STOCK MARKET DEVELOPMENT AND ECONOMIC GROWTH IN INDIA:

A STUDY IN THE CONTEXT OF FINANCIAL LIBERALISATION

Stock Market Development and Economic Growth in India: A Study in the Context of Financial Liberalisation

Dissertation submitted in partial fulfillment of the requirements for the Degree of PhD in Economics of the Jawaharlal Nehru University

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I hereby affirm that the work for the dissertation, **"STOCK MARKET DEVELOPMENT AND ECONOMIC GROWTH IN INDIA: A STUDY IN THE CONTEXT OF FINANCIAL LIBERALISATION"**, being submitted as part of the requirements for award of the degree of Doctor of Philosophy in Economics of the Jawaharlal Nehru University, was carried out entirely by myself. I also affirm that it was not part of any other programme of study and has not been submitted to any other University for the award of any Degree.

July 2011

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Certified that this study is a bona fide work of *Ranjan Kumar Dash*, carried out under our supervision at the Centre for Development Studies.

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... Dedicated to my Beloved Parents

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ABSTRACT OF DISSERTATION

Stock Market Development and Economic Growth in India: A Study in the Context of Financial Liberalisation

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The present study examines the impact of stock market development on economic growth in India by analysing three major channels of stock market, viz., liquidity, savings, and capital mobilization and efficient allocation of capital for the period 1980-2007. In contrast to earlier studies, this study tries to identify the relative importance of different channels of stock market such a study assumes significance in the context of the ongoing debate regarding the benefits of stock market liberalisation in India.

Results of the study suggest that equity market has witnessed a significant improvement, since the reform process began in the early 1990s, in terms of various parameters such as size of the market, liquidity, transparency, stability, international integration and efficiency. Comparison of Indian stock market with developed markets indicate that Indian equity market is comparable to many developed market such as the US, UK, and Japan in term of size, liquidity, trading infrastructure, and transaction cost.

Volatility of stock prices is another empirical aspect of stock market development, which has received considerable attention in the literature. We estimate time varying volatility by using E-GARCH model. Our results indicate that volatility is marginally higher during post-liberalisation period. From structural break analysis we found that, there are three break dates and all the break points are related to economic and political events. None of the break dates is related to stock market liberalisation events. Thus, the analysis of Indian stocks market clearly suggest that following financial liberalisation, they have sufficiently developed and, have a positive impact on savings, corporate financing and economic growth.

The study finds stable and long-run equilibrium relationship between savings rates (private and household financial) and stock market development after controlling for

other determinants of savings. Coefficient of stock market index is positive and significant, indicating stock market has positive influence on savings rate. Causality analysis between stock market and savings rates indicate that the causality runs in both directions. The results of the linkage between stock market development and financing for corporate investment indicates that stock market is now second highest source of external financing after debt. External source is more important for Indian corporate sector as compared to developed countries. Findings of this study suggest that corporate financing patterns in India are similar to the pattern observed for other emerging markets. Econometric estimation suggests that bank financing and stock market are substitutable in nature. Results indicate that there exist a significant negative correlation between stock market indicators and dispersion of Tobin's Q, indicating allocative efficiency of stock market.

Analysing the relationship between stock market and economic growth, the study finds there exists a long-run relation between stock market and economic growth. From Granger causality test, it is found that there exists two-way causality between stock market and economic growth, supporting the feedback hypothesis. Further, relative strength of the channel indicate that savings has highest impact on growth followed by liquidity, and capital mobilization.

The study provides country level insights into the effect of stock market development on economic growth. The findings of this study have some valuable policy implications. It gives some insight for policy makers about the possible linkages between stock market and the economy.

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CHAPTER I

Introduction

A well-diversified and competitive financial market is vital for long-term economic development because financial markets play an important role in the process of economic development by facilitating intermediation between savers and investors as well as allocating capital to the most productive uses (Goldsmith, 1969 and McKinnon, 1973). The better they perform this service, the more likely it is that savers will be motivated to supply capital, thereby reducing its cost to investors by facilitating intermediation[1]. The benefit is thus of two types, viz., quantitative and qualitative; the quantitative benefit being higher level of savings and investment in an economy, and the qualitative benefit being the improvement in efficiency of intermediation and thereby raising the productivity of scarce capital. The stock market is an economic institution, which promotes efficiency in capital formation and allocation.

