RESEARCH
BULLETIN

THE INSTITUTE OF COST ACCOUNTANTS OF INDIA

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The CMA professionals would ethically drive enterprises globally by creating value to stakeholders in the socio-economic context through competencies drawn from the integration of strategy, management and accounting.

The Institute of Cost Accountants of India would be the preferred source of resources and professionals for the financial leadership of enterprises globally.

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Foreword

Greetings!!!

The financial management is undeniably an inevitable part of the overall management of an organization. Gone are the days when financial management was confined to just traditional raising and allocation of funds. Financial management today is much more advanced and refined, involving innovative financial products, new market horizons, financial modeling and of course keeping shareholders happy for Shareholders' Wealth Maximization.

Financial management involves planning, organizing, controlling and monitoring financial resources in order to achieve organizational objectives. Effective financial management can be achieved if we have a sound organizational plan. A plan in this context means having set objectives and having agreed, developed and evaluated the policies, strategies, tactics and actions to achieve these objectives. Sound financial management facilitates in long-term strategic planning and short-term operations planning. This financial planning should become part of one's organization's ongoing planning process.

The Research Bulletin, Vol. 43, No. III, October 2017 issue consists of pragmatic articles on Financial Health of Banks, Market Responsiveness, Industrial Investment Decisions, Securities Market, Competition Risk, Working Capital Leverage, etc. I am sure this indispensable volume will provide the requisite insight to the readers on issues it has covered and will prove to be highly of use to the readers by elevating their knowledge base.

I take this opportunity to express my gratitude for esteemed members of the Editorial Board and Research Committee, the eminent contributors and the entire research team of the Institute for their sincere effort to publish this volume in time.

CMA Sanjay Gupta
President &
Chairman - IT & Research Committee
The Institute of Cost Accountants of India

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Editor's Note

Greetings!!!

Profitability of the concern purely depends on the effectiveness and proper utilization of funds by the business concern. Financial management helps to improve the profitability position of the concern with the help of strong financial control devices such as budgetary control, ratio analysis and cost-volume-profit analysis. Financial management is very much important in the field of increasing the wealth of the investors and the business concern. Ultimate aim of any business concern is to achieve the maximum profit and higher profitability leading to wealth maximization of investors as well as the nation. Savings are possible only when the business concern earns higher profitability and maximum wealth. Effective financial management helps in promoting and mobilizing individual and corporate savings. Nowadays, financial management is also popularly known as business finance or corporate finances.

Again, financial management is essential to achieving sustainable success, and is universal to all organizations, regardless of size, type, and location. Strategies and plans need to be informed by quantitative and qualitative insights and a sound understanding of the external competitive environment, including customers, as well as of internal organizational performance. Sound financial planning, management, and control provide the basis for an organization achieving its goals and can be the difference between success and failure. Good financial management system enables an organization to monitor its daily activities, maintain short-term working capital needs, and effectively manages its resources as well as provides the information it requires to enable it to plan and operate more efficiently.

To manage and deploy resources to deliver organizational objectives is a vital contribution of finance and management professionals, either in their capacity as the employee of, or as an advisor or consultant to, an organization. Professional management accountants' purview encompasses the application of tools and techniques to improve performance and financial management of organizations. They must have organizational and environmental awareness, and be cognizant and knowledgeable of other disciplines, such as technology, people and project management, and managing, measuring, and linking financial and non-financial activities and performance. Technology and automation are also creating more and better information and analysis to support decision making and to help improve performance.

This volume of 'Research Bulletin' highlights some important issues like, Financial Health of Banks, Market Responsiveness, Industrial Investment

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Decisions, Securities Market, Competition Risk, Working Capital Leverage, etc. I feel academicians and professionals would be immensely benefitted by going through these Research Articles.

We are extremely happy to convey that our next issue of Research Bulletin, Vol.43, No. IV would be published in January, 2018 and it is a non-theme based volume.

Further, it gives me an immense pleasure to inform you that our esteemed 'Research Bulletin' has been enlisted in the UGC (University Grants Commission) approved journal list.

We look forward to constructive feedback from our readers on the articles and overall development of the 'Research Bulletin'. Please mail us at: *research.bulletin@icmai.in*. I express my sincere thanks to all the contributors and reviewers of this important issue and hope our esteemed readers get requisite academic inputs from the articles incorporated here.

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Contents

A COMPARATIVE ASSESSMENT OF FINANCIAL HEALTH OF SBI AND ICICI BANK

Gaurav Deep Rai

Abstract:

Every economy's financial system across the globe is sustained by its banking sector. The advent of globalization and liberalization have posed serious threats and opportunities on the financial sector for which the health of the banking industry is of paramount importance. In the Indian context, since the early nineties, banks have strived to meet the ever increasing ends through the financial inclusion agenda, reaching to the remotest areas with a motive of achieving inclusive growth and development. This paper attempts to comparatively analyze the different facets of financial health of the two major banks in the private and public industry. Latest financial information has been incorporated to provide a comprehensive study of SBI and ICICI bank. Mann-Whitney U test has been deployed to relatively test the different aspects of soundness and also verify the adoption of the extant guidelines issued by the Basel Committee on Banking Supervision and the RBI.

Key Words:

Financial Performance, Capital Adequacy Ratio, Cost to Income Ratio, ROA, ROE, NPA Ratio, Provision Coverage Ratio, Liquidity Coverage Ratio, Profit per employee, SBI, ICICI.

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Introduction

The financial system is an important facet of modern economic development. It is often referred as the conduit for savers and investors, facilitating production and accumulation of capital. Banks are indeed, the backbone of an economy's financial system due to their pivotal role in mobilizing mammoth funds and savings from surplus to deficit units thereby fostering the agenda of financial inclusion. Consequent to this process of accumulative capital growth through channelization of savings into investment, economic development is certainly inexorable. Banks are invariably fraught with tremendous pressure, risks and expectations. The performance of an economy is positively correlated with the financial health and soundness of banking institutions rather than their non-banking counterparts (Cameron, 1972).In order to achieve the vitality, stability and soundness in any economy, a vibrant and healthy banking foundation is indispensable. Accordingly, banks are portrayed as the mart of the world; nerve center and the barometer of economic perspectives (Sharma, 1974).Banks in the Indian context have been the pillars of the financial service sector combating all global economic crisis and shocks for many decades. It has stood tall in times of intense competition exhibiting sound growth, efficiency and health (Bhowmick, 2016).

The economic reforms initiated in the month of August, 1991 under the Narasimham Committee with a motive of investigating all facets of the financial sector. The Committee stressed on upholding the efficiency and competitiveness of the Indian financial system, objectively enhancing the allocative efficiency of financial resources through operational flexibility and viability. The post-reform period saw an ambience of operational flexibility and sustained growth in the balance sheets of the banks. Sound financial health was markedly observed through improved capital adequacy ratio (CAR)and superior improved asset quality. Technological innovation through the advent of globalization and liberalization ensured competitiveness and gains in productivity. Technological deepening enabled proactive social banking and incorporating the agenda of financial inclusion, directing credit to the underprivileged sectors of the society. On the darker side, Public Sector Banks (PSBs) faced extreme competition from their private counterparts. Sophisticated technology leveraged by the multi-national banks sold better products, policies and schemes aiding customer satisfaction and convenience. PSBs were driven to the brink from such product and technological innovation. Last few decades witnessed enhanced growth and viability of the public as well as the private sector banking arenas which were a major component in the thrust for sustained growth in the economy's national income. The present paper seeks to analyze relatively the financial health and performance of the largest commercial banks in the public and private sector, with regard to asset size namely State Bank of India (SBI) and Industrial Credit and Investment Corporation of India (ICICI). An attempt is made to comprehend the financial performance and earning ability in the private and public banking industries through secondary information via annual financial statements and reports.

Overview of Literature

There is a plethora of research articles on

the financial performance, soundness and health of banking sector. Much academic attention has been diverted to fathom the relationship between soundness and performance of the financial sector with the performance of the economy as a whole. The magnitude and functioning of the Indian banking sector have led to ingress of competitive commercial banking system into remote areas to meet the increasing ends. This has led to decisive changes in the contemporary structure with the intention of achieving growth in size, resources, efficiency and inclusivity (RBI, 2013). One such paradigm shift caused in the financial sector is investment in technology, aimed with benefits of enriching productivity, lowering of costs and wider base of customers served (Musara, 2010; Subbarao, 2009). The cost of financial transactions are curbed with better allocation of resources simultaneously with sustained growth in profits. A positive correlation of profitability and cost savings with the level of invested technology in the US was reported for the tenure 1992-2003 (Kozak, 2005; Berger, 2003). The US banking sector exhibited substantial growth and performance in consolidation with the incorporation of modern technology, which was reflected in the growth of the national income. Rajput *et al*. (2011) reported that financial performance of banks was enhanced due to investment in technological innovation for the time frame of 2005-2010.

The burgeoning literature on the systemic crisis of the banking sector reveals that its occurrence were positively correlated with high inflation and real interest rates with low scores of growth (Kunt&Detragiache, 1998). (Čihák&Schaeck, 2007) Pioneer advocates propounded Financial Soundness Indicators (FSIs) namely, Total Regulatory Capital to Risk Weighted Assets (CRAR) and Non-Performing Assets (NPA) ratio predicted systemic crunches in the financial service sectors while Return on Equity (ROE) projected the timing of crisis. Schaeck&Čihák (2007) studied financial information of about 2,600 European banks with a motive to test the relationship of high capital ratios with intense competition. Their empirical evidence substantiated the fact that banks hold higher capital ratios while operating at an intensely competitive environment. The increase in the degree of competition leads to a decrease in the banks' soundness (Smith, 1984; Hellmanet al., 2000 and Repullo, 2004). In circumstances of higher competition, bank managers are more engaged in undertaking excessive risks to the shareholders' benefit at the cost of the depositors (Čihák&Schaeck, 2007). Hence, banks with monopoly power are more prone to undertake risky loans with could lead to their subsequent failure (Caminal and Matutes, 2002). Healthy competition, increased concentration and less activity restrictions infused in the banking industry is likely to increase the stability of the banks (Barth et al., 2004; Boyd and de Nicoló, 2005; Beck et al., 2006;Boyd et al.2006; Schaeck et al., 2006).

Navajas and Thegeya (2013) tested the effectiveness of FSIs, macroeconomic indicators and institutional indicators in predicting the banking crises. Within the time frame of 2005-2012, a multivariate-logit model was implemented across countries with secondary information from the IMF's FSI database. It was reported that regulatory capital to risk-weighted assets (CAR) and return on equity (ROE) was significantly negatively correlated with the occurrence of banking crises. The ROE

ominously indicated global financial crises which mirrored the analysis on the global crises of 1990s (Čihák and Schaeck, 2007; Navajas and Thegeya, 2013).

Objective of Study

There is no absolute definition of the construct financial health and soundness. This concept has been interpreted by many authors in varied perspectives. In general finance experts and industrialists agree that monetary stability and consistent financial asset price (real and financial) lead to greater confidence in the functioning of markets of an economy. Banking sector is said to be financial sound when it effectively allocates financial resources in the most cost effective manner, identifies and mitigates probable threats to is financial vulnerability. Consequently regular assessment of capacity of the bank to deal with endogenous and exogenous systemic crises (Bhowmick, 2016). The present paper attempts to comprehend the financial performance of the major players in the public and private banking industry. This paper also endeavors to fathom the importance of selected benchmark ratios to exhibit the financial health of each bank. Lastly, a comparative analysis extracted from the annual reports of banks for the last nine financial years i.e. 2008-09 to 2016-17 is undertaken to provide a current and comprehensive approach to portray the financial health of the selected banks.

Performance Indicators for Exhibiting Financial Health of the Selected Banks

- **Capital Adequacy Level:**
  - Tier I Capital/Risk Weighted Assets
  - Tier II Capital/Risk Weighted Assets
  - Total Regulatory Capital/Risk Weighted Assets (CRAR)

- **Profitability**
  - Return on Equity (ROE)
  - Return on Asset (ROA)
  - Cost to Income Ratio
  - Profit per employee

- **Assets Quality**
  - Net Non-Performing Assets to Net Advances (NNPA Ratio)
  - Provisioning Coverage Ratio (PCR)

- **Liquidity Management**
  - Liquidity Coverage Ratio (LCR)

Keeping in view the above parameters of financial health, we construct the following hypothesis for testing:

H_X: There is a significant difference in each and every facet of financial health and soundness of State Bank of India (SBI) and Industrial Credit and Investment Corporation of India (ICICI) Bank.

Research Methodology

This study endeavors to investigate the diverse facets of financial health of the major players in the private and public banking sectors. A descriptive approach is deployed to unearth the possible variations in the financial performance of SBI and ICICI bank for the time frame extending from 2008-2009 till 2016-17. Current financial indicators are implemented in the study to provide an updated analysis of the annual performances. The period also pertains to the global financial meltdown of 2007-08, triggered by the subprime mortgage crisis in the US and the bankruptcy of Lehman Brothers. The present study is predominantly based on secondary financial information

collated from the respective banks' websites, magazines, annual reports and journals concerning past researches on the relevant subject. Ratio Analysis has also been incorporated to exhibit the possible strengths and weakness in the public and private sectors with limited scope. The hypotheses are tested through the Mann-Whitney U-tests to depict possible variations in the financial health of the banks. Mann-Whitney U test is a non-parametric test incorporated to verify whether the two samples come from the same population through allotment of ranks. U test is used when the data is ordinal in nature and when the assumptions of the t-test are not met.

Findings and Discussions

1. Assessment of Capital Adequacy Levels

Such levels are expressed through Capital Adequacy Ratio (CAR) or Capital to Risk Weighted Asset Ratio (CRAR).This ratio measures the bank's capital, as a percentage to its risk adjusted (or weighted) assets. It exposes the ability of a bank to absorb a reasonable amount of risk in conformity with the statutory norms set by the RBI. CRAR has a bearing on the overall performance of the bank, protects the depositors and promotes stability in the financial system.

CRAR is measured dividing Capital by risk weighted assets. **(1)**

Capital includes share capital, reserves and surplus (revaluation reserve and foreign currency translation reserve are considered at discounted amount), capital instruments and general provisions. In conformity with the RBI guidelines, Risk Weighted Assets (RWAs) are computed by assigning risk weights to various classes of assets viz. cash and bank balance, investments, loans and advances, fixed assets, other assets and off-balance sheet exposures. Prominently, two levels of capital are measured:

- **Tier I:** Level of capital capable of absorbing losses or risks without any cease in its trading. It includes paid up capital + statutory reserves + disclosed free reserves) - (equity investments in subsidiary + intangible assets + current and brought forward losses) (Source: Wikipedia)

- **Tier II:** This type of capital absorbs losses at the event of liquidation, thereby provides lesser security to depositors. Tier II capital comprises undisclosed reserves, general loss reserves, hybrid debt capital instruments and subordinated debts. (Source: Wikipedia)

$$\text{Therefore, } \textbf{Overall CRAR} = \frac{\textbf{(Tier I capital + Tier II capital)}}{\textbf{RWAs}} \quad \textbf{(2)}$$

The March 31, 2017, Basel III guidelines require the Bank to maintain a minimum CRAR of 10.30% with minimum Tier I CRAR of 8.30% and Tier II CRAR of 2%. The Table 1 exhibit the

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CRAR of SBI and ICICI banks for the nine financial years (2008-9 to 2016-17):

Table 1: CRAR at Tier I & Tier II Levels of SBI and ICICI, 2008-9 to 2016-17

Financial Years	CRAR at Tier I Level				CRAR at Tier II Level			
	SBI	Rank Allotted	ICICI Bank	Rank Allotted	SBI	Rank Allotted	ICICI Bank	Rank Allotted
2008-09	9.38	2	11.84	10	4.87	13	3.69	8
2009-10	9.45	3	14	17	3.94	9	5.4	15
2010-11	7.77	1	13.2	16	4.21	11	6.3	18
2011-12	9.79	5	12.68	11	4.07	10	5.84	16
2012-13	9.49	4	12.8	14	3.43	5	5.94	17
2013-14	9.98	6	12.78	12.5	2.98	2	4.92	14
2014-15	10.1	7	12.78	12.5	2.69	1	4.24	12
2015-16	10.41	9	13.09	15	3.53	6	3.55	7
2016-17	10.27	8	14.36	18	3.29	4	3.03	3
Sum of Ranks	45		126		61		110	
Mean	9.63		13.06		3.67		4.77	
SD	0.79		0.75		0.67		1.19	
No. of Data (N)	9		9		9		9	
Mann-Whitney U	0.000**				16.0*			
Z	3.578**				2.163*			

Source: Annual financial Reports of SBI and ICICI banks
** Values significant at .01 level of significance
* Values significant at .05 level of significance

As we can see that Mann-Whitney U tests were directed at both tiers of capital adequacy levels for verification of maintenance of standards as per the guidelines of Basel Committee and ascertainment of any significant difference between the banks' capital adequacy norms. The left hand side of the Table 1 exhibits results of U tests for the first tier; the obtained value of U viz. 0 is less than the critical value of U (11) at .01 level of significance which substantiates the alternative hypothesis that there is a significant difference between the capital adequacy norms of SBI and ICICI banks.

Furthermore, the Z value of 3.578 is more than 2.576, which leads us to reject the null hypothesis. We can infer that both the banks have maintained the guidelines of Basel Committee on Banking Supervision (BCBS)of 8.30% for tier I, but ICICI bank has maintained a considerable higher average of 13.059 over its public counterpart with 9.627. Hence, we deduce that there is a significant difference in the CRAR levels of SBI and ICICI bank, with the latter holding a better level of capital adequacy.

On the other hand, the guidelines of Basel Committee on capital adequacy at Tier II

level of 2% has been adequately maintained by both the banks, but the mean scores of ICICI bank (4.77) is relatively better than the same of SBI (3.67). From this we infer that there is a significant difference between the banks' capital adequacy levels at 95 percent confidence levels, based on the Mann-Whitney U value of 16 which is much less than the critical value of 17 (at .05 level). Furthermore the Z score is more than 1.96 which is associated with a p-value less than .05, which provides enough evidence of spatial randomness in the subject area. Hence, the null hypothesis is rejected and we deduce that there is a significant variation in the capital adequacy norms at tier II level.

On the whole, it is to be noted that the overall CRAR average of ICICI bank stood higher at 17.83 in relation to SBI of 13.28. Results portray that the U value is 0.00 with a p-value less than 0.01 and the Z score of -3.576 falling beyond the -2.576 and +2.576. Therefore, we have sufficient evidence to reject the null hypothesis and conclude that the overall Capital to Risk Weighted Asset ratio of SBI and ICICI banks statistically vary at 99 percent confidence level.

2. Assessment of Profitability

Through review of literature it has been ascertained that assorted measures of profitability have been incorporated to gauge the efficiency of earnings, prominent ratios namely Return on Equity (ROE), Return on Assets (ROA) and Cost to Income Ratio and the same are implemented in the present paper. Each of the ratios are briefly discussed:

- **Return on Equity (ROE)**

It exhibits the amount of net income earned on equity funds (in percentages). It reveals the actual profit a bank is able to generate with the funds owned by the equity shareholders. ROE is calculated by Net Income divided by average equity.

- **Return on Assets (ROA)**

It reflects the ability of the banks to acquire deposits at a nominal rate and invest the same in profitable ventures of investments (Ahmed, 2009). The efficiency of a bank in managing its assets in terms of revenue generation is revealed through ROA. There are ample variations of computation of profit-to-asset ratio which are interpreted by elite experts according to the intent of calculation. With the dearth of a proper accounting guideline, use of different computation may lead to ambiguity, consequently quelling its usage and prominence. It is traditionally measured by Net Profits After Taxes (PAT) divided by Average Assets. Unfortunately, it represents a myopic view, as interest paid to the lenders are excluded from calculation of PAT. The assets of a bank are financed, both by the shareholders and creditors. Hence the actual return on assets should include PAT and the interest to the lenders. Furthermore, for a vivid inter-bank comparison, with varying degrees of capital composition, the very fact that interest on debt qualifies for tax deduction in determining the net taxable income is to be noted. Consequently, the effective return to the depositors or lenders is less than the actual interest payment by the tax shield on such interest payments (Khan & Jain, 2017). Finally, the real profit-to-asset ratio is deduced as:

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ROA = <u>PAT+ (Interest paid to lenders – Tax advantage on interest payment)</u>
$$\text{Average Total Assets} \qquad (3)$$

- **Cost to Income Ratio (C/I)**

It unveils the income generated by a bank per rupee cost (Mishra &Yadav, 2015).The degree of expensiveness of a bank to produce a single unit of output is measured by this ratio. It is advisable for the banks to keep this ratio as low as possible for smooth performance and efficiency. A key financial indicator of banking performance and is measured by dividing operating costs by operating income.

- **Profit per employee**

This ratio shows the degree of operating performance of a bank's employees. A High Profit per employee ratio indicates that the bank is effectively managing its employees. It is ascertained by net profit after tax divided by number of employees.

Each of the above facets of profitability are vividly discussed in the following tables 2 and 3.

Table 2: ROE & ROA Levels of SBI and ICICI, 2008-9 to 2016-17

Financial Years	Return on Equity				Return on Assets			
	SBI	Rank Allotted	ICICI Bank	Rank Allotted	SBI	Rank Allotted	ICICI Bank	Rank Allotted
2008-09	15.07	17	7.7	2	4.27	8.5	4.99	16
2009-10	14.04	12	7.9	4	3.88	4	4.27	8.5
2010-11	12.84	10	11.6	9	3.55	2	4.32	10
2011-12	14.36	13	13	11	4.09	7	5.07	17
2012-13	15.94	18	14.7	14	4.39	11	5.08	18
2013-14	10.49	6	14.9	15	4.08	6	4.70	14
2014-15	11.17	7	15	16	3.98	5	4.80	15
2015-16	7.74	3	11.32	8	3.69	3	4.65	13
2016-17	7.25	1	10.34	5	3.52	1	4.48	12
Sum of Ranks	87		84		47.5		123.50	
Mean	12.10		11.83		3.94		4.71	
SD	3.14		2.83		0.31		0.31	
No. of Data (N)	9		9		9		9	
Mann-Whitney U	39.00				2.50**			
Z	-0.132				-3.36**			

Source: Annual financial Reports of SBI and ICICI banks
** Values significant at .01 level of significance

The above ROE scores as per the Indian GAAP have been compared through the Mann-Whitney U tests and the obtained value of U i.e. 39 with a p-value of 0.895 falls beyond

the significance level. Consequently, the Z score is beyond the acceptance region (viz. -1.96 to +1.96) leading us to believe the presence of no spatial pattern in the financial data, in spite of the superior mean ROE score of SBI (12.10) over nine financial years. Hence, we accept the null hypothesis stating no significant difference in the ROE levels of the given banks.

On the contrary, the implementation of U tests over ROA of the banks provide interesting results. The ROA scores of ICICI bank on an average is greater than that of SBI over the given period. The U value of 2.50, with a p-value less than 0.01, is statistically significant at 99 percent confidence level and the Z score lies beyond -2.576. This authenticates us to reject the null hypothesis and finally deduce that the ROA ratios of the banks significantly vary at .01 level of significance.

Table 3: Cost to Income & Profit per employee Ratios of SBI and ICICI, 2008-9 to 2016-17

Financial Years	Cost to Income Ratio				Profit per employee Ratio (₹ in million)			
	SBI	Rank Allotted	ICICI Bank	Rank Allotted	SBI	Rank Allotted	ICICI Bank	Rank Allotted
2008-09	46.62	11	43.40	9	0.474	4	1.10	12.5
2009-10	52.59	17	37.00	4	0.446	2	0.90	10
2010-11	47.60	12	41.95	7	0.385	1	1.00	11
2011-12	45.23	10	42.91	8	0.531	7	1.10	12.5
2012-13	48.51	14	40.49	6	0.645	9	1.40	16
2013-14	52.67	18	38.20	5	0.485	5	1.40	16
2014-15	49.04	15	36.80	3	0.602	8	1.60	18
2015-16	49.13	16	34.70	1	0.47	3	1.40	16
2016-17	47.75	13	35.80	2	0.511	6	1.20	14
Sum of Ranks	126		45		45		126	
Mean	48.79		39.03		0.51		1.23	
SD	2.49		3.24		0.08		0.23	
No. of Data (N)	9		9				9	
Mann-Whitney U	0.00**				0.00**			
Z	-3.576**				-3.585**			

Source: Annual financial Reports of SBI and ICICI banks
** Values significant at .01 level of significance

Table 3 shows the analysis of U test of Cost to Income ratios of the selected banks. It can be perceived from above that the U value of 0.00 is significantly lower than the critical value (11) and the Z score of -3.576 with a significant p-value lower than 0.01. This supports the alternative hypothesis i.e. the cost to income ratios of the given banks

significantly differ at .01 level of confidence. It is to be kept in mind that the C/I ratio of SBI (48.79) is fairly larger than ICICI bank's average (39.03), which means that ICICI bank relatively produces a marginal output at a lesser cost than SBI.

Considering the Profit per employee Ratios of the banks, ICICI bank is effectively managing its employees and their operational performance is comparatively better than that of SBI which is depicted through superior mean scores. Yet again the low Mann-Whitney U value is statistically significant as it is much lower than the critical value of 11 at 99 percent confidence level. The low Z score further substantiates the rejection of the null hypothesis as it falls much below -2.576 and its associated p-value less than .01. Hence, we accept the notion that profit per employee significantly varies at 0.01 level of significance.

3. Assessment of Assets Quality

The present study attempts to understand the quality of assets portfolio of the selected banks based on two major ratios:

- **Net Non - Performing Assets to Net Advances (NNPA Ratio)**

NPAs refer to the portion of loan portfolio which are in default or due on periodical payments of interest or principal amounts for a period of 90 days or more. The quality of assets portfolio is inversely impacted by the presence of NPAs which represents the quantified 'Credit Risk' (Mishra &Yadav, 2015). It denotes the inevitable burden on the banks and its financial health is greatly reflected through proper management of NPAs within the acceptance level. This study only concentrates on the NNPA ratio for comparison excluding the Gross NPA ratio.

- **Provisioning Coverage Ratio (PCR)**

Provisioning is one of the major reforms undertaken by the RBI to mitigate NPAs. Provisioning means to set aside a certain percentage of their NPAs or bad assets from their earnings. It is measured dividing provision for non-performing advances by gross non-performing advances.

Table 4: NNPA Ratio & PCR of SBI and ICICI, 2008-9 to 2016-17

Financial Years	Net Non-Performing Assets to Net Advances				Provisioning Coverage Ratio			
	SBI	Rank Allotted	ICICI Bank	Rank Allotted	SBI	Rank Allotted	ICICI Bank	Rank Allotted
2008-09	1.79	8	1.96	11	56.98	4	53.5	3
2009-10	1.72	7	1.87	10	59.23	6	59.5	7
2010-11	1.63	6	0.94	4	64.95	10	76	16
2011-12	1.82	9	0.62	1	68.1	13	80.4	18

2012-13	2.1	12	0.64	2	66.58	12	76.8	17
2013-14	2.57	14	0.82	3	62.86	9	68.6	14
2014-15	2.12	13	1.4	5	69.13	15	58.6	5
2015-16	3.81	17	2.67	15	60.69	8	50.6	2
2016-17	3.71	16	4.89	18	65.95	11	40.2	1
Sum of Ranks	102		69		88		83	
Mean	2.36		1.76		63.83		62.69	
SD	0.84		1.37		4.16		13.64	
No. of Data (N)	9		9		9		9	
Mann-Whitney U	24.00				38.00			
Z	-1.457				-0.221			

Source: Annual financial Reports of SBI and ICICI banks
* Values significant at .05 level of significance

The table above exhibits the NNPA and PCR ratios for latest nine financial years of the banks. Lower NNPA ratios exhibit rising quality of good loans while a high PCR reflects decrease in the needs of future provisioning given the gross non-performing advances. The Mann-Whitney U tests reveal no significant variation in both the ratios. The values of U for comparative study of NNPA and PCR are 24 and 38respectively which is more than the critical level of 17 at .05 level of significance. Consequently, the Z scores of -1.457 and -0.221 fall within the region of -1.96 to +1.96 and the associated significance values (0.145; 0.825) more than 0.05, corroborates evidence of no spatial randomness in the data. Hence, we accept the null hypothesis i.e. the NNPA and PCR of SBI and ICICI bank do not statistically differ over the selected nine financial years.

4. Assessment of Liquidity Management

The BCBS has introduced and mandated guidelines on Liquidity Risk to promote Short term soundness by maintaining standard Liquidity Coverage Ratio (LCR). It ensures that a bank possesses, adequate stock of unencumbered high quality liquid assets (HQLA) to survive an uncertain liquidity crisis. HQLA are liquid assets that can be converted into cash to meet its immediate obligations for a 30 calendar daytime horizon under a significantly severe liquidity stress scenario. The following table 5 shows the LCR for the quarters ended 31st March 2016- 31st March 2017. It is measured by:

LCR = <u>Stock of high quality liquid assets (HQLAs)</u>   (4)
             Total net cash outflow over the next 30 calendar days

The extant guidelines set by the RBI with regard to minimum LCR initiating from January 1, 2015 are shown in the next page:

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January 1	2015	2016	2017	2018	2019
Minimum LCR	60.0%	70.0%	80.0%	90.0%	100.0%

Table 5: Liquidity Coverage Ratio (%) of SBI and ICICI for five quarters (2016-17)

Quarters ended	SBI	Rank Allotted	ICICI Bank	Rank Allotted
March 31, 2016	76.36	1	91.62	3
June 30, 2016	86.79	2	96.11	4
September 30, 2016	104.69	8	96.25	5
December 31, 2016	135.22	9	102.91	6
March 31, 2017	144.06	10	97.67	7
Sum of Ranks		30		25
Mean		109.42		96.91
SD		29.55		4.05
No. of Data (N)		5		5
Mann-Whitney U	10.00			
Z	-0.522			

Source: Annual financial Reports of SBI and ICICI banks
* Values significant at .05 level of significance

The RBI guidelines on LCR have been successfully maintained by the banks for the respective quarters. SBI's average LCR is relatively better than ICICI bank but in spite of insignificant differences, the Mann-Whitney tests provide no significant difference between the LCR of given banks for five consecutive quarters. The U value is higher than the critical value (5) and the p-value (0.602) is large enough to be accepted at 95 per cent confidence level. The Z score of -0.522 falls within -1.96 to +1.96 region which confirms the acceptance of the null hypothesis. Finally, there is no statistical difference between the SBI and ICICI banks' norms on maintenance of liquidity.

Conclusion and Implications

The present study attempts to add more insight in the burgeoning literature to understand the financial health of SBI and ICICI bank with current data available. Various facets of financial health and soundness were meticulously analyzed to portray a comprehensive analysis on the relevant subject. Overall, the capital adequacy norms of ICICI banks were relatively superior to its public counterpart. Though not much significant difference was observed in the ROE, ICICI bank has prominently greater return on its assets. SBI needs to concentrate on the higher costs incurred in providing additional level of output which is exhibited through higher Cost to Income ratios. The efficiency of ICICI bank in managing employees and their operational performance was significantly shown by higher mean scores of Profit per employee. The quality of assets portfolio did not significantly vary between the banks, despite better results shown by ICICI Bank. Both the banks maintained the standard Liquidity Coverage Ratio as per the Basel Committee on Banking Supervision and the RBI guidelines. SBI exhibited greater degree of high quality liquid assets in comparison to its private competitor, but not much

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significant difference was observed. One can easily perceive from the above analysis that ICICI bank has performed relatively better in majority of the facets of financial health indicators. With the passage of time the financial performance of ICICI bank has been rising in comparison to SBI in almost all the spheres of financial health.

