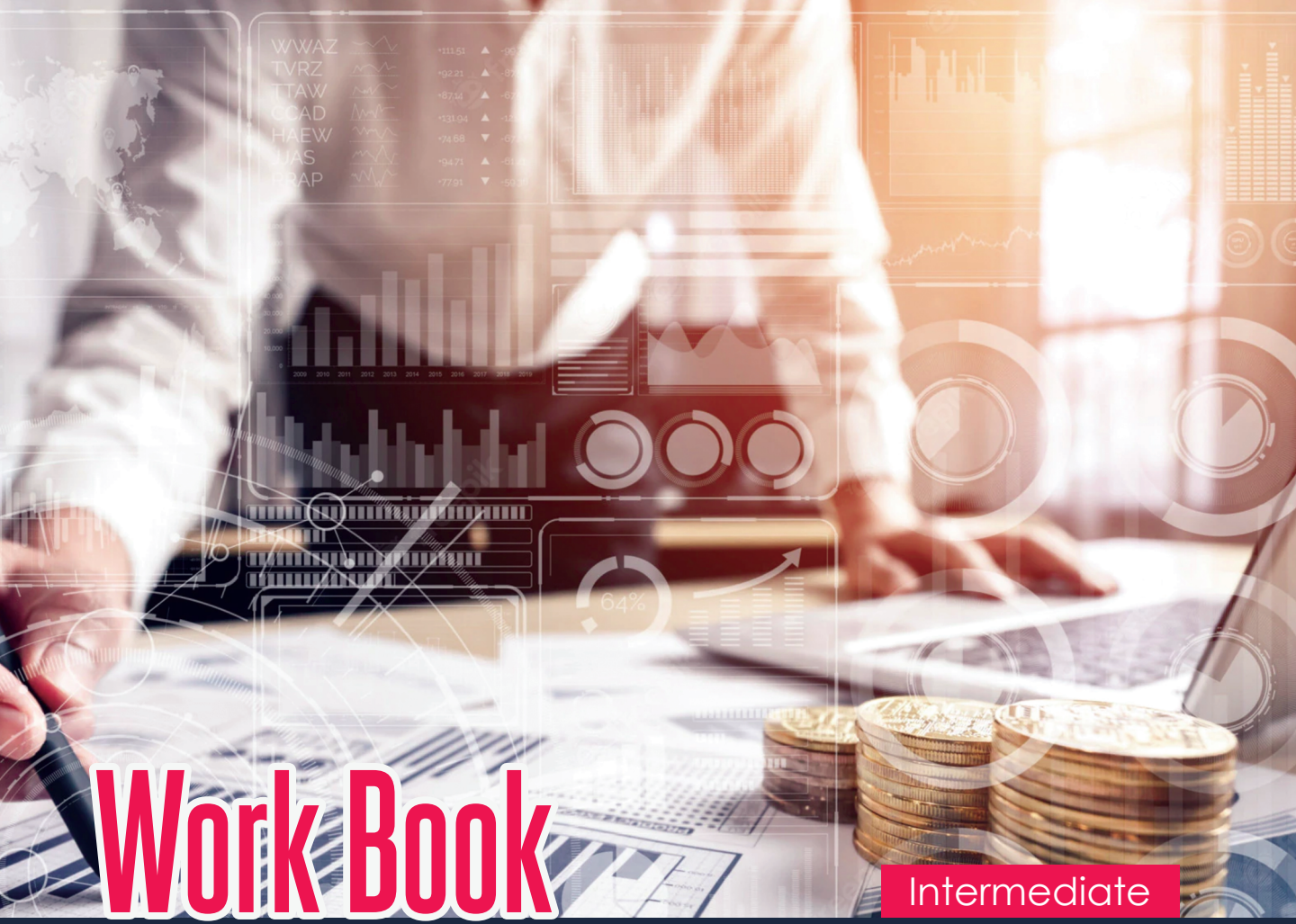

# Work Book

Intermediate

# Financial Management and Business Data Analytics

Paper 11

The Institute of Cost Accountants of India
Statutory Body under an Act of Parliament
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# WORKBOOK

# Financial Management and Business Data Analytics

## INTERMEDIATE

## Paper 11

## SYLLABUS 2022

The Institute of Cost Accountants of India

CMA Bhawan, 12, Sudder Street, Kolkata - 700 016

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studies@icmai.in

# Preface

The landscape of professional education is undergoing a profound transformation, driven by the evolving demands of a globally integrated economy. In this dynamic environment, it is imperative to equip students not only with technical knowledge but also with the analytical skills and professional acumen essential for success.

Effective learning extends beyond theoretical understanding—it necessitates the development of strong conceptual foundations, critical thinking abilities, and disciplined study habits. These attributes are cultivated through continuous practice and engagement with thought-provoking academic material. To facilitate this process, the curriculum, instructional methods, and assessments must be designed to provide comprehensive, structured, and intellectually stimulating learning experiences.

Building on the success of the previous editions, we are pleased to present the new edition of our 'Workbook' in an e-distributed format. This edition has been meticulously developed to enhance students' comprehension and application of key concepts. Each chapter is structured to offer a seamless learning experience and integrating practical illustrations in a phased manner to align with the evolving regulatory framework.

We are confident that this new edition will continue to serve as a valuable academic resource, empowering students to achieve their professional aspirations with confidence and competence.
The Directorate of Studies, The Institute of Cost Accountants of India

The Directorate of Studies,

The Institute of Cost Accountants of India

# INDEX

**ILLUSTRATION 1**

A machine costs ₹. 1,96,000 and its effective life is estimated at 12 years. If the scrap value is ₹. 6,000, what should be retained out of profit at the end of each year to accumulate at compound interest rate at 5% p.a., so that a new machine can be purchased after 12 years?

**Solution:**

Effective cost of the machine = ₹. 1,96,000 - 6,000 = ₹. 1,90,000.

Now FV = Annuity Amount × FVIFA (5%, 12y)

or, ₹. 1,90,000 = Annuity Amount × 15.917

or, Annuity Amount = ₹. 1,90,000 ÷ 15.917

or, Annuity Amount = ₹. 11,936

So, annual profit retained of ₹. 11,936 for 12 years @ 5% will accumulate to ₹. 1,90,000 which together with scrap value of ₹. 6000 can be used to purchase the new machine.

**ILLUSTRATION 2**

A 10-year savings annuity of ₹. 4,000 per year is beginning at the end of current year. The payment of retirement annuity is to begin 16 years from now (the first payment is to be received at the end of year 16) and will continue to provide a 20-year payment annuity. If this plan is arranged through a savings bank that pays interest @ 7% per year on the deposited funds, what is the size of the yearly retirement annuity that will result?

**Solution:**

Compounded amount of the 10-payment savings annuity of ₹. 4,000 corresponding to 10 payments and 7%.

FV = Annuity Amount × FVIFA(r,n)

FV = ₹. 4,000 × FVIFA (7%,10)

FV = 4,000(13.816) = ₹. 55,264

The amount of ₹. 55,264 is available immediately after the last payment. Now, compound the amount of ₹. 55,264 for 5 years as a single payment at 7%. This will give the total cumulative value in the beginning of year 16.

FV = PV × FVIF(r,n)

FV = PV × FVIF (7%,5)

FV = 55,264(1.403) = ₹. 77,535.

Finally, obtain the size of the equal retirement annuity payment by using the amount of ₹. 77,535 as the present value of the retirement annuity. Substitute the values corresponding to 20-payments and 7% as follows:

PV = Annuity Amount × PVIFA(r,n)

PV = Annuity Amount × PVIFA (7%,20)

₹. 77,535 = Annuity Amount × (10.594)

Annuity Amount = ₹. 7,318.

Thus, the savings annuity of ₹. 4,000 for 10 years will produce 20 years retirement annuity of ₹. 7,318 per year starting at the end of 16 years from now.

## ILLUSTRATION 3

A company is offered a contract which has the following terms: An immediate cash outlay of ₹. 15,000 followed by a cash inflow of ₹. 17,900 after 3 years. What is the company's rate of return on this contract?

**Solution:**

The amount of ₹. 15,000 cash outflows earn an unknown rate of interest of r% to generate compounded amount of ₹. 17,900 after 3 years.

Accordingly,

$FV = PV(1 + r)^n$

₹. 17,900 = ₹. 15,000 $(1 + r)^3$

₹. 17,900/ ₹. 15,000 = $(1 + r)^3$

$1.193 = (1 + r)^3$

As per the FVIF table, value closest to the value of 1.193 in the 3 years row is found in 6% interest rate. Thus, the actual rate of interest on the contract is slightly greater than 6%.

## ILLUSTRATION 4

Mr. Q deposited ₹. 50,000 in bank for a time period of 1 year. The bank gives two options: (i) to receive interest at the rate of 11% per annum compounded monthly and (ii) to receive interest at the rate of 11.75% per annum compounded semi-annually. Which option Mr. Q would choose?

**Solution:**

FV = $PV\left(1+\frac{r}{m}\right)^{mn}$ when compounding is done multiple times.

PV = Present Value

FV = Future Value

r = Interest rate

n = Number of years

m = Number of times compounding is done.

**Option (i)**

FV = $50{,}000\left(1+\frac{0.11}{12}\right)^{12\times1}$ = 50,000 × 1.1157188 = ₹. 55,785.94

**Option (ii)**

FV = $50{,}000\left(1+\frac{0.1175}{2}\right)^{2\times1}$ = 50,000 × 1.12095156 = ₹. 56,047.58

Therefore, Mr. Q should choose option (ii) which has the highest Future Value as compared to option (i).

## ILLUSTRATION 5

Mr. U takes loan of ₹. 45,50,000 from bank for purchasing house. He decides to repay the loan in 15 years in 15 equal annual instalments. The bank charges an interest at the rate of 9% p. a. What will be the amount of instalment if payments are to be made bi-annually?

**Solution:**

PV = Annuity × PVIFA (r, n)

Here, PV = Present Value, i.e. 45,00,000

A = Annuity i.e., Equated Half Yearly Instalment

r = Discount rate, i.e. 9% or 0.09 p.a. i.e., 0.045 per semi-annual period

n = Number of years, i.e. 15 years = 30 half years

Conditionally,

45,00,000 = A × PVIFA (4.5%, 30)

or, 45,00,000 = A × 16.29

or, A = 45,00,000/16.29 = ₹. 2,76,243.09

So, amount of instalment payable is ₹. 2,76,243.09 per half year.

## ILLUSTRATION 6

Mr. P wants to save for his son's education. The approximate amount required to be paid in 15 years from now is ₹. 65,00,000. With this plan, he wants to save fixed amount annually in the form of bank deposit. The bank pays interest at the rate of 14% p.a. How much Mr. P should save per year if the amount of deposit with interest would be sufficient to finance his son's education after 15 years?

**Solution:**

FV = A × FVIFA (r, n)

Where, A = Annual fixed amount

r = Rate of interest i.e. 14% or, 0.14 p.a.

n = Number of years i.e. 15 years

FV = Compounded sum of Annuity or Future Value of an Annuity

**Conditionally,**

65,00,000 = A × FVIFA (14%, 15 years)

or, 65,00,000 = A × 43.8424

or, A = 65,00,000/43.8424

or, A = ₹. 1,48,258.31

So, Mr. P should invest ₹. 1,48,258.31 per year.

## ILLUSTRATION 7

What is the Effective Rate of Interest, if the Rate of Interest is 12 per cent per annum, when compounding is done annually, semi-annually, and quarterly?

**Solution:**

Effective Rate of Interest = $\left(1+\frac{r}{m}\right)^{m}-1$

In this case, i = 12%

A. When interest is compounded annually, m = 1. Hence, Effective Rate of Interest = 12%

B. When interest is compounded semi-annually, m = 2,

Effective Rate of Interest = $\left(1+\frac{r}{m}\right)^{m}-1=\left(1+\frac{0.12}{2}\right)^{2}-1=(1.06)^{2}-1=0.1236=12.36\%$

C. When interest is compounded quarterly, m = 4

Effective Rate of Interest = – 1 = – 1 = (1.03)4 – 1 = 0.1255 = 12.55%

## ILLUSTRATION 8

Mr. X is planning to buy a machine for his firm. He has two options. He can either purchase it by making cash payment of ₹. 5 lakhs or ₹. 6,15,000 is to be paid in six equal annual instalments. Which option do you suggest to the doctor, assuming the rate of return is 12%?

**Solution:**

Present Value of outflow under both options is required for decision-making purposes.

**Option One**

Payment of ₹. 5,00,000 in cash now. Hence, the Present Value of cash outflow is ₹. 5,00,000.

**Option Two**

Payment of ₹. 6,15,000 in six equal annual instalments. That is, payment of ₹. (6,15,000/6) = ₹. 1,02,500 at the end of each year.

At discount rate of 12%, the present value of ₹. 1,02,500 paid at the end of each year, for six years is:

| Year | Cash Inflows (₹.) | PV of Re. l at 12% | PV of Cash Flows (₹.) |
|---|---|---|---|
| 1 | 1,02,500 | 0.893 | 91,532.50 |
| 2 | 1,02,500 | 0.797 | 81,692.50 |
| 3 | 1,02,500 | 0.712 | 72,980.00 |
| 4 | 1,02,500 | 0.636 | 65,190.00 |
| 5 | 1,02,500 | 0.567 | 58,117.50 |
| 6 | 1,02,500 | 0.507 | 51,967.50 |
| | | **4.112** | **4,21,480.00** |

Or

PV of Annuity = P × PV of Annuity of Re. 1 at 1% for n years

= ₹. 1,02,500 × PV of Annuity of ₹. 1 at 12% for 5 years

= ₹. 1,02,500 × 4.112

= ₹. 4,21,480

Decision: Since payment of ₹. 1,02,500 each year-end for 6 years is cheaper in today's value when compared to payment of ₹. 5,00,000 at the time of purchase, it is advisable for the doctor to choose the second option.

## ILLUSTRATION 9

Mr. Y wants to make a deposit at year zero into an account that will earn 8% compounded annually. It is desired to withdraw ₹. 5,000 three years from now and ₹. 7,000 six years from now. What is the size of the year zero deposit that will produce these future payments?

**Solution:**

The initial deposit should be the sum of the present values of the two later withdrawals by using the present value table.

PV = FV × PVIF(r, n)

PV = ₹. 5,000 × PVFIF (8%, 3) + ₹. 7,000 × PVIF (8%, 6)

PV = ₹. 5,000 (0.794) + ₹. 7,000 (0.630)

PV = ₹. 3,970 + ₹. 4,410 = ₹. 8,380.

The amount of ₹. 8380 grows to a value of ₹. 10,559 in three years; ₹. 5,000 is withdrawn then,

leaving ₹. 5,559. This amount is left for another three years to compound to the desired amount of ₹. 7,000. Therefore, an amount of ₹. 8,380 deposited today will result in the desired withdrawals.

## ILLUSTRATION 10

Calculate the ex-ante return and risk from the following information.

| Scenario | Boom | Moderate | Recession |
|---|---|---|---|
| Return (Ri) (%) | 20 | 15 | 10 |
| Probability (Pi) | 0.2 | 0.5 | 0.3 |

**Solution:**

Calculation of ex-ante return and risk

| Scenario | Return ($R_i$) (%) | Probability ($P_i$) | $R_i P_i$ | $[R_i - E(R)]$ | $[R_i - E(R)]^2$ | $P_i [R_i - E(R)]^2$ |
|---|---|---|---|---|---|---|
| Boom | 20 | 0.2 | 10.0 | 1.0 | 1 | 0.2 |
| Moderate | 12 | 0.5 | 6.0 | -7.0 | 49 | 24.5 |
| Recession | 10 | 0.3 | 3.0 | -9.0 | 81 | 24.3 |
| | | | 19.0 | | 96 | 49 |

Ex-ante Return = $\sum$ Ri Pi

Ex-ante Risk = σ = $\sqrt{49}$ = 7%

## ILLUSTRATION 11

Your client holds the following securities:

| Particulars of Securities | Cost (₹.) | Dividends (₹.) | Market Price (₹.) | BETA |
|---|---|---|---|---|
| **Equity Shares:** | | | | |
| Co. A | 8,000 | 800 | 8,200 | 0.8 |
| Co. B | 10,000 | 800 | 10,500 | 0.7 |
| Co. C | 16,000 | 800 | 22,000 | 0.5 |
| Co. D | 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.

**Solution:**

Calculation of expected return on market portfolio ($R_m$)

| Investment | Cost (₹.) | Dividends (₹.) | Capital Gains (₹.) |
|---|---|---|---|
| Shares A | 8,000 | 800 | 200 |
| Shares B | 10,000 | 800 | 500 |
| Shares C | 16,000 | 800 | 6,000 |
| Shares D | 34,000 | 3,400 | -1,700 |
| | 68,000 | 5,800 | 5,000 |

Rm = (5,800 + 5,000) / 68,000 × 100 = 15.88%

Calculation of expected rate of return on individual security:

**Security**

Share A 6 + 0.8(15.88-6.0) = 13.90 %

Share B 6 + 0.7(15.88-6.0) = 12.92 %

Share C 6 + 0.5(15.88-6.0) = 10.94 %

Share D 6 + 0.2(15.88-6.0) = 7.98 %

## ILLUSTRATION 12

During a five-year period, the relevant results for the aggregate market are that the risk-free rate (rf) is 8% and the return on market (rm) is 14%. For that period, the results of five portfolio managers are as follows:

| Portfolio Manager | Actual Average Return (%) | Beta (B) |
|---|---|---|
| P | 13 | 0.80 |
| Q | 14 | 1.05 |
| R | 17 | 1.25 |
| S | 13 | 0.90 |
| T | 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?

**Solution:**

(i) CAPM Equation: $Rj = Rf + \beta (Rm - Rf)$

Where Rj = Expected rate of return Rf = Risk free rate

Rm = Return on Market

$\beta$ = Beta

The expected rates of return are as follows:

| Portfolio Manager | Expected Return (%) | Actual Average Return (%) | Difference between Actual & Expected Returns |
|---|---|---|---|
| P | 8% + 0.80 (14%-8%) = 12.8 | 13 | + 0.2 |
| Q | 8% + 1.05(14%-8%) = 14.3 | 14 | - 0.3 |
| R | 8% + 1.25(14%-8%) = 15.5 | 17 | +1.5 |
| S | 8% + 0.90(14%-8%) = 13.4 | 13 | - 0.4 |
| T | 8% + 0.95(14%-8%) = 13.7 | 15 | +1.3 |

(ii) Managers Q and S did not perform up to expectation, they have to be warned.