Theoretically, the traditional growth theory (such as Harrod-Domar and new classical growth theory) has ignored the relationship between financial sector development and economic growth because it focused on steady-state level of capital stock per worker or productivity, but not on the rate of growth (which was attributed to exogenous technical progress) (Pagano, 1993). On the other hand, endogenous growth models focus on the relationship between financial development and long-run economic growth, emphasizing that well developed financial markets help diversify agents' liquidity and investment risk, attract more savings into productive investment and prevent the premature withdrawal of capital invested in the long-term projects. In this framework, financial intermediation is shown to not only have level effects, but also growth effects (Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; King and Levine, 1993). Therefore, development of financial sector could influence economic growth by increasing the productivity of capital or lowering of intermediation costs, by enhancing the saving rate and channeling savings to the corporate sector.

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[1] See Levine (1997) for a comprehensive survey on the latest literature on financial intermediation and economic growth.

This introductory chapter is organized into four sections. Section 1.1 presents the analytical framework and discusses the channels through which stock market development affects economic growth. Section 1.2 is a review of the empirical literature. Section 1.3 discusses the development of stock market in India. Section 1.4 elucidates the significance of the study. Against the background of theoretical and empirical literature, section 1.5 delineates the specific objectives of the study followed by the methodology and chapter scheme.

1.1 Stock Market and Economic Growth

The idea that financial markets may be related to real activities is not new, but the view of this relationship has changed over time. Gurley and Shaw (1955) were the first to study the relationship between financial markets and real activity. They argued that well developed financial markets contribute to economic growth by enhancing physical capital accumulation. Their hypothesis was later supported by Goldsmith (1969), Shaw (1973), and MacKinnon (1973)[2].

Until 1990s, the literature focused mainly on the role of financial intermediation in the process of economic growth and capital accumulation (Gurley and Shaw, 1955; Goldsmith, 1969; McKinnon, 1973; Shaw, 1973; Stiglitz and Weiss, 1981; Diamond, 1984; King and Levine, 1993; Levine and Zervos, 1998; Khan and Senhadji, 2000; Beck and Levine, 2004). Recently, however, a new wave of interest on a specific aspect of financial market development (stock market) has occupied economists' investigative interest (Greenwood and Smith, 1997; Levine and Zervos, 1998; Henry, 2000; Levine, 2002; Caporale et al., 2004; Capasso, 2006)[3]. The literature on the role of stock market in economic development is thus a recent phenomenon[4].

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[2] There are two different views regarding the role of financial system for a country's economic growth: (1) the financial system is relevant and it matters to a country's growth (Hicks, 1969); and (2) it is irrelevant (Robinson, 1952).

[3] The importance of stock market in economic growth is also recognized by Atje and Jovanovic (1993). In their conclusion they argue that "it is even more surprising that more countries are not developing their stock market as quickly as they can as a means of speeding up their economic development" (p. 636).

[4] The nature and economic significance of the relationship between stock market development and growth vary according to a country's level of economic development with a larger impact in less developed economies (Filler, Hanousek and Campos, 1999).

Although stock market development is a common feature of financial and economic development, many believe that stock markets in developing countries are highly volatile and 'speculative' in nature – that they have little positive impact on economic growth (Mayer, 1988; Singh, 1993; Grabel, 1995)[5]. Nonetheless, there are reasons to believe that stock markets might play an important role in developing countries by fostering faster capital formation and efficiently allocating capital to productive investments. Hence, the development of stock market is expected to have positive impact on economic growth[6].

1.1.1 Stock Market and Economic Growth: The Theoretical Framework

Stock market contributes to economic growth through the specific services it performs either directly or indirectly. Broadly speaking, stock market affects economic growth through six channels. These are: creating liquidity, diversification of risk, better information about firm, corporate control, augmentation of savings and finally, capital mobilisation and efficient allocation. All these channels are discussed below in detail:

1.1.2 Creating Liquidity

Levine (1991) and Bencivenga, Smith and Starr (1996) emphasise the positive role of liquidity provided by stock exchanges on the size of new real asset investments through common stock financing. Although many profitable investments require a long-run commitment of capital, savers do not like to forgo control of their savings for long periods. Liquid equity markets solve this problem by providing an asset to savers that they can quickly and inexpensively sell. At the same time, firms have permanent access to capital raised through equity sale. Moreover, Kyle (1984) and Holmstrom and Tirole (1993) argue that liquid stock market could increase incentives for investors to get information about firms and improve corporate governance. In addition, Greenwood and Smith (1997) demonstrate that large stock markets can lower the cost of mobilizing savings and thereby facilitate investment in the most

[5] The Keynesian hypothesis is that, stock market is a casino and it may not matter for a country's growth.

