the VaR, there exists a variety of models. Among them, the more widely-used are: (1) the historical simulation, which assumes that currency returns on a firm's foreign exchange position will have the same distribution as they had in the past; (2) the variance-covariance model, which assumes that currency returns on a firm's total foreign exchange position are always (jointly) normally distributed and that the change in the value of the foreign exchange position is linearly dependent on all currency returns; and (3) Monte Carlo simulation, which assumes that future currency returns will be randomly distributed.

The historical simulation is the simplest method of calculation. This involves running the firm's current foreign exchange position across a set of historical exchange rate changes to yield a distribution of losses in the value of the foreign exchange position, say 1,000, and then computing a percentile (the VaR). Thus, assuming a 99% confidence level and a 1-day holding period, the VaR could be computed by sorting in ascending order the 1,000 daily losses and taking the 11th largest loss out of the 1,000 (since the confidence level implies that 1 percent of losses – 10 losses –should exceed the VaR). The main benefit of this method is that it does not assume a normal distribution of currency returns, as it is well documented that these returns are not normal but rather leptokurtic. Its shortcomings, however, are that this calculation requires a large database and is computationally intensive.

The variance – covariance model assumes that (1) the change in the value of a firm's total foreign exchange position is a linear combination of all the changes in the values of individual foreign exchange positions, so that also the total currency return is linearly dependent on all individual currency returns; and (2) the currency returns are jointly normally distributed. Thus, for a 99% confidence level, the VaR can be calculated as:

VaR = - Vp (Mp + 2.33 Sp)

where Vp is the initial value (in currency units) of the foreign exchange position.

Mp is the mean of the currency return on the firm's total foreign exchange position, which is a weighted average of individual foreign exchange positions.

Sp is the standard deviation of the currency return on the firm's total foreign exchange position, which is the standard deviation of the weighted transformation of the variance-covariance matrix of individual foreign exchange positions (note that the latter includes the correlations of individual foreign exchange positions).

While the variance-covariance model allows for a quick calculation, its drawbacks include the restrictive assumptions of a normal distribution of currency returns and a linear combination of the total foreign exchange position. Note, however, that the normality assumption could be relaxed (Longin, 2001). When a non-normal distribution is used instead, the computational cost would be higher due to the additional estimation of the confidence interval for the loss exceeding the VaR.

Monte Carlo simulation usually involves principal components analysis of the variance-covariance model, followed by random simulation of the components. While its main advantages include its ability to handle any underlying distribution and to more accurately assess the VaR when non-linear currency factors are present in the foreign exchange position (e.g., options), its serious drawback is the computationally intensive process.

Management of Exchange Rate Risk

After identifying the types of exchange rate risk and measuring the associated risk exposure, a firm needs to decide whether or not to hedge these risks. In international finance, the issue of the appropriate strategy to manage (hedge) the different types of exchange rate risk has yet to be settled (Jacque, 1996). In practice, however, corporate treasurers have used various currency risk management strategies depending, *ceteris paribus*, on the prevalence of a certain type of risk and the size of the firm (Allen, 2003).

Hedging strategies

Indicatively, transaction risk is often hedged tactically (selectively) or strategically to preserve cash flows and earnings, depending on the firm's treasury view on the future movements of the currencies involved. Tactical hedging is used by most firms to hedge their transaction currency risk relating to short-term receivable and payable transactions, while strategic hedging is used for longer-period transactions. However, some firms decide to use passive hedging, which involves the maintenance of the same hedging structure and execution over regular hedging periods, irrespective of currency expectations – that is, it does not require that a firm takes a currency view.

Translation, or balance sheet, risk is hedged very infrequently and non-systematically, often to avoid the impact of possible abrupt currency shocks on net assets. This risk involves mainly long-term foreign exposures, such as the firm's valuation of subsidiaries, its debt structure and international investments. However, the long-term nature of these items and the fact that currency translation affects the balance sheet rather than the income statement of a firm, make hedging of the translation risk less of a priority for management. For the translation of currency risk of a subsidiary's value, it is standard practice to hedge the net balance sheet exposures, i.e., the net assets (gross assets less liabilities) of the subsidiary that might be affected by an adverse exchange rate move.

Within the framework of hedging the exchange rate risk in a consolidated balance sheet, the issue of hedging a firm's debt profile is also of paramount importance (Marrison, 2002; Jorion and Khoury, 1996). The currency and maturity composition of a firm's debt determines the susceptibility of its net equity and earnings to exchange rate changes. To reduce the impact of exchange rates on the volatility of earnings, the firm may use an optimization model to devise an optimal set of hedging strategies to manage its currency risk. Hedging the remaining currency exposure after the optimization of the debt composition is a difficult task. A firm may use tactical hedging, in addition to optimization, to reduce the residual currency risk. Moreover, if exchange rates do not move in the anticipated direction, translation risk hedging may cause either cash flow or earnings volatility. Therefore, hedging translation risk often involves careful weighing of the costs of hedging against the potential cost of not hedging.

Economic risk is often hedged as a residual risk. Economic risk is difficult to quantify, as it reflects the potential impact of exchange rate moves on the present value of future cash flows. This may require measuring the potential impact of an exchange rate deviation from the benchmark rate used to forecast a firm's revenue and cost streams over a given period. In this case, the impact on each flow may be netted out over product lines and across markets, with the net economic risk becoming small for firms that invest in many foreign markets because of offsetting effects. Also, if exchange rate changes follow inflation differentials (through PPP) and a firm has a subsidiary that faces cost inflation above the general inflation rate, the firm could find its competitiveness eroding and its original value deteriorating as a result of exchange rate adjustments that are not in line with PPP (Froot and Thaler, 1990). Under these circumstances, the firm could best hedge its economic exposure by creating payables (e.g., financing operations) in the currency in which the firm's subsidiary experiences the higher cost inflation (i.e., in the currency in which the firm's value is vulnerable).

Sophisticated corporate treasuries, however, are developing efficient frontiers of hedging strategies as a more integrated approach to hedge currency risk than buying a plain vanilla hedge to cover certain foreign exchange exposure (Kritzman, 1993). In effect, an efficient frontier measures the cost of the hedge against the degree of risk hedged. Thus, an efficient frontier determines the most efficient hedging strategy as that which is the cheapest for the most risk hedged. Given a currency view and exposure, hedging optimization models usually compare 100% unhedged strategies with 100% hedged using vanilla forwards and option strategies in order to find the optimal one. Although this approach to managing risk provides the least-cost hedging structure for a given risk profile, it critically depends on the corporate treasurer's view of the exchange rate. Note that such optimization can be used for transaction, translation or economic currency risk, provided that the firm has a specific currency view (i.e., a possible exchange rate forecast over a specified time period).

Methods of Managing Risk

(a) Exposure Netting, i.e. creating an offsetting borrowing of asset. Also called Money Market Operations.

(b) Forward Exchange Contracts.

(c) Currency Futures and Options.

(d) Appropriate Capital Structure (for long term risks) [Expectations on funds raised in Foreign Currency will also vary with exchange rate fluctuations, thereby leaving the Value of the Firm unaffected to a great extent).

(e) Diversified production, Marketing and Financing (for Economic Risk).

(f) Foreign Currency Bank Account, so that inflow and outflow are matched at different points time, and protecting the Firm against exchange rate fluctuations.

(g) Currency Swap Arrangement.

Foreign Exchange Risk Hedging Tools

Forward Contract

Hedging refers to managing risk to an extent that it is bearable. In international trade and dealings foreign exchange plays an important role. Fluctuations in foreign exchange rates can have significant implications on business decisions and outcomes. Many international trade and business dealings are shelved or become unworthy due to significant exchange rate risk embedded in them. Historically, the foremost instrument used for managing exchange rate risk is the forward rate. Forward rates are custom agreements between two parties to fix the exchange rate for a future transaction. This simple arrangement easily eliminates exchange rate risk, however, it has some shortcomings, particularly the difficulty in getting a counter party who would agree to fix the future rate for the amount and at the time period in question. By entering into a forward rate agreement with a bank, the businessman simply transfers the risk to the bank, which will now have to bear this risk. Of course, the bank, in turn, may have to make some other arrangement to manage this risk. Forward contracts are somewhat less familiar, probably because no formal trading facility, building or even regulating body exists.

Futures Contract

The futures market came into existence as an answer for the shortcomings inherent in the forward market. The futures market solves some of the shortcomings of the forward market, particularly the need and the difficulty in finding a counter party. A currency futures contract is an agreement between two parties to buy or sell a particular currency at a future date, at a particular exchange rate that is fixed or agreed upon upfront. This sounds a lot like the forward contract. In fact, the futures contract is similar to the forward contract but is much more liquid. It is liquid because it is traded in an organized exchange —

i.e. the futures market. Futures contracts are standardized contracts and thus are bought and sold just like shares in a stock market. The futures contract is also a legal contract just like the forward, however, the obligation can be 'removed' prior to the expiry of the contract by making an opposite transaction,

i.e. if one had purchased a futures contract then one may exit by selling the same contract. When hedging with futures, if the risk is an appreciation in value, then one needs to buy futures, whereas if the risk is a depreciation then one needs to sell futures. Consider our earlier example, instead of using forwards, ABC could have thus sold rupee futures to hedge against a rupee depreciation. Let's assume accordingly that ABC sold rupee futures at the rate RM0.10 per rupee. Hence the size of the contract is RM1,000,000. Now assume that the rupee depreciates to RM0.07 per rupee — the very thing ABC was afraid of. ABC would then close the futures contract by buying back the contract at this new rate. Note that in essence ABC bought the contract for RM0.07 and sold it for RM0.10. This gives a futures profit of RM 3,00,000 [(RM0.10-RM0.07) x 1,00,00,000]. However, in the spot market ABC gets only RM 7,00,000 when it exchanges the 10,000,000 rupees at RM0.07. The total cash flow, however, is maintained at RM 10,00,000 (RM 7,00,000 from spot and RM300,000 profit from futures). With perfect hedging the cash flow would always be RM1 million no matter what happens to the exchange rate in the spot market. One advantage of using futures for hedging is that ABC can release itself from the futures obligation by buying back the contract anytime before the expiry of the contract. To enter into a futures contract a trader, however, needs to pay a deposit (called an initial margin) first. Then his position will be tracked on a daily basis so much so that whenever his account makes a loss for the day, the trader will receive a margin call (also known as variation margin), requiring him to pay up the losses.

Currency Options

A currency option may be defined as a contract between two parties — a buyer and a seller — whereby the buyer of the option has the right but not the obligation, to buy or sell a specified currency at a specified exchange rate, at or before a specified date, from the seller of the option. While the buyer of an option enjoys a right but not an obligation, the seller of the option, nevertheless, has an obligation in the event the buyer exercises the given right. There are two types of options:

- **Call option** — gives the buyer the right to buy a specified currency at a specified exchange rate, at or before a specified date.

- **Put option** — gives the buyer the right to sell a specified currency at a specified exchange rate, at or before a specified date.

The seller of the option, of course, needs to be compensated for giving the right. The compensation is called the price or the premium of the option. The seller thus has an obligation in the event the right is exercised by the buyer.

For example, assume that a trader buys a September RM0.10 rupee call option for RM0.01. This means that the trader has the right to buy rupees for RM0.10 per rupee at anytime until the contract expires in September. The trader pays a premium of RM0.01 for this right. The RM0.10 is called the strike price or the exercise price. If the rupee appreciates over RM0.10 anytime before expiry, the trader may exercise his right and buy it for only RM0.10 per rupee. If, however, the rupee were to depreciate below RM0.10, the trader may just let the contract expire without taking any action since he is not obligated to buy it at RM0.10. In this case, if he needs physical rupee, he may just buy it in the spot market at the new lower rate.

In hedging using options, calls are used if the risk is an upward trend in price, while puts are used if the risk is a downward trend. In our ABC example, since the risk is a depreciation of rupees, ABC would need to buy put options on rupees. If rupees were to depreciate at the time ABC receives its rupee revenue, then ABC would exercise its right and thereby effectively obtain a higher exchange rate. If, however, rupees were to appreciate instead, ABC would then just let the contract expire and exchange its rupees in the spot market at the higher exchange rate. Therefore, the options market allows traders to enjoy unlimited favourable movements while limiting losses. This feature is unique to options, unlike the forward or futures contracts where the trader has to forego favourable movements and there are also no limits to losses.

Options are particularly suited as a hedging tool for contingent cash flows, as is the case in bidding processes. When a firm bids for a project overseas, which involves foreign exchange risk, the options market allows it to quote its bid price and at the same time protect itself from the exchange rate fluctuations in the event the bid is won. In the case of hedging with forwards or futures, the firm would be automatically placed in a speculative position in the event of an unsuccessful bid, without any limit to its downside losses.

Money Market Operations

Money Market Operations refers to creating; an equivalent asset or liability against a Foreign Currency Liability or Receivable. It involves a series of transactions for taking the opposite position. It involves creating an Foreign Currency Asset (Deposits) or Foreign Currency Liability (Borrowings), based on the respective positions. All markets are not open and all currencies are not fully convertible. Therefore, this option may have very little practical application.

Leading and Lagging

It refers to the adjustment of the times of payments that are made in foreign currencies. Leading is the payment of an obligation before due date while lagging is delaying the payment of an obligation past due date. The purpose of these techniques is for the company to take advantage of expected devaluation or revaluation of the appropriate currencies. Lead and lag payments are particularly useful when forward contracts are not possible.

It is more attractive to use for the payments between associate companies within a group. Leading and lagging are aggressive foreign exchange management tactics designed to take the advantage of expected exchange rate changes. Buckley (1988) supports the argument with the following example:

Subsidiary b in B country owes money to subsidiary a in country A with payment due in three months' time and with the debt denominated in US dollar. On the other side, country B's currency is expected to devalue within three months against US dollar moreover vis-à-vis country A's currency. Under these circumstances, if company b leads -pays early - it will have to part with less of country B's currency to buy US dollar to make payment to company A. Therefore, lead is attractive for the company. When we take reverse the example-revaluation expectation, it could be attractive for the lagging.

On the other hand, in case of lagging payment to an independent third party, there is always the possibility of upsetting the trading relationship, with possible loss of credit facilities or having prices increased to compensate for the delay in the receipt of funds. There is also the possibility of damage to the lagging company's external credit rating.

Currency Swaps

Currency Swap involves an exchange of cash payments in one currency for cash payments in another currency. It is an agreement to exchange principal and interest-rate obligations in different currencies at an agreed rate. Currency Swaps allows a Firm to re-denominate a loan from one currency into another currency.

Basis:

- An Indian Company will be able to get funds at a lower rate in India than abroad. Likewise, an American Company would be able to get funds at a lower rate in US than in India.
- If the American Company wants to make an investment in India and the Indian Company in the US, then the Companies would borrow in their respective countries, and exchange the interest obligations, for mutual benefit.

Example: Interest Rate offered by an American Bank and an Indian Bank are as follows-

Banks in ⇒	**India**	**USA**
Interest Rate for Indian Co.	10%	8%
Interest Rate for USA Co.	12.50%	7%

In the above case, the USA Company would borrow in the US and fund that for Indian Company's operations, and the Indian Company will borrow in India and find that for American Company's operations. The gain of 1.50% (difference in spread) will be shared among the Company. If the gain is shared in equal measure, then the effective interest rates would be —

— For Indian Company: USA Rate of 7% Less Share in Gain 0.75% = 6.25%

— For US Company: India Rate of 12.50% Less Share in Gain 0.75% = 11.75%

Exposure Netting

Exposure netting involves offsetting exposures in one currency with exposures in the same or another currency, where exchange rates are expected to move in such a way that losses(gains) on the first exposed position should be offset by gains (losses) on the second currency exposure.

The assumption underlying exposure netting is that the net gain or loss on the entire exposure portfolio is what matters, rather than the gain or loss on any individual monetary unit.

Settlement Risk: Settlement Netting/ Settlement Risk is the difference of the summed transactions between the parties which is actually transferred.

Example: A Bank is required to pay USD 1,00,000 and USD 2,75,000 to Mr. A, and collect from him USD 1,75,000, Euro 50,000, then the net payable is called the settlement netting or settlement risk.

Situation for Exposure Netting: Exposure netting occurs where outstanding positions are netted against one another in the event of counter party default.

Currency Forward Contract Agreement

Foreign currency forward contracts are used as a foreign currency hedge when an investor has an obligation to either make or take a foreign currency payment at some point in the future. If the date of the foreign currency payment and the last trading date of the foreign currency forwards contract are matched up, the investor has in effect "locked in" the exchange rate payment amount.

By locking into a forward contract to sell a currency, the seller sets a future exchange rate with no upfront cost. For example, a U.S. exporter signs a contract today to sell hardware to a French importer. The terms of the contract require the importer to pay euros in six months' time. The exporter now has a known euro receivable. Over the next six months, the dollar value of the euro receivable will rise or fall depending on fluctuations in the exchange rate. To mitigate his uncertainty about the direction of the exchange rate, the exporter may elect to lock in the rate at which he will sell the euros and buy dollars in six months. To accomplish this, he hedges the euro receivable by locking in a forward.

This arrangement leaves the exporter fully protected should the currency depreciate below the contract level. However, he gives up all benefits if the currency appreciates. In fact, the seller of a forward rate faces unlimited costs should the currency appreciate. This is a major drawback for many companies that consider this to be the true cost of a forward contract hedge. For companies that consider this to be only an opportunity cost, this aspect of a forward is an acceptable "cost". For this reason, forwards are one of the least forgiving hedging instruments because they require the buyer to accurately estimate the future value of the exposure amount.

Like other future and forward contracts, foreign currency futures contracts have standard contract sizes, time periods, settlement procedures and are traded on regulated exchanges throughout the world. Foreign currency forwards contracts may have different contract sizes, time periods and settlement procedures than futures contracts. Foreign currency forwards contracts are considered over-the-counter (OTC) because there is no centralized trading location and transactions are conducted directly between parties via telephone and online trading platforms at thousands of locations worldwide.

Key Points:

- Developed and grew in the late '70s when governments relaxed their control over their currencies
- Used mainly by banks and corporations to mange foreign exchange risk
- Allows the user to "lock in" or set a future exchange rate.
- Parties can deliver the currency or settle the difference in rates with cash.

Example: Currency Forward Contracts

Corporation A has a foreign sub in Italy that will be sending it 10 million euros in six months. Corp. A will need to swap the euro for the euros it will be receiving from the sub. In other words, Corp. A is long euros and short dollars. It is short dollars because it will need to purchase them in the near future. Corp. A can wait six months and see what happens in the currency markets or enter into a currency forward contract. To accomplish this, Corp. A can short the forward contract, or euro, and go long the dollar.

Corp. A goes to Citigroup and receives a quote of .935 in six months. This allows Corp. A to buy dollars and sell euros. Now Corp. A will be able to turn its 10 million euros into 10 million * .935 = 935,000 dollars in six months.

Six months from now if rates are at .91, Corp. A will be ecstatic because it will have realized a higher exchange rate. If the rate has increased to .95, Corp. A would still receive the .935 it originally contracts to receive from Citigroup, but in this case, Corp. A will not have received the benefit of a more favorable exchange rate.

Extent of Forward Cover:

Aspect	Full Forward Cover	Partial Forward Cover
Meaning	Full cover refers to buying or selling (as appropriate) the foreign currency equivalent to that foreign currency liability or receivable.	It refers to buying or selling (as appropriate) the foreign currency at less than the corresponding foreign currency liability or receivable.
Example	Against a Dollar Receivable of USD 10,000, selling USD 10,000 in the Forward Cover market.	Against a Euro Receivable of 50,000, selling Euro 30,000 in the Forward Cover market.
Applicability	When the Firm is sure that the Foreign Currency will fall or rise.	Firm is not 100% sure that the Foreign Currency will fall or rise.

The differences between long and short positions in forward markets are as follows:

- The long position holder is the buyer of the contract and the short position holder is the seller of the contract.
- The long position will take the delivery of the asset and pay the seller of the asset the contract value, while the seller is obligated to deliver the asset versus the cash value of the contract at the origination date of this transaction.

- When it comes to default, both parties are at risk because typically no cash is exchanged at the beginning of the transaction. However, some transactions do require that one or both sides put up some form of collateral to protect them from the defaulted party.

Procedures for Settling a Forward Contract at Expiration

A forward contact at expiration can be settled in one of two ways:

1. **Physical Delivery** - Refers to an option or futures contract that requires the actual underlying asset to be delivered on the specified delivery date, rather than being traded out with offsetting contracts. Most derivatives are not actually exercised, but are traded out before their delivery dates. However, physical delivery still occurs with some trades: it is most common with commodities, but can also occur with other financial instruments. Settlement by physical delivery is carried out by clearing brokers or their agents. Promptly after the last day of trading, the regulated exchange's clearing organization will report a purchase and sale of the underlying asset at the previous day's settlement price (also referred to as the "invoice price"). Traders who hold a short position in a physically settled security futures contract to expiration are required to make delivery of the underlying asset. Those who already own the assets may tender them to the appropriate clearing organization. Traders who do not own assets are obligated to purchase them at the current price.

   Exchanges specify the conditions of delivery for the contracts they cover. Acceptable locations for delivery (in the case of commodities or energies) and requirements as to the quality, grade or nature of the underlying asset to be delivered are regulated by the exchanges. For example, only certain Treasury bonds may be delivered under the Chicago Board of Trade's Treasury bond future. Only certain growths of coffee may be delivered under the Coffee, Sugar and Cocoa Exchange's coffee future. In many commodity or energy markets, parties want to settle futures by delivery, but exchange rules are too restrictive for their needs. For example, the New York Mercantile Exchange requires that natural gas be delivered only at the Henry Hub in Louisiana, a location that may not be convenient for all futures traders.

2. **Cash Settlement** - Refers to an option or futures contract that requires the counterparties to the contract to net out the cash difference in the value of their positions. The appropriate party receives the cash difference. In the case of cash settlement, no actual assets are delivered at the expiration of a futures contract. Instead, traders must settle any open positions by making or receiving a cash payment based on the difference between the final settlement price and the previous day's settlement price. Under normal circumstances, the final settlement price for a cash- settled contract will reflect the opening price for the underlying asset. Once this payment is made, neither the buyer nor the seller of the futures contract has any further obligations on the contract.

Terminating a Forward Contract Prior to Expiration

Parties to a futures contract may also terminate the contract prior to expiration through an offset. Offset is the transaction of a reversing trade on the exchange. If you are long 20 March soybean futures traded on the Chicago Board of Trade, you can close the position by taking an offsetting short position in 20 March soybean contracts on the same exchange. There will be a final margining at the end of the day, and then the position will be closed. In other words, if you buy a futures contract and subsequently sell a comparable contract, you have offset your position and the contract is extinguished. Offset trades must match in respect to the underlying asset, delivery dates, quantity, etc., or the original position will not be effectively terminated. In such cases, price movements in the original contract will continue to result in gains or losses.

Compare this to the forward market wherein if you buy a forward contract and then sell an identical forward contract you are left with obligations under two contracts - one long and one short

Default Risk and Early Termination

Default risk on early termination only applies to forward contracts because there is no default risk on futures. (As we stated earlier, futures trades made on a formal exchange are cleared through a clearing organization, which acts as the buyer to all sellers and the seller to all buyers. The clearing house acts as a counterparty, guaranteeing delivery and payment and nullifying any default risk.)

Forward contracts are negotiated agreements between buyer and seller. To enter into a forward contract, it is necessary to find someone who wants to buy exactly what you want to sell when and where you want to sell it. Without a formal exchange and clearing house to guarantee delivery and payment, there is always a chance that either the buyer or the seller will default on an obligation. If one of these counterparties fails, the other is still responsible for performing under the contract. Traders in forward contracts who re-enter the market to execute a reversing trade prior to the expiration date will effectively *increase* their default risk exposure because they will be dealing with two different counterparties, both of which have to live up to their ends of the bargain. To extinguish default risk on a forward contract, a trader must place the reversing position with *the same* counterparty and under the same terms as in the originally contract. Obviously, this makes it difficult to get out of a forward contract prior to termination.

Roll Over of Forward Contract

In the forex (FX) market, rollover is the process of extending the settlement date of an open position. In most currency trades, a trader is required to take delivery of the currency two days after the transaction date. However, by rolling over the position - simultaneously closing the existing position at the daily close rate and re-entering at the new opening rate the next trading day - the trader artificially extends the settlement period by one day.

Often referred to as tomorrow next, rollover is useful in FX because many traders have no intention of taking delivery of the currency they buy - rather, they want to profit from changes in the exchange rates. Since every forex trade is transacted by borrowing one country's currency to buy another, receiving and paying interest is a regular occurrence. At the close of every trading day, a trader who took a long position in a high yielding currency relative to the currency that he or she borrowed will receive an amount of interest in his or her account. Conversely, a trader will need to pay interest if the currency he or she borrowed has a higher interest rate relative to the currency that he or she purchased. Traders who do not want to collect or pay interest should close out of their positions by 5pm ET.

Note that the interest that is received or paid by a currency trader in the course of these forex trades is regarded by the IRS as ordinary interest income or expense. For tax purposes, the currency trader should keep track of interest received or paid, separate from regular trading gains and losses.

Cross-Currency Roll Over

Cross Currency Roll Over contacts are contracts to cover overseas leg of long term foreign exchange liabilities or assets. The cover is initially obtained for six months & later extended for further period of 6 months & so on.

Roll Over charge or benefit depends on forward premium or discount, which in turn, is a function of interest rate differential between US dollar & the other currency. There is no risk of currency appreciation or depreciation in the overseas leg.

Roll over for a maturity period exceeding 6 months is not possible because in the inter-bank market, quotations beyond 6 months are not available.

Under the Roll over contracts the basic rate of exchange is fixed but loss or gain arises at the time of each Roll over depending upon the market conditions.

Money Market Hedge

Money Market Operations refers to creating an equivalent asset or liability against a Foreign Currency Liability or Receivable. It involves a series of transactions for taking the opposite position. It involves creating an Foreign Currency Asset (Deposits) or Foreign Currency Liability (Borrowings), based on the position it is.