# 2 Tools for Financial Analysis [Study Material - Module 3]

1. K Ltd. provides you the following income statement, you have to prepare a Common Size Statement and also interpret the results.

**Income Statement for the year ended 31st March**

| Particulars | 2022 (₹.) | 2023 (₹.) |
|---|---|---|
| Net Sales | 10,50,000 | 13,50,000 |
| Less: Cost of Goods Sold | 5,70,000 | 6,45,000 |
| **Gross Profit** | 4,80,000 | 7,05,000 |
| Less: Other Operating Expenses | 1,50,000 | 2,16,000 |
| **Operating Profit** | 3,30,000 | 4,89,000 |
| Less: Interest on Long term Debt | 60,000 | 51,000 |
| **Profit Before Tax (PBT)** | 2,70,000 | 4,38,000 |

**Solution:**

**K Ltd.**

**Common Statement for the year 31st March, 2022 and 2023**

| Particulars | 2022 | 2023 |
|---|---|---|
| Net Sales | 100% | 100% |
| Less: Cost of Goods Sold | 54.3% | 47.8% |
| $\frac{\text{Cost of Goods Sold}}{\text{Net Sales}} \times 100$ | | |
| Gross Profit | 45.7% | 52.20% |
| $\frac{\text{Gross Profit}}{\text{Net Sales}} \times 100$ | | |

| Particulars | 2022 | 2023 |
|---|---|---|
| Less: Other operating expenses $\frac{\text{Other Operating Expenses}}{\text{Net Sales}} \times 100$ | 14.3% | 16% |
| Operating Profit $\frac{\text{Operating Profit}}{\text{Net Sales}} \times 100$ | 31.4% | 36.2% |
| Less: Interest on Long term Debt $\frac{\text{Interest}}{\text{Net Sales}} \times 100$ | 5.7% | 3.8% |
| Profit Before Tax (PBT) $\frac{\text{PBT}}{\text{Net Sales}} \times 100$ | 25.7% | 32.4% |

**Comments:**

- The PBT to net sales has increased from 25.7% in the year 2022-23 to 32.4% in the year 2022-23. It indicates that the profit earning capacity of the company has improved during the study period.
- The interest on long-term debt to net sales has declined from 5.7% in the 2022-23 to 3.8% in 2022-23. It implies that the financial burden of the company has reduced significantly during the study period.

## ILLUSTRATION 2

The income statements of B & Co. for the year ended on 31.12.2021 and 2022 are given below. Prepare a Comparative Income Statement and comment. (₹. in lakh)

| Particulars | 2021 (₹.) | 2022 (₹.) |
|---|---|---|
| Net Sales | 1,890 | 2,500 |
| Cost of Goods Sold | 1,240 | 1,570 |
| Operating expenses: | | |
| Office and administrative expenses | 180 | 210 |
| Selling and distribution expenses | 90 | 104 |

| Particulars | 2021 (₹.) | 2022 (₹.) |
|---|---|---|
| Non-operating expense: | | |
| Interest on loan | 50 | 70 |
| Income tax | 110 | 120 |

**Solution:**

**M/S Y & Co.**

**Comparative Income Statement**

**For the year ended on 31.12.2021 and 2022**

| Particulars | 2021 (₹.) | 2022 (₹.) | Absolute Change (₹.) | Percentage Change (%) |
|---|---|---|---|---|
| Net Sales | 1,890 | 2,500 | 610 | 32.28 |
| Less: Cost of Goods Sold | 1,240 | 1,570 | 330 | 26.61 |
| Gross Profit (a) | 650 | 930 | 280 | 43.07 |
| Less: Operating expenses: | | | | |
| Office and admn. expenses | 180 | 210 | 30 | 16.67 |
| Selling and dist. expenses | 90 | 104 | 14 | 15.56 |
| Total (b) | 270 | 314 | 44 | 16.30 |
| Operating Profit (a – b) | 380 | 616 | 236 | 62.10 |
| Less: Non-operating expense: | | | | |
| Interest on loan | 50 | 70 | 20 | 40.00 |
| Net Profit before tax | 330 | 546 | 216 | 65.45 |
| Less: Income tax | 110 | 120 | 10 | 9.09 |
| | 220 | 426 | 206 | 93.64 |

## ILLUSTRATION 3

Following are Balance Sheets of NELCO Ltd. for the year ended 31st March, 2023 and 2024.

Convert them into common size balance sheet and interpret the changes. (Figures in ₹.)

| Liabilities | 2023 | 2024 | Assets | 2023 | 2024 |
|---|---|---|---|---|---|
| Equity Share Capital | 1,00,000 | 1,65,000 | Fixed Assets (net) | 1,20,000 | 1,75,000 |
| Preference Sh. Capital | 50,000 | 75,000 | Stock | 20,000 | 25,000 |
| Reserves | 10,000 | 15,000 | Debtors | 50,000 | 62,500 |
| Profit & Loss Account | 15,000 | 22,500 | Bills Receivable | 10,000 | 30,000 |
| Bank Overdraft | 25,000 | 25,000 | Prepaid Expenses | 5,000 | 6,000 |
| Creditors | 20,000 | 25,000 | Cash in Bank | 20,000 | 26,500 |
| Provision for Taxation | 10,000 | 12,500 | Cash in Hand | 5,000 | 15,000 |
| | 2,30,000 | 3,40,000 | | 2,30,000 | 3,40,000 |

Solution:

Common Size Balance Sheet as on 31st March, 2023 and 2024

| Particulars | 2023 | | 2024 | |
|---|---|---|---|---|
| | ₹. | % | ₹. | % |
| Shareholders' Fund: | | | | |
| Equity Share Capital | 1,00,000 | 43.48% | 1,65,000 | 48.53% |
| Preference Share Capital | 50,000 | 21.74% | 75,000 | 22.05% |
| Reserves | 10,000 | 4.34% | 15,000 | 4.41% |
| Profit & Loss Account | 7,500 | 3.26% | 10,000 | 2.95% |
| **(1)** | 1,67,500 | 72.82% | 2,65,000 | 77.94% |
| Current Liabilities: | | | | |
| Bank Overdraft | 25,000 | 10.87% | 25,000 | 7.35% |
| Creditors | 20,000 | 8.70% | 25,000 | 7.35% |
| Provision for Tax | 10,000 | 4.35% | 12,500 | 3.68% |
| Proposed Dividend | 7,500 | 3.26% | 12,500 | 3.68% |
| **(2)** | 62,500 | 27.18% | 75,000 | 22.06% |
| Total Liabilities (1) + (2) | 2,30,000 | 100% | 2,40,000 | 100% |
| Fixed Asset (Net) (a) | 1,20,000 | 52.17% | 1,75,000 | 51.47% |
| Current Assets | | | | |
| Stock | 20,000 | 8.70% | 25,000 | 7.35% |
| Debtors | 50,000 | 21.74% | 62,500 | 18.38% |

| Particulars | 2023 | | 2024 | |
|---|---|---|---|---|
| | ₹. | % | ₹. | % |
| Bills Receivables | 10,000 | 4.34% | 30,000 | 8.82% |
| Prepaid Expenses | 5,000 | 2.17% | 6,000 | 1.78% |
| Cash in Bank | 20,000 | 8.70% | 26,500 | 7.79% |
| Cash in Hand | 5,000 | 2.18% | 15,000 | 4.41% |
| **(b)** | 1,10,000 | 47.83% | 1,65,000 | 48.53% |
| Total Assets (a) + (b) | 2,30,000 | 100% | 3,40,000 | 100% |

Interpretation:

a. In 2023, Current Assets increased from 47.83% to 48.53%.

b. Cash in Hand and Bank is increased by ₹.16,500

c. Current Liabilities were decreased from 27.18% to 22.06%. The company can settle the current liabilities from current assets. The liquidity position is reasonably good.

d. Fixed Assets were increased from ₹.1,20,000 to ₹.1,75,000. These were purchased from the additional share capital issued.

e. The overall financial position is satisfactory.

## ILLUSTRATION 4

The following are the ratios relating to the activities of A Ltd:

| | |
|---|---|
| Debtors velocity | 3 months |
| Stock velocity | 8 months |
| Creditors velocity | 2 months |
| Gross profit ratio | 25 per cent |

Gross profit for the current year ended December 31 amounts to ₹ 4,00,000. Closing stock of the year is ₹ 10,000 above the opening stock. Bills receivable amount to ₹ 25,000 and bills payable to ₹ 10,000. Find out: (a) Sales, (b) Sundry debtors, (c) Closing stock, and (d) Sundry creditors.

**Solution:**

(a) Determination of sales: Sales = ₹ 4,00,000/25% = ₹.16,00,000

(b) Determination of sundry debtors:

Debtors velocity is 3 months. In other words, debtors' collection period is 3 months, or debtors' turnover ratio is (12/3) 4. Assuming all sales to be credit sales and debtors turnover ratio being calculated on the basis of year-end figures,

Debtors turnover ratio = Credit sales /(Closing debtors + Bills receivable)

or, Closing debtors + Bills receivable = Credit sales/ Debtors turnover ratio = ₹ 16, 00, 000/4 = ₹ 4,00,000

Closing debtors = ₹ 4,00,000 – ₹ 25,000 = ₹ 3,75,000

(c) Determination of closing stock:

Stock velocity of 8 months signifies that the inventory holding period is 8 months and stock turnover ratio is 1.5 = (12 months ÷ 8).

Stock turnover = Cost of goods sold (i.e., Sales – Gross profit)/ Average stock

or, 1.5 = ₹ 12, 00, 000/Average stock

or, Average stock = ₹ 12,00,000/1.5 = ₹ 8,00,000

Closing stock – Opening stock = ₹ 10,000 ..... (1)

(Closing stock + Opening stock)/2 = ₹ 8,00,000

Or, Closing stock + Opening stock = ₹ 16,00,000 ..... (2)

Subtracting (1) from (2) we have,

2 Opening stock = ₹ 15,90,000

or, Opening stock = ₹ 7,95,000

Therefore, Closing stock = ₹ 8,05,000

(d) Determination of sundry creditors:

Creditors velocity of 2 months signifies that the credit payment period is 2 months. In other words, creditors' turnover ratio is 6(12 months ÷ 2). Assuming all purchases to be credit purchases and creditors turnover is based on year-end figures,

Creditors turnover ratio = Credit purchases/ (Creditors + Bills payable)

or, 6 = ₹ 12,10, 000/(Creditors + ₹ 10,000)

or, Creditors + ₹ 10,000 = ₹ 12,10, 000/6 = ₹ 2,01,667

Creditors = ₹ 2,01,667 – ₹ 10,000 = ₹ 1,91,667

**Note:** Credit purchases are calculated as follows:

Cost of goods sold = Opening stock + Purchases – Closing stock

₹ 12,00,000 = ₹ 7,95,000 + Purchases – ₹ 8,05,000

₹ 12,00,000 + ₹ 10,000 = Purchases

₹ 12,10,000 = Purchases (credit).

## ILLUSTRATION 5

From the following particulars, prepare a summarised Balance Sheet in detail as at 31st March, 2023:

Fixed Assets to Net worth = 0.8: 1.

Current Ratio = 3: 1

Fixed Assets = ₹. 16,00,000.

Reserve included in proprietor's fund = 25%

Acid Test Ratio = 3: 2

Cash and Bank = ₹. 30,000

Long-term Loan = Nil

**Solution:**

(1) Fixed Assets/Net worth = 0.8

16,00,000/Net worth = 0.8

Net worth = 20,00,000.

So, Share Capital + Reserves = 20,00,000

Reserve included in proprietor's fund ---- 25%

So, Share Capital = 75% of 20,00,000 = 15,00,000

Reserves = 25% of 20,00,000 = 5,00,0000

Again, Net Worth = Fixed Assets + Working Capital = 20,00,000

Working Capital = 20,00,000 -- 16,00,000 = 4,00,000

(2) Current Assets/Current Liabilities = 3

or, Current Assets = 3 Current Liabilities.

Working capital = Current Assets -- Current Liabilities = 4,00,000

or, 3 Current Liabilities -- Current Liabilities = 4,00,000

or, 2 × Current Liabilities = 4,00,000; Current Liabilities = 2,00,000;

Current Assets = 3 × 2,00,000 = 6,00,000.

Acid Test Ratio = 3:2

or, (Current Assets – Stock)/Current Liabilities = 3/2

or, (6,00,000 – Stock)/2,00,000 = 3:2

or, 12,00,000 -- 2 Stock = 6,00,000

or, 2 Stock = 6,00,000

or, Stock = 3,00,000.

**Balance Sheet as on 31.03.2023**

| Liabilities | ₹. | Assets | | ₹. |
|---|---|---|---|---|
| Share Capital | 15,00,000 | Fixed Assets | | 16,00,000 |
| Reserve | 5,00,000 | Current Assets: | | |
| Current Liabilities | 2,00,000 | Bank | 30,000 | |
| | | Stock | 3,00,000 | |
| | | Others | 2,70,000 | 6,00,000 |
| | 22,00,000 | | | 22,00,000 |

## ILLUSTRATION 6

Using the following data, complete the Balance Sheet of F Limited as at 31.3.2023:

(a) Gross Profit 25% of Sales

(b) Gross Profit = ₹. 2,40,000

(c) Shareholders' equity = ₹. 40,000

(d) Credit sales to total sales = 80%

(e) Total turnover to total assets = 4 times

(f) Cost of sales to Inventory = 10 times

(g) Average collection period = 5 days, assume 365 days in a year.

(h) Long-term debt =?

(i) Current ratio = 1.5

(j) Sundry Creditors = ₹. 1,20,000.

**Solution:**

**Working Notes:**

(1) Calculation of Sales

Given, Gross profit @ 25% = 2,40,000

Sales = 2,40,000/ 25% = 9,60,000.

(a) Credit Sales = 80% of ₹. 9,60,000 = ₹. 7,68,000

(b) Cash Sales = 20% of ₹. 9,60,000 = ₹. 1,92,000.

(2) Calculation of Cost of Goods Sold

Cost of Goods Sold = Sales - Gross Profit = ₹. 9,60,000 - ₹. 2,40,000 = ₹. 7,20,000.

(3) Calculation of Closing Inventory

Cost of Goods Sold to Inventory = 10 times.

Inventory = COGS / 10 = 720000/ 10 = 72,000 (assuming opening and closing inventory are same)

(4) Calculation of Total Assets

Total Turnover to Total Assets = 4 times.

Total Turnover/Total Assets = 4

Total Assets = 9,60,000/ 4 = 2,40,000

(5) Calculation of Current Assets

Current Ratio = Current Assets/Current Liabilities = 1.5: 1 (as, CL = Creditors = 120000)

1.5 Current Liabilities = Current Assets

or Current Assets = ₹. 1,20,000 / 1.5 = ₹. 1,80,000.

(6) Calculation of Debtors

Average collection period = 5 days

Debtors = (Credit Sales/365) × 5

Debtors = (7,68,000/365) × 5 = 10,520

(7) Calculation of Cash

Current Assets = 1,80,000

Cash + Debtors + Inventory = 90,000

Cash = 1,80,000 – 10,520 – 72,000 = 97,480

Balance Sheet as on 31.03.2023

| Liabilities | ₹. | Assets | | ₹. |
|---|---|---|---|---|
| Shareholders' equity | 40,000 | Fixed Assets (b. f) | | 60,000 |
| Long term loan (b. f) | 80,000 | Current Assets: | | |
| Current Liabilities | 1,20,000 | Cash | 97,480 | |
| | | Debtors | 10,520 | |
| | | Stock | 72,000 | 1,80,000 |
| | 2,40,000 | | | 2,40,000 |

## ILLUSTRATION 7

From the information given below relating to Bad Past Ltd., calculate Altman's Z-score and comment:

Working Capital to Total Assets = 30%

Retained Earnings to Total Assets = 25%

EBIT to Total Assets = 20%

Market Value of Equity Shares to Book Value of Total Debt = 170%

Sales to Total Assets = 0.5 times

**Solution:**

As per Altman's Model (1968) of Corporate Distress Prediction:

$Z = 1.2\ X_1 + 1.4\ X_2 + 3.3\ X_3 + 0.6\ X_4 + 1.0\ X_5$

Here, the five variables are as follows:

$X_1$ = Working Capital to Total Assets = 30%

$X_2$ = Retained Earnings to Total Assets = 25%

$X_3$ = EBIT to Total Assets = 20%

$X_4$ = Market Value of Equity Shares to Book Value of Total Debt = 70%

X = Sales to Total Assets = 0.5 times

Hence, Z-score = (1.2 × 30%) + (1.4 × 25%) + (3.3 × 20%) + (0.6 × 170%) + (1 × 0.50)

= 0.36 + 0.35 + 0.66 + 1.02 + 0.50

= 2.89

**Comment:** As the calculated value of Z-score is higher than 1.81 but lower than 2.99, it falls in the grey area and hence the bankruptcy status cannot be identified explicitly. It requires further analysis.

## ILLUSTRATION 8

A firm wants to know whether it belongs to the non- bankrupt class of firms. Certain figures are extracted from the financial statements of the firm. You are required to use Altman's Z score model and place the firm in the appropriate class.

- Sales : ₹. 40,00,000
- EBIT : ₹. 20,00,000
- Total Assets : ₹. 80,00,000
- Book Value of Total Liabilities : ₹ 32,00,000
- Retained Earnings : ₹. 48,00,000
- Market Value of Equity : ₹. 1,60,00,000
- Working Capital : ₹. 16,00,000

**Solution:**

As per Altman's model,

$Z = 1.2\ X_1 + 1.4\ X_2 + 3.3\ X_3 + 0.6\ X4 + 1.0\ X_5$

Where,

$X_1$ = Working Capital / Total Assets = 16,00,000/80,00,000 = 0.2

$X_2$ = Retained Earnings / Total Assets = 48,00,000/80,00,000 = 0.6

$X_3$ = Earnings Before Interest and Tax / Total Assets = 20,00,000/80,00,000 = 0.25

$X_4$ = Market Value of Equity / Total Liabilities = 1,60,00,000/32,00,000 = 5

$X_5$ = Sales / Total Assets = 40,00,000/80,00,000 = 0.5

So, $Z = 1.2(0.2) + 1.4(0.6) + 3.3(0.25) + 0.6(5) + 1.0(0.5) = 5.405$

Since, in this case the Z score of the firm is higher than 2.99, the firm is a non-distressed firm and is in a non-bankrupt class.