[6] A detailed articulation of the role of stock market is found in Ryrie (1991), who states that stock market contributes to economic development through: a) being an initial source and a facilitator of equity finance; b) being an efficient mechanism for spreading ownership widely in the population and mobilizing savings; c) allocating capital to productive use; and d) facilitating a link between capital markets of a particular country and the markets of the industrial world.

productive sectors. Therefore, liquid stock market improves the allocation of capital, thereby increasing the prospect for long-term economic growth. There exist contrary opinions as well regarding the impact of liquidity on the volume of savings, arguing that the desire for a higher level of liquidity works against the propensity to save (Bencivenga and Smith, 1991; Jappelli and Pagano, 1994).

1.1.3 Risk Diversification

The second important contribution of stock market to the promotion of economic growth is the opportunities it offers for the diversification of risk globally. Saint-Paul (1992), Devereux and Smith (1994), and Obstfeld (1994) strongly argue that the opportunities for risk diversification through integrated stock market makes high-risk-high-return domestic and international projects viable, and hence, allocate resources more efficiently. This occurs because liberalization can reduce both components viz., cost of equity and risk free rate and risk premium (Henry, 2000). Stock market development is expected to increase net capital inflows and this "supply effect" could reduce risk free rate. Second, more risk sharing between foreign and domestic residents may reduce equity premium. Increased capital inflows may also increase stock market liquidity, and increased liquidity reduces the equity premium. (Levine and Zervos, 1998). Therefore, through risk diversification stock market increases both quality and quantity of investment. Again, theory also suggests the circumstances in which greater risk sharing slows growth (Devereux and Smith, 1994; Obstfeld, 1994).

1.1.4 Better Information

The third channel through which the stock market affects economic growth is through the provision of better information about firms (Grossman and Stiglitz, 1980; Kyle, 1984; Holmstrom and Tirole, 1993). A well developed stock market helps investors to identify worthier firms which help in making their investment decision, better. When stock market performs this role well it is said to be informationally efficient and hence, more efficient in allocating resource among corporations resulting in a higher rate of economic growth in the long-run. However, Stiglitz (1985, 1994) argues that well-functioning stock markets quickly reveal information through price changes. This will reduce incentives for expanding private resources to obtain information.

1.1.5 Corporate Control

The fourth mechanism through which stock market promotes economic growth is by influencing corporate control. Verrecchia (1982), and Jensen and Murphy (1990) show that, an efficient stock market helps to mitigate the principal-agent problem and promote efficient resource allocation and economic growth. For example, equity financing may play a role in mitigating the conflict of interest that arise between different stakeholders within the firm thereby causing a reduction in agency costs, within an economy under information asymmetry and uncertainty. Laffont and Tirole (1988) and Scharfstein (1988) argue that takeover threats induce managers to maximise a firm's equity price. In a market economy the link between corporate profits and economic growth is quite obvious.

1.1.6 Augmentation of Savings

It is argued that absence of liquid and efficient stocks may encourage domestic investors to reduce investment in favour of consumption, thereby lowering savings due to perceived higher level of risk and lack of opportunities for investment. Therefore, by providing investors additional financial instrument that may better meet their risk preferences and liquidity needs, large, liquid and efficient stock markets are expected to enhance domestic savings (Greenwood and Smith, 1997 and Levine and Zervos, 1998). Better savings mobilization may increase the savings rate and investment and thereby higher economic growth given the fact that savings are key to sustainable and long-term growth (Lewis, 1955 and Slow, 1956). By pooling resources on larger projects, which would otherwise have difficulty in accessing finance, stock markets can increase the level of savings and improve its composition (i.e., shifting from real to financial assets and transforming savings to longer-term, more stable sources) (Greenwood and Smith, 1997).