In hedging Foreign Currency risk under the Money Market Operations route, the following steps are involved —

Step	Process
1	Identification of Position, i.e. whether the Firm wants to hedge its position against a Foreign Currency Receivable [Asset] or a Foreign Currency Payable [Liability]
2	Creation of Foreign Currency Liability or Asset, such that at the time of maturity — (a) Foreign Currency Liability including Interest = Foreign Currency Receivable (b) Foreign Currency Asset including Interest = Foreign Currency Payable

(a) Hedging against Foreign Currency Receivable:

Facts: Firm will receive Foreign Currency at Maturity. To realize it in home currency, the Firm will **SELL** Foreign Currency at Maturity.

Inference: ⇒ Foreign Currency Receivable is an Asset ⇒ Under Money Market Hedge, Liability in Foreign Currency should be created ⇒ Firm should borrow in Foreign Currency and Invest in Home Currency.

Action	Time	Activity
Borrow	Now	Borrow in Foreign currency, at its Borrowing Rate, which including the interest payable thereon till the maturity, will be equivalent to the Foreign Currency Receivable at the time of maturity. $\text{Amount Borrowed} = \frac{\text{Foreign Currency Receivable}}{1+\text{Borrowing Interest Rate for the Period Till Maturity}}$
Convert	Now	Convert the Foreign Currency Borrowings at Spot Rate to Local / Home Currency. Home Currency Realized = Borrowings x Bid Rate for the Foreign Currency in terms of Home Currency.
Invest	Now	Invest the home currency realized in Home Currency Deposits.
Realize	Maturity	Realize the maturity value of Home Currency Deposits.
Receive	Maturity	Receive the Foreign Currency Remittance from the Customer abroad.
Repay	Maturity	Repay the Foreign Currency Loan using the inward remittance from the Foreign Customer.

(b) Hedging Against Foreign Currency Payable:

Facts: Firm will pay Foreign Currency at Maturity. To repay the Liability, the Firm will **BUY** Foreign Currency at Maturity.

Inference: ⇒ Foreign Currency Payable is a Liability ⇒ Under Money Market Hedge, Asset in Foreign Currency should be created ⇒ Firm should borrow in Home Currency and Invest in Foreign Currency.

Action	Time	Activity
Borrow	Now	Borrow in Home Currency, sum equivalent to amount required for investing in Foreign Currency Deposits, which would yield at maturity, an amount equivalent to the Foreign Currency Liability. $\text{Amount Borrowed} = \frac{\text{Foreign Currency Payable}}{1+\text{Forex Deposit Rate for the Period Till Maturity}} \times \text{Spot Ask Rate}$
Convert	Now	Convert the Home Currency Borrowings into Foreign Currency at Spot Rate
Invest	Now	Invest the Foreign Currency purchased in Foreign Currency Deposits.
Realize	Maturity	Realize the maturity value Foreign Currency Deposits.
Settle	Maturity	Use the Maturity Value of Foreign Currency Deposits to settle the Foreign Currency Liability.
Repay	Maturity	Repay the amount borrowed in Home Currency along with interest.

Money Market Operations and Covered interest Arbitrage

Though the sequence of activities, for both Money Market Operations and Covered Interest Arbitrage is similar, the difference lies on the purpose of entering into these actions —

Aspect	Covered Interest Arbitrage	Money Market Operations
Purpose	Covered Interest Arbitrage is undertaken with a view to make a gain out of inefficiency in fixing the Forward Quote.	Money Market Operations are done to hedge a Foreign Currency Risk associated with a future receivable or payable. The purpose is to eliminate the uncertainty and not to make gain.
Result	It will always result in gain.	It may not result in gain when compared with the spot rate prevailing on the maturity date.
Pre-Requisites	It does not require any future liability or receivable to be present before borrowing or investing.	To undertake money market operations, it is a prerequisite to have an ascertained future receivable or liability.

Asset & Liability Management

Asset and Liability- Management refers to creating the liability in the same currency as the asset. If Fixed Assets are acquired for Foreign Operations for use abroad, then the funding is done through Foreign Currency Liability. Asset Liability Management would be fruitful, only if operating cash flows are also denominated in the Foreign Currency i.e. only if an entity has operations abroad. A proper Asset Liability Management would result in proper tax planning and the financials will present a true or an unbiased picture of the state of operations.

Example: Purchase of Land in United Kingdom by a GBP denominated loan. Change in exchange rate would affect both the asset and liability values, and therefore, the consolidated results would also reflect proper picture.

11.5 FOREIGN INVESTMENT ANALYSIS

Global corporations evaluating foreign investments find their analysis complicated by a variety of problems that are rarely, if ever, faced by domestic firms. Recent times have seen a massive surge in cross-border direct investments. With direct (as distinct from Portfolio) investments, range from purchase of new equipment to replace existing equipment, to an investment in an entirely new business venture in a country where, typically, manufacturing or assembly has not previously been done. The technique is also useful for decisions to disinvest, that is, liquidate or simply walk away from an existing for investment. The overall financial investment decision has two components like the quantitative analysis of available data and the decision to invest abroad as part of the firm's strategic plans. Investments of sufficient size as to be important are usually conceived initially because they fit into a firm's strategic plan. The quantitative analysis which follows is usually done to determine if implementation of the strategic plan is financially feasible or desirable. Foreign investment deals with the quantitative aspects of foreign investment analysis. It treats, first, the general methodology of capital budgeting, second, the international complexities of that procedure, and third, the implications of international accounting for conclusions reached by that methodology. For convenience, the United States will be regarded as "home". However, the principles discussed have relevance for any home company investing in a foreign language. In recent years, abundance of new research has been conducted in one area of international corporate finance. The major thrust of this work has been to apply the methodology and logic of financial economics to the study of key international financial decisions. Critical problem areas, such as foreign exchange risk management and foreign investment analysis, have benefited from the insights provided by financial economics – a discipline that emphasizes the use of economic analysis to understand basic working of financial markets, particularly the measurement and pricing of risk and the international allocation of funds.

Taxes levied by the Host Country (Foreign Country) will be significantly different from the taxes levied in the Home Country. Even in the Host Country, taxes on residents will vary from taxes on non-residents. Therefore, taxes on income and other indirect tax levies should be given appropriate considerations.

Political Risks: It is the possibility that the political conditions surrounding the project may become adverse, due to change in Host Country's Government Policies. Examples of Political Risk —

(a) Expropriation, i.e. Seizure of property/ nationalization of industry without paying full compensation [In India Retail Trades have been opened up for Foreign Investment. At a later date, the Government may ban Foreign Investment in Retail Trade.]

(b) Banning of Products to cater to local demand.

(c) Levy of additional taxes on profits.

(d) Exchange control regulations blocking flow of funds.

(e) Restrictions on employment of foreign managerial / technical personnel Considering the above, a higher risk premium for the project in the foreign country should be adjusted.

Economic risks: Economic risks which influence the success of a project are exchange rate changes and inflation. Effect of these should also be considered while evaluating based on NPV.

Exchange Rate Risk: Impact of exchange rate changes and inflation upon incremental revenue and upon each element of incremental cost need to be computed.

Foreign investment proposal under Discounted Cash Flow approach

General Principles: The general principles applicable to an international investment are similar to domestic investment decisions, which are —

(a) Discounting incremental cash flow of the investment.

(b) Discounting should be done based on opportunity cost of capital.

(c) The entity should be able to invest the operating surplus for a return which is equivalent to the opportunity cost of capital.

Special Consideration: In case of evaluation of Foreign Investment proposal, consideration should be accorded to the exchange rate applicable for the Foreign Investment Proposals. Following are the points to be noted in this regard —

(a) Foreign Currency Cash Flow: If the project is evaluated based on the Foreign Currency cash Flows, then the discount rate applied should be adjusted for Foreign Currency risks or movements.

(b) Home Currency Cash Flow: If the project is evaluated based on the Home Currency Cash Flows (i.e. by estimating the Future Spot Rate and converting foreign currency cash flows), then the opportunity cost of capital applicable to Home Currency Cash Flows.

Steps Involved:

(a) Cash Flows in Foreign Currency:

Step 1: Compute the Operating and Investing Cash Flows in Foreign Currency

Step 2: Compute the appropriate discount rate applicable for the Foreign Currency Cash Flow.

Step 3: Evaluate the project by discounting the Foreign Currency Cash Flows using the Foreign Currency Discount Rate i.e. Compute NPV in Foreign Currency Terms.

Step 4: Apply the Spot Rate to convert NPV in Foreign Currency Terms to Home Currency NPV.

(b) Cash Flows in Home Currency:

Step 1: Compute the Operating and Investing Cash Flows in Foreign Currency.

Step 2: Compute the expected Future Spot Rate based on inflation, interest rate differentials or annualized appreciation or depreciation in Foreign Currency.

Step 3: Convert the Foreign Currency Cash Flows into Home Currency Cash Flows using such Future Spot Rates.

Step 4: Compute the Home Currency Discount Rate.

Step 5: Evaluate the project by discounting the Cash flows expressed in Home Currency using the Home Currency Discount Rate to identify the Project NPV in Home Currency Terms.

Computation of Foreign Currency Discount Rates:

(a) Fischer Effect (Inflation Adjustment): Real Rate of Return will be identical for a project in all the countries. Only the inflation for different countries will vary and therefore, only that should be adjusted to ascertain the appropriate discount rate —

- Identify the Real Rate of Return for the project.
- Apply inflation applicable for the Foreign Country, to identify- the Nominal Discount Rate for discounting Foreign Currency Cash Flows.

(b) Risk Premium Model: Required Rate of Return for a project in any country will have two components i.e. Risk Free Rate of Return and the Risk Premium. Risk Premium for a project should be identical for a project in different countries. Therefore,- the risk free rate appropriate for the Foreign Country should be adjusted for the Risk Premium of the Project to identify the appropriate discount rate.

- Identify the Risk Premium for the Project, as if it will be denominated in Home Currency.

$$1+\frac{\text{Home Currency}}{\text{Discount Rate}}=\left(1+\frac{\text{Home Currency}}{\text{Risk Free Rate}}\right)\times\left(1+\frac{\text{Project Risk}}{\text{Premium}}\right)$$

$$\Rightarrow \text{Project Risk Premium}=\frac{1+\text{Home Currency Discount Rate}}{1+\text{Home Currency Risk Free Rate}}-1$$

- Identify the Foreign Currency Risk Free Rate of Return.
- Apply the Project Risk Premium to the Foreign Currency Risk Free Rate of Return to determine the Foreign Currency Discount Rate.

$$1+\frac{\text{Foreign Currency}}{\text{Discount Rate}}=\left(1+\frac{\text{Foreign Currency}}{\text{Risk Free Rate}}\right)\times\left(1+\frac{\text{Project Risk}}{\text{Premium}}\right)$$

International Portfolio Investment

A grouping of investment assets that focuses on securities from foreign markets rather than domestic ones is known as International Portfolio Investment. An international portfolio is designed to give the investor exposure to growth in emerging and international markets and provide diversification.

In recent years, economic activity has been characterized by a dramatic increase in the international dimensions of business operations. National economics in all parts of the world have become more closely linked by way of a growing volume of cross-border transactions, not only in terms of goods and services but even more so with respect to financial claims of all kinds. Reduced regulatory barriers between countries, lower cost of communications as well as travel and transportation have resulted in a higher degree of market integration. With respect to real goods and services, this trend towards globalization is clearly reflected in the worldwide growth of exports and imports as a proportion of GDP of individual countries. Consequently, consumption patterns have been internationalized as well, both directly and indirectly.

Alongside the increase in international trade, one can easily observe the globalization of financial activity. Indeed, the growth of cross-border or international flows of financial assets has outpaced the expansion of trade in goods and services. These developments are underpinned by advances in communication and transportation technology. They make geographic distances less significant, and hence, extend the scope of information as well as the speed with which it is available, thus leading to faster and more efficient global financial operations. By the same token, and not unrelated to the technologically driven developments just mentioned, policy-induced capital market liberalization, such as the abolition of capital and exchange controls in most countries, permits an ever growing volume of international financial flows.

As a consequence, investment opportunities are no longer restricted to domestic markets, but financial capital can now seek opportunities abroad with relative ease. Indeed, international competition for funds has caused

an explosive growth in international flows of equities as well as fixed-income and monetary instruments. Emerging markets, in particular, as they have become more and more accessible, have begun to offer seemingly attractive investment alternatives to investors around the globe.

International capital flows are further driven by a divergence in population trends between developed and developing countries. Mature, industrialized countries today are characterized by aging populations with significant needs for private capital accumulation. The underlying demand for savings vehicles is further reinforced by the necessary shift from pay-as-you-go pension schemes towards capital market- based arrangements. By the same token, developing countries with their relatively young populations require persistent and high levels of investment in order to create jobs and raise standards of living in line with the aspirations of their impatient populations. All this provides significant incentives for the growth of international markets for all kinds of financial claims in general and securities in particular.

While the environment has undoubtedly become more conducive to international portfolio investment, the potential benefits for savers/investors have lost none of their attractions. There are the less-than- perfect correlations between national economies, the possibility of hedging an increasingly international consumption basket, and the participation in exceptional growth opportunities abroad, which can now be taken advantage of through international portfolio investment. However, there is considerable controversy among investment professionals, both in academia as well as in the financial services industry, on the issue to what extent these intuitively perceived benefits of international portfolio investment are sufficiently significant.

When the circumstances of the real world are taken into account, additional risks, costs and other constraints to international portfolio investment at best limit the potential advantages, at worst negate the benefits.

Let us now discuss first the different types of unique risks and constrains that are faced by an international portfolio investors:

Unique Risks

The unique international risk can be divided into two components: exchange risk (broadly defined) and political (or country) risk. These are discussed below:

(1) Currency Risk

As foreign assets are denominated, or at least expressed, in foreign currency terms, a portfolio of foreign securities is usually exposed to unexpected changes in the exchange rates of the respective currencies (exchange rate risk or currency risk). These changes can be a source of additional risk to the investor, but at the same time can *reduce* risk for the investor. The net effect depends, first of all, on how volatility is measured, in particular whether it is measured in "real" terms against some index of consumption of goods, or in nominal terms, expressed in units of a base currency. In any case, the effect ultimately depends on the specifics of the portfolio composition, the volatility of the exchange rates, most importantly on the correlation of returns of the securities and exchange rates, and finally on the correlation between the currencies involved. If total risk of a foreign security is decomposed into the components currency risk and volatility in local-currency value, exchange risk contributes significantly to the total volatility of a security. Nevertheless, total risk is less than the sum of market and currency risk.

For equities, currency risk represents typically between 10 and 15 percent of total risk when measured in nominal terms, and the relative contribution is generally even higher for bonds. However, currency risk can be diversified away by investing in securities denominated in many different currencies, preferably with offsetting correlations. In addition to diversification, exchange risk can of course be reduced by means of "hedging" i.e. establishing short or long positions via the use of currency futures and forwards, which represent essentially long or short positions of fixed income instruments, typically with maturities of less than one year. It is not surprising therefore that such strategy continues to be heatedly debated by academics and practitioners alike. In particular, there is no clear guidance with regard to the optimal hedge ratio in an international portfolio investment framework. Contrary to some authors who point out the performance improvement due to "complete" hedges, other researchers find indications that currency hedges are opted to reduce total portfolio risk in the short run, but actually increase the return variance in the long run if the portfolio is fully hedged.

(2) Country Risk

The fact that a security is issued or traded in a different and sovereign political jurisdiction than that of the consumer-investor gives rise to what is referred to as country risk or political risk. Country risk in general can be categorized into transfer risks (restrictions on capital flows), operational risks (constraints on management and corporate activity) and ownership-control risks (Government policies with regard to ownership/managerial control). It embraces the possibility of exchange controls, expropriation of assets, changes in tax policy (like withholding taxes being imposed after the investment are undertaken) or other changes in the business environment of the country. In effect, country risk are local Government policies that lower the actual (after tax) return on the foreign investment or make the repatriation of dividends, interest, and principal more difficult. Political risk also includes default risk due to Government actions and the general uncertainty regarding political and economic developments in the foreign country. In order to deal with these issues, the investor needs to assess the country's prospects for economic growth, its political developments, and its balance of payments trends. Interestingly, political risk is not unique to developing countries. In addition to assessing the degree of Government intervention in business, the ability of the labour force and the extent of a country's natural resources, the investor needs to appraise the structure, size, and liquidity of its securities markets.

Institutional Constraints for International Portfolio Investment

Institutional constraints are typically Government-imposed, and include taxes, foreign exchange controls, and capital market controls, as well as factors such as weak or nonexistent laws protecting the rights of minority stockholders, the lack of regulation to prevent insider trading, or simply inadequate rules on timely and proper disclosure of material facts and information to security holders. These are discussed below:

(1) Taxation

When it comes to international portfolio investment, taxes are both an obstacle as well as an incentive to cross-border activities. Not surprisingly, the issues are complex in large part because rules regarding taxation are made by individual Governments, and there are many of these, all having very complex motivations that reach far beyond simply revenue generation. It is obvious then, since tax laws are national, that it is individual countries that determine the tax rates paid on various returns from portfolio investment, such as dividends, interest and capital gains, all these rules differ considerably from country to country. Countries also differ in terms of institutional arrangements for investing in securities, but in all countries there are institutional investors which may be tax exempt (e.g. pension funds) or have the opportunity for extensive tax deferral (insurance companies). However, countries do not tax returns from all securities in the same way. Income from some securities tends to be exempt in part or totally from income taxes. Almost all countries tax their resident taxpayers on returns from portfolio investment, whether the underlying securities have been issued and are held abroad or at home. This is known as the worldwide income concept. There are a significant number of countries, however, who tax returns from foreign securities held abroad only when repatriated. Obviously, such rules promote a pattern of international portfolio investment where financial wealth is kept "offshore," preferably in jurisdictions that treat foreign investors kindly. Such jurisdictions are frequently referred to as "tax havens." Since such tax havens benefit from the financial industry that caters to investors from abroad, they often make themselves more attractive by adopting law confidentiality provisions, generally referred to as "secrecy laws," protecting the identity of (foreign) investors from the prying eyes of foreign Governments, creditors, relatives and others. It is not surprising, therefore, that tax havens are also used by investors from countries that do not exempt returns from foreign portfolio investment. Apart from differences in national tax regimes, barriers to international portfolio investment are primarily created by "withholding taxes" that most countries in the world (except tax havens) level on investors residing in other countries, on dividends, interest and royalties paid by their resident borrowers.

(2) Foreign Exchange Controls

While the effect of taxation as an obstacle to international portfolio investment is only incidental to its primary purpose, which is to raise revenue, exchange controls are specifically intended to restrain capital flows. Balance of payment reasons or the effort to reserve financial capital for domestic uses lead to these controls. They are accomplished by prohibiting the conversion of domestic funds for foreign moneys for the purpose of acquiring securities abroad. Purchases of securities are usually the first category of international financial transactions to be

subjected to, and the last to be freed from, foreign exchange controls. While countries are quite ready to restrict undesired capital inflows and outflows, they prove reluctant to remove controls when the underlying problem has ceased to exist, or even when economic trends have reversed themselves. Inflow constraints limit the fraction of a domestic firm's equity that may be held by foreign investors. With a binding inflow constraint, one would expect two different prices for domestic assets. Because of the diversification benefit offered by holding foreign securities, there should be a premium on those shares available to foreign investors. On the other hand, outflow constraints limit the amount of capital a domestic investor may spend on foreign assets. Under these conditions, one would expect that, since domestic investors must pay a premium for foreign assets, they will try and substitute those assets with cheap domestic near-substitutes. Thus, foreign asset premiums imply a home bias in portfolio selection. While inflow constraints create a premium on "foreign" share prices, outflow constraints and the home bias will create a premium on "domestic" share prices. Thus, it remains unclear which of the price effects dominates.

(3) Capital Market Regulations

Regulations of primary and secondary security markets typically aim at protecting the buyer of financial securities and try to ensure that transactions are carried out on a fair and competitive basis. These functions are usually accomplished through an examining and regulating body, such as the SEBI in India. Supervision and control of practices and information disclosure by a relatively impartial body is important for maintaining investors' confidence in a market. It is crucial for foreign investors who will have even less direct knowledge of potential abuses, and whose ability to judge the conditions affecting returns on securities may be very limited. Most commonly, capital market controls manifest themselves in form of restrictions on the issuance of securities in national capital markets by foreign entities, thereby making foreign securities unavailable to domestic investors. Moreover, some countries put limits on the amount of investment that the local investors can do abroad or constrain the extent of foreign ownership in national companies. While few industrialized countries nowadays prohibit the acquisition of foreign securities by private investors, institutional investors face a quite different situation. Indeed, there is almost no country where financial institutions, insurance companies, pension funds, and similar fiduciaries are not subject to rules and regulations that make it difficult for them to invest in foreign securities.

(4) Transaction Costs

Transaction costs associated with the purchase of securities in foreign markets tend to be substantially higher compared to buying securities in the domestic market. Clearly, this fact serves as an obstacle to international portfolio investment. Trading in foreign markets causes extra costs for financial intermediaries, because access to the market can be expensive. The same is true for information about prices, market movements, companies and industries, technical equipment and everything else that is necessary to actively participate in trading. Moreover, there are administrative overheads, costs for the data transfer between the domestic bank and its foreign counterpart. Therefore, financial institutions try to pass these costs on to their customers, i.e. the investor. Simply time differences can be a costly headache, due to the fact that someone has to do transactions at times outside normal business hours. However, transactions costs faced by international investors can be mitigated by the characteristic of "liquidity," providing depth, breadth, and resilience of certain capital markets, thus reducing this constraint and as a consequence inducing international portfolio investment to these countries. Issuers from the investors' countries will then have a powerful incentive to list their securities on the exchange(s) of such markets. The development of efficient institutions, the range of expertise and experience available, the volume of transactions and breadth of securities traded, and the readiness with which the market can absorb large, sudden sales or purchases of securities at relatively stable prices all vary substantially from country to country.

(5) Familiarity with Foreign Markets

Finally, investing abroad requires some knowledge about and familiarity with foreign markets. Cultural differences come in many manifestations and flavours such as the way business is conducted, trading procedures, time zones, reporting customs, etc. In order to get a full understanding of the performance of a foreign company and its economic context, a much higher effort has to be made on the investor's side. He might face high cost of information, and the available information might not be of the same type as at home due to deviations in accounting standards and methods (e.g. with regard to depreciation, provisions, pensions), which make their interpretation more difficult. However, multinational corporations increasingly publish their financial information in English in addition to their local language and adjust the style, presentation and frequency of their disclosure,

e.g., of earnings estimates, to Indian standards. Moreover, major financial intermediaries provide information about foreign markets and companies to investors as international investment gains importance; the same is true for data services that extend their coverage to foreign corporations. Sometimes, existing or perceived cultural differences represent more of a psychological barrier than a barrier of a real nature. As the benefits from international investment/ diversification are known, it might be worthwhile to invest a reasonable amount of time studying foreign markets in order to overcome barriers and take advantage of the gains possible.

Benefits of International Portfolio Investment

Investments in international market have the following advantages:

(1) Attractive Opportunities: While the Indian securities market and real estate market have provided excellent returns in recent years, valuations in many sectors have become somewhat stretched. Savvy investors are aware that attractive opportunities are available outside.

(2) Diversification Benefits: By diversifying across nations whose economic cycles do not move perfect lockstep, investors can achieve a better risk-return tradeoff. In general broader the diversification, the less variable the returns are. Securities returns are less correlated across countries than within countries. This is because of political, institutional factors vary across countries - e.g., currency markets, regulation/deregulation, general economic conditions, business cycle differences, political issues, central bank issues, fiscal policy, industry structure, etc. Gains from international portfolio diversification depend on the degree of correlation ($-1 \leq \rho \leq +1$) between the home country and a foreign country. The general rule for this is that the greater the degree of correlation between two countries' markets, the lower the benefit of combing those countries in a portfolio or vice-e-versa.

Channels for International Portfolio Investment

Investors who wish to benefit from the ownership of foreign securities can implement their portfolio strategy in a number of ways, each of which has its peculiar advantages and drawbacks. These are discussed as follows:

(A) Direct Foreign Portfolio Investment

This type of strategy is normally done by large investors. This can be done in following two ways:

(1) Purchase of Foreign Securities in Foreign Markets: The most direct way to implement international portfolio investment is the purchase of foreign securities directly in the respective local (foreign) market of the issuer. While restrictions on outward International portfolio investors have been eliminated by many countries, theoretically foreign investors could place orders through banks or securities brokers either in the domestic or foreign country, when they wish to purchase foreign securities. This is true for both outstanding securities and new issues. When the securities have to be purchased in a secondary market, it is usually in the domestic market of the issuing entity, i.e. the borrower. At this point a number of problems arise. On a technical level, there are difficulties with the delivery of the certificates. Also, there is the expense of making timely payment in foreign funds. Finally, investors may find it difficult to secure good information on the situation of the issuer, conversion and purchase offers, and rights issues, and to collect interest and dividends. Many of these technical problems stem from a lack of international integration of securities markets. Because of a combination of extensive regulation to protect the investing public from fraud, conflict of interest, or gross incompetence, or the resistance of entrenched local institutions to competition, especially from abroad, organized securities markets have been less open to securities firms operating on a multinational basis than, say, markets for commercial banking services.

(2) Purchase of Foreign Securities in the Domestic Market: In some countries, the possibility exists to purchase foreign securities in the domestic market of the investor. This represents in many respects a convenient alternative for purchasing foreign securities abroad. Foreign securities are available to the investor domestically as well, if the issuing corporation sells its securities not only in the market of the country where it is incorporated, but also in other markets. Such transactions are often accompanied by a listing of the securities usually on one of the exchanges of the country where the securities are placed. Normally, a minimum number of securities must be distributed among local investors as a requirement for listing, or alternatively the listing is a prerequisite

for the successful placement of a substantial issue. Since the latter part of the 1980s, world financial markets have witnessed a considerable volume of so-called "Global"-equity issues, often in connection with the privatization of state-owned enterprises. Local listing fees as well as different disclosure requirements can make multiple listings quite expensive for corporations.