## ILLUSTRATION 9

From the following information extracted from the Balance Sheets of W Ltd., calculate Funds from Operations: (Figure in ₹.)

| | 31.03.2021 | 31.03.2022 |
|---|---|---|
| Share Capital | 80,000 | 1,00,000 |
| General Reserve | 30,000 | 35,000 |
| Profit and Loss Account | 40,000 | 1,00,000 |
| Depreciation Fund | 15,000 | 18,000 |
| Goodwill | 15,000 | 10,000 |
| Preliminary Expenses | 3,000 | 2,000 |
| Patents | 10,000 | 8,000 |

Bonus shares have been issued for ₹. 20.000 during 2021-22 capitalizing profits from Profit and Loss Account. It is observed in the Profit and Loss Account that an income from sale of machinery ₹.6.000 has been received.

**Solution:**

| | (₹.) |
|---|---|
| Profit and Loss Account (as on 31st March. 2022) | 1,00,000 |
| + Increase in share capital (Bonus issue) | |
| Transferring from Profit and Loss A/c | 20,000 |
| + Transfer to General Reserve | 5,000 |
| + Provision for Depreciation | 3,000 |
| + Goodwill written off | 5,000 |
| + Preliminary Expenses written off' | 1,000 |
| + Patents written off | 2,000 |
| (-) Income from sale of machinery | 6,000 |
| | 1,30,000 |
| (-) Balance m Profit and Loss Account (31.03.21) | 40,000 |
| Funds from Operations | 90,000 |

## ILLUSTRATION 10

Following information is available from the books of Suresh Ltd. for the year end 31-12-2021 and 31-12-2022.

| Particulars | 31-12-2021 | 31-12-2022 |
|---|---|---|
| Profit made during the year | - | 2,50,000 |
| Income received in advance | 500 | 400 |
| Prepaid expenses | 1,600 | 2,000 |
| Debtors | 80,000 | 20,000 |
| Bills receivable | 25,000 | 40,000 |
| Creditors | 45,000 | 65,000 |
| Bills payable | 13,000 | 5,000 |
| Outstanding expenses | 2,500 | 3,000 |
| Accrued income | 1,500 | 1,800 |

Calculate cash flow from operations for the year ending 31-12-2022.

**Solution:**

Calculation for cash from operation for the year ending on 31.03.2022

| Particulars | ₹. | ₹. |
|---|---|---|
| Profit made during the year | | 2,50,000 |
| Add: | | |
| Decrease in Debtors | | |
| Increase in Creditors | 60,000 | |
| Increase in Outstanding Expenses | 20,000 | 80,500 |
| | 500 | 3,30,500 |
| Less: | | |
| Decrease in income received in advance | 100 | |
| Increase in prepaid expenses | 400 | |
| Increase in bills receivable | 15,000 | |

| Particulars | ₹. | ₹. |
|---|---|---|
| Decrease in bills payable | 8,000 | |
| Increase in accrued income | 300 | (-)23,800 |
| | | 2,06,700 |

## ILLUSTRATION 11

Calculate Cash Flow from Operating Activities from the following:

| | |
|---|---|
| Net Profit before tax | ₹. 13,60,000 |
| Items considered in determining the above Net Profit: | |
| Interest on long term borrowings | ₹. 1,60,000 |
| Depreciation and Amortization | ₹. 3,40,000 |
| Transfer to Reserves | ₹. 2,00,000 |
| Gain on sale of machinery | ₹. 1,20,000 |

**Balances of Current Assets and Current Liabilities were as follows:**

| Particulars | Opening Balance (₹.) | Closing Balance (₹.) |
|---|---|---|
| Trade Receivables | 11,00,000 | 9,60,000 |
| Trade Payables | 7,60,000 | 8,00,000 |
| Inventories | 5,60,000 | 6,40,000 |
| Prepaid Expense | 80,000 | 1,00,000 |
| Income received in advance | 20,000 | 60,000 |

**Solution:**

**Cash Flow Statement**

**For the year ended on .....**

| Particulars | ₹. | ₹. |
|---|---|---|
| Net Profit before tax | | 13,60,000 |
| Add: Depreciation and amortization | | 3,40,000 |
| Add: Interest on long term borrowings | | 1,60,000 |

| Particulars | ₹. | ₹. |
|---|---|---|
| Add: Transfer to Reserves | | 2,00,000 |
| Less: Gain on sale of machinery | | (1,20,000) |
| Operating profit before working capital changes | | 19,40,000 |
| Add: Decrease in trade receivables | | 1,40,000 |
| Add: Increase in trade payables | | 40,000 |
| Add: Increase in income received in advance | | 40,000 |
| | | 21,60,000 |
| Less: Increase in inventory | | (80,000) |
| Less: Increase in prepaid expense | | (20,000) |
| Cash Flow from Operating Activities | | 20,60,000 |

## ILLUSTRATION 12

From the following summary of cash account of XL Pharma Ltd. for the year ended 31.03.2024, calculate Cash Flow from Operating Activities using Direct Method and prepare Cash Flow Statement.

| Particulars | ₹. | Particulars | ₹. |
|---|---|---|---|
| To Balance b/d | 5,00,000 | By Cash Purchase | 5,20,000 |
| To Cash Sales | 6,00,000 | By Trade Payables | 5,76,000 |
| To Trade Receivables | 6,40,000 | By Rent | 2,00,000 |
| To Interest and Dividend | 8,000 | By Administrative Exp. | 1,00,000 |
| To Bank Loan | 6,00,000 | By Income Tax | 1,20,000 |
| To Sale of Investment | 3,20,000 | By Investment | 3,60,000 |
| To Trade Commission | 1,60,000 | By Repayment of Loan | 4,00,000 |
| | | By Interest on Bank Loan | 28,000 |
| | | By Balance c/d | 5,24,000 |
| | 28,28,000 | | 28,28,000 |

**Solution:**

**Cash Flow Statement**

**For the year ended on 31.03.2024**

| Particulars | ₹. | ₹. |
|---|---|---|
| Cash Flow from Operating Activities | | |
| Cash Sales | | 6,00,000 |
| Collection from Trade Receivables | | 6,40,000 |
| Trade Commission received | | 1,60,000 |
| | | 14,00,000 |
| Less: Cash purchase | 5,20,000 | |
| Less: Payment to Trade Payables | 5,76,000 | |
| Less: Payment of Rent | 2,00,000 | |
| Less: Payment of administration expenses | 1,00,000 | 13,96,000 |
| Cash Generated from Operations | | 4,000 |
| Less: Payment of Income Tax | | 1,20,000 |
| | | (1,16,000) |
| Cash Flow from Investing Activities | | |
| Sale of investment | 3,20,000 | |
| Interest and dividend received | 8,000 | |
| Purchase of investment | (3,60,000) | (32,000) |
| Cash Flow from Financing Activities | | |
| Bank loan raised | 6,00,000 | |
| Repayment of loan | (4,00,000) | |
| Interest on bank loan | (28,000) | 1,72,000 |
| | | 24,000 |
| Add: Opening Cash Balance | | 5,00,000 |
| Closing Cash Balance | | 5,24,000 |

# 3 Sources of Finance and Cost of Capital [Study Material - Module 4]

**ILLUSTRATION 1**

A company's share is currently quoted in the market at ₹.20. The company pays a dividend of ₹.2 per share and the investors expect a growth rate of 5% per year. You are required to calculate (a) cost of Equity Capital of the company and (b) the market price per share if the anticipated growth rate dividend is 7%.

**Solution:**

(a) The cost of Equity Capital (Ke) may be ascertained as follows:

$$K_e = \frac{D_1}{P_0} + g$$

Where,

$D_1$ = Dividend per share at the end of the current year, i.e. ₹. 2

$P_0$ = Market price per share, i.e. ₹. 20

g = Expected growth rate of dividend, i.e. 5% or 0.05

Therefore, $K_e = \frac{2}{20} + 0.05 = 0.15 = 15\%$

(b) We know,

$$K_e = \frac{D_1}{P_0} + g$$

Where, $D_1$ = ₹. 2, $K_e$ = 0.15, g = 0.07

$$K_e = 0.15 = \frac{2}{P_0} + 0.07$$

$$P_0 = \frac{2}{0.15 - 0.07} = ₹.\ 25 \text{ per share}$$

## ILLUSTRATION 2

Y company Ltd. issues 1,000 12% preference shares of ₹.1000 each at a premium of 10% but redeemable at a premium of 20% after 5 years. The company pays underwriting commission at the rate of 5%. If tax on dividend is 12.5%, surcharge is 2.5% and education cess is 3%, calculate the cost of Preference Share Capital.

**Solution:**

The Cost of Capital of redeemable preference share $K_p$ may be computed as follows:

$$K_p = \frac{D(1 + Dt) + 1/n(RV - NP)}{1/2(RV + NP)}$$

Where,

Kp = Cost of Preference Share Capital

D = Annual Preference Dividend, i.e. ₹.120 per share

RV = Redeemable Value, i.e. ₹.1000 + (20% of ₹.100) = ₹.1200

NP = Net Proceeds of the Share, ₹.1000+ (10% of ₹.1000) – 5% of ₹.1100 = ₹.1045

n = Number of years for redemption, i.e. 5 years

$D_t$ = Dividend Tax = 12.5+ surcharge at the rate of 2.5% + education cess at the rate of 3%

= 12.5 + 2.5% of (12.5) + 3% of (12.5 + 0.3125) = 12.5 + 0.3125 + 0.3844

= 13.1969% or 0.1319

Therefore,

$$Kp = \frac{120(1 + 0.1319) + 1/5(1200 - 1045)}{1/2(1200 + 1045)} = 0.1486 = 14.86\%$$

## ILLUSTRATION 3

R & Co. has issued 12% debenture of face value ₹.100 for ₹.10 lakh. The debenture is expected to be sold at 5% discount. It also involves flotation cost of ₹.5 per debenture. The debentures are redeemable at a premium of 5% after 10 years. Calculate the cost of debenture if the tax rate is 50%.

**Solution:**

After tax cost of debenture ($K_d$) may be calculated as follows:

Cost of debenture ($K_d$) = $\frac{I(1-t) + 1/n(RV - NP)}{1/2(RV + NP)}$

Where,

$K_d$ = Cost of debt after tax

I = Rate of interest, i.e. 12% or ₹.12 per debenture

t = Tax rate, i.e. 50% or 0.50

n = Number of years in which debenture is to be redeemed, i.e. 10 years

RV = Principal value at the time of redemption, i.e. ₹.100 + (5% of ₹.100) or ₹.105 per debenture

NP = Net cash proceeds at the time of issue, i.e. [₹.100 – (5% of ₹.100) – ₹.5] or ₹.90 per debenture

Therefore,

$K_d = \frac{12(1 - 0.50) + 1/10(105 - 90)}{1/2(105 + 90)} = 0.07692 = 7.69\%$

## ILLUST RATION 4

Shares of A Ltd. are currently selling at ₹. 340 each. The company has been regularly paying dividends for last several years as follows:

| Year | Amount (₹.) |
|---|---|
| 1 | 24.00 |
| 2 | 25.44 |
| 3 | 26.96 |
| 4 | 28.58 |
| 5 | 30.30 |
| 6 | 32.14 |

Find out the growth rate of the company, given that the company follows a policy of fixed DP Ratio. Also find out the cost of equity of the company. Given, FVIF (6%, 5) = 1.339

**Solution:**

In this case, Dividend for year 1, ₹.24.00 has increased to ₹.32.14 for the year 6. So, the cumulative growth rate for 5 years is calculated as follows:

Conditionally, $D_1 \times FVIF\ (x\%, 5) = D_6$

or, 24.00 × FVIF (x%, 5) = 32.14

Or, FVIF (x%, 5) = 32.14/24.00 = 1.339 = FVIF (6%, 5)

So, the growth rate in dividend = 6%

Cost of Equity = $\frac{D_1}{P_0} + g = \frac{32.14\ (1 + 0.06)}{340} + 0.06 = 16.02\%$

## ILLUSTRATION 5

X Ltd. has 10% perpetual debt of ₹.1,00,000. The tax rate is 35%. Determine the Cost of Capital (before tax as well as after tax) assuming the debt is issued at (i) par, (ii) 10% discount and (iii) 10% premium.

**Solution:**

(i) Debt issued at par:

Before-tax cost, $K_i = \frac{I}{NP} = \frac{100000 \times 10\%}{100000} = 10\%$

After-tax cost, $K_d = K_i\ (1 - t) = 10\%\ (1 - 0.35) = 6.5\%$

(ii) Issued at discount:

Before-tax cost, $K_i = \frac{10000}{90000} = 11.11\%$

After-tax cost, $K_d = 11.11\%\ (1 - 0.35) = 7.22\%$

(iii) Issued at premium:

Before-tax cost, $K_i = \frac{10000}{110000} = 9.09\%$

After-tax cost, $K_d = 9.09\%\ (1 - 0.35) = 5.91\%$

## ILLUSTRATION 6

Equity shares (F.V ₹. 10 each) of ABC Ltd. are being quoted at PE of 7.5 times. The retained earnings of the company being ₹.12 at 40%.

(i) Find out the cost of equity, $K_e$, if the growth rate of the firm is 7%.

(ii) Find out the indicated market price of the shares, given that the $K_e$ remains as above and growth rate increases to 9%.

(iii) If Ke of the firm is 15% and growth rate being 10%, then what is the indicated market price of the equity share.

**Solution:**

Retained earnings = ₹.12

Retention Ratio = 40%

So, Earnings Per Share = ₹.12/0.40 = ₹.30

Price Earnings Ratio = 7.5 times

Dividend Per share, D0 = (₹.30 – ₹.12) = ₹.18

(i) Since, $D_1 = D_0 (1+g) = 18.00(1+.07) =$ ₹. 19.26

$P_0 = 30 \times 7.5 =$ ₹. 225

If g = 7%, $K_e = (D_1/P_0) + g = (19.26/225) + 0.07 = 15.56\%$

(ii) If $K_e = 15.56\%$ and g = 9% $P_0 = 19.62/(0.1556 – 0.09) =$ ₹. 299.09

(iii) If $K_e = 15\%$ and g = 10% $P_0 = 19.80/(0.15 – 0.10) =$ ₹. 396.00

## ILLUSTRATION 7

While considering the most desirable Capital Structure of a company, the following estimates of the cost of debt and Equity Capital (after tax) have been made at various levels of the debt-equity mix:

| Debt as Percentage of Total Capital Employed | Cost of Debt (%) | Cost of Equity (%) |
|---|---|---|
| 0 | - | 15 |
| 10 | 7 | 15 |
| 20 | 7 | 16 |
| 30 | 8 | 17 |
| 40 | 9 | 18 |
| 50 | 10 | 21 |
| 60 | 11 | 24 |

What is composite Cost of Capital at different levels of debt-financing? Can you suggest an optimal debt–equity mix in the above case?

**Solution:**

The following table shows Cost of Capital at different levels:

| Equity | | | Debt | | | Total Cost of Capital ($K_o$) |
|---|---|---|---|---|---|---|
| Proportion | Cost | Weighted Cost | Proportion | Cost | Weighted Cost | |
| 1.00 | 15 | 15 | — | — | — | 15.0 |
| 0.90 | 15 | 13.5 | 0.10 | 7 | 0.7 | 14.2 |
| 0.80 | 16 | 12.8 | 0.20 | 7 | 1.4 | 14.2 |
| 0.70 | 17 | 11.9 | 030 | 8 | 2.4 | 14.3 |
| 0.60 | 18 | 10.8 | 0.40 | 9 | 3.6 | 14.4 |
| 0.50 | 21 | 10.5 | 0.50 | 10 | 5 | 15.5 |
| 0.40 | 21 | 9.6 | 0.60 | 11 | 6.6 | 16.2 |

From the above table, it is evident that the Cost of Capital is minimum at two levels, i.e. (a) when equity is 90% and debt is 10% and (b) when equity is 80% and debt is 20%; hence, either of the two levels may be adopted.

## ILLUSTRATION 8

The current Capital Structure of a firm is given as follows:

| | Amount (₹. in lakh) |
|---|---|
| Equity Share Capital (₹.100 each) | 400 |
| Retained earnings | 200 |
| 12% debentures (₹.100 each) | 400 |
| | 1,000 |

You are given the following further information:

(i) Current market value per share is ₹. 300

Dividend paid per share in the last year was ₹. 45

Growth rate in dividend is 10%

(ii) The market value of debenture is ₹. 110 per debenture

(iii) Corporate tax rate is 40%

Using market values as weights, find out the average Cost of Capital of the firm.

**Solution:**

Calculation of Specific Cost of Capital:

(i) For Equity Share Capital ($K_e$)

$$K_e = \frac{D_1}{P_0} + g$$

Where, $D_0$ = Previous year dividend per share, i.e. ₹. 45

$P_0$ = Market price per share, i.e. ₹. 300

g = Expected growth rate in dividend, i.e. 10% or 0.10

$D_1 = D_0(1+g) = 45(1+0.10) =$ ₹. 49.50

So, $K_e$ = + 0.10 = 0.265 = 26.5%

(ii) For Retained Earnings ($K_r$)

$K_r = K_e$ = 26.5%, assuming external yield criterion

(iii) For 12% Debentures ($K_d$)

$K_d = I (1 – t)$

where,

I = Cost of debentures before tax, i.e. 12%

t = Corporate tax rate, i.e. 40% or 0.40

$K_d = 12 (1 – 0.40) = 7.20\%$

Calculation of Market Value

The total market value of equity of ₹.12,00,00,000 (i.e. 4,00,000 shares at the rate of ₹.300 per share) has been divided into equity share capital and retained earnings in the ratio of their book value, i.e. 2:1.