1.1.7 Capital Mobilisation and Efficient Allocation

Stock market may promote economic growth by serving as an alternative source for funds (in comparison to debt and bank financing) for investment (Singh and Hamid, 1992; Singh, 1995). As economies develop, more funds are needed to meet rapid expansion. In this context, development of stock market could provide necessary funds for corporate investment and removes obstacle associate with debt financing. Further, stock market not only caters as an alternative source of fund, but also

improves the allocative efficiency of funds through the operation of the forces of demand and supply to those firms with relatively high and increasing productivity. This in turn increases capital accumulation and economic growth (Demirgüç-Kunt and Levine, 1996; Bencivenga Smith and Starr, 1996; Levine and Zervos, 1998). Therefore, stock market serves as a veritable tool in the mobilization and allocation of savings among competing uses which is critical to growth and efficiency of the economy (Greenwood and Smith, 1997).

1.2 Financial Liberalisation and Stock Market Development[7] - A Review

A landmark/departure in the financial literature is the McKinnon-Shaw (1973) (M-S) 'financial repression paradigm'. According to this paradigm interest rate ceiling, high reserve ratio and directed credit programmes are the sources of financial repression which necessarily result in low savings; credit rationing; low investment; and over all low growth. In financially repressed economies, the quality of investment suffers, as the available funds are not rationed on the basis of marginal productivity of investment, but at the lender's discretion. The M-S hypothesis had major impact through the work of the IMF and World Bank, both of which encouraged financial liberalisation[8] as part of economic liberalisation. Since the mid 1970s, many countries in Latin America, Asia and in Africa have been adopting financial liberalisation.[9] The focus has been on liberalizing interest rates, deregulation of the financial sector, strengthening the banking system, introduction of new financial instruments, and development of capital markets, in particular the stock market[10]. This is founded on the premise that goods and asset markets move towards stable adjustment under a

[7] Stock Market development is measured by market size, market liquidity, market concentration, market volatility and institutional development. Therefore, stock market development is multifaceted concept (Garcia and Liu, 1999).

[8] At the forefront of the critique of financial market liberalization is Stiglitz, who argues that empirical evidence suggests no link between capital market liberalization and economic growth (Stiglitz, 2002).

[9] The relationships between financial market liberalisation and economic development have been extensively explored; the result indicate that liberalisation of financial system is a major factor in economic development, but needs to be carefully sequenced and managed (Caprio, Atiyas and Hanson, 1994; Levine, 1997; Bekaert and Harvey, 2000). In particular, experience shows that it is vital to strengthen the supporting institutional framework, i.e. the regulatory and supervisory functions of the state and the use of market in disciplining the financial institutions.

[10] The literature on domestic stock market development has found that more developed countries tend to have deeper stock markets (see, for example, Rajan and Zingales, 2003; La Porta, Lopez-de-Silanes, and Shleifer, 2006) and that the laws and enforcement mechanisms that protect the rights of minority investor's foster equity market development (La Porta et al., 1997, 1998).

freely operating price-clearing mechanism. Liberalisation thesis was further extended by Cho (1986) and Bossone (2000); and they argue that financial liberalisation may remain incomplete without an efficient market for equity capital as a means for spreading risk[11]. As a result, stock market development has been central to the domestic financial liberalization of most developing countries (Levine, 2005; and Yartey and Adjasi, 2007). Therefore, development of stock market could help in strengthening the corporate capital structure and in making the financial system efficient and competitive.

Arguably, economic benefits are attributed to stock market development. Subrahmanyam (1975) advances a theoretical argument to support the integration of emerging stock markets with those of developed countries. Using an abstract model, he shows that the integration of international capital market is Pareto-optimal, meaning that the welfare of individuals in the economies concerned generally improves and never declines. However, Krugman's (1993) survey of theoretical and empirical articles on the role played by international financial integration in development demonstrates that integration of financial markets would not promote flow of capital to developing countries, but to the capital-abundant North. Baldwin (1993) comments that Krugman could have underplayed the role of positive expectations and the fact that fundamental liberalisation required for development may not occur, in the absence of capital flows.

Since the 1980s many emerging economies embraced financial sector liberalisation with mixed results[12]. Evidence shows that the expansion of equity market in many Asian countries especially after liberalisation is truly impressive (Clemente, 1994). Some of these emerging markets are comparable in term of size and liquidly to the European market. The importance of stock market in twenty-first century can be judged from the fact that before 1989, there were just five stock markets in Sub-Sahara Africa and three in North Africa but today there are nineteen stock exchanges (Yartey and Adjasi, 2007). The market capitalization of emerging market countries

[11] Further, the debt crisis in the Latin American countries and financial crisis in East Asian countries have influenced for the development of domestic stock markets.