This research article endeavored to comparatively analyze the financial information of selected banks with limited facets of financial health. Other financial tools such as Economic Value Added (Stern & Stewart Co., 1989) and Shareholder Value Analysis (Rappaport, 1998) could definitely add a new dimension in portraying the residual income and the real value created by the banks. This sows seed for further research and vivid understanding of the subject.

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MARKET RESPONSIVENESS TOWARDS VOLUNTARY ENVIRONMENTAL DISCLOSURE: A LONGITUDINAL STUDY IN INDIAN CONTEXT

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Abstract:

The present study tries to understand the relationship between environmental disclosure and market value of firm both in polluting and non-polluting industry perspectives in the context of India. The study reveals that environmental disclosure has no impact on long term market value creation in polluting sector and negative association in non-polluting sector in Indian context. In short run, environmental disclosure has positive association with market value of firm. Overall analysis of the study reveals that environmental disclosures have short term market reactions but investors do not consider corporate environmental responsibility as value-relevant in the long run.

Key Words:

Market Responsiveness, Environmental Disclosure Index, Tobin's Q, Corporate Environmental Responsibility

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1. Introduction

Stock market performance has been a very popular measure of economic performance of firms. Studies on the relationship between sustainable environmental practices and stock market performances of firms reported varying but more consistent outcomes as compared to the accounting based measures. Fogler and Nutt (1975) hypothesized that better pollution rating will lead to higher price earnings ratio. Combining the data of Bragdon and Marlin (1972) with quarterly price earnings ratio the authors found no significant association between firm's environmental performance indicators and price earnings ratio however we must take note that the sample size of the study was very small. Using a larger sample of US firms Belkaoui (1976) reported that pollution control and the disclosure of the pollution control information has temporary but positive impact on the stock prices. Shane and Spicer (1983) found the same positive association of stock prices with the external release of information on firms' pollution control related performances which are in line with the findings of Cormier et al (1993). In other studies, Blacconiere and Patten (1994) and Hamilton (1995) emphasized the risk management perspective of corporate environmental performance. The studies reported that firms with higher environmental performances and disclosures experienced lesser volatility in stock market returns. The positive association between sustainable environmental practices, disclosure and firms' stock market based economic performances is further established by Feldman et al (1997), Cohen et al (1997) and Al-Tuwaijri et al (2004) in US market and HalkosandSepetis (2007) in Greek market.

Among the contradictory outcomes in the recent times Lanoie et al (1998) reported no relationship and Hassel et al (2005) reported negative relationship among firms listed in Stockholm Stock Exchange.

Thus the reported consistency in the positive association between environmental disclosure and market based measure of firm performance are more as compared to the association between environmental disclosure and accounting based measure of firm performances. But, there are contradictory results also as reported in the literature above. Moreover we have come across different dimensions of measurements of market value creation of the firm. Some measurements represent long term market value creation of the firm and some measurements represent short term market value creation like return on equity, price to earnings ratio etc. Disclosure is a mechanism of information dissemination and it may have different impacts on short term as well as long term market value creation and that may differ across countries depending on the stakeholders' awareness about the issue. The cultural, political and legal dimensions are different in different countries and so the stakeholders' activism. This stakeholders' concern or the activism determines how a firm is going to act in respect of environmental responsibility. In the present study we want to see the influence of environmental disclosures on the market value creation of the firm controlling for firm characteristics. Firm characteristics like size, profitability, leverage, capital intensity are obviously primary factors behind market value creation and so to isolate the impact of disclosure on the market value creation firm

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characteristics as control variables are indispensible in the model.

2. Hypothesis Development

The varying results of the studies on the environmental disclosures and market value creation may be due to the difference in the variables taken to satisfy different objectives of the studies. For example, release of environmental news is a short term phenomena and will impact the market accordingly whereas forming an environmental committee in the board has long term implications and market will discount the information not in the same manner like the release of environmental news. In the present study we intend to show how corporate environmental disclosures impact the market value of the firm in long term as well as short term. So a very important aspect of the study is to identify suitable measures of the long term and short term market value creation of the firm. For this purpose we have taken Tobin's Q as a measure of long term value creation by the firm. Latridis (2013) studied common-law Malaysia and reported positive association between corporate environmental disclosure and Tobin's Q. On the other hand price to earnings (P/E) ratio is considered as a measure of the short term multiple of value creation. Using these two variables we estimate how long term as well as short term value creation measures react to voluntary environmental disclosures. Following is the brief description about these two measures.

The concept of Tobin's Q was first introduced by Kaldor (1965) though the name 'q' was not introduced. A further development on the study of Kaldor (1965), Tobin (1969) first introduced the term 'q'.

Tobin's q plays a prominent role in various investment decisions. It is actually defined as the market value of the firm divided by the replacement cost of its assets. Q is used to explain a number of corporate valuation issues like the relationship between firm value and managerial equity ownership (McConnell &Servaes, 1990, pp. 595 – 162), differences in investment and diversification decisions, financing, compensation and dividend policies (Smith & Watts, 1992, pp. 263 – 292) etc. Over the period it has been a popular measure of intellectual capital valuation also. The measurement of Tobin's q essentially captures the excess of market value of equity and long term liability over the book value of equity and long term liability of the firm. So, the quotient actually indicates the sustained value created by the firm over the long term. In the present study we try to assess the relation of good environmental performance and disclosures with the sustained market value created by the firm over the long period of its operation. If the stakeholders and more specifically the investors regard environmental performance and disclosure over and above the regulatory levels as important aspects of corporate citizenship then firm also in turn disclose high. On the other hand if stakeholders do not consider this as an important aspect for good corporate citizenship then the decision to be environmentally efficient and responsible and dissemination of such information in the public domain becomes redundant. To find out the prevailing relationship between Tobin's q as a measure of long term market value creation and the environmental disclosures we form the following hypothesis.

Hypothesis 1: Higher voluntary environmental disclosures lead to higher

levels of Tobin's Q both in polluting as well as non-polluting sectors.

Price to earnings ratios is primarily a comparative measure to find out if the share of a company is correctly valued in comparison to its peers. A low P/E ratio of a stock indicates low growth and low risk as compared to its peers with high P/E ratio. It is a multiple which is widely used by the investors for choosing a potential growth candidate for the short time horizon. Being a short term measure it is greatly impacted by the market shocks. In an age of information and in semi-strong form of market efficiency any information in the public domain is quickly absorbed in the market prices. Environmental disclosure is one such information which market may consider in short term and corrects the price accordingly. In the present study we want to see if the market reacts to the environmental disclosures in short term. We take price to earnings (P/E) ratio as the measure of the short term market value creation and form our hypothesis in the following way.

Hypothesis 2: Voluntary environmental disclosures are positively associated with P/E multiple both in polluting as well as non-polluting sectors.

3. Dataset, Environmental Disclosure Index and Model Specification

3.1 Dataset

Our study comprises sample from polluting as well as non-polluting sectors in Indian context. The sample used for this study is similar to the earlier chapter. Referring Ministry of Environment and Forests, Govt. of India we have identified cement and Iron & steel industry as these are categorized as heavily polluting and covered under 'Red' category of the Central Action Plan. On the other hand information technology and enabled services (IT&ES) is taken as a non-polluting sector. Our primary sampling design was to take top thirty market capitalization Companies from each sector for the time period of 2008-09 to 2012-13, that is five years of study period. We could not include the data beyond that, that is, 2013-14 onward as there is a major regulatory change due to the new Companies Act, 2013 replacing Companies Act, 1956. There are certain elements in our environmental disclosure calculation which are voluntary in the earlier Companies Act 1956 but have been made regulatory in the new Companies Act of 2013. So, by extending the time period beyond 2012-13 we may lose the comparability and lead to the data inconsistency. Moreover Indian companies reacted slowly to the global bandwagon of corporate sustainability reporting. The overall environmental disclosures among Indian companies are low. So, a study period before 2008-09 was not considered in this study as the disclosure before this period was very low and insignificant. Further, due to inconsistency and incomparability of data for some of the companies we had reduced our target sample size of 30 companies from each sector and the final sample comprised of 26 companies from cement industry, 29 companies from iron and steel industry and 29 companies from IT & ES industry. So the total sample comprised of 84 companies distributed in cement, iron and steel and information technology and enabled services sector for the study period of five years.

3.2 Environmental Disclosure Index

The key issue of the research design in the present study is to construct a reliable proxy for the quality of voluntary environmental disclosure of the firm (Roy & Ghosh, 2011, pp. 7 – 27). For the purpose of this study we have used the same environmental disclosure grid used in the previous chapter. Environmental disclosures on print based reports that is, annual report, sustainability report and environmental report are considered for the purpose of the study. Content analysis methodology is used to measure the extent of disclosure. For construction of the disclosure grid we have extensively referred Global Reporting Initiative's G4 guideline on discretionary disclosure of corporate environmental practices as it is the most widely accepted voluntary disclosure guidelines for large companies (KPMG, 2008). For scoring and index construction methodology of voluntary environmental disclosures using content analysis we have further referred Aerts, Cormier and Magnan (2007) and Al-Tuwaijri et al (2004). The detail scoring method is given in the Annexure of this paper.

3.3 Model Specification

The main aspect of this paper is to study the impact of voluntary environmental disclosures on market value creation, both short term as well as long term in nature, controlling for firm characteristics. So the functional relationship is presented as follows:

(Market Value of Firm)$_{it}$ = f (Environmental Disclosure, Firm Characteristics)$_{it}$

The study uses a panel data methodology to test the model. We have used the fixed effect panel data model for the purpose of estimation. Fixed Effects Panel Data method here is applied on the unbalanced panel data set of 26 sample companies from cement industry, 29 companies from iron and steel industry and 29 companies from IT&ES industry over 5 years study period. For long term and short term measure of market value creation we have taken Tobin's Q and P/E multiple respectively. So the working models with longitudinal dataset from the same sample with unobserved fixed effect are as follows:

(Tobin's Q)$_{it}$ = α$_0$ + α$_1$D$_1$ + α$_2$D$_2$+ α$_3$D$_3$+

α$_4$D$_4$+ β$_1$(Environmental Disclosure)$_{it}$ +

β$_2$(Leverage)$_{it}$ + β$_3$(Capital intensity)$_{it}$

+ β$_4$(Age of fixed assets)$_{it}$ +

β$_5$(Firm size)$_{it}$ + β$_6$(ROA)$_{it}$ + a$_i$ + u$_{it}$

For short term measures Tobin's Q is replaced by P/E multiple in the following model.

(P/E Ratio)$_{it}$ = α$_0$ + α$_1$D$_1$ + α$_2$D$_2$+ α$_3$D$_3$+

α$_4$D$_4$+ β$_1$(Environmental Disclosure)$_{it}$ +

β$_2$(Leverage)$_{it}$ + β$_3$(Capital intensity)$_{it}$

+ β$_4$(Age of fixed assets)$_{it}$ +

β$_5$(Firm size)$_{it}$ + β$_6$(ROA)$_{it}$ + a$_i$ + u$_{it}$

The fixed effect panel data model is estimated with time-demeaned or within transformation method. Here D_1 to D_4 are four consecutive time dummies for five year study period taking 2008-09 as the base year. The measurements of the variables are

as follows:

Tobin's Q: We have used an approximate measure of q. It is calculated as the market value of equity plus book value of preference shares plus book value of long term debt scaled by total asset.

P/E Ratio: Market price per share divided by the earnings per share

Environmental Disclosure: Voluntary disclosure score generated through content analysis

Leverage: long term debt to equity ratio

Capital intensity: percentage of net block to total asset

Age of fixed assets: ratio of accumulated depreciation to gross block

Firm size: natural logarithm of Total Asset

Return on assets: percentage of PBIT to Net block

4. Results and Analysis:

The content analysis with our environmental disclosure reports that the overall mean disclosure score is quite low for Indian companies considered for this study. Out of total possible score of 60, the highest mean disclosure score from iron and steel industry stood at 25.15 followed by IT&ES (21.08) and cement (20.06) industry. Firms scored very low on the parameters of assurance, governance, commitments and engagements. Environmental performance indicators are also rudimentary in nature. But, the disclosure score reveals that for all the three sectors the average disclosures are gradually increasing over the study period. The summary scores are presented in Table 1.

Table – 1: Environmental disclosures mean score by industry

		Cement Industry		Iron and steel Industry		IT&ES Industry
Samples companies		**26**		**29**		**29**
Disclosure Grid		**2008 - 09**	**2009 - 10**	**2010 - 11**	**2011 - 12**	**2012 - 13**
Strategy and Analysis	Cement	2.35	2.4	2.58	2.62	2.85
	Iron & steel	2.90	3.10	3.17	3.38	3.55
	IT&ES	2.74	2.68	2.79	2.90	2.97
Assurance	Cement	0.17	0.24	0.23	0.31	0.35
	Iron & steel	0.17	0.17	0.21	0.28	0.28
	IT&ES	0.30	0.29	0.31	0.31	0.31
Governance, Commitments and Engagements	Cement	0.61	0.72	0.77	1.00	1.00
	Iron & steel	1.03	1.14	1.31	1.62	1.72
	IT&ES	0.89	0.89	1.10	1.10	1.21
Laws and Regulations	Cement	0.17	0.2	0.23	0.23	0.62
	Iron & steel	0.57	0.62	0.79	0.97	1.17
	IT&ES	0.926	0.96	1.21	1.41	1.55

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Expenditures and Risks	Cement	3.30	3.72	3.92	4.38	4.81
	Iron & steel	3.47	4.03	4.72	5.21	5.62
	IT&ES	3.111	3.36	3.79	4.14	4.34
Environmental Performance Indicators	Cement	9.91	11.32	12.35	13.23	13.69
	Iron & steel	12.57	13.97	15.21	15.90	16.93
	IT&ES	10.704	10.75	12.03	12.97	13.34
Mean score of disclosure	Cement	**16.52**	**18.6**	**20.08**	**21.77**	**23.31**
	Iron & steel	**20.70**	**23.03**	**25.41**	**27.34**	**29.28**
	IT&ES	**18.67**	**18.93**	**21.24**	**22.83**	**23.72**
Overall mean Score of Environmental Disclosure	Cement	**20.06**				
	Iron & steel	**25.15**				
	IT&ES	**21.08**				

The descriptive statistics (Table 2) further reveal the variability of disclosures among IT & ES companies are highest with standard deviation being 16.688. As per our expectation the average value of Tobin's Q in ITES industry is much higher (17.724) than cement (2.564) and iron and steel (2.811) industry. P/E ratio in the cement industry has outperformed others (24.99) but at the same time it is more sensitive also bearing the highest value of standard deviation (28.24). Among corporate governance variables, ITES companies scored highest in terms of board independence (54.625) which reflects the culture of openness to ideas among technology companies. Ownership concentration in the polluting sectors under sample is quite same but the ownership is slightly less concentrated in ITES companies (50.281). Cement industry is highest in terms of public shareholding (18.10) and ITES scored lowest (15.95) on this parameter reflecting greater influence of institutional investors. The correlation matrixes of the variables of three sectors are given separately in Table 3a, Table 3b and Table 3c.

Table – 2: Summary statistics of Variables

Variables	Cement Industry				Iron and steel				IT&ES Industry			
	Mean	StdDvn	Min.	Max.	Mean	StdDvn	Min.	Max.	Mean	StdDvn	Min.	Max.
Environmental Disclosure	20.06	12.37	7.000	54.00	25.15	13.747	7.00	60.00	21.08	16.668	3.0000	59.000
Tobin's Q	2.564	2.336	0.477	13.0353	2.81153	2.8366	0.5784	21.2393	17.724	20.034	0.64549	93.370
P/E Ratio	24.99	28.24	0.570	176.43	12.81105	16.11	0.20	104.52	14.039	9.4499	0.200	53.330

Leverage	1.25	3.07	0.0	23.89	0.79	0.81	0.00	3.93	0.19887	0.44124	0.010000	1.98000
Capital Intensity	60.13	27.79	1.47	202.72	49.56	31.65	4.88	243.08	20.645	14.987	0.15603	88.444
Age of Fixed Assets	0.40	0.17	0.06	0.75	0.34	0.17	0.00	0.70	0.46144	0.21391	0.000	0.88256
Firm size	5.88	1.76	2.41	9.48	6.90	1.58	3.68	10.23	5.0145	1.9571	0.040822	8.5378
ROA	33.54	149.6	-1309	787.81	31.72	25.83	-13.14	139.77	219.68	574.78	-12.220	4920.8

Table – 3a: Correlation Matrix (Cement Industry)

	Environmental Disclosure	Tobin's Q	P/E Ratio	Leverage	Capital Intensity	Age of Fixed Asset	Firm size	ROA
Environmental Disclosure	1.0000	0.3598	-0.0312	-0.2147	-0.0468	0.2487	0.6161	0.0641
Tobin's Q		1.0000	0.1582	0.0713	-0.5606	0.2959	-0.0626	0.1308
P/E Ratio			1.0000	-0.0161	-0.0959	-0.0743	-0.1380	0.0487
Leverage				1.0000	0.0820	0.1702	-0.1299	0.0102
Capital Intensity					1.0000	-0.3161	0.1187	-0.0899
Age of Fixed Asset						1.0000	-0.1789	0.1568
Firm size							1.0000	-0.0095
ROA								1.000

Table – 3b: Correlation Matrix (Iron & Steel Industry)

	Environmental Disclosure	Tobin's Q	P/E Ratio	Leverage	Capital Intensity	Age of Fixed Asset	Firm size	ROA
Environmental Disclosure	1.0000	-0.0087	0.0982	-0.0958	-0.0702	0.0915	0.5993	0.2779
Tobin's Q		1.0000	0.2334	-0.0402	-0.4649	-0.0680	-0.1141	0.2541
P/E Ratio			1.0000	-0.1041	0.1064	-0.0176	0.0912	0.0994
Leverage				1.0000	0.0059	-0.2065	0.2357	-0.1851
Capital Intensity					1.0000	0.0831	0.1349	-0.1374

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						Age of Fixed Asset	Firm size	ROA
Age of Fixed Asset						1.0000	-0.2058	0.2797
Firm size							1.0000	-0.1023
ROA								1.0000

Table – 3c: Correlation Matrix (IT&ES Industry)

	Environmental Disclosure	Tobin's Q	P/E Ratio	Leverage	Capital Intensity	Age of Fixed Asset	Firm size	ROA
Environmental Disclosure	1.0000	- 0.2420	0.2898	-0.1710	-0.1068	0.0310	0.5904	-0.0956
Tobin's Q		1.0000	0.4115	0.1527	-0.5308	0.2084	0.0984	0.3392
P/E Ratio			1.0000	-0.2056	-0.3203	0.2247	0.0100	0.0170
Leverage				1.0000	0.0280	0.0060	0.1299	0.0171
Capital Intensity					1.0000	-0.4291	0.3874	-0.3133
Age of Fixed Asset						1.0000	-0.3743	0.0245
Firm size							1.0000	-0.3127
ROA								1.000

Now we present the results of our working model. Table 4 and Table 5 reports the results of the working model on the cement industry taking separately the impact of corporate environmental disclosures on Tobin's Q and P/E ratio. Table4 presents the result of model with Tobin's Q. The time dummy variables used in the model are showing significant positive coefficient which is also increasing over the study period. This indicates that there is a gradual increase in the sustained market value of the firms in cement industry over the study period. The most important independent variable is environmental disclosure which reports negative association with Tobin's Q but the coefficient is not statistically significant. This clearly indicates that in polluting industry like cement, investors do not consider environmental information as value relevant or important for valuation. Among control variables leverage is positively associated and capital intensity is negatively associated with Tobin's Q. Both the values are statistically significant at 5% and 10% respectively. This relation may be due to the measurement of the quotient as we consider long term debt in the numerator and total assets in the denominator while we calculate Tobin's Q. Contrary to our prediction, firm size is negatively associated with Tobin's Q and this is statistically significant also.

Table – 4: Impact of Voluntary Environmental Disclosure on Market Based Measures in Cement Industry

Explanatory Variables	Predicted sign	Dependent Variable: Tobin's Q		
		Coefficient	Std. Error	t ratio
Constant		11.6142	2.07891	5.587***
D_1	+	1.7087	0.496704	3.440***
D_2	+	1.17567	0.465627	2.5249**
D_3	+	1.15162	0.477799	2.4102**
D_4	+	1.36773	0.533926	2.5616**
Environmental Disclosure	+	-0.0109138	0.0306557	-0.3560
Leverage	+	0.162029	0.0630978	2.5679**
Capital Intensity	+/-	-0.0148012	0.007520	-1.9682*
Age of Fixed Assets	+/-	-1.28584	1.74336	-0.7376
Firm Size	+	-1.48611	0.335742	-4.42***
ROA	+	0.00032	0.000565	0.5664
R-squared		0.782966		
Adjusted R-squared		0.698564		
F Value		9.276634***		
Durbin-Watson		1.962743		
N (observations)		26		
Test for Differing Group Intercepts		Null hypothesis: The groups have a common intercept Test statistic: $F(25, 90) = 4.5498***$		

Table 5 shows the result of the model using P/E ratio. As P/E ratio is a short term measure, so the coefficients of time dummies are not so important here. The result shows that our main explanatory variable 'Environmental Disclosure' is positively associated (0.552816) with P/E ratio. This clearly indicates that investors value environmental information in the short run. Positive or negative information about the environmental performance of the company is discounted by the market in the share price. Among control variables leverage shows a significant negative association (-0.852909) with price to earnings ratio. Similarly, 'Age of Fixed Assets' (-45.8081) and 'Firm Size' (-8.90465) also report negative association with price to earnings ratio. Both the coefficients are significant at 5% level. Following our predicted sign ROA is positively associated (0.0221381) with P/E ratio and the relation is highly significant with 1% level of significance. The fitment of both the working models with Tobin's q and P/E ratio is satisfactory and F values are statistically significant at 1% level. Thus as an overall interpretation we may state that environmental disclosures of top market capitalization companies in cement industry is not value relevant for long term market value creation but have an impact in short term comparative valuation.

Table – 5: Impact of Voluntary Environmental Disclosure on Market Based Measures in Cement Industry

Explanatory Variables	Predicted sign	Dependent Variable: P/E Ratio		
		Coefficient	Std. Error	t ratio
Constant		65.4143	25.3726	2.5782**
D_1	+	42.098	6.37421	6.6044***
D_2	+	23.3081	10.7966	2.1588**
D_3	+	2.29225	7.93906	0.2887
D_4	+	2.19634	7.87275	0.2790
Environmental Disclosure	+	0.552816	0.480692	1.1500*
Leverage	+	-0.852909	0.541489	-1.5751*
Capital Intensity	+/-	0.0883265	0.121172	0.7289
Age of Fixed Assets	+/-	-45.8081	19.6488	-2.3313**
Firm Size	+	-8.90465	4.0628	-2.1918**
ROA	+	0.0221381	0.004558	4.8570***
R-squared		0.515663		
Adjusted R-squared		0.327310		
F Value		2.73775***		
Durbin-Watson		2.33902		
N (observations)		26		
Test for Differing Group Intercepts		Null hypothesis: The groups have a common intercept Test statistic: : $F_{(25, 90)} = 0.961577$**		

Table 6 reports the result of our working model with Tobin's q in iron and steel industry. The adjusted R-squared value is 0.688994 which shows the fitment of the model is good. Like our result in cement industry, in iron and steel industry also report negative and insignificant association between environmental disclosure and long term market value creation (Tobin's q) of the firm. This implies that in iron and steel industry environmental disclosures are not value relevant in regard to long term market value creation. Control variables in the model are not significant except firm size. Contrary to our predicted sign, firm size is negatively associated with Tobin's q. We assumed that the in the age of competition the potential for larger firms to create more value in the long run is more in compared to the smaller firms. So, we predicted positive association between firm size and long term market value creation. Now, total assets come in the calculation of the Tobin's Q as denominator. This may be the reason of our reported negative association. In further research this relation may be tested with firm size taking natural log of total sales as the proxy of size.

Table – 6: Impact of Voluntary Environmental Disclosure on Market Based Measures in Iron & Steel Industry

Explanatory Variables	Predicted sign	Dependent Variable: Tobin's Q		
		Coefficient	Std. Error	t ratio
Constant		20.1856	6.26089	3.224***
D_1	+	2.32785	0.530641	4.387***
D_2	+	1.73154	0.417861	4.144***
D_3	+	1.4038	0.486101	2.888***
D_4	+	1.33729	0.604503	2.2122**
Environmental Disclosure	+	-0.0408394	0.0646361	0.6318
Leverage	+	-0.22317	0.33002	-0.6762
Capital Intensity	+/-	-0.0147799	0.0102597	-1.4406
Age of Fixed Assets	+/-	-5.06694	3.41716	-1.4828
Firm Size	+	-2.19704	0.875189	-2.510**
ROA	+	0.002940	0.00959	0.3065
R-squared		0.771065		
Adjusted R-squared		0.688994		
F Value		9.39509***		
Durbin-Watson		1.999349		
N (observations)		29		
Test for Differing Group Intercepts		Null hypothesis: The groups have a common intercept Test statistic: F(28, 106) =7.6753***		

Table 7 reports the result of our working model using P/E ratio. None of the time dummies are significant in the model though these variables are not important for measuring the impact of environmental disclosures in short term value creation. But, the most important independent variable of 'Environmental Disclosure' reports a high positive association with P/E ratio and the value is statistically significant at 1% level.

This result states that, like cement industry, companies from iron and steel industry also considers environmental information and disclosures are value relevant in short term measures. Among control variables only firm size is positively associated (5.73144) with P/E ratio that is significant at 5% level. So, the overall result of companies iron and steel industry is quite similar to that of cement industry results.

Table – 7: Impact of Voluntary Environmental Disclosure on Market Based Measures in Iron & Steel Industry

Explanatory Variables	Predicted sign	Dependent Variable: P/E Ratio		
		Coefficient	Std. Error	t ratio
Constant		-79.8021	53.9787	-1.4784
D_1	+	2.8983	3.67225	0.7892
D_2	+	-6.94414	6.93763	-1.0009
D_3	+	-11.901	9.28621	-1.2816

D_4	+	-12.6801	9.48158	-1.3373
Environmental Disclosure	+	1.68854	1.01569	1.6625*
Leverage	+	-0.798544	5.98503	-0.1334
Capital Intensity	+/-	0.12804	0.150412	0.8513
Age of Fixed Assets	+/-	37.1212	42.1702	0.8803
Firm Size	+	5.73144	5.4868	1.0446**
ROA	+	0.0710964	0.09088	0.7823
R-squared		0.475872		
Adjusted R-squared		0.287977		
F Value		2.532652***		
Durbin-Watson		1.922929		
N (observations)		29		
Test for Differing Group Intercepts		Null hypothesis: The groups have a common intercept Test statistic: F(28, 106) = 2.79696***		

Table 8 presents the result of the working model with Tobin's q using the pooled sample of the polluting sectors that is cement and iron and steel. The result shows that all the coefficients of time dummies are positive and highly significant at 1% level. The result further shows that an environmental disclosure is negatively associated (-0.0178018) with Tobin's q and the coefficient is not significant statistically. So, we can state that in overall polluting industry considering cement and iron and steel together, there is no impact of environmental disclosures on Tobin's q. That means environmental performance and disclosures of firms in polluting industry are not relevant for the creation of long term market value. Three out of five control variables show significant relation with Tobin's q. Leverage is positively associated (0.144893) and capital intensity is negatively associated (-0.0121531) with Tobin's q which are statistically significant at 5% level. Further the coefficient of firm size shows a negative value (-1.68119) which is statistically significant. The result of pooled sample is exactly in line with the results of cement industry as reported in the earlier tables.

Table – 8: Impact of Voluntary Environmental Disclosure on Market Based Measures in Pooled Sample of Cement and Iron & Steel Industry

Explanatory Variables	Predicted sign	Dependent Variable: Tobin's Q		
		Coefficient	Std. Error	t ratio
Constant		13.8	2.38613	5.7834***
D_1	+	1.9908	0.366844	5.4268***
D_2	+	1.37762	0.287353	4.7942***
D_3	+	1.11096	0.300591	3.6959***
D_4	+	1.10091	0.344399	3.1966***
Environmental Disclosure	+	-0.0178018	0.0320315	-0.5558
Leverage	+	0.144893	0.0602087	2.4065**

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Capital Intensity	+/-	-0.0121531	0.00599562	-2.0270**
Age of Fixed Assets	+/-	-1.40014	1.55626	-0.8997
Firm Size	+	-1.68119	0.392559	-4.2826***
ROA	+	0.000534535	0.000580232	0.9212
R-squared		0.766803		
Adjusted R-squared		0.694353		
F Value		10.58395***		
Durbin-Watson		2.068658		
N (observations)		55		
Test for Differing Group Intercepts		Null hypothesis: The groups have a common intercept Test statistic: F(54, 206) = 7.05019***		

Table 9 reports the result of our working model with P/E ratio taking full sample of polluting industry that is cement and iron and steel industry both. In the pooled sample only one time dummy is statistically significant. Like industry specific result, the pooled sample also shows positive association (0.913096) of environmental disclosures with P/E ratio. The coefficient is statistically significant at 5% level. Hence we may confirm that corporate environmental disclosures have definite short term relevance on the market valuation of the firm. On the other hand neither individual samples of polluting industry nor the pooled sample of polluting industry report any relevance of the corporate environmental disclosures on the long term market value creation of the firm. This result points towards the low levels of stakeholders' awareness about the issues of environmental sustainability in general and corporate environmental sustainability in specific in Indian context.

Table – 9: Impact of Voluntary Environmental Disclosure on Market Based Measures in Pooled Sample of Cement and Iron & Steel Industry

Explanatory Variables	Predicted sign	Dependent Variable: P/E Ratio		
		Coefficient	*Std. Error*	*t ratio*
Constant		36.4557	20.7554	1.7564*
D_1	+	21.8055	4.01881	5.4259***
D_2	+	9.57371	5.6355	1.6988*
D_3	+	-0.762199	4.55518	-0.1673
D_4	+	0.0543553	4.90545	0.0111
Environmental Disclosure	+	0.913096	0.43063	2.1204**
Leverage	+	-0.451064	0.833704	-0.5410
Capital Intensity	+/-	0.0465561	0.0932073	0.4995
Age of Fixed Assets	+/-	-46.0568	17.2565	-2.6690***
Firm Size	+	-4.78191	3.29699	-1.4504
ROA	+	0.0156842	0.0025745	6.0921***

R-squared		0.418733
Adjusted R-squared		0.238145
F Value		2.318724***
Durbin-Watson		2.004333
N (observations)		55
Test for Differing Group Intercepts		Null hypothesis: The groups have a common intercept Test statistic: $F(54, 206) = 1.6945$***

Finally we present the result of non-polluting sector in Table 10. After studying the impact of environmental disclosure on long term and short term market value creation in polluting sector it is important to see how stakeholders in general and investors in specific value environmental information disclosure in non-polluting sector like ITES. The model with Tobin's q shows good explanatory power with adjusted R-squared value of 0.72585. All the coefficients of time dummy variables are positive and highly significant. Interestingly, our main independent variable environmental disclosure reports a negative association (-0.484433) with Tobin's Q which is significant at 5% level. This result when interpreted with the earlier results reveals the state of investors' perception about environmental performance and disclosure in Indian context. Where investors do not consider environmental disclosure value relevant for long term even in polluting sector then it is quite obvious that they regard environmental disclosure negatively in case of non-polluting sector. This result leads to the interpretation that expenditures on corporate environmental responsibilities are regarded as the misallocation of resources in non-polluting sector.