(B) Indirect Foreign Portfolio Investment

This type of strategy is normally done by small investors. This can be done in the following ways:

(1) Equity-linked Eurobonds: As it appears difficult and/or costly to invest internationally by purchasing foreign securities directly because of burdensome procedures, lack of information, differences in accounting standards, low liquidity and limited choice of domestically available foreign shares, indirect foreign portfolio investment represents a viable alternative strategy. One way proposed for this approach is through the acquisition of securities whose value is closely linked to foreign shares such as equity-linked eurobonds. These are basically eurobonds with warrants and convertible eurobonds. They represent hybrid financial instruments that consist of a straight debt component and a call option on the foreign stock. In the case of warrants, these options can and often are separated from the debt instrument and traded individually. With convertible eurobonds, the two components of the instrument are unchangeably tied to each other. Due to the equity component of eurobonds with warrants and convertible eurobonds, the value of these instruments is not only dependent on the movement of interest rates (as straight debt), but also changes with the developments of the underlying equity. Also, for some equity markets that are largely closed to outside investors, warrants or embedded equity options can offer a way to circumvent existing restrictions and open access to these markets through the back door, or avoid settlement problems in underdeveloped markets. Warrants, once separated from the bond, tend to return to their home market and serve as equity options — especially if these instruments are restricted or prohibited. From this perspective, equity-linked eurobonds can be useful instruments in the context of international portfolio investment. Moreover, they represent a means to some institutional investors whose equity investments are restricted to still participate in equity markets.

(2) Purchase of Shares of Multinational Companies: Without barriers to international trade in securities, investors would have easy access to shares of foreign firms. Thus, they could accomplish "homemade" international portfolio diversification themselves, and the acquisition of foreign securities (or companies) by domestic firms would not provide benefits that investors could not obtain for themselves. Foreign assets and securities would be priced on the same grounds as domestic assets. However, because barriers to foreign investment exist, segmented capital markets could be a source of important advantages to multinational companies (MNCs). In particular, unlike expansion through domestic acquisitions, in many cases foreign acquisitions can add to the value of an MNC. This is because a foreign asset may be acquired at the market value priced in the segmented foreign market. The same asset, when made available to domestic investors, could be valued higher because (a) foreign investors are, on average, more risk averse than domestic investors; and/or (b) the foreign asset is perceived to be less risky (i.e., it has a smaller beta) when evaluated in the context of the domestic (home) capital market. Thus, some of the foreign assets that are priced fairly (have a net present value equal to zero) in the context of the foreign capital market may command a positive net present value in the context of the domestic capital market and, as a result, may add to the wealth of the shareholders of the acquiring firm. It must be noted that this source of advantage has nothing to do with diversification effects per se; it simply involves benefits from arbitrage in markets for risk, i.e. market segmentation. As a rule, companies engaged in international business and foreign operations (MNCs) have better access to foreign firms and securities than domestic investors. This suggests that such companies provide their (domestic) shareholders with the benefits of (indirect) international portfolio diversification. This view can easily lead to simplistic conclusions. However, if domestic investors already hold well-diversified portfolios (the domestic market portfolio), then an MNC provides diversification benefits if and only if new foreign investments expand the accessible investment opportunity set of domestic investors.

(3) International Mutual Funds: The easiest and most effective way to implement international portfolio investment, especially for the individual investor, is to invest in "international" mutual funds. Investing in mutual funds solves the problem of the individual investor to obtain information about foreign companies/securities, gain

market access and deal with all the problems associated with foreign securities trading. Instead, the fund management company takes care of these issues for all investors of the fund with the benefit of economies of scale due to pooled resources. In return, investors are in most cases charged e.g. through up-front fees for the service of the fund and also the management of the portfolio. These costs to the investor are generally less for funds that replicate a local or international index because they have a simple investment strategy that does not require costly and time-intensive research. One of the important dimensions of mutual funds is whether they are open-end or closed-end. The former in contrast to the latter do not limit the number of shares of the funds, i.e. new investors can always enter the fund and are not constrained by the availability of shares in a secondary market. As a consequence, the capital invested in the fund varies considerably over time. Closed-end funds are typically used with respect to markets that are not very liquid. The closed-end structure isolates the fund manager from the problem of having to buy or sell shares in response to new fund purchases or redemptions. However, this structure leads almost invariably to deviations from net asset values (NAV), i.e. premium or discounts, a phenomenon that has given rise to a substantial literature. Whereas the relationship between premium/market price and NAV often appears to be of a random nature, the existence of a (positive) premium seems to be rational for those funds specializing in countries which impose significant foreign investor constraints, such as an illiquid market, substantial information gathering costs or other restrictions on market access. If funds provide a means to investors to circumvent these obstacles, they can be expected to trade at a premium. Another puzzling phenomenon of closed-end country funds traded consists in their slow reaction to changes in the fundamental value and their strong correlation with stock market.

Measuring the Return and Risk of Foreign Investment

The realised rupee return for an Indian resident investing in a foreign market depends on the return in the foreign currency as well as the change in the exchange rate between the foreign currency and the Indian national rupee (INR). Formally, the rate of return in INR terms from investing in the ith foreign market is as follows:

$$R_{i\ INR} = (1 + R_i)\ (1+ e_i) -1$$

$$= R_i + e_i + R_i e_i$$

Where,

R_i = the foreign currency rate of return in the ith foreign market and

e_i = the rate of change in the exchange rate between the foreign currency and the INR.

e_i will be positive (negative) if the foreign currency appreciates (depreciates) vis-à-vis the INR.

To illustrate, suppose an Indian resident just sold shares of IBM he purchased a year ago and earned a rate of return of 15 percent in terms of the US dollar (R_i = 0.15). During the same period the US dollar depreciated 5 percent against the INR (e_i = -.05). The realised rate of return in INR terms from this investment is:

$$R_{i\ INR} = (1+0.15)\ (1- 0.05)-1$$

$$= 1.0925 -1= 0.0925 \text{ or } 9.25 \text{ percent}$$

The risk of foreign investment, measured in terms of variance, is shown as follows:

$$Var\ (R_{i\ INR}) = Var\ (R_i) + Var\ (e_i) + 2Cov\ (R_i, e_i) + \Delta\ Var$$

Where,

Var (R_i) = the variance of foreign currency rate of return,

Var (e_i) = the variance of the exchange rate change,

Cov (R_i,e_i) = the covariance between the foreign currency rate of return and the exchange rate change, and

Δ Var = the contribution of the cross- product term, $R_i e_i$, to the risk of the foreign investment.

If the exchange rate remains unchanged, implying that e_i is Zero, only one term, Var (R_i), remains on the right side, it is clear that exchange rate change contributes to the risk of foreign investment in three ways:

(1) Its own volatility — Var (e_i)

(2) Its covariance with the returns in the foreign market — $Cov(R_i, e_i)$

(3) Its contribution to the cross- product term — Δ Var

Empirical evidence suggested the following:

(a) Exchange rate uncertainty contributes more significantly to the risk associated with foreign bond return and less significantly to the risk associated with foreign equity returns.

(b) Exchange rate changes tend to covary positively with foreign bond returns and interestingly, negatively with foreign equity returns

(c) The cross products terms, Δ Var, as expected contributes little to volatility.

CAPM and APT

Generally, the capital asset pricing model (CAPM) or the arbitrage pricing theory (APT) is used to estimate expected returns in the international capital market, just as we do for domestic assets. However, these models have to be adapted to the international context.

(1) Capital Asset Pricing Model: For developing a world CAPM, we have to replace the domestic market portfolio with the world market portfolio and measure beta relative to the world market portfolio.

Although such a straightforward generalization of CAPM appears to be reasonable first step, it is characterized by some problems:

(a) Capital barriers across countries, taxes, and transaction costs may prevent investors from holding a world index portfolio. In fact, some assets may simply be not available to foreign investors.

(b) Investors in different countries view exchange rate risk from the point of view of their countries. So, their assessment of the risk characteristics of various securities will differ. Hence, they will not have identical efficient frontiers.

(c) Consumption baskets of investors in different countries tend to vary. If relative prices of goods change over time, investors in different countries will have different inflation risks.

Due to these problems, the simple CAPM will not work as well in a global context. There is some empirical evidence that assets that are less accessible to foreign investors carry higher risk premiums compared to what a simple CAPM would predict.

(2) Arbitrage Pricing Theory: Compared to CAPM, the APT appears to be more useful in the international context as it can incorporate special risk factors that arise in international investing. Inter alia, the following factors are neutral candidates for inclusion in an APT model for global investing:

(a) A world stock index

(b) A national (domestic) stock index

(c) Currency movement factor

(d) Industrial sector index

In short with declining barriers to international capital flows and improved communications and data processing technology facilitating low-cost information about foreign securities, investors are showing avid interest in international investing to realize its enormous potentials. Internationally diversified portfolio promises higher returns with less risk than domestically diversified portfolio. The foreign exchange risks of a portfolio or the general portfolio of activities of the MNCs are reduced through international diversification. The extent to which risk is reduced by portfolio diversification depends on how highly the individual assets in the portfolio are correlated. The risk of an individual asset when it is held in a portfolio with a large number of securities depends on its return covariance with other securities in the portfolio and not on its return variance. There are several routes to international security investment such as investing in domestic MNCs, investing in foreign securities in the foreign market, investing in foreign securities in the domestic market, holding depository receipts, investing in mutual funds.

The gains in return-risk efficiency can be improved by hedging the currency risk of foreign investments. Reducing the currency risk of an internationally diversified portfolio can greatly reduce the variability of return without a corresponding decrease in expected return.

International Capital Budgeting

The decision to invest abroad takes a concrete shape when a future project is evaluated in order to ascertain whether the implementation of the project is going to add to the value of the investing company. The evaluation of the long term investment project is known as capital budgeting. The technique of capital budgeting is almost similar between a domestic company and an international company. The only difference is that some additional complexities appear in the case of international capital budgeting. These complexities influence the computation of the cash flow and the required rate of return.

Capital budgeting evaluates the investment decisions related to assets. The "capital" in capital budgeting refers to the investment of resources in assets, while the budgeting refers to the analysis and assessment of cash inflows and outflows related to the proposed capital investment over a specified period of time. Objectives of capital budgeting is to -

(i) determine whether or not a proposed capital investment will be a profitable one over the specified time period, and,

(ii) to select between investment alternatives.

Capital budgeting at the international level addresses the issues related to:

(i) exchange rate fluctuations and capital market segmentation,

(ii) international financing arrangement of capital and related to cost of capital,

(iii) international taxation,

(iv) country risk or political risk etc.

Capital Budgeting: Net Present Value Approach

- The investment decisions of a firm are generally known as the capital budgeting, or capital expenditure decisions.
- Investment Decisions: Expansion, Acquisition, modernisation and replacement
- Investments lead to Exchange of current funds for future benefits.
- The funds are invested in long-term assets so as to create cash inflows over a long period.
- The future benefits will occur to the firm over a series of years. Three steps are involved in the evaluation of an investment proposal:
- Estimation of cash flows
- Estimation of the required rate of return (the opportunity cost of capital)
- Application of a decision rule for making the choice

Any investment should increase shareholders value. It should recognise the fact that bigger cash flows are preferable to smaller ones and early cash flows are preferable to later ones. It should help to choose among mutually exclusive projects that project which maximises the shareholders' wealth.

- Cash flows of the investment project should be forecasted based on realistic assumptions.
- Appropriate discount rate should be identified to discount the forecasted cash flows. The
- Appropriate discount rate is the project's opportunity cost of capital.
- Present value of cash flows should be calculated using the opportunity cost of capital as the discount rate.
- The project should be accepted if Net Present Value is positive (i.e., NPV > 0).

Evaluation Criteria:

1. Non-discounting Methods: The methods for evaluating investment proposals are grouped as discounting and non-discounting methods. One such method involves the average accounting rate of return earned by the project. It represents the mean profit on account of investment prior to interest and tax payment. The mean profit is compared with the hurdle rate or required rate of return. The project is acceptable if the mean profit is higher than the hurdle rate. Despite being a simple method, it has some shortcomings, namely, it is based on the accounting income and not on the cash flow; it considers profit before tax, rather than post tax profit, and finally, it ignores the time value.

2. Discounting methods: It takes normally three forms:

(i) Net Present Value (NPV) Method—

Net present value should be found out by subtracting present value of cash outflows from present value of cash inflows.

$$NPV = \left[\frac{CF_1}{(1+k)} + \frac{CF_2}{(1+k)^2} + \frac{CF_3}{(1+k)^3} + \cdots + \frac{CF_1}{(1+k)^n}\right] - I_o$$

$$NPV = \sum_{t=1}^{n}\left(\frac{CF_t}{(1+k)^n} - I_o\right)$$

Acceptance Rule: NPV: +: Accepted,

NPV: - : Rejected

NPV: 0: May be accepted or rejected

Higher NPV consider for mutually exclusive projects. NPV is most acceptable investment rule for the following reasons:

- Time value of money is recognised by discount rate
- Measure of true profitability
- Shareholders' value maximised

The discount rate used in NPV is the opportunity cost or the WACC

$$Kw = \alpha K_e + K_d (1-\alpha)(1-t)$$

In the above case it is assumed that-

- Business risk of the project is same as the firm's current business risk
- Debt-Equity ratio remains the same throughout the project period.

(ii) Profitability Index (PI) Method: These show the relationship between net cash inflows and initial investments. It shows the relative gains and would be expressed as the following equation:

$$P = \sum_{t=1}^{n} \frac{CF_t / (1+k)^n}{I_o}$$

(iii) Internal Rate of Return (IRR) Method: IRR is that discount rate that must bring down the value of cash inflows (net) during the life of the project to equate the value of initial investment. Expressed as an equation:

Since the above two assumptions are not true, the discount rate is not valid and hence the process of evaluation is not correct. Hence, in place of NPV, an Adjusted NPV is used with following corrections;

- Project evaluation is carried out with Cost of Equity of the firm
- Present value of any cash flows such as subsidies, external financing etc., would be factored using special discount rates.

$$\sum_{t=1}^{n}\left[\frac{CF_t}{(1+IRR)^n}\right] = I_o = 0$$

11.6 SOURCES OF FOREIGN CURRENCY

Major sources for raising foreign currency finances are as follows :

1. **Foreign Currency Term Loan:**

   Financial Institutions provide Foreign Currency Term Loan for meeting the foreign currency expenditures towards —

   (a) Import of Plant, Machinery and Equipment, and

   (b) Payment of Foreign Technical Know How Fees.

2. **Export Credit Schemes**:

   Export Credit Agencies finance exports of capital goods and related technical services.

Types of Export Credit:

- **Buyer's Credit**: Credit is provided directly to the Indian buyer, for purchase of capital goods and / or technical service from the overseas exporter.
- **Supplier's Credit**: Credit is provided to the overseas exporters, so that they can make available medium-term finance to Indian importers.

Regulatory: These agencies are formed by the Governments of the respective countries and follow certain consensus guidelines for supporting exports, under a convention known as the Berne Union.

3. **External Commercial Borrowings(ECB) :**

   These include raising finance from international markets for plant and machinery imports. Funds can be raised subject to the terms and conditions stipulated by the Government of India, which imposes restrictions on the amount raised under automatic route. Funds raised above the stipulated limit would require the prior approval of the Ministry of Finance.

   Types of ECB: External Commercial Borrowings include Bank Loans, Supplier's and Buyer's credit, fixed and floating rate bonds and Borrowing from private sector windows of Multilateral Financial Institutions such as International Finance Corporation.

4. **Euro Issues:**

   Subscription can come from any part of the world except India. This takes the following forms —

   (a) **Depository Receipts Mechanism:** An indirect equity investment, these are issued through Overseas Depository Banks, on behalf of the issuing Company.

   (b) **Foreign Currency/ Euro Convertible Issues:** Euro Convertible Issues is a debt with 'an option to convert it into equity.

   (c) **Debt Route:** Funds can also be raised by way of pure Debt Bonds.

5. **Issues in Foreign Domestic Markets:**

   Capital can also be raised by issuing Exchange Traded instruments in Foreign Markets. These include ADRs, GDRs, etc.

Debt Route

The following are some of the instruments used for borrowing of funds from the international market —

1. **Syndicated Bank Loans:** Borrower should obtain a good credit rating from the rating agencies.

   Large loans can be obtained in a reasonably short period with few formalities. Duration of the loan is generally 5 to 10 years, interest rate is based on LIBOR Plus spread depending upon the rating.

2. **Foreign Bonds:** These are debt instruments denominated in a currency which is foreign to the borrower and is sold in the country of that currency.

   Example: British Firm / Company placing Dollar denominated bonds in USA.

3. **External Commercial Borrowings (ECB's):**

   (a) External Commercial borrowings include the following —

   - Commercial Bank Loans,
   - Buyer's Credit,
   - Supplier's Credit,
   - Securitized Instruments such as Floating Rate Notes and Fixed Rate Bonds,
   - Credit from Official Export Credit Agencies, and
   - Commercial Borrowings from multilateral financial institutions like IFCI, ADB, etc.

   (b) ECB's are subject to overall ceilings with sub-ceilings fixed by the Government from time to time.

4. **Euro Bonds:** Euro Bonds are debt instruments denominated in a currency issued outside the country of that currency. These are usually bearer bonds and can take the form of- (i) traditional fixed rate bonds. (ii) floating rate of notes (FRN's), (iii) Convertible bonds.

   Example: A Rupee Bond floated in France, a Yen Bond floated in Germany.

5. **Euro-bonds with Equity Warrants:** These bonds carry a coupon rate determined by the market rates. The warrants are detachable. Pure bonds are traded at a discount. Fixed income funds may like to invest for the purpose of regular income.

6. **Euro-Convertible Zero Bonds:** These bonds are structured as convertible bonds. No interest is payable on the bonds. But the conversion of bonds takes place on maturity at a pre-determined price. Usually there is a 5 years maturity period and they are treated as a deferred equity issue.

7. **Euro Commercial Papers:** ECP's are short-term money market instruments with a maturity period of less than one year. They are usually designated in US Dollars.

Depository Receipts

A depositary receipt (DR) is a type of negotiable (transferable) financial security that is traded on a local stock exchange but represents a security, usually in the form of equity, that is issued by a foreign publicly listed company. The DR, which is a physical certificate, allows investors to hold shares in equity of other countries. One of the most common types of DRs is the American depositary receipt (ADR), which has been offering companies, investors and traders global investment opportunities since the 1920s.

Since then, DRs have spread to other parts of the globe in the form of global depositary receipts (GDRs) (the other most common type of DR), European DRs and international DRs. ADRs are typically traded on a U.S. national stock exchange, such as the New York Stock Exchange (NYSE) or the American Stock Exchange, while GDRs are commonly listed on European stock exchanges such as the London Stock Exchange. Both ADRs and GDRs are usually denominated in U.S. dollars, but can also be denominated in euros.

How Does the DR Work?

The DR is created when a foreign company wishes to list its already publicly traded shares or debt securities on a foreign stock exchange. Before it can be listed to a particular stock exchange, the company in question will first have to meet certain requirements put forth by the exchange. Initial public offerings, however, can also issue a DR. DRs can be traded publicly or over-the-counter.

Pricing and Cross-Trading

When any DR is traded, the broker will aim to find the best price of the share in question. He or she will therefore compare the U.S. dollar price of the ADR with the U.S. dollar equivalent price of the local share on the domestic market. If the ADR of the Russian gas company is trading at US$12 per share and the share trading on the Russian market is trading at $11 per share (converted from Russian rubles to dollars), a broker would aim to buy more local shares from Russia and issue ADRs on the U.S. market. This action then causes the local Russian price and the price of the ADR to reach parity. The continual buying and selling in both markets, however, usually keeps the prices of the ADR and the security on the home market in close range of one another. Because of this minimal price differential, most ADRs are traded by means of intramarket trading.

A U.S. broker may also sell ADRs back into the local Russian market. This is known as cross-border trading. When this happens, an amount of ADRs is canceled by the depository and the local shares are released from the custodian bank and delivered back to the Russian broker who bought them. The Russian broker pays for them in roubles, which are converted into dollars by the U.S. broker.

The Benefits of Depository Receipts

The DR functions as a means to increase global trade, which in turn can help increase not only volumes on local and foreign markets but also the exchange of information, technology, regulatory procedures as well as market transparency. Thus, instead of being faced with impediments to foreign investment, as is often the case in many emerging markets, the DR investor and company can both benefit from investment abroad.

Benefits :

For the Company

A company may opt to issue a DR to obtain greater exposure and raise capital in the world market. Issuing DRs has the added benefit of increasing the share's liquidity while boosting the company's prestige on its local market ("the company is traded internationally"). Depositary receipts encourage an international shareholder base, and provide expatriates living abroad with an easier opportunity to invest in their home countries. Moreover, in many countries, especially those with emerging markets, obstacles often prevent foreign investors from entering the local market. By issuing a DR, a company can still encourage investment from abroad without having to worry about barriers to entry that a foreign investor might face.

For the Investor

Buying into a DR immediately turns an investors' portfolio into a global one. Investors gain the benefits of diversification while trading in their own market under familiar settlement and clearance conditions. More importantly, DR investors will be able to reap the benefits of these usually higher risk, higher return equities, without having to endure the added risks of going directly into foreign markets, which may pose lack of transparency or instability resulting from changing regulatory procedures. It is important to remember that an investor will still bear some foreign-exchange risk, stemming from uncertainties in emerging economies and societies. On the other hand, the investor can also benefit from competitive rates the U.S. dollar and euro have to most foreign currencies.

Giving you the opportunity to add the benefits of foreign investment while bypassing the unnecessary risks of investing outside your own borders, you may want to consider adding these securities to your portfolio. As with any security, however, investing in ADRs requires an understanding of why they are used, and how they are issued and traded.

American Depository Receipts

An **American Depositary Receipt (ADR)** is a certificate that represent shares of a foreign stock owned and issued by a U.S. bank. The foreign shares are usually held in custody overseas, but the certificates trade in the U.S. Through this system, a large number of foreign-based companies are actively traded on one of the three major U.S. equity markets (the NYSE, AMEX or Nasdaq).

Example:

Investors can purchase *ADRs* from broker/dealers. These broker/dealers in turn can obtain ADRs for their clients in one of two ways: they can purchase already-issued ADRs on a U.S. exchange, or they can create new ADRs.

To create an ADR, a U.S.-based broker/dealer purchases shares of the issuer in question in the issuer's home market. The U.S. broker/dealer then deposits those shares in a bank in that market. The bank then issues ADRs representing those shares to the broker/dealer's custodian or the broker-dealer itself, which can then apply them to the client's account.

A broker/dealer's decision to create new ADRs is largely based on its opinion of the availability of the shares, the pricing and market for the ADRs, and market conditions.

Broker/dealers don't always start the ADR creation process, but when they do, it is referred to as an unsponsored ADR program (meaning the foreign company itself has no active role in the creation of the ADRs). By contrast, foreign companies that wish to make their shares available to U.S. investors can initiate what are called sponsored ADR programs. Most ADR programs are sponsored, as foreign firms often choose to actively create ADRs in an effort to gain access to American markets.

ADRs are issued and pay dividends in U.S. dollars, making them a good way for domestic investors to own shares of a foreign company without the complications of currency conversion. However, this does not mean ADRs are without currency risk. Rather, the company pays dividends in its native currency and the issuing bank distributes those dividends in dollars -- net of conversion costs and foreign taxes – to ADR shareholders. When the exchange rate changes, the value of the dividend changes.

For example, let's assume the ADRs of XYZ Company, a French company, pay an annual cash dividend of 3 Euros per share. Let's also assume that the exchange rate between the two currencies is even -- meaning one Euro has an equivalent value to one dollar. XYZ Company's dividend payment would therefore equal $3 from the perspective of a U.S. investor. However, if the euro were to suddenly decline in value to an exchange rate of one euro per $0.75, then the dividend payment for ADR investors would effectively fall to $2.25. The reverse is also true. If the euro were to strengthen to $1.50, then XYZ Company's annual dividend payment would be worth $4.50.

ADRs give U.S. investors the ability to easily purchase shares in foreign firms, and they are typically much more convenient and cost effective for domestic investors (versus purchasing stocks in overseas markets). And because many foreign firms are involved in industries and geographical markets where U.S. multinationals don't have a presence, investors can use ADRs to help diversify their portfolios on a much more global scale.

Advantages and Limitations:

Advantages	Limitations
(a) Access to Large Capital. (b) Access to Foreign Exchange. (c) No Change in the Shareholding / voting pattern. (d) Increased recognition for the Company internationally by bankers, customers, etc. (e) No Exchange Rate risk since the Company pays interest and dividends in Indian Rupees.	(a) High cost of Issue. (b) Requirement as to large size of issue. (c) Stringent compliance requirements.

Process for Raising Equity through ADR:

(a) **Issue Intermediaries**: ADRs are issued by Overseas Depository Bank (ODB), who have a Domestic Custodian Bank (DCB) in India.

(b) **Deposit of Securities**: Company willing to raise equity through ADRs should deposit the securities with the DCB in India.

(c) **Authorization for Issue of ADRs**: The Indian Company authorizes the ODB to issue ADR against the security of Company's Equity Shares.

(d) **Issue of ADR**: ODB issues ADRs to investors at a predetermined ratio to the Company's securities.

(e) **Redemption of ADR**: When an investor redeems his ADRs, the appropriate number of underlying equity shares or bonds is released.

(f) **Dividend / Interest**: The Indian Company pays interest to the ODB, which in turn distributes dividends to the ADR holders based on the prevailing exchange rate.

Sponsored ADRs and Unsponsored ADRs

Companies have a choice of four types of Depository Receipt facilities: unsponsored and three levels of sponsored Depository Receipts. Unsponsored Depository Receipts are issued by one or more depositories in response to market demand, but without a formal agreement with the company. Today, unsponsored Depository Receipts are considered obsolete and, under most circumstances, are no longer established due to lack of control over the facility and its hidden costs. Sponsored Depository Receipts are issued by one depository appointed by the company under a Deposit Agreement or service contract. Sponsored Depository Receipts offer control over the facility, the flexibility to list on a national exchange in the U.S. and the ability to raise capital.