[12] See Akyuz and Kotte, 1991, for a review of successes and failures of financial liberalization.

has more than doubled over the past decade growing from less than $2 trillion in 1995 to about $5 trillion in 2005 (Yartey, 2008). As a percentage of world market capitalization, emerging markets share is more than 20 percent and steadily growing over time (Standard and Poor, 2007). Similarly, capital raised from stock market has increased from $54 billon in 1990 to $902 billon by 2007 (WFE, 2008). Emerging markets account for bulk of this capital. Today, 40% of the world's publicly traded companies are in emerging markets (WFE, 2008). This indicates the importance of stock market in today's world. The fascinating growth of emerging markets suits the 'global neoclassical' model which emphasises international financial openness.

Thus, liberalisation is imperative for stock market development. It increases the pool of capital available to local firms and broadens the investor base. This in turn leads to increased liquidity and spurts savings and investment. Further, the scrutiny of foreign investors may increase transparency and promote the adoption of better corporate governance practices (Stulz, 1999; Errunza, 2001). Consistent with these arguments, a number of studies find evidence of increase in domestic stock market depth and efficiency following liberalization[13]. Levine and Zervos (1998) in a cross-country study of 16 emerging countries found that following capital control, liberalisation of stock market tends to make it larger in size, more liquid, and volatile. Williamson and Mahar (1998) found that financial liberalisation leads to financial deepening, but at the same time it could also generate a financial crisis. Similarly, De La Torre, Gozzi and Schmukler (2007) found that financial liberalisation tends to increase domestic stock market capitalization and trading activity. At the same time liberalisation also increases the activity in international equity markets, with potential negative spillover effects on the domestic market. Therefore, stock market liberalization might make domestic market illiquid and segmented.

Some analysts have concluded that banks are more suitable than stock markets for developing countries in particular, and that stock markets will do more harm than good (Singh, 1997). Singh argues that some characteristics of mature stock markets – volatility, deterrence of risk-averse savers and demand from speculative investors for

[13] See, for example, Bekaert and Harvey (2000), Henry (2000, 2003), Kim and Singal (2000), and Edison and Warnock (2003) among others.

short term profits at the expense of long term growth – were likely to be larger problem in developing markets, with a negative impact on the country's overall development. The high degree of price volatility on stock markets in developing countries reduces the efficiency of the price signals in allocating investment resources. However, Boyd and Prescott (1986), Boyd and smith (1998) and Blackburn et al (2005) have all shown that both stock market and banks are necessary in promoting economic growth. Therefore, they consider stock markets as compliment to banks rather than substitutes.

Taking into account the importance of stock market, supporters of financial liberalisation argue that developing countries should liberalise their financial market in order to attract foreign portfolio equity flows [McKinnon (1973, 1991); Shaw (1973); Cho (1986)]. Their argument runs from the point that huge amount of capital available in the developed countries through pension funds and investment funds could be attracted to the developing countries, provided the latter liberalised their financial market externally and developed their stock market internally. Empirical evidence supports this argument. For example, portfolio equity flows to emerging markets increased from $22 billion in 1995 to $568 billion in 2007, indicating benefits of stock market development in attracting capital.

It is often argued that liberalisation converts stock market to fit a free economy wherein society authorises the financial system to allocate resources (Cho, 1986). With the globalisation of financial market, the numbers of participants in most major stock markets are growing and markets are becoming more competitive. Removal of restrictions on international capital flows, as carried out by many countries is expected to contribute to a greater integration of financial markets. Theoretically, such integration would contribute to greater efficiency and allocation of capital. Perotti and Oijen (2001) found that the resolution of political risk through continuous and sustained privatization has been a major source for the recent growth in emerging stock markets. It seems that sustained privatization has gradually strengthened the institutional framework by forcing a resolution of political and legal uncertainties that hinder equity market. Modigliani and Perotti (1997) show that a strong institutional framework of "rules of the game" is necessary to protect minority investors and thus, to promote the development of stock markets.