Table – 10: Impact of Voluntary Environmental Disclosure on Market Based Measures in IT & ES Industry

Explanatory Variables	Predicted sign	Dependent Variable: Tobin's Q		
		Coefficient	Std. Error	t ratio
Constant		44.7659	13.9615	3.206***
D_1	+	11.4218	3.83125	2.981***
D_2	+	7.89232	3.1951	2.4701**
D_3	+	9.33717	3.0668	3.045***
D_4	+	10.8414	3.68431	2.943***
Environmental Disclosure	+	-0.484433	0.226855	-2.135**
Leverage	+	0.815087	2.6655	0.3058
Capital Intensity	+/-	-0.497718	0.217171	-2.292**
Age of Fixed Assets	+/-	-13.6082	8.36086	-1.6276*
Firm Size	+	-1.80763	2.4379	-0.7415
ROA	+	0.00303	0.002513	1.2043
R-squared		0.799731		
Adjusted R-squared		0.72585		
F Value		10.82392***		

Durbin-Watson		2.005050
N (observations)		29
Test for Differing Group Intercepts		Null hypothesis: The groups have a common intercept Test statistic: $F_{(28, 103)} = 5.383^{***}$

Table 11 reports the result of our working model with P/E ratio. Like our results in polluting industry, in non-polluting sector also the variable environmental disclosure is positively associated with P/E ratio and the value is statistically significant also at 10% level of significance. So, in non-polluting technology intensive ITES sector also the environmental news or disclosures are considered value relevant for short term comparability of the firms in the sector.

Among control variables firm size reports negative association (-2.44661) with P/E ratio which is significant at 10% level. On the other hand return on assets (ROA) shows a low but positive (0.00348) coefficient value which is significant at 5% level. Thus the overall results of polluting and non-polluting sectors are quite comparable except for long term market value creation in ITES sector where investors do not consider environmental disclosures positively.

Table – 11: Impact of Voluntary Environmental Disclosure on Market Based Measures in IT & ES Industry

Explanatory Variables	Predicted sign	Dependent Variable: P/E Ratio		
		Coefficient	*Std. Error*	*t ratio*
Constant		30.6728	7.75736	3.9540***
D_1	+	8.38282	1.85219	4.5259***
D_2	+	10.0274	2.49381	4.0209***
D_3	+	7.27033	2.42625	2.9965***
D_4	+	6.6503	2.27192	2.9272***
Environmental Disclosure	+	0.24517	0.12583	-1.9483*
Leverage	+	-2.99291	2.04726	-1.4619
Capital Intensity	+/-	-0.08413	0.06599	-1.2749
Age of Fixed Assets	+/-	-5.70309	3.9252	-1.4529
Firm Size	+	-2.44661	1.5319	-1.5971*
ROA	+	0.00348	0.00154	2.2660**
R-squared		0.541619		
Adjusted R-squared		0.372507		
F Value		3.20273***		
Durbin-Watson		2.210387		
N (observations)		29		
Test for Differing Group Intercepts		Null hypothesis: The groups have a common intercept Test statistic: $F_{(28, 103)} = 1.87096^{**}$		

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5. Conclusion

Market valuation is an important aspect for any corporation and especially for corporations listed in the stock exchanges. The market price of shares is sensitive to various factors both in the short term as well as in the long term. In the present study we have tried to find out the relationship that how corporate environmental disclosures impact the market value creation of the firm both in short term as well as long term. The results are mixed in regard to our hypothesis. The results of polluting as well as non-polluting sector show the level of stakeholders' responsiveness about the issues of corporate environmental responsibility. The results consistently show no significant association between environmental disclosures and long term market value creation in case of polluting samples and negative association in case of non-polluting ITES sector. On the other hand short term measure of P/E multiple is found positively associated with corporate environmental disclosures in both polluting and non-polluting sectors. This phenomenon may be treated in terms of market efficiency. In short run environmental disclosures are treated more like any other information in the market, positive or negative, and quickly discount the same in the prices of securities. In sustainability perspectives this is not of much importance as it may be regarded as a mare short term market reactions.

Disclosure of environmental performance is an action of environmental responsibility on the part of corporates. When the investors do not consider this act of environmental responsibility as value-relevant in the long run, we may assume that environmental irresponsibility on the part of corporates may also be regarded irrelevant for valuations by the investors' community in Indian context.

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Annexure
Environmental Disclosure Grid

Sl No.	Items	Scale of Scoring	Map to GRI
A)	**Strategy and Analysis (Maximum Score 5)** **Rating Scale A**	*Follow	
1	Declaration of environmental policy by senior decision makers	0-1	GN 1.1
2	Disclosure of key environmental risks and impacts and the management system in place for that	0-1	GN 1.2
3	Disclosure of relevant achievements, event, awards and failures in the reporting period	0-1	GN 1.1
4	Mention of environmental goals and key challenges of the company in future (3 to 5 years)	0-1	GN 1.1
5	Involvement to environmental organization/association for improving environmental practices	0-1	GN 4.13
B)	**Assurance (Max score 1)** **Rating Scale A**	*Follow	
1	Assurance and verification of corporate environmental performance is done by an independent organization	0-1	GN 3.13
C)	**Governance, commitments and engagements (Max score 3)** **Rating Scale A**	*Follow	
1	Environmental committee is present in the board	0-1	GN 4.1

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2	Conducts periodic environmental audits	0-1	GN 4.9
3	Adopts and follows environmental charters and principles that are developed externally	0-1	GN 4.12
D)	**Laws and Regulations Conformity (Max score 6)** **Rating Scale B**	****Follow**	
1	Litigations, actual and potential fines	0-3	EN 28
2	Order to conform corrective actions	0-3	
E)	**Expenditures and Risk (Max score 12)** **Rating Scale B**	****Follow**	
1	Investment on R&D and technologies to improve environmental efficiency and performance	0-3	EN 30
2	Environmental operating costs	0-3	
3	Disclosure of specific mechanism that is in place to identify environmental opportunities and risks	0-3	GN 1.2
4	Provisions for future expenditures	0-3	
F) Environmental Performance Indicators (Maximum Score 33) **Rating Scale B**		****Follow**	
1	Energy consumption (direct and indirect)	0-3	EN 3,4
2	Materials usage and the proportion of recycled materials as inputs	0-3	EN 1,2
3	Amount of energy saved due to efficiency, conservation and usage of renewable energy	0-3	EN 5,6
4	Total usage of water and the efficiency of water usage	0-3	EN 8,9,10
5	Total quantity of greenhouse gas emission (direct and indirect)	0-3	EN 16,17
6	Total quantity of the reduction of greenhouse gas emission and the measures taken for the reduction	0-3	EN 18
7	Quantity of NOx, SOx and ozone depleting substances generated	0-3	EN 19,20
8	Quantity of significant water, land and air discharges and spills	0-3	EN 21,23
9	Waste treatment, generation and disposal	0-3	EN 22, 24, 25
10	Process in place to reduce the environmental footprint of products and services	0-3	EN 26,27
11	Natural resources conservations	0-3	EN 11,12,13,14,15
Total Maximum Possible Score is 60			

*Rating Scale A

  1: Yes, the item is mentioned
  0: No, the item is not mentioned

**Rating Scale B

  3: Item described in monetary or quantitative terms
  2: Item described specifically
  1: Item discussed in general

ROLE OF NON-FINANCIAL FACTORS IN INDUSTRIAL INVESTMENT DECISIONS: FINDINGS FROM SURVEY

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Dipen Roy
Dhruba Charan Hota

Abstract:

Many of the project benefits and costs are of non-financial nature. Therefore, complete dependence on normative financial appraisal to arrive at long-term investment decisions may be short-sighted and may not be desirable. The paper asserts that analyzing non-financial factors for taking capital budgeting decisions is essentially an important step. The authors used questionnaire survey method to collect data and assess the importance of various non-financial factors in capital budgeting 'decision-making' in corporate sector. Analysis of data reveals that CFOs assign greater importance on financial factors than non-financial factors. This is consistent with the objective of wealth maximization. Corporate houses today depend more on the strategic moves to fight non-price competition in the imperfectly competitive market. All these have rendered strategic analysis the most important step in non-financial analysis. Indeed, if a project does not fit into the organizational strategy, then the project should be rejected straightway because the major challenge is survival and growth.

Key Words:

Non-Financial Sectors, Capital Budgeting Decision, Chief Financial Officer (CFO), Corporate Houses, Organization Structure

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1. Introduction

The decision-making process for investments is complex and goes beyond the financial aspects. Nonetheless, innumerable research studies surveying usage of financial appraisal methods [*Pike, (1996); Arnold & Hatzopolous, (2000); Graham and Harvey, (2001)*] give an impression that choice of capital budgeting alternative is purely based on *quantitative justification*. To ensure this quantitative justification conventional methods of financial appraisal such as *Internal Rate of Return, Net Present Value Method, Accounting Rate of Return and Payback Period are being applied.* Researchers believe that use of more scientific methods is likely to result in better financial decisions. Contrary to this understanding, very recent studies point to the fact that financial importance comes much later after the evaluation of other important factors like corporate strategy, technological feasibility, product quality and competitive power. Moutinho Nuno, *et al.* (2011) from their studies of Portuguese firms observed that financial factors come only in the third order of importance, after strategic and technical aspects. It points that studying the role of non-financial aspects of capital budgeting is essentially an important academic exercise.

In fact, many of the project's goals tend to be qualitative and not easily measurable in monetary terms (*Kaplan and Atkinson, 2000; Pike and Neale, 2001*). Therefore, if appraisal of capital projects is carried out purely on the basis of financial factors alone, many of the attributes of a project will be left outside the process of formal project appraisal. It demands that appraisal mechanism so adopted should be comprehensive enough so that the impacts of non-financial and financial factors are rightly taken into account and due weights are assigned. *Andreou et al.* (1989) note that a project generates externalities, in terms of costs and benefits that are not taken into account in financial forecasts. In the context of their observations, they argue that financial techniques may be used only as a guide to indicate desirability of the project. Other factors such as organizational, social and political, etc. constitute the greatest source of uncertainty that must be taken into consideration before selecting a project for financing.

Adler (2000) points out that evaluation of qualitative aspects cannot be included in terms of evaluation of financial forecasts. Chen (1995) identifies strategy, quality, flexibility, potential future growth, market condition, ethical and social considerations, prestige and legal issues as the non-financial aspects in project evaluation. Lopes & Flavell (1998) draw the attention to the need for studying non-financial areas like strategic, technical, political, social, environmental, organizational and management while making capital investment decisions. Datta and Mukherjee (2001) observe that to make a project successful, the corporate houses must examine the social, political, technical and financial implications.

Though non-financial project aspects such as political, environmental, legal and social factors are proved to be important-, yet-, in the prevalent practice of corporate investment appraisal, these factors have been not been formally incorporated into normal appraisal process (Mohamed and Mc Cowan, 2001). While dozens of models are

there for assessment of the impacts of financial factors, no model exists there to account for the impacts of non-financial factors. Numerous authors like Skitmore et. al. (1989), Chen (1995), Lopes & Flavell (1998), Adler (2000), Meredith and Mantel (2000), Love *et al*. (2002) point to the need for taking both financial and non-financial factors into account at the time of making appraisal of large capital outlays.

The fact is that even if the financial conditions are extremely favorable, neglect of these non-financial factors can lead to destined failure of a project. This is evident from some recent events taking place in Indian industrial world. One of such evidences is Tata Motor's Singur Project, formulated for assembly of world's cheapest car Nano, which the company had to abandon for improper evaluation of political and social risk. Another example that can be cited is the venture of Vendanta Aluminum meant for extracting bauxite form Niyamgiri hills, Orissa. The project had to be abandoned due to objection of the Union Ministry of Environment and Forests for non-compliance of forest clearance as per the directives in August 2010.

Chris Carr, Kolehmainen, K and Mitchell, F (2010) draw the attention to trend that firms identified as market makers, value creators, re-focusers and restructurers have different contextual frameworks for strategic decision-making. Thus, actual decision-making process for investments in a competitive market environment is complex and goes beyond the routine financial evaluation.

Moutinho Nuno (2010) in their study of Portuguese firms showed that the most important areas considered in project appraisal and capital budgeting decision making processes are strategic and technical. The financial factors were considered only after the strategic and technical analysis (see Table 1). Social and political analyses were given less relevance. It is suggested that even though the monetary aspects of the project might be very sound, the qualitative traits need to be explored in detail for the complete sustainability of the project.

Table.1: Types of Analysis and Corresponding Weights

Types of Analysis	Weights / Importance
Strategic Analysis	97.8%
Technical analysis	79.6%
Financial Analysis	76.3%
Political Analysis	16.1%
Social Analysis	15.1%

Source: Moutinho Nuno (2010): Non-Financial Analysis in Project Appraisal – An Empirical Study accessed from https://bibliotecadigital.ipb.pt/handle/10198/48 35 on 27th July 2016

Numerous scholars have investigated the practice of capital budgeting in corporate sector. More than ninety percent of 'research studies in Capital Budgeting' is focused on normative financial appraisal, which covers survey of appraisal methods used, methods of determining cut-off rate for discounting and tools of incorporating risk in project decisions. Notable of studies are credited to Pike Richard, (1996), Ryan and Ryan (2002), George Kester and Geraldine Robbins (2011), Singh, S., Jain, P. K., and Yadav, S. S. (2012), Tomasz Wnukpel (2013), Andor G., et al. (2015), Kengatharan, L. (2016).

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Invariably the scholars note the gradual progress in adapting to theoretically sound methods of quantitative appraisal. Kengatharan, L. (2016) in his research paper "Capital Budgeting Theory and Practice: A Review and Agenda for Future Research" made a longitudinal study on capital budgeting practices followed across the world during the last two decades i.e., from 1993-2013. He has done a detailed review and analysis of the studies published during the last two decades with regard to the capital budgeting theory and practice. This paper also throws light on the agenda for future research in this area. He notes that some improvements have taken place in respect of the use sophisticated capital budgeting practices. However, still there is a gap between theory and practice.

On the basis of responses received from 125 companies *Arora, Preeti (2012)* observes that the major goal of the firms is to maximize market share followed by maximizing the market value of the share. The scholar observes that Discounted Payback Period is the most preferred capital budgeting technique. Payback Period, Internal Rate of Return and Net Present Value are occupying second, third and fourth ranks in terms of their popularity in the industry. The highest numbers of firms are found to use Sensitivity Analysis as tool to handle the investment risk.

Yadav, Anuradha (2015) observes that bigger size companies give greater preference to IRR, while unsung entrepreneurs rely more on NPV. She also finds that the small entrepreneurs are keener in estimating the payback period (PP) as compared to larger companies. The responded small entrepreneurs are relying more on debt financing which is considered as a cheaper source of finance than equity capital.

Lakew, D M and Rao, Prabhakar D (2014) show that in Ethiopian firms' capital budgeting techniques choice is significantly related to their size, educational qualification of the officers, experience of the officers and multinational culture of the firms under normative approach.

Hall, J and Millard, S (2010) observes that non-financial factors play a pivotal role in choosing an investment. Corporate houses count the 'environmental considerations, social interest, 'availability of raw material and qualified managerial personnel' as non-financial factors. From a survey of 67 South African industrial firms listed on the JSE Securities Exchange they find that 6 per cent of the respondents rejected investment proposal for inadequate compliance of non-financial criteria.

Kersyte Agne (2011) surveys the theoretical process aspects of capital budgeting. According to the author capital budgeting is a process characterized by competition for scarce resource. Hence, project policy, project organization and reward system play dominant role on the final selection of a project. He points that capital budgeting is a complex multi-stage process in which managers act at multiple level of a firm play distinct roles. As management in the organization has different objective other than shareholders' wealth maximization, so they try to influence the outcome of the decisions so that interests of management is better served.

Tomasz W (2013) observes that in majority of companies, investment process involves entire team of managers representing from

basic business, sales, marketing, logistics, accounting and finance. In 71% of companies investment projects are evaluated by teams whereas in the rest of firms projects are evaluated by top management. So far as the final investment decision is concerned, 88% of executives responded that it is entrusted to the Board. Wang Xin (2010) points that many cultural, social and political aspects influence capital budgeting decisions of MNCs.

Batra, Roopali and Verma, Satish (2017) survey 77 BSE listed companies for studying the capital budgeting practices in Indian corporate houses. The survey reveals that Indian companies are gradually adapting to theoretically consistent methods of capital budgeting. However, they note lack of conformity in matters of using real option and risk handling methods. They also surveyed the non-financial factors affecting capital budgeting and observe that majority of the companies surveyed consider project linkage with corporate strategy as an important non-financial criterion. Other non-financial factors getting due importance are environment pollution, employee safety, production technology, manpower availability, etc.

In the light of discussions presented above, this study proposes to examine the role of non-financial factors in capital budgeting decision-making of Indian corporate houses. As Google search engine provides no evidence of similar work undertaken in India, studying role of non-financial factors in capital budgeting, according to the knowledge of the authors, may be treated as perhaps the first attempt in India.

2. Objectives of the Study

a) To examine contemporary process of capital budgeting decision-making at firm level.
b) To make a review of non-financial factors that affect capital budgeting decisions of a firm.
c) To examine if the Indian companies assign due importance to non-financial factors along with financial factors of a project.
d) To examine if financial factors predominates the non-financial factors in the process of capital budgeting decision-making.

3. Research Methodology

To establish the research background, the authors have made extensive survey of relevant literature in capital budgeting. Secondary data relating to violation of pollution control norms and corporate closure have been collected from home page of the Ministry of Environment, Government of India to show how non-compliance of environmental norms can result in termination of a project.

The study is based on survey conducted by the authors. Primary data have been collected directly from the CFOs of a sample of 31 randomly selected companies listed on NSE through personal interview with printed questionnaire. Companies surveyed are all large companies with consistent track record of bulk investments in fixed assets. Average investment in Fixed Assets of the companies is around 20,000 crore. Capital Budgeting and expansion are regular features of all the companies. Of the 31 companies surveyed, 20 companies belong to top 50 companies that constitute Nifty Index of NSE. The sample consists of companies from various

industries like manufacturing, telecom, IT, aviation, coal, cement, steel, chemical, etc.

The questionnaire was drafted with multiple-choice type objective questions covering points like size of investment, choice of appraisal method, importance assigned to various financial and non-financial factors, people who take part in decision making, etc. The study has been done in 2016. Statistical tools like descriptive statistics, charts, Analysis of Variance have been used for arriving at scientific conclusions.

4. Review of Non-Financial Factors Affecting Capital Budgeting Decisions

This section of study is dedicated in making a review of non-financial factors that have possible influence on capital budgeting decisions of a firm. The plausible factors conventionally understood to affect capital budgeting at firm level are environment, organizational structure, technological feasibility, political and social risks. These factors have been discussed in the sub-paragraphs.

4.1 Capital Budgeting and Environmental Pollution

Government of India has expressed her concern for protecting the environment from its present trend of degradation. In addition to legal enactments, lots of administrative steps have been taken in the form of creation of Pollution Control Board, Green Tribunal, etc. Corporate houses draw resources from environment for producing goods and services. As stipulated by the Pollution Control Board, the corporate houses have the social responsibility of keeping environment free from pollution and undertake measures for protecting the environment. While choosing a long-term investment in the forms of building factory or equipment, industries are required to obtain Environmental Clearances [certificates] from the Pollution Control Board. They cannot launch a project, which has net negative environmental consequence.

Table 2: List of 17 Highly Polluting Industries

Sl. No	Industry Category	Complying	Defaulting	Closed	Total
1.	Aluminium	8	-	-	8
2.	Cement	175	22	80	277
3.	Choir-Alkali	27	1	4	32
4.	Copper	5	-	-	5
5.	Distillery	176	29	34	239
6.	Dyes and Intermediates	62	3	30	95
7.	Fertilizers	79	7	35	121

8.	Iron and Steel	56	3	10	69
9.	Oil & Refineries	19	-	3	22
10.	Pesticides	61	18	26	105
11.	Petrochemicals	44	1	11	56
12.	Pharmaceuticals	291	32	75	398
13.	Pulp & Paper	104	33	47	184
14.	Sugar	377	69	66	512
15.	Tannery	103	8	38	149
16.	Power Plant	198	27	19	244
17.	Zinc	6	-	-	6
	TOTAL	1791	253	478	2522

Source: Report of the Working Group on "Effectively Integrating Industrial Growth and Environment Sustainability'', Twelfth Five Year Plan (2012-2017), Planning Commission, Govt. of India.

Therefore, while capital budgeting is done, adequate attention should be given to environmental factors; finally, a project with negative environmental effect should not be chosen for consideration. Very recently, government has adopted measures to promote green technology; corporate houses and households adopting green technology are getting financial incentives. In short, besides economic considerations, environment is an important determinant in the selection of a project proposal. In social cost-benefit analysis, there is a convention of incorporating environmental costs into the analysis of investment alternatives, then pollution prevention technologies may appear more attractive than end-of-pipe oriented investments (*Martin A Spitzer et.al., 1993).*

The Central Pollution Control Board has identified 17 highly polluting industries, the majority of which are manufacturing industries [see Table 2]. Government is reviewing the level of pollution caused by the industrial houses and issues notices to the defaulting industrial units for immediate closure. The table above shows that non-compliance of environmental norms results in closure of 478 units. Owing to this fact, besides financial risks, the corporate houses should consider potential environmental risks associated with the projects under considerations.

4.2 Capital Budgeting and Technological Considerations

Technology is an obvious requirement for every industrial establishment to stay in market and fight competition. Use of advanced technology improves quality of the production, reduces consumption of input, minimizes throughput time and reduces cost of production. It imparts competitive advantage to the industrial houses. Thus, choosing projects with high technology component has gathered momentum. As per Pike (2001), since majority of costs and benefits of new technology investments are of non-financial nature, the principles prescribed for selection of new technology investments should be thoroughly different from the conventional principles of normative financial appraisal predominantly infested by the use of DCF methods.

Technological risks arise due to obsolescence, appointment of unskilled and untrained workforce on the equipment, etc. This is not always certain that new technology always brings the success; in some cases, before the prototype is successfully marketed, the bugs in the technology get manifested.

Table 3: Importance of Technology in Capital Budgeting

Importance of Technology	Number of Companies	Percentage of Companies
Extremely Important	7	22.5%
Important	24	77.5%
Not Important	0	0%
Total	31	100%

While the survey was conducted the CFOs and directors have been asked to assign score to technology on the basis of the assessment of importance of technology in their project appraisal. The result of the survey has been presented in Table 3 given above. Record of responses noted above reveals that technology is an important variable in the process of project selection. Seven of the thirty one companies consider technology as extremely important and remaining 24 companies consider it important. 'None of the companies surveyed' did not state that technology is not important.

4.3 Strategic Factors and Capital Budgeting

Firms generally accept those projects that can contribute to their strategic success. 'For long-term projects, profit maximization is not the sole objective of the firms; rather, they focus on harnessing their competitive strength, while short-term projects mainly focus on profit' (Kenny, 2003). If a project does not fit into the organizational strategy, then the project gets rejected straightway in spite of the attractiveness of the project in terms of financial parameters. While investing in long-term projects, firms basically aim at acquiring market share or look for market opportunities, assume more risks in projects and try to improve firm's competitive advantage.

Shapiro Allan (1993) presents examples of American Home Products that earned remarkable return on shareholders' equity during the decade (1974-1983) of deepest economic decline. Even in turbulent market in India, ITC is working nicely. While many industries face a downturn, firms in IT sector record a steady rise, pharmaceuticals shine. It indicates that industry analysis and economy analysis should be an integral part of capital budgeting.

It is not true that all strategies work under a given situation. Identifying the right strategy at the right time is counted as the right formula to win the competition. All companies do not make value addition; companies choosing right strategy do it, while others adopting wrong strategy make a dent in shareholders' net worth. Today in the contemporary industrial world the yardsticks that have become very popular in the context of making long-term investments in plants and equipments are market share, core competence, growth, differentiation, brand equity, etc. Corporate houses use portfolio models such BCG matrix, GE matrix to identify the appropriate investment proposals from their strategic stand-point.

While the survey was conducted, the CFOs and finance directors have been asked to assign score to corporate strategy on the basis of the assessment of its importance in the process of their project appraisal. The result of the survey has been presented in the table 4 in the next page:

Table 4: Importance of Strategy in Capital Budgeting

Importance of Strategy	Number of Companies	Percentage
Extremely Important	16	51.6%
Important	13	42.0%
Not Important	2	6.4%
Total	31	100%

The result of the survey reveals that 16 respondents (i.e., more than 50%) treat strategy as the extremely important, while thirteen other respondents mark it as important. Only two respondents marked it as unimportant. That is, out of thirty one respondents, twenty nine respondents treat corporate strategy as important at the time of making appraisal of project proposals. The success of a project tends to be greater when firms attribute more importance to any of the strategic aspects analyzed (Moutinho Nuno, 2010).

4.4 Political Factors and Capital Budgeting

Impact of political factor on the success of a project can be noticeably understood at the time of presenting union budget in parliament. A great degree of volatility is noted in the indices of share market. Some industries get political patronage, while others lose. Lopes and Flavell (1998) point

that investment subsidies and the government's environmental policy are the two most relevant political aspects in long-term investment decisions.

In the perspective of international investment decisions of the Multinational Companies political risks constitute a big part. Instead of investing in countries inflicted by political turmoil, the MNCs prefer investing in safe destinations characterized by political stability. Many industrial houses resort to political lobbying to cope with political risks. The authors of this paper have found that incorporating this factor might make the questionnaire very lengthy and sensitive. So, questions on this topic have been avoided. However, the authors appreciate that only pressure of political risk results in abandoning the Nano Project at Singur by Tata Motors.

5. Organizational Structure and the Process of Capital Budgeting

Bower Joseph (1970) first points to the role of organizational structure on capital budgeting. People in organizations try to influence the outcomes of capital budgeting decisions so that their own interests would be served. The organizational level, where a capital budgeting decision is taken, has a considerable influence on determining the attributes of the investment. To study whether a division of authority is there in the organization in respect of Capital Budgeting decision-making, a survey has been made to see which of the organizational authority is playing the most powerful role in defining and implementing capital budgeting proposals.

In the Questionnaire there were questions relating to originating and implementation

of capital budgeting proposals. It was observed that in case of the proposals for new investments, majority of the proposals originated at the board-level, which accounts for 64.51% of responses; it further revealed that in 25.81% of the cases the heads of departments and divisions placed proposals for new investments. The role of the Head of Marketing division was confined to 9.68% only. See Table 5.

Table 5: New Investments and Proposal Initiating Agent

Decision Initiating Authority	Frequency	Percentage
Board of Directors	20	64.51
Head of the Division	8	25.81
Head of Marketing	3	9.68
Total	31	100%

However, the most of the cases of expansion suggestions originated at the point of Divisional Heads (see Table 6). The survey reveals that the final approval for each investment decision was the prerogative of the Board of Directors, Chairman and Managing Directors. It is revealed that the final decision making power for capital investments rests with the top management.

Table - 6: Expansion Proposal and Initiating Authority

Initiating Authority of Expansion Proposals	Frequency	Percentage
Operations Manager	2	6.67
Divisional Heads	25	83.33
Strategy Dept.	2	6.67

& MD		
MD	2	10.00

According to Van Horne James (2001) for a new product, capital budgeting proposals usually originate in the Marketing Department. Proposal for replacement of existing equipment and buildings usually arise from the Production Department or from the Operations Manager. (Van Horne James, 2001) The findings of this study indicate certain change in the existing industry practice. The survey reveals that in 87% cases the authority of sanctioning an investment proposal is vested with the Board of Directors. The authority of divisional heads or project heads is limited to 6.5 percent only. See Table 7.

Table 7: Investment Approval and Sanctioning Authority

Authority Approving Investment Proposal	Frequency	Percentage
Board of Directors, CMD	27	87.00
Divisional Head	2	6.50
Project Head	2	6.50
Total	31	100.00

6. Relative Importance of Non-Financial Factors

In the light of discussions presented above, this paragraph proposes to present the findings of the study undertaken to assess the role of financial and non-financial factors in capital budgeting decision-making of Indian corporate houses. To gain an insight regarding relative importance of different financial and non-financial variables, a set of 11 variables has been selected [See Table 8]. The CFOs or Finance

Directors of responding companies were asked to assign value to each variable according to their assessment of importance of the variables on a five point scale. [1 meaning least important, 5 meaning highest important] Compiled responses in respect of multiple variables on a five point scale have been compiled in the Table 9 below:

Table - 8: List of variables affecting Capital Budgeting

1. Strategy	7. Technology
2. Environment	8. Operating
3. Profitability	Convenience
4. Cost of	9. Environmental

Capital	Pollution
5. Liquidity	10. Future Orientation
6. Competition	11. Operating Employee Skill

The data presented in Table 9 indicate that the allegation that corporate houses emphasize too much on financial factors seems to be true. The fact is that they care for the non-financial factors and financial factor almost with similar weights. The most important point is that there is no formal methodology for incorporating non-financial factors into the analysis.

Table 9: Weights that CFOs Assigned to Financial and Non-Financial Variables

Serial No of Firm	Strategy	Environment	Operating Employee	Profit	Cost of Capital	Liquidity PBP	Technology	Operating Convenience	Product Market	Future Orientation	Competitors Modernization
1	4	3	2	5	5	4	5	3	4	5	5
2	4	1	3	5	4	5	2	2	4	5	3
3	5	3	3	5	5	4	4	3	4	5	5
4	5	5	4	5	5	4	4	4	4	5	5
5	4	5	4	5	3	3	5	4	4	2	2
6	5	4	3	5	4	3	5	4	4	4	5
7	4	5	3	5	5	3	2	2	3	4	2
8	5	4	3	5	4	4	4	4	4	4	4
9	4	5	3	4	4	4	5	5	4	4	5
10	4	5	3	5	4	3	4	4	2	3	1
11	5	5	4	5	5	4	4	4	4	5	4
12	2	3	3	5	5	4	3	3	4	3	2
13	4	5	3	5	5	3	4	5	3	2	3
14	4	5	2	3	3	3	5	5	1	1	3
15	3	4	2	5	5	3	4	3	3	2	3
16	4	4	1	5	5	3	2	2	1	3	2
17	4	4	5	5	4	3	4	4	5	5	5
18	5	4	4	5	5	4	4	4	4	5	5

19	5	4	4	5	5	5	4	4	5	4	5
20	4	3	4	3	1	3	3	4	3	2	2
21	5	3	4	5	5	4	4	4	4	5	4
22	5	4	4	5	5	5	4	4	5	5	4
23	2	2	2	5	5	5	4	3	4	2	3
24	3	4	4	3	1	2	3	4	4	3	2
25	5	4	3	4	4	3	3	3	5	5	2
26	5	3	4	4	3	3	2	1	5	5	2
27	3	5	3	5	4	4	3	4	4	4	5
28	5	5	3	4	3	4	5	5	4	4	5
29	5	4	4	5	5	3	5	4	3	4	3
30	5	5	4	5	5	3	4	4	3	5	3
31	**3**	5	1	5	5	2	2	0	4	4	3
Mean Score	**4.19**	**4.03**	**3.19**	**4.67**	**4.22**	**3.55**	**3.74**	**3.51**	**3.71**	**3.83**	**3.45**

Source: Survey responses of the CFOs

This study gives much freedom to the respondents in assigning values to eleven variables. The average score of each variable is shown in bold face at the bottom of the table. The results show that consciously the responding CFOs give more importance on financial factors like profits and costs. Average scores for profits and costs were 4.67 and 4.22 respectively. Immediately after these two, strategic and environmental factors assume third and fourth positions. Average scores of these two variables are 4.19 and 4.03 respectively. Remaining other variables have scores between 3.45 and 4. It means that the responding CFOs don't treat any of the non-financial variables as less important. Results of t-test shows that difference between two averages scored for strategic priority and profit priority is significant. The result of t-test for comparing (two means) average scores for strategic priority and profit priority is given below:

Table 10: Independent Samples t-Test

Variables	N	Mean	Std. Deviation	Std. Error Mean	t-test for Equality of Means		
					T	df	Sig. (2-tailed)
Profits	31	4.6774	.65254	.11720	2.406	60	.020
Strategy	31	4.1935	.90992	.16343			

Given, the Null Hypothesis for the test is Ho: $\mu_1 = \mu_2$. Computed t is 2.40. At 5% level of significance critical value of t is equal to 1.96. Since the computed value is greater than the critical value, the Null Hypothesis is rejected. At this point it is transparent that CFOs have significant inclination towards financial and profitability criterion. To recheck the result a different methodology has been used in the following paragraph.