Sponsored Level I Depository Receipts

A sponsored Level I Depository Receipt program is the simplest method for companies to access the U.S. and non-U.S. capital markets. Level I Depository Receipts are traded in the U.S. over-the-counter ("OTC") market and on some exchanges outside the United States. The company does not have to comply with U.S. Generally Accepted Accounting Principles ("GAAP") or full Securities and Exchange Commission ("SEC") disclosure. Essentially, a Sponsored Level I Depository Receipt program allows companies to enjoy the benefits of a publicly traded security without changing its current reporting process.

The Sponsored Level I Depository Receipt market is the fastest growing segment of the Depository Receipt business. Of the more than 1,600 Depository Receipt programs currently trading, the vast majority of the sponsored programs are Level I facilities. In addition, because of the benefits investors receive by investing in Depository Receipts, it is not unusual for a company with a Level I program to obtain 5% to 15% of its shareholder base in Depository Receipt form. Many well-known multinational companies have established such programs including: Roche Holding, ANZ Bank, South African Brewery, Guinness, Cemex, Jardine Matheson Holding, Dresdner Bank, Mannesmann, RWE, CS Holding, Shiseido, Nestle, Rolls Royce, and Volkswagen to name a few. In addition, numerous companies such as RTZ, Elf Aquitaine, Glaxo Wellcome, Western Mining, Hanson, Medeva, Bank of Ireland, Astra, Telebrás and Ashanti Gold Fields Company Ltd. started with a Level I program and have upgraded to a Level II (Listing) or Level III (Offering) program.

Sponsored Level II and III Depository Receipts

Companies that wish to either list their securities on an exchange in the U.S. or raise capital use sponsored Level II or III Depository Receipts respectively. These types of Depository Receipts can also be listed on some exchanges outside the United States. Each level requires different SEC registration and reporting, plus adherence to U.S. GAAP. The companies must also meet the listing requirements of the national exchange (New York Stock Exchange, American Stock Exchange) or NASDAQ, whichever it chooses.

Each higher level of Depository Receipt program generally increases the visibility and attractiveness of the Depository Receipt.

Private Placement (144A) Depository Receipt

In addition to the three levels of sponsored Depository Receipt programs that trade publicly, a company can also access the U.S. and other markets outside the U.S. through a private placement of sponsored Depository Receipts. Through the private placement of Depository Receipts, a company can raise capital by placing Depository Receipts with large institutional investors in the United States, avoiding SEC registration and to non-U.S. investors in reliance on Regulation S. A Level I program can be established alongside a 144A program.

Global Depository Receipt

These are a class of investment which allows international investors to own shares in foreign companies where the foreign market is hard to access for the retail investor, and without having to worry about foreign currencies and tax treatments. Global Depository Receipts are issued by international investments banks as certificates (the **GDR**)

which represents the foreign shares but which can be traded on the local stock exchange. For example a UK investor may be able to buy shares in a Vietnamese company via a GDR issued by a UK investment. The GDR will be denominated in GB Pounds and will be tradable on the London Stock Exchange. The investment bank takes care of currency exchange, foreign taxes etc. and pays dividends on the GDR in GB Pounds.

The concept originally started in the USA with the creation of American Depository Receipts which were created so that US retail investors could buy shares in a foreign company without having to worry about foreign exchange, or foreign taxes.

It should be noted that although the risks of owning the foreign shares directly has been removed, there is now a risk of third party default, because the investment bank owns the underlying assets, and may not be able to pass on the benefits to ADR holders if they get into financial difficulty.

Global Depository Receipts (GDRs) are negotiable certificates issued by depository banks which represent ownership of a given number of a company's shares which can be listed and traded independently from the underlying shares. These instruments are typically used by companies from emerging markets and marketed to professional investors only.

GDRs can be listed on either the Main Market via a Standard Listing or on the Professional Securities Market. A GDR will be used to access two or more markets, usually London and the US. They are often launched for capital raising purposes, so the US element is generally either a Rule 144(a) ADR or a Level III ADR, depending on whether the issuer aims to tap the private placement or public US markets.

These securities are generally traded in US dollars on the Exchange's Electronic Trading Service the International Order Book (IOB). Associated dividends are paid to investors in US dollars. GDRs are settled in either DTC or Euroclear Bank enhancing their cross border liquidity. The more liquid IOB securities have central counterparty clearing ensuring pre and post trade anonymity as well as mitigation of counterparty risk.

Features

(a) **Underlying Shares:** Each GDR may represent one or more underlying share, which are physically held by the Custodian appointed by the Depository Bank.

(b) **Entry in Company's Books:** In the Company's books, the Depository Bank's name appears as the holder of the shares.

(c) **Returns:** Depository gets the dividends from the Company (in local currency) and distributes them to the holders of the Depository Receipts after converting into dollars at the going rate of exchange.

(d) **Negotiable:** GDRs are exchangeable with the underlying share either at any time, or after the lapse of a particular period of time, generally 45 Days.

(e) **Globally Marketed:** GDRs are marketed globally without being confined to borders of any market or country as it can be traded in more than one country.

(f) **Settlement:** GDRs are settled through CEDEL & Euro-Clear International Book Entry Systems.

Impact of GDR's on Indian Capital Market

(a) **Track of Worldwide Events:** Arbitrage possibility in GDR Issues has created additional responsibility on the investors. Investors are now required to keep track of world wide economic events, and how the Company's GDRs are being traded.

(b) **Free Pricing:** GDR can be issued for any price, and therefore retail investors can longer expect discounted rights or public issues.

(c) **Flow of Foreign Investment into India:** Since GDRs are sold primarily to institutional investors abroad, it serves as an easy way for flow of huge volume of foreign funds into Indian Capital Market.

Warrants

A warrant is a security that entitles the holder to buy the underlying stock of the issuing company at a fixed exercise price until the expiration date. Some important characteristics to consider include the following:

- A warrant is exercised when the holder informs the issuer of their intention to purchase the shares underlying the warrant.
- A warrant's "premium" represents how much extra you have to pay for your shares when buying them through the warrant as compared to buying them in the regular way.
- A warrant's "gearing" is the way to ascertain how much more exposure you have to the underlying shares using the warrant as compared to the exposure you would have if you buy the shares through the market.
- If you plan on exercising the warrant, you must do so before the expiration date. The more time remaining until expiration, the more time for the underlying security to appreciate, which, in turn, will increase the price of the warrant (unless it depreciates). Therefore, the expiration date is the date on which the right to exercise ceases to exist.
- Like options, there are different exercise types associated with warrants such as American style (holder can exercise anytime before expiration) or European style (holder can only exercise on expiration date).

Sometimes, the issuer will try to establish a market for the warrant and to register it with a listed exchange. In this case, the price can be obtained from a stockbroker. Often, though, warrants are privately held or not registered, which makes their prices less obvious.

Warrants Versus Other Convertibles

Warrants are very similar to call options. For instance, many warrants confer the same rights as equity options, and warrants often can be traded in secondary markets like options. However, there are several key differences between warrants and equity options:

- Warrants are issued by private parties, typically the corporation on which a warrant is based, rather than a public options exchange.
- Warrants issued by the company itself are dilutive. When the warrant issued by the company is exercised, the company issues new shares of stock, so the number of outstanding shares increases. When a call option is exercised, the owner of the call option receives an existing share from an assigned call writer. Unlike common stock shares outstanding, warrants do not have voting rights.
- Warrants are considered over-the-counter instruments, and thus are usually only traded by financial institutions with the capacity to settle and clear these types of transactions.
- A warrant's lifetime is measured in years (as long as 15 years), while options are typically measured in months. Upon expiration, the warrants are worthless unless the price of the common stock is greater than the exercise price.
- Warrants are not standardized like exchange-listed options. While each option contract is generally over 1,000 underlying ordinary shares, the number of warrants that must be exercised by the holder to buy the underlying asset depends on the conversion ratio set out in the offer documentation for the warrant issue.

Valuation

There are various methods of evaluating warrants, the most popular being the Black-Scholes evaluation model. However, it is important to have some understanding of the various influences on warrant prices. The market value of a warrant can be divided into two components:

Intrinsic value: This is simply the difference between the exercise (strike) price and the underlying stock price. Warrants are also referred to as in-the-money or out-of-the-money, depending on where the current asset price is in relation to the warrant's exercise price. Thus, for instance, for call warrants, if the stock price is below the strike price, the warrant has no intrinsic value (only time value - to be explained shortly). If the stock price is above the strike, the warrant has intrinsic value and is said to be in-the-money.

Time value: Time value can be considered as the value of the continuing exposure to the movement in the underlying security that the warrant provides. Time value declines as the expiration of the warrant gets closer. This erosion of time value is called time decay. It is not constant, but increases rapidly towards expiration. Time value is affected by time to expiration, volatility, dividends and interest rates.

Traditional warrants are issued in conjunction with a bond (known as a warrant-linked bond), and represent the right to acquire shares in the entity issuing the bond. In other words, the writer of a traditional warrant is also the issuer of the underlying instrument. Warrants are issued in this way to reduce the interest rate that must be offered in order to sell the bond issue. Valuing this type of warrant can be accomplished with the following equation:

$$P_0 - \left(\sum_{t=1}^{T} \frac{C}{(1+r)^t}\right) - \frac{F}{(1+r)^T}$$

Where: P is the price paid for the bond with warrants; C is the coupon payment; T is the maturity of the bond; r is the required rate of return; and F is the face value of the bond.

Uses, Advantages & Disadvantages

Warrants are often used as deal sweeteners, in order to entice hesitant investors. However, a warrant only benefits the investor if the company grows. Warrants can also be used for portfolio protection. For example, put warrants allow the owner to protect the value of the owner's portfolio against falls in the market or in particular shares. Because of the dilutive nature of warrants, their issuance can lead to a decrease in stock value and loss of voting control. Warrants may also carry liquidity risk, due to their specialized nature.

Foreign Currency Convertible Bonds (FCCB)

A foreign currency convertible Bond (FCCBs) is a quasi-debt instrument that is issued in a currency other than the issuer's domestic currency. Over the last few years, a majority of Indian Companies issuing FCCBs raised fund in several foreign currency. FCCBs could have a coupon rate of zero but have yield on maturity or FCCBs could also carry lower interest rate and yield on maturity. This is a bullet payment of interest at maturity if the bondholder opts for redemption.

This bond is a mix between the debt and equity instrument and provides the bondholders an option to convert the bonds into equity. This bond gives the issuers an ability to access capital available in foreign markets and make their presence felt in the international market.

FCCB are attractive to both investors and issuers. The investors receive the safety of guaranteed payments on the bond and are also able to take advantage of price appreciation in the company's stock.

Features of FCCBs

- FCCB can be either unsecured or secured. But, in practice most of the FCCB issued in India are unsecured.
- FCCB issues have a 'Call' and 'Put' option to suit the structure of the Bond. Both the options are subject to RBI guidelines.
- Public issue of FCCB shall be through reputed lead managers and Private placement is permitted subject to certain conditions.
- It is also possible to issue zero coupon Foreign Currency Convertible Bonds and in this case, the holders of the bond are generally interested to convert the bonds into equity.
- The yield to maturity of FCCB normally ranges 2-7%.
- FCCB are generally listed to stock exchange to increase its liquidity. Credit rating of bonds is not mandatory. But, rating can help better marketing of the bonds.
- FCCB Issue related expenses shall not exceed 4% of issue size and in case of private placement, shall not exceed 2% of the issue size.

Interest payable on bonds is also called as coupon rate. The key feature of FCCBs is that the interest is guaranteed and the bondholder also gets the option to convert the bond into equity. The coupon rate is payable at periodic intervals as agreed between the issuer and the bondholder. The holder of FCCBs has the option to convert the bonds into equity within the stipulated timeframe. Thus, FCCBs have the flavour of both debt and equity. If the bondholder opts for conversion, he would receive shares of the issuing company at a redetermined or rather the rate agreed at the time of subscribing to the FCCB issue. This is known as the conversion price. The FCCB conversion price is generally at a substantial premium to the market price prevailing at the time of issue.

FCCBs are issued in accordance with the [Scheme for issue of Foreign Currency Convertible Bonds and Ordinary Shares (Through Depository Receipt Mechanism) Scheme, 1993, and subscribed by a non- resident in foreign currency and convertible into ordinary shares of the issuing company in any manner, either in whole, or in part, on the basis of any equity related warrants attached to debt instruments.

Disadvantages

- Exchange risk is more in FCCBs as interest on bond would be payable in foreign currency. Thus companies with low debt equity ratios, large forex earnings potential only opted for FCCBs.
- FCCBs means creation of more debt and a FOREX outgo in terms of interest which is in foreign exchange.
- In case of convertible bond the interest rate is low (around 3 to 4%) but there is exchange risk on interest as well as principal if the bonds are not converted in to equity.
- If the stock price plummets, investors will not go for conversion but redemption. So, companies have to refinance to fulfill the redemption promise which can hit earnings.
- It will remain as debt in the balance sheet until conversion.

Euro issues

Until about the mid- eighties. India's external debt was mostly public debt from multilateral institutions like the World Bank, the International Monetary Fund and the Asian Development Bank. Then Indian corporate resorted to commercial borrowings, the bulk of it being in the form of syndicated credit. When the foreign exchange crisis hit the economy in mid – 1990, India's credit ratings plunged below the investment grade and all external funding avenues were closed. This situation continued until 1992. Following economic liberalization, Indian companies started exploring the global market once again. Unlike the earlier period, when syndicated credit was the predominant from of raising external finance, companies began looking at bonds and euro equities, which are collectively referred to as "Euro Issues". The two principal mechanisms used by Indian companies are the Depository receipts mechanism and Foreign Currency Convertible Bonds (FCCBs). The former represents indirect equity investment in the form of Global Depository (GDRs) and American depository receipts (ADRs), while the latter is debt with an option to convert it into equity.

Euro Issues are simply means of raising funds in the international market, and have no special connotation or legal meaning. The term Euro Issue is really a misnomer, as initially these instruments were aimed at the European market, and were listed on either Luxembourg or London Exchanges, but now they have expanded to tap the global market and not just Europe.

Advantages of Euro Issues

There are several advantages for companies to issue Eurobonds:

- Obtaining financing by issuing Eurobonds is often cheaper than obtaining a foreign currency bank loan.
- It is a way for companies to obtain financing in an economy where financing is hard to obtain. Issuing Eurobonds gives companies wider access to the international market which they may normally not be able to access.
- It gives companies the ability to raise funds without having to issue shares.
- Since Eurobonds are normally aimed at institutional investors and not the public, there are no advertisement costs involved and this therefore means lower costs for the issuing firm.

- Allows companies to obtain funds in a foreign currency to create a foreign currency liability to match against a foreign currency asset.

Disadvantages of Euro Issues

Against these advantages, there are some disadvantages to consider:

- there are issue costs to take into account
- if the debt is not matched against a foreign currency asset, the Eurobond issuing firm may be open to foreign exchange risk.

There are several benefits to an investor who does put its money into Eurobonds :

- The bonds give an investor a possibility of achieving a higher yield on investments as compare to investing in most shares, bank and building society accounts, money market placements, etc.
- It is a "safe" investment in the sense that the full value of the bond will be replayed when the bond matures.

As for disadvantages to the investor:

- Investing in a Eurobond is not a good idea for investors who may need a repayment of the investment at short notice.
- There is always the risk of the issuing company going under and the maturity value of the Eurobond not being paid.

Euro Commercial Paper

Euro Commercial Papers are short term paper issued by non-bank borrowers. The principal distinguishing feature is that Commercial Papers are not underwritten by a bank and the issuer, therefore, is one with very high credentials. The paper is usually issued in higher denominations of the order of $ 1,00,000 and the market is dominated by large professional investors. Although Euro Commercial Papers can be issued in interest bearing form, they are usually issued at a discount to face value and quoted in the secondary market on a yield basis.

Euro Convertible Bond (ECB)

Euro Convertible Bonds are quasi debt securities (unsecured) which can be converted into Depository Receipts or local shares at a fixed price after the minimum lock-in period. Price of Equity Shares at the time of conversion will have a premium element. Bonds carry a fixed rate of interest, and the payment of interest is made in US Dollars.

Issue of these Bonds carry options —

Call Option: Right to the Company to convert the ECB into Equity before maturity. Pre-Mature conversion is generally done, when the market price of the shares exceeds a particular percentage of the conversion price.

Put Option: Put Option allows the investors to get his money back before maturity.

Prior Government Approval: Company desirous of issuing ECB, should obtain the prior permission of Ministry' of Economic Affairs. Certain restrictions are imposed on the eligibility norms such as good financial track record, nature of industry etc.

Proceeds of ECBs can be applied only for the following —

(a) Import of Capital Goods,

(b) Retiring Foreign Currency Debts,

(c) Capitalizing Indian Joint Venture Abroad,

(d) Application for Working Capital and Others is restricted to 25% of total proceeds.

"Note Issuance Facility"

Note-Issuance-Facility (NIF) is a Medium-Term Commitment on the part of underwriting banks which obliges them to purchase any short term notes which the borrower is unable to sell in the market, at an agreed spread over a suitable benchmark (Example: LIBOR).

Advantages:

- **Reduced Cost of Borrowing:** Borrower can sell notes at a spread lower than that at which the underwriters are committed to buy, thereby reducing the cost of borrowing.
- **Access to Large Number of Investors:** Note Issuance Facility is a short term facility and therefore, majority of investors, who are not interested in Long Term Investments, would find this as an good short term investment.

Participating Notes

Participatory Notes – or P-Notes or PNs – are instruments issued by registered foreign institutional investors to overseas investors, who wish to invest in the Indian stock markets without registering themselves with the market regulator, the Securities and Exchange Board of India.

Financial instruments used by **hedge funds** that are not registered with Sebi to invest in Indian securities. Indian-based brokerages to buy India-based securities / stocks and then issue participatory notes to foreign investors. Any dividends or capital gains collected from the underlying securities go back to the investor.

Since international access to the Indian capital market is limited to FIIs. The market has found a way to circumvent this by creating the device called participatory notes, which are said to account for half the $80 billion that stands to the credit of FIIs. Investing through P-Notes is very simple and hence very popular.

Hedge funds, which invest through participatory notes, borrow money cheaply from Western markets and invest these funds into stocks in emerging markets. This gives them double benefit: a chance to make a killing in a stock market where stocks are on the rise; and a chance to make the most of the rising value of the local currency.

P-Notes are issued to the real investors on the basis of stocks purchased by the FII. The registered FII looks after all the transactions, which appear as proprietary trades in its books. It is not obligatory for the FIIs to disclose their client details to the SEBI, unless asked specifically.

Who Can Invest in P-Notes?

(a) Any entity incorporated in a jurisdiction that requires filing of constitutional and/or other documents with a registrar of companies or comparable regulatory agency or body under the applicable companies legislation in that jurisdiction;

(b) Any entity that is regulated, authorised or supervised by a central bank, such as the Bank of England, the Federal Reserve, the Hong Kong Monetary Authority, the Monetary Authority of Singapore or any other similar body provided that the entity must not only be authorised but also be regulated by the aforesaid regulatory bodies;

(c) Any entity that is regulated, authorised or supervised by securities or futures commission, such as the Financial Services Authority (UK), the Securities and Exchange Commission, the Commodities Futures Trading Commission, the Securities and Futures Commission (Hong Kong or Taiwan), Australia Securities and Investments Commission (Australia) or other securities or futures authority or commission in any country, state or territory;

(d) Any entity that is a member of securities or futures exchanges such as the New York Stock Exchange (Sub-account), London Stock Exchange (UK), Tokyo Stock Exchange (Japan), NASD (Sub-account) or other similar self-regulatory securities or futures authority or commission within any country, state or territory provided that the aforesaid organizations which are in the nature of self regulatory organizations are ultimately accountable to the respective securities / financial market regulators.

(e) Any individual or entity (such as fund, trust, collective investment scheme, Investment Company or limited partnership) whose investment advisory function is managed by an entity satisfying the criteria of (a), (b), (c) or (d) above.

11.7 FOREIGN INVESTMENT IN INDIA

Foreign investments in the country can take the form of investments in listed companies (i.e., FII investments), investments in listed/unlisted companies other than through stock exchanges (i.e., through the foreign direct investment or private equity/foreign venture capital investment route), investments through American Depository Receipts/Global Depository Receipts (ADR/GDR), or investments by non- resident Indians (NRIs) and Persons of Indian Origin (PIOs) in various Forms.

The fast and steadily growing economy of India in majority of its sectors, has made India one of the most famous and popular destinations in the whole world, for Foreign Direct Investment. India's ever- expanding markets, liberalization of trade policies, development in technology and telecommunication, and loosening of diverse **foreign investment restrictions**, have further collectively made India, the apple of investors' eye, for most productive, profitable, and secure foreign investment. According to a recent survey by the United Nations Conference on Trade and Development (UNCTAD), India has conspicuously emerged out as the second most popular and preferable destination in the entire world, after China, for highly profitable foreign direct investment.

In recent years, bulk of the **foreign direct investment in Indian business sectors** of infrastructure, telecommunication, information technology, computer hardware and software, and hospitality services, have been made by investors of countries like US, UK, Mauritius, Singapore, and many others.

The **foreign direct investment** in Indian business sectors, can easily be made in a variety of ways, through the Governmental and Automatic Routes. However, the Joint Ventures are the most popular and preferred forms of making investment in Indian industry. At present, the most lucrative business sectors for FDI in India are, Infrastructure (Power, Steel, Railways, etc.); Telecommunications; Hospitality sector; Education; Retail; Real Estate; Retail sector, Petroleum and Petroleum Products; Biotechnology; Alternative Energy, etc.

Joint Venture

As business projects get larger, technology more expensive, and the costs of failure too large to be borne alone, businesses feel the need to work with joint ventures. In general, a joint venture ("JV") is an association of two or more entities (whether corporate, government, individual or otherwise) combining property and expertise to carry out a single business enterprise and having a joint proprietary interest, a joint right to control and a sharing of profits and losses. Regardless of the scope of the undertaking, the nature of the JV or the respective degrees of equity or management involvement, a JV must: (1) be a separately identifiable entity; (2) have an ownership interest in such entity by each joint venture partner ("JVP"); and (3) have an active management involvement or deliberate rejection of the right to such involvement by each JVP.

In increasing numbers, businesses have been reaching beyond national boundaries in an effort to locate new opportunities for growth, new markets, and new venture capital. Each foreign market offers unique opportunities and risks, and many firms naturally look to JVs with one or more partners for assistance in entering new markets. JVs have become a major feature of the international business landscape due to increased global competitiveness and technological innovation.

JVs are common and successful in several industries. For example, in the land development and construction industries, JVs are often used to obtain sufficient financing to acquire large land tracts or to undertake major building projects. JVs are also common in the manufacturing, mining, and service industries. A JV may be formed to conduct research and development work on a new product or technical application, to manufacture or produce various products, to market and distribute products and services in a specified geographic area, or to perform a combination of these functions. The function of the JV will be linked to the overall objectives of the parties and will dictate to a large extent the substantive terms of the JV arrangement.

The formation of a JV can be a complex process. After a compatible JVP is selected, the specific goals of the enterprise must be defined, the structure of the JV must be negotiated, numerous legal issues must be recognized and resolved, and potential areas of conflict between the JVPs must be identified and reconciled. If the JV is formed under the laws of a country other than the United States, the JVPs must take the time to understand the requirements of the foreign country's corporate law.

Reasons for Forming a Joint Venture

There are many motivations that lead to the formation of a JV. They include:

- **Risk Sharing** – Risk sharing is a common reason to form a JV, particularly, in highly capital intensive industries and in industries where the high costs of product development equal a high likelihood of failure of any particular product.
- **Economies of Scale** – If an industry has high fixed costs, a JV with a larger company can provide the economies of scale necessary to compete globally and can be an effective way by which two companies can pool resources and achieve critical mass.
- **Market Access** – For companies that lack a basic understanding of customers and the relationship/ infrastructure to distribute their products to customers, forming a JV with the right partner can provide instant access to establish, efficient and effective distribution channels and receptive customer bases. This is important to a company because creating new distribution channels and identifying new customer bases can be extremely difficult, time consuming and expensive activities.
- **Geographical Constraints** – When there is an attractive business opportunity in a foreign market, partnering with a local company is attractive to a foreign company because penetrating a foreign market can be difficult both because of a lack of experience in such market and local barriers to foreign-owned or foreign-controlled companies.
- **Funding Constraints** – When a company is confronted with high up-front development costs, finding the right JVP can provide necessary financing and credibility with third parties.
- **Acquisition Barriers; Prelude to Acquisition** – When a company wants to acquire another but cannot due to cost, size, or geographical restrictions or legal barriers, teaming up with a JVP is an attractive option. The JV is substantially less costly and thus less risky than complete acquisitions, and is sometimes used as a first step to a complete acquisition with the JVP. Such an arrangement allows the purchaser the flexibility to cut its losses if the investment proves less fruitful than anticipated or to acquire the remainder of the company under certain circumstances.

Basic Elements of a Joint Venture

- **Contractual Agreement.** JVs are established by express contracts that consist of one or more agreements involving two or more individuals or organizations and that are entered into for a specific business purpose.
- **Specific Limited Purpose and Duration.** JVs are formed for a specific business objective and can have a limited life span or be long-term. JVs are frequently established for a limited duration because (a) the complementary activities involve a limited amount of assets; (b) the complementary assets have only a limited service life; and/or (c) the complementary production activities will be of only limited efficacy.
- **Joint Property Interest.** Each JV participant contributes property, cash, or other assets and organizational capital for the pursuit of a common and specific business purpose. Thus, a JV is not merely a contractual relationship, but rather the contributions are made to a newly-formed business enterprise, usually a corporation, limited liability company, or partnership. As such, the participants acquire a joint property interest in the assets and subject matter of the JV.
- **Common Financial and Intangible Goals and Objectives.** The JV participants share a common expectation regarding the nature and amount of the expected financial and intangible goals and objectives of the JV. The goals and objectives of a JV tend to be narrowly focused, recognizing that the assets deployed by each participant represent only a portion of the overall resource base.
- **Shared Profits, Losses, Management, and Control.** The JV participants share in the specific and identifiable financial and intangible profits and losses, as well as in certain elements of the management and control of the JV.