The international asset pricing model predicts that stock market liberalisation does reduce the liberalizing country's cost of equity capital (Stulz, 1999; Bekaert and Harvey, 2000; Errunza and Miller, 2000; Henry, 2000). Empirical research by Errunza and Miller (2000), Henry (2000) and Kim and Singal (2000) support the hypothesis that stock market liberalisation causes a one-time revaluation of stock prices and a reduction in the aggregate cost of equity capital. In turn, this should encourage firms to list on the market, increasing liquidity and attractiveness of stocks to investors. At the heart of this theory is market integration. Markets are considered integrated when assets of identical risk command the same expected return. In perfectly integrated markets, capital flows across international borders to equate the price of risk. If capital controls or other barriers impede capital movements, then the price of risk should differ internationally.

The provision of funds to finance domestic capital formation is increasingly being recognized as a key factor bearing upon the prospects for long-term economic growth in developing countries. Further, the capital structure of firms in developing countries where there is no viable equity markets are generally characterized by heavy reliance on internal finance and bank borrowings which tend to raise the debt/equity ratios. The undercapitalization of firms with high debt/equity ratios tends to lower the viability and solvency of both the corporate sector and the banking system especially during economic downturn. The evidence on the contribution of equity markets to corporate finance in both advanced and emerging economies suggests that the role of the stock markets in providing capital for corporate expansion is mixed[14]. Based on a flow of funds accounts analysis of firms in eight industrial countries, over 1970–85 Mayer (1989) found that stock market contributed to only a small proportion of corporate finance. Indeed, in both Britain and the USA, firms bought back more equity than they had issued. Singh and Hamid (1992) examined the financing patterns of top listed companies in manufacturing, quoted on the stock markets in each of ten developing countries – Brazil, India, Jordan, Malaysia, Mexico, Pakistan, Republic of Korea, Thailand, Turkey, and Zimbabwe – and found that firms rely more on external resources for corporate expansion. The proportion of corporate growth financed by

[14] The financial system in many developing countries are characterized by high domestic ownership resulting in an oligopolistic form of market structure thereby creating privileged access to credit for large companies but limited access to smaller and emerging companies (World Bank, 1998).

internal finance was about 16 per cent in Korea, 30 per cent in Malaysia, 57 per cent in Zimbabwe, and 67 per cent in Pakistan. In the 10 sample developing countries, equity finance contributed about 40 per cent of net asset growth. However, the relative importance of external debt and equity varies widely among countries. New equity contributed only 16 per cent of new capital for Indian firms, but 66 per cent for Turkish firms, and about 44 per cent for firms in Zimbabwe. A study by Glen and Singh (2003) found that liabilities accounted for 49 per cent of total financing over the period 1996 to 2000 for seven major African Countries. Of the remaining 51 per cent, internal equity represented 29 per cent, with external equity representing 22 per cent. Glen and Singh (2003) also found substantial differences in the above pattern across advanced and developing countries and across individual countries. Studies at micro-economic level by Demirguc-Kunt and Maksimovic (1998) and Rajan and Zingales (1998) find that financial institutions such as stock markets have been crucial for firm and industrial expansion.

In the Indian context, numbers of studies have examined various aspects of Indian stock market. Most of them have found that India's stock market has grown manifold and is now comparable to many developed market (Vaghul, 1994; Sen and Vaidya, 1997; Bhaduri, 2005; IMF 2006; Bhaduri and Shankar, 2007). This extraordinary performance of the Indian stock market can be attributed to financial liberalisation.

During the period from 1988 to 1993, Indian stock market exhibited rapid development in terms of size, liquidity and international integration (Levine and Demirguc-Kunt, 1996; Nagraj, 1996). Nagraj (1996) found that India's capital market witnessed rapid growth since 1980s; he also found that there exists no association between growth in capital market mobilisation, aggregate saving rate, corporate physical investment and gross value added. However, this study does not cover the liberalization years. Samal (1997) concluded that equity market development depends on the economic growth of emerging economies like that of India and not on the portfolio investments by foreign institutional investors (FIIs). FIIs investment greatly influences share price movement and creates volatility in the equity market. A study by Pal (2006) reports that secondary segment of the stock market has performed quite well in the post-liberalization period. He attributes this high growth in Indian stock

markets to strong FIIs investment. By using monthly data on size, liquidity and volatility from 1989 to 1998, Biswal and Kamaiah (2001) found that the stock market in India has witnessed a phenomenonal but uneven growth in post liberalisation period. Similarly, Poshakwale (1996), Alimov et al. (2004) and Wong et al. (2005) examined whether the Indian stock market is weak or efficient and their result indicates that Indian market is informationally efficient. On the other hand, (Correa, 2000) found that Indian stock markets are inefficient and liberalisation seems to have had no impact on efficiency. All the above-mentioned studies have confirmed that stock markets in India have witnessed a phenomenal growth during liberalisation period.