Market value of ESC = 1200000 × 2/3 = ₹. 8,00,00,000

Market value of Retained earnings = 1200000 × 1/3 = ₹. 4,00,00,000

Market value of Debentures = 400000 × 110 = ₹. 4,40,00,000

Calculation of Weighted Average Cost of Capital ($K_0$) (using Market Values as Weights)

| Source of Capital | Amount (Market value) (₹.) | Proportion or Weights | After-tax Cost (%) | Weighted Cost |
|---|---|---|---|---|
| Equity Share Capital | 8,00,00,000 | 0.4878 | 26.50 | 12.9267 |

| Source of Capital | Amount (Market value) (₹.) | Proportion or Weights | After-tax Cost (%) | Weighted Cost |
|---|---|---|---|---|
| Retained Earnings | 4,00,00,000 | 0.2439 | 26.50 | 6.4634 |
| 12% Debentures | 4,40,00,000 | 0.2683 | 7.20 | 1.9318 |
| | 16,40,00,000 | 1.0000 | | 21.3219 |

So, WACC = $K_0$ = 21.32%

## ILLUSTRATION 9

X Ltd. provides you the following information:

| Particulars | |
|---|---|
| No. of Equity Shares (₹. l0 each) | 1,50,000 |
| No. of 17% Preference Shares (₹. l00 each) | 40,000 |
| Retained Earnings | ₹. 10,00,000 |
| No. of 7.5% Debentures (₹ 100 each) | 60,000 |
| 10% Long-term Loan | ₹. 20,00,000 |

Additional Information:

(i) The Current market price of the company's equity share is ₹. 60. Expected Dividend per Equity Share for the last year is ₹. 2.40 which is expected to grow @ 5%. The flotation cost on issue of new equity shares is expected to be ₹. 10 per share.

(ii) The Preference shares of the company which are redeemable at par after 5 years are currently selling at ₹. 90 per Preference Share.

(iii) The Debentures of the company which are redeemable at 10% premium after 5 years are currently quoted at ₹. 90 per debenture.

(iv) The corporate tax rate is 20%.

Calculate Weighted Average Cost of Capital using Market Value Weights.

**Solution:**

Calculation of specific costs:

$$\text{Cost of Equity } (K_e) = \frac{D_1}{P_0} + g = \frac{2.40}{60 - 10} + 0.05 = 0.098 = 9.8\%$$

Cost of Preference Share Capital ($K_p$) = $\frac{D+1/n(P-I)}{\frac{1}{2}(p+I)} = \frac{17+1/5(100-90)}{\frac{1}{2}(100+90)}$ = 0.20 = 20%

Cost of Retained Earnings ($K_r$) = $K_e$ = 9.8%

Cost of Debentures ($K_d$) = $\frac{Int.(1-t)+1/n(P-I)}{\frac{1}{2}(P+I)} = \frac{7.50(1-0.20)+1/5(110-90)}{\frac{1}{2}(110+90)}$ = 0.10 = 10%

Cost of Loan ($K_l$) = r(1-t) = 10(1 – 0.20) = 8%

Calculation of Market Value

MV of Equity and RE = 60 × 150000 = ₹. 90,00,000 (to be divided in BV ratio)

MV of Equity = 90,00,000 × 15/20 = ₹. 67,50,000;

MV of RE = 90,00,000 × 5/20 = ₹. 22,50,000

MV of PSC = 90 × 40000 = ₹. 36,00,000

MV of Debenture = 90 × 60000 = ₹. 54,00,000;

MV of LTL = BV of LTL = ₹. 20,00,000

**Calculation of Weighted Average Cost of Capital using Market Value weights**

| Sources | Market Value | MV Weights ($W_i$) | Cost ($K_i$) (%) | $K_i W_i$ (%) |
|---|---|---|---|---|
| ESC | 67,50,000 | 0.3375 | 9.8 | 3.3075 |
| PSC | 36,00,000 | 0.18 | 20 | 3.6 |
| Retained Earnings | 22,50,000 | 0.1125 | 9.8 | 1.1025 |
| Debentures | 54,00,000 | 0.27 | 10 | 2.70 |
| LTL | 20,00,000 | 0.10 | 8 | 0.80 |
| Total | 2,00,00,000 | 1.00 | | 11.51 |

So, WACC is 11.51%

## ILLUSTRATION 10

The Capital Structure and other information of a company are given as follows:

| Sources | Amount (in lakh) | After-tax Cost of Capital (%) |
|---|---|---|
| Equity Shares (₹.100 each) | 100 | 14 |
| Reserve and Surplus | 50 | ? |
| Debentures | 200 | ? |

The market value of equity share is ₹.300 per share. The company uses market value of weights for computing average cost of capital. Corporate tax rate is 40% whereas the average Cost of Capital is 10%. What is the cost of reserve and surplus and cost of debt (before tax)?

**Solution:**

Let cost of debt ($k_d$) be x

Computation of WACC (Weights under Market Value)

| Sources | Market Value (in lakh) | Weights | Specific cost (%) | Weighted cost (%) |
|---|---|---|---|---|
| Equity Share Cap. | 100 | 0.40 | 14 | 5.60 |
| Reserve and Surplus | 50 | 0.20 | 14* | 2.80 |
| Debentures | 200 | 0.40 | x | 0.40x |
| | 500 | 1.00 | | 10.00 (given) |

*Cost of reserve and surplus = $K_e$ = 14% (As per external yield criteria)

Now, 5.60% + 2.80% + 0.4x = 10.00%

0.4x = (10.00 – 8.40) %

x = 1.60%

$K_d$ = 1.60/.40

= 4% (after tax)

Cost of debt (before tax) = 4%/(1 – 0.40) = 6.67%

## ILLUSTRATION 11

X Ltd. requires additional finance of ₹.20 lakhs for meeting its investment plans. It has ₹.4 lakh in the form of retained earnings available for investment purposes. The following are the further details:

(i) Debt–equity mix, 40:60

(ii) Cost of debt: up to ₹. 4,00,000, 10% (before tax)
Beyond ₹. 4,00,000, 12% (before tax)

(iii) Earnings per share, ₹. 5

(iv) Dividend payout, 60% of earnings

(v) Expected growth rate in dividend, 5%

(vi) Current market price per share, ₹. 35

(vii) Tax rate, 35%

Compute the overall weighted average after tax cost of additional finance.

**Solution:**

| | | |
|---|---|---|
| Additional finance required | | = ₹. 20,00,000 |
| Debt–equity mix | | = 40:60 |
| So, Long-term debt required | | = ₹. 8,00,000 |
| Rate of Tax | | = 35% |
| Equity finance required | = ₹. 20,00,000 × 60% | = ₹. 12,00,000 |
| Less: Retained earnings available | | = ₹. 4,00,000 |
| New equity share capital required | | = ₹. 8,00,000 |
| Earnings per share | | = ₹. 5 |
| So, Dividend per share | = ₹. 5 × 60% | = ₹. 3 |
| Growth rate in dividend | | = 5% |
| Market price per share | | = ₹. 35 |

(i) Cost of equity = $K_e = \frac{D_1}{P_0} + g = \frac{3(1+0.05)}{35} + 0.05 = 0.14 = 14\%$

(ii) Cost of retained earnings ($K_r$) = Cost of equity ($K_e$) = 14%

(iii) Cost of 10% long-term debt = $K_d$ = 10% (1 – 0.35) = 0.65 or 6.50%

(iv) Cost of 12% long-term debt = $K_d$ = 12% (1 – 0.35) = 0.780 or 7.80%

**Computation of WACC**

| Sources of Finance | Market Value (₹.) | Weights | Specific Cost (%) | Weighted Cost (%) |
|---|---|---|---|---|
| Equity shares capital | 8,00,000 | 0.40 | 14.00 | 5.60 |
| Retained earnings | 4,00,000 | 0.20 | 14.00 | 2.80 |
| 10% Long-term debt | 4,00,000 | 0.20 | 6.50 | 1.30 |
| 12% Long-term debt | 4,00,000 | 0.20 | 7.80 | 1.56 |
| | 20,00,000 | 1.00 | | 11.26 |

Therefore weighted average Cost of Capital is 11.26%

## ILLUSTRATION 12

The capital structure of a company is given below:

| | | |
|---|---|---|
| Equity share capital (5,000 shares of ₹.100 each) | ₹. | 5,00,000 |
| 10% Preference share (2,000 shares of 100 each | ₹. | 2,00,000 |
| 12% Debentures | ₹. | 3,00,000 |
| | ₹. | 10,00,000 |

The operating profit is ₹.2,90,000. The market price of each equity shares is ₹. 250 and of each preference share is ₹.125.

Find the cost of each source of capital assuming

(a) Corporate tax to be 30% and

(b) Corporate dividend tax to be 10%.

**Solution:**

(i) Corporate tax = 30%

Corporate dividend tax = 10%

Operating profit = ₹. 2,90,000

Cost of equity = Ke = $\frac{E}{P}$

where,

E = Earnings per share

$P_1$ = Market price of each equity share = ₹.250

Now, earnings available to equity shareholders:

| Particulars | ₹. |
|---|---|
| Operating profit | 2,90,000 |
| Interest on Debenture (₹.3,00,000 × 12%) | 36,000 |
| | 2,54,000 |
| Corporate Tax @ 30% (₹.2,54,000 × 30%) | 76,200 |
| | 1,77,800 |
| Preference Dividend (₹.2,00,000 × 10%) | 20,000 |
| | 1,57,800 |
| Dividend distribution Tax on Preference Share Dividend (₹.20,000 × 10%) | 2,000 |
| Earnings available to equity share holders | 1,55,800 |

E = Earnings per share

= Earnings available to equity shareholders/No of equity shares = 1,55,800/5,000 = ₹.31.16

Cost of equity = Ke = $\frac{E}{P_1} = \frac{31.16}{250} = 0.12464 = 12.464\%$

Cost of Preference Shares = $K_p = \frac{D}{P_1}(1 + Dt)$

where,

D = Dividend per preference share = ₹. 10

$P_1$ = Market price of preference share = ₹. 125

Dt = Corporate dividend tax = 10%

So, $Kp = \frac{D}{P_1}(1 + Dt) = \frac{10}{125}(1 + 0.10) = 8.8\%$

Cost of Debentures = $K_d = I (1 – t)$

where,

I = Rate of interest

t = Corporate tax = 30%

$K_d = I (1 – t) = 12(1 – 0.30) = 8.4\%$

So, Cost of Debentures = $K_d = 8.4\%$.

# 4 Capital Budgeting [Study Material - Module 5]

**ILLUSTRATION 1**

A company is considering a new project for which the investment data are as follows:

Capital outlay ₹. 4,00,000

Depreciation 20% p.a.

Forecasted annual income before charging depreciation, but after all other charges are as follows:

| Year | ₹. |
|---|---|
| 1 | 2,00,000 |
| 2 | 2,00,000 |
| 3 | 1,60,000 |
| 4 | 1,60,000 |
| 5 | 80,000 |

On the basis of the available data, set out calculations, illustrating and comparing the following methods of evaluating the return:

(a) Payback method.

(b) Rate of return on original investment.

**Solution:**

Since there is no tax, the annual income before depreciation and after other charges is equivalent to Cash flows (CF).

(a) Capital outlay of ₹. 2,00,000 is recovered in the first two years, (₹.2,00,000 (year 1) + ₹ 2,00,000 (year 2), therefore, the pay-back period is two years.

(b) Rate of return on original investment:

| Year | Income (₹.) | Depreciation (₹.) | Net Income (₹.) |
|---|---|---|---|
| 1 | 2,00,000 | 80,000 | 1,20,000 |
| 2 | 2,00,000 | 80,000 | 1,20,000 |
| 3 | 1,60,000 | 80,000 | 80,000 |
| 4 | 1,60,000 | 80,000 | 80,000 |
| 5 | 80,000 | 80,000 | Nil |
| | | | 4,00,000 |

Average Income = ₹. 4,00,000/5 = ₹. 80,000

Rate of Return = (Average income/ Original investment) × 100

= (80,000/4,00,000) × 100

= 20%

## ILLUSTRATION 2

A Ltd. has decided to purchase a machine to augment the company's installed capacity to meet the growing demand for its products. There are three machines under consideration of the management The relevant details including estimated yearly expenditure and sales arc given below: All sales arc on cash. Corporate Income Tax rate is 30%.

| | Machine A | Machine B | Machine C |
|---|---|---|---|
| Initial investment required | ₹. 3,00,000 | ₹. 3,00,000 | ₹. 3,00,000 |
| Estimated annual sales | 5,00,000 | 4,00,000 | 4,50,000 |
| Cost of Production (estimated): | | | |
| Direct Materials | 40,000 | 50,000 | 48,000 |
| Direct labour | 50,000 | 30,000 | 36,000 |
| Factory Overheads | 60,000 | 50,000 | 58,000 |
| Administration costs | 20,000 | 10,000 | 15,000 |
| Selling and distribution costs | 10,000 | 10,000 | 10,000 |

The economic life of Machine A is 2 years, while it is 3 years for the other two. The scrap values arc ₹.40,000, ₹.25,000, and ₹. 30,000 respectively. You are required to find out the most profitable investment based on Pay Back Period Method.

**Solution:**

**Calculation of Pay Back Period of Machines:**

| | Machine A | Machine B | Machine C |
|---|---|---|---|
| Initial investment (A) | 6,00,000 | 6,00,000 | 6,00,000 |
| Sales (B) | 10,00,000 | 8,00,000 | 9,00,000 |
| Costs: | 0 | 0 | 0 |
| Direct Material | 80,000 | 1,00,000 | 96,000 |
| Direct Labour | 1,00,000 | 60,000 | 72,000 |
| Factory Overhead | 1,20,000 | 1,00,000 | 1,16,000 |
| Depreciation | 2,60,000 | 1,83,333 | 1,80,000 |
| Administration Cost | 40,000 | 20,000 | 30,000 |
| Selling and Distribution costs. | 20,000 | 20,000 | 20,000 |
| Total Cost (C) | 6,20,000 | 4,83,333 | 5,14,000 |
| Profit before Tax (B - C) | 3,80,000 | 3,16,667 | 3,86,000 |
| Less: Tax @ 30% | 1,14,000 | 95,000 | 1,15,800 |
| Profit after Tax | 2,66,000 | 2,21,667 | 2,70,200 |
| Add: Depreciation | 2,60,000 | 1,83,333 | 1,80,000 |
| Net Cash Flow (D) | 5,26,000 | 4,05,000 | 4,50,200 |
| Payback period (years) (A ÷ D) | 1.14 | 1.48 | 1.33 |

Machine A has lowest payback period, so it may be preferred over the other two Machines.

## ILLUSTRATION 3

A firm whose cost of capital is 10% is considering two mutually exclusive projects A and B, the details of which are:

| | Year | Project A (₹.) | Project B (₹.) |
|---|---|---|---|
| Initial Cost | 0 | ₹.2,00,000 | ₹.2,00,000 |
| Cash Inflows | 1 | 20,000 | 1,00,000 |
| | 2 | 40,000 | 80,000 |

| | Year | Project A (₹.) | Project B (₹.) |
|---|---|---|---|
| | 3 | 60,000 | 40,000 |
| | 4 | 90,000 | 20,000 |
| | 5 | 1,20,000 | 20,000 |

Compute the Net Present Value and Profitability Index at 10% for the two projects.

**Solution:**

**Calculation of NPV**

| Year | CF(₹.) | | PVIF @10% | Total PV (₹.) | |
|---|---|---|---|---|---|
| | A | B | | A | B |
| **1** | 20,000 | 1,00,000 | 0.909 | 18,180 | 90900 |
| **2** | 40,000 | 80,000 | 0.826 | 33,040 | 66080 |
| **3** | 60,000 | 40,000 | 0.751 | 45,060 | 30040 |
| **4** | 90,000 | 20,000 | 0.683 | 61,470 | 13660 |
| **5** | 1,20,000 | 20,000 | 0.621 | 74,520 | 12420 |
| **Total PV** | | | | 2,32,270 | 2,13,100 |
| Less cash outflow | | | | 2,00,000 | 2,00,000 |
| NPV | | | | 32,270 | 13,100 |
| PI = (PV of Inflows/PV of Outflows) | | | | 1.161 | 1.065 |

Thus, under both NPV and PI method, project A is accepted.

## ILLUSTRATION 4

M Ltd. has an investment budget of ₹.100 lakhs. It has short listed two projects A and B after completing the market and technical appraisals. The management wants to complete the financial appraisal before making the investment. Further particulars regarding the two projects are given below: (₹. in lakhs)

| Particulars | A | B |
|---|---|---|
| Investment required | 100 | 90 |
| Average annual cash inflow before depreciation and tax (estimate) | 28 | 24 |

Salvage value: Nil for both projects. Estimate life – 10 years for both projects.

The company follows straight line method of charging depreciation. Its tax rate is 50%.

You are required to calculate the NPV for the 2 projects with a cost of Capital of 12%.

**Note:** P.V of an annuity of Re. 1 for ten years at different discount rate is given below:

| Rate % | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|
| PVIFA | 6.1446 | 5.8992 | 5.6502 | 5.4262 | 5.2161 | 5.0188 |

**Solution:**

**Calculation of NPV**

| Particulars | Project A (₹.) | Project B (₹.) |
|---|---|---|
| Av. Annual cash inflow before depreciation and tax | 28 | 24 |
| Less: Depreciation | 10 | 9 |
| EBT | 18 | 15 |
| Less: Tax @ 50% | 9 | 7.5 |
| PAT | 9 | 7.5 |
| Add: Depreciation | 10 | 9 |
| Cash inflow after tax | 19 | 16.5 |
| NPV at 12% cost of capital | 19 × 5.6502 = 107.3538 | 16.5 × 5.6502 = 93.2283 |
| Less: Initial investment | 100.00 | 90.00 |
| Net present Value | 7.3538 | 3.2283 |
| As Project A has more NPV than Project B, Project A should be accepted. | | |

## ILLUSTRATION 5

From the particulars given below calculate the IRR of the project.

(i) Net cash flow after tax over the four years of the project life.

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| CFAT (₹.) | 5,000 | 8,000 | 10,000 | 4,000 |

(ii) Initial outlay is ₹. 20,000, Salvage value at the end of the project life is Nil.

(iii) Present value of Re. 1 receivable at the end of year 1, 2, 3 and 4

| Rate | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|
| 12% | .892 | .797 | .712 | .636 | 3.037 |
| 13% | .885 | .783 | .693 | .613 | 2.974 |
| 14% | .877 | .770 | .675 | .592 | 2.914 |
| 15% | .867 | .756 | .658 | .572 | 2.853 |
| 16% | .862 | .743 | .641 | .552 | 2.798 |

**Solution:**

We apply trial and error approach to calculate the IRR.

$$\text{Fake Payback Period} = \frac{\text{Initial Investment}}{\text{Average Annual Cash inflow}}$$

$$= \frac{20000}{(5000 + 8000 + 10000 + 4000)/4}$$

= 2.963 years.

From the 4th year row of the PVIFA table we find that the value nearest to the fake payback period is 2.963 and the corresponding rate is 13%. So 13% should be the first trial rate.