Structuring the Joint Venture

Structuring any JV may pose a challenge. This is especially true where parties are from different jurisdictions and various cultural backgrounds are involved. After parties have decided on fundamental issues such as the

commercial nature, scope and mutual objectives of the joint venture, the JVPs must determine the geographic location of the venture and what form or legal structure the joint venture will take.

Generally, the structure chosen will be between different types of partnerships, corporations, or some form of a limited liability company, depending on the tax and tort liability each JVP wants to be exposed to. The precise tax and legal features of vehicles of the same general type will vary from one country to another, but the U.S. forms of businesses can be broadly classified as follows:

- **Corporations** – Corporations are a commonly preferred choice for JVs. The legal status of a corporation is clear, and its ability to own assets, incur liabilities and enter into legally binding contracts is obvious to third parties. The liability of shareholders for the corporation's debts and obligations is limited to their capital investment in the corporation, something that is not always the case with other entities. From a tax perspective, corporations may be undesirable because they generally lack pass-through tax status, making its shareholders unable to set off profits and losses generated by the JV against income or expenses from other activities. Also, the net income of a corporation is likely to be subject to corporate tax in the jurisdiction it is located, be it in the U.S. or elsewhere. Such tax payable by the corporation may not be credible against taxes payable on dividends and other profit distribution from the corporation and its shareholders. However, the presence or absence of tax treaties between respective countries may still make the corporation profitable.

- **General Partnerships** – All partners in a general partnership have personal liability for debts and other obligations incurred by the partnership. One advantage of a general partnership in the U.S. and many other countries is that normally no income or franchise tax is imposed on it. Also, all partners can act on behalf of, and legally bind, the partnership via third parties.

- **Limited Partnerships** – Under a limited partnership there are two distinct types of partners, general and limited. The general partner carries responsibilities similar to the one he carries in a general partnership, including the ability to legally bind the whole partnership and being personally liable for debts and obligations of the partnership. The limited partner, on the other hand, mainly contributes capital and receives a specified share of the profits. The limited partner is excluded from active management of the partnership, but is exempt from personal liability for debts and obligations of the partnership.

- **Limited Liability Company** – A limited liability company is a hybrid between the partnership and the corporation in that it provides the JVPs with insulation from the liabilities of the LLC as in a corporation, while generally being classified as a partnership for U.S. tax purposes. All members may take part in management. Hybrid vehicles such as the LLC are not recognized in all parts of the world.

Managing the Joint Venture

Some JVs are *dominant parent* enterprises – projects are managed by one parent like wholly owned subsidiaries. The dominant parent selects all the functional managers for the enterprise. The board of directors, although made up of executives from each parent, plays a largely ceremonial role as the dominant parent executives make all the venture's operating and strategic decisions. Having managers from only one parent can lead to frustrations for the managers as well as parent company executives.

A dominant parent enterprise is appropriate where a JVP is chosen for reasons other than managerial input – i.e., financial backing, access to resources, patents, or because it consumes a large amount of the product to be made. Dominant parent joint ventures are also appropriate when a company takes on a partner solely in response to pressures from a host government. In such situations, a foreign company often prefers to find a passive local company that (1) has no knowledge of the product, (2) is willing to be a passive investor, and (3) is neither a government agency nor controlled by the government. The passive partner, who may be supplying technology or money, must trust the competence and honesty of the dominant parent. If the local partner never learns the business of the JV, the dominant parent's bargaining position with the host government will remain strong.

Other JVs are *shared management* ventures, where both parents manage the enterprise. Each parent supplies both functional managers and executives to serve on the board of directors. Here, the board of directors has a real decision-making function.

One type of shared management venture is the 50:50 JV. This type of JV is characterized by 50:50 participation in which each partner contributes 50 percent of the equity in return for 50 percent participating control. Under such participation, each JVP is equally at risk, and is not subservient to the other JVP as would be the case where majority control is vested in one party. This sharing of interest and control also raises the possibility of deadlock during disputes and early termination of the JV.

It is important to note that not all shared management ventures own equal shares. JVs are flexible so that they can be structured in such as way that one JVP has more than a co-equal role in the JV (e.g., 40/60).

Shared management is critical in ventures where both JVPs are needed for managerial input, as in manufacturing situations where one parent is supplying technology and the other knowledge of the local market. However, deteriorating performance in a shared management venture obliges each parent to become more involved in the operation of the venture. Unless either parent is willing to defer to the other's knowledge or expertise, the decision-making process can become slow can confused and trigger a series of events that can lead to the destruction of the venture.

Because the amount and type of help needed from a partner may change over time, some companies opt to begin their venture under a shared management that they can later convert to a dominant venture. However, once both parents have become accustomed to operating the venture, such transitions become difficult to make.

The high failure rate of shared management ventures suggests that dominant ventures outperform shared management ventures. Since shared management ventures are not consistently used for riskier business tasks, their high failure rate is a strong indication that they are more difficult to operate than dominant parent ventures. Parents of the venture may, and often do, disagree over strategic and organizational decisions. Differences in the parent venture's priorities, direction, and perhaps values result in confusion, frustration, and slowness in the decision-making process and may place a joint venture at a distinct competitive disadvantage. As a result, if a partner is chosen for reasons other than managerial input a dominant parent structure will usually be best.

Majority ownership and dominance of a joint venture do not always go hand in hand. A parent holding only 24% of one venture's shares may be its exclusive manager. Similarly, one parent may dominate a venture, despite the fact that it is a 50-50 deal.

Termination of Joint Ventures

Any number of events may lead to the termination of a JV. Many termination events are anticipated and provided for in the joint venture agreement. For example, a breach of the joint venture agreement may trigger termination, as will other events, such as failure to meet research and development deadlines. A JV may terminate upon achieving its objectives. Alternatively, a JV may terminate upon failing to meet its objectives. The agreement could provide that one JVP buy the other out or sell its shares, or vice versa.

Excessive costs, failure to achieve projected income, or unforeseen capital requirements may make the continuation of a JV unattractive. In addition, a change in the JV's objectives or those of a shareholder may also lead to the early termination of the JV. Changes in objectives may result from a JVP's internal strategic redirection, competitive advances, or market changes beyond the control of the JV or its shareholders. Disagreement by JVPs on fundamental management issues may also lead to termination.

An obvious disadvantage of sharing capital obligations is the need to share profits generated from the actual operation of the JV. Issues can arise in this area not so much because of the cash contributed, but because of the fact that the parties will also be contributing intangible assets to the business, such as intellectual property rights and technical expertise. Technology and management sharing can potentially create significant problems among the parties. In particular, one party's mastery of the other's technology can lead to improvements on that technology beyond the intended services of the JV, a factor that tends to discourage companies from disclosing their technologies for fear of losing the competitive edge to their JVP.

Many commentators argue that JVs offer a structure for reducing the "free riding" of the local JV partner because both partners contribute to the costs associated with the exploitation of the technology in proportion to their expected benefits. The theory is that a JV partner will have an incentive to focus on protecting the results of the JV activities rather than trying to replicate independently the results for its own account.

Foreign Technology

The most important consideration for obtaining Foreign Technology is with reference to the manner of payment of consideration to the person giving the Foreign Technology. It can take the following forms —

(A) One Time Lumpsum Payment:

- Amount will become certain.
- Amount can be discounted forward and will be less.
- Forex exposure risk is avoided.
- Provides an opportunity to reduce per unit cost of technology by maximizing sales.

(B) Periodic Payments in the form of Royalty:

- Ensures that the sales benefit is realized before technology payment accrues.
- Provides easy installments for funding.

Tax issues:

If it is a lump sum upfront payment, tax also could be certain; whereas, in protracted royalty payment, there is a chance of tax uncertainty. It would be advisable for the payer to obtain beforehand expert opinion as to how to plan its tax shield in the best manner possible.

Government Clearance:

Automatic permission will be given for foreign technology agreements upto certain limits. The conditions to be satisfied for obtaining Government permission should also be considered.

ILLUSTRATIONS

Illustration 1

On 25th March 2015, a customer requested his bank to remit DG 12,50,000 to Holland in payment of import of diamonds under an irrevocable LC. However due to bank strikes, the bank could affect the remittance only on 2nd April 2015. The inter bank market rates were as follows:

Place	25.03.2015	02.04.2015
Bombay [$/₹ 100]	2.2873 - 2.2962	2.3063 - 2.3159
London[US$/Pound]	1.9120 -1.9135	1.9050 - 1.9070
DG/Pound	4.1125 - 4.1140	4.0120 - 4.0130

The bank wishes to retain an exchange margin of 0.25%. How much does the customer stand to gain or lose due to the delay?

Solution:

1. Determination of Rupee Value of DG 1 on 25.03.2015

Process: Buy US $ at Ask Rate at Bombay ⇒ Buy Pound (using US $) at Ask Rate at London

⇒ Sell Pound at Bid Rate for DG

Therefore, ₹ / DG = Ask Rate at Bombay (for Purchase of Dollar) × Ask Rate for Pound at London (for Purchase of Pound) × Bid Rate for DG (for conversion of Pound into DG)

= 100/2.2873 × 1.9135 × (1/4.1125) = ₹ 20.34 per DG

2. Determination of Rupee Value of DG 1 on 02.04.2015

Process: Buy US $ at Ask Rate at Bombay ⇒ Buy Pound (using US $) at Ask Rate at London

⇒ Sell Pound at Bid Rate for DG

Therefore, ₹ / DG = Ask Rate at Bombay (for Purchase of Dollar) × Ask Rate for Pound at London (for Purchase of Pound) × Bid Rate for DG (for conversion of Pound into DG)

= 100/2.3063 × 1.9070 × (1/ 4.0120) = ₹ 20.61 per DG

3. Loss because of Delay

(a) Loss without considering Banker's Margin (Extra Money payable by the Company)

= Amount Payable × (Exchange Rate on the date of actual payment - Exchange Rate on the date on which payable)

= DG 12,50,000 × (₹ 20.61 - ₹ 20.34) = ₹ 3,37,500

(b) Banker's Margin on Loss

= ₹ 3,37,500 × 0.25% = ₹ 844

(c) Total Loss to the Company = ₹ 3,37,500 + ₹ 844 = ₹ 3,38,344

Illustration 2

You have the following quotes from Bank A and Bank B —

	Bank A		Bank B	
Spot	USD/CHF	1.4650/55	USD/CHF	1.4653/60
3 Months		5/10		
6 Months		10/15		
Spot	GBP/USD	1.7645/60	GBP /USD	1.7640/50
3 Months		25/20		
6 Months		35/25		

Calculate —

(a) How much minimum CHF amount you have to pay for 1 Million GBP spot?

(b) Considering the quotes from Bank A only, for GBP / CHF, what are the Implied Swap Points for spot over 3 months?

Solution:

1. Determination of Exchange Rates based on Cross Currency Quotes

Note: The Cheapest Available Quote among Bank A and Bank B has been chosen wherever applicable.

For Buying GBP using CHF, the relevant rate is the ask rate for GBP in CHF

Ask CHF / GBP = Ask Rate CHF / USD x Ask Rate USD / GBP

= 1 / (Bid Rate USD / CHF) x 1 /(Bid Rate GBP / USD)

= (1÷1.4653) x (1 ÷ 1.7645) = 0.3868

Therefore to buy 1 Million GBP, the required CHF = 10,00,000 X 0.3868 = CHF 386800

Similarly,

Bid CHF / GBP = Bid CHF / USD x Bid USD / GBP

= 1/ (Ask Rate USD / CHF) x 1 / (Ask Rate GBP / USD)

= (1 ÷1.4655) x (1 ÷ 1.7650) = 0.3866

2. Determination of Swap Points based on Bank A Quotes alone

The Spot Rates for GBP/CHF -

Bid GBP/CHF = Bid USD/CHF x Bid GBP/USD

= 1.4650 x 1.7645 = 2.5850

Ask GBP/CHF = Ask USD / CHF x Ask GBP / USD

= 1.4655 x 1.7660 = 2.5881

The Futures Rates for GBP/CHF -

Bid GBP /CHF = Bid USD / CHF x Bid GBP / USD

= 1.4655 x 1.7620 = 2.5822

Ask GBP / CHF = Ask USD / CHF x Ask GBP / USD

= 1.4665 x 1.7640 = 2.5869

The implied SWAP points is the difference between the Spot and Forward rates = **0.0028/0.0012 or 28/12.**

Illustration 3

Given the following -

$/£	1.3670/1.3708
S.Fr/DEM	1.0030/1.0078
$/S.Fr	0.8790 / 0.8803
And if DEM / £ in the market are 1.5560 /1.5576	

Find out if any arbitrage opportunity exists.

If so, show how $10,000 available with you can be used to generate risk - less profit.

Solution:

1. Calculation of Cross Rate

(a) Bid [DEM / £] = Bid [$ / £] x Bid [S Fr. / $] x Bid [DEM / S Fr.]

= Bid [$ / £] X 1 / Ask [$ / S Fr.] X 1 / Ask [S Fr. / DEM)

=1.3670 x 1 / 0.8803 x 1 / 1.0078

= 1.54086

(b) Ask [DEM/£] = Ask [$ / £] X Ask [S Fr./$] X Ask [DEM / S Fr.]

= Ask [$ / £] X 1/ Bid [$ / S Fr.] X 1 / Bid [S Fr. / DEM]

= 1.3708 x 1/0.8790 x 1/1.0030

= 1.55483

	Cross Rate	Market Rate
DEM / £	**1.54086 – 1.55483**	**1.5560 – 1.5576**

Since both the rates are apart there exist an arbitrage opportunity.

1. Arbitrage

Relevant Rule for conversion: Based on nature of Quote (Direct or Indirect)

Nature of Quote	Buying Foreign Currency (Converting Home Currency into Foreign Currency)	Selling Foreign Currency (Converting Foreign Currency into Home currency)
Direct Quote, relevant rate is	Ask Rate	Bid Rate
Indirect Quote, relevant rate is	1 ÷ Bid Rate	1 ÷ Ask Rate

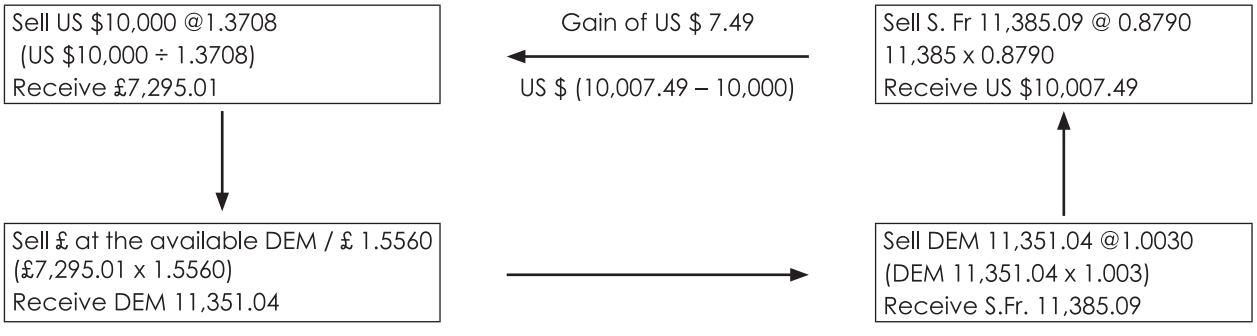


Illustration 4

Evaluation of Forward Premium – Encashing Foreign Currency Deposits –

The following 2 – way quotes appear in the foreign exchange market –

	Spot Rate	2-Months Forward
₹ / US $	₹ 46.00/ ₹ 46.25	₹ 47.00/ ₹ 47.50

Required –

(a) How many US Dollars should a firm sell to get ₹ 25 Lakhs after two months?

(b) How many Rupees is the firm required to pay to obtain US $2,00,000 in the spot market?

(c) Assume the firm has US $ 69,000 current account's earning interest. ROI on Rupee Investment is 10% p.a. should the firm encash the US $ now, 2 months later?

Solution:

1. (a) US dollars for ₹ 25 Lakhs in the forward Market

Action	Sell Foreign Currency in Forward Market
Relevant Rate	Forward Bid Rate = ₹ 47.00
US $ Required to get ₹ 25,00,000	₹ 25,00,000 ÷ ₹ 47.00 = US $ 53,191.49

(b) ₹ Required to obtain US dollars 2,00,000 in the Spot Market

Action	Buy Foreign Currency in Spot Market
Relevant Rate	Spot Ask Rate = ₹ 46.25
Rupees Required to obtain $2,00,000	US $ 2,00,000 x ₹ 46.25 = ₹ 92,50,000

(c) Evaluation of Investment in Rupee

Forward Premium (for Bid Rates) $= \frac{\text{Forward Rate ₹47 - Spot Rate ₹46}}{\text{Spot Rate ₹46}} \times \frac{12 \text{ Months}}{2 \text{ Months}} \times 100$

$= 13.04\%$

Observation and conclusion — Annualized Forward Premium for Bid Rates (13.04%) is greater than the Annual Return on Investment in Rupees (10%). Therefore, the firm should not encash its US $ balance now. It should sell the US $ in the forward market and encash them two months later.

Alternatively

Particulars	**Encash Now**	**Encash 2 Months Later**
Relevant Rate	Spot Bid Rate = ₹ 46.00	Forward Bid Rate = ₹47.00
₹ available for US $ 69,000	₹ 31,74,000	₹ 32,43,000
Add: Interest for 2 Months (if converted now)	₹ 52,900 (31,74,000 × 10% × 2/12)	Not Applicable
Amount Available after Two Months	**₹ 32,26,900**	**₹ 32,43,000**

Conclusion: Encashing two months later yields higher Rupee Return than encashing now and investing in Rupee Deposits. Therefore, the firm should wait for two months to encash under forward market.

Illustration 5

Ankita Papers Ltd (APL), on 1st July 2015 entered into a 3 Month forward contract for buying GBP 1,00,000 for meeting an import obligation. The relevant rates on various dates are-

Date	Nature of Quote	Quote
01.07.2015	Spot	₹ 81.50 - 81.85
	3-Month Forward	₹ 81.90 - 82.30
01.08.2015	Spot	₹ 82.10- 82.40
	2-Month Forward	₹ 82.25 - 82.60
01.09.2015	Spot	₹ 81.70 - 82.05
	1-Month Forward	₹ 82.00 - 82.30
	2-Month Forward	₹ 82.40 - 82.70
01.10.2015	Spot	₹ 82.50 - 82.75
	1-Month Forward	₹ 82.60 - 82.90

Explain the further course of action if APL—

(a) Honours the contract on

- 01.10.2015
- 01.09.2015; and meets the import obligation on the same date.

(b) Cancels the contract on —

- 01.08.2015
- 01.09.2015
- 01.10.2015; as the import obligation does not materialize.

(c) Rolls over the contract for --

- 2 Months on 01.09.2015
- 1 Month on 01.10.2015; as the import obligation gets postponed to 01.11.2015. Also determine the cost / gain of that action. Ignore transaction costs.

Solution:

A. APL Honours the Contract

On (Date)	Action	Cost/ Gain
01.10.2015	No Further Action	NIL
01.09.2015	• Original deal (Buy Contract) should be cancelled. • **Sell Forward:** Therefore, APL should enter into a 1-Month Forward Contract for sale of GBP 1,00,000 at ₹ 82.00 (Forward Bid Rate) for reversal of original contract. • **Settlement of Difference:** Net difference between the original contract and the new contract should be settled i.e. GBP 1,00,000 X (3-Month Buy Rate (Ask Rate) as on 01.07.2015 ₹ 82.30 **Less** 1-Month Sell Rate (Bid Rate) as on 01.09.2015 ₹ 82.00) = ₹ **30,000 to be paid to the Banker.** • **Buy Spot:** Buy GBP 1,00,000 at Spot Ask Rate of ₹ 82.05 and settle the import obligation.	Cost of Settlement ₹ 30,000.

B. APL Cancels the Contract

On (Date)	Action	Cost/Gain
01.08.2015	• Original deal (Buy Contract) should be cancelled. • Sell Forward: Therefore, APL should enter into a 2-Month Forward Contract for sale of GBP 1,00,000 at ₹ 82.25 (Forward Bid Rate) for reversal of original contract. • Settlement of Difference: Net difference between the original contract and the new contract should be settled i.e. GBP 1,00,000 X (3-Month Buy Rate (Ask Rate) as on 01.07.2015 ₹ 82.30 Less 2-Month Sell Rate (Bid Rate) as on 01.08.2015 ₹ 82.25) • = ₹ 5,000 to be paid to the Banker.	Cost of Cancellation ₹ 5,000.

On (Date)	Action	Cost / Gain
01.09.2015	• Original deal (Buy Contract) should be cancelled. • **Sell Forward:** Therefore, APL should enter into a 1-Month Forward Contract for sale of GBP 1,00,000 at ₹ 82.00 for reversal of original contract. • **Settlement of Difference**: Net difference between the original contract and the new contract should be settled i.e. GBP 1,00,000 x (3-Month Buy Rate (Ask Rate) as on 01.07.2015 ₹ 82.30 **Less** 1-Month Sell Rate (Buy Rate) as on 01.09.2015 ₹ 82.00) = ₹ **30,000 to be paid to the Banker.**	Cost of Cancellation ₹ 30,000.
01.10.2015	• Original deal (Buy Contract) should be cancelled. • **Sell Spot:** Therefore. APL should sell GBP 1,00,000 at the Spot Bid Rate of ₹ 82.50 for reversal of original contract. • **Settlement** of **Difference:** Net difference between the original contract and the spot sale contract should be settled i.e. GBP 1,00,000 x (3-Month Buy Rate-(Ask Rate) as on 01.07.2015 ₹ 82.30 **Less** Spot Bid Rate as on 01.10.2015 ₹ 82.50) = (₹ 20,000) i.e. ₹ **20,000 to be received from the Banker.**	Gain on Cancellation ₹ 20,000.

C. APL Rolls Over the Contract for a further period of Two Months

On (Date)	Action	Cost / Gain
01.09.2015	• Original deal (Buy Contract) should be cancelled. • **Sell Forward:** Therefore, APL should sell GBP 1,00,000 at the 1-Month Forward Bid Rate of ₹ 82.00 for reversal of original contract. • **Settlement of Difference:** Net difference between the original 3-Month Forward Buy Contract and 1-Month Forward Sell Contract should be settled i.e. GBP 1,00,000 X (3-Month Buy Rate (Ask Rate) as on 01.07.2015 ₹ 82.30 **Less** 1-Month Sell Rate (Bid Rate) as on 01.09.2015 ₹ 82.00) = ₹ 30,000 i.e. ₹ **30,000 to be paid to the Banker.** • **Buy Forward:** APL should buy GBP 1,00,000 at 2-Month Forward Ask Rate of ₹ 82.70.	Cost of Roll Over ₹30,000.

01.10.2015	• Original deal (Buy Contract) should be cancelled. • **Sell Spot:** Therefore. APL should sell GBP 1,00,000 at the Spot Bid Rate of ₹ 82.50 for reversal of original contract. • **Settlement of Difference:** Net difference between the original 3-Month Forward Buy Contract and the Spot Bid Rate of ₹ 82.50 should be settled i.e. GBP 1.00,000 x (3-Month Buy Rate (Ask Rate) as on 01.07.2015 ₹ 82.30 **Less** Spot Bid Rate as on 01.10.2015 ₹ 82.50) = (₹ 20,000) i.e. ₹ **20,000 to be received from the Banker.** • **Buy Forward:** APL should buy GBP 1,00,000 at 1-Month Forward Ask Rate of ₹ 82.90.	Gain on Roll Over ₹ 20.000.

Illustration 6

Sunny Ltd. (SL), have exported goods to UAE for Arab Emirates Dirham (AED) 5,00,000 at a credit period of 90 days. Rupee is appreciating against the AED and SL is exploring alternatives to mitigate loss due to AED Depreciation. From the following information, analyze the possibility of Money Market Hedge —

Foreign Exchange Rates		
	Bid	Ask
Spot	₹ 11.50	₹ 11.80
3-Month Forward	₹ 11.20	₹ 11.40

Money Market Rates		
	Deposit	Borrowings
AED	9%	12%
Rupees	8%	10%

Solution:

Facts: SL will sell AED 5,00,000 in 3 Months

Evaluation: Money Market Hedge is possible only if the 3-Month Forward Rate is lower than value of Spot Bid in the next 3 Months (computed by applying UA Borrowing Rate and Rupee Deposit Rate).

Value of Spot Bid

In 3 Month's Time $= \text{Spot Bid Rate} \times \frac{(1+\text{Rupee Deposit Rate for 3 Months})}{(1+\text{AED Deposit Rate for 3 Months})}$

$= ₹11.50 \times \frac{(1 + 8\% \text{ p.a. for 3 Months})}{(1 + 12\% \text{ p.a. for 3 Months})}$

$= ₹ 11.50 \text{ X } (1+ 0.02) \div (1+ 0.03) = ₹ 11.388 = ₹ 11.39$

Value of Spot Bid ₹ 11.39 in 3 Month's time > Forward Bid Rate of ₹ 11.20

$\Rightarrow$ Therefore, there is a possibility for Money Market Hedge

Inference: $\Rightarrow$ AED 5,00,000 Receivable is an Asset

$\Rightarrow$ Under Money Market Hedge, liability in AED should be created

$\Rightarrow$ SL should borrow AED for 3 Months, which along with interest would amount to AED 5,00,000 in 3 Months.