To sum up, we find that M-S hypothesis has had a major impact on financial liberalisation and many countries have liberalised their financial sector with major emphasis is on the development of market-based systems. In this context, government have been proactive in developing the stock market with series of reforms. As a result, worldwide stock markets have grown rapidly and emerging markets account bulk of this increase. Market infrastructure, law and regulations have improved; at the same time financial crisis and volatility in emerging markets have also increased. This has increased the role of stock market in resource mobilisation and allocation in developing countries. Empirical evidence also supports this argument. Stock market is now important source of funds for corporate investment and vital segments of financial system.

1.3. Financial Liberalisation and Stock Market Development in India

The place and role of stock market within the Indian financial system came into scrutiny in the 1980's but more particularly, in the discourse on financial sector liberalisation after 1991 following Narasimham Committee Report[15]. As a result, a series of measures have been initiated towards financial sector liberalisation (including stock market liberalisation). Among others, market forces are assigned the role of resources mobilization and allocation[16]. The opening of the stock market has

[15] The objectives of financial sector liberalisation is to develop a more resilient, competitive, dynamic and stable financial system with best practices that supports and contributes positively to the growth of the economy (Narasimham Committee, 1991).

[16] In pre-liberalization period, corporate sector depended mainly on bank credit for source of funds (Allen et al., 2007).

wide implications not only for internal structure and functioning of the stock market, but also for the even development of other segments of the financial system[17].

Table 1.1: Growth of Stock Exchanges in India Pre-liberalization Period

Year	No. of Stock Exchanges	No. of listed Companies	Market Capitalization Ratio	Turnover Ratio	Value traded Ratio
1960-61	5	1203	7.0	34.9	2.5
1970-71	8	1599	4.1	40.2	1.6
1975-76	8	1940	3.8	44.6	1.7
1979-80	9	2065	4.4	42.1	1.9
1980-81	9	2265	5.6	59.5	5.2
1981-82	9	2445	5.9	34.1	2.7
1982-83	11	2873	6.5	44.6	2.8
1983-84	12	3118	6.8	24.8	1.6
1984-85	13	4344	6.8	34.5	1.9
1985-86	15	4744	8.6	48.3	2.3
1987-88	15	5560	9.9	43.9	2.6
1988-89	15	5764	10	68.9	6.3
1989-90	19	5987	12.9	65.9	7.3
1990-91	19	6229	19.3	56.9	9.7

Source: Bombay Stock Exchange Directory, Various Issues and RBI, Report on Currency and finance, Various Issues.

Notes: (1) market capitalization ratio is defined as total market value of stocks listed to GDP. It indicates size of the stock market; (2) Turnover ratio is defined as the ratio of total value traded to total market capitalization. High turnover ratio is often used as an indicator of low transaction costs; (3) Value traded ratio is defined as the ratio of total value traded to GDP

In the pre-liberalisation period (before 1991), the new issue market in India was underdeveloped and companies had to obtain prior permission to issue capital under the Capital Issue (Control) Act 1947. As a result the price of the securities and volume of capital were fixed by the Controller of Capital Issues. Trading on all stock exchanges was through open outcry, settlement systems were paper-based, and market intermediaries were largely unregulated. Further, activity in the primary market was restricted to few major investors leading to liquidity constraints, narrow trading base in secondary market. As a result, stocks were dormant and not an important source of funds for corporate sector in pre-liberalisation period. The growth of stock exchanges in pre-liberalisation period in India is given in Table 1.1. It is evident that stock market size as measured by the number of listed companies[18] and market

[17] More generally, stock markets are seen as enhancing the operations of the domestic financial system in general and the capital market in particular (Kenny and Moss, 1998).