**Calculation for NPV at alternative rates.**

| Year | CFAT | PVIF@ 13% | PV of CIAT | PVIF @14% | PV of CIAT |
|---|---|---|---|---|---|
| **1** | 5,000 | 0.885 | 4,425 | 0.877 | 4,385 |
| **2** | 8,000 | 0.783 | 6,264 | 0.770 | 6,160 |
| **3** | 10,000 | 0.693 | 6,930 | 0.675 | 6,750 |
| **4** | 4,000 | 0.613 | 2,452 | 0.592 | 2,368 |
| **Total Present Value** | | | 20,071 | | 19,663 |
| Less. Initial Investment | | | 20,000 | | 20,000 |
| NPV | | | 71 | | (-) 337 |

From the above table it is evident that IRR lies between 13% and 14% (as NPV at IRR = 0).

Applying simple interpolation, we get,

$$\frac{IRR - 13}{14 - 13} = \frac{0 - 71}{-337 - 71}$$

Or, IRR – 13 = 0.17

Or, IRR = 13.17%

So, IRR of the project is 13.17%.

## ILLUSTRATION 6

A Company can make either of two investments – Project E and Project F. Assuming a required rate of return of 10% p.a., evaluate the investment proposals under (i) Pay Back Profitability, (ii) Discounted Pay Back Period and (iii) Profitability Index. The particulars relating to the projects are given below:

| | **Project E** | **Project F** |
|---|---|---|
| Initial outlay (₹.) | 20,000 | 28,000 |
| Estimated life (years) | 5 | 5 |
| Scrap value (₹.) | Nil | Nil |
| Net Cash Flow (₹.) | | |
| End of Year 1 | 4,000 | 7,500 |
| Year 2 | 5,000 | 8,750 |
| Year 3 | 6,000 | 7,500 |
| Year 4 | 9,000 | 7,500 |
| Year 5 | 5,000 | 7,500 |

It is estimated that each of the alternative proposals will require an additional working capital of ₹. 2,000 which will be received back in full after the expiry of each project life. The present value of Re. 1, to be received at the end of each year, at 10% p.a. is given below:

| **Year** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| P.V. factor (Re.) | 0.909 | 0.827 | 0.751 | 0.683 | 0.621 |

**.Solution:**

(i) Evaluation of Projects under Payback Profitability

| Year | Project E NCF (₹.) | Project F NCF (₹.) |
|---|---|---|
| **1** | 4,000 | 7,500 |
| **2** | 5,000 | 8,750 |
| **3** | 6,000 | 7,500 |
| **4** | 9,000 | 7,500 |
| **5** | 7,000 (5,000+2,000) | 9,500 (7,500+2,000) |
| **Total NCF** | 31,000 | 40,750 |
| (-) Initial Investment | 22,000 (20,000+2,000) | 30,000 (28,000+2,000) |
| Payback Profitability | 9,000 | 10,750 |

Under Payback Profitability method Project F with higher payback profit is acceptable.

(ii) Evaluation of projects under Discounted Payback Period (DPBP) method

| Year | NCF | | PVIF @ 10% | PV of CF | | Cumulative CF | |
|---|---|---|---|---|---|---|---|
| | Project E | Project F | | Project E | Project F | Project E | Project F |
| **1** | 4,000 | 7,500 | 0.909 | 3,636 | 6,817.5 | 3,636 | 6,817.5 |
| **2** | 5,000 | 8,750 | 0.826 | 4,130 | 7,227.5 | 7,766 | 14,045 |
| **3** | 6,000 | 7,500 | 0.751 | 4,506 | 5,632.5 | 12,272 | 19,677.5 |
| **4** | 9,000 | 7,500 | 0.683 | 6,147 | 5,122.5 | 18,419 | 24,800 |
| **5** | 7,000 | 9,500 | 0.621 | 4,347 | 5,899.5 | 22,766 | 30,699.5 |

We apply simple interpolation method to calculate DPBP as follows –

For Project E

$$\frac{PBP - 4}{5 - 4} = \frac{22000 - 18419}{22766 - 18419}$$

Or, PBP = 4.82 years

Similarly, for Project F

$$\frac{PBP - 4}{5 - 4} = \frac{30000 - 24800}{30699.5 - 24800}$$

Or, PBP = 4.88 years

Thus Project E with lower DPBP is acceptable.

(iii) Evaluation of projects under PI method.

$$\text{PI for Project E} = \frac{\text{Total PV}}{\text{Initial Investment}} = \frac{22766}{22000} = 1.035$$

$$\text{PI for Project F} = \frac{\text{Total PV}}{\text{Initial Investment}} = \frac{30699.5}{30000} = 1.023$$

Since PI is higher for Project E, it is acceptable.

## ILLUSTRATION 7

A machine costing ₹.12,00,000 is required to undertake a proposed project. The effective life of the machine is expected to be 5 years with residual value of ₹.2,00,000. The company follows SLM of charging depreciation. The estimated EBT of the project are as follows:

| Year | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| EBIT (₹.) | 4,80,000 | 5,60,000 | 6,40,000 | 4,00,000 | 32,000 |

If tax rate is 40% and cost of capital is 15%, calculate the NPV and suggest whether the machine should be acquired or not.

Given the PV of Re.1 at 15% discount rate:

| Year | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| PVIF | 0.8696 | 0.7561 | 0.6575 | 0.5718 | 0.4972 |

**Solution:**

**Calculation of NPV**

| Year | EBIT | Tax @40% | EAT | Depreciation | CFAT | PVIF | PVCF |
|---|---|---|---|---|---|---|---|
| 1 | 4,80,000 | 1,92,000 | 2,88,000 | 2,00,000 | 4,88,000 | 0.8696 | 4,24364.8 |
| 2 | 5,60,000 | 2,24,000 | 3,36,000 | 2,00,000 | 536,000 | 0.7561 | 4,05369.6 |
| 3 | 6,40,000 | 2,56,000 | 3,84,000 | 2,00,000 | 534,000 | 0.6575 | 3,83,980 |
| 1 | 4,00,000 | 1,60,000 | 2,40,000 | 2,00,000 | 4,40,000 | 0.5718 | 2,51392 |

| Year | EBIT | Tax @40% | EAT | Depreciation | CFAT | PVIF | PVCF |
|---|---|---|---|---|---|---|---|
| 5 | 3,20,000 | 1,28,000 | 1,92,000 | 2,00,000 | 5,92,000 | 0.4972 | 2,94342.4 |
| Total PV | | | | | | | 17,59,549 |
| (-) Initial Investment | | | | | | | 12,00,000 |
| NPV | | | | | | | 5,59348.8 |

Note: Depreciation = (12,00,000 – 2,00,000)/5 = ₹.2,00,000

Note: 5th year CFAT includes the scrap value of ₹.2,00,000.

Since NPV is positive, it is acceptable.

## ILLUSTRATION 8

Following figures relate to a new project for which a machine is to be acquired at a cost of ₹.2,50,000 and initially ₹.60,000 is to be invested as working capital:

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| EBDIT (₹.) | 80,000 | 90,000 | 1,45,000 | 1,20,000 |
| Depreciation (₹.) | 75,000 | 62,000 | 48,000 | 25,000 |

At the beginning of 2nd year, an amount of ₹.10,000 is to be introduced as additional working capital.

On completion of the project i.e. at the end of the fourth year, it is expected that ₹.40,000 will be realized from sale of scrap and working capital will be recovered in full. Cost of capital is 12% and applicable tax rate is 30%.

Calculate NPV of the project and comment on its acceptability.

**Solution:**

**Calculation for PV of Cash Inflow (Figures in ₹.)**

| Year | EBD1T | Depreciation | EBIT | Tax (30%) | EAT | CFAT | PVIF at 12% | PVCF |
|---|---|---|---|---|---|---|---|---|
| 1 | 80,000 | 75,000 | 5,000 | 1,500 | 3,500 | 78,500 | 0.893 | 70,100.5 |
| 2 | 90,000 | 62,000 | 28,000 | 8,400 | 19,600 | 81,600 | 0.797 | 65,035.2 |

| Year | EBD1T | Depreciation | EBIT | Tax (30%) | EAT | CFAT | PVIF at 12% | PVCF |
|---|---|---|---|---|---|---|---|---|
| 3 | 1,45,000 | 48,000 | 97,000 | 29,100 | 67,900 | 1,15,900 | 0.712 | 82,520.8 |
| 4 | 1,20,000 | 25,000 | 95,000 | 28,500 | 66,500 | 2,01,500 | 0.636 | 1,28,154 |
| Total | | | | | | | | 3,45,810.5 |

**Note:** Cash flow of 4th year includes ₹.70,000 working capital realized and ₹.40,000 scrap value realized.

**Calculation for PV of Cash Outflows**

| Year | Cash outflows (₹.) | PVIF at 12% | PV of Cash outflows (₹.) |
|---|---|---|---|
| 0 | 3,10,000 | 1 | 3,10,000 |
| 1 | 10,000 | 0.893 | 8,930 |
| Total PV | | | 3,18,930 |

**Note:** Cash flow for year o (i.e. initial cash flow includes ₹.60,000 working capital investment.

So, NPV = PV of cash inflow - PV of cash outflow = ₹.3,45,810.50 – ₹.3,18,930

= ₹.26,880.50

## ILLUSTRATION 9

X Ltd. has ₹.2000000 allocated for capital budgeting purposes. The following proposals are available:

| Projects | Initial Outlay (₹.) | Total PV (₹.) |
|---|---|---|
| A | 12,00,000 | 14,64,000 |
| B | 6,00,000 | 5,70,000 |
| C | 12,00,000 | 16,80,000 |
| D | 18,00,000 | 21,24,000 |
| E | 8,00,000 | 9,60,000 |
| F | 16,00,000 | 16,80,000 |

Which of the above investments should be undertaken? Assume that the projects are divisible.

**Solution:**

**Calculation for NPV, Profitability Index and Ranking**

| Projects | Initial Outlay | Total PV | PI | Ranking | NPV |
|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) = (3)/ (2) | (5) | (6) = (3) – (2) |
| A | 12,00,000 | 14,64,000 | 1.22 | 2 | 2,64,000 |
| B | 6,00,000 | 5,70,000 | 0.95 | 6 | -30,000 |
| C | 12,00,000 | 16,80,000 | 1.4 | 1 | 4,80,000 |
| D | 18,00,000 | 21,24,000 | 1.18 | 4 | 3,24,000 |
| E | 8,00,000 | 9,60,000 | 1.2 | 3 | 1,60,000 |
| F | 16,00,000 | 16,80,000 | 1.05 | 5 | 80,000 |

Selection of the projects based on PI ranking.

| Ranking | Projects | Initial Outlay (₹.) | Cumulative Initial Outlay (₹.) | NPV (₹.) |
|---|---|---|---|---|
| 1 | C | 12,00,000 | 12,00,000 | 4,80,000 |
| 2 | A | 12,00,000 | 24,00,000 | 2,64,000 |
| 3 | E | 8,00,000 | 32,00,000 | 1,60,000 |
| 4 | D | 8,00,000 | 40,00,000 | 1,44,000* (3,24,000 × 8/18) |
| **Total** | | **40,00,000** | | **10,48,000** |

## ILLUSTRATION 10

From the following information, calculate Net Present Value of the following business proposal and suggest whether the proposal should be accepted or rejected:

| | |
|---|---|
| Initial Investment in Fixed Assets | ₹. 10,00,000 |
| Initial Investment in Working Capital | ₹. 2,00,000 |
| Salvage Value of Fixed Assets after 3 years | ₹. 4,00,000 |
| Annual Cash inflows before tax | ₹. 6,00,000 |
| Income tax rate (on profit and capital gain) | 30% |

Cost of capital 18%

Depreciation is to be charged on WDV method @40%.

Present Values of Re. 1.00 at 18% are as follows:

| Year | 1 | 2 | 3 |
|---|---|---|---|
| PVIF | 0.8475 | 0.7182 | 0.6086 |

**Solution:**

1. Initial Cash Out Flow

| Particulars | Amount (₹.) |
|---|---|
| Fixed Assets | 10,00,000 |
| Working Capital | 2,00,000 |
| Total | 12,00,000 |

2. Annual Cash Flows

| Year | CFBT | Depreciation | Taxable Profit | Tax @ 30% | CFAT | PVIF | PV @ 18% |
|---|---|---|---|---|---|---|---|
| 1 | 6,00,000 | 4,00,000 | 2,00,000 | 60,000 | 5,40,000* | 0.8475 | 4,57,650 |
| 2 | 6,00,000 | 2,40,000 | 3,60,000 | 1,08,000 | 4,92,000 | 0.7182 | 3,53,354 |
| 3 | 6,00,000 | 1,44,000 | 4,56,000 | 1,36,800 | 4,63,200 | 0.6086 | 2,81,904 |
| | | 7,84,000 | | | | | 10,92,908 |

3. Terminal Cash Flows

| Particulars | ₹. |
|---|---|
| Salvage Value | 4,00,000 |
| Tax on Capital Gain (4,00,000 – 2,16,000) × 30% | (-)55,200 |
| Working Capital | 2,00,000 |
| Total | 5,44,800 |
| PVIF (18% 3rd Year) | 0.6086 |
| Present Value | 3,31,565 |

WDV = 10,00,000 – 7,84,000 = 2,16,000

Net Present Value = (10,92,908 + 3,31,565) - 12,00,000 = ₹.2,24,473

Decision: NPV is positive and hence the proposal should be accepted.

## ILLUSTRATION 11

A particular project has a four years life with yearly projected net profit of ₹. 10,000 after charging yearly depreciation of ₹. 8000 in order to write off the capital cost of ₹. 32,000. Out of the capital cost, ₹. 20,000 is payable immediately (year 0) and balance in next year (which will be needed for evaluation). Stock amounting to ₹. 6,000 (to be invested in year 0) will be required throughout the project and for debtors a further sum of ₹. 8,000 will have to be invested in year 1. The working capital will be recouped in year 5. It is expected that the machinery will fetch a residual value of ₹. 2,000 at the end of 4th year. Income tax is payable @ 40% and the Depreciation is charged on written down value @ 25% per annum. Income tax is payable next year. The residual value of the machine, ₹. 2,000 will also bear tax @ 40%. Although the profit is for 4 years, for computation of tax and realization of working capital, the computation will be required up to 5 years. Advise the firm.

**PV of Cash Outflows:**

| | |
|---|---|
| Capital cost at $T_0$ | ₹. 20,000 |
| Capital cost at $T_1$ (₹. 12,000 × .909) | ₹. 10,908 |
| Working Capital (Stock) at $T_0$ | ₹. 6,000 |
| Working Capital (Debtors) at $T_1$ (₹.8,000×0.909) | ₹. 7,272 |
| | ₹. 44,180 |

**Calculation of NPV (figures in ₹.)**

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Net profit | 10,000 | 10,000 | 10,000 | 10,000 | - |
| (+) Depreciation | 8,000 | 8,000 | 8,000 | 8,000 | - |
| (+) Residual value | - | - | - | 2,000 | - |
| (-) Tax @ 40% of preceding year's profit | - | 4,000 | 4,000 | 4,000 | 4,800* |
| (+) Working Capital recovered | - | - | - | - | 14,000 |
| Cash inflow | 18,000 | 14,000 | 14,000 | 16,000 | 9,200 |
| PVIF (10%, n) | 0.909 | 0.826 | 0.751 | 0.683 | 0.621 |

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Present Value | 16362 | 11,564 | 10,514 | 10,928 | 5,713 |
| Total PV of cash inflow | | | | | 55081 |
| (-) PV of cash outflow | | | | | 44,180 |
| NPV | | | | | 10,901 |

* 40% of (10,000 + 2,000) = ₹.4,800

Decision: As the NPV of the project is positive, the firm can take it up.

## ILLUSTRATION 12

P Ltd. is the manufacturer of a low-end consumer durable Q. In order to modernize the manufacturing facility, P Ltd. wants to buy a new machinery costing ₹. 20,00,000 at cash price. The annual cash flow before tax over the entire lifespan of the company is ₹. 6,00,000 p.a. The marginal rate of tax is 40% and cost of capital is 10% p.a. The scrap value at the end of the useful life of the machinery is negligible. The company is currently following a straight-line method of charging depreciation on machineries. Do you think the project is financially viable?

The company has an alternative to charge accelerated depreciation @ 30% of the depreciable amount each for the first three years and @ 10% for the fourth year. Does it change your suggestion?

**Solution:**

**Computation of NPV (Under Straight Line Method of Depreciation).**

| Particulars | ₹. |
|---|---|
| CFBT | 3,00,000 |
| (-) Depreciation | 2,00,000 |
| Taxable Profit | 1,00,000 |
| Tax @ 40% | 40,000 |
| PAT | 60,000 |
| (+) Depreciation | 2,00,000 |
| CFAT | 2,60,000 |
| PVIFA (10%, 5) | 3.79 |
| Total PV | 9,85,400 |

| Particulars | ₹. |
|---|---|
| (-) Initial Investment | 10,00,000 |
| NPV | (14,600) |

Since the NPV is negative, the decision of buying the machine is not viable.

**Computation of NPV (Under MACRS).**

| Year | CFBT | Depreciation | Taxable Profit | Tax | CFAT | PVIF @10% | PV |
|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) = (2) – (3) | (5) = (4)×40% | (6) = (4)-(5) + (3) | (7) | (8) = (6) ×(7) |
| 1 | 3,00,000 | 3,00,000 | 0 | 0 | 3,00,000 | 0.909 | 2,72,700 |
| 2 | 3,00,000 | 3,00,000 | 0 | 0 | 3,00,000 | 0.826 | 2,47,800 |
| 3 | 3,00,000 | 3,00,000 | 0 | 0 | 3,00,000 | 0.751 | 2,25,300 |
| 4 | 3,00,000 | 1,00,000 | 2,00,000 | 80,000 | 2,20,000 | 0.683 | 1,50,260 |
| 5 | 3,00,000 | 0 | 3,00,000 | 1,20,000 | 1,80,000 | 0.621 | 1,11,780 |
| Total PV | | | | | | | 10,07,840 |
| Less. Initial Investment | | | | | | | 10,00,000 |
| NPV | | | | | | | 7,840 |

Since the NPV is positive, the decision of buying the machine is viable. Thus, using MACRS the company finds the same project acceptable which was not acceptable under SLM.

**ILLUSTRATION 1**

Find out the optimum cash balance as per Baumol's Model for the following:

| | |
|---|---|
| Annual cash needed | ₹. 4,80,000 |
| Transaction cost | ₹. 500 per conversion |
| Interest rate | ₹. 12% p.a. |

What are the opportunity costs of holding cash, the transaction cost and the total costs. What these would be if cash held is ₹. 30,000 or ₹. 40,000?