Action	Date	Activity
Borrow	Now	Borrow an amount of AED at 12% p.a. for 3 Months so that, the total liability including interest for 3 months, is AED 5,00,000. ⇒ AED 5,00,000 ÷(1 + Interest Rate for 3 Months) ⇒ AED 5.00,000 ÷ (1 + 12% × 3 Months/ 12 Months) ⇒ AED 5,00,000 ÷ 1.03 = AED 4,85,436.8932 should be borrowed.
Convert	Now	Convert AED 485436.8932 into Rupees at Spot Rate (Bid Rate since AED is sold) ⇒ AED 4,85,436.8932 × ₹ 11.50 = ₹ 55,82,524
Invest	Now	Invest ₹ 55,82,524 in Rupee Deposit for 3 Months at 8% p.a.
Realize	3 Months hence	Realize the maturity value of rupee deposit. Amount received will be - ⇒ ₹ 55,82,524 × (1 + Interest Rate for 3 Months) ⇒ ₹ 55,82,524 × (1 + 8% × 3 Months/ 12 Months) ⇒ ₹ 55,82,524 × (1 + 0.02) = ₹ 55,82,524 × 1.02 = ₹ 56,94,175
Receive	3 Months hence	Receive the AED 5,00,000 from the customer abroad.
Repay	3 Months hence	Repay the AED Loan using the money received from the customer abroad. Amount Payable = Amount Borrowed AED 4,85,436.8932 × (1 + 12% p.a. for 3 Months) = USD 4,85,436.8932 x 1.03 = AED 5,00,000.

2. Amount Saved by Utilizing Money Market Hedge

Action: Enter into a 3-Months Forward Sale Contract for sale of AED 5,00,000 at ₹ 11.20. Sell AED 5,00,000 3 Months from now at ₹ 11.20

Effect: Amount in ₹ in hand in 3 Months = AED 5,00,000 × ₹ I 1.20

= ₹ 56,00,000

Amount Saved under Money Market Hedge

Under Money Market Hedge is ₹ 56,94,175

Less: Under Forward Contract is ₹ 56,00,000

Amount Saved ₹ 94,175

Conclusion: Hedging risks using Money Market Operations will be advantageous to SL.

Illustration 7.

The following table shows interest rates and exchange rates for the US Dollar and French Franc. The spot exchange rate is 7.05 Francs per Dollar. Complete the missing entries —

	3 Months	6 Months	1 Year
Dollar Interest Rate (Annual)	11½%	12¼%	?
Franc Interest Rate (Annual)	19½%	?	20%
Forward Francs per Dollar	?	?	7.52
Forward Discount on Franc (Percent per Year)	?	(6.3%)	?

Solution:

Particulars	3 Months	6 Months	1 Year
Dollar Interest Rate (Annual)	11½%	12¼%	12 ½%
Franc Interest Rate (Annual)	19½%	**18.94%**	20%
Forward Francs per Dollar	**7.1871**	**7.2721**	7.52
Forward Discount on Franc (Percent per Year)	**(7.78%)**	(6.3%)	6.67%

Working Notes:

1. Spot Rate 1 $ = 7.05 Francs
2. 3 Months Forward; (for $ 1)

   = Spot Rate x [(1 + Francs Interest Rate for 3 Months) / (1 + Dollar Interest Rate for 3 Months] = 7.05 Francs X [(1 + 19.5%/4) / (1 + 11.5%/4)] =Fr. 7.1871 [Interest Rate Parity Method]
3. Forward Discount Rate [3 Months]

   = [(Forward Rate - Spot Rate) /Spot Rate] x 100 x 12/No. of Months' Forward Rate

   = (7.1871 -7.05)/7.05 X 100 X 12/3 = 7.78% (Annualized)
4. 6 Months Forward Rate;

   = Spot Rate X [1 + (Discount Rate X No. of Months Forward/ 12)]

   = Fr.7.05 X [1 + (6.3% X 6/12)]

   = Fr. 7.05 x [1 + 0.0315] = Fr. 7.2721
5. Franc Interest Rate [6 Months] = Assuming Franc Interest Rate = x, applying the same in Interest Rate Parity Formula for determining Forward Rate —

   $$\text{Forward Rate} = \text{Franc Spot Rate} \times \frac{(1+\text{Francs Interest Rate for 6 Months})}{(1+\text{Dollar Interest Rate for 6 Months})}$$

   Fr. 7.2721 = Fr. 7.05 x (1 + x/2) / (1 + 12.25%/2)

   Fr.7.2721 = Fr. 7.05 x (1 + x/2)/(I + 0.6125);

   1 + x/2 = Fr.7.2721 x 1.06125/Fr.7.05

   X/2 = 1.0947 - 1 = 0.0947 or 9.47%

   X = 18.94%
6. Dollar Interest Rate [1 Year] = Assuming Dollar Interest Rate = x, applying the same in Interest Rate Parity Formula for determining Forward Rate —

   $$\text{Forward Rate} = \text{Franc Spot Rate} \frac{(1+\text{Francs Interest Rate for 1 Year})}{(1+\text{Dollar Interest Rate for 1 Year})}$$

   Fr.7.52 = Fr. 7.05 x (1 + 20%) / (1 + x)

   Fr.7.52 = Fr. 7.05 x (1 +0.2)/(1 + x);

   1 + x = Fr.7.05 X 1.2/Fr.7.52

   x = 1.125-1 =0.125 or 12.50%
7. Forward Discount Rate:

   = [Forward Rate - Spot Rate] / [Spot Rate] X 100 X 12/ No. of Months Forward

   = (7.52 - 7.05) / 7.05 x 100 X 12/12 Months = 0.0667 or 6.67%

Illustration 8.

Following information is made available —

Spot rate for 1 US $	₹ 48.0123
180 -Days Forward rate for 1 US $	₹ 48.8190
Annualized Interest Rate for 6 Months - Rupee	12%
Annualized Interest Rate for 6 Months - US $	8%

Is there any arbitrage possibility? If yes how an arbitrageur can take advantage of the situation, if he is willing to borrow ₹ 40,00,000 or US $ 83,312?

Solution:

1. Direction of Cash Flow

(Based on Interest Rate Parity Theory)

Particulars	**Value**
Forward Rate	₹ 48.8190
For the above forward rate, theoretical 6-Month interest for Rupee is - $= \frac{\text{Forward Rate} \times (1 + 8\% \times 6 \text{ Months}/12 \text{ Months})}{\text{Spot Rate}} - 1$ $= \frac{₹48.819 \times (1 + 8\% \times 6 \text{ Months}/12 \text{ Months})}{₹ 48.0123} - 1$ $= \frac{₹48.819 \times (1 + 4\%)}{₹ 48.0123} - 1$ = [(₹ 48.819) x (1.04) ÷ ₹ 48.0123] – 1 = [50.7718 ÷ 48.0123] - 1 = 1.0575 – 1 = 0.0575 or 5.75% Annual Interest Rate 5.75% X 12 Months / 6 Months = 11.50%	11.50%
Prevailing Interest Rate	12%
In comparison to theoretical interest rate, the actual rate is -	Higher
Therefore, money will flow—	Into India

Conclusion: Since the theoretical interest rate and the actual interest rate differ, arbitrage possibility exists by borrowing in USD and investing in Rupee.

2. Sequence of Activities for Gain

Action	**Date**	**Activity**
Borrow	Now	Borrow USD 83,312 at 8% p.a. for 6 Months
Convert	Now	Convert USD 83,312 at Spot Rate ⇒ USD 83,312 x ₹ 48.0123 = ₹ 40,00,000
Invest	Now	Invest ₹ 40 Lakhs in Rupee Deposit for 6 Months at 12% p.a.
Realize	6 Months Later	Realize the maturity value of rupee deposit. Amount received will be - ⇒ ₹ 40,00,000 × (1 + Interest Rate for 6 Months) ⇒ ₹ 40,00,000 × (1 + 12% X 6 Months/ 12 Months) ⇒ ₹ 40,00,000 × (1 + 1.06) = ₹ 42,40,000
Convert	6 Months Later	Convert maturity proceeds of ₹ 42,40,000 at Forward Rate of ₹ 48.8190 ⇒ ₹ 42,40,000 ÷ ₹ 48.8190 = USD 86,851.43
Repay	6 Months Later	Repay the USD Loan from the conversion out of money received on conversion. Amount Payable = Amount Borrowed USD 83,312 × (1 + 8% p.a. for 6 Months) = USD 83,312 × 1.04 = USD 86,644.48
Gain	6 Months Later	Conversion of Maturity Proceeds Less Loan Repaid = USD 86,851.43 - USD 86,644.48 = USD 206.95 or ₹ 10,103 [USD 206.95 converted at Forward Rate]

Illustration 9.

A Laptop Bag is priced at $ 105.00 at New York. The same bag is priced at ₹ 4,250 in Mumbai. Determine Exchange Rate in Mumbai.

(a) If, over the next one year, price of the bag increases by 7% in Mumbai and by 4% in New York, determine the price of the bag at Mumbai and-New York? Also determine the exchange rate prevailing at New York for ₹ 100.

(b) Determine the appreciation or depreciation in ₹ in one year from now.

Solution:

1. Exchange Rate in Mumbai (Purchasing Power Parity Theory)

   Exchange Rate in Mumbai per $ = Bag Price in ₹ at Mumbai / Bag Price in $ at New York

   = ₹ 4,250 ÷ USD 105 = ₹ 40.4762

2. Price in a Year's time

   Mumbai = Prevailing Price × (1 + Increase in Rate) = ₹ 4250 × (1 + 7%)

   = ₹ 4,250 x 1.07 = ₹ 4,547.50

   New York = Prevailing Price x (1 + Increase in Rate) = USD 105 × (1 + 4%)

   = USD 105 × 1.04 = USD 109.20

3. Exchange Rate in New York (after one year)

   Exchange Rate in New York per ₹ 100

   = (Bag Price in $ at New York/ Bag Price in ₹ at Mumbai) x ₹ 100

   = (USD 109.20 ÷ ₹ 4,547.50) x ₹ I00= USD 2.4013

4. Depreciation (in %) of ₹ over the year

   Depreciation = [(1 + Indian Inflation Rate) / (1 + New York Inflation Rate)] - 1

   = [(1 + 7%) / (1 + 4%)] - 1 = (1.07 / 1.04) - 1 = 2,88%

   Alternatively = (Future Spot Rate ₹ / $ - Spot Rate of ₹ / $) ÷ Spot Rate × 100

   Future Spot = Bag Price in Mumbai / Bag Price in New York in one year = ₹ 4,547.50 / USD 109.20

   = ₹ 41.6438

   Depreciation = (Future Spot ₹ 41.6438 - Spot Rate ₹ 40.4762) ÷ Spot Rate ₹ 40.4762 x 100

   = ₹ 1.1676 ÷ ₹ 40.4762 × 100 = 2.88%

Illustration 10.

₹ / GBP	**82.60/90**
3 Months Forward	20/70
6 Months Forward	50/75

Interest Rates (Annualized)	India	**London**
3 Months	8%	5%
6 Months	10%	8%

Verify whether there is any scope for covered interest arbitrage by borrowing in rupee.

Solution:

Particulars	**3 Months**	**6 Months**
A. Outflow at the end of the period		
Amount Borrowed in ₹	1,00,000	1,00,000
Add: Interest Payable-	2,000	5,000
	(1,00,000 x 8% X 3/12)	(1,00,000 x 10% x 6/12)
Total Outflow at the end of the period [A]	1,02,000	1,05,000

B. Inflow at the end of the Period:		
(a) GBP obtained by converting money borrowed at Spot Rate [Ask Rate]	GBP 1,206.2726 (₹ 1,00.000/82.90)	GBP 1,206.2726 (₹ 1,00,000/ 82.90)
(b) Invest the GBP 1206.2726 @	5% p.a. for 3 Months	8% p.a. for 6 Months
(c) Interest Receivable at the end of the period	GBP 15.0784 (GBP 1.206.2726 x 5% x 3 / 1 2)	GBP 48.2509 (GBP 1,206.2726 x 8% x 6/12)
(d) Total Amount Receivable in GBP at the end of the period [a + c]	GBP 1,221.3510	GBP 1,254.5235
(e) Forward Rate [Bid Rate]	₹ 82.80 [₹ 82.60 + 0.20 Premium]	₹ 83.10 [₹ 82.60 + 0.50 Premium]
(f) Convert GBP Received in ₹ at Forward Rate [d × e] [B]	**₹ 1,01,128** [₹ 82.80 x GBP 1,221.3510]	**₹ 1,04,251** (₹ 83.10 x GBP 1,254.5235]
C. Total Cash Loss [A-B]	₹ 872	₹ 749
D. Cash Loss in % of Money Invested	**0.872%** [₹ 872 /₹ 1,00,000]	**0.749%** [₹ 749/₹ 1,00,000]

Conclusion: Amount of rupee received is less than the amount repaid, there is no scope for Covered interest arbitrage by borrowing in Rupee.

Alternative Approach:

The above conclusion can be derived by the comparing Estimated Future Value per GBP Invested in lines with Interest Rate Parity Analysis (using Spot Ask Rate) and Forward Rate Quoted (Bid Rate) as follows —

Particulars	**3 Months**	**6 Months**
A. Forward Rate [Bid Rate] Rate at which GBP can be sold	₹ 82.80 [₹ 82.60 + 0.20 Premium]	₹ 83.10 [₹ 82.60 + 0.50 Premium]
B. Estimated Future Value [Under Interest Rate Parity Analysis]	$\frac{₹82.90 \times (1 + 8\% \times 3/12)}{(1 + 5\% \times 3/12)}$ = ₹ 83.5141	$\frac{₹82.90 \times (1 + 10\% \times 6/12)}{(1 + 8\% \times 6/12)}$ = ₹ 83.6971
C. Loss per GBP Invested [without removing effect of interest on Investment] **[B-A]**	₹ 0.7141	₹ 0.5971
D. Interest on Loss per GBP Invested	₹ 0.0089 [₹ 0.7141 x 5% x 3/12]	₹ 0.0239 [₹ 0.5971x 8% x 6/12]
E. Loss per GBP Invested [after removing effect of interest on GBP Investment] [C + D]	₹ 0.7230	₹ 0.6210
F. Loss per GBP Invested (in **%) [E / A]**	**0.872%** [₹ 0.7230 /₹ 82.90]	**0.749%** [₹ 0.6210/₹ 82.90]

Note: Decision can be arrived at by comparing Figures in B with Figures in A. Since the Estimated Future Value [applying Interest Rate Parity Analysis on Spot Rate - Ask Rate] is higher than the Forward Rate [Bid Rate], there is no scope of Covered Interest Arbitrage.

Step C through F is provided to illustrate that the net effect under both the approaches are the same.

Illustration 11.

Good Morning Ltd., London will have to make a payment of US $ 3,64,897 in six month's time. It is currently 1st October. The company is considering the various choices it has in order to hedge its transaction exposure.

Exchange rates:

Spot rate	$1.5617 – 1.5773
Six month forward rate	$1.5455 – 1.5609

	Borrow(%)	Deposit(%)
US	6	4.5
UK	7	5.5

Foreign currency option prices (1 unit is £ 12,500):

Exercise Price	Call option (March)	Put option (March)
$1.70	$ 0.037	$ 0.096

By making the appropriate calculations and ignoring time value of money (in case of Premia) decide which of the following alternative is preferable by the company?

(a) Forward market;

(b) Cash (Money) market;

(c) Currency options.

Solution:

Relevant Rule for Conversion: Based on nature of Quote (Direct or indirect)

Nature of Quote	Buying-Foreign Currency (Converting - Home Currency into Foreign Currency)	Selling Foreign Currency (Converting Foreign Currency into Home Currency)
Direct Quote, relevant rate is	Ask Rate	Bid Rate
Indirect Quote, relevant rate is	1 ÷ Bid Rate	1 ÷ Ask Rate

(a) Forward Market:

Particulars	Computation	Amount ($)
Amount Payable	Given	$ 3,64,897
Amount under Forward Contract	$ 3,64,897 ÷1.5455 (Forward Bid Rate)	£2,36,103

(b) Cash Money Market

1. **Requisite:** Money Market Hedge is possible only in case of difference in rates of interest for borrowing and investing.

2. **Activity Flow:**

   Borrow: Borrow Sterling equivalent of money at 7% p.a. for 6 Months for investing. **Convert:** Convert the money borrowed in Sterling to US $ at Spot Rate (**Bid)**

   Invest: Invest US $ so converted in Dollar Deposits at 4.5% p.a. for 6 Months

   Realize: Realize the Deposit including Interest and use the proceeds to settle the liability.

3. Cash Flow:

Particulars		Amount
Amount Payable	After 6 Months	US $ 3,64,897
Amount to be Invested at 4.5% p.a. for realizing US $ 3,64,897 = US $ 3,64,897 ÷ (1 + Interest Rate of 4.5% p.a. × 6/12) = $ 3,64,897 ÷ 1.0225		US $ 3,56,867
Amount be borrowed	= Amount to be invested in US $ 3,56,867 ÷ 1.5617 (Spot Bid Rate)	£2,28,512
Interest payable	On money borrowed @ 7% p.a. for 6 Months = ₹ 2,28,512 × 7% × 6 Months / 12 Months	£ 7,998
Total Amount Payable	**Amount Borrowed £ 2,28,512 + Interest £ 7,998**	**£2,36,510**

(c) Currency Options

Payment is to be made in Pounds after 6 months, hence Put option to sell Pounds is relevant.

Number of Options Contract

- Value of one Options Contract = Value per unit X Exercise price = £ 12,500 x 1.70 = £21,250
- Number of Contracts to be purchased = Amount payable in 6 month's time ÷ Value per contract = 3,64,897 ÷ 21,250 = 17.17 Contracts

Alternative 1: 17 Options Contracts are undertaken and the balance through Forward Contract.

- Value covered under Options = 17 Contracts X $ 21,250 per Contract = $ 3,61,250
- Value under Forward Contract = Amount payable after 6 months - Value under Options = $ 3,64,897 - $ 3,61,250 = $3,647

Cash Flows under Options

Particulars	Amount
Value of Forward Contract in £ = ($ 3,647 ÷ 1.5455)	£ 2360
Premium Payable [$0.096 X 17 x 12,500 = $ 20,400 = $ 20,400 ÷1.5617 (Spot Bid Rate)	£ 13,063
Value of the 17 Options Contract [17 x 12,500]	£2,12,500
Total Outflow under Options	£ 2,27,923

Alternative 2: 18 Option Contracts are undertaken and the excess Dollars are sold in the Forward Market

- Value covered under Options = 18 Contracts X $ 21,250 per Contract = $ 3,82,500
- Value sold under Forward Contract = Amount payable after 6 months - Value under Options = $3,64,897 - $ 3,82,500 = $**17,603**

Cash Flows under Options

Particulars	Amount
Value of Forward Contract in £ = ($ 17,063 ÷ 1.5609)	£ 11,277
Premium Payable [$0.096 × 18 × 12,500 = $ 21,600 = $21,600 ÷ 1.5617 (Spot Bid Rate)	£ 1,3831
Value of the 18 Options Contract [18 × 12,500]	£ 2,25,000
Total Outflow under Options	£ 2,27,554

Conclusion: The Cash outflow under Options is the lowest and hence it may be undertaken.

Illustration 12.

Your Company has to make a US $ 1 Million payment in three month's time. The dollars are available now. You decide to invest them for three months and you are given the following information.

(i) The US deposit rate is 8% p.a.

(ii) The sterling deposit rate is 10% p.a.

(iii) The spot exchange rate is $1.80 / pound.

(iv) The three month forward rate is $ 1.78/ pound.

- Where should your company invest for better results?
- Assuming that the interest rates and the spot exchange rate remain as above, what forward rate would yield an equilibrium situation?
- Assuming that the US interest rate and the spot and forward rates remain as in the original question, where would you invest if the sterling deposit rate were 14% per annum?
- With the originally stated spot and forward rates and the same dollar deposit rate, what is the equilibrium sterling deposit rate?

Solution:

(i) Invest for better results

Since the US $ are available now, amount can be invested in

1. US $ Deposits @ 8% p.a. or
2. Converted into Sterling Currency at the Spot Rate and invested in UK Deposits.

Alternative 1

Particulars	Value
Invest in $ deposits @	8% p.a. for 3 months.
Income = $ 10,00,000 x 8/100x3/12	$ 20,000

Alternative 2

Particulars		Value
1.	Convert Dollars into Pounds at Spot Rate (US $ 10,00,000 ÷ 1.80)	£5,55,556
2.	Invest £5,55,556 in Sterling Deposits at the rate of 10% p.a. for 3 months interest on £5,55,556 @ 10% for 3 months = £5,55,556 10% × 3/12	£13,889
3.	Total Cash Inflow at the end of 3 months [(1)+(2)]	£5,69,445
4.	Amount earned in US $ = [(3) × 1.78 (Forward Rate)]	US $ 10,13,612
5.	Gain in US $ [10,13,612 – 10,00,000]	US $13,612

Gain in **Alternative 1** is higher. Hence, company should invest in US Deposits.

(ii) Equilibrium Forward Rate 3 Months Forward; (for 1 £)

= Spot Rate × [(1 + US Interest Rate for 3 Months) / (1 + Sterling Interest Rate for 3 Months]

= $ 1.8 × [(1 + 8%/4) / (1 + 10%/4)] = $1.7912/ £ [Interest Rate Parity Method]

Equilibrium 3 months Forward Rate = $ 1.7912 / £

(iii) Investment if Sterling Deposit: Rate is 14%

Particulars	Amount
1. Amount invested in Sterling Deposit Rate	£ 5,55,556
2. Interest Income @ 14% for 3 months £ 5,55.556 x 14 % x 3 / 12	£ 19,444
3. Total Cash Inflow at the end of 3 months [(1)+ (2)]	£ 5,75,000
4. Amount earned in US $ = [(3) x 1.78 (Forward Rate)]	US $ 10,23,500
5. Gain in US $ [10,23,500 - 10,00,000]	US $ 23,500

Conclusion: Gain is highest of all the considered alternatives, therefore amount should be invested in Sterling Deposits @ 14%.

(iv) Equilibrium Sterling Deposit Rate - Franc Interest Rate [6 Months] = Assuming Sterling Interest Rate = x, applying the same in Interest Rate Parity Formula for determining Forward Rate —

$$£\ 1 = \text{Spot Rate} \times \frac{(1+\text{US Interest Rate for 3 Months})}{(1+\text{Sterling Interest Rate for 3 Months})}$$

1 £ = $1.80 × (1 + 8%/4) / (1 + x/4)

1 £ = $1.80 x (1 + 0.02) / (1 + x/4);

⇒ $1.78 = $1.80 x (1 + 0.02)/ (1 + x/4):

⇒ 1+ x/4 = $ 1.80 X 1.02/$ 1.78

⇒ x/4 = 1.03146 -1 = 0.03146 or 3.146%

⇒ **x = 12.58%**

Equilibrium Sterling Interest Rate = 12.58%

Illustration 13.

DS Inc. is considering a new plan in Netherlands. The plan will cost 26 Million Guilders. Incremental Cash Flows are expected to be 3 Million Guilders per year for the first 3 years. 4 Million Guilders for the next 3, 5 Million Guilders in Years 7 to 9, and 6 Million Guilders in years 10 through 19, after which the project will terminate with no residual value.

The present exchange rate is 1.90 Guilders per dollar. The required rate of return on repatriated dollar is 16%.

(a) If the exchange rate states at 1.90, what is the project NPV?

(b) If the guider appreciates to 1.84 for years 1 - 3, to 1.78 for years 4-6,1.72 for years 7-9, and to 1.65 for years 10-19, what happens to the NPV?

Solution:

1. Net Present Value under Fixed Exchange Rate ($ 1 = Guilders 1.90)

Particulars	Years				
	0	1- 3	4 - 6	7 - 9	10 - 19
(a) Cash Flows in Guilders	(26.00)	3.00 p.a.	4.00 p.a.	5.00 p.a.	6.00 p.a.
(b) Exchange Rate [Guilders /$]	1.90	1.90	1.90	1.90	1.90
(c) Cash Flow in $	(13.6842) [26.00/1.90]	1.5789 [3.00/1.90]	2.1053 [4.00/1.90]	2.6312 [5.00/1.90]	3.1579 [6.00/1.90]
(d) Discount Factor @ 16%	1	2.246	1.439	0.922	1.270
(e) Discounted Cash Flow	(13.6842)	3.5462	3.030	2.4260	4.0105

Net Present Value = **US $ (0.6715) Million**

Recommendation: Since the Net Present Value is negative, the project should not be accepted.

2. Net Present Value under Variable Exchange Rates

Particulars	Years				
	0	1-3	4-6	7 -9	10-19
Cash Flows in Guilders	(26.00)	3.00 p.a.	4.00 p.a.	5.00 p.a.	6.00 p.a.
Exchange Rate [Guilders / $]	1.90	1.84	1.78	1.72	1.65
Cash Flow in $	(13.6842) [26.00/1.90]	1.6304 [3.00/1.84]	2.2472 [4.00/1.78]	2.9070 [5.00/1.72]	3.6364 [6.00/1.65]
Discount Facfor @ 16%	1	2.246	1.439	0.922	1.270
Discounted Cash Flow	(13.6842)	3.6619	3.2337	2.6803	4.6182

Net Present Value = **US $ 0.5099 Million**

Recommendation: Since the Net Present Value is positive, the project **may be** accepted.

Illustration 14.

Following are the details of cash inflows and outflows in foreign currency denominations of M Co., an Indian export firm, which have no foreign subsidiaries —

Currency	Inflow	Outflow	Spot rate	Forward rate
US $	4,00,00,000	2,00,00,000	48.01	48.82
French Franc (F Fr)	2,00,00,000	80,00,000	7.45	8.12
UK £	3,00,00,000	2,00,00,000	75.57	75.98
Japanese Yen	1,50,00,000	2,50,00,000	3.20	2.40

(a) Determine the net exposure of each foreign currency in terms of Rupees.

(b) Are any of the exposure positions off-setting to some extent?