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6.1 Importance of Non-Financial Factors: A Study with 3 Point Nominal Scale

This paragraph is presenting the almost same experiment with a different methodology. In this experiment the responding CFOs were asked to record their assessment on a three point nominal scale. The responses obtained from the CFOs regarding importance and non-importance of nine different factors have been presented in the table given below:

Table 11: Importance of Financial and Non-financial Factors: Survey of CFO Opinions

Sl. No	Factors	Extremely important	Important	Unimportant	Total
1	Investment Risk	22	6	3	31
2	Projects' expected return	22	9	0	31
3	Gestation period	4	24	3	31
4	Technology up-gradation	10	20	1	31
5	Product cost	13	17	1	31
6	Competition	13	11	7	31
7	Environmental Pollution	18	11	2	31
8	Strategy	17	10	4	31
9	Organization Structure	5	17	9	31

Looking at the summary of survey findings, it seemed reasonable to check if the corporate houses maintain significant bias towards a particular non-financial or financial factor. The result of Chi-Square Test clearly indicates that FCOs are not evenly assigning importance to various financial and non-financial factors [Null Hypothesis: CFOs are evenly assigning importance to various financial and non-financial factors]. The result shows that computed value of Chi-Square is very high compared to critical value 26.29 for 16 degrees of freedom at 5% level of significance. It means that there is significant difference in importance assigned to various financial and non-financial factors. Proportion test indicates presence of greater bias towards financial priorities. This is consistent with the propositions of shareholders' wealth maximization.

In the survey results major anomalies, not consistent with theoretical prescriptions, have been noticed in case of technology up-gradation, gestation period and organization structure. It is a fact that organization structure and distribution of authority play a very decisive role in deciding the project to be selected. Kaplan and Atkinson (2000) point to the reality that when the executives are given the power of making discretionary investment of certain limit and discretionary limit is falling short of projected size of investments, the executives prefer to define investments in incremental terms instead of global terms. The executives give preference to their wisdom, instead of getting it criticized at board meeting. Hence they think it appropriate to develop a project step by step gradually over time instead of preparing the whole project and getting it vetted by somebody else of the board members.

The result suggests that the allegation that corporate houses emphasize too much on financial factors, is true. The fact is that the CFOs need care for the financial factors with

greater weights in order to protect their job, because performance evaluation of a manager is made on the basis of their contribution to investment return and value addition to shareholders' wealth. After all, survival of a firm depends on its ability to make profits.

7. Multi-factor Model and Non-Financial Factors

This paragraph is dedicated to report that, in developed countries, the corporate houses have begun to make use of multi-factor models to incorporate multiple factors into a single decision-index so that project decisions can be objectively taken without undermining the importance of a factor. Some of those models include

a) 0-1 Factor Model
b) Un-weighted Factor Scoring Model
c) Weighted Factor Scoring Model
d) Constrained Weighted Factor Scoring Model

In some standard textbooks of project management thorough discussions about different factor models are available [see Meredith and Mantel (2000)]. Weighted Factor Scoring Model and Constrained Weighted Factor Scoring Model are advanced versions compared to the first and second methods enlisted above. Roy D and Hota D. C. (2016) have outlined how the weights of the factors can be determined using Eigen values of the factors deduced from statistical method called factor analysis.

8. Conclusion

Many of the project benefits and costs are of non-financial nature. Therefore, analyzing non-financial factors for capital budgeting decisions is essentially an important step. The study reveals that some changes have taken place in the process of capital budgeting at firm level. Instead of new capital budgeting proposals being initiated by departmental heads, these are getting initiated and approved at the level of the board of directors. This is consistent with strategic approach to management. Corporate houses today depend more on the strategic moves to fight competition in the imperfectly competitive market. Due to this emerging phenomenon, along with checking the financial worth of a project, a great degree of importance has been placed on the strategic analysis. Indeed, in spite of attractive financial indices if a project does not match to the strategic requirements of the firm, the project should be rejected straightway, because in the turbulent business environment the most important challenge is the question of survival.

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STUDY OF LONG-RUN AND SHORT-RUN RELATIONSHIP AMONG THE NIFTY LARGE CAP, MID CAP AND SMALL CAP STOCK INDICES OF NSE

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Avijit Sikdar

Abstract:

The inter connection between capital market indices are increasing over the year. A stock market is defined to be an efficient market when stock prices reflect simultaneously the new information appears in the market and, therefore, the current prices of stock reflect all traded and publicly available information about the stock. Recent research reveals that there are long term relationships between stock markets of different nations. Studies have also been done on the cointegration of stock indices within country. In this study we have try to investigate the cointegration among the three major Nifty broad Indices of India Nifty 50, Nifty Mid Cap 50 and Nifty Small Cap 50. All these indices have different market capitalisation and constitutes by different kind of shares. Here I have taken daily closing data of these indices from 1st January, 2012 and ending on 31st December, 2016. We have used test of stationarity for presence of unit root or auto-correlation and Johansen Cointegration test to examine the presence cointegration among the indices. For short run causality we have applied unrestricted VAR model. The result confirms that there are no cointegrating relationships between the three indices. However, the VAR model indicates that there is short run causality in return between those indices.

Key Words:

Stock Indices, Data Stationarity, Johansen Cointegration Test, VAR Framework

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1. Introduction

The study of inter connection between capital market indices in the financial research is increasing over the year. A stock market is defined to be an efficient market when stock prices reflect simultaneously the new information appears in the market and, therefore random in nature, not follows any rule or pattern. The current prices of stock reflect all traded and publicly available information about the stock. The efficient market hypothesis (EMH), in particular semi-strong form efficiency, which states that stock prices must contain all relevant information including publicly available information, In simple language, we can say that investor could not be able to utilised available information in order to forecast stock price movements so as to make a abnormal gain through stock trading. The present study tries to examine the cointegration between the Indian stock market indices in recent years. In this study we considered the three significant market indices of National stock exchange, Viz. NSE Small Cap50, NSE Mid Cap50 and NSE Nifty 50(large cap), which have different market capitalisation, to capture the long term connection between them. So that we can predict the movement of one indices with the help of information of other indices. Moreover, these three indices are considered the benchmark of Indian economic development and growth. All the three indices have different level of market representation and if any kind of long term relationship can be established between these indices, it may indicate the violation of Efficient Market Hypothesis and may also suggest that the indices are being driven by similar market forces. Market inefficiency allows investors to take informed decisions and earn big gains.

Presence of co-integration will imply that certain market forces affect these indices to move in such a way that long term equilibrium is established between these indices.

1.2 Literature Review

A good number of literatures are available on the co-integration between Indian stock indices and with various stock indices of other developing and developed countries and also with other indicators, like foreign exchange market. Some of them are states briefly in the following paragraphs.

K. Kasa,(1992) in their article "Common Stochastic trends in international stock markets," published in *Journal Monetary Economics*, applied Johansen's cointegration test to study the association of stock markets indices and found that there is common trend in the developed capital markets of the US, Japan, Germany, Britain and Canada for the period 1974-1990.

A. K. Mishra,(2002) in his paper "International Financial Integration of Domestic Financial Markets: A study of India," published in *The ICFAI Journal of Applied Finance*, found strong empirical evidence that there is strong correlations between NASDAQ index and the BSE index but found no significant cointegrating vector between the two.

M. V. Subha, and S.T. Nambi,(2010) in their research article "A Study on Cointegration between Indi-an and American Stock Markets," published in *Journal of Contemporary Research in Management,* used Engle Granger test of cointegration to study long run relationship between

American and Indian stock markets and confirmed that there is no significant cointegration between the two markets.

S. Ali, B.Z. Butt, and Kashif Rehman,(2011) in their paper "Co-movement Between Emerging and Developed Stock Markets: An Investigation Through Cointegration Analysis," published in *World Applied Sciences Journal*, identified short term correlations between the stock market of Pakistan with those of India, China, Indonesia, Singapore, Taiwan, Malaysia, Japan, USA and UK but not found any significant cointegration between these stock markets.

D. Gulati, and M. Kakhani,(2012) in thier research article "Relationship between Stock Market and Foreign Exchange Market in India: An Empirical Study," published in *Pacific Busi-ness Review International*, used Granger causality test to determine relationships between INR/$ exchange rate and some Indian capital market indices but could not find any significant relationship.

R. MacDonald, and M.P. Taylor (1991), in their "Exchange Rates, Policy Convergence, and the European Monetary System," published in Review *of Economics and Statistics*, have proved long-term stocks co-movements among some developed equity markets.

Visal Deo, (2014) in his published paper "Investigating Cointegration between Some Indian Stock Indices", in International Journal of Scientific & Engineering Research, have investigated the existence of cointegration between four indices of Indian stock market by using Engle-Granger test and Johansen Cointegration test. Results confirm the presence of at least one

cointegrating relationship between the four indices.

So the overall result from the review of literature is conflicting in each others. Moreover, few works have been carried on the particulars issues of long term relation and short term causality among the indices. In this paper we have tried to bridge the gap by study of Long-run and short-run Relationship among the Large Cap, Mid Cap and Small Cap Indices of NSE.

1.3 Objectives of Study

This paper is drafted to study the following objectives

1. To check the stationary of time series data at level form and at 1st level difference of Nifty 50, Nifty Mid Cap and Nifty Small Cap.

2. To find out the co-integration between the above nifty indices (Nifty 50, Nifty Mid Cap 50 and Nifty Small Cap 50) Using Johansan Co-integration Test.

3. To examine the inter relationship of short-run causality or error correction mechanism between Nifty 50, Nifty Mid Cap and Nifty Small Cap by using VAR (Vector Auto Regressive) system.

1.4 Research Methodology

The above study is based on five calendar periods starting from 1st January, 2012 and ending on 31st December, 2016. Data are downloaded from the website of National Stock exchange relating to daily closing stock indices of Nifty 50, Nifty Mid Cap 50 and Nifty Small Cap 50. Various time series statistical tools are utilised to study the

above objectives. All the calculations for co-integration analysis have been done on the natural logarithm of the index series which reduces the hetroscedasticity (unequal variance) of time series data as log-transformation compresses the scales in which variables are measured. For checking stationarity of data we can use Augmented Dickey-Fuller Test and Phillips-Perron (PP) Test. However we use the first method to test the unit root (non stationarity) of these data. For the purpose of long term relationship between the indices we can use Engle-Garner Cointegration Test or Johansan Co-integration Test. However, we use here the Johansan Co-integration Test. Now to study the inter relationship in the variation among the variable we can use Vector Auto Regressive (VAR) model or Vector Error Correction Model (VECM). If the data at level form have cointegration we can use restricted VAR but if data are not cointegrated then we should use unrestricted VAR. The entire null hypothesis is tested using appropriate test statistics at 5% level of significance (which is assumed to be appropriate in financial time series literature). The entire analysis has been done by using the E-Views7 Statistical Package.

Definition of Variables

lnlc	Natural log of Nifty 50	Log Nifty
D(lnlc)	Daily return of Nifty 50	Log nifty50$_t$ – Log Nifty50$_{t-1}$
lnmc	Natural log of Nifty Mid Cap50	Log Nifty Mid Cap
D(lnmc)	Daily return of Nifty Mid Cap 50	Log nifty Mid Cap$_t$ – Log Nifty Mid Cap$_{t-1}$

lnsc	Natural log of Nifty Small Cap50	Log Nifty Small Cap
D(lnsc)	Daily return of Nifty Small Cap 50	Log nifty Small Cap$_t$ – Log Nifty Small Cap$_{t-1}$

1.5 Conceptual frame work of Indices

The indices are designed to reflect the overall market sentiments. It is calculated based on free float market capitalisation. National Stock Exchange is the one of the oldest stock exchange of India. A stock market index reflects the relative value of a group of stocks in numerical terms. When the constituent shares within stocks within an index change value, the index value changes. An index is important parameter to measure the performance of economy as a whole. There are several types of sectoral and broad indices are constructed based on different characteristics, like market capitalisation, nature of industry, nature of volatility etc. There are several types of indices like, broad market indices, sectoral indices, thematic indices, customised indices and many other indices. Furthermore, there are several sub indices under each of these categories. Our study is based on three most important indices under the category of Broad Indices in terms of trading volume and market capitalisation. Such indices are Nifty 50, Nifty Mid Cap 50 and Nifty Small Cap 50.

The NIFTY 50 is a diversified 50 stock index covering 13 sectors of the economy from manufacturing to financial services. The NIFTY 50 Index represents about 65% of the free float market capitalization of the stocks listed on NSE as on March 31, 2016.

The primary objective of the NIFTY Midcap 50 Index is to identify the movement of the midcap segment of the market. NIFTY Midcap 50 includes top 50 companies based on full market capitalisation from NIFTY Midcap 150 index. The NIFTY Midcap 50 Index represents about 5% of the free float market capitalization of the stocks listed on NSE as on March 31, 2016.

Table: 1 Risk and Return of Nifty 50, Nifty Midcap 50 and Nifty Small cap 50

Indices	Nifty 50		Nifty Mid Cap 50		Nifty Small Cap 50	
Base Period	Nov, 1995		Jan,2004		April,2005	
Market Capitalization	Rs. 200bn to 3500bn		Rs. 50bn to 200bn		less than Rs. 50bn	
	1YR	5Yrs	1YR	5Yrs	1YR	5Yrs
Return (%)	27.09	10.52	53.9	12.27	55.03	13.02
Std. Deviation	13.22	15.27	19.48	22.27	20.52	22.15
Coefficient of Variation	48.80	145.15	36.14	181.50	37.29	170.12

The primary objective of the NIFTY Small Capital 50 Index is to capture the movement of the small cap segment of the market. The NIFTY Small cap 50 Index represents about 2% of the free float market capitalization of the stocks listed on NSE as on March 31, 2016. The respective risk and return of these three indices are given in the above Table1. Out of these indices the return and risk is relatively high for Nifty Small Cap50.

1.6 Data analysis and findings

A. To check the stationary of time series data at level form and at 1st level difference of Nifty 50, Nifty Mid Cap and Nifty Small Cap.

We have used the Augmented Dickey fuller Test to check whether they time series data are stationary at level form or at first level difference. For that purpose we can form the following hypothesis.

a) Null Hypothesis: Daily Index data of Nifty 50, Nifty Mid Cap and Nifty Small Cap are not stationary.

Alternative Hypothesis: Daily Index data are stationary.

b) Null Hypothesis: Daily Index data are non stationary at 1st level difference.

Alternative Hypothesis: Daily Index data are non stationary at 1st level difference.

If p value is less than 0.05 we will reject the hypothesis and if p value more than 0.05 we accept the null hypothesis.

Here we have used Augmented Dickey Fuller (ADF) unit Root Test for this purpose and estimated the following equation with drift and slope coefficient.

$$\Delta(Y_t) = \alpha + \gamma(Y_{t-1}) + \delta_1\Delta\,(Y_{t-1})\;+\;\ldots\ldots\ldots+\delta_{p-1}\Delta(Y_{t-p+1})+ \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where α is the intercept, δ is the slope coefficient and p is the lag order of the auto regression process and Y_t denotes the endogenous variables (Lnlc, Lnmc and lnsc).

Table 2: ADF Test result at Level and at First difference

	t-Statistic	Prob.*
Null Hypothesis: LNLC has a unit root		
Exogenous: Constant	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.73269	0.414467
Null Hypothesis: D(LNLC) has a unit root		
Augmented Dickey-Fuller test statistic	-32.8599	0.000
Null Hypothesis: LNMC has a unit root		
Augmented Dickey-Fuller test statistic	-1.41847	0.574501
Null Hypothesis: D(LNMC) has a unit root		
Augmented Dickey-Fuller test statistic	-32.9897	0.000000
Null Hypothesis: LNSC has a unit root		
Augmented Dickey-Fuller test statistic	-1.25446	0.65245
Null Hypothesis: D(LNSC) has a unit root		
Augmented Dickey-Fuller test statistic	-30.4603	0.000000
Test critical values:	1% level	-3.43542
	5% level	-2.86367
	10% level	-2.56795

The results of the test are arranged in table 2. The result indicates that all the daily index data are not stationary at level form but stationary at first level difference i.e. I (1). The data has unit Root. This result indicates that we can move on with the two tests of cointegration.

B. To find out the co-integration **between the above nifty indices (Nifty 50, Nifty Mid Cap and Nifty Small Cap) Using Johansen Cointegration Test.**

We can use Engle-Garner Cointegration Model or Johansan Co-integration Model to test the long term relationship among the Nifty 50, Nifty Mid Cap and Nifty Small Cap indices. We have used Johansen Cointegration Test in this paper to examine the cointegration among the Nifty indices. The hypothesis of the test is

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(a) **Null hypothesis: No cointegration among the time series data.**

Alternative hypothesis: there is cointegration among the variables.

The test statistics used for this purpose are Trace Statistic and Max-Eigen Statistic and they are tested at 5% level of significance. The decision rule are same as above. If p value is less than 0.05 we will reject the hypothesis and if p value more than 0.05 we accept the null hypothesis.

For the Johansen Cointegration test we have used two statistic, Eigen value and Trace statistic expressed as follows

Trace statistic: Trace = -T Σ log(1-$\lambda_t^{1)}$) ....(2)
t = r+1,......,p
Maximum Eigen Value Statistic: λ_{max} (r,r+1) = -T Σ log(1-λ_{t+1}^1) ....(3)

If the absolute value of the computed trace statistic is greater than its critical value, then we reject our null hypothesis of no cointegration and claim that there exists at least one-way cointegration relation between the variables under study at 5% level of significance. Same logic we will apply for Eigen value statistic.

Table 3: Johansen Cointegration Test

Trend assumption: Linear deterministic trend				
Series: LNLC LNMC LNSC				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.***
None	0.008478508	17.3879664	29.797073	0.6113
At most 1	0.003563109	6.84682324	15.494712	0.5955
At most 2	0.001959158	2.42781654	3.8414655	0.1191
Trace test indicates no cointegration at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigen value)				
Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None	0.008478508	10.5411432	21.131616	0.69274
At most 1	0.003563109	4.41900669	14.264600	0.81267
At most 2	0.001959158	2.42781654	3.8414655	0.11919
Max-Eigen value test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

The estimates of the cointegrating relationship between the variables can be seen in the table 3. None of the Trace Statistic and Max-Eigen Statistic is statistically significant. The result of Johansen Cointegration Test indicates that there is no cointegration among the indices at level form. We can accept the null hypothesis. So we can conclude that there is no co-integration among these indices. If the variables are cointegrated or have long run relationship or association then we can run restricted VAR i.e. VECM (vector error correction model). But if the variables are not cointegrated among themselves we can't run VECM rather we have to use unrestricted VAR. Both the trace and the Max-Eigen statistics conclude that no co-integrating relationship between the three index variables. So we use Unrestricted VAR framework.

C. To examine the inter relationship of short-run growth/return between Nifty 50, Nifty Mid Cap and Nifty Small Cap by using VAR (Vector Auto Regressive) system

VAR represents a proper simultaneous equation system in that all variables in it are treated as endogenous. In VAR modelling, the value of variables is expressed as a linear function of past or lagged values of those variables and all other variables included in the model. Here no priori distinction between dependent and independent variable. Application of VAR system is suitable When there is simultaneity of relationship between variables, log nifty large cap 50(LNLC), log nifty midcap 50(LNMC) and log nifty small cap 50(LNSC).

a) Hypothesis: There is no short term dynamic and causality exists between the variables lnlc, lnmc and lnsc.

Alternative Hypothesis: There is no short term dynamic and causality exists between the variables lnlc, lnmc and lnsc.

If two variables X_{1t} and X_{2t} are not cointegrated and unit root exist then we can formulate VAR framework of lag order 1 as follows to study the short term relation i.e short term dynamic relation and causal relation.

$$\Delta X_{1t} = \alpha_{01} + \beta_{11}\Delta X_{2t} + \gamma_{11}\Delta X_{1t-1} + \gamma_{21}\Delta X_{2t-1} + \varepsilon_{1t} \ldots\ldots\ldots\ldots \text{(4)}$$

$$\Delta X_{2t} = \alpha_{02} + \beta_{12}\Delta X_{1t} + \gamma_{12}\Delta X_{1t-1} + \gamma_{22}\Delta X_{2t-1} + \varepsilon_{2t} \ldots\ldots\ldots\ldots \text{(5)}$$

Where β_1 represent contemporaneous effect of between the variables and γ_1 represent the dynamic relation and γ_2 represent the causal relationship. Now to solve this simultaneous equation we need to impose condition that $\beta_1 = 0$.

The order of lag will be determined based on order of integration of the variables. Before estimating VAR model, we have to ensure that all these variables are stationary, if these variables are not stationary, we have to make them stationary by differencing and differenced variables are to be used. Here all the variables are

integrated of order 1. Hence they are non stationary at level form but stationary at first level difference. Another issue in this connection is to determine the value of lag length, which is empirical question. From the table 3, using lag order selection criterion, it appears that values of AIC, SIC and HQC are all minimum at lag 1. So we are using vector auto regressive model of order 1.

Table 4: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
Endogenous variables: D(LNLC) D(LNMC) D(LNSC)						
0	12757.28643	NA	2.19E-13	-20.638	-20.62558	-20.63333
1	12801.04088	87.22570*	2.07e-13*	-20.69424*	-20.64454*	-20.67554*
2	12803.99511	5.874986	2.09E-13	-20.68446	-20.59747	-20.65174
3	12808.17154	8.285286	2.10E-13	-20.67665	-20.55239	-20.62991
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error/ AIC: Akaike information criterion/SC: Schwarz information criterion/HQ: Hannan-Quinn information criterion						

In the table 4 we have estimated VAR (1) model using the index data. The second column corresponds to results relating to Nifty large cap index equation, the third to nifty midcap index equation and fourth to nifty small cap index equation.

Table 5: Vector Autoregression Estimates

	D(LNLC)	D(LNMC)	D(LNSC)
D(LNLC(-1))	0.158120304	0.17999945	0.066166167
	(0.049175322)	(0.07235654)	(0.071105804)
	[3.21544]	[2.48767]	[0.93053]
	{0.001314*}	{0.012902*}	{0.352157}
D(LNMC(-1))	-0.131804293	-0.101294987	0.007168974
	(0.053046752)	(0.07805296)	(0.076703757)
	[-2.48468]	[-1.29777]	[0.09346]
	{0.013011*}	{0.194446}	{0.925541}
D(LNSC(-1))	0.063069849	0.074837327	0.10245309
	(0.048464662)	(0.07131088)	(0.07007821)
	[1.30136]	[1.04945]	[1.46198]
	{0.193217}	{0.294039}	{0.143831}
C	0.000408155	0.000495488	0.000442363
	(0.000277273)	(0.00040798)	(0.00040092)
	[1.47203]	[1.21449]	[1.10335]
	{0.141097}	{0.224638}	{0.269948}
R-squared	0.01070962	0.010692999	0.021776371

Adj. R-squared	0.008304538	0.008287876	0.019398194
Akaike AIC	-6.420799977	-5.6483719	-5.683245866
Schwarz SC	-6.404253119	-5.631825043	-5.666699009
Determinant resid covariance (dof adj.)		2.04E-13	
Determinant resid covariance		2.02E-13	
Log likelihood		12824.36516	
Akaike information criterion		-20.69848976	
Schwarz criterion		-20.64884919	

Standard errors in ( ) & t-statistics in [ ]

The outputs of VAR model gives short term dynamics variable of its own lag period and short term causality influenced by other variables. There is significant dynamic effect of large cap Nifty return of lag of 1 period (0.158) at 1% level. Significant negative causality has been identified by the return of Mid Cap Nifty [D(LMCN)] of lag period 1 on return of large cap Nifty (-0.131) at 5% level of Significance. Similarly short term significant dynamics has been identified in case of return of Nifty mid cap at a lag of one period. No other coefficients are appeared as significant in this VAR model. The Result can be can be interpreted that higher return/growth (difference in log values of index will give the return from the index) in Nifty large cap 50 index [D(LNLC)] during period t-1 leads to higher growth of Nifty large cap 50 index in period t. Although the negative causal relationship is indicated between growth in Nifty Midcap 50 [D(LNMC)] of period t-1 and return in Nifty large cap 50 index [D(LNLC)]. This is revealed through statistical significance by computed t value and respective p values of estimated coefficient. Same relation holds between growth of Nifty midcap 50 Index and its lag value. However, no other estimated coefficient appears to be statistically significant in any of the other equations. The high negative value of Akaike information criterion (-20.69) and Schwarz

criterio (-20.648) indicates the appropriateness of VAR System. To check whether the Model is good, we need to do diagnostic checking of the residual term.

To examine possible presence of autocorrelation in our VAR model, we have conducted the Autocorrelation LM test. The result, Table 6, shows that the computed LM statistic (which follows Chi-square distribution) is statistically insignificant (as p>0.1) even for lag 1 which leads to acceptance of null hypothesis of absence of serial auto correlation in the residual of VAR model. Hence we can accept the VAR Framework.

Table 6: Auto Correlation LM Test

VAR Residual Serial Correlation LM Tests						
Null Hypothesis: no serial correlation at lag order h						
Lags	1	2	3	4	5	6
LM-Stat	4.65608	6.319518	10.53146	20.53795	6.996951	11.92545
Prob	0.8632	0.707562	0.309196	0.014868	0.637437	0.217545

1.7 Conclusion of the study:

Augmented Dickey fuller Test indicated that these data are non stationary at level form but stationary at first level difference. So the data is integrated of order 1. As suggested by the results of the Johansen test of cointegration confirms that there are no cointegrating relationships between the three indices **Nifty 50, Nifty Mid Cap and Nifty Small Cap.** The trace statistic and Max-eigenvalue statistic suggests absence of a cointegrating vector. This shows that in the long run, the three indices not move in equilibrium which again exposes the efficiency of Indian stock markets. However, there is statistically significant short run causality and dynamic relation exists between the variables large cap Nifty returns and Mid cap Nifty returns. Today's return from large cap nifty is influenced by the return of nifty large cap and nifty mid cap index of one period lag i.e yesterday's return.

Nevertheless, statistically significant short term relation present between today's return and tomorrows' return of Nifty mid cap index. These relationships put the question in short run stock market efficiency but for long run, Indian stock market indicates efficiency. Hence abnormal gain may possible for short period by speculators but no supernormal gain can be expected in long term. The paper is, however, not devoid of limitations. They are as follows:

first the data used in the study is restricted to last five years which can be extended upto 10 years; second, we are using closing value of indices, however, we can use average value of opening closing, high and low value of indices of a particular day; third we have used here the Johansan Co-integration Test to study the long run relationship. However, we can use Engle-Garner Cointegration Test. Subject to these limitations this paper indicates that there is no co-integration among the major stock indices of National stock Exchange of India, though short term causality among the returns of Nifty large cap and Nifty mid cap index have identified.