**Solution:**

Optimum cash balance as per Baumol Model is:

$C = \sqrt{\frac{2AF}{O}}$ Where A = Annual cash needed = ₹.4,80,000; F = Transaction cost per conversion = ₹.50;

O = Carrying cost or interest cost per rune per annum = 0.12

So, $C = \sqrt{\frac{2\times 4,80,000\times 50}{0.12}}$ = ₹.20,000

Average Cash balance = C/2 = ₹. 10,000 (i.e., 20,000 ÷ 2)

Interest Cost @ 12% = C/2 × O = ₹.10,000 × 12% = ₹. 1,200

No. of transactions = A/C = 4,80,000 ÷ 20,000 = 24

Transaction cost (24 × 500) = ₹. 1,200

Total cost = ₹. 1,200 + ₹.1,200 = ₹. 2,400

If the cash held is ₹. 30,000 or ₹. 40,000, the costs would be:

| Particulars | Cash Balance ₹.30,000 | Cash Balance ₹.40,000 |
|---|---|---|
| Average cash | ₹.15,000 | ₹.20,000 |
| Interest cost @12% | ₹.1,800 | ₹.2,400 |
| No. of transaction | 16 | 12 |
| Transaction cost | ₹.800 | ₹.600 |
| Total cost | ₹.2,600 | ₹.3,000 |

## ILLUSTRATION 2

Simplex Ltd. has a standard deviation of monthly net cash flows of ₹. 300. It's transaction cost of converting cash into marketable securities is ₹. 10 and the interest is 1% per month. The minimum cash balance required is ₹. 200. Set out the Upper, Lower and Return limit for the firm as per Miller-Orr Model.

**Solution:**

As per Miller-Orr model,

$$Z = \sqrt[3]{\frac{3TV}{4i}}$$

Where, T = Transaction cost per conversion = ₹.10

V = Variance of daily cash requirement = $(300)^2$ = 90000

i = Monthly rate of interest = 1%

L = Minimum cash balance = ₹.200

So, $Z = \sqrt[3]{\frac{3\times10\times90000}{4\times0.01}}$ = ₹. 407

The relevant limits can be ascertained as follows:

Lower limit, L = ₹. 200

Z = ₹. 407

Return Level, R = Z + L = 407 + 200 = ₹. 607

Upper Level, U = 3Z + L = 3 × 407 + 200 = ₹.1,421

## ILLUSTRATION 3

Cash flows of Travel Excel Ltd. behave in a random manner. Find out the 'Return Point' and 'Upper Limit', as per Miller-Orr Model, on the basis of the following information:

(i) Cost of effecting a marketable securities transaction is ₹. 1500.

(ii) Annual yield on marketable securities is 12%.

(iii) Standard deviation of daily cash balance is ₹. 600.

(iv) The minimum cash balance is ₹. 7,000.

Also find out average cash balance.

**Solution:**

As per Miller-Orr model,

$$Z = \sqrt[3]{\frac{3TV}{4i}}$$

Where, T = Transaction cost per conversion = ₹.1500

V = Variance of daily cash requirement = $(600)^2$ = 360000

i = Daily rate of interest = 12%/365 = 0.0328%

L = Minimum cash balance = ₹.7000

So, $Z = \sqrt[3]{\frac{3\times1500\times360000}{4\times0.000328}}$ = ₹.10,728

Return Level, R = Z + L = 10728 + 7000 = ₹.17,728

Upper Level, U = 3Z + L = 3 x 10728 + 7000 = ₹.39,184

## ILLUSTRATION 4

The annual cash requirement of N Ltd is ₹.10 lakh. The company has marketable securities in lot sizes of ₹. 50,000, ₹. 1,00,000, ₹. 2,00,000, ₹. 2,50,000 and ₹. 5,00,000. Cost of conversion of marketable securities per lot is ₹. 1,000. The company can earn 5 per cent yield on its securities.

You are required to prepare a table indicating which lot size will have to be sold by the company. Also, show that economic lot size can be obtained by the Baumol Model.

**Solution:**

**Table showing cost under different lot sizes**

| Particulars | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. Annual cash required (₹.) | 10,00,000 | 10,00,000 | 10,00,000 | 10,00,000 | 10,00,000 |
| 2. Lot size (₹.) | 50,000 | 1,00,000 | 2,00,000 | 2,50,000 | 5,00,000 |
| 3. No. of transaction | 20 | 10 | 5 | 4 | 2 |
| 4. Transaction cost (₹.) | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| 5. Total transaction cost (₹.) | 20,000 | 10,000 | 5,000 | 4,000 | 2,000 |
| 6. Average cash (₹.) [(2) × ½] | 25,000 | 50,000 | 1,00,000 | 1,25,000 | 2,50,000 |
| 7. Interest cost @ 5% [(6) × 5%] | 1,250 | 2,500 | 5,000 | 6,250 | 12,500 |
| 8. Total cost (₹.) [5+7] | 21,250 | 12,500 | 10,000 | 10,250 | 14,500 |

As per Baumol's Model,

$Z = \sqrt{\frac{2AF}{O}}$ Where A = Annual cash needed = ₹.10,00,000; F = Transaction cost per conversion = ₹.1,000; O = Carrying cost or interest cost per rune per annum = 0.05

So, $Z = \sqrt{\frac{2 \times 1000000 \times 1000}{0.05}}$ = ₹. 2,00,000

## ILLUSTRATION 5

A company believes that it is possible to increase sales if credit terms are relaxed. The profit plan, based on the old credit terms, envisages projected sales at ₹. 20,00,000, a 30 per cent profit-volume ratio, fixed cost at ₹. 1,00,000, bad debts of 1.00 per cent and an accounts receivable turnover ratio of 10 times.

The relaxed credit policy is expected to increase sales to ₹. 24,00,000. However, bad debts will rise to 2 per cent of sales, the accounts receivable turnover ratio will be decreased to 6 times. Should the company adopt new (relaxed) credit policy, assuming the company's target rate of return is 20 per cent.

Solution:

The two credit policies can be compared as follows:

| Particulars | Existing Terms | Proposed Terms |
|---|---|---|
| Sales | ₹. 20,00,000 | ₹. 24,00,000 |
| Contribution @ 30% | 6,00,000 | 7,20,000 |
| Less: Fixed Cost | 1,00,000 | 1,00,000 |
| Net Income (A) | 5,00,000 | 6,20,000 |
| Total Debtors at Cost | 15,00,000 | 17,80,000 |
| Credit Period Turnover | 10 times | 6 times |
| Average Debtors | ₹. 1,50,000 | ₹. 2,96,667 |
| Average cost @ 20% | 30,000 | 59,333 |
| Bad Debt @ 1% and 2% | 20,000 | 48,000 |
| Total Cost (B) | 50,000 | 1,07,333 |
| Net Benefit (A-B) | 4,50,000 | 5,12,667 |

As the benefits is higher in proposed case, it is better and may be adopted.

## ILLUSTRATION 6

XYZ Ltd. is examining the question of relaxing its credit policy. It sells at present 40,000 units at a price of ₹. 100 per unit, the variable cost per unit is ₹. 88 and average cost per unit at the current sales volume is ₹. 92. All the sales are on credit, the average collection period being 36 days. A relaxed credit policy is expected to increase sales by 10% and the average age of receivables to 60 days. Assuming 15% return, should the firm relax its credit policy? Assume 360 days in a year.

**Solution:**

Evaluation of Proposals

| | Present Plan (40,000 units) | Proposed Plan (44,000 units) |
|---|---|---|
| Sales @ ₹. 100 p.u | ₹. 40,00,000 | ₹. 44,00,000 |
| -Variable costs (₹. 88 per unit) | 35,20,000 | 38,72,000 |

| | Present Plan (40,000 units) | Proposed Plan (44,000 units) |
|---|---|---|
| -Fixed costs (40000 units × ₹. 4) | 1,60,000 | 1,60,000 |
| Net Profit | 3,20,000 | 3,68,000 |
| Investment cost | 55,200 | 1,00,800 |
| Income | 2,64,800 | 2,67,200 |

The firm should relax its credit policy as it increases the profit by ₹. 2,400.

**Working Notes:**

The investment costs have been calculated as follows:

| | Present Plan | Proposed Plan |
|---|---|---|
| Cost of sales (Variable + Fixed cost) | ₹. 36,80,000 | ₹. 40,32,000 |
| Average daily sale (360 days a year) | 10,222 | 11,200 |
| Credit period | 36 days | 60 days |
| Therefore, average debtors | 3,68,000 | 6,72,000 |
| Interest @ 15% | 55,200 | 1,00,800 |

## ILLUSTRATION 7

K Ltd. produces a product which has a monthly demand of 4,000 units. The product requires a component Harliv which is purchased at ₹. 20. For every finished product, one unit of the component is required. The ordering cost is ₹.120 per order and the holding cost is 10% p.a.

As a Cost and Management Accountant you are required to calculate:

(i) Economic order quantity.

(ii) If the minimum lot size to be supplied is 4000 units, what is the extra cost, K Ltd. has to incur?

**Solution:**

Economic Order Quantity (EOQ) = $\sqrt{\frac{2AS}{I}}$

A = Annual consumption in units = 4,000 × 12 = 48,000 units

S = Cost of placing an order = ₹. 120

I = Inventory carrying cost = $20 \times \frac{10}{100}$ = ₹. 2

$$EOQ = \sqrt{\frac{2\times 48000\times 120}{2}}$$

$$= \sqrt{\frac{1,15,20,000}{2}}$$

$$= \sqrt{57,60,000}$$

= 2400 units

**Statement Showing Comparative Inventory Cost**

| | Lot Size = 2400 Units (₹.) | Lot Size = 4,000 Units (₹.) |
|---|---|---|
| Ordering Cost $\left(\frac{48,000}{2,400}\times 120\right)$ and $\left(\frac{48,000}{4,000}\times 120\right)$ | 2,400 | 1,440 |
| Carrying Cost $\left(2400\times\frac{1}{2}\times 20\times\frac{10}{100}\right)$ and $\left(4,000\times\frac{1}{2}\times 20\times\frac{10}{100}\right)$ | 2,400 | 4,000 |
| Total Inventory Carrying Cost | 4,800 | 5,440 |
| Extra Cost if lot size of 4,000 units is supplied = ₹. 5,440 – ₹. 4,800 = ₹. 640 | | |

## ILLUSTRATION 8

X Ltd. buys 1,00,000 units of material P every month to supply steady demand for the material in production. Order costs are ₹. 200 per order and the carrying costs are 10 paise per unit per month. Find out economic quantity. Should X Ltd. accept a quantity discount of 1 paise per unit for materials P if it buys in lots of 50,000 units?

**Solution:**

Economic Order Quantity (EOQ) = $\sqrt{\frac{2AS}{I}}$

A = Annual consumption in units = 1,00,000 × 12 = 12,00,000 units

S = Cost of placing an order = ₹. 200

I = Inventory carrying cost = ₹. 0.10 × 12 = ₹. 1.20

$$EOQ = \sqrt{\frac{2 \times 1200000 \times 200}{1.20}}$$

= 20,000 units

**Calculation of comparative cost**

| | EOQ Offer | Discount Offer |
|---|---|---|
| Order Size (units) | 20,000 | 50,000 |
| No. of Orders = 12,00,000/Order size | 60 | 24 |
| Cost per order (₹.) | 200 | 200 |
| Total ordering cost (₹.) | 12,000 | 4,800 |
| Average inventory = Order size/2 (units) | 10,000 | 25,000 |
| Carrying cost per unit per annum (₹.) | 1.20 | 1.20 |
| Total carrying cost (₹.) | 12,000 | 30,000 |
| Total inventory cost (₹.) | 24,000 | 34,800 |
| (-) Discount (1200000 × 0.01) (₹.) | Nil | 12,000 |
| Net cost (₹.) | 24,000 | 22,800 |

So, the firm can save in annual cost of maintaining inventory to the extent of (24,000 – 22,800) = ₹. 1,200 by accepting the discount offer.

## ILLUSTRATION 9

A Ltd. has received an offer of quantity discounts on its order of materials as under:

| Ordering quantities (Kgs) | Price per kg. (₹.) |
|---|---|
| Less than 500 | 24.00 |
| 500 but less than 1600 | 23.60 |
| 1,600 but less than 4000 | 23.20 |
| 4,000 but less than 8,000 | 22.80 |
| 8,000 and above | 22.40 |

The annual requirement for the material is 8,000 kgs. The ordering cost per order is ₹. 13.00 and the stock holding cost is estimated at 20% of material cost per annum. As a Cost and Management Accountant you have to compute the most economical ordering quantity.

**Solution:**

**Computation of most Economical ordering quantity**

| Ordering quantity Size (kg) | 400 | 500 | 1600 | 4000 | 8000 |
|---|---|---|---|---|---|
| Number of Orders (Annual Req./ Order Size) | 20 | 16 | 5 | 2 | 1 |
| Average inventory (Kg) | 200 | 250 | 800 | 2000 | 4000 |
| Value of average inventory (₹.) | 4,800 | 5,900 | 18,560 | 45,600 | 89,600 |
| Annual total cost: | ₹. | ₹. | ₹. | ₹. | ₹. |
| (i) Cost of material | 1,92,000 | 1,88,800 | 1,85,600 | 1,82,400 | 1,79,200 |
| (ii) Ordering cost (No. of orders × 13) | 260 | 208 | 65 | 26 | 13 |
| (iii) Carrying cost (20% of value of average inventory) | 960 | 1,180 | 3,712 | 9,120 | 17,920 |
| **Total annual cost (i + ii + iii)** | **193220** | **190188** | **189377** | **191546** | **197133** |

From the above calculations it is clear that the total annual cost of ₹. 1,89,377 is the lowest at on ordering quantity of 1,600 kgs; Hence, the most economical ordering quantity is 1,600 kgs.

## ILLUSTRATION 10

EM Ltd. provides the following particulars relating to its working

| (i) Cost/Profit per unit: | |
|---|---|
| Raw Material Cost | ₹.84 |
| Direct Labour Cost | 36 |
| Overheads (All Variable) | 36 |
| Total Cost | 156 |
| Profit | 44 |
| Selling Price | 200 |
| (ii) Average Amount of Back up Stock: | |
| Raw Material | 2 months |
| Work-in-Progress (50% Complete) | ½ month |

| | |
|---|---|
| Finished Goods | 1 month |
| (iii) Credit allowed by Suppliers | 2 months |
| (iv) Credit allowed to Customers | 2 months |
| (v) Average time lag in the payment of: | |
| Wages | ½ month |
| Overhead Expenses | 1½ months |

(vi) Required Cash in hand and at Bank ₹. 6,00,000.

(vii) 25% of the output is sold for cash.

For an expected annual sale of 1,00,000 units, work out the working capital requirement assuming that production is carried on evenly throughout the year and wages and overheads accrue similarly.

**Solution:**

**Statement of Working Capital Requirement**

| Particulars | | ₹. |
|---|---|---|
| I. Current Assets: | | |
| Cash | | ₹. 6,00,000 |
| Raw Material (1,00,000 × 84) ÷ 6 | | 14,00,000 |
| Work in Progress: | | |
| Raw Material (1,00,000 × 84) ÷ 24 | ₹. 3,50,000 | |
| Labour [(1,00,000 × 36) ÷ 24)] 50% | 75,000 | |
| Overhead [(1,00,000 × 36) ÷ 24)] 50% | 75,000 | 5,00,000 |
| Finished Goods (1,00,000 × 156) ÷ 12 | | 13,00,000 |
| Debtors (1,00,000 × 75% × 156) ÷ 6 | | 19,50,000 |
| Total Current Assets (CA) | | 57,50,000 |
| II Current Liabilities: | | |
| Creditors (1,00,000 × 84) ÷ 6 | | 14,00,000 |
| O/S Wages (1,00,000 × 36) ÷ 24 | | 1,50,000 |
| O/S Overheads (1,00,000 × 36) ÷ 12] × 1.5 | | 4,50,000 |
| Total Current Liabilities (CL) | | 20,00,000 |
| Net Working Capital Requirement (CA - CL) | | 37,50,000 |

## ILLUSTRATION 11

From the following information you are required to estimate the net working capital requirement:

| | Cost per unit (₹.) |
|---|---|
| Raw Materials | 40 |
| Direct labour | 15 |
| Overheads (excluding depreciation) | 30 |
| Total Cost | 85 |
| Additional Information: | 30 |
| Selling-Price | ₹. 100 per unit |
| Output | 1,04,000 units per annum |
| Raw Material in stock | average 4 weeks |
| Work-in-process: | |
| (Assume 50% completion stage with | |
| full material consumption) | average 2 weeks |
| Finished goods in stock | average 4 weeks |
| Credit allowed by suppliers | average 4 weeks |
| Credit allowed to debtors | average 8 weeks |
| Cash at bank is expected to be | ₹.1,00,000 |

Assume that production is sustained at an even pace during the 52 weeks of the year. All sales are on credit basis. State any other assumption that you might have made while computing.

**Solution:**

**Statement Showing Net Working Capital Requirements**

| Particulars | | ₹. |
|---|---|---|
| Current Assets: | | |
| Minimum cash balance | | 1,00,000 |
| Stock of Raw Materials (4 weeks) | | |
| 1,04,000 × 40 5 (4/52) | | 3,20,000 |

| Particulars | | ₹. |
|---|---|---|
| Stock of work-in-progress (2 weeks) | | |
| Raw material 1,04,000 × 40 × (2/52) | 1,60,000 | |
| Direct labour (50% completion) | | |
| 1,04,000 × 15 × (2/52) × 50% | 30,000 | |
| Overheads (50% completion) | | |
| 1,04,000 × 30 × (2/52) × 50% | 60,000 | 2,50,000 |
| Stock of finished goods (4 weeks) | | |
| 1,04,000 × 85 × (4/52) | | 6,80,000 |
| Amount blocked in Debtors at cost (8 weeks) | | |
| 1,04,000 × 85 × (8/52) | | 13,60,000 |
| Total Current Assets | | 27,10,000 |
| Less: Current Liabilities: | | |
| Creditors for raw materials (4 weeks) | | |
| 1,04,000 × 40 × (4/52) | | 3,20,000 |
| Net Working Capital Required | | 23,90,000 |

## ILLUSTRATION 12

Prepare a working capital forecast from the following information:

Production during the previous year was 20,00,000 units. The same level of activity is intended to be maintained during the current year. The expected ratios of cost to selling price are:

| | |
|---|---|
| Raw materials | 40% |
| Direct Wages | 20% |
| Overheads | 20% |

The raw materials ordinarily remain in stores for 3 months before production. Every unit of production remains in the process for 2 months and is assumed to be consisting of 100% raw material, wages and overheads. Finished goods remain in the warehouse for 3 months. Credit allowed by creditors is 4 months from the date of the delivery of raw material and credit given to debtors is 3 months from the date of dispatch.