Solution:

1. Computation of Net Exposure

Particulars	US $	F Fr	UK £	Japan Yen
Inflow (in Lakhs)	400.00	200.00	300.00	150.00
Less: Outflow	(200.00)	(80.00)	(200.00)	(250.00)
Net Exposure (Foreign Currency Terms)	200.00	120.00	100.00	(100.00)
Spot Exchange Rate	48.01	7.45	75.57	3.20
Net Exposure (in Rupee Terms based on Spot Exchange Rate)	9602 [200x48.01]	894 [120 x 7.45]	7557 [100 x 75.57]	(32) [100 x 3.20/10]

Particulars	US $	F Fr	UK£	Japan Yen
Forward Rate [₹ , FC]	48.82	8.12	75.98	2.40
Less: Spot Exchange Rate [₹ / FC]	48.01	7.45	75.57	3.20
Forward Premium/ (Discount)	0.81	0.67	0.41	(0.80)
Net Exposure in Rupee Terms based on extent of uncertainty represented by Premium / (Discount)	162.0 [200 x 0.81]	80.4 [120 x 0.67]	41.0 [100 x 0.41]	8.0 [(100) x (0.8)/ 10]

2. Off Setting Position:

(a) Net Exposure in all the currencies are offset by better forward rates. In the case of USD. F Fr and UK Pound, the net exposure is receivable, and the forward rates are quoted at a premium for these currencies.

(b) In case of Japanese Yen, the net exposure is payable, and the forward rate is quoted at a discount. Therefore, a better forward rate is also offsetting the net payable in Japanese Yen.

Illustration 15.

AGIP Ltd., is a supplier of leather goods to retailers in the UK and other Western European countries. The company is considering entering into a joint venture with a manufacturer is South America. The two companies will each own 50 per cent of the limited liability company JV (SA) and will share profits equally. £450,000 of the initial capital is being provided by AGIP Ltd., and the equivalent in South American dollars (SA $) is being provided by the foreign partner. Manager of the Joint Venture expects the following net operating cash flows, which are in nominal terms. SA $ 000 forward rates of exchange to the Sterling

Year 1	4,250	10
Year 2	6,500	15
Year 3	8,350	21

For tax reasons JV (SV) the company to be formed specifically for the joint venture, will be registered in South America. Ignore taxation in your calculations.

Assume you are financial adviser retained by AGIP limited to advise on the proposed joint venture. Calculate the NPV of the project under the two assumptions explained below. Use a discount rate of 16 % for both assumptions.

- **Assumptions 1**: The South American country has exchange controls which prohibit the payment of dividends above 50 per cent of the annual cash flows for the first three years of the project. The accumulated balance can be repatriated at the end of the third year.
- **Assumption 2**: The Government of the South American country is considering removing exchange controls and restriction on repatriation of profits. If this happens all cash flows will be distributed as dividends to the partner companies at the end of each year.

Comment briefly on whether or not the joint venture should proceed based solely on these calculations.

Solution:

1. With exchange controls: [Amount in 000s]

Year	PAT SA $	AGIP share SA $	50%div SA $	AGIP share £	Disc Factor @ 16 %	DCFAT £
0				(450)	1.000	(450)
1	4,250	2,125	1,062	106	0.862	91
2	6,500	3,250	1,625	108	0.743	80
3	8,350	4,175	2,088	100	0.641	64
			4,775	227	0.641	146
Net Present value						(69)

Exchange controls removed and all earnings distributed as dividends [Amount in 000s].

Year	PAT SA $	AGIP share SA $	AGIP Share in £	Disc Factor @ 16%	DCFAT £
0			(450)	1.000	(450)
1	4,250	2,125	212	0.862	183
2	6,500	3,250	217	0.743	161
3	8,350	4,175	199	0.641	127
Net present value					21

3. If exchange controls exist, in the South American Country the project has a negative and should not be undertaken, Investing in countries with a history of high inflation and political volatility adds to the risk of the project and AGIP Ltd., should proceeds with caution.

EXERCISES

Short – Answer Type Questions

1. What do you mean by 'foreign exchange market'? Who are the participants in such market?
2. Explain the terms – bid rate, offer rate, direct quote, indirect quote, spot rate, cross rate and forward rate?
3. What do you understand by 'currency arbitrage'? Differentiate two-point arbitrage from three point currency arbitrage .
4. What is 'covered interest arbitrage'? Explain the steps to be taken in covered interest arbitrage.
5. Examine how 'money market hedge' may be undertaken.
6. What are the different types of exchange rate risk that may arise in business operations?

Long – Answer Type Questions

7. Critically examine 'purchasing power parity' theory.
8. What do you mean by 'Fisher effect' and 'International Fisher effect'? Is there any relationship between the two? Explain.
9. Briefly discuss the various methods of managing exchange rate risk.
10. Discuss the various sources of raising foreign currency finances.
11. Give a brief account of 'international portfolio investment' and 'international capital budgeting'.
12. Aradhya Ltd. (AL), on 1st January 2015 entered into a 3 Month forward contract for selling USD 1,00,000. The relevant rates on various dates are —

Date	Nature of Quote	Quote
01.01.2015	Spot	₹ 41.50 - 41.70
	3-Month Forward	₹ 42.40 - 42.80
01.02.2015	Spot	₹ 42.10 - 42.40
	2-Month Forward	₹ 42.30 - 42.60
	3-Month Forward	₹ 42.50 - 42.80
01.03.2015	Spot	₹ 41.00 - 41.40
	1-Month Forward	₹ 42.00 - 42.30
	2-Month Forward	₹ 42.40 - 42.70
01.04.2015	Spot	₹ 40.50 - 40.80
	1-Month Forward	₹ 40.80 - 41.00

Explain the further course of action if AL —

(a) Honours the contract on —

- 01.02.2015
- 01.03.2015
- 01.04.2015; and converts the Export Proceeds on the same date.

(b) Cancels the contract on —

- 01.02.2015
- 01.03.2015
- 01.04.2015; as the Export Proceeds did not materialize. .

(c) Rolls over the contract for—

- 3 Months on 01.02.2015
- 2 Months on 01.03.2015
- 1 Month on 01.04.2015; as the Export Proceeds will materialize only on 01.05.2015.

Also determine the cost / gain of that action. Ignore transaction costs.

13. An exporter is a UK based company. Invoice amount is $3,50,000. Credit period is three months.

Exchange rates in London		**Rate of interest in money market**		
Particulars	**Exchange rate**	**Currency**	**Deposit**	**Loan**
Spot Rate ($/£)	1.5865 -1.5905	$	7%	9%
3 Month forward rate ($/£)	1.6100 -1.6140	£	5%	8%

Compute and show how a money market hedge can be put in place. Compare and contrast the outcome with a forward contract.

14. ABC Ltd is considering a project in US, which will involve an initial investment of US $1,10,00,000. The project will have 5 years of life. Current spot exchange rate is ₹ 48 per US $. The risk free rate in US is 8% and the same in India is 12%. Cash inflows from the project are as follows —

Years	**1**	**2**	**3**	**4**	**5**
Cash Inflow (US $)	20,00,000	25,00,000	30,00,000	40,00,000	50,00,000

Calculate the NPV of the project using foreign currency approach. Required rate of return on this project is 14%.

PREVIOUS TERMS QUESTION PAPERS

FINAL EXAMINATION

June 2019

P-14 (SFM)
Syllabus 2016

Strategic Financial Management

Time Allowed: 3 Hours | Full Marks: 100

The figures in the margin on the right side indicate full marks.
Working Notes should form part of the respective answers.
Wherever necessary, candidates may make appropriate assumptions and clearly state them.
No present value factor table or other statistical table will be given in addition to this question paper. Candidates may use the values tabulated at the end of this question paper.
*The paper contains two sectiona, **A** and **B. Section A** is compulsory and contains question no. 1 for **20 marks. Section B** contains question numbers 2 to 8, each carrying **16 marks.***
*answer **any five** questions from **Section B**.*

Section - A

Answer *all* questions. Each question carries two marks.

1. Choose the Correct Option from the four alternatives given (1 mark is for the correct choice and 1 mark for justification/workings. You may present only the Roman numeral, your choice and the reason/workings, without copying the question.) 2x10=20

(i) A company is considering four projects A, B, C and D with the following information:

	Project A	Project B	Project C	Project D
Expected NPV (₹)	60,000	80,000	70,000	90,000
Standard deviation (₹)	4,000	10,000	12,000	14,000

Which project will fit the requirement of low risk apetite?

(A) Project A

(B) Project B

(C) Project C

(D) Project D

(ii) From the following quotes of a bank, determine the rate at which Yen can be purchased with Rupees.

₹/£ Sterling	75.31 – 33
£ Sterling/Dollar ($)	1.563 – 65
Dollar ($)/Yen (¥)	1.048/52 [per 100 Yen]

(A) ₹ 124.02

(B) ₹ 142.02

(C) ₹ 412.02

(D) ₹ 214.02

(iii) The spot Value of Nifty is 4430. An investor bought a one month Nifty 4410 call option for a premium of ₹ 12. The option is:

(A) In the money

(B) At the money

(C) Out of the money

(D) Insufficient data

(iv) A certain mutual fund has a return of 17% with standard deviation of 3.5% and the sharpe ratio is 4. The risk free rate is

(A) 12.5%

(B) 4%

(C) 3%

(D) 7.5%

(v) The following information of a project are given below:

Expected cash flow (₹)	Probability
6,000	0.20
16,000	0.80

If certainty equivalent coefficient is 0.7, what will be certain (Risk less) cash flows of the project?

(A) ₹ 12,000

(B) ₹ 9,800

(C) ₹ 9,000

(D) ₹ 15,400

(vi) The spot and 6 months forward rates of US dollar in relation to the rupee (₹/$) are ₹ 74.532/75.4143 and ₹75.1278/76.2538 respectively. What will be the annualized forward margin (with respect to Ask price)?

(A) 2.42%

(B) 1.60%

(C) 2.23%

(D) 2.31%

(vii) B can earn a return of 18% by investing in equity shares on his own. Now he is considering a recently announced equity based Mutual Fund Scheme in which initial expenses are 1% and annual recurring expenses are 2%. How much should be Mutual Fund earn to provide B, a return of 18%?

(A) 18.18%

(B) 20.18%

(C) 22.18%

(D) 21%

(viii) You are given the following information of a stock:

Strike Price	₹ 400
Current stock price	₹ 370
Risk free rate of interest	5%

Theoretical minimum price of a European 6 months' put option after six months is

(A) ₹ 9.37

(B) ₹ 20.12

(C) ₹ 30.76

(D) ₹ 20.63

(ix) MS Ltd. is planning to invest in USA. The annual rates of inflation are 8% in India and 3% in USA. If spot rate is currently ₹ 75.50/$, what spot rate can the company expect after 3 years?

(A) ₹ 65.49

(B) ₹ 79.16

(C) ₹ 87.04

(D) ₹ 72.00

(x) If the covariance between the returns on a portfolio BC and returns on the market index is 25 and the variance of returns on the market index is 20, what will be the systematic risk of BC under the variance approach?

(A) 1.25

(B) 1.56

(C) 5.45

(D) 31.25

Section-B

Answer **any five** questions.

2. KJ Hospital wants to install a testing equipment. It wants to analyse whether to purchase the machine from a bank borrowing or to lease it from LR. The following information is given:

(i)	Cost of the equipment	₹ 50 lacs	to be paid at the beginning of the 1st year
	Life	5 years	
(iii)	Residual value	₹ 5 lacs	at the end of the 5th year
(iv)	Depreciation	Cost less residual value, written off equally p.a. for the life of the asset	
(v)	Annual Lease Rent	₹ 12 lacs	Payable at the end of each year from year 1 to year 5
(vi)	If asset is purchased, bank loan available at	10% interest per annum	Year-end payment includes ₹10 lacs each year towards principal and additionally, interest on the balance outstanding at the beginning of the year.
(vii)	Annual maintenance charges to be incurred by KJ if the equipment is purchased	₹ 2 lacs per annum	payable at the end of each year

(viii)	Tax rate applicable for KJ and LR	40%	Assume KJ and LR are profitable
(ix)	After-tax weighted average cost of capital	12% p.a.	For both LR and KJ
(x)	Long term capital gains tax	20%	LR (For sale value in excess of the residual value)

The lessor LR is an investor company that specializes in the leasing of various medical equipments across the country. LR would buy the equipment from its own funds, maintain the machine incurring ₹ 1 lac p.a. (year end). LR is confident of reworking the equipment at the end of 5 years at no extra cost and finding a rural hospital which would pay ₹ 13 lacs for it at the end of the 5th year. However, for its depreciation, it would write off equal amounts each year considering (i) to (iv) as for KJ. The lessor is also a profit-making company with a 40% corporate tax rate and 20% tax rate on long term capital gains.

(a) For KJ, present statements of discounted cash flows under the options of buying the machine with borrowed funds and leasing, using the appropriate discount rate. Present year wise annual cash flows (in ₹ lacs, up to two decimal places), without netting off, arrive at the sub totals of pre-discounted cash flows for each year and then apply PV factors (up to three decimals as given) and then arrive at the total present value Use '+' for inflows and '- or ( )' for outflows.

(b) Evaluate the viability of the proposal for the lessor LR. Comment on the situation. 16

3. (a) IP, an importer in India has imported a machine from USA for US $ 20,000 for which the payment is due in three months. The following information is given:

Foreign Exchange Rates (₹/US $)		
	Bid	Ask
Spot	74.60	74.90
3 months forward	75.50	75.90

Money Market Rates (p.a.) (Compounded annually)		
	Deposit	Borrowing
US$	6%	9%
Rupees	7%	11%

(i) Show with appropriate supporting calculations whether a money market hedge is possible or not.

(ii) Compute the cost (in annualized percentage) of a Forward Contract Hedge.

(iii) Present rupee outflows under (i) and (ii) and advise the importer on the best course of action to minimize rupee outflow.

(Exchange rate and values should be shown upto two decimal places) 8

(b) An investor had purchased a 4 month call option on the equity shares of N Ltd. of ₹ 10 of which the current market price is ₹ 132 and the exercise price is ₹ 150. You expect the price to range between ₹120 to ₹190. The expected share price of N Ltd. and related probability is given below:

Expected Price (₹)	120	140	160	180	190
Probability	0.05	0.20	0.50	0.10	0.15

You are required to compute the following:

(i) Expected share price at the end of 4 months

(ii) Value of call option at the end of 4 months, if the expected price prevails.

(iii) In case the option is held to its maturity, what will be the expected value of the call option? 8

4. (a) EC Limited is considering a new project with initial investment. It is estimated that IRR of the project is 16% having an estimated life of 5 years. The Finance Manager has studied that project with sensitivity analysis and informs that annual fixed cost sensitivity is 7.8416%, whereas cost of capital (discount rate) sensitivity is 60%.

Other information available are:

Profit Volume Ratio (P/V) is	70%
Variable cost	₹ 60 per unit
Annual Cash Flow (year end)	₹ 57,500

Ignore depreciation on initial investment and taxes.

Calculate:

(i) Initial investment of the project

(ii) Net Present Value of the project

(iii) Annual Fixed Cost

(iv) Estimated annual sales units

(v) Break Even Units 8

(b) The expected returns on two stocks for particular market returns are given in the following table:

Market Return	Stock A	Stock B
7%	4%	9%
25%	40%	18%

You are required to calculate:

(i) The beta of the two stocks.

(ii) The expected return of each stock, if the market return is 60% likely to be 7% and 40% likely to be 25%.

(iii) The security market line (SML), if risk free rate is 7.5% and market return is with likelihood as per (ii).

(iv) The Alpha of the two stocks. 8

5. (a) During a five year period, the relevant results for the aggregate market are that the risk-free rate (r_f) is 8% and the return on market (r_m) is 14%. For that period, the results of five portfolio managers are as follows:

Portfolio Manager	Actual Average Return (%)	Beta (β)
A	13	0.80
B	14	1.05
C	17	1.25
D	13	0.90
E	15	0.95

Using CAPM model, you are required to

(i) calculate the expected rate of return for each portfolio manager and compare the actual returns with the expected returns; and

(ii) find which of the mangers need to be warned for under-performance? 8

(b) A mutual fund made an issue of 20,00,000 units of ₹ 10 each at the beginning of the year. No entry load was charged. It made the following investments:

Particulars	Amount (₹)
1,00,000 Equity shares of ₹ 100 each @ ₹ 160	1,60,00,000
8% Government Securities	16,00,000
11% Debentures (unlisted)	10,00,000
10% Debentures (listed)	10,00,000
Total	1,96,00,000

During the year, dividends of ₹ 24,00,000 were received on equity shares. Interest on all securities was received for a full year as on the valuation date. Equity shares have a value of ₹ 180 per share as on valuation date and unlisted debentures are to be valued at 85% of the invested value. Initial expenses were ₹ 3 lacs, which are fully charged to the scheme in the first year. Up to the end of the year, operational expenses incurred were ₹ 4 lacs, of which ₹ 1.5 lacs remains payble next year. Just before the year end, 60,000 units were redeemed when the NAV was ₹ 12.5 NAV per unit and an exit load of 1 % was charged. Find the NAV per unit as on valuation date which is at the end of the year. 8

6. (a) An investor has the following constituent holdings in his portfolio:

Security	No. of shares	Price per share (₹)	Share Beta
A	400	500	1.4
B	500	750	1.2
C	200	250	1.6

(i) Find the market value weighted average beta of his portfolio.

(ii) If the investor wants a target beta for his portfolio at 0.9, how would he dispose of his securities and replace them with Government securities if he want to sell in the order of risk? Present the revised tabulation of his holding and prove that the target beta has been achieved by your advice.

(iii) If he is willing to invest further, how much investment should he make in G Sec to make his beta 0.9, without selling any share at all? 10

(b) An 8.5% bond of ₹1,000 face value with five year maturity at par and a yield to maturity of 10% has ₹954.74 as the current market value. Calculate the price of the bond and compare it with the market price. What action should the holder of the bond take? 6

7. (a) Companies X and Y want to raise US$ 50 million each. They have been offered the following rates per annum:

Company	Fixed	Floating
X	7.5	LIBOR + 25 bps
Y	8.45	LIBOR + 37 bps

Bank B, on a commission of 0.2% (fully borne by Y) is arranging an interest rate swap between X and Y. X wants a floating rate and Y wants a fixed rate. Work out the payables and receivables on the swap (in %), given that the benefits (after commission) are shared between X and Y in the ratio 60 : 40. What will be the effective rate of interest payable by X and Y their respective gains (in %) due to the swap? How many dollars does each save per annum due to the swap? 8

(b) The US $ is selling in India ₹ 75.90. The interest rate for a 6 months borrowing in India is 10% per annum and the corresponding rate in US is 4%.

(i) Do you expect that US$ will be at a premium or at a discount in the Indian Forex Market? Why?

(ii) What will be the expected 6-months forward rate for US $ in India?

(iii) What will be the annualised rate of forward premium or discount? 8

8. Answer any four out of the following five questions:

(a) State the differences between Commercial Papre (CP) and Certificate of Deposit (CD) on the following aspects: 4

(i) Issuer

(ii) Conditions to be satisfied by an issuer to be eligible for an issue.

(b) State the differences between Indian Treasury Bills and Central Government securities on the following aspects: 4

(i) Purpose of issue

(ii) Tenor

(c) Name the most appropriate combined trading strategy on the stock of PQ Ltd. in the following independent cases. (You may present only columns I and II in your answer books.) 4

Sl. No.	Strategy	Action		Expiry Date	Strike Price
		Buy	Sell		
I	II	III	IV	V	VI
(i)		One call		30th June	215
		One put		30th June	215
(ii)			Two Calls	20th June	220
			One Put	20th June	220
(iii)			One Call	20th June	230
			Two Puts	20th June	230
(iv)		One call		20th June	215
		One Put		20th June	220

(d) State the differences between the commodity market and equity market futures in the following aspects: 4

(i) Initial Margin

(ii) Basis of price movements

(e) How would you choose indivisible projects under capital rationing? Can there be a situation where a project with lower NPV is chosen while discarding a project with higher NPV? Explain. 4

PV Factor Table:

End of Year / Rate	1	2	3	4	5
4%	0.962	0.925	0.890	0.855	0.822
4.8%	0.954	0.910	0.869	0.829	0.791
6%	0.943	0.890	0.840	0.792	0.747
7.2%	0.933	0.870	0.812	0.757	0.706
8.5%	0.922	0.849	0.783	0.722	0.665
10%	0.909	0.826	0.751	0.683	0.621
12%	0.893	0.797	0.712	0.636	0.567

Annuity Factors

4 yrs	5 yrs
3.632	4.454
3.562	4.353
3.465	4.212
3.372	4.078
3.276	3.941
3.169	3.791
3.038	3.605

$e^{.0225}$	1.0228	$e^{-0.0225}$	0.978
$e^{0.025}$	1.02532	$e^{-0.25}$	0.975
$e^{0.225}$	1.2523	$e^{-0.225}$	0.799
$e^{0.25}$	1.2840	$e^{-0.025}$	0.779
$e^{0.5}$	1.6458	$e^{-0.5}$	0.608

Annuity factors for 5 years:

Rate	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%
Factor	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127

FINAL EXAMINATION

December 2018

P-14 (SFM)
Syllabus 2016

Strategic Financial Management

Time Allowed: 3 Hours | Full Marks: 100

The figures in the margin on the right side indicate full marks.
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*The paper contains two sectiona, **A** and **B. Section A** is compulsory and contains question no. 1 for **20 marks. Section B** contains question numbers 2 to 8, each carrying **16 marks.***
*answer **any five** questions from **Section B**.*

Section - A

Answer *all* questions. Each question carries two marks.

1. Choose the correct option from the four alternatives given : (1 mark is for the correct choice and 1 mark is for the justifications/workings. You may present only the Roman numeral, your choice and the reasons/workings, without copying the question). 2×10=20

   (i) M buys a call option contract for a premium of ₹ 200. The exercise price is ₹ 25 and the current market price of the share is ₹ 22. If the share price after three months reaches ₹ 30, what is the profit made by M on exercising the option? A contract is for 100 shares. Ignore transaction charges.

   (A) ₹ 200

   (B) ₹ 300

   (C) ₹ 100

   (D) ₹ 600

   (ii) You are a forex dealer in India. Rates of rupee and pound in the international market are US $0.01386952 and US $1.3181401 respectively. What will be your direct quote of £ (pound) to your customer?

   (A) ₹54.6987

   (B) ₹71.1408

   (C) ₹95.0386

   (D) ₹0.0105

   (iii) 'Bank rate' published by the Reserve Bank refers to

   (A) the repo rate transacted by RBI.

   (B) the rate at which housing or other long term loans shall be sanctioned by scheduled banks to their customers.

   (C) The rate at which RBI is willing to buy or rediscount bills of exchange or other commercial paper.

   (D) the rate which RBI uses as cut-off for auction of Government securities.

(iv) An investor has invested in a mutual fund when the NAG was ₹ 15.50 per unit. After 90 days the NAV was ₹ 14.45 per unit. During the period the investor got a cash dividend of ₹ 1.35 per unit and capital gain distribution of Re. 0.20. The annualized return based on 360 days year count will be

(A) 3.23%

(B) 12.92%

(C) 0.8075%

(D) 16.45%

(v) Initial investment of a project is ₹ 25 lakh. Expected annual cash flows are ₹ 6.5 lakh for 10 years Cost of capital is 15%. The annuity factor for 15% for 10 years is 5.019. The Profitability Index of the project will be

(A) 1.305

(B) 3.846

(C) 0.26

(D) 0.7663

(vi) Rate of inflation = 5.1%, β = 0.85, Risk premium = 2.295%, Market return = 12%. The real rate of return will be

(A) 4.2%

(B) 11.70%

(C) 6%

(D) 5.95%

(vii) In a constant dividend model, the following estimates the difference between the required rate of return and the growth rate :

(A) Earnings Retention ratio

(B) Leverage ratio

(C) Dividend Pay-out ratio

(D) Dividend yield ratio

(viii) Presently, a company's share price is ₹ 120. After 6 months, the price will be either ₹ 150 with a probability of 0.8 or ₹ 110 with a probability of 0.2. A call option exists with an exercise price of ₹ 130. What will be the expected value of call option at maturity date?

(A) ₹ 20

(B) ₹ 16

(C) ₹ 12

(D) ₹ 10

(ix) A stock is currently selling at ₹ 270. The call option to buy the stock at ₹ 265 costs ₹ 12. What is the Time Value of the option ?

(A) ₹ 5

(B) ₹ 17

(C) ₹ 7

(D) None of (A), (B) or (C)

(x) A Ltd., an export customer requested his banker B to purchase a bill for USD 80,000. Calculate the rate to be quoted to A Ltd. if B wants a margin of 0.08%, given that the inter bank rate is ₹/$ 71.50/10.

(A) ₹ 71.1569

(B) ₹ 71.0431

(C) ₹71.5572

(D) ₹71.4428

SECTION – B

Answer any five question

2. (a) The distribution of return of security 'S' and the market portfolio 'M' is given below :

Probability	Return %	
	S	M
0.30	30	- 10
0.40	20	20
0.30	0	30

You are required to calculate :

(i) the expected return of security 'S' and the market portfolio 'M'.

(ii) the covariance between the market portfolio and security, and

(iii) beta for the security. 8

(b) Shares of N Limited are being quoted at ₹ 600. Three months' futures rate is ₹ 636 per share with a lot size of 500 shares. The company does not expect to distribute any dividend in the interim period and the risk free return is 9% p.a. continuously compounded.

(i) Compute the Theoretical Forward Price.

(ii) What is the recommended action for a trader in shares in the spot and futures market ? Substantiate your conclusion with logical steps and compute the gains per contract if any, due to futures.

(iii) What would be the recommended action and gains, if the three months' future rate is ₹ 600 per sha re? 8

3. (a) An Indian exporter has sold handicaraft items to an American business house. The exporter will be receiving US dollar 1 lakh in 90 days. Premium for a dollar put option with a strike price of ₹ 71.00 and a 90 days settlement is ₹ 1. The exporter anticipates the spot rate after 90 days to be ₹ 69.50.

(i) Should the exporter hedge its account receivable in the options market ?