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2. Econometrics by Examples by D. Gujrati,

Data set

date	LNLC	LNMC	LNSC
02-Jan-12	8.4418	7.4760	7.3371
03-Jan-12	8.4691	7.5144	7.3683
04-Jan-12	8.4658	7.5118	7.3652
05-Jan-12	8.4659	7.5092	7.3652
06-Jan-12	8.4668	7.5070	7.3683
07-Jan-12	8.4652	7.5127	7.3756
09-Jan-12	8.4644	7.5237	7.3847
10-Jan-12	8.4866	7.5579	7.4100
11-Jan-12	8.4890	7.5689	7.4186
12-Jan-12	8.4829	7.5742	7.4186

13-Jan-12	8.4900	7.5835	7.4427
16-Jan-12	8.4916	7.5838	7.4400
17-Jan-12	8.5106	7.6004	7.4506
18-Jan-12	8.5083	7.5861	7.4405
19-Jan-12	8.5209	7.6043	7.4552
20-Jan-12	8.5269	7.6120	7.4542
23-Jan-12	8.5264	7.6132	7.4538
24-Jan-12	8.5423	7.6313	7.4658
25-Jan-12	8.5484	7.6482	7.4824
27-Jan-12	8.5573	7.6548	7.4917
30-Jan-12	8.5345	7.6287	7.4639
31-Jan-12	8.5563	7.6543	7.4897
01-Feb-12	8.5633	7.6686	7.5082
02-Feb-12	8.5698	7.6715	7.5116
03-Feb-12	8.5803	7.6875	7.5258
06-Feb-12	8.5870	7.7079	7.5409
07-Feb-12	8.5821	7.6921	7.5429
08-Feb-12	8.5882	7.7083	7.5636
09-Feb-12	8.5964	7.7273	7.5800
10-Feb-12	8.5907	7.7215	7.5860
13-Feb-12	8.5923	7.7281	7.5824
14-Feb-12	8.5971	7.7429	7.5959
15-Feb-12	8.6183	7.7726	7.6050
16-Feb-12	8.6165	7.7822	7.6141
17-Feb-12	8.6241	7.7933	7.6127
21-Feb-12	8.6318	7.8076	7.6257
22-Feb-12	8.6135	7.7558	7.5841
23-Feb-12	8.6095	7.7487	7.5772
24-Feb-12	8.5996	7.7450	7.5675
27-Feb-12	8.5719	7.7038	7.5319
28-Feb-12	8.5896	7.7457	7.5688
29-Feb-12	8.5914	7.7611	7.5736
01-Mar-12	8.5829	7.7531	7.5680
02-Mar-12	8.5866	7.7464	7.5676
03-Mar-12	8.5866	7.7461	7.5708
05-Mar-12	8.5717	7.7277	7.5554
06-Mar-12	8.5607	7.7142	7.5349
07-Mar-12	8.5603	7.7182	7.5399
09-Mar-12	8.5818	7.7555	7.5661
12-Mar-12	8.5866	7.7693	7.5746
13-Mar-12	8.5996	7.7783	7.5848
14-Mar-12	8.6059	7.7794	7.5852
15-Mar-12	8.5905	7.7524	7.5677
16-Mar-12	8.5788	7.7409	7.5572
19-Mar-12	8.5673	7.7262	7.5412
20-Mar-12	8.5707	7.7389	7.5509
21-Mar-12	8.5876	7.7616	7.5736

22-Mar-12	8.5619	7.7311	7.5434	30-May-12	8.5073	7.5889	7.4557
23-Mar-12	8.5713	7.7450	7.5500	31-May-12	8.5019	7.5931	7.4560
26-Mar-12	8.5534	7.7251	7.5332	01-Jun-12	8.4850	7.5735	7.4361
27-Mar-12	8.5647	7.7317	7.5351	04-Jun-12	8.4864	7.5717	7.4382
28-Mar-12	8.5554	7.7139	7.5210	05-Jun-12	8.4895	7.5748	7.4410
29-Mar-12	8.5523	7.7134	7.5188	06-Jun-12	8.5166	7.6024	7.4712
30-Mar-12	8.5746	7.7411	7.5486	07-Jun-12	8.5271	7.6121	7.4814
02-Apr-12	8.5788	7.7492	7.5589	08-Jun-12	8.5308	7.6173	7.4835
03-Apr-12	8.5864	7.7605	7.5714	11-Jun-12	8.5280	7.6152	7.4776
04-Apr-12	8.5798	7.7605	7.5686	12-Jun-12	8.5401	7.6259	7.4859
09-Apr-12	8.5630	7.7397	7.5515	13-Jun-12	8.5412	7.6242	7.4869
10-Apr-12	8.5648	7.7390	7.5584	14-Jun-12	8.5281	7.6077	7.4749
11-Apr-12	8.5616	7.7303	7.5529	15-Jun-12	8.5446	7.6186	7.4826
12-Apr-12	8.5711	7.7424	7.5645	18-Jun-12	8.5300	7.6024	7.4673
13-Apr-12	8.5578	7.7313	7.5516	19-Jun-12	8.5378	7.6047	7.4723
16-Apr-12	8.5614	7.7364	7.5642	20-Jun-12	8.5410	7.6176	7.4836
17-Apr-12	8.5735	7.7444	7.5739	21-Jun-12	8.5497	7.6306	7.4936
18-Apr-12	8.5755	7.7474	7.5684	22-Jun-12	8.5460	7.6344	7.4948
19-Apr-12	8.5816	7.7477	7.5700	25-Jun-12	8.5399	7.6324	7.4933
20-Apr-12	8.5737	7.7372	7.5583	26-Jun-12	8.5411	7.6383	7.4934
23-Apr-12	8.5565	7.7179	7.5369	27-Jun-12	8.5452	7.6451	7.4996
24-Apr-12	8.5608	7.7105	7.5350	28-Jun-12	8.5466	7.6435	7.5024
25-Apr-12	8.5568	7.6956	7.5266	29-Jun-12	8.5715	7.6672	7.5232
26-Apr-12	8.5543	7.6869	7.5237	02-Jul-12	8.5714	7.6771	7.5316
27-Apr-12	8.5546	7.6818	7.5247	03-Jul-12	8.5732	7.6855	7.5354
28-Apr-12	8.5581	7.6882	7.5299	04-Jul-12	8.5759	7.6957	7.5420
30-Apr-12	8.5656	7.6992	7.5400	05-Jul-12	8.5806	7.7028	7.5590
02-May-12	8.5639	7.6975	7.5405	06-Jul-12	8.5787	7.6918	7.5501
03-May-12	8.5542	7.6826	7.5334	09-Jul-12	8.5708	7.6716	7.5352
04-May-12	8.5344	7.6609	7.5108	10-Jul-12	8.5840	7.6882	7.5513
07-May-12	8.5398	7.6722	7.5165	11-Jul-12	8.5767	7.6825	7.5457
08-May-12	8.5172	7.6516	7.4940	12-Jul-12	8.5632	7.6759	7.5367
09-May-12	8.5121	7.6321	7.4731	13-Jul-12	8.5616	7.6722	7.5392
10-May-12	8.5103	7.6308	7.4709	16-Jul-12	8.5559	7.6651	7.5302
11-May-12	8.5029	7.6173	7.4575	17-Jul-12	8.5550	7.6555	7.5160
14-May-12	8.4986	7.6051	7.4361	18-Jul-12	8.5595	7.6591	7.5240
15-May-12	8.5057	7.6125	7.4459	19-Jul-12	8.5646	7.6631	7.5290
16-May-12	8.4884	7.6013	7.4333	20-Jul-12	8.5574	7.6615	7.5240
17-May-12	8.4909	7.5936	7.4383	23-Jul-12	8.5405	7.6418	7.5065
18-May-12	8.4952	7.5898	7.4393	24-Jul-12	8.5425	7.6444	7.5065
21-May-12	8.4982	7.5971	7.4522	25-Jul-12	8.5389	7.6341	7.5016
22-May-12	8.4889	7.5863	7.4427	26-Jul-12	8.5258	7.6083	7.4669
23-May-12	8.4838	7.5789	7.4378	27-Jul-12	8.5370	7.6020	7.4492
24-May-12	8.5013	7.5892	7.4496	30-Jul-12	8.5564	7.6240	7.4730
25-May-12	8.5011	7.5956	7.4545	31-Jul-12	8.5620	7.6300	7.4772
28-May-12	8.5143	7.6159	7.4653	01-Aug-12	8.5642	7.6407	7.4900
29-May-12	8.5152	7.6089	7.4691	02-Aug-12	8.5617	7.6469	7.4932

03-Aug-12	8.5594	7.6428	7.4925	12-Oct-12	8.6440	7.7346	7.5757
06-Aug-12	8.5722	7.6499	7.5031	15-Oct-12	8.6460	7.7350	7.5757
07-Aug-12	8.5824	7.6542	7.5029	16-Oct-12	8.6391	7.7205	7.5669
08-Aug-12	8.5826	7.6508	7.4996	17-Oct-12	8.6412	7.7193	7.5654
09-Aug-12	8.5798	7.6448	7.4961	18-Oct-12	8.6515	7.7325	7.5813
10-Aug-12	8.5793	7.6441	7.4926	19-Oct-12	8.6455	7.7223	7.5716
13-Aug-12	8.5845	7.6549	7.4945	22-Oct-12	8.6512	7.7226	7.5679
14-Aug-12	8.5905	7.6586	7.4972	23-Oct-12	8.6467	7.7141	7.5663
16-Aug-12	8.5873	7.6562	7.5015	25-Oct-12	8.6492	7.7092	7.5632
17-Aug-12	8.5879	7.6471	7.5019	26-Oct-12	8.6419	7.6958	7.5478
21-Aug-12	8.5980	7.6505	7.5017	29-Oct-12	8.6422	7.6908	7.5496
22-Aug-12	8.5965	7.6409	7.4986	30-Oct-12	8.6301	7.6788	7.5412
23-Aug-12	8.5970	7.6387	7.5000	31-Oct-12	8.6340	7.6845	7.5458
24-Aug-12	8.5917	7.6342	7.4956	01-Nov-12	8.6385	7.6994	7.5566
27-Aug-12	8.5849	7.6207	7.4786	02-Nov-12	8.6478	7.7082	7.5606
28-Aug-12	8.5820	7.6083	7.4624	05-Nov-12	8.6490	7.7001	7.5574
29-Aug-12	8.5732	7.6000	7.4561	06-Nov-12	8.6525	7.7027	7.5644
30-Aug-12	8.5783	7.6017	7.4591	07-Nov-12	8.6587	7.7137	7.5751
31-Aug-12	8.5676	7.5980	7.4582	08-Nov-12	8.6550	7.7153	7.5747
03-Sep-12	8.5667	7.5975	7.4604	09-Nov-12	8.6458	7.7052	7.5628
04-Sep-12	8.5705	7.6042	7.4694	12-Nov-12	8.6454	7.7096	7.5694
05-Sep-12	8.5613	7.5959	7.4692	13-Nov-12	8.6424	7.7115	7.5756
06-Sep-12	8.5638	7.6021	7.4762	15-Nov-12	8.6360	7.7114	7.5822
07-Sep-12	8.5834	7.6176	7.4883	16-Nov-12	8.6259	7.6962	7.5721
08-Sep-12	8.5865	7.6217	7.4987	19-Nov-12	8.6254	7.6865	7.5610
10-Sep-12	8.5874	7.6241	7.5011	20-Nov-12	8.6254	7.6742	7.5464
11-Sep-12	8.5923	7.6276	7.5083	21-Nov-12	8.6332	7.6816	7.5500
12-Sep-12	8.5999	7.6294	7.5117	22-Nov-12	8.6355	7.6856	7.5518
13-Sep-12	8.6007	7.6176	7.5095	23-Nov-12	8.6353	7.6853	7.5582
14-Sep-12	8.6265	7.6322	7.5174	26-Nov-12	8.6369	7.6942	7.5708
17-Sep-12	8.6323	7.6573	7.5303	27-Nov-12	8.6530	7.7081	7.5861
18-Sep-12	8.6305	7.6759	7.5446	29-Nov-12	8.6699	7.7179	7.5974
20-Sep-12	8.6223	7.6658	7.5378	30-Nov-12	8.6793	7.7356	7.6151
21-Sep-12	8.6467	7.6924	7.5493	03-Dec-12	8.6778	7.7474	7.6349
24-Sep-12	8.6429	7.6955	7.5495	04-Dec-12	8.6809	7.7545	7.6299
25-Sep-12	8.6436	7.6978	7.5525	05-Dec-12	8.6828	7.7596	7.6374
26-Sep-12	8.6418	7.7012	7.5512	06-Dec-12	8.6879	7.7705	7.6473
27-Sep-12	8.6393	7.7039	7.5524	07-Dec-12	8.6840	7.7665	7.6469
28-Sep-12	8.6488	7.7198	7.5596	10-Dec-12	8.6842	7.7740	7.6556
01-Oct-12	8.6515	7.7274	7.5744	11-Dec-12	8.6825	7.7625	7.6390
03-Oct-12	8.6537	7.7349	7.5823	12-Dec-12	8.6807	7.7672	7.6397
04-Oct-12	8.6635	7.7398	7.5905	13-Dec-12	8.6745	7.7507	7.6093
05-Oct-12	8.6564	7.7300	7.5813	14-Dec-12	8.6792	7.7613	7.6172
08-Oct-12	8.6440	7.7213	7.5742	17-Dec-12	8.6755	7.7680	7.6194
09-Oct-12	8.6490	7.7283	7.5805	18-Dec-12	8.6822	7.7783	7.6313
10-Oct-12	8.6398	7.7138	7.5618	19-Dec-12	8.6877	7.7797	7.6378
11-Oct-12	8.6496	7.7351	7.5757	20-Dec-12	8.6855	7.7746	7.6320

21-Dec-12	8.6738	7.7516	7.6066	26-Feb-13	8.6651	7.6508	7.4982
24-Dec-12	8.6752	7.7525	7.6091	27-Feb-13	8.6470	7.6067	7.4627
26-Dec-12	8.6837	7.7601	7.6171	28-Feb-13	8.6517	7.6224	7.4621
27-Dec-12	8.6776	7.7553	7.6105	01-Mar-13	8.6480	7.6009	7.4378
28-Dec-12	8.6841	7.7653	7.6139	04-Mar-13	8.6629	7.6237	7.4639
31-Dec-12	8.6836	7.7704	7.6228	05-Mar-13	8.6688	7.6362	7.4822
Date	8.6913	7.7872	7.6400	06-Mar-13	8.6765	7.6434	7.4852
01-Jan-13	8.6984	7.7936	7.6471	07-Mar-13	8.6904	7.6546	7.4961
02-Jan-13	8.7011	7.7994	7.6549	08-Mar-13	8.6899	7.6555	7.5010
03-Jan-13	8.7022	7.8024	7.6646	11-Mar-13	8.6851	7.6466	7.4965
04-Jan-13	8.6976	7.8064	7.6707	12-Mar-13	8.6744	7.6340	7.4791
07-Jan-13	8.6998	7.8101	7.6684	13-Mar-13	8.6842	7.6512	7.4827
08-Jan-13	8.6948	7.8026	7.6635	14-Mar-13	8.6781	7.6395	7.4728
09-Jan-13	8.6943	7.7987	7.6572	15-Mar-13	8.6717	7.6322	7.4658
10-Jan-13	8.6914	7.7812	7.6420	18-Mar-13	8.6563	7.6082	7.4453
11-Jan-13	8.7035	7.8022	7.6583	19-Mar-13	8.6472	7.5792	7.4210
14-Jan-13	8.7089	7.8038	7.6596	20-Mar-13	8.6410	7.5583	7.4044
15-Jan-13	8.6998	7.7849	7.6402	21-Mar-13	8.6396	7.5560	7.4029
16-Jan-13	8.7060	7.7905	7.6444	22-Mar-13	8.6365	7.5485	7.3973
17-Jan-13	8.7102	7.7885	7.6455	25-Mar-13	8.6379	7.5391	7.3984
18-Jan-13	8.7131	7.7950	7.6461	26-Mar-13	8.6452	7.5668	7.4199
21-Jan-13	8.7076	7.7812	7.6308	28-Mar-13	8.6490	7.5829	7.4395
22-Jan-13	8.7085	7.7676	7.6187	01-Apr-13	8.6566	7.6073	7.4633
23-Jan-13	8.7027	7.7315	7.5835	02-Apr-13	8.6435	7.5946	7.4519
24-Jan-13	8.7119	7.7616	7.6002	03-Apr-13	8.6260	7.5743	7.4256
25-Jan-13	8.7119	7.7593	7.6064	04-Apr-13	8.6221	7.5740	7.4279
28-Jan-13	8.7078	7.7472	7.5965	05-Apr-13	8.6203	7.5738	7.4271
29-Jan-13	8.7088	7.7425	7.5976	08-Apr-13	8.6116	7.5630	7.4116
30-Jan-13	8.7053	7.7514	7.5986	09-Apr-13	8.6231	7.5765	7.4222
31-Jan-13	8.6993	7.7475	7.6004	10-Apr-13	8.6294	7.5760	7.4235
01-Feb-13	8.6974	7.7321	7.5814	11-Apr-13	8.6177	7.5842	7.4222
04-Feb-13	8.6923	7.7215	7.5753	12-Apr-13	8.6249	7.5848	7.4309
05-Feb-13	8.6927	7.7257	7.5782	15-Apr-13	8.6463	7.6068	7.4445
06-Feb-13	8.6893	7.7182	7.5667	16-Apr-13	8.6462	7.6107	7.4450
07-Feb-13	8.6833	7.7083	7.5551	17-Apr-13	8.6627	7.6223	7.4542
08-Feb-13	8.6823	7.7078	7.5565	18-Apr-13	8.6715	7.6439	7.4647
11-Feb-13	8.6865	7.6977	7.5498	22-Apr-13	8.6720	7.6385	7.4613
12-Feb-13	8.6883	7.6866	7.5405	23-Apr-13	8.6855	7.6430	7.4638
13-Feb-13	8.6822	7.6685	7.5235	25-Apr-13	8.6779	7.6308	7.4525
14-Feb-13	8.6806	7.6743	7.5287	26-Apr-13	8.6834	7.6475	7.4609
15-Feb-13	8.6824	7.6820	7.5375	29-Apr-13	8.6878	7.6445	7.4680
18-Feb-13	8.6894	7.6973	7.5485	30-Apr-13	8.6994	7.6607	7.4764
19-Feb-13	8.6900	7.6963	7.5486	02-May-13	8.6901	7.6580	7.4732
20-Feb-13	8.6746	7.6679	7.5288	03-May-13	8.6947	7.6727	7.4923
21-Feb-13	8.6742	7.6711	7.5306	06-May-13	8.7067	7.6811	7.5001
22-Feb-13	8.6750	7.6592	7.5134	07-May-13	8.7110	7.6763	7.5126
25-Feb-13	8.6589	7.6399	7.4910	08-May-13	8.7078	7.6668	7.4999

09-May-13	8.7152	7.6688	7.4977	12-Jul-13	8.7046	7.5868	7.3324
10-May-13	8.7172	7.6718	7.4993	15-Jul-13	8.6920	7.5666	7.3100
11-May-13	8.6963	7.6481	7.4796	16-Jul-13	8.6951	7.5536	7.3048
13-May-13	8.6987	7.6511	7.4789	17-Jul-13	8.7058	7.5695	7.3192
14-May-13	8.7237	7.6737	7.5017	18-Jul-13	8.7044	7.5643	7.3145
15-May-13	8.7274	7.6759	7.5038	19-Jul-13	8.7048	7.5675	7.3149
16-May-13	8.7303	7.6834	7.5054	22-Jul-13	8.7124	7.5714	7.3179
17-May-13	8.7253	7.6782	7.4987	23-Jul-13	8.6979	7.5551	7.2933
20-May-13	8.7184	7.6667	7.4856	24-Jul-13	8.6840	7.5455	7.2847
21-May-13	8.7151	7.6508	7.4714	25-Jul-13	8.6804	7.5395	7.2808
22-May-13	8.6940	7.6238	7.4417	26-Jul-13	8.6711	7.5297	7.2639
23-May-13	8.6968	7.6327	7.4477	29-Jul-13	8.6578	7.4998	7.2378
24-May-13	8.7133	7.6461	7.4593	30-Jul-13	8.6556	7.5121	7.2276
27-May-13	8.7179	7.6504	7.4662	31-Jul-13	8.6531	7.4872	7.2005
28-May-13	8.7167	7.6383	7.4556	01-Aug-13	8.6443	7.4653	7.1902
29-May-13	8.7200	7.6369	7.4539	02-Aug-13	8.6457	7.4729	7.1971
30-May-13	8.6972	7.6127	7.4215	05-Aug-13	8.6202	7.4458	7.1699
31-May-13	8.6893	7.6181	7.4278	06-Aug-13	8.6160	7.4648	7.1890
03-Jun-13	8.6860	7.6217	7.4320	07-Aug-13	8.6244	7.4784	7.2066
04-Jun-13	8.6867	7.6299	7.4341	08-Aug-13	8.6327	7.4967	7.2221
05-Jun-13	8.6863	7.6337	7.4384	12-Aug-13	8.6481	7.5179	7.2414
06-Jun-13	8.6795	7.6183	7.4300	13-Aug-13	8.6556	7.5237	7.2457
07-Jun-13	8.6790	7.6003	7.4120	14-Aug-13	8.6139	7.4777	7.2067
10-Jun-13	8.6637	7.5798	7.3879	16-Aug-13	8.5969	7.4680	7.1913
11-Jun-13	8.6587	7.5757	7.3772	19-Aug-13	8.5944	7.4748	7.1926
12-Jun-13	8.6481	7.5519	7.3507	20-Aug-13	8.5759	7.4456	7.1820
13-Jun-13	8.6671	7.5655	7.3668	21-Aug-13	8.5957	7.4737	7.1922
14-Jun-13	8.6742	7.5721	7.3694	22-Aug-13	8.6074	7.4863	7.2096
17-Jun-13	8.6680	7.5803	7.3673	23-Aug-13	8.6082	7.4920	7.2130
18-Jun-13	8.6694	7.5890	7.3750	26-Aug-13	8.5731	7.4632	7.1840
19-Jun-13	8.6405	7.5611	7.3447	27-Aug-13	8.5726	7.4611	7.1764
20-Jun-13	8.6425	7.5424	7.3172	28-Aug-13	8.5958	7.4764	7.1949
21-Jun-13	8.6288	7.5161	7.2915	29-Aug-13	8.6074	7.4785	7.1984
24-Jun-13	8.6321	7.5148	7.2836	30-Aug-13	8.6217	7.4995	7.2170
25-Jun-13	8.6285	7.5101	7.2665	02-Sep-13	8.5833	7.4713	7.1945
26-Jun-13	8.6451	7.5138	7.2754	03-Sep-13	8.6030	7.4862	7.2061
27-Jun-13	8.6729	7.5452	7.3069	04-Sep-13	8.6293	7.5050	7.2275
28-Jun-13	8.6825	7.5771	7.3311	05-Sep-13	8.6448	7.5076	7.2279
01-Jul-13	8.6755	7.5670	7.3246	06-Sep-13	8.6822	7.5195	7.2401
02-Jul-13	8.6606	7.5384	7.2920	10-Sep-13	8.6849	7.5374	7.2656
03-Jul-13	8.6720	7.5469	7.2987	11-Sep-13	8.6743	7.5281	7.2645
04-Jul-13	8.6773	7.5499	7.2993	12-Sep-13	8.6743	7.5375	7.2731
05-Jul-13	8.6676	7.5545	7.2965	13-Sep-13	8.6726	7.5305	7.2611
08-Jul-13	8.6757	7.5675	7.3109	16-Sep-13	8.6742	7.5329	7.2592
09-Jul-13	8.6685	7.5605	7.3109	17-Sep-13	8.6826	7.5361	7.2641
10-Jul-13	8.6886	7.5709	7.3247	18-Sep-13	8.7186	7.5733	7.2812
11-Jul-13	8.7010	7.5739	7.3220	19-Sep-13	8.7015	7.5663	7.2504

Date				Date			
20-Sep-13	8.6810	7.5527	7.2442	29-Nov-13	8.7352	7.6927	7.4406
23-Sep-13	8.6814	7.5580	7.2474	02-Dec-13	8.7326	7.6901	7.4434
24-Sep-13	8.6783	7.5612	7.2514	03-Dec-13	8.7260	7.6803	7.4352
25-Sep-13	8.6797	7.5575	7.2549	04-Dec-13	8.7389	7.6932	7.4359
26-Sep-13	8.6713	7.5551	7.2552	05-Dec-13	8.7419	7.6996	7.4394
27-Sep-13	8.6544	7.5413	7.2461	06-Dec-13	8.7584	7.7116	7.4413
30-Sep-13	8.6622	7.5539	7.2574	09-Dec-13	8.7535	7.7100	7.4333
01-Oct-13	8.6844	7.5773	7.2747	10-Dec-13	8.7496	7.7012	7.4326
03-Oct-13	8.6839	7.5770	7.2782	11-Dec-13	8.7383	7.6922	7.4299
04-Oct-13	8.6837	7.5883	7.2894	12-Dec-13	8.7272	7.6745	7.4171
07-Oct-13	8.6875	7.5894	7.3031	13-Dec-13	8.7250	7.6803	7.4210
08-Oct-13	8.7008	7.5991	7.3151	16-Dec-13	8.7224	7.6767	7.4201
09-Oct-13	8.7030	7.6005	7.3268	17-Dec-13	8.7351	7.6993	7.4384
10-Oct-13	8.7154	7.6027	7.3316	18-Dec-13	8.7269	7.6932	7.4358
11-Oct-13	8.7181	7.6086	7.3469	19-Dec-13	8.7442	7.7130	7.4693
14-Oct-13	8.7142	7.5939	7.3281	20-Dec-13	8.7458	7.7274	7.4816
15-Oct-13	8.7071	7.5915	7.3393	23-Dec-13	8.7433	7.7317	7.4871
17-Oct-13	8.7306	7.6120	7.3516	24-Dec-13	8.7450	7.7337	7.5046
18-Oct-13	8.7331	7.6273	7.3664	26-Dec-13	8.7505	7.7396	7.5042
21-Oct-13	8.7328	7.6337	7.3799	27-Dec-13	8.7469	7.7368	7.5040
22-Oct-13	8.7288	7.6277	7.3736	30-Dec-13	8.7489	7.7419	7.5102
23-Oct-13	8.7265	7.6273	7.3728	31-Dec-13	8.7486	7.7502	7.5249
24-Oct-13	8.7234	7.6145	7.3647	Date	8.7357	7.7245	7.5005
25-Oct-13	8.7162	7.6044	7.3543	01-Jan-14	8.7341	7.7282	7.5139
28-Oct-13	8.7357	7.6222	7.3682	02-Jan-14	8.7309	7.7340	7.5296
29-Oct-13	8.7406	7.6239	7.3771	03-Jan-14	8.7262	7.7236	7.5256
30-Oct-13	8.7482	7.6423	7.3852	06-Jan-14	8.7282	7.7270	7.5289
31-Oct-13	8.7494	7.6617	7.4014	07-Jan-14	8.7272	7.7147	7.5261
01-Nov-13	8.7511	7.6670	7.4133	08-Jan-14	8.7277	7.7036	7.5200
03-Nov-13	8.7408	7.6761	7.4243	09-Jan-14	8.7440	7.7032	7.5260
05-Nov-13	8.7347	7.6718	7.4248	10-Jan-14	8.7390	7.7063	7.5231
06-Nov-13	8.7302	7.6533	7.4089	13-Jan-14	8.7516	7.7094	7.5238
07-Nov-13	8.7227	7.6570	7.4084	14-Jan-14	8.7513	7.7079	7.5181
08-Nov-13	8.7126	7.6487	7.3904	15-Jan-14	8.7422	7.6947	7.4948
11-Nov-13	8.7025	7.6344	7.3793	16-Jan-14	8.7489	7.7081	7.5092
12-Nov-13	8.6978	7.6298	7.3741	17-Jan-14	8.7505	7.7113	7.5238
13-Nov-13	8.7088	7.6485	7.3938	20-Jan-14	8.7545	7.7156	7.5268
14-Nov-13	8.7305	7.6652	7.4073	21-Jan-14	8.7555	7.7109	7.5145
18-Nov-13	8.7328	7.6678	7.4123	22-Jan-14	8.7430	7.6888	7.4917
19-Nov-13	8.7198	7.6602	7.4154	23-Jan-14	8.7219	7.6477	7.4549
20-Nov-13	8.6994	7.6431	7.3941	24-Jan-14	8.7203	7.6460	7.4600
21-Nov-13	8.6988	7.6422	7.3978	27-Jan-14	8.7194	7.6529	7.4632
22-Nov-13	8.7186	7.6645	7.4159	28-Jan-14	8.7117	7.6378	7.4468
25-Nov-13	8.7093	7.6580	7.4058	29-Jan-14	8.7143	7.6644	7.4727
26-Nov-13	8.7090	7.6626	7.4093	30-Jan-14	8.6998	7.6490	7.4599
27-Nov-13	8.7147	7.6731	7.4189	31-Jan-14	8.6997	7.6530	7.4655
28-Nov-13	8.7284	7.6861	7.4310	03-Feb-14	8.7032	7.6576	7.4737

04-Feb-14	8.7055	7.6596	7.4699	15-Apr-14	8.8216	7.8519	7.6524
05-Feb-14	8.7100	7.6704	7.4761	16-Apr-14	8.8273	7.8637	7.6662
06-Feb-14	8.7084	7.6648	7.4695	17-Apr-14	8.8269	7.8580	7.6697
07-Feb-14	8.7099	7.6647	7.4787	21-Apr-14	8.8307	7.8528	7.6715
10-Feb-14	8.7134	7.6622	7.4818	22-Apr-14	8.8221	7.8520	7.6685
11-Feb-14	8.6997	7.6431	7.4702	23-Apr-14	8.8190	7.8665	7.6715
12-Feb-14	8.7075	7.6463	7.4709	25-Apr-14	8.8121	7.8553	7.6671
13-Feb-14	8.7117	7.6471	7.4726	28-Apr-14	8.8093	7.8341	7.6448
14-Feb-14	8.7205	7.6576	7.4934	29-Apr-14	8.8091	7.8398	7.6533
17-Feb-14	8.7247	7.6619	7.5043	30-Apr-14	8.8098	7.8393	7.6446
18-Feb-14	8.7146	7.6614	7.5022	02-May-14	8.8121	7.8399	7.6512
19-Feb-14	8.7251	7.6691	7.5111	05-May-14	8.8028	7.8373	7.6486
20-Feb-14	8.7301	7.6712	7.5080	06-May-14	8.8039	7.8314	7.6555
21-Feb-14	8.7323	7.6712	7.5133	07-May-14	8.8333	7.8565	7.6730
24-Feb-14	8.7385	7.6719	7.5196	08-May-14	8.8557	7.8697	7.6805
25-Feb-14	8.7446	7.6818	7.5223	09-May-14	8.8691	7.8969	7.7063
26-Feb-14	8.7358	7.6758	7.5237	12-May-14	8.8691	7.9222	7.7124
28-Feb-14	8.7480	7.6927	7.5372	13-May-14	8.8711	7.9121	7.7014
03-Mar-14	8.7528	7.7011	7.5393	14-May-14	8.8823	7.9469	7.7180
04-Mar-14	8.7642	7.7205	7.5511	15-May-14	8.8906	8.0123	7.7737
05-Mar-14	8.7836	7.7311	7.5481	16-May-14	8.8923	8.0171	7.8055
06-Mar-14	8.7853	7.7398	7.5507	19-May-14	8.8892	8.0200	7.8175
07-Mar-14	8.7814	7.7342	7.5499	20-May-14	8.8924	8.0366	7.8552
10-Mar-14	8.7822	7.7323	7.5476	21-May-14	8.9048	8.0689	7.8786
11-Mar-14	8.7785	7.7193	7.5335	22-May-14	8.9037	8.0429	7.8427
12-Mar-14	8.7802	7.7254	7.5304	23-May-14	8.8981	8.0310	7.8336
13-Mar-14	8.7821	7.7372	7.5519	26-May-14	8.8997	8.0371	7.8386
14-Mar-14	8.7833	7.7435	7.5551	27-May-14	8.8868	8.0246	7.8360
18-Mar-14	8.7770	7.7336	7.5530	28-May-14	8.8860	8.0227	7.8405
19-Mar-14	8.7785	7.7429	7.5627	29-May-14	8.9042	8.0537	7.8631
20-Mar-14	8.7788	7.7445	7.5689	30-May-14	8.9114	8.0604	7.8797
21-Mar-14	8.7923	7.7506	7.5671	02-Jun-14	8.9095	8.0817	7.9050
22-Mar-14	8.7933	7.7605	7.5753	03-Jun-14	8.9192	8.1042	7.9198
24-Mar-14	8.7950	7.7643	7.5785	04-Jun-14	8.9337	8.1228	7.9412
25-Mar-14	8.8011	7.7648	7.5849	05-Jun-14	8.9431	8.1417	7.9714
26-Mar-14	8.8093	7.7971	7.5998	06-Jun-14	8.9433	8.1334	7.9691
27-Mar-14	8.8105	7.8100	7.6076	09-Jun-14	8.9394	8.1107	7.9544
28-Mar-14	8.8130	7.8049	7.6092	10-Jun-14	8.9424	8.1126	7.9459
31-Mar-14	8.8177	7.8259	7.6292	11-Jun-14	8.9283	8.0760	7.9114
01-Apr-14	8.8152	7.8169	7.6248	12-Jun-14	8.9271	8.0834	7.9157
02-Apr-14	8.8090	7.8202	7.6345	13-Jun-14	8.9401	8.1002	7.9323
03-Apr-14	8.8091	7.8183	7.6395	16-Jun-14	8.9304	8.0867	7.9204
04-Apr-14	8.8241	7.8408	7.6607	17-Jun-14	8.9281	8.0752	7.9203
07-Apr-14	8.8241	7.8594	7.6615	18-Jun-14	8.9242	8.0667	7.9113
09-Apr-14	8.8212	7.8568	7.6628	19-Jun-14	8.9218	8.0766	7.9206
10-Apr-14	8.8148	7.8456	7.6538	20-Jun-14	8.9333	8.0996	7.9435
11-Apr-14	8.8062	7.8299	7.6371	23-Jun-14	8.9318	8.1026	7.9470