The estimated balance of cash to be held ₹. 4,00,000

Lag in payment of wages ½ month

Lag in payment of expenses ½ month

Selling price is ₹. 8 per unit. You are required to make a provision of 10% for contingency (except cash). Relevant assumptions may be made.

**Solution:**

Total Sales = 20,00,000 × 8 = ₹. 1,60,00,000

**Statement of Working Capital Requirement**

| Particulars | ₹. | ₹. |
|---|---|---|
| A. Current Asset: | | |
| Debtors (1,60,00,000 × 80% × 3/12) | ₹. 32,00,000 | |
| Finished Goods (1,60,00,000 × 80% × 3/12) | 32,00,000 | |
| Work-in-progress (1,60,00,000 × 80% × 2/12) | 21,33,333 | |
| Raw Materials (1,60,00,000 × 40% × 3/12) | 16,00,000 | |
| Total current assets | | 1,01,33,333 |
| B. Current Liabilities: | | |
| Creditors (1,60,00,000 × 40% × 4/12) | 21,33,333 | |
| Wages (1,60,00,000 × 20% × 1/24) | 1,33,333 | |
| Overheads (1,60,00,000 × 20% × 1/2 4) | 1,33,334 | 24,00,000 |
| Excess of CA over CL | | 77,33,333 |
| + 10% contingency | | 7,73,333 |
| | | 85,06,666 |
| Cash | | 4,00,000 |
| Working Capital Requirement | | 89,06,666 |

## ILLUSTRATION 1

Two companies are identical except that A Ltd. has a debt of ₹. 10,00,000 at 10% whereas B Ltd. does not have debt in its capital structure. The total assets of both the com panics A and B are same i.e. ₹. 20,00,000 on which each company earns 20% return. Find the value of each company and overall cost of capital using net operating income (NOI). Approach Equity capitalization rate for B Ltd. is 15%. The tax rate is 30%.

**Solution:**

Net Operating Income Approach (With Taxes):

$$\text{Value of B Ltd. (Unlevered)} = \frac{\text{EBIT}\ (1-t)}{K_e} = \frac{400000\ (1-0.3)}{0.15} = ₹.\ 18,66,667$$

$$\text{Value of A Ltd. (Levered)} = V_B + D(t)$$

$$= ₹.\ 18,66,667 + 10,00,000\ (.3)$$

$$= ₹.\ 21,66,667$$

Calculation of Overall Cost of Capital:

$K_0$ (B Ltd.) = $K_e$ = 15%

$$K_0\ (\text{A Ltd.}) = \frac{\text{EBIT}\ (1-t)}{V_A} = \frac{400000\ (1-0.3)}{21,66,667} = 12.92\%$$

## ILLUSTRATION 2

The following estimates of the cost of debt and cost of equity capital have been made at various level of the debt-equity mix for ABC Ltd.

| % of Debt | Cost of Debt | Cost of Equity |
|---|---|---|
| 0 | 5.0% | 12.0% |

| % of Debt | Cost of Debt | Cost of Equity |
|---|---|---|
| 10 | 5.0% | 12.0% |
| 20 | 5.0% | 12.5% |
| 30 | 5.5% | 13.0% |
| 40 | 6.0% | 14.0% |
| 50 | 6.5% | 16.0% |
| 60 | 7.0% | 20.0% |

Assuming no tax, determine the optimal debt equity ratio for the company on the basis of the overall cost of capital, WACC.

**Solution:**

The overall cost of capital, WACC, may be defined as:

$$WACC = K_d \frac{D}{D+E} + Ke \frac{E}{D+E}$$

The WACC for the firm may be calculated as follows:

| $K_d$% | $K_e$% | D/(D + E) | E/(D + E) | $K_o$% |
|---|---|---|---|---|
| 5.0 | 12.0 | 0.0 | 1.0 | 12.00 |
| 5.0 | 12.0 | 0.1 | 0.9 | 11.30 |
| 5.0 | 12.5 | 0.2 | 0.8 | 11.00 |
| 5.5 | 13.0 | 0.3 | 0.7 | 10.75 |
| 6.0 | 14.0 | 0.4 | 0.6 | 10.80 |
| 6.5 | 16.0 | 0.5 | 0.5 | 11.25 |
| 7.0 | 20.0 | 0.6 | 0.4 | 12.20 |

The optimal debt equity mix for the company occurs at a point when the overall cost of capital, K0 is minimum. The above calculations show that the Ko is minimum at a point when the debt is 30% of the total capital employed. Therefore, the firm should use 30% debt and 70% equity in its capital structure and its Ko would be 10.75%.

## ILLUSTRATION 3

S. Ltd. and T. Ltd. are in the same risk class and are identical in all respects except that company S uses debt while company T does not use debt. The levered firm has ₹. 9,00,000 debentures carrying 10% rate of interest. Both the firms earn 20% operating profit on their total assets of ₹. 15 lakhs. The company is in the tax bracket of 35% and capitalisation rate of 15% on all equity shares.

You are required to compute the value of S Ltd. and T Ltd. using Net Income approach.

**Solution:**

Calculation of Value of S. Ltd. and T. Ltd. using Net Income Approach

| Particulars | S. Ltd. | T. Ltd. |
|---|---|---|
| Total Assets | ₹. 15,00,000 | ₹. 15,00,000 |
| Operating Profits | 20% | 20% |
| EBIT | ₹. 3,00,000 | ₹. 3,00,000 |
| Less: Interest | ₹. 90,000 | — |
| Profit before tax | ₹. 2,10,000 | ₹. 3,00,000 |
| Less: Tax @ 35% | ₹. 73,500 | ₹. 1,05,000 |
| Profit after tax | ₹. 1,36,500 | ₹. 1,95,000 |
| Equity Capitalization rate (ke) | 15% | 15% |
| Value of E (PAT/ke) | ₹. 9,10,000 | ₹. 13,00,000 |
| Value of D | ₹. 9,00,000 | — |
| Total Value of the firm | ₹. 18,10,000 | ₹. 13,00,000 |

## ILLUSTRATION 4

Compute the market value of the firm, value of shares and the average cost of capital from the following information.

Net operating income ₹. 1,00,000

Total investment ₹. 5,00,000

Equity capitalization Rate:

(a) If the firm uses no debt 10%

(b) If the firm uses ₹. 2,50,000 debentures 11%

(c) If the firm uses ₹. 4,00,000 debentures 13%

Assume that ₹. 5,00,000 debentures can be raised at 6% rate of interest whereas ₹. 4,00,000 debentures can be raised at 7% rate of interest.

**Solution**

Computation of market value of firm value of shares and the average cost of capital.

| Particulars | (a) No Debt | (b) ₹. 2,50,000, 6% debentures | (c) ₹. 4,00,000, 7% debentures |
|---|---|---|---|
| Net operating income (₹.) | 1,00,000 | 1,00,000 | 1,00,000 |
| (-) Interest (₹.) | --- | 15,000 | 28,000 |
| Earnings available to Equity shareholders (₹.) | 1,00,000 | 85,000 | 72,000 |
| Equity Capitalization Rate | 10% | 11% | 13% |
| Market value of shares (₹.) | 100000/10% = 10,00,000 | 85,000/ 11% = 7,72,727 | 72,000/ 13% = 5,53,846 |
| Value of Debt (₹.) | Nil | 2,50,000 | 4,00,000 |
| Market Value of firm (₹.) | 10,00,000 | 10,22,727 | 9,53,846 |
| $K_o = \frac{EBIT}{V}$ | = 10% | = 9.78% | = 10.48% |

## ILLUSTRATION 5

A company had the following balance sheet as on 31 March 2023:

| Liabilities | ₹. | Assets | ₹. |
|---|---|---|---|
| Equity Share Capital of ₹. 10 each | 40,00,000 | Fixed assets (net) | 1,28,00,000 |
| Reserves and Surplus | 8,00,000 | Current assets | 32,00,000 |
| 15% Debentures | 80,00,000 | | |
| Current liabilities | 32,00,000 | | |
| | 1,60,00,000 | | 1,60,00,000 |

**Additional information:**

| | |
|---|---|
| Fixed costs per annum (excluding Interest) | ₹. 32,00,000 |
| Variable operating costs ratio | 70% |
| Total assets turnover ratio | 2.5 |
| Income tax rate | 40% |

Required:

Calculate the following and comment:

(a) Operating Leverage

(b) Financial Leverage

(c) Combined Leverage

(d) Earnings Per Share

**Solution:**

**A. Preparation of Income Statement**

Problem states that Total Assets Turnover Ratio is 2.5

In other words, Turnover/Total Assets = 2.5

Given, Total Assets = ₹. 1,60,00,000

Turnover = 1,60,00,000 × 2.5

Or, Turnover = ₹. 4,00,00,000

**Income Statement**

| Particulars | ₹. |
|---|---|
| Sales | 4,00,00,000 |
| Less: Variable Cost (70% of Sales) | 2,80,00,000 |
| Contribution | 1,20,00,000 |
| Less: Fixed Cost | 32,00,000 |
| Earnings before Interest and lax | 88,00,000 |
| Less: Interest on Debi (15% of ₹. 80 Lakhs) | 12,00,000 |
| Earnings before lax | 76,00,000 |

| Particulars | ₹. |
|---|---|
| Less: Tax @ 40% | 30,40,000 |
| Earnings after Tax | 45,60,000 |
| | |
| Number of Equity Shares (40,00,000/10) | 4,00,000 |
| Earnings per Share<br>(Earnings after Tax /Number of Shares) | ₹.11.40 |

**B. Calculation of Leverages**

$$\text{Degree of Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = 1,20,00,000/88,00,000 = 1.36$$

$$\text{Degree of Financial Leverage} = \frac{\text{EBIT}}{\text{EBIT}} = 88,00,000/76,00,000 = 1.16$$

$$\text{Degree of Combined Leverage} = \frac{\text{Contribution}}{\text{EBT}} = 1,20,00,000/76,00,000 = 1.58$$

## ILLUSTRATION 6

A firm sells its only product at ₹. 10 per unit. Its variable cost is 70%, while fixed costs are ₹.1,000. Present Sales are 1000 units.

Required:

(a) Find out:

(i) DOL

(ii) EBIT if Sales increase by 40% and

(iii) EBIT if Sales fall by 40%

(b) By what percentage should sales fall before the firm starts incurring losses?

**Solution:**

**A. Calculation of DOL Change in EBIT**

**Income Statement**

| | (₹.) |
|---|---|
| Sales (1000 units × ₹. 10 per unit) | 10,000 |

| | |
|---|---|
| Less: Variable Cost (70% of Sales) | 7,000 |
| Contribution | 3,000 |
| Less: Fixed Cost | 1,000 |
| Earnings before Interest and lax | 2,000 |

- **Degree of Operating Leverage**

  Degree of Operating Leverage = Contribution/EBIT = 3000/2000 = 1.5

- **Calculation of EBIT when Sales increases by 40%**

  DOL = Change in EBIT/Change in Sales

  DOL = 1.5

  That is, for any change in sales, the change in EBIT will be 1.5 times.

  So, when Sales increase by 40%, EBIT will increase by 60% (i.e., 40% × 1.5)

  So. EBIT will be ₹.2.000 + 60% of ₹.2,000 = ₹. 3.200

- **Calculation of EBIT when Sales fall by 40%**

  DOL = Change in EBIT/Change in Sales

  DOL = 1.5

  That is, for any change in Sales, the change in EBIT will be 1.5 times

  So, when Sales fall by 40%, EBIT will fall by 60% (i.e., 40% × 1.5)

  So, EBIT will be ₹.2,000 - 60% of ₹.2.000 = ₹.800

**B. Calculation of change in Sales for the firm to incur losses**

The Present EBIT is ₹.2,000.

f the firm has to incur losses, its EBIT has to fall by 100%.

DOL = Change in EBIT/ Change in Sales

DOL = 1.5

Change in EBIT/Change in Sales = 1.5

That is, Change in Sales = Change in EBIT/1.5 = 100%/1.5 = 66.67% (i.e., 2/3rd)

So, when Sales fall by 66.67% (i.e., by ₹.6,667), EBIT will fall by 100% (i.e., the firm will not make any profits). Any fall beyond this will result in losses.

## ILLUSTRATION 7

Calculate operating leverage and financial leverage under situations A, B and C and plans I, II and Ill respectively, from the following information relating to operation of Capital Structure of XYZ Co. Ltd. Also find out the combinations of operating and financial leverage, which give the highest value and the least values. How are these calculations useful to the financial manager?

| | |
|---|---|
| Installed capacity | 1,200 units |
| Actual production and sales | 800 units |
| Selling price per unit | ₹.15 |
| Variable cost per unit | ₹.10 |

**Fixed Cost**

Situation A: ₹. 1,000

Situation B: ₹. 2,000

Situation C: ₹. 3,000

Capital Structure

| | Plan I (₹.) | Plan II (₹.) | Plan III (₹.) |
|---|---|---|---|
| Equity | 5,000 | 7,500 | 2,500 |
| 12% debt | 5,000 | 2500 | 7,500 |

**Solution:**

**Preparation of Income Statement and calculation of Leverages (for 800 Units)**

| | Plan 1 | | | Plan 2 | | | Plan 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Situation | | | Situation | | | Situation | | |
| | A | B | C | A | B | C | A | B | C |
| Sales (@ ₹.15) | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| Variable Cost (@ ₹. 10) | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| Contribution | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| Fixed Cost | 1000 | 2,000 | 3,000 | 1,000 | 2,000 | 3,000 | 1,000 | 2,000 | 3,000 |
| **EBIT** | 3,000 | 2,000 | 1,000 | 3,000 | 2,000 | 1,000 | 3,000 | 2,000 | 1,000 |

| | Plan 1 | | | Plan 2 | | | Plan 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Situation | | | Situation | | | Situation | | |
| | A | B | C | A | B | C | A | B | C |
| Less: Interest | 600 | 600 | 600 | 300 | 300 | 300 | 900 | 100 | 100 |
| **EBI** | **2,400** | **1,400** | **400** | **2,700** | **1,700** | **700** | **2,100** | **1,100** | **100** |
| DOL (Contribution/ EBIT) | 1.33 | 2.00 | 4.00 | 1.33 | 2.00 | 4.00 | 1.33 | 2.00 | 4.00 |
| DFL (EBIT/EBT) | 1.25 | 1.43 | 2.5 | 1.11 | 1.18 | 1.43 | 1.43 | 1.82 | 10 |
| DCL (Contribution/ EBIT) | 1.67 | 2.86 | 10 | 1.48 | 2.35 | 5.71 | 1.90 | 3.64 | 40 |

Plan 1 under Situation A gives the lowest combination of operating and financial leverages, and Plan 3 under Situation C gives the highest combination of operating and financial leverages. These leverages, being a measure of risk, can help a finance manager to decide on the Capital Structure that matches with the risk profile of the company and the situation in which operations are to be carried out that can help in minimizing operating risk.

## ILLUSTRATION 8

N Ltd. provides you the following information:

(i) Capital Gearing Ratio: 3

(ii) Fixed Cost: 1/3rd to total operating cost

(iii) Dividend Yield: 6%

(iv) Operating Ratio: 75%

(v) Ratio of 18% Preference Shares to 15% Debentures: 12.5%

(vi) Dividend Payout Ratio: 30%

(vii) Accumulated Reserves: ₹.4,00,000

(viii) Capital Employed: ₹.24,00,000

(ix) Market Price of an Equity Share of ₹.10: ₹.135

(x) Tax Rate: 40%

Prepare an Income Statement and calculate the degree of operating leverage, financial leverage

and combined leverage.

**Solution:**

Capital Gearing Ratio = 3

Fixed income bearing instruments / Equity shareholder's fund = 3

18% Preference Shares + 15% Debentures / Equity shareholder's fund = 3

18% Preference Shares + 15% Debentures = 3 Equity shareholder's fund ..... (1)

Again, Capital Employed = ₹.24,00,000

Equity shareholder's fund + 18% Preference Shares + 15% Debentures = ₹.24,00,000

Equity shareholder's fund + 3 Equity shareholder's fund = ₹.24,00,000

Equity shareholder's fund = ₹.24,00,000 / 4 = ₹.6,00,000

Equity share capital + Reserves & Surplus = ₹.6,00,000

Equity share capital + ₹.4,00,000 = ₹.6,00,000

Equity share capital = ₹.2,00,000

So, 18% Preference Shares + 15% Debentures = 3 × ₹.6,00,000 = ₹.18,00,000

Further, 18% Preference Shares / 15% Debentures = 12.5%

18% Preference Shares / 15% Debentures = 1 / 8

15% Debentures = 8 × 18% Preference Shares ..... (3)

18% Preference Shares + 8 × 18% Preference Shares = ₹.18,00,000

18% Preference Shares = ₹.18,00,000 / 9 = ₹.2,00,000

15% Debentures = 8 × 18% Preference Shares = 8 × ₹.2,00,000 = ₹.16,00,000

Dividend Yield = 6%

DPS / MPPS = 6% [DPS = Dividend per equity share, MPPS

= Market Price per equity share]

DPS / 135 = 6%

DPS = 135 × 6% = 8.1

Dividend Payout Ratio = 30%

DPS / EPS = 30% [EPS = Earnings per equity share]

8.1 / EPS = 30%

EPS = 8.1 / 30% = 27

Number of equity shares = Equity share capital / Face value per equity share

= ₹.2,00,000 / ₹.10 = 20,000

Operating Ratio = 75%

So, Operating Profit Ratio = (100 – 75) % = 25%

Operating Profit / Sales = 25%

EBIT / Sales = 25%..... (4)

**Computation of EBIT**

| Particulars | Amount (₹.) |
|---|---|
| EAES (EPS X Number of equity shares) | 5,40,000 (₹.27 × 20,000) |
| Add: Preference dividend | 36,000 (18% of ₹.2,00,000) |
| EAT | 5,76,000 |
| Add: Tax | 3,84,000 (5,76,000 × 0.4 / 0.6) |
| EBT | 9,60,000 |
| Add: Interest on debentures | 2,40,000 (15% of ₹. 16,00,000) |
| EBIT | 12,00,000 |

Putting EBIT = ₹.12,00,000 in equation (4) we get,

₹. 12,00,000 / Sales = 25%

Sales = ₹.12,00,000 / 25% = ₹.48,00,000

Operating Ratio = 75%

Operating Expenses (or cost) / Sales = 75%

Operating Expenses (or cost) = ₹.48,00,000 × 75% = ₹.36,00,000

Fixed Cost = 1/3rd to total operating cost = l/3rd × ₹. 36,00,000 = ₹.12,00,000

Variable Cost = 2/3rd to total operating cost = 2/3rd × ₹.36,00,000 = ₹.24,00,000

**Income Statement N Ltd.**

| Particulars | Amount (₹.) |
|---|---|
| Sales | 18,00,000 |
| Less: Variable Cost | 2 1,00,000 |
| Contribution | 24,00,000 |
| Less: Fixed Cost | 12,00,000 |
| EBIT | 12,00,000 |
| Less: Interest on debentures | 2,40,000 |
| EBT | 9,60,000 |
| Less: Tax @ 40% | 3,84,000 |
| EAT | 5,76,000 |
| Preference dividend | 36,000 |
| EAES | 5,40,000 |
| DOL (Contribution / EBIT) | 2 |
| DFL (EBIT/[EBT-(Pd/1-t)] | 1.33 |
| DCL (DOL × DFL) | 2.67 |

## ILLUSTRATION 9

The following data are available for XY Ltd –

Earnings per share ₹. 3.00

Internal rate of return 15%

Cost of capital 12%

If Walter's valuation formula holds, what will be the price per share when the dividend pay-out ratio is 50%, 75% and 100%?