[18] The rationale of including this measure is that as the number of listed company increases, available securities and trading volume also increases. therefore, it also captures size of the stock market.

capitalisation ratio[19] has increased manifold over time. Market capitalisation ratio, which was 7 per cent in 1960-61, decreased to 5.6 per cent in 1980-81 but there after increased to 19.3 per cent at the end of 1990-91. Two measures of liquidity – total value traded ratio[20] and turnover ratio – indicators of level of trading activity in the stock market are also shown in the table. Value traded ratio, which was 2.5% at the beginning of 1960s, increased to 5.2% in 1980-81 and further increased to 9.7% in 1990-91, indicating low liquidity of Indian stock market.

1.3.1 Stock Markets in Post-Liberalisation Period (1992-2007)

In 1991, following a balance of payment crisis, India government set in motion widespread deregulation and liberalization policies also known as Structural Adjustment Programme (SAP). Some of the major financial sector liberalisation policies, which have widespread implication on stock market development, resource mobilisation and allocations, are:

(a) Phasing out directed credit system

(b) Deregulation of interest rates and reduction of Statutory Liquidity Ratio (SLR) to release resources for private sector.

(c) The abolition of Capital Control Issue (CCI) Act, 1947 in 1992, and allowing companies to freely decide the price and volume of new issues.

(d) Establishment of Securities and Exchange Board of India (SEBI) as the regulator of the securities market to protect the integrity of transactions and usher improvements into the microstructure of capital markets.

(e) Foreign Institutional Investors (FIIs) such as pension funds, mutual funds, investment trusts, asset management companies, nominee companies and institutional portfolio managers were allowed to invest in Indian securities market from 1992 onwards.

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[19] In terms of economic significance, the assumption behind market capitalization is that market size is positively correlated with the ability to mobilize capital and diversify risk on an economy wide basis (Agarwal, 2001

[20] The value traded ratio measures the organized trading of firm equity as a share of national output and therefore should positively reflect liquidity on an economy-wide basis and complements the market capitalization ratio.

(f) Domestic companies were allowed to raise capital through Global Depository Receipts (GDRs)[21], American Depository Receipts (ADRs)[22], Euro[23] and external commercial borrowings. Investment norms for Non-residential Indians (NRIs) were liberalized. They are now permitted to buy shares and debentures without prior permission of Reserve Bank of India (RBI).

(g) Private mutual funds were permitted to invest in capital market from 1997. All mutual funds permitted to apply for firm allotment in public issues. To improve the scope of investment by mutual funds, mutual funds were permitted to underwrite public issues.

(h) Establishment of Over the Counter Exchange of India (OTCEI) and the National Stock Exchange (NSE) of India in 1993-94 with nationwide screen-based stock trading and electronic display, clearing and settlement facilities. Similarly, automatic on-line screen based trading introduced at Bombay Stock Exchange (BSE) in March 1995.

All these liberalisation measures have significant impact on the development of stock market and it is discussed in next section.

1.3.2 Primary Market

Activities in the primary market were active in early 1990s but declined thereafter following scams, recession in the economy and slow down in industrial production. Total resources mobilised from primary market increased from Rs. 16,366 crores in 1991-92 to Rs. 48,084 crores in 1994-95 followed by declining trend in resources mobilisation in the following years. However, from 1997-98 capital raised from primary market shows an increasing trend. At the end of 2006-07 total resource mobilisation by corporate sector from the primary market was Rs.1,94,958 crores. Domestic resource raised as a ratio of gross capital formation varies from 11% to 24% in post-liberalization period (1992-2007), which is substantially higher compared to

[21] A financial instrument used by Indian companies to raise capital from foreign market denominated either in U.S. dollars or in other currencies.

[22] A GDR issued in America is known an American Depository Receipts (ADRs) and ADRs are traded in American stock exchanges.

[23] Indian companies can raise resources through Foreign Currency Convertible Bonds/Euro Currency Bonds (FCCBs/ECBs) in the Euro market.

pre-liberalisation era. This clearly shows the importance of securities market as the major source for capital formulation.

Further, Indian securities market is also getting integrated with the global market, through Euro issues. Now Indian companies are raising a significant amount of resources from Euro market, as a sum total of Rs.75,650 was raised between 1992-07, since they were permitted access in 1992 (see Table 1.2).

Table 1.2: Resource Mobilization from Primary Market by Corporate Sector (in Rs. Crores)

Year	Corporate Securities	Domestic Issues	Private Placements	