24-Jun-14	8.9218	8.0908	7.9447	02-Sep-14	8.9991	8.0901	7.9529
25-Jun-14	8.9238	8.0959	7.9460	03-Sep-14	8.9980	8.0919	7.9559
26-Jun-14	8.9374	8.1257	7.9632	04-Sep-14	9.0087	8.1074	7.9674
27-Jun-14	8.9405	8.1269	7.9660	05-Sep-14	9.0061	8.1131	7.9727
30-Jun-14	8.9522	8.1410	7.9760	08-Sep-14	8.9989	8.1116	7.9785
01-Jul-14	8.9509	8.1368	7.9715	09-Sep-14	8.9979	8.1198	7.9907
02-Jul-14	8.9557	8.1420	7.9785	10-Sep-14	9.0003	8.1199	7.9931
03-Jul-14	8.9602	8.1423	7.9766	11-Sep-14	8.9924	8.1219	7.9919
04-Jul-14	8.9390	8.0798	7.9350	12-Sep-14	8.9788	8.0756	7.9552
07-Jul-14	8.9339	8.0564	7.9099	15-Sep-14	8.9841	8.0816	7.9563
08-Jul-14	8.9317	8.0614	7.9242	16-Sep-14	9.0014	8.1068	7.9827
09-Jul-14	8.9173	8.0159	7.8890	17-Sep-14	9.0023	8.0965	7.9905
10-Jul-14	8.9165	8.0257	7.8887	18-Sep-14	9.0053	8.0940	7.9963
11-Jul-14	8.9262	8.0541	7.9163	19-Sep-14	8.9894	8.0667	7.9686
14-Jul-14	8.9391	8.0693	7.9380	22-Sep-14	8.9875	8.0559	7.9430
15-Jul-14	8.9412	8.0848	7.9482	23-Sep-14	8.9761	8.0252	7.9083
16-Jul-14	8.9443	8.0752	7.9466	24-Sep-14	8.9833	8.0444	7.9130
17-Jul-14	8.9469	8.0731	7.9526	25-Sep-14	8.9820	8.0504	7.9282
18-Jul-14	8.9577	8.0726	7.9458	26-Sep-14	8.9828	8.0480	7.9323
21-Jul-14	8.9613	8.0700	7.9361	29-Sep-14	8.9804	8.0482	7.9260
22-Jul-14	8.9658	8.0715	7.9300	30-Sep-14	8.9686	8.0396	7.9167
23-Jul-14	8.9607	8.0476	7.9105	01-Oct-14	8.9673	8.0431	7.9068
24-Jul-14	8.9553	8.0423	7.9024	07-Oct-14	8.9823	8.0633	7.9277
25-Jul-14	8.9608	8.0534	7.9100	08-Oct-14	8.9695	8.0440	7.9150
28-Jul-14	8.9517	8.0553	7.9152	09-Oct-14	8.9726	8.0493	7.9208
30-Jul-14	8.9362	8.0474	7.9074	10-Oct-14	8.9701	8.0496	7.9234
31-Jul-14	8.9468	8.0644	7.9238	13-Oct-14	8.9552	8.0185	7.8879
01-Aug-14	8.9550	8.0721	7.9372	14-Oct-14	8.9593	8.0326	7.8858
04-Aug-14	8.9453	8.0612	7.9282	16-Oct-14	8.9720	8.0503	7.9007
05-Aug-14	8.9424	8.0573	7.9260	17-Oct-14	8.9781	8.0601	7.9137
06-Aug-14	8.9318	8.0323	7.8959	20-Oct-14	8.9867	8.0705	7.9339
07-Aug-14	8.9393	8.0433	7.9014	21-Oct-14	8.9890	8.0748	7.9404
08-Aug-14	8.9525	8.0491	7.9105	22-Oct-14	8.9862	8.0661	7.9311
11-Aug-14	8.9541	8.0252	7.8758	23-Oct-14	8.9906	8.0692	7.9359
12-Aug-14	8.9608	8.0401	7.8869	27-Oct-14	8.9984	8.0718	7.9454
13-Aug-14	8.9714	8.0615	7.9137	28-Oct-14	9.0081	8.0788	7.9561
14-Aug-14	8.9743	8.0692	7.9296	29-Oct-14	9.0267	8.0996	7.9698
18-Aug-14	8.9715	8.0699	7.9317	30-Oct-14	9.0269	8.1117	7.9907
19-Aug-14	8.9735	8.0725	7.9287	31-Oct-14	9.0286	8.1093	7.9922
20-Aug-14	8.9763	8.0772	7.9265	03-Nov-14	9.0285	8.1066	7.9908
21-Aug-14	8.9754	8.0610	7.9134	05-Nov-14	9.0293	8.1070	7.9912
22-Aug-14	8.9752	8.0560	7.9111	07-Nov-14	9.0315	8.1145	7.9990
25-Aug-14	8.9792	8.0570	7.9187	10-Nov-14	9.0340	8.1215	7.9986
26-Aug-14	8.9815	8.0492	7.9179	11-Nov-14	9.0310	8.1154	7.9909
27-Aug-14	8.9907	8.0786	7.9360	12-Nov-14	9.0348	8.1269	7.9959
28-Aug-14	8.9975	8.0836	7.9502	13-Nov-14	9.0396	8.1356	8.0072
01-Sep-14	9.0014	8.0906	7.9568	14-Nov-14	9.0391	8.1446	8.0119

Date				Date			
17-Nov-14	9.0339	8.1245	8.0080	21-Jan-15	9.0950	8.1476	8.0532
18-Nov-14	9.0362	8.1202	8.0029	22-Jan-15	9.0954	8.1503	8.0535
19-Nov-14	9.0452	8.1205	7.9954	23-Jan-15	9.0997	8.1571	8.0560
20-Nov-14	9.0514	8.1273	7.9912	27-Jan-15	9.0835	8.1560	8.0553
21-Nov-14	9.0435	8.1059	7.9716	28-Jan-15	9.0822	8.1652	8.0701
24-Nov-14	9.0450	8.1139	7.9844	29-Jan-15	9.0776	8.1523	8.0679
25-Nov-14	9.0471	8.1202	7.9880	30-Jan-15	9.0738	8.1467	8.0618
26-Nov-14	9.0582	8.1369	7.9906	02-Feb-15	9.0724	8.1244	8.0514
27-Nov-14	9.0544	8.1327	7.9792	03-Feb-15	9.0666	8.1124	8.0389
28-Nov-14	9.0507	8.1443	7.9931	04-Feb-15	9.0509	8.0886	8.0256
01-Dec-14	9.0522	8.1547	8.0078	05-Feb-15	9.0555	8.0947	8.0249
02-Dec-14	9.0554	8.1572	8.0133	06-Feb-15	9.0627	8.1211	8.0367
03-Dec-14	9.0523	8.1482	8.0072	09-Feb-15	9.0724	8.1331	8.0482
04-Dec-14	9.0405	8.1337	8.0020	10-Feb-15	9.0831	8.1420	8.0499
05-Dec-14	9.0289	8.1089	7.9815	11-Feb-15	9.0836	8.1344	8.0498
08-Dec-14	9.0307	8.1222	7.9954	12-Feb-15	9.0903	8.1399	8.0598
09-Dec-14	9.0232	8.1107	7.9920	13-Feb-15	9.0933	8.1429	8.0609
10-Dec-14	9.0148	8.0928	7.9736	16-Feb-15	9.0863	8.1462	8.0596
11-Dec-14	9.0143	8.0853	7.9710	18-Feb-15	9.0774	8.1319	8.0464
12-Dec-14	8.9956	8.0553	7.9301	19-Feb-15	9.0782	8.1295	8.0448
15-Dec-14	8.9909	8.0486	7.9157	20-Feb-15	9.0788	8.1304	8.0418
16-Dec-14	9.0069	8.0859	7.9516	23-Feb-15	9.0692	8.1177	8.0370
17-Dec-14	9.0150	8.0923	7.9508	24-Feb-15	9.0876	8.1434	8.0552
18-Dec-14	9.0269	8.1023	7.9684	25-Feb-15	9.0940	8.1428	8.0468
19-Dec-14	9.0200	8.0907	7.9635	26-Feb-15	9.1002	8.1604	8.0697
22-Dec-14	9.0087	8.0918	7.9654	27-Feb-15	9.1046	8.1715	8.0844
23-Dec-14	9.0120	8.0995	7.9683	28-Feb-15	9.0963	8.1489	8.0701
24-Dec-14	9.0175	8.1097	7.9732	02-Mar-15	9.0980	8.1542	8.0724
26-Dec-14	9.0178	8.1150	7.9814	03-Mar-15	9.0776	8.1400	8.0568
29-Dec-14	9.0219	8.1207	7.9985	04-Mar-15	9.0725	8.1412	8.0603
30-Dec-14	9.0221	8.1223	8.0150	05-Mar-15	9.0711	8.1370	8.0597
31-Dec-14	9.0354	8.1300	8.0238	09-Mar-15	9.0798	8.1585	8.0727
Date	9.0334	8.1330	8.0259	10-Mar-15	9.0651	8.1357	8.0571
01-Jan-15	9.0030	8.0925	7.9887	11-Mar-15	9.0634	8.1335	8.0564
02-Jan-15	8.9999	8.0899	7.9933	12-Mar-15	9.0738	8.1450	8.0615
05-Jan-15	9.0161	8.1142	8.0118	13-Mar-15	9.0695	8.1484	8.0668
06-Jan-15	9.0221	8.1140	8.0098	16-Mar-15	9.0635	8.1402	8.0545
07-Jan-15	9.0268	8.1253	8.0192	17-Mar-15	9.0561	8.1227	8.0289
08-Jan-15	9.0239	8.1195	8.0227	18-Mar-15	9.0538	8.1185	8.0172
09-Jan-15	9.0213	8.1145	8.0163	19-Mar-15	9.0529	8.1149	8.0151
12-Jan-15	9.0471	8.1320	8.0386	20-Mar-15	9.0514	8.1130	8.0066
13-Jan-15	9.0494	8.1391	8.0437	23-Mar-15	9.0291	8.1034	7.9950
14-Jan-15	9.0538	8.1419	8.0506	24-Mar-15	9.0290	8.1050	7.9987
15-Jan-15	9.0706	8.1440	8.0517	25-Mar-15	9.0469	8.1249	8.0284
16-Jan-15	9.0745	8.1458	8.0461	26-Mar-15	9.0468	8.1238	8.0399
19-Jan-15	9.0781	8.1436	8.0495	27-Mar-15	9.0579	8.1377	8.0621
20-Jan-15	9.0865	8.1464	8.0435	30-Mar-15	9.0665	8.1387	8.0865

31-Mar-15	9.0665	8.1489	8.1054	10-Jun-15	8.9889	8.0389	7.9479
01-Apr-15	9.0727	8.1554	8.1151	11-Jun-15	8.9931	8.0453	7.9557
06-Apr-15	9.0800	8.1605	8.1152	12-Jun-15	8.9986	8.0547	7.9676
07-Apr-15	9.0803	8.1733	8.1152	15-Jun-15	9.0088	8.0623	7.9798
08-Apr-15	9.0864	8.1773	8.1205	16-Jun-15	9.0149	8.0721	7.9773
09-Apr-15	9.0768	8.1677	8.1137	17-Jun-15	9.0304	8.0896	7.9993
10-Apr-15	9.0718	8.1573	8.0996	18-Jun-15	9.0338	8.0966	8.0001
13-Apr-15	9.0602	8.1475	8.0910	19-Jun-15	9.0313	8.0794	7.9936
15-Apr-15	9.0417	8.1223	8.0652	22-Jun-15	9.0357	8.0864	7.9973
16-Apr-15	9.0333	8.1163	8.0608	23-Jun-15	9.0337	8.0856	8.0045
17-Apr-15	9.0395	8.1205	8.0580	24-Jun-15	9.0262	8.0673	7.9828
20-Apr-15	9.0358	8.1164	8.0560	25-Jun-15	9.0322	8.0748	7.9950
21-Apr-15	9.0246	8.0918	8.0283	26-Jun-15	9.0423	8.0948	8.0121
22-Apr-15	9.0136	8.0691	7.9914	29-Jun-15	9.0413	8.1014	8.0236
23-Apr-15	9.0223	8.0853	8.0147	30-Jun-15	9.0460	8.0995	8.0235
24-Apr-15	9.0167	8.0878	8.0193	01-Jul-15	9.0504	8.1158	8.0370
27-Apr-15	9.0096	8.0916	8.0156	02-Jul-15	9.0491	8.1237	8.0484
28-Apr-15	9.0279	8.1198	8.0397	03-Jul-15	9.0316	8.1059	8.0295
29-Apr-15	9.0270	8.1195	8.0464	06-Jul-15	9.0274	8.1088	8.0310
30-Apr-15	8.9992	8.0759	8.0020	07-Jul-15	9.0313	8.1093	8.0387
04-May-15	8.9943	8.0530	7.9822	08-Jul-15	9.0431	8.1224	8.0531
05-May-15	9.0109	8.0727	8.0052	09-Jul-15	9.0424	8.1269	8.0589
06-May-15	9.0270	8.0962	8.0177	10-Jul-15	9.0506	8.1274	8.0617
07-May-15	9.0029	8.0693	7.9860	13-Jul-15	9.0605	8.1381	8.0631
08-May-15	9.0162	8.0841	7.9995	14-Jul-15	9.0607	8.1424	8.0725
11-May-15	9.0148	8.1024	8.0124	15-Jul-15	9.0599	8.1458	8.0751
12-May-15	9.0195	8.1019	8.0106	16-Jul-15	9.0513	8.1270	8.0554
13-May-15	9.0328	8.1143	8.0226	17-Jul-15	9.0634	8.1431	8.0671
14-May-15	9.0319	8.1143	8.0282	20-Jul-15	9.0583	8.1485	8.0791
15-May-15	9.0388	8.1159	8.0259	21-Jul-15	9.0504	8.1372	8.0702
18-May-15	9.0385	8.1138	8.0243	22-Jul-15	9.0313	8.1176	8.0511
19-May-15	9.0430	8.1122	8.0210	23-Jul-15	9.0285	8.1156	8.0473
20-May-15	9.0324	8.1118	8.0208	24-Jul-15	9.0330	8.1225	8.0583
21-May-15	9.0287	8.1113	8.0151	27-Jul-15	9.0386	8.1365	8.0711
22-May-15	9.0282	8.1142	8.0142	28-Jul-15	9.0517	8.1443	8.0830
25-May-15	9.0263	8.1151	8.0153	29-Jul-15	9.0529	8.1550	8.0922
26-May-15	9.0400	8.1232	8.0304	30-Jul-15	9.0498	8.1683	8.1004
27-May-15	9.0400	8.1221	8.0305	31-Jul-15	9.0558	8.1710	8.1036
28-May-15	9.0163	8.0936	8.0057	03-Aug-15	9.0582	8.1732	8.0994
29-May-15	9.0039	8.0709	7.9711	04-Aug-15	9.0554	8.1719	8.0966
01-Jun-15	9.0034	8.0663	7.9684	05-Aug-15	9.0508	8.1630	8.0868
02-Jun-15	9.0014	8.0680	7.9688	06-Aug-15	9.0434	8.1476	8.0679
03-Jun-15	8.9927	8.0457	7.9507	07-Aug-15	9.0300	8.1204	8.0390
04-Jun-15	8.9900	8.0458	7.9409	10-Aug-15	9.0307	8.1137	8.0241
05-Jun-15	9.0026	8.0566	7.9529	11-Aug-15	9.0500	8.1369	8.0455
08-Jun-15	8.9829	8.0337	7.9372	12-Aug-15	9.0451	8.1438	8.0476
09-Jun-15	8.9851	8.0355	7.9366	13-Aug-15	9.0439	8.1500	8.0647

14-Aug-15	9.0473	8.1446	8.0617	26-Oct-15	9.0011	8.1100	7.9894
17-Aug-15	9.0327	8.1209	8.0369	27-Oct-15	8.9954	8.1039	7.9776
18-Aug-15	9.0240	8.1148	8.0272	28-Oct-15	8.9935	8.1019	7.9778
19-Aug-15	8.9630	7.9995	7.9096	29-Oct-15	8.9948	8.1036	7.9825
20-Aug-15	8.9722	8.0251	7.9314	30-Oct-15	8.9922	8.1018	7.9804
21-Aug-15	8.9608	8.0247	7.9422	02-Nov-15	8.9816	8.0813	7.9576
24-Aug-15	8.9808	8.0553	7.9702	03-Nov-15	8.9815	8.0742	7.9523
25-Aug-15	8.9874	8.0542	7.9706	04-Nov-15	8.9765	8.0874	7.9638
26-Aug-15	8.9836	8.0510	7.9677	05-Nov-15	8.9597	8.0725	7.9477
27-Aug-15	8.9601	8.0223	7.9394	06-Nov-15	8.9651	8.0805	7.9638
28-Aug-15	8.9512	8.0153	7.9372	09-Nov-15	8.9570	8.0772	7.9534
31-Aug-15	8.9648	8.0287	7.9556	10-Nov-15	8.9627	8.0880	7.9614
01-Sep-15	8.9431	8.0006	7.9212	11-Nov-15	8.9667	8.0956	7.9678
02-Sep-15	8.9305	7.9852	7.9031	13-Nov-15	8.9531	8.0818	7.9575
03-Sep-15	8.9474	8.0033	7.9189	16-Nov-15	8.9673	8.0941	7.9736
04-Sep-15	8.9643	8.0271	7.9388	17-Nov-15	8.9691	8.1054	7.9789
07-Sep-15	8.9604	8.0269	7.9364	18-Nov-15	8.9682	8.1087	7.9825
08-Sep-15	8.9605	8.0271	7.9428	19-Nov-15	8.9659	8.1093	7.9914
09-Sep-15	8.9711	8.0466	7.9533	20-Nov-15	8.9726	8.1187	7.9962
10-Sep-15	8.9656	8.0380	7.9457	23-Nov-15	8.9800	8.1276	7.9976
11-Sep-15	8.9745	8.0368	7.9374	24-Nov-15	8.9791	8.1333	8.0044
14-Sep-15	8.9849	8.0450	7.9449	26-Nov-15	8.9815	8.1387	8.0127
15-Sep-15	8.9843	8.0630	7.9597	27-Nov-15	8.9786	8.1350	8.0115
16-Sep-15	8.9634	8.0450	7.9448	30-Nov-15	8.9701	8.1289	8.0088
18-Sep-15	8.9678	8.0550	7.9509	01-Dec-15	8.9596	8.1185	7.9909
21-Sep-15	8.9706	8.0584	7.9556	02-Dec-15	8.9574	8.1176	7.9952
22-Sep-15	8.9613	8.0565	7.9581	03-Dec-15	8.9492	8.0992	7.9773
23-Sep-15	8.9674	8.0564	7.9641	04-Dec-15	8.9375	8.0775	7.9513
24-Sep-15	8.9808	8.0713	7.9764	07-Dec-15	8.9468	8.0915	7.9625
28-Sep-15	8.9810	8.0713	7.9758	08-Dec-15	8.9373	8.0756	7.9581
29-Sep-15	9.0020	8.0944	7.9961	09-Dec-15	8.9425	8.0780	7.9646
30-Sep-15	9.0061	8.1036	8.0029	10-Dec-15	8.9491	8.0830	7.9738
01-Oct-15	9.0091	8.1061	8.0029	11-Dec-15	8.9556	8.0889	7.9789
05-Oct-15	9.0032	8.1004	7.9960	14-Dec-15	8.9675	8.1080	8.0018
06-Oct-15	9.0106	8.1016	7.9936	15-Dec-15	8.9570	8.1065	8.0004
07-Oct-15	9.0050	8.1028	7.9977	16-Dec-15	8.9663	8.1150	8.0094
08-Oct-15	9.0035	8.1082	8.0092	17-Dec-15	8.9601	8.1075	8.0079
09-Oct-15	9.0006	8.1079	8.0044	18-Dec-15	8.9703	8.1129	8.0154
12-Oct-15	9.0094	8.1162	8.0022	21-Dec-15	8.9697	8.1217	8.0254
13-Oct-15	9.0165	8.1218	8.0047	22-Dec-15	8.9778	8.1245	8.0283
14-Oct-15	9.0210	8.1271	8.0110	23-Dec-15	8.9783	8.1283	8.0267
15-Oct-15	9.0194	8.1313	8.0103	24-Dec-15	8.9741	8.1288	8.0264
16-Oct-15	9.0182	8.1258	8.0052	28-Dec-15	8.9805	8.1360	8.0360
19-Oct-15	9.0235	8.1260	8.0011	29-Dec-15	8.9826	8.1525	8.0484
20-Oct-15	9.0192	8.1187	7.9919	30-Dec-15	8.9608	8.1389	8.0359
21-Oct-15	9.0159	8.1219	7.9965	31-Dec-15	8.9599	8.1503	8.0425
23-Oct-15	9.0084	8.1162	7.9958	Date	8.9543	8.1448	8.0369

01-Jan-16	8.9317	8.1063	7.9986	10-Mar-16	8.9225	8.0054	7.8474
04-Jan-16	8.9361	8.1203	8.0107	11-Mar-16	8.9243	8.0074	7.8551
05-Jan-16	8.9311	8.1144	8.0017	14-Mar-16	8.9365	8.0210	7.8609
06-Jan-16	8.9240	8.1025	7.9931	15-Mar-16	8.9495	8.0392	7.8785
07-Jan-16	8.9309	8.0852	7.9668	16-Mar-16	8.9509	8.0474	7.8809
08-Jan-16	8.9276	8.0671	7.9454	17-Mar-16	8.9511	8.0503	7.8820
11-Jan-16	8.9143	8.0220	7.9002	18-Mar-16	8.9379	8.0348	7.8593
12-Jan-16	8.9026	7.9905	7.8462	21-Mar-16	8.9355	8.0335	7.8553
13-Jan-16	8.9140	8.0094	7.8673	22-Mar-16	8.9535	8.0565	7.8767
14-Jan-16	8.8969	7.9824	7.8450	23-Mar-16	8.9540	8.0711	7.8840
15-Jan-16	8.8924	7.9878	7.8492	28-Mar-16	8.9507	8.0786	7.8997
18-Jan-16	8.9123	8.0202	7.8741	29-Mar-16	8.9566	8.0764	7.9051
19-Jan-16	8.9141	8.0225	7.8835	30-Mar-16	8.9363	8.0534	7.8818
20-Jan-16	8.9143	8.0313	7.8859	31-Mar-16	8.9378	8.0613	7.8929
21-Jan-16	8.9126	8.0271	7.8864	01-Apr-16	8.9288	8.0521	7.8887
22-Jan-16	8.9311	8.0370	7.9014	04-Apr-16	8.9300	8.0614	7.8983
25-Jan-16	8.9301	8.0347	7.9112	05-Apr-16	8.9453	8.0775	7.9091
27-Jan-16	8.9167	8.0211	7.8912	06-Apr-16	8.9501	8.0885	7.9211
28-Jan-16	8.9041	7.9949	7.8603	07-Apr-16	8.9683	8.1027	7.9319
29-Jan-16	8.9098	7.9867	7.8463	08-Apr-16	8.9765	8.1128	7.9460
01-Feb-16	8.9212	8.0141	7.8664	11-Apr-16	8.9765	8.1187	7.9571
02-Feb-16	8.9075	8.0105	7.8717	12-Apr-16	8.9761	8.1117	7.9529
03-Feb-16	8.8954	7.9899	7.8555	13-Apr-16	8.9745	8.1161	7.9519
04-Feb-16	8.8840	7.9782	7.8316	18-Apr-16	8.9689	8.1156	7.9452
05-Feb-16	8.8503	7.9193	7.7696	20-Apr-16	8.9825	8.1275	7.9504
08-Feb-16	8.8509	7.9097	7.7521	21-Apr-16	8.9847	8.1277	7.9559
09-Feb-16	8.8767	7.9537	7.7961	22-Apr-16	8.9679	8.1076	7.9481
10-Feb-16	8.8605	7.9219	7.7698	25-Apr-16	8.9682	8.1071	7.9443
11-Feb-16	8.8690	7.9309	7.7716	26-Apr-16	8.9626	8.1141	7.9475
12-Feb-16	8.8807	7.9365	7.7786	27-Apr-16	8.9551	8.1025	7.9446
15-Feb-16	8.8833	7.9399	7.7881	28-Apr-16	8.9498	8.0894	7.9267
16-Feb-16	8.8866	7.9455	7.7954	29-Apr-16	8.9536	8.0895	7.9282
17-Feb-16	8.8692	7.9305	7.7802	02-May-16	8.9533	8.0982	7.9347
18-Feb-16	8.8563	7.9228	7.7669	03-May-16	8.9703	8.1118	7.9509
19-Feb-16	8.8495	7.9037	7.7516	04-May-16	8.9731	8.1085	7.9512
22-Feb-16	8.8579	7.9063	7.7468	05-May-16	8.9681	8.1060	7.9479
23-Feb-16	8.8518	7.9087	7.7469	06-May-16	8.9747	8.1128	7.9580
24-Feb-16	8.8849	7.9448	7.7878	09-May-16	8.9638	8.1091	7.9555
25-Feb-16	8.9050	7.9745	7.8165	10-May-16	8.9696	8.1108	7.9550
26-Feb-16	8.9194	7.9882	7.8336	11-May-16	8.9734	8.1136	7.9603
29-Feb-16	8.9207	8.0014	7.8381	12-May-16	8.9708	8.1152	7.9609
01-Mar-16	8.9207	8.0039	7.8461	13-May-16	8.9597	8.0966	7.9524
02-Mar-16	8.9269	8.0148	7.8530	16-May-16	8.9554	8.0952	7.9415
03-Mar-16	8.9208	8.0081	7.8503	17-May-16	8.9530	8.0865	7.9325
04-Mar-16	8.9240	8.0095	7.8489	18-May-16	8.9553	8.0802	7.9288
08-Mar-16	8.9278	8.0117	7.8539	19-May-16	8.9790	8.0964	7.9357
09-Mar-16	8.9174	8.0091	7.8499	20-May-16	8.9959	8.1116	7.9449

23-May-16	9.0066	8.1229	7.9598	28-Jul-16	9.0531	8.1921	8.0567
24-May-16	9.0093	8.1279	7.9637	29-Jul-16	9.0538	8.1985	8.0628
25-May-16	9.0070	8.1245	7.9629	01-Aug-16	9.0691	8.2158	8.0790
26-May-16	9.0094	8.1165	7.9630	02-Aug-16	9.0724	8.2225	8.0900
27-May-16	9.0142	8.1225	7.9628	03-Aug-16	9.0686	8.2181	8.0824
30-May-16	9.0144	8.1120	7.9583	04-Aug-16	9.0566	8.2037	8.0647
31-May-16	9.0120	8.1170	7.9613	05-Aug-16	9.0586	8.2057	8.0617
01-Jun-16	9.0200	8.1261	7.9747	08-Aug-16	9.0679	8.2072	8.0654
02-Jun-16	9.0208	8.1356	7.9892	09-Aug-16	9.0645	8.2136	8.0714
03-Jun-16	9.0123	8.1309	7.9909	10-Aug-16	9.0623	8.2205	8.0779
06-Jun-16	9.0082	8.1270	7.9892	11-Aug-16	9.0680	8.2268	8.0877
07-Jun-16	9.0009	8.1201	7.9857	12-Aug-16	9.0673	8.2385	8.0938
08-Jun-16	9.0007	8.1297	7.9943	16-Aug-16	9.0629	8.2292	8.0909
09-Jun-16	9.0127	8.1365	8.0021	17-Aug-16	9.0633	8.2349	8.0947
10-Jun-16	9.0046	8.1301	8.0022	18-Aug-16	9.0653	8.2422	8.1010
13-Jun-16	9.0082	8.1310	8.0101	19-Aug-16	9.0586	8.2381	8.0892
14-Jun-16	9.0166	8.1377	8.0129	22-Aug-16	9.0563	8.2415	8.0888
15-Jun-16	9.0143	8.1384	8.0157	23-Aug-16	9.0604	8.2481	8.0872
16-Jun-16	9.0123	8.1316	8.0076	24-Aug-16	9.0762	8.2608	8.0985
17-Jun-16	9.0204	8.1325	8.0054	25-Aug-16	9.0809	8.2660	8.1025
20-Jun-16	8.9982	8.1161	7.9797	26-Aug-16	9.0796	8.2600	8.0947
21-Jun-16	8.9990	8.1265	7.9977	29-Aug-16	9.0836	8.2723	8.1070
22-Jun-16	9.0031	8.1355	8.0028	30-Aug-16	9.0986	8.2824	8.1158
23-Jun-16	9.0124	8.1469	8.0184	31-Aug-16	9.0958	8.2876	8.1277
24-Jun-16	9.0225	8.1585	8.0376	01-Sep-16	9.0997	8.2949	8.1431
27-Jun-16	9.0274	8.1714	8.0446	02-Sep-16	9.0901	8.2880	8.1323
28-Jun-16	9.0325	8.1833	8.0605	06-Sep-16	9.0729	8.2506	8.0960
29-Jun-16	9.0283	8.1829	8.0631	07-Sep-16	9.0741	8.2752	8.1189
30-Jun-16	9.0286	8.1757	8.0619	08-Sep-16	9.0760	8.2752	8.1216
01-Jul-16	9.0268	8.1702	8.0570	09-Sep-16	9.0802	8.2742	8.1245
04-Jul-16	9.0440	8.1821	8.0684	12-Sep-16	9.0835	8.2846	8.1325
05-Jul-16	9.0503	8.1876	8.0762	14-Sep-16	9.0798	8.2773	8.1327
07-Jul-16	9.0501	8.1773	8.0622	15-Sep-16	9.0799	8.2734	8.1328
08-Jul-16	9.0554	8.1836	8.0718	16-Sep-16	9.0901	8.2919	8.1459
11-Jul-16	9.0527	8.1740	8.0609	19-Sep-16	9.0861	8.2942	8.1496
12-Jul-16	9.0488	8.1646	8.0566	20-Sep-16	9.0737	8.2877	8.1431
13-Jul-16	9.0512	8.1632	8.0573	21-Sep-16	9.0718	8.2858	8.1406
14-Jul-16	9.0555	8.1780	8.0662	22-Sep-16	9.0763	8.3045	8.1524
15-Jul-16	9.0490	8.1677	8.0681	23-Sep-16	9.0585	8.2579	8.0925
18-Jul-16	9.0527	8.1813	8.0710	26-Sep-16	9.0608	8.2839	8.1201
19-Jul-16	9.0637	8.1946	8.0827	27-Sep-16	9.0754	8.3127	8.1548
20-Jul-16	9.0584	8.1871	8.0721	28-Sep-16	9.0790	8.3214	8.1598
21-Jul-16	9.0614	8.1929	8.0766	29-Sep-16	9.0761	8.3312	8.1651
22-Jul-16	9.0672	8.1997	8.0877	30-Sep-16	9.0722	8.3240	8.1555
25-Jul-16	9.0640	8.2116	8.0840	03-Oct-16	9.0708	8.3266	8.1562
26-Jul-16	9.0638	8.2177	8.0816	04-Oct-16	9.0721	8.3274	8.1570
27-Jul-16	9.0622	8.2123	8.0732	05-Oct-16	9.0564	8.3076	8.1410

06-Oct-16	9.0576	8.3178	8.1483	15-Dec-16	8.9948	8.2023	8.0112
07-Oct-16	9.0502	8.3006	8.1437	16-Dec-16	8.9846	8.1888	7.9993
10-Oct-16	9.0685	8.3198	8.1609	19-Dec-16	8.9854	8.1885	7.9994
13-Oct-16	9.0664	8.3191	8.1663	20-Dec-16	8.9757	8.1595	7.9754
14-Oct-16	9.0710	8.3242	8.1739	21-Dec-16	8.9913	8.1788	7.9973
17-Oct-16	9.0703	8.3302	8.1768	22-Dec-16	8.9915	8.1821	8.0061
18-Oct-16	9.0721	8.3295	8.1800	23-Dec-16	9.0001	8.2003	8.0178
19-Oct-16	9.0701	8.3309	8.1807	26-Dec-16	9.0102	8.2058	8.0279
20-Oct-16	9.0613	8.3202	8.1681				
21-Oct-16	9.0613	8.3077	8.1597				
24-Oct-16	9.0639	8.3186	8.1717				
25-Oct-16	9.0625	8.3212	8.1791				
26-Oct-16	9.0626	8.3220	8.1760				
27-Oct-16	9.0495	8.2975	8.1493				
28-Oct-16	9.0460	8.2829	8.1389				
30-Oct-16	9.0400	8.2661	8.1184				
01-Nov-16	9.0475	8.2768	8.1358				
02-Nov-16	9.0529	8.2807	8.1420				
03-Nov-16	9.0398	8.2572	8.1027				
04-Nov-16	9.0508	8.2841	8.1250				
07-Nov-16	9.0236	8.2403	8.0840				
08-Nov-16	9.0007	8.2007	8.0218				
09-Nov-16	9.0011	8.2019	8.0246				
10-Nov-16	8.9971	8.2001	8.0183				
11-Nov-16	8.9964	8.2026	8.0195				
15-Nov-16	8.9783	8.1669	7.9828				
16-Nov-16	8.9875	8.1807	7.9952				
17-Nov-16	8.9914	8.1900	8.0114				
18-Nov-16	8.9829	8.1791	8.0069				
21-Nov-16	9.0014	8.1995	8.0263				
22-Nov-16	9.0029	8.2055	8.0347				
23-Nov-16	9.0048	8.2132	8.0432				
24-Nov-16	9.0149	8.2295	8.0595				
25-Nov-16	9.0110	8.2159	8.0456				
28-Nov-16	8.9980	8.1982	8.0306				
29-Nov-16	9.0032	8.2070	8.0310				
30-Nov-16	9.0049	8.2138	8.0412				
01-Dec-16	8.9999	8.2093	8.0318				
02-Dec-16	9.0176	8.2277	8.0489				
05-Dec-16	9.0194	8.2387	8.0572				
06-Dec-16	9.0083	8.2223	8.0451				
07-Dec-16	9.0145	8.2232	8.0431				
08-Dec-16	9.0097	8.2170	8.0335				
09-Dec-16	9.0062	8.2227	8.0383				
12-Dec-16	9.0045	8.2184	8.0291				
13-Dec-16	9.0002	8.2180	8.0242				
14-Dec-16	8.9974	8.2011	8.0092				

TESTING THE IMPACT OF COMPETITION ON RISK OF INDIAN COMMERCIAL BANKS: A COMPARATIVE STUDY

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Abstract:

The present paper is a comparative investigation of the impact of bank competition on risk of public sector and private sector banks in India after controlling relevant bank specific and macroeconomic variables. Secondary data on listed public sector and private sectors banks in India are collected from 'Capitaline Plus' corporate database for a period of 16 years from 2000 to 2015. Employing alternative measures of bank risk and competition, the study finds that the influence of competition on risk is negative for public sector banks, which supports the competition stability view. However, in case of private sector banks quite opposite results are found, supporting competition fragility view. This result is expected as both the bank groups have different levels of competition. While the degree of competition is more for public sector banks, the market structure is relatively more concentrated within private sector banks.