(ii) If the exporter is anticipating a spot rate to be ₹ 70.50 or ₹ 71.50 after 90 days, how would it affect the exporter's decision ? 8

(b) A company operating in USA has on 1st September 2018 invoiced sales in $ to an Indian company, the payment being due on 1st December 2018. The invoice amount is $ 13,750. At spot rate on 1/9/2018 it is equivalent to ₹ 10,18,875. The 3 months forward rate is presently quoted at $ 0.01340 per rupee. The importer wants to hedge half his exposure by a forward contract. Explain the hedging transaction by forward contract that he will enter into and calculate the pay outs and the net gain or loss due to hedging if the spot rates are as follows on 1st December 2018.

(i) $ 0.01338

(ii) $ 0.01352

Present your calculation using ₹/$ upto two decimal places. Ignore transaction cost. 8

4. (a) A company wishes to acquire an asset costing ₹ 1,00,000. The company has an offer from a bank to lend @ 18%. The principal amount is repayable in equal 5 year end instalments. A leasing company has also submitted a proposal to the company to acquire the asset on lease at year end rentals of ₹ 280 per ₹ 1,000

of the asset value for 5 years. The asset's life is estimated at 5 years with residual value of ₹ 10,000 and the cost net of residual value is depreciated equally each year over its life. Assume that this is the only asset of its class so that at the end of the 5th year there will be a capital gain or lss with 20% tax effect when the asset is sold. The tax rate of the company is 50%.

For what minimum sale value of the asset at the end of the 5th year will the decision to borrow and own the asset be preferred to leasing ? Present annual cash flows and arrive at the discounted cash flows for each year showing salvage value separately. Use PV factors as provided. Round off calculations to the nearest rupee. Assume cash flows on interest and taxes also at year ends. 8

(b) A Ltd. has an investment proposal, requiring an outlay of ₹ 5 lakh. The investment proposal is expected to have two years economic life with no salvage value.

In year 1, there is a 0.4 probability that cash inflow after tax will be ₹ 3 lakh and 0.6 probability that cash inflow after tax will be ₹ 4 lakh. The probability assigned to cash inflow after tax for year 2 are as follows :

Cash inflow for year 1 (₹)	3 Lakh		4 Lakh	
Cash inflow for year 2 (₹)	₹	Probability	₹	Probability
	1.50 lakh	0.2	2.40 lakh	0.4
	1.92 lakh	0.3	3.00 lakh	0.5
	2.64 lakh	0.5	3.60 lakh	0.1

The company uses 10% discount rate for this type of investment.

(i) Construct a decision tree for the proposed investment project.

(ii) Calculate the expected Net Present Value (NPV), giving the break up of each path of the decision tree.

(iii) What Net Present Value will the project yield, if the worst outcome is realized? What is its probability?

(iv) What is the probability of having a negative NPV?

(v) Will the project be accepted?

Use pv factors as given in the table. Present calculations to the nearest rupee. 8

5. (a) The returns on strock S and market portfolio M for a period of six periods in excess of the risk free rate of 6% are given as follows :

Period	Return on stock S %	Return on market portfolio %
1	12.0	8.0
2	15.0	12.0
3	11.0	11.0
4	2.0	-4.0
5	10.00	9.5
6	-12.0	-2.0

Additional details that may be used optionally :

Variance $(\%)^2$	82.93	40.15
Mean (%)	6.33	5.75
Covariance $(\%)^2$	48.27	

(i) Determine the equation for the characteristic line of the stock – S.

(ii) What would be the return on stock S if the market return is 17.5%?

(iii) Is your finding in (ii) above compatible with the data given ? Why ? Comment on the correlation coefficient. 8

(b) Sagar owns a portfolio in three stocks as detailed below :

Stock	No. of shares	Price (₹/share)	Beta
X	400000	400	1.3
Y	800000	300	1.2
Z	1200000	100	1.1

The index futures is traded at ₹ 10,250. Assume that the index factor is 100.

(i) Compute the existing portfolio beta upto two decimals.

(ii) Find out the number of contracts (rounded off to the nearest integer) of stock index futures to be bought or sold in order to :

(A) Decrease the portfolio β to 0.8

(B) Increase the portfolio β to 1.5. What will be the proportion of market value of investments in X to the value of total investments plus 10% margin on futures? 8

6. The following are the data on five mutual funds :

Mutual Fund	Return	Standard Deviation	Beta
A	15	7	1.25
B	18	10	0.75
C	14	5	1.40
D	12	6	0.98
E	16	9	1.50

(i) Compute the Sharpe Ratio and Treynor's Ratio and rank these funds assuming the risk free rate as 6% .

(ii) Compute the unsystematic risk of these funds.

(iii) Which of the two measures in (i) is more appropriate ? Why ?

(iv) Assuming that the risk free rate is not known, would you still be able to rank the funds using the Sharpe's and Treynor's ratios ? Why? 16

7. (a) Saptarshi Ltd. has just installed Machine- M at a cost of ₹ 2,10,000. The machine has a five year life with no residual value. The annual volume of production is estimated at 150000 units, which can be sole at ₹ 6 per unit in the first two years and at ₹ 7,8 and 9 in the third, fourth and fifth years. The first year's operating costs are estimated at ₹ 2,00,000 (excluding depreciation) at this output level. Fixed costs are estimated at ₹ 3 per unit for the same level of production. The second year's cost will be the same as in the first year. Thereafter, costs (operating and fixed) will increase over the first year's cost by 10%, 20% and 25% respectively in the third, fourth and fifth years.

Saptarshi Ltd. has just come across another model called Machine-N capable of fiving the same output at the same fixed and operating costs as in the first year of Machine- M. There will be no change over the first year's costs in the next four years also. Capital cost of this machine is ₹ 2,50,000 and the estimated life is five years with nil residual value.

The company has an offer for sale of Machine- M at ₹1,10,000. But the cost of dismantling and removal will amount to ₹40,000. As the company has not yet commenced operations, it wants to sell Machine- M and purchase Machine- N.

Saptarshi Ltd. will be a zero-tax company for seven years in view of several incentives and allowances available.

The cost of capital is 15%.

(i) Advise whether the company should opt for the replacement. Present calculations of discounted annual cash flows to the nearest rupee without netting off.

(ii) Will there be any change in your view, if machine-M has not been installed, but the company is in the process of selecting one or the other machine ?

Support your view with necessary workings. Cash flows of revenue and cost may be taken at year ends. 8

(b) From the following project details, calculate the sensitivity of the

(i) Project cost

(ii) Cash inflows

(iii) Which variable is more sensitive ?

Project cost	₹ 12,000	Salvage value	Nil
Life of the project	4 years	Cost of capital	14%
Nil salvage value			

Cash inflows after tax :

end of year 1 : ₹ 5,000

end of year 2 : ₹ 5,000

end of year 3 : 10% increase over year 1 inflow

end of year 4 : 10% increase over year 1 inflow

(iv) Would you conclude that cost of capital is more sensitive than (i) or (ii) above? 8

8. Answer any four out of the following five questions :

(a) Compare commodity futures and financial futures with respect to the following aspects: 4

(i) Valuation

(ii) Delivery and settlement

(iii) Contract features and life

(iv) Supply and consumption pattern

(b) State the type of risk in each of the following independent situations : 4

(You may present only the question Roman numeral and type of risk without copying the situations into your answer books).

(i) The owner of a house property wants to sell it, but he is not able to find buyers.

(ii) The risk of recession anticipated by the automobile industry

(iii) The risk of loss in value of investment that cannot be eliminated by an investor through diversification.

(iv) The risk of a bank which has given a car loan to a person who has no defaulted two instalments of EMIs.

(c) Classify the following items under the appropriate category – whether Money Market (MM) or Capital Market (CM) : (You may choose to write only the Roman numeral under the appropriate head. Do not use brackets for the Roman numerals) 4

i. Inter Bank Participation Certificate

ii. Equity Shares

iii. SWAPS

iv. REPOS

v. RBI and government are participants

vi. Commercial paper

vii. Global Depository Receipts (GDRs)

viii. Deep Discount Bonds (DDBs)

You may use the following format in your answer books :

MM	CM

(d) Write short notes on 'repo' and 'reverse repo'. 4

(e) What is 'credit default risk' and 'counter party risk'? 4

Values for use by candidates.

$e^{0.0225}$	1.0228
$e^{0.225}$	1.2523
$e^{.25}$	1.2840

PV factor table

End of Year / Rate	1	2	3	4	5
18%	0.847	0.718	0.609	0.516	0.437
9%	0.917	0.842	0.772	0.708	0.650
15%	0.870	0.756	0.658	0.572	0.497
14%	0.877	0.769	0.675	0.592	0.519
10%	0.9091	0.8264	0.7513	0.6830	0.6209
16%	0.877	0.769	0.675	0.592	0.519
17%	0.855	0.731	0.624	0.534	0.456
25%	0.8	0.64	0.512	0.410	0.328
26%	0.794	0.630	0.500	0.397	0.315
26.6%	0.790	0.624	0.493	0.389	0.307
26.65%	0.790	0.623	0.492	0.389	0.307
15.4%	0.867	0.751	0.651	0.564	0.489
12.6%	0.888	0.789	0.700	0.622	0.552

Annuity Factors

4 yrs	5 yrs
2.69	3.127
3.239	3.889
2.856	3.353
2.913	3.432

FINAL EXAMINATION

June 2018

P-14 (SFM)
Syllabus 2016

Strategic Financial Management

Time Allowed: 3 Hours | Full Marks: 100

The figures in the margin on the right side indicate full marks.
Working Notes should form part of the respective answers.
Wherever necessary, candidates may make appropriate assumptions and clearly state them.
No present value factor table or other statistical table will be given in addition to this question paper. Candidates may use the values tabulated at the end of this question paper.
*The paper contains two sectiona, **A** and **B. Section A** is compulsory and contains question no. 1 for **20 marks. Section B** contains question numbers 2 to 8, each carrying **16 marks.***
*answer **any five** questions from **Section B**.*

Section - A

Answer *all* questions. Each question carries two marks.

1. Choose the Correct Option from the four alternatives given: (One mark is for the correct choice and one mark is for the justification/workings. You may present only the Roman numeral, your choice and the reason/ working, without copying the question). 2×10=20

(i) A company has ₹ 7 crore available for investment. It has evaluated its options and has found that only four investment projects given below have positive NPV. All these investments are divisible and get proportional NPVs.

Project	Initial Investment (₹ crore)	NPV (₹ crore)	PI
W	6.00	1.80	1.30
X	3.00	0.60	1.20
Y	2.00	0.50	1.25
Z	2.50	1.50	1.60

Which investment projects should be selected?

(A) Project W in full and X in part

(B) Project Z in full and W in part

(C) Project W in full and Z in part

(D) Project Z and Y in full and X in part

(ii) An investor is bullish about X Ltd. which trades in the spot market at ₹ 1,150. He buys two call option contracts with three months (one contract is 100 shares) with a strike price of ₹ 1,195 at a premium of ₹ 35 per share. Three months later, the share is selling at ₹ 1,240.

Net profit/loss of the investor on the position will be

(A) ₹ 1,000

(B) ₹ 16,000

(C) ₹ 11,000

(D) ₹ 2,000

(iii) Duhita Ltd. intends to buy an equipment. Quotes are obtained for two different makes A and B as given below:

	Cost (₹ Million)	Estimate life (years)
A	4.5	10
B	6.00	15

Ignoring the operations and maintenance costs which will be almost the same for A and B, which one would be chapter? The company's cost of capital is 10%

[Given: PVIFA (10%, 10 yrs.) = 6.1446 and PVIFA (10%, 15 years) = 7.6061]

(A) A will be cheaper

(B) B will be cheaper

(C) Cost will be the same

(D) They are not comparable and therefore nothing can be said about which is cheaper.

(iv) BLC Ltd. a valued customer engaged in import business, is in need to remit EURO 1 million to his European exporter. The spot rate of ₹/US$ is ₹ 65.47/65.57 and that of US$/EURO is $ 0.8053/0.8057. What rate will a banker quote to BLC Ltd. if the bank's margin is 0.50%?

(A) ₹ 53.09

(B) ₹ 53.067

(C) ₹ 53.01

(D) ₹ 52.99

(v) Given for a project:

Annual Cash inflow = ₹ 80,000, Useful life = 4 years

Undiscounted Pay-Back period = 2.855 years

What is the cost of the project?

(A) ₹ 1,12,084

(B) ₹ 2,28,400

(C) ₹ 9,13,600

(D) None of the above

(vi) A project had an equity beta of 1.4 and is to be financed by a combination of 25% Debt and 75% Equity. Assume Debt Beta as zero, R_f = 12% and R_m = 18%.

Hence, the required rate of return of the project is

(A) 16.72%

(B) 18.30%

(C) 17.45%

(D) 12.00%

(vii) An Indian Company is planning to invest in the US. The annual rates of inflation are 8% in India and 3% in USA. If the spot rate is currently ₹ 60.50/$, what spot rate can you expect after 5 years, assuming the inflation rates will remain the same over 5 years?

(A) ₹ 88.89

(B) ₹ 54.95

(C) ₹ 76.68

(D) ₹ 76.10

(viii) Which of the following securities is most liquid?

(A) Money Market instruments

(B) Capital Market instruments

(C) Gilt-edged securities

(D) Index futures

(ix) While plotting a graph with risk on X-axis and expected return on Y-axis, a line drawn with co-ordinates (0, r_f) and (β, r_m) is called

(A) Security Market Line

(B) Characteristic Line

(C) Capital Market Line

(D) CAPM Line

(x) If the RBI intends to reduce the supply of money as part of anti-inflation policy, it might

(A) Lower the bank rate

(B) Increase the Cash Reserve Ration

(C) Decrease the SLR

(D) Buy Government securities in the open market.

Section – B

Answer any five questions out of the following seven questions.

Each question carries 16 marks.

2. (a) Electronics Pvt. Ltd. is considering a proposal to replace one of its machines. In this connection, the following information is available:

The existing machine was purchased 3 years ago for ₹ 20 Lakh. It was depreciated 20 per cent per annum on reducing balance basis. It has remaining useful life of 5 years, but its maintenance cost is expected to increase by ₹ 1 Lakh per year from the end of sixth year of its installation. Its present realizable value is ₹ 12 Lakh. The company has several machines having 20% depreciation.

The new machine costs ₹30 Lakh and is subject to the same rate and basis of depreciation. On sale after 5 years, it is expected to realize ₹18 Lakh. With the new machine, the annual pre-tax operating costs (excluding depreciation) are expected to decrease by ₹2 Lakh. In addition, the machine would increase productivity on account of which net pre-tax revenues would increase by ₹3 Lakh annually (reckoned at year end). The tax rate applicable to the company is 40% and the cost of capital is 10 per cent.

Advise the company on the choice of the machine from a financial perspective on the basis of NPV.

PV Factors (10%)

Year	1	2	3	4	5
PV Factor	0.909	0.826	0.751	0.683	0.621

Present an incremental analysis of using the existing machine versus replacing the machine with a new one. Present annual discounted cash flows in your answers with separate calculation showing annual discounted cash flows on account of incremental depreciation without netting off capital asset outflows or inflows. Calculations are to be presented to the nearest rupee. P.V. factors with above decimal places should be used. 10

(b) The following two-way quotes appear in the foreign exchange market:

	Spot Rate	2-Months Forward
₹/US$	₹ 66.00/₹ 66.25	₹ 67.00/ ₹ 67.50

(i) How many US Dollars should a firm sell to get ₹ 50 Lakh after two months?

(ii) How many Rupees is the firm required to pay to obtain US $ 3,00,000 in the spot market?

(iii) Assume that the firm has US $ 1,19,000 earning no interest. ROI on Rupee Investment is 8% p.a. Should the firm encash the US $ now or 2 months later? 6

3. (a) The following quotes are available for 3-months options in respect of a share of P Ltd. which is currently traded at ₹ 310.

Strike Price	₹ 300
Call option	₹ 30
Put option	₹ 20

An investor devises a strategy of buying a call and selling the share and a put option. Risk free interest rate is 10% per annum.

Using Put-call parity theory

(i) Find out profit/loss of the investor.

(ii) What would be the position if the strategy adopted is selling a call and buying the put and the share? ($e^{0.025}$ = 1. 0253; $e^{0.25}$ = 1. 2840) 8

(b) The Stock Research Division of Bharati Investment Services Ltd. has developed ex-ante probability distribution for the likely economic scenarios over the next one year and estimates the corresponding one period rates of return on Stock A, B and Market Index as follows:

Economic scenarios	Probability	One period rate of return %		
		Stock A	Stock B	Market
Recession	0.15	-15	-3	-10
Low growth	0.25	10	7	13
Medium growth	0.45	25	15	18
High growth	0.15	40	25	32

The expected risk free real rate of return and the premium for inflation are 3.0% and 6.5% p.a. respectively.

As a financial analyst in the Research Division you are required to calculate the following for stock A and stock B:

(i) Expected return

(ii) Covariance of returns with the market returns

(iii) Beta 2+4+2=8

4. (a) X Ltd. has imported goods from USA worth US $ 10 million and it requires 90 days to make the payment. The USA supplier has offered a 60 days interest free credit period and for additional credit for 30 days interest is to be charged at 8% per annum. (Consider 360 days p.a.)

The banker of X Ltd. Offers a 30 days loan at 10% per annum and its quotes for foreign exchange are as follows:

Spot 1 US $	₹ 64.50
60 days forward rate for 1 US $	₹ 65.10
90 days forward rate for 1 US $	₹ 65.50

You are required to evaluate the following options:

(i) Pay the USA supplier in 60 days or

(ii) Avail the supplier's offer of 90 days' credit. Advise X Ltd. accordingly.

(b) Your client holds the following securities:

Particulars of Securities	Cost (₹)	Dividends (₹)	Market Price (₹)	BETA
Equity Shares:				
Co. T	8,000	800	8,200	0.8
Co. Q	10,000	800	10,500	0.7
Co. M	16,000	800	22,000	0.5
Co. P	34,000	3,400	32,300	0.2

Assuming a Risk-free rate of 6%, calculate the expected rate of return in each, using the Capital Asset Pricing Model (CAPM). Assume equal proportion of securities for market portfolio as also for the client. Calculations should be presented up to two decimal places. 6

5. (a) XYZ Ltd. is considering acquisition of an additional computer to supplement its computer services to its clients. It has two options:

(i) To purchase the computer for ₹ 22,00,000.

(ii) To lease the computer for 3 years from a leasing company for ₹ 5,00,000 as annual year end lease rent. The agreement also requires as additional one time lump sum lease rent payment of ₹ 6,00,000 at the end of the third year. Lease rents are payable at the year ends and the computer is returned to the lessor after the lease period.

The company estimates that the computer considered for purchase now will be worth ₹ 10 lakhs at the end of the third year and proceeds are taxable at the end of the third year at the usual 50% tax rates. Forecast pre-tax year end revenues are:

Year	₹
1	22,50,000
2	25,00,000
3	27,50,000

Annual year end pre-tax operating costs (excluding depreciation/lease rent of computer) are estimated at ₹ 9,00,000 with an additional ₹ 1,00,000 for start-up and training costs at the beginning of the first year, the tax benefit of which can be claimed at the end of the first year. These costs are to be borne by XYZ Ltd. XYZ Ltd. will borrow at 16% interest to finance the acquisition of the computer and the repayments are to be made according to the following schedule:

Year-end	Principal (₹)	Interest (₹)	Total (₹)
1	5,00,000	3,52,000	8,52,000
2	8,50,000	2,72,000	11,22,000
3	8.50,000	1,36,000	9,86,000

The company depreciates the computer at 60% of cost in the first year and the remaining at the end of the second year. Consider these at year ends. The Management of XYZ Ltd. approaches you, as a Management Accountant, for advice. Will the computer's use be justified? Which alternative would you recommend and why? Support your advice with relevant calculations. Present annual discounted cash flows to the nearest rupee, for each option using PV factors up to the decimals provided. Indicate inflows by '+' and outflows by '-' or '()'

Note: Present value factor at 8% and 16% rate of discount:

Year	1	2	3
8%	0.926	0.857	0.794
16%	0.862	0.743	0.641

10

(b) A Portfolio Manager has the following four stocks in his portfolio:

Security	No. of shares	Market price (₹) per share	β = Beta
ADU	12,000	40	0.9
DVU	6,000	20	1.0
NDU	10,000	25	1.5
SVU	2,000	225	1.2

Compute the following:

(i) Portfolio Beta (β)

(ii) If the Portfolio Manager seeks to reduce the portfolio Beta to 0.8, how much risk-free investment should he bring in? Consider that he disposes the riskier securities first and replaces them with risk free investment. Present the revised portfolio. 6

6. (a) Y, a British firm with a US subsidiary, seeks to refinance some of its existing British pound debt to include floating rate obligations. The best floating rate it can obtain in London is LIBOR + 2.0%. Its current debts are as follows:

US$ 10 million owed to CT Bank at 9.5% (fixed annually); and

£ 5 million owed to MD Bank at 9.5% (fixed) annually.

HRS Company wishes to finance exports to Britain with £3 million of pound denominated fixed rate debt for six months. HRS is unable to obtain a fixed interest rate in London for less than 13.5% interest because of its lack of credit history in the UK. However, Lloyds Bank is willing to extend a floating rate British pound loan at LIBOR + 2%. HRS, however, cannot afford to pay more than 12%.

Assume that Y is in a strong bargaining position and can negotiate the best deal possible, but HRS will not pay over 12%. Assume further that transaction costs are 0.5% and exchange rates are stable.

Can Y and HRS help each another by an interest rate swap? If so, how? Compute the amount of gains for Y, HRS and the Swap Dealer.

Illustrate the effective post-swap interest rates of each party with a diagram. What are the effective interest rates for each party over the six months period of the swap? 8

(b) A manager is trying to decide which of the three mutually exclusive project X, Y or Z to undertake. Each of the projects could lead to varying net profits which are classified as outcomes I, II and III. The manager has constructed the following pay-off table or matrix (a conditional profit table).

Outcomes		Project		
	Probability	X	Y	z
		Net Profit (₹)		
I (Worst)	0.2	5,00,000	7,00,000	9,00,000
II (Most likely)	0.5	8,50,000	7,50,000	10,00,000
III (Best)	0.3	13,00,000	14,00,000	11,00,000

(i) Which project should be undertaken using Expected Value Criterion?

(ii) Which project should be chosen, if minimax regret rule is applicable? 8

7. (a) Bharat Oil Corporation (BOC) imports crude oil for its requirements on a regular basis. Its requirements are estimated at 100 tonnes per month. Of late, there has been a surge in the prices of oil. The current price (month of June) of crude oil is ₹ 5,500 per barrel. The firm expects the price to rise in the coming months to ₹ 5,800 by August. It wants to hedge against the rising prices for some of its requirements of the month of August.

Multi Commodity Exchange (MCX) in India offers futures contracts in crude oil. The contract size is 100 barrels and August contract is currently traded at ₹ 5,668 per barrel.

BOC would like to hedge half its exposure in futures and leave the other half to market conditions. While hedging, the number of futures contracts dealt with should be rounded off to the next higher integer. Then, how many contracts should it book?

Compare the hedged and exposed parts regarding the effective price per barrel and also compute the effective price per barrel for the whole requirement of August, if in August,

(i) The spot price is ₹ 5,570 and futures price is ₹ 5,788,

(ii) The spot price is ₹ 5,417 and futures price is ₹ 5,455?

Ignore marking-to-market and initial margin on futures contracts.

Given that 1 tonne = 7.33 barrels. 10

(b) A share is currently priced at ₹ 600. It is known that at the end of one month, it will be either ₹ 570 or ₹ 630. The risk-free interest rate is 8% per annum with continuous compounding. Find the value of a one month European call option with a strike price of ₹ 592 with the help of a Binomial Model. (Given that $e^{0.007}$ = 1.00702) 6

8. Answer any four out of the following five questions:

(a) State the type of risk in the following situation: (You may present only the question Roman numeral and the type of risk in your answer) 4

(i) The risk of loss arising from sovereign State freezing foreign currency payments.

(ii) The risk that stock prices or stock indices values and/or their implied volatility may change.

(iii) The risk arising from the people, system and processes through which a company operates.

(iv) Changes in currency exchange rates.

(b) You are required to present Columns I, IV and V after filling up the contents of columns IV And V. 4

Sl. No.	Situation	Option Type	_____the money (Fill up In/At/Out of)	Action:(Exercise/Lapse/ Indifferent)
Column	II	III	IV	V
(i)	CMP<EP	Call		
(ii)	CMP<EP	Put		
(iii)	CMP>EP	Call		
(iv)	CMP>EP	Put		

EP=Exercise Price; CMP=Current Market Price

(c) Identify the following financial instruments: (You may present only the Roman numeral and the name of the instrument in your answers) 4

(i) X is a negotiable instrument issued in US $ and issued by a US Depository Bank for the benefit of a non US company that wishes to raise money in the US. X is listed on NYSE and NASDAQ. Issue of X offers access to both institutional and retail markets in the US.

(ii) Y is an instrument issued abroad by authorized overseas corporate bodies against shares or bonds of Indian companies held with nominated domestic custodial banks. An Indian company intending to issue Y will issue the corresponding number of shares to an overseas depository bank. Y is freely transferable outside India and dividend in respect of the shares represented by Y are paid in Indian rupees. Y is traded on OTC basis (Over the Counter). Y is listed on the London Stock Exchange.

(iii) Z is a zero - interest bond sold at a discount and redeemed at face value on maturity. Investors in Z are not looking for immediate return. Z is issued by the issuer to meet the long term requirements spanning 20 - 30 years. Z can also be traded in the market.

(iv) W is a negotiable certificate issued by a company or the Government, entitles the holder to repayment of principal and interest. Interest is paid periodically at predetermined intervals and the principal is repaid at a specified maturity date.

(d) A certain project is expected to generate year and annual net cash inflows of ₹ 5,00,000 for four years. The cost of capital (real discount rate is 10%). Inflation rate is 5% p.a.

(i) What are the nominal cash flows and real cash flows of the second year's inflows which occur at the end of year 2?

(ii) What is the present value of the inflow of the second year that you would use in determining the NPV of the project? 4

(You are not required to calculate the values. You are only required to substitute the values in appropriate formulae for the answers).

(e) Explain the concept of 'option' in relation to a capital budgeting decision. What would be the value of the option? 4

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