**Solution:**

As per Walter's model, value per share is given by –

$P = \frac{D+\frac{r}{k}(E-D)}{k}$ where P = Market price per share, D = Dividend per share, E = Earnings per share,

r = rate of return on investment, k = cost of capital.

| Statement Showing Computation of Market Price of Share | | |
|---|---|---|
| Dividend Payout Ratio = 50% | Dividend Payout Ratio = 75% | Dividend Payout Ratio = 100% |
| Here, E = 3, D = 3×0.5 = 1.5<br>k = 0.12 and r = 0.15<br>So, $P = \frac{1.5+\frac{0.15}{0.12}(3-1.5)}{0.12}$<br>$= \frac{3.375}{0.12}$<br>$= 28.125$ | Here, E = 3, D = 3×0.75 = 2.25<br>k = 0.12 and r = 0.15<br>So, $P = \frac{2.25+\frac{0.15}{0.12}(3-2.25)}{0.12}$<br>$= \frac{3.1875}{0.12}$<br>$= 26.5625$ | Here, E = 3, D = 3×1 = 3<br>k = 0.12 and r = 0.15<br>$P = \frac{3+\frac{0.15}{0.12}(3-3)}{0.12}$<br>$= \frac{3}{0.12}$<br>$= 25$ |

## ILLUSTRATION 10

ABC Ltd. has 500000 outstanding shares of ₹. 10 each. The company earns a rate of 24% on its investments and retains 50% of earnings as a policy. If cost of capital is 18%, calculate price of the share according to Gordon's Model. The company has total investment of around ₹.50,00,000 in assets. If payout ratio changes to 10%, 90% how will share price change? Also comment on the optimal dividend policy for ABC Ltd as per Gordon's model.

**Solution:**

Given, Cost of capital (k) = 18% = 0.18

Return on investment (r) = 24% = 0.24

Earnings per share (E) = $\frac{5000000 \times 0.24}{500000}$ = ₹ 2.40

Retention ratio (b) = 50% = 0.50

As per Gordon's model, value per share = P = $\frac{E(1-b)}{k-b\times r} = \frac{24(1-0.5)}{0.18-0.5\times 0.24} = \frac{1.25}{0.06}$ = ₹. 20

If payout ratio (1-b) = 10% i.e. 0.10, then, retention ratio (b) = 90% = 0.90

Value per share = P = $\frac{E(1-b)}{k-b\times r} = \frac{24(1-0.9)}{0.18-0.9\times 0.24} = \frac{0.24}{-0.036}$ = –6.67 (₹.)

Now, if payout ratio (1-b) = 90% i.e. 0.90, then, retention ratio (b) = 10% = 0.10

Value per share = $P = \frac{E(1-b)}{k-b \times r} = \frac{24(1-0.1)}{0.18-0.1 \times 0.24} = \frac{2.16}{0.156}$ = ₹. 13.85

In this case r > k, so the firm is a growth firm. Hence, according to Gordon model as the retention ratio increases the value per share also increases. Therefore, the optimal policy for the firm is to retain as much as possible. However, according to Gordon, maximum retention ratio should be lower than k/r i.e. 0.18/0.24 = 2/3.

## ILLUSTRATION 11

D Ltd. has 10 lakhs equity shares outstanding at the beginning of the accounting year 2005. The current market price of the shares is ₹. 150 each. The BOD of the company has recommended ₹. 8 per share as dividend. The rate of capitalization, appropriate to the risk class to which the company belongs, is 12%.

(i) Based on M-M approach, calculate the market price of the shares of the company when the recommended dividend is (a) declared and (b) not declared.

(ii) How many new shares are to be issued by the company at the end of the accounting year on the assumption that the net income for the year is ₹. 2 crores and the investment budget is ₹. 4 crores when (a) the above dividends are distributed and (b) dividends are not declared?

(iii) Show that the market value of the shares of the company at the end of the accounting year will remain the same whether dividends are declared or not.

**Solution:**

Given, cost of capital (K) = 12% i.e.0.12

Current market price per share ($P_0$) = ₹. 150

We know that, as per M-M, current market price per share (P0) = $\frac{D_1 + P_1}{1 + K}$ where $D_1$ = Dividend per share at the end of the year, $P_1$ = Price (Terminal value) per share at the end of the year

(i) (a) Price per share at the end of the year when dividend is declared (i.e. $D_1 = 8$):

Conditionally, $150 = \frac{8 + P_1}{1 + 0.12}$

or, $8 + P_1 = 150 \times 1.12$

or, $P_1 = 160$

(b) Price per share at the end of the year when dividend is declared (i.e. $D_1$ = ₹. 0):

Conditionally, $150 = \frac{0 + P_1}{1 + 0.10}$

or, $P_1 = 150 \times 1.12$

or, $P_1 = 168$

(ii) (a) New shares to be issued when dividend is declared:

Given, I = amount of investment required = ₹. 40000000

E = Earnings i.e. net profit available = ₹. 20000000

$D_1$ = Dividend per share at the end of the year = ₹. 8

$P_1$ = Price per share at the end of the year = ₹. 160

n = existing number of shares = 1000000

m = Number of new shares to be issued

Conditionally, $mP_1 = I - (E - nD_1)$

or, $m \times 160 = 40000000 - (20000000 - 1000000 \times 8)$

or, $m \times 160 = 28000000$

or, $m = \frac{28000000}{160} = 175000$

(b) New shares to be issued when dividend is not declared:

Here, $D_1 = 0$

Conditionally, $mP_1 = I - (E - nD_1)$

or, $m \times 168 = 40000000 - (20000000 - 1000000 \times 0)$

or, $m \times 168 = 20000000$

or, $m = \frac{20000000}{168} = 119048$

(iii) Verification of M-M Dividend Irrelevance Theory.

Value of the firm at the end of the year if dividend is declared = $(n + m) \times P_1$

$= (1000000+175000) \times 160$

= ₹. 1880 lakhs

Value of the firm at the end of the year if dividend is declared = $(n + m) \times P_1$

$= (1000000+119048) \times 168$

= ₹. 1880 lakhs

So, the value of the firm remains the same at the end of the year in both the cases.

## ILLUSTRATION 12

The following figures are collected from the annual report of PQR Ltd.:

| | |
|---|---|
| Net profit | ₹. 60 Lakhs |
| Outstanding 12% Preference shares | ₹. 200 Lakhs |
| Number of Equity shares | 6 Lakhs |
| Return on Investment | 20% |
| Cost of capital | 16% |

What should be the approximate dividend payout ratio so as to keep the share price at ₹.42 by using Walter's model?

**Solution:**

As per Walter's model, value per share is given by –

$P = \frac{D+\frac{r}{k}(E-D)}{k}$ where P = Current Market price per share, D = Dividend per share, E = Earnings per share, r = rate of return on investment, k = cost of capital.

Here, r = 20% i.e. 0.20, k = 16% i.e. 0.16

$E = \frac{60 - (200 \times 12\%)}{6} = ₹.6$

Let D/P ratio is y

So, D = ₹. 6×y

Conditionally, $P = \frac{D+\frac{r}{k}(E-D)}{k}$

or, $42 = \frac{6y+\frac{0.20}{0.16}(6-6y)}{0.16}$

or, $6.72 = 6y + 7.50 - 7.50y$

or, $1.5y = 0.78$

or, $y = 0.52$

So the required dividend payout ratio is 52%.

# Business Data Analytics

**CASE 1:**

Mr. A is the owner of M & M Manufacturers Ltd. The company produces auto parts and supply to various leading automobile companies in India. Till date the company keeps most of its records in physical form. However, Mr. B, a friend of Mr. A has suggested him that he should switch to maintaining digital records instead of physical records as the former offers manifold advantages. Mr. A has approached you to suggestion. You, as a CMA, suggest him the appropriate steps to be followed in this process of transformation.

**Answer:**

The entire process of digitization may be executed in the following six phases:

**Phase 1: Justification of the proposed digitization project**

At the very initiation of the digitization project, the accrual benefit of the project needs to be identified. Also need to compute the cost aspect of the project and the assessment of availability of resources. Risk assessment is an important part project assessment. For the resources that may be facing quick destruction may be required an early digitization.

Most importantly, the expected value generation through digitization should be expressed in clear terms.

**Phase 2: Assessment**

In any institutions, all records are never digitized. The data that requires digitization is to be decided on the basis of content and context. Some data may be digitized in a consolidated format, and some in detailed format. The files, tables, documents, expected future use etc. are to be accessed and evaluated for the assessment.

The hardware and software requirements for digitization is also assessed at this stage. The human resource requirement for executing the digitization project is also planned. The risk assessment at this level e.g. possibilities of natural disasters, and/or cyber-attacks etc. also need to be completed.

### Phase 3: Planning

Successful execution of digitization project needs meticulous planning. There are several stages for planning e.g. selection of digitization approach, Project documentation, Resources management, technical specifications, and Risk management.

The institution may decide to complete the digitization in-house or alternatively by an outsourced agency. It may also be done on-demand or in batches.

### Phase 4: Digitization activities

Upon the completion of assessment and planning phase, the digitization activities start. The Wisconsin Historical Society developed a six-phase process viz. Planning, Capture, Primary quality control, Editing, Secondary quality control, and storage and management.

The planning schedule is prepared at the fist stage, calibration of hardware/software and scanning etc is done next. A primary quality check is done on the output to check the reliability. Cropping, colour correction, assigning Metadata etc. is done at the editing stage. A final check of quality is done on randomly selected samples. And finally, user copies are created, and uploaded to dedicated storage space, after doing file validation.

### Phase 5: Processes in the care of records

Once the digitization of records is complete, there are few additional requirements arise which may be linked to administration of records. The permission for accession of data, intellectual control (over data), classification (if necessary), and upkeeping and maintenance of data are few additional requirements for data management.

### Phase 6: Evaluation

Once the digitization project is updated and implemented, the final phase should be a systematic determination of the project's merit, worth and significant using objective criteria. The primary purpose is to enable reflection and assist identify changes that would improve future digitization processes.

## CASE 2:

Excel Fintech is a database provider which compiles and provides various data regarding start-ups. The data are collected from the start-up firms directly as well as some secondary sources. The database is updated every week. Excel's clients include various high net-worth individuals as well as some premier research institutes of the country. Recently one of the Board members of Excel has expressed concern over ethical use of data in the company as it may pose a serious threat for its reputation. Excel has decided to conduct a workshop for its employees on data ethics. Excel

has requested you to deliver a session on data ethics in the workshop. Prepare a brief note on principles of data ethics that you want to deliver to the participants of the workshop.

**Answer:**

The five basic principles of data ethics that a business organization should follow are:

**(i)** **Regarding ownership:** The first principle is that ownership of any personal information belongs to the person. It is unlawful and unethical to collect someone's personal data without their consent. The consent may be obtained through digital privacy policies or signed agreements or by asking the users to agree with terms and conditions. It is always advisable to ask for permission beforehand to avoid future legal and ethical complications. In case of financial data, some data may be sensitive in nature. Prior permission must be obtained before using the financial data for further analysis.

**(ii)** **Regarding transparency:** Maintaining transparency is important while gathering data. The objective with which the company is collecting user's data should be known to the user. For example, if the company is using cookies to track the online behaviour of the user, it should be mentioned to the user through a written policy that cookies would be used for tracking user's online behaviour and the collected data will be stored in a secure database to train an algorithm to enhance user experience. After reading the policy, the user may decide to accept or not to accept the policy. Similarly, while collecting the financial data from clients, it should be clearly mentioned that for which purpose the data should be used.

**(iii)** **Regarding privacy:** As the user may allow to collect, store and analyze the personally identifiable information (PII), that does not imply it should be made publicly available. For companies, it is mandatory to publish some financial information to public e.g. through annual reports. However, there may be many confidential information, which if falls on a wrong hand may create problems and financial loss. To protect privacy of data, a data security process should be in place. This may include file encryption and dual authentication password etc. The possibility of breach of data privacy may also be done through de- identifying a dataset.

**(iv)** **Regarding intention:** The intension of data analysis should never be making profits out of others weaknesses or for hurting others. Collecting data which is unnecessary for analysis should be avoided and it's unethical.

**(v)** **Regarding outcomes:** In some cases, even if the intentions are good, the result of data analysis may inadvertently hurt the clients and data providers. This is called disparate impact, which is unethical.

## CASE 3:

Mr. P is a management trainee appointed recently in your organization. The Deputy Manager, Finance, is his immediate reporting authority. Recently, the Deputy Manager has asked Mr. P to

explore the possibility of including data visualization in report design for the Board meeting to be held in next week. Being new to this filed, Mr. P has approached you to guide him and suggest certain strategic steps to include data visualization in report design. Suggest a few critical steps in this regard.

**Answer:**

There are few strategic steps to include data Visualisation in report design, as mentioned below:

**(a) Find a story in the data**

Data-driven storytelling is a powerful tool. Finding a story that connects with the reader can help to create an effective report. It's also not that hard as it looks. In order to locate the story, one must arrange the data, identify any missing numbers, and then check for outliers. One may then view the data and examine the link between factors.

**(b) Create a narrative**

When some individuals hear the term "data storytelling," they believe that it consists of a few statistics and that the task is complete. This is a frequent misconception that is false. Strong data storytelling comprises an engaging narrative that takes the audience through the facts and aids in their comprehension. Moreover, an explanation of the significance of these ideas is essential. To compose an excellent story, one must:

(i) Engage the viewer with a catchy title and subheadings.

(ii) Incorporate context into the data.

(iii) Create a consistent and logical flow.

(iv) Highlight significant discoveries and insights from the data.

**(c) Choose the most suitable data Visualisation**

Data Visualisation is not limited to the creation of charts and graphs. It involves presenting the facts in the most comprehensible chart possible. Applying basic design principles and utilising features like as form, size, colour, and labelling may have a significant impact on how people comprehend the data. For instance, deciding the optimal number of slices for a pie chart or the space between bars in a bar graph. Knowing these tips may greatly improve the data visualisations.

**(d) Follow the visual language**

The report design may be for internal or external consumption. Despite this, one should develop material consistent with the company's style guide. It is essential to adhere to data visualisation principles in order to achieve both uniformity and comprehension. A strategic methodology assists in implementation.

**(e) Publicize the report**

Some reports are not intended for public consumption. However, since they include so much essential information, they may contain knowledge that is of interest to individuals or media outside of the business.

**CASE 4:**

Primex Fintech is a start-up in BFSI sector. Currently it offers micro insurance products in various categories. However, it has plans to digital lending in future also. The firm wants to leverage data analytics to expand its business. For this purpose, Primex has approached your company, a leading data analytics solution provider. Your manager, Mr. P has asked to arrange for a client meet with Primex to explain the benefits of implementing data mining in finance and management and thereby persuade them to appoint your company to offer data mining and analytics services. Prepare a brief note on the benefits of implementing data mining in finance and management.

**Answer:**

The widespread use of data mining techniques by business intelligence and data analytics teams enables them to harvest insights for their organisations and industries.

Utilizing data mining techniques, hidden patterns and future trends and behaviours in financial markets may be predicted. Typically, sophisticated statistical, mathematical, and artificial intelligence approaches are necessary for data mining, particularly for high-frequency financial data. Among the data mining applications are:

**(i) Detecting money laundering and other financial crimes:**

Money laundering is the illegal conversion of black money to white money. In today's society, data mining techniques have advanced to the point where they are deemed suitable for detecting money laundering. The data mining methodology provides a mechanism for bank customers to detect or verify the detection of the anti-money laundering impact.

**(ii) Prediction of loan repayment and customer credit policy analysis:**

Loan Distribution is the core business function of every bank. The loan Prediction system automatically computes the size of the characteristics it employs and examines data pertaining to its size. Consequently, data mining aids in the management of all critical data and massive databases by utilising its models.

**(iii) Target marketing:**

Together, data mining and marketing work to target a certain market, and they also assist and determine market decisions. With data mining, it is possible to keep earnings, margins, etc. and determine which product is optimal for various types of customers.

**(iv) Design and construction of data warehouses:**

The business is able to retrieve or move the data into several huge data warehouses, allowing a vast volume of data to be correctly and reliably evaluated with the aid of various data mining methodologies and techniques. It also examines a vast number of transactions.

# The Institute of Cost Accountants of India

**Statutory Body under an Act of Parliament**

www.icmai.in


**Headquarters:**
**CMA Bhawan; 3, Institutional Area; Lodhi Road; New Delhi - 110003**
**Ph: +91-11-2462-2156/2157/2158; 24666124**

**Kolkata Office:**
**CMA Bhawan; 12, Sudder Street; Kolkata - 700016**
**Ph: +91-33-4036-4779/4721/4726/4777**

E-mail: studies@icmai.in


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