Key Words:

Bank Risk; Banking Competition; Financial Stability; Public Sector Banks; Private Sector Banks.

The Institute of Cost Accountants of India

1. Introduction

In recent years, banking sector in India has gone through tremendous changes due to growing competition and dynamic operating environment which escalate various types of risk such as market risk, operational risk, liquidity risk etc along with the credit risk. One of the crucial pillars of sound economy is the stability of its banking sector. Competition is an important factor which is of great concern for the banking sector because of it has direct effects on their financial stability. But the existing literature supports two extreme views about the association between competition and bank risk. *Competition fragility* view (franchise-value framework) states that competitive market structure compels banks to undertake higher risk in order to increase their shareholders return as competition deteriorate not only the profits of banks but their number of customers as well (Keeley, 1990; Demsetz *et al.*, 1996). Therefore, there is an inverse relationship between competition and stability or the association between competition and bank risk is positive. On the other hand, Boyd and Nicolo (2005) have proposed a contrasting view known as *competition stability* view (risk-shifting paradigm) which states that less competition among banks in the market place could result in higher interest rate charges on bank loans, which may increase the credit risk of borrowers as a result of moral hazard and adverse selection problem. This view, thus, states that competition and bank risk are inversely associated.

Like the contrasting theoretical views, empirical literature suggests that there is a positive (Berger *et al.*, 2009; Beck *et al.*, 2013) as well as negative association (Boyd and Nicolo, 2005; Agoraki *et al.*, 2011; Kick

and Prieto, 2015) between bank competition and risk. Nevertheless, some researchers also observe non-linear association between competition and risk (Martinez-Miera and Repullo, 2008; Tabak *et al.*, 2012). Thus, neither theory nor the empirical studies provide sufficient conclusive evidence whether bank competition can reduce the risk of banks. |Further, the empirical studies are mostly confined to developed countries. In Indian context, studies are very limited. Against this backdrop, the present study is a modest attempt to investigate the impact of market competition on the risk of Indian public sector and private sector banks. This comparative study is expected to prove some insight about the degree of completion between the two banks groups and their impact on bank risk. Instead of formulating any hypothesis, the study intents to generate the role of competition based on empirical findings. The remaining part of this paper is organized as follows. Section 2 provides detail review of empirical literature. Section 3 is devoted for data and methodology adopted in this study. Results and discussion are presented in section 4 followed by concluding remarks in section 5.

2. Literature Review

High competition in the banking sector is a crucial issue in the literature due to its direct impact on bank's financial stability. Most of the literature has employed both structural and non-structural measures of bank competition. Structural measures of bank competition are based on *Structure Conduct Performance* (SCP) model which assume that market structure affects banks' behaviour, which ultimately influences their performance. Two widely used structural measures of competition are Hirschman-Herfindahl Index (HHI) and concentration

ratios (CRn) (Bikker and Haff, 2002, Uddin and Suzuki, 2014). On the other hand, non-structural measures are based on New Empirical Industrial Organization (NEIO) approach which states that the competitive behaviour is directly revealed by the firms, and does not depends on the market structure. Panzar-Rosse H-statistics, Lerner index and Boone indicator are most commonly used non-structural measures (Claessens and Laeven, 2004; Sarkar and Sensarma, 2015).

Competition has both positive as well as negative effects on banking system. Higher competition may leads to innovation, better quality financial products and better prices for the individual customer and the society as a whole. Therefore, competition strengthens the financial soundness which ultimately enhances the solvency of the banks. Hence, higher competition leads to stability of banks (lower risk) which is consistent with the 'competition stability' view (Boyd and Nicolo, 2005). On the other hand, 'competition fragility' view states that higher competition affects the solvency of banks, which may ultimately leads to financial instability (higher risk). Therefore, an inverse relationship exists between competition and stability (Keeley, 1990; Demsetz et al., 1996). Interestingly, some empirical literature also suggests non-linear association between competition and bank risk (Martinez-Miera and Repullo, 2008). They observe that banks return on assets depend on the degree of competition in the loan market and the riskiness of banks assets depends on the behaviour of borrowers. They have observed that the relation between competition and stability can be 'U-shaped', i.e. as the number of banks increases, the probability of bank default first declines but increases beyond a certain point.

The empirical literature on the association between competition and bank risk are summarized in tables 1, 2 and 3.

Table 1: Summary of studies on competition and risk in Developed countries

Authors	Sample	Model	Results
Competition-fragility view			
Ruiz-Porras (2008)	47 countries during 1990-1997	OLS and Panel data regression	Supports *Competition- fragility* view.
Berger et al. (2009)	8235 banks from 23 developed countries	GMM	Consistent with the traditional *competition-fragility* view.
Beck *et al.* (2013)	US banks during 1994-2009	Panel data regression	Support the competition-fragility view.
Titko *et al.,* (2015)	16 Latvian banks during 2007-2013	OLS and Panel data regression	Indicates *competition fragility*.
Competition-stability view			
Boyd *et al.,* (2006)	2,500 U.S. banks in 2003	Panel data regression	Supports *competition-stability* view.
Agoraki *et al.,* (2011)	banks in Central European countries during 1998-2005	GMM & Panel data regression	Market power has a negative impact on bank risk
Kick and	German banks during	OLS and Panel	Negative relationship between

		data regression	market competition and the level of bank risk
Prieto (2015)	1994-2010		
Davis and Karim (2013)	27 EU countries during 1998-2012	GLS	In long run, the impact of competition on bank risk is found to be negative
Notes: OLS is Ordinary Least square technique; GMM is Generalized Methods of Moments; GLS is Generalized least square;			

Table 2: Summary of studies on competition and risk in Emerging countries

Authors	Sample	Model	Results
Competition-fragility view			
Soedarmonoa *et al.,* (2011)	Banks in 11 emerging countries of Asia during 1994-2009	SUR	At the time of crisis, low competition leads to financial stability, which is reverse in case of normal times
Turk Ariss (2010)	821 banks in 60 developing countries during 1999-2005	Panel data regression	Competition has a negative effect on financial stability of banks
Zaghdoudi *et al.,* (2015)	9 Tunisian banks during 1980-2009	Panel data regression	Competition increases risk taking which affects the financial stability of banks.
Competition-stability view			
Yeyati and Micco (2007)	8 Latin American countries	WLS	Competition has negative influence on the risk level of banks
Liu *et al.,* (2012)	four South-East Asian countries during 1998-2008	OLS, Panel data regression and GMM	Consistent with the *competition stability* view.
Amidu and Wolfe (2013)	978 banks in 55 emerging countries 2000-2007	Three-stage-least-squares (3SLS)	Supports the *competition stability* view
Fu et al., (2014)	Banks from 14 Asia Pacific economies during 2003-2010.	Panel data regression and GMM	Competition enhances financial stability of banks.
NOTES: SUR is Seemingly Unrelated Regression; WLS is weighted least square estimate, GLS is Generalized least squares,			

Table 3: Summary of studies with non-linear relationship between competition and risk

Authors	Sample	Model	Results
Tabak *et al.,* (2012)	10 Latin American countries during 2003-2008	Panel data regression	Association between bank competition and risk is non-linear
Jimenez *et al.,* (2013)	Spanish Banking Sector during 1988-2003	GMM	Their empirical results suggest a nonlinear relationship between banking market competition and

			bank risk-taking
Samantas (2016)	Banks in EU countries during 2003-2010	OLS	Non-linear association between market power and bank soundness.
Notes: OLS is Ordinary Least square technique; GMM is Generalized Methods of Moments.			

In India, the empirical evidence relating to this issue is in infant stage although the recent literature indicates the increase in the degree of competition among Indian commercial banks (Maji and Hazarika 2016). Sarkar and Sensarma (2015) have conducted a study to investigate the nexus between competition and stability of select commercial banks in India during 2000-2013. However, the study observes contradictory results based on different definitions of bank risk. On the other hand, the findings of Maji and Hazarika (2016) indicate that competition is inversely associated with the banks' financial soundness. Interestingly, the study observes that degree of competition is more in case of public sector banks as compared to private sector banks. These findings motivate us to examine the influence of competition on the risk of Indian public sector and private sector banks in the absence of any empirical evidence.

3. Research Methodology

3.1 Data and Sample of the Study

The sample of the study is all listed public sector and private sectors banks in India. As on 31st March, 2015, there are 41 commercial banks listed in the Bombay Stock Exchange (BSE), of which one bank is foreign bank and we have excluded from our sample. The final sample, thus, consists of 40 commercial banks out of which 24 are public sector banks and 16 are Indian private sector banks. The primary source of data is 'Capitaline Plus' corporate database. However, we have also collected

information from annual reports of the respective banks and various economic survey reports of the Government of India. The study period is 16 years from 1999-2000 to 2014-15.

3.2 Measurement of bank risk and competition *Bank Risk*

In order to measure risk of Indian banks, credit risk and insolvency risk are considered in the present study.

For measuring **credit risk**, gross non-performing assets (GNPA) ratio is used which is the most commonly used measure of banks' credit risk (Chaibi, and Ftiti, 2015). Thus, the following formula for credit risk is used:

$$GNPA = \left(\frac{\text{Gross NPAs}}{\text{Gross Loans}}\right) \times 100 \qquad \text{... (i)}$$

Insolvency risk of banks has recently been given more importance due to the fact that it takes into consideration the impact of credit risk and other types risks (market risk, operational risk, liquidity risk etc) faced by the banks. As per literature, insolvency risk is measured by Z-statistic suggested by Hannan and Hanweck (1988). Most of the researchers have employed Z-Statistic which explains distance-to-default risk of banks (Barry *et al.*, 2011; Ghosh, 2014). It considers three important components such as banks' return on assets, volatility of return and the capital level. Higher Z Statistic is the indicator of lower insolvency

risk and vice versa. The present study has used the following definition of Z Statistic:

$$Z \, Statistic = \frac{ROA + CAP}{\sigma(ROA)} \qquad \ldots(ii)$$

Where ROA is the return on assets; CAP is the capital to asset ratio and $\sigma(ROA)$ is the volatility of ROA. $\sigma(ROA)$ is the rolling standard deviation of ROA of three consecutive years t, t-1 and t-2.

Bank Competition

The present study has employed both structural and non-structural measures of bank competition. Among the structural measures, Herfindahl– Hirschman Index (HHI) and concentration ratio (CR) are applied, which are widely used in the empirical literature (Yeyati and Micco, 2007; Uddin and Suzuki, 2014). HHI is computed based on total assets with the help of following formula:

$$HHI_D = \sum_{i=1}^{n} S_i^2 \qquad \ldots(1),$$ where, S_i is the market share of bank i in the market and n is the number of banks. In an industry with n banks, the maximum possible value of the HHI is 1, while its minimum possible value is $1/n$. The higher value of HHI indicates greater market concentration or lower level of competition. The interpretation of HHI is:

H < 0.01 indicates a highly competitive index.
H < 0.15 indicates an unconcentrated index.
H is between 0.15 to 0.25 indicates moderate concentration.
H > 0.25 indicates high concentration.

For measuring concentration ratio (CR) we have used five bank concentration ratio based on total deposits by employing the following formula:

$$CR_K = \sum_{i=1}^{K} S_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots.(2)$$

where S_i is the market share of ith largest banks in terms of total assets, total deposits and total loans & advances. Concentration ratio ranges from 0 to 1. CR equals to 0 indicates no concentration or perfect competition. CR ranges from 0 to 0.5 implies low concentration. If the value of CR lies between 0.5 to 0.8, it indicates moderate concentration or oligopoly. Lastly, the CR ranges from 0.8 to 1 is the indicator of high concentration or the movement towards monopoly. Likewise, CR equals to 1 means monopoly.

Apart from structural measures, the present study has applied H – statistic suggested by Panzar and Rosse (1987) a non-structural measures of competition, which is extensively used in empirical literature (Claessens and Laeven, 2004; Sarkar and Sensarma, 2015). H-statistic is derived from the reduced form of revenue equation and indicates the sum of the coefficients of input price factors with respect to the bank's revenue (Yeyati and Micco, 2007; Sarkar and Sensarma, 2015). Following the extant literature, we compute H-statistics employing in the next page model:

$$\ln(R_{it}) = \alpha_i + \beta_1 \ln(W_{1it}) + \beta_2 \ln(W_{2it}) + \beta_3 \ln(W_{3it}) + \gamma_1 \ln(CF_{1it}) + \gamma_2 \ln(CF_{2it}) + \gamma_3 \ln(CF_{3it})$$
$$+ \gamma_4 \ln(CF_{4it}) + \varepsilon_{it} \qquad \dots(3)$$

Where,

R = Total revenue/total assets (proxy for output price of loans and other services and includes total interest revenue, fee income, commission income, and other operating income)

W_1 = Interest expenses/total deposits and money market funding (proxy for input price of deposits)

W_2 = Personnel expenses to total assets (proxy for input price of labor or human resource)

W_3 = Other operating and administrative expense to total assets (proxy for input price of equipment and fixed assets)

CF_1 = Ratio of deposits to deposits and money market funding

CF_2 = Net loans to total assets,

CF_3 = Equity to total assets, and

CF_4 = Bank size, measured as total balance sheet assets.

The H-statistic is sum of input elasticities, i.e. $H = \sum_{i=1}^{n} \beta_i \qquad \dots (iii)$

The interpretation of H-statistic is:
  H ≤ 0 indicates monopoly.
  0 < H <1 indicates monopolistic competition
  H = 1 indicates perfect competition

3.3 Other explanatory variables

Bank profitability (ROA): Return on assets (ROA) has been used as the most common proxy for bank profitability in the literature (Rime, 2001). The present study employed the ratio of operating profit to total assets for measuring profitability. The impact of profitability on bank risk is a controversial issue in the banking literature suggesting both positive as well as negative association (Maji and Hazarika, 2016).

Size (SIZE): Empirical literature suggests that size is an important factor that influences bank's risk levels (Rime, 2001; Ghosh, 2014). Large banks are expected to have lower risk due to risk diversification, economies of scale and better opportunities of managing credit activities through skilled employees. The natural logarithm of total assets is used to measure the bank size in this study.

Loan loss provision (LLP): The existing empirical research suggests mixed result on the association between LLP and bank risk (Rime, 2001).Therefore, the present study uses the definition for LLP as the ratio of loan loss reserve to gross loans.

Human capital efficiency (HCE): In this study, HCE is considered as an explanatory variable due to the importance of human resources in managing bank risk. Many empirical evidences shed light on the significant role of human resources in enhancing the financial performance of banks (Mavridis and Kyrmizoglou, 2005; Ghosh and Maji, 2015).

In order to measure the efficiency of human resources, the present study employs the value added intellectual coefficient (VAIC) model suggested by Pulic (2000) to measure human capital efficiency (HCE), which is widely used in the banking literature on intellectual capital measurement (Mavridis

and Kyrmizoglou, 2005; Ghosh and Maji, 2015). Following the VAIC model, HCE is defined as:

HCE = VA/HC …. (iv), where VA is the difference between output (total revenue generated by a firm during a year) and input (summation of all costs incurred by a firm in generating revenue except employee costs which are treated as value creating entity). Algebraically VA can be expresses as:

VA = NI + T + I + D + A + EC …. (v),

Where, NI is net income after tax; T is corporate tax; I is interest expense; D is depreciation; A is amortization and EC is the employee costs. Human capital (HC) is defined as the overall employee cost during a period. HCE reflects the efficiency of the human capital (HC) in generating added value.

Macroeconomic variables: Many researchers advocate that growth in GDP has a direct impact on the credit risk of banks (Ramanadh and Rajesham, 2013). The present study considers growth in gross domestic factor (GGDP) as the country-specific macroeconomic variable that affect the level of bank risk. The data for GGDP during 2000-2015 are collected from the RBI database and Economic Survey reports.

3.4 Empirical Models

Before formulating any model to examine the impact of bank competition on risk, the study has tested the endogeneity between the two variables employing *Hausman test of endogeneity*. However, the results of Hausman test indicate that there is no endogeneity between the variables. Hence, appropriate panel data regression model is employed in this study. In order to find out the appropriate panel data regression model, the study has undertaken two most widely used tests: Breusch-Pagan test and Hausman test. The results advocate in favour of fixed effects regression model. Thus, the following two models are employed.

$$GNPA_{i,t} = \beta_i + \beta_1 COMPT_{i,t} + \beta_2 ROA_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LLP_{i,t} + \beta_5 HCE_{i,t} + \beta_6 GGDP_{i,t} + \varepsilon_{i,t} \quad \dots (Model\ 1)$$

$$Z\ stat._{i,t} = \beta_i + \beta_1 COMPT_{i,t} + \beta_2 ROA_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LLP_{i,t} + \beta_5 HCE_{i,t} + \beta_6 GGDP_{i,t} + \varepsilon_{i,t} \quad \dots (Model\ 2)$$

As per literature, both HHI and CR are computed on the basis of total assets, total deposits and total loans & advances. In present context, HHI based on total assets and CR based on total deposits is used as the measure of competition in the regression models. Three measures of bank competition and two measures of bank risk ultimately generate six models.

4. Results and Discussion

4.1. Distribution of credit risk

Figure 1 shows the results of box plots of GNPA for Public sector & Private sector banks together. It is evident from the figures that there is a declining trend of GNPA till 2008 for both the bank groups. After 2008, the level of GNPA is increasing in case of

public sector banks and for private sector banks there is no much fluctuation. This suggests that private sector banks are able to control their levels of credit risk after 2008. Further the variability of GNPA is more during 2000 to 2004 for both the bank groups as indicated by the larger size of the box. However, in recent times the dispersion is relatively less for all the cases. It is also seen that the outliers are more in case of public sector banks. Since, all the outliers lie above the maximum point of the box plot indicating some banks with high GNPA.

Figure 1: Box Plot of GNPA for Public & Private Sector Banks
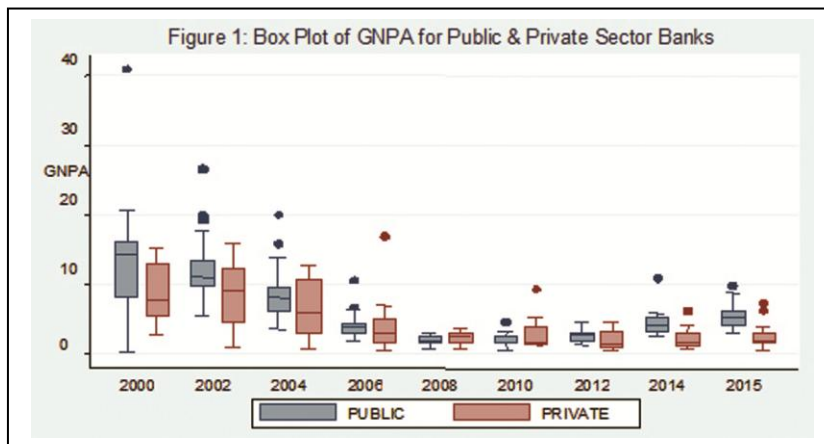
4.2. Distribution of insolvency risk

The box plot of Z Statistics is shown in figure 2 for public and private sector banks together. The plots exhibit fluctuating trend of median values of Z Statistics during the study period and the outliers can be seen most in the year 2000 for all the banks. It is also seen that the median values of Z Statistics in both the bank groups show more fluctuations during the study period. Since Z Statistics indicates distance to insolvency risk, higher Z Statistics implies lower insolvency risk and higher stability. The box plots suggest the consistency in the financial stability is less for both the bank groups. It is also seen that the outliers are more in case of public sector banks as compared to that of the private sector banks. This reveals that there are some public sector banks which have higher as well as low level of financial stability.

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Figure 2: Box Plot of Z Stat for Public & Private Sector Banks
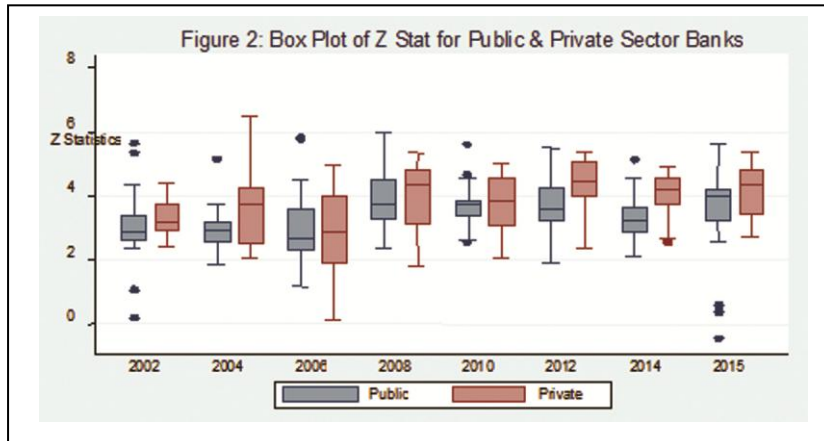
4.3. Degree of competition

Table 4 demonstrates the degree of competition for both public sector and private sector bank by employing different measures of competition. The table reveals that, the observed H statistic is found to be high (0.866) in case of public sector banks as compared to private sector banks (0.535). This indicates that the market structure of Indian public sector banks is highly competitive in nature. However, market competition is relatively less in case private sector banks. Similarly, the average HHI based on total assets is found to be around 0.1 for public sector banks, whereas in case of private sector banks, the average HHI is found to be more than 0.1. The results of HHI, thus, indicate that the market structure of Indian public sector banks is unconcentrated or competitive but it is relatively more concentrated in case of private sector banks. It is also evident from the table that the HHI has declined in the year 2015 as compared to 2000 in case of

public sector banks, which is reverse in case of private sector banks. In case of concentration ratio, the values of CR based on total deposits depict that the degree of concentration in the market of public sector banks is less (more competitive) but in case of private sector banks the degree of concentration is high. While the concentrations ratios have declined in case of public sector banks in 2015 as compared to 2000, the ratios have increased in case of private sector banks. Thus, the observed results clearly demonstrate that the degree of competition is comparatively more in case of Indian public sector banks than that of private sector banks.

Table 4: Degree of competition based on H-statistic, HHI_{TA} and CR_{TD}						
Banks	Measures	2000	2005	2010	2015	Average of 16 years
Public sector banks	H-statistic	---	----	----	----	0.866
	HHI_{TA}	0.119	0.107	0.095	0.094	0.102
	CR_5	0.569	0.536	0.499	0.530	0.529
Private sector banks	H-statistics	---	---	---	---	0.535
	HHI_{TA}	0.091	0.233	0.183	0.173	0.197
	CR_5	0.418	0.645	0.732	0.744	0.663

4.4. Regression results for public sector and private sector banks
Bank competition and credit risk

The regression results for public sector and private sector banks for model 1 are shown in table 5. Three measures of competition are employed in the model, namely H-statistic, HHI based on total assets and CR_5 based on total deposits.

In case of public sector banks, the coefficient of H-statistic is insignificant, but the observed coefficients of other two measures of competition are found to be positive and significant. The positive impact of both HHI and CR on credit risk implies that when concentration increases bank risk is also increases. There is thus an inverse association between competition and bank risk, which supports the '*competition stability*' view. However, in case of private sector banks opposite results are found. The influence of both HHI_{TA} and CR_{TD} are found to be negative and significant. This implies that when concentration increases, bank risk decreases, which supports the '*competition fragility*', view. The observed 'competition stability', view in case of public sector and 'competition fragility' view for private sector are not contradictory rather supports the earlier results. In case of public sector, the distribution of GNPA as discussed earlier indicates that there is a declining trend of

GNPA, which is more pronounced during 2000 to 2008. At the same time, the competition has increased as observed from the assessment of competition employing different measures. Thus, the observed negative association between competition and risk supports the earlier results. However, in case of private sector banks the GNPA has declined over the years during the study period along with decrease in competition. Hence, the observed positive association between competition and risk is quite expected.

In case of other explanatory variables, the influence of ROA on risk is found to be negative for both the bank groups. Likewise, the inverse association between HCE and bank risk is observed to be negative for both the cases. Similarly, the impact of LLP on GNPA is found to be positive and significant for both public sector and private sector banks. In case of bank size also, inverse association is found although the results are not significant for all cases of public sector banks. For GGDP also, the results support the negative influence of GGDP on bank risk. The observed R^2 and F-statistics speaks in favour of the goodness of the fit of the regression model used in the present context.

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Table 5: Regression Results of model 1				
Banks	Variable	H-Stats	HHI$_{TA}$	CR$_{TD}$
		Coefficient	Coefficient	Coefficient
Public sector banks	Constant	0.105 (9.40***)	-0.155 (-7.69***)	-0.632 (-12.36***)
	COMPT	-0.009 (-0.77)	2.268 (14.12***)	1.319 (14.67***)
	ROA	-0.029 (-9.24***)	-0.032 (-12.60***)	-0.028 (-11.36***)
	SIZE	-0.048 (-11.04***)	-0.006 (-1.52)	-0.002 (-0.55)
	LLP	3.247 (11.00***)	2.511 (10.63***)	2.03 (8.43***)
	HCE	-0.001 (-3.83***)	-0.000 (-4.44***)	-0.001 (-4.71***)
	GDP	-0.001 (-1.54)	-0.001 (-1.20)	-0.001 (-1.72**)
R^2		0.6418	0.7764	0.7828
F-statistics		98.55***	190.92***	198.19***
Private sector banks	Constant	0.301 (13.89***)	0.317 (14.37***)	0.365 (16.03***)
	COMPT	0.007 (0.65)	-0.082 (-2.76***)	-0.183 (-5.91***)
	ROA	-1.131 (-5.16***)	-1.147 (-5.54***)	-1.222 (-6.26***)
	SIZE	-0.019 (-11.50***)	-0.019 (-11.97***)	-0.014 (-7.69***)
	LLP	1.336 (6.94***)	1.450 (6.84***)	1.344 (6.78***)
	HCE	-0.001 (-4.70***)	-0.001 (-5.25***)	-0.002 (-6.23***)
	GGDP	-0.004 (-5.23***)	-0.003 (-4.74***)	-0.002 (-3.15***)
R^2		0.6019	0.6154	0.6593
F-statistics		51.41***	54.41***	65.81***

Notes:*** and ** indicate significant at 1% and 5% level respectively; Dependent variable is GNPA.
Panel data test results:
Significant chi-square value of Breusch-Pagan test indicates the appropriateness of random effects model instead of pooled OLS. Again, the significant chi-square value of Hausman test advocates that fixed effects model is more appropriate than random effects model for the present data set. Hence, fixed effects model is employed for both the cases.

Bank competition and insolvency risk

The regression results for public sector as well as private sector banks for model 2 are shown in table 6 using three measures of bank competition- H-statistic, HHI$_{TA}$ and CR5$_{TD}$. The coefficients of H-statistic are found to be positive but not significant for

public sector banks. In case of HHI_{TA} and $CR5_{TD}$, the coefficients are found to be negative and significant for public sector banks. This implies that when concentration increases, solvency decreases. Alternatively, when competition decreases, the insolvency risk increases. There is, thus, an inverse association between competition and insolvency risk of Indian public sector banks, which once again supports the *competition stability* view. On the other hand, the coefficients of HHI_{TA} and $CR5_{TD}$ in case of private sector banks are found to be positive, although the coefficient is significant only in case of HHI_{TA}. The positive association indicates that when concentration increases, stability or solvency is also increases. Alternatively, there is positive association between competition and insolvency risk, which supports *competition fragility* view.

Among the other explanatory variables, the influences of ROA and HCE on Z statistic are found to be positive and significant for both the bank groups. However, the coefficient of LLP is found to be negative and significant in case of public sector banks whereas, it is insignificant in case of private sector banks. This indicates that higher level of loan loss provisions affect the financial stability of public sector banks. Again, GGDP is significantly associated with the Z score in case of public sector banks, but it is insignificant for private sector banks. Similar contradictory results are found in case of bank size. The observed R^2 are quite satisfactory and F-statistic is significant at 1% level for all the cases.

Table 6: Regression Results of model 2				
Banks	**Variable**	**H-Stats**	HHI_{TA}	$CR_{L\&A}$
		Coefficient	*Coefficient*	*Coefficient*
Public sector banks	Constant	2.470 (2.10**)	-5.530 (-1.67**)	9.279 (1.78**)
	COMPT	0.159 (0.95)	-0.362 (-2.61**)	-0.104 (-1.64*)
	ROA	0.225 (2.41**)	0.194 (2.10**)	0.196 (2.10**)
	SIZE	0.012 (0.12)	0.472 (2.30**)	-0.057 (-0.34)
	LLP	-0.329 (-4.48***)	-36.19 (-4.90***)	-0.272 (-3.38***)
	HCE	0.083 (2.92***)	0.063 (2.15**)	0.091 (3.14***)
	GGDP	-1.226 (-1.24)	-1.558 (-1.58)	-0.679 (-0.68)
R^2		0.2429	0.2487	0.2559
F-statistics		15.08***	15.56***	16.16***
Private sector banks	Constant	-1.576 (-1.82**)	0.791 (0.39)	-2.151 (1.66**)
	COMPT	0.086 (0.38)	0.157 (1.62*)	1.552 (0.69)

ROA	0.708	0.715	0.797
	(9.43***)	(9.59***)	(7.88***)
SIZE	0.196	0.118	0.132
	(2.34**)	(1.14)	(0.82)
LLP	5.438	0.975	8.298
	(0.78)	(1.26)	(1.05)
HCE	0.034	0.039	0.059
	(2.15**)	(2.43**)	(2.90***)
GGDP	-2.186	-1.020	-1.330
	(-0.19)	(-0.81)	(-0.08)
R^2	0.4364	0.4375	0.4394
F-statistics	22.45***	22.56***	22.73***

Notes: *** and ** indicate significant at 1% and 5% level respectively; Dependent variable is Z-Stats.

Panel data test results:

For this model, significant chi-square value of Breusch-Pagan test indicates the appropriateness of random effect model instead of pooled OLS. Again, the significant chi-square value of Hausman test advocates that fixed effect model is more appropriate than random effect for the present data set.

5. Conclusion

The present study is an empirical investigation of the association between bank competition and risk taking behavior of public sector and private sector banks in India. For this, two different measures for bank risk and three different measures of competition are considered. To a significant extent all the models provide consistent results relating to the influence of select explanatory variables on the response variable, which strongly advocate about the reliability of the results. The results indicate that there is a significant inverse association between bank competition and risk in case of public sector banks, which supports the *competition stability* view. However, in case of private sector banks, the results provide contrasting view about the association between bank competition and risk. The results support in favour of *competition fragility* view for private sector banks. These contradictory results are expected because the degree of competition is different in both the bank groups.

The outcome of the study has the following policy implications. First, in public sector banks, the inverse association between competition and risk suggests that competition improves the banking stability. However, in case of private sector banks, the positive association advocates that competition enhances bank risk. This may be due to the fact that some banks are controlling the private sector market. The results may be different if we segregate the banks into new and old private sector banks, which can be investigated further. Second, the findings indicate negative influence of profitability on risk of both the bank groups. This suggests that increase in profitability can reduce the level of risk in Indian banks. Profitability can be improved by enhancing the interest spread and through product diversification. In this respect, efficient utilization of workforce is essential. Third, human capital efficiency is negatively

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related with the level of risk of both the bank groups. This indicates that bank employees play a vital role in reducing the risk and maintaining stability of banks. Thus, banks should try to enhance the skill and knowledge of the employees through adequate training & orientation programs and by providing sufficient infrastructure. This is consistent with the reports of National Skill Development Corporation of India and McKinsey & Company [1] that human resources are the key factor for the success of Indian banks.

Note [1]: Human Resource and Skill Requirements in the Banking, Financial Services and Insurance Sector (2022) – A Report – by National Skill Development Corporation, www.nsdcindia.org/pdf/bfsi.pdf. Mckinsey and Company (2010) ''The Human capital key: unlocking the golden decade in Indian banking''.

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WORKING CAPITAL LEVERAGE – TESTING OF THE HYPOTHESIS DEVELOPED BY E. W. WALKAR

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Pradip Kumar Das

Abstract:

Maintaining optimum level of working capital is a serious problem to the finance manager as it confirms satisfactory earnings to the corporate without jeopardizing its working capital position. Viewers in this perspective, the present study is devoted to judge the strength of working capital leverage of ten reputed Sensex Companies listed at BSE in India and especially to test the hypothesis developed by Prof. Ernest W. Walkar. Based on correlation analysis, the findings of the study conclude that barring a very few cases, there exists a negative relationship between risk and return of the selected companies, and thus, moderately satisfy the proposition of Walkar. Leverage as a control variable has significant negative relationship with firm value and profitability of firms implying increase in the level of leverage leads to decline in the profitability of the firm as well as value of the firm.

Key Words:

Leverage, Optimum Level, Return, Risk, Sensex Companies, Working Capital

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Introduction

Working capital management presents a stimulating challenge to the financial executive and necessitates his constant watch and exercise of skill and judgement as it directly affects the liquidity and profitability. Many a business have come to grief on account of inadequate working capital and many business houses have suffered owing to excessive provisions of working capital. The basic problem facing the finance manager is to maintain optimum level of working capital involving the problem of trade-off between risk and return. Efficient working capital management involves planning and controlling working capital in such a manner that eliminates the risk of inability to meet due short-term obligations on the one hand and avoid excessive investment on the other hand[1]. The reason for working capital not being able to optimise itself is that there are various functional areas influencing it and these primarily take care of their own needs[2]. Decision on the level of working capital components become frequent repetitive and time consuming. Working capital management being a very susceptible area in the field of financial management embarrasses decision of the amount of working capital and it's financing. Corollary to this is the financial leverage. Brigham and Gapenski opines, "If the firm earns more on investments financed with borrowed funds than it pays in interest, the rate of return on owners' capital is magnified or leveraged"[3]. Internally generated, funds are not usually sufficient for firms' fund requirements. Opportunities for growth require more that cannot be provided from current resources. In such a situation, firms resort to financial leverage for improving financial performance.

The hypothesis drawn from the assumption of Prof. E. W. Walkar states that, "If the amount of working capital is varied relative to fixed capital, the amount of risk that a firm assumes is also varied and opportunity for gain or loss is increased"[4]. The proposition of Walkar implies a risk-return trade-off of working capital management. A number of studies have been carried out on different aspects of financial appraisal by different authors in different perspectives.

In the light of this motivation, the present paper is concerned with the examination of working capital leverage and verification of the hypothesis developed by Prof. E. W. Walkar in the cases of ten Sensex Companies listed at BSE in India which represents the various industrial sectors of the India economy.

Literature Review

Literature review constituting the basis of any research work guides the researchers for achieving better result by using different methodology. It shows limitations of various available studies and also explores the avenues for future and present research efforts related to the subject matter. This review highlights the gap in the literature that the present study seeks to bridge. An examination of the previous studies is important for developing a study that can be applied in the context of the selected Indian companies. A study of leverage, an important aspect of working capital is of major importance to both the internal and external analysts. A few remarkable tested studies that have been carried out in the area of working capital leverage are presented here briefly as under: -

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A. Mallick and D. Sur, (1998) examine the relationship between return on investment and working capital management in tea industry and also examine the working capital leverage of tea industry. They record a negative correlation with return on investment[5].

Deloof MarC., (2003) presents a picture of how working capital management affects profitability of Belgium firms. He concludes that the way in which working capital is managed will have a significant impact on the profitability of the firm[6].

Joshua Abor's (2005) research paper reveals significant relationship between financial leverage and profitability[7].

Joshi, Lalit Kumar and Ghosh, Sudipta, (2012) study the working capital performance of Cipla Ltd. during the period 2004-2005 to 2008-2009. They observe significant negative relationship between liquidity and profitability[8].

Dr. Panigrahi Ashok Kumar, (2012) studies the relationship between working capital management and profitability of ACC Cement Company for assessing the impact of working capital management on profit during the period 1999-2000 to 2009-2010. He deduces that there is a moderate relationship between working capital management and the firm's profitability[9].

Madhavi, K., (2014) makes a study of the correlation between liquidity position and profitability of the paper mill in A. P. He observes inefficient working capital management makes a negative impact on profitability and liquidity position of the paper mills[10].

Vijaya, (1977) conducts a study on working capital management in six cooperative and seven private sector companies in the sugar industry of Tamilnadu and finds that there is a negative correlation between return on investment and working capital[11].

Brigham, E. and Gapenski, L., (1997) observe that if the firm earns more on investments financed with borrowed funds than it pays investment the rate of return on owners' capital is magnified or leveraged[12].

Kargar, J., (1994) finds that the profitability-liquidity trade-off is important because if working capital management is not given due considerations, then the firms are likely to fail and face bankruptcy[13].

Haq Ikram Ul., Sohail Muhammad Zaman Khalid and Alam Zaheer (2011) examine the relationship between working capital management and profitability by using fourteen companies in the Cement Industry in the Khyber Pakhtonkhuwa Province (KPP) (2004-2009). They deduce from the result that there is a moderate relationship between working capital management and the firm's profitability[14].

L. J. Gitaman (1976) defines financial leverage as the ability of a firm to use fixed financial charges to magnify the effects of changes in EBIT on the firm's earning per share[15].

Merwin H. Waterman (1953) suggests consideration of pertinent variables; the lower the interest rate, the greater will be the profit and the less the chance of loss; the less the amount borrowed, the lower will be the profit or less; also the greater the borrowing, the more the risk of unprofitable

leverage and the greater the chance of gain[16].

Objective of the Study

The distinct objective of the study is – 1) To examine the strength of working capital leverage and 2) Especially to test the hypothesis of Prof. E. W. Walkar by choosing ten reputed Sensex Companies in India.

Hypothesis Development

In conformity with the objectives of the study, the following testable hypothesis has been formulated: -

H_0: - There exists no significant relationship between rate of return and working capital to fixed capital.

H_1: - There exists significant relationship between rate of return and working capital to fixed capital.

For testing the hypothesis, 5% level of significance is considered in the study.

Data and Research Methodology

The researcher, being an external analyst, has to depend mainly on published annual reports and accounts, the secondary data for the examination of working capital leverage of selected Sensex Companies for the period from 2013 to 2017. The latest year for which data are available is 2017. The analysis, therefore, confines itself for the period from 2013 to 2017. Though there was found apathy or indifference on the part of executives in supplying information, the researcher could overcome the same through moral persuasion and intensive pestering. It was made clear to them that the information so collected will be exclusively used for academic purpose and proper secrecy will be maintained. Editing, classification and tabulation of the financial data collected from the aforesaid sources have been done as per the requirement of the study. Companies selected in a sample are chosen purposely either to serve a particular object or because it is felt they possess all the characteristics of the parent population[17]. Different statistical techniques and tools have been applied for the purpose of the study and analysis.

For the purpose of examining the working capital leverage and testing the hypothesis, statistical technique of simple correlation coefficient formula introduced by Karl Pearson has been followed. By treating profitability in terms of return on investment and working capital in relation to fixed capital as two independent variables, correlation coefficient has been computed by applying Karl Pearson's formula as follows: -

$$r = \frac{\sum xy}{\sqrt{x^2} \times \sqrt{y^2}}$$

Where, r = Correlation Coefficient, xy = Product of the deviations from respective means.

Simple correlation implies the interdependence of two sets of variables upon each other in such a way that changes in one are in sympathy with changes in other[18].

Probable error tells us the limit within which the various values of the coefficient of correlations of the units taken out of the same group or the entire group will vary.

The required units for the purpose of the present study have been selected on the basis of "Non-Profitability Sampling" or "Purposive Sampling Method". Correlation coefficient less than the probable error indicate that "r" is insignificant. Probable error of "r" is computed in the following manner[19]: -

Probable Error of "r" = $0.6745 \times \frac{1-r^2}{\sqrt{n}}$

Where n = Number of units or companies.

The significance of correlation coefficient tested by "t" – test is as follows: -

$$t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2}$$

Where, r = Correlation Coefficient; n – 2 = Degrees of Freedom.

Table – 1: Measures of Working Capital Leverage

Performance Indicators	Performance Drivers	Performance Measures
i) Working Capital	Networking Capital	Total Current Assets – Total Current Liabilities
ii) Profitability	Return On Investment	Earnings Before Invest and Tax (EBIT) ÷ Investment

Limitations of the Study

Limitations are always a part of any kind of research work; as the annual report is mainly based on secondary data, proper care must be taken in knowing the limitations of the required study.

1. The study of the selected companies is just for the last five years, ending 2017. Hence, any uneven trend before or beyond the said period will be the limitations of the study.
2. The major limitation of the present study is that the analysis is restricted to 10 particular units.
3. The study is based on monetary information; study of the non-monetary factors is ignored.
4. The inherent limitation is secondary data. The published data is not uniform and not properly disclosed. Hence, this may be taken as another limitation.
5. As per the requirement of the study, some data have been grouped and sub-grouped.
6. There is non-availability of sufficient literature and information from the company.

A Brief Discussion on Prof. E. W. WALKAR'S Hypothesis

One of the propositions developed by Prof. E. W. Walkar opines that "If amount of working capital is varied relative to fixed capital, the amount of risk that a firm assumes is also varied and opportunity for gain or loss is increased". The basic assumption underlying this hypothesis is that there exists a definite relationship between the degree of risk and rate of return and relationship can be changed by changing the level of working capital. Ratio of working capital to fixed capital has an impact on the level of risk and profitability. Working capital leverage effectively guides to find out percentage reduction in working capital required to result in a more than

proportionate increase in return on investment. Usually, leverage states the firm's ability to meet fixed cost assets or funds to magnify the return to its owners. Increase in leverage enhances the uncertainty of returns but at the same time, it also enhances the size of possible return. The higher the degree of leverage, higher the risk but higher is the expected return[20]. As with lifting heavy objects, leverage allows one to accomplish things not otherwise possible[21]. Thus, working capital leverage affects the change in working capital in relation to fixed capital on return of investment. With increase in working capital in relation to fixed capital, there should be decrease in return on investment and vice-versa.

Walkar accepts that working capital is needed only when actual production takes place. Working capital also depends upon certain factors influencing amount of various current assets necessitated to support given volume of output, managements' philosophy concerning risk. The type of capital used to finance working capital directly affects the amount of risk that a firm assumes as well as the opportunity for gain or loss[22]. He also accepts that the greater the disparity between maturities of a firm's debt instruments and its flow of internally generated funds, the greater the risk and vice-versa[23]. Walkar opines that capital should be invested in each component of working capital as long as the equity position of the firm increases.

Working Capital Leverage (WCL) can be expressed as –

$$\frac{\text{Return On Investment (ROI)}}{\text{Working Capital to Fixed Capital (WC/FC)}}$$

For computing working capital leverage, both the net and gross concepts of working capital can be accepted, but for the present study purpose, only net concept of working capital is considered. Return is the profitability of the firm. According to Walkar when the level of working capital relative to sales decreases, the opportunity for gain or loss increases and vice versa. While gain resulting from decrease in working capital is measurable, the losses that may occur cannot be measured[24].

Analysis and Major Findings

TABLE – 2 evidences the working capital leverage scores of the selected Sensex Companies in India. Such leverages have been computed by applying the following formula: -

$$\frac{\text{Profitability in terms of Return On Investment (ROI)}}{\text{Working Capital in relation to Fixed Capital (WC/FC)}}$$

TABLE shows that the overall working capital leverages in all the five years varied from 0.77 in 2015 to 1.21 in 2016. Except in the year 2015, working capital leverages were moderate. Walkar thinks leverage must at least be at unity. Except 2015, in all the years of study leverages were more than unity. In 2015, though the leverage was positive, it was less than 1.

Table – 2: Net Working Capital Leverage (WCL - in times) of the selected companies under study

Name of the Company	2013	2014	2015	2016	2017	Average
1)Bajaj Auto Ltd.	1.40	3.51	0.54	2.12	0.60	1.63
2) Hero Moto Corp.	1.91	1.84	1.68	1.59	0.96	1.60
3) Asian Paints Ltd.	1.41	0.90	0.88	1.04	0.67	0.98
4) Dr. Reddy's Laboratories Ltd.	0.49	0.36	0.26	0.23	0.30	0.3.3
5) Cipla Ltd.	0.32	0.50	0.38	0.39	0.25	0.37
6) Infosys Ltd.	3.49	0.35	0.42	0.52	0.38	1.03
7) ITC Ltd.	0.96	0.88	0.74	0.97	0.55	0.82
8) Larsen & Toubro Ltd.	0.27	0.36	0.23	0.23	0.22	0.26
9) Coal India Ltd.	0.65	1.38	1.33	3.06	4.95	2.27
10) ONGC	0.75	1.02	1.23	1.94	2.26	1.44
Average	1.17	1.11	0.77	1.21	1.11	

Source: - Annual Reports and Accounts – Results Computed

Coming to sample companies individually, all the companies had shown positive working capital leverages in all the years of study. Dr. Reddy's Laboratories Ltd., Cipla Ltd., ITC Ltd. and Larsen & Toubro Ltd. had shown positive working capital leverages, but the leverages were less than unity in all the years of study.

Working capital leverage of Dr. Reddy's Laboratories Ltd. had ranged between 0.23 in 2016 to 0.49 in 2013. On an average it was 0.33. Working capital leverage of Cipla Ltd. had ranged between 0.25 in 2017 and 0.32 in 2013. On an average, it was 0.37. In the case of ITC Ltd., leverage was found to be ranging between 0.55 in 2017 and 0.96 in 2013. On an average, it was 0.82. In case of Larsen and Toubro Ltd., they were ranging between 0.22 in 2017 and 0.36 in 2014. On an average, it was found to be 0.26.

In the cases of Hero Moto Corp., Coal India Ltd. and ONGC, working capital leverages were more than unity or 1 except the years 2017, 2013 and 2013 in Hero Moto Corp., Coal India Ltd. and ONGC respectively where they were found to be less than unity. On an average, the leverages were 1.60, 2.27 and 1.44 i.e. more than unity or 1 in these companies.

In the case of Bajaj Auto Ltd., working capital leverages were more than unity in three years and in the remaining two years, they were less than unity.

Asian Paints Ltd. had shown working capital leverages more than unity in two years only and in the remaining three years, they were less than unity.

Infosys Ltd. had positive working capital leverage and more than one in one year only; in the remaining years, though positive, leverages were found to be less than one.

Working capital leverage of 2.27 in the case of Coal India Ltd. had been observed to be the highest followed by Bajaj Auto Ltd. (1.63), Hero Moto Corp. (1.60), ONGC (1.44), Infosys Ltd. (1.03), Asian Paints Ltd. (0.98), ITC Ltd. (0.82), Cipla Ltd. (0.37), Dr. Reddy's Laboratories Ltd. (0.33) and Larsen & Toubro Ltd. (0.26).

Year wise analysis shows that in 2013, Infosys Ltd. had the highest working capital leverage of 3.49 and Larsen & Toubro Ltd. had the lowest working capital leverage of 0.27; in 2014, Bajaj Auto Ltd. had the highest leverage of 3.51 and Infosys Ltd. had the lowest of 0.35; in 2015, Hero Moto Corp. had shown the highest leverage of 1.68 and the lowest of 0.23 was observed in the case of Larsen & Toubro Ltd.; in 2016, the highest working capital leverage of 3.06 was observed in Coal India Ltd. and the lowest leverage of 0.23 were observed in Dr. Reddy's Laboratories Ltd. and Larsen & Toubro Ltd.; and lastly in 2017, highest leverage of 4.95 was observed in Coal India Ltd. and lowest of 0.22 was observed in Larsen & Toubro Ltd.

From the year wise analysis, it is found that working capital leverages ranged between 0.77 in 2015 and 1.21 in 2016.

In brief, positive working capital leverages had been observed in all the years of study, although they had been observed to be more than unity or one in few cases. On an average, highest working capital leverage of 2.27 was found in Coal India Ltd. and lowest of 0.26 was found in Larsen & Toubro Ltd.

The hypothesis of Walkar evidences that the rate of change in return on investment is in correspondence with the rate of change in the working capital in relation to fixed capital. As he opines it must be at unity i.e. if there is a decrease in working capital in relation to fixed capital, there must be an increase in the rate of return to the investors at least by same margin. The same can be expressed as follows:

$$\frac{\text{Change in Return On Investment } (\Delta \text{ROI})}{\text{Change in Working Capital in relation to Fixed Capital } (\Delta \text{WC/FC})} = 1 \text{ or more}$$

Walkar proposes that there would be negative relationship in between 'change in Return On Investment' and 'change in Working Capital in relation to Fixed Capital' at least by unity. If the working capital in relation to fixed capital decreases, the profitability in terms of investment will increase by same margin. Let us test this hypothesis.

With a view to testing the hypothesis of Prof. Walkar simple correlation coefficient in between Return on investment and

Working Capital in relation to fixed Capital of the selected companies has been computed and scores been exhibited in TABLE – 3.

Table – 3: Correlation Coefficients between ROI and WC/FC of the selected companies under study

Name of the Company	Correlation Coefficient (r)	Computed Value (t)	Probable Error (PE)
1) Bajaj Auto Ltd.	-0.56	-1.16	(±0.15)
2) Hero Moto Corp.	-0.90	-3.54	(±0.04)
3) Asian Paints Ltd.	-0.82	-2.49	(±0.07)
4) Dr. Reddy's Laboratories Ltd.	-0.05	-0.09	(±0.21)
5) Cipla Ltd.	+0.71	1.73	(±0.11)
6) Infosys Ltd.	+0.15	0.26	(±0.21)
7) ITC Ltd.	-0.34	-0.63	(±0.19)
8) Larsen & Toubro Ltd.	-0.57	-1.20	(±0.14)
9) Coal India Ltd.	-0.74	-1.91	(±0.10)
10) ONGC	-0.87	-3.08	(±0.05)

Source: - Annual Reports and Accounts – Results Computed

TABLE shows that only two companies i.e. Cipla Ltd. and Infosys Ltd., rate of return on investment and working capital in relation to fixed capital had been observed to be positively correlated indicating association of large value of one variable with large value of another variable and vice-versa. Put it differently, it can be said that ROI and WC/FC had not been always found to be varying in similar direction i.e. change in ROI was not always corroborated identically with change in WC/FC. Probable errors were ±0.11 and ±0.21 in Cipla Ltd. and Infosys Ltd. respectively. To study the significance of the computed values of such correlation coefficient the 't' test had been applied here. The computed values of 't' i.e. 1.73 and 0.26 respectively were less than the critical values of 't' (i.e. 3.18) at 5% level of significance. Hence, H_0 i.e. the null hypothesis may be accepted which signifies that there were no very significant relationship between ROI and WC/FC of the two companies under study. Such positive correlation between ΔROI and ΔWC/FC had been observed to be decidedly significant in

the case of Cipla Ltd. Such positive correlation had been found to be insignificant in the case of Infosys Ltd.

In the remaining eight companies, the correlation coefficients between ΔROI and ΔWC/FC were found to be negative i.e. the changes in working capital in relation to fixed capital had reverse impacts on return on investment. Probable errors and computed values of 't' had been shown in the table. Computed values of 't' of all the selected companies were always less than the critical values of 3.18 which signify that ROI and WC/FC were not very significantly related.

Correlation coefficient between return on investment and working capital in relation to fixed capital of all the companies taken together, Probable errors and 't' values have been shown in TABLE – 4.

Table – 4: Correlation Coefficient between ROI and WC/FC of all the selected companies taken together

Year	ROI	WC/FC	Correlation Coefficient (r)	Computed Value (t)	Probable Error (PE)
2013	25.78	38.06			
2014	28.72	34.79			
2015	25.76	38.97	- 0.43	-0.83	±0.25
2016	28.33	30.30			
2017	24.45	33.44			

Source: - Annual Reports and Accounts – Results Computed

TABLE evidences that in all the selected companies taken together ROI and WC/FC were negatively correlated. The same phenomenon can be better understood in GRAPH – 1 and COLUMN CHART – 1.
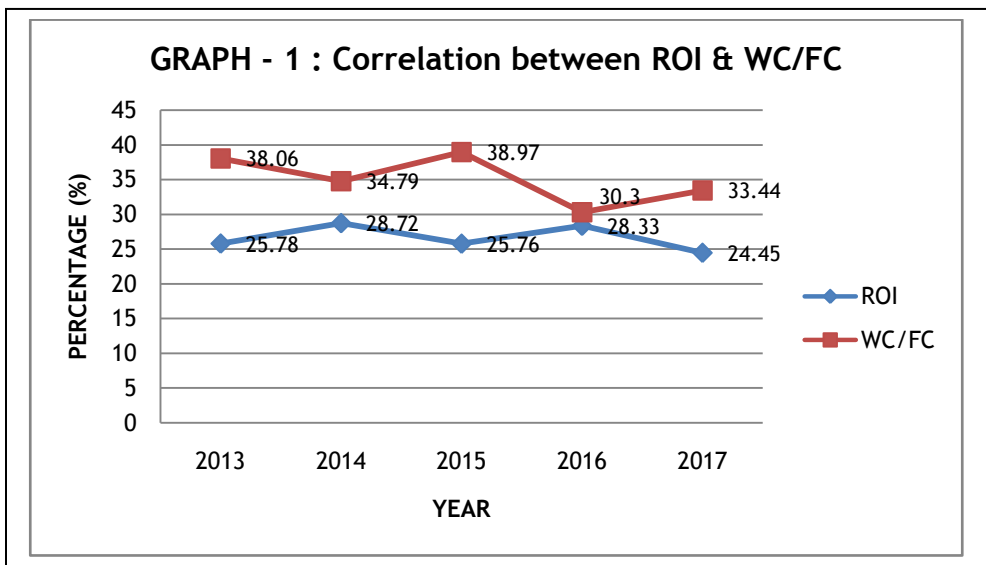
Source: - Annual Reports and Accounts – Results Computed

COLUMN CHART -1 : Correlation between ROI & WC/FC
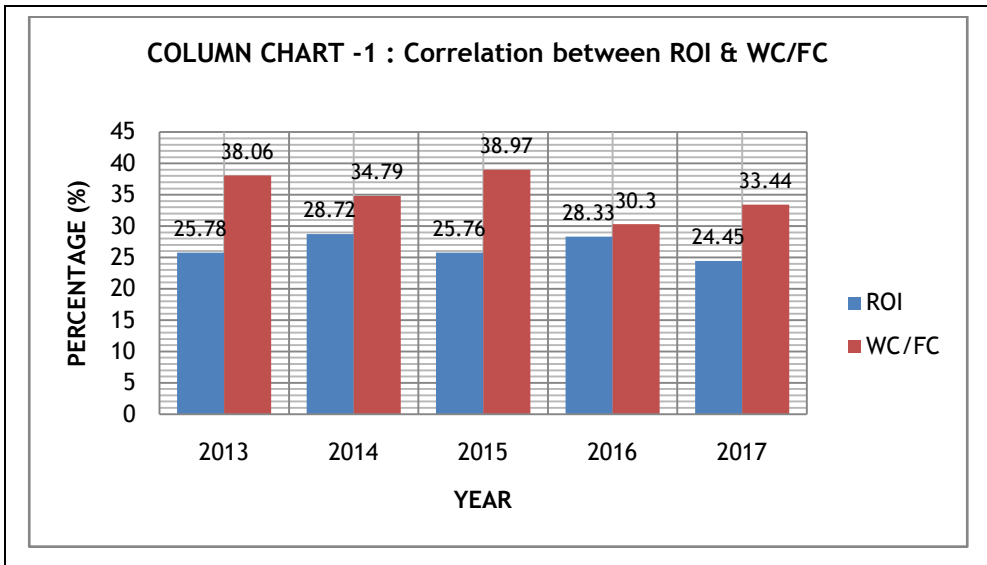
Source: - Annual Reports and Accounts – Results Computed

Correlation Coefficient between ROI and WC/FC was -0.43, Probable error was ±0.25. To study the significance of the computed value of such a correlation coefficient, the 't' –test has further been applied here. The computed value of 't' i.e. 0.83 was less than the critical value of 't' (i.e. 3.18) at 5% level of significance. Hence, H_0, the null hypothesis may be accepted which signifies that there were no decidedly significant relationship between the return on investment and working capital in relation to fixed capital. They were moderately related to each other. Thus, it can be inferred that barring a very few cases, the selected Sensex Companies in India under study moderately satisfied the proposition of E. W. Walkar.

Concluding Comment

The importance of working capital policy and financial leverage on the companies' performance is emphasized in this study to draw attention of business executives to be evident but is often slighted. The hypothesis of Prof. E. W. Walkar relating to the relationship between return on investment and working capital in relation to fixed capital has been tested while judging the working capital leverage of the selected Sensex Companies of various industrial sectors in India. Decision with regard to the companies' liquidity and maturing composition of their debts are largely influenced by a trade-off between profitability and risk. The study with the help of Karl Pearson's simple correlation coefficient technique followed by

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significance of correlation coefficient ('t' test) reveals that though barring a very few cases return on investment and working capital in relation to fixed capital are negatively correlated. Thus, it can be concluded that both the profitability in terms of return on investment and working capital in relation to fixed capital of the companies under study excepting a very few have negative impact with each other. In maximum cases, there are no significant relationships between them, and on the whole also, the impact with each other is found to be moderate. Hence, the study moderately satisfies the proposition of Walkar.

Suggestions or Recommendation

The study concludes that there exists a moderate relationship between working capital management policy and profitability of the selected companies in India. The study recommends that for the companies to remain in profitable, they should introduce working capital management practice that helps in making decisions about investment mix and policy matching investment to allocation for cost and balancing risk against profitability or return.

Research Opportunities

The correlation of working capital and profitability or risk and return being comprehensive, exhaustive study on the subject in a single report is practically almost impossible. This research paper only covers the operations of listed ten Sensex Companies for a period of five years. Given sufficient time and resources, an attempt can be made to study the entire listed companies of all the sectors in India and for a longer period also and applying different

statistical tools for even better results. The study has investigated the relationship between risk and return of the selected companies in India. To this end, therefore, a further study should be carried out to assess the relationship of other industrial sectors. Other factors also influence the risk and return. The research could be conducted to identify these factors and to what extent they affect return as to improve the financial performance of the companies. Further research studies can assess the impact of working capital policy on operational efficiency of various sectors in the economy.

Besides, further research works can assess the influence of foreign exchange on the financial performance of the companies given that products are imported. The fluctuation in the exchange rate can force a firm to stock a lot of fuel in apprehension of depreciation of the Indian currency causing rise in sale price. Further studies can assess whether working capital management policy affects the investment policies and financing decisions in relation to how a firm opts for alternative sources of funds to enhance financial performance. For drawing concluding comment and observation, further research work is welcome to bridge this gap.

Acknowledgement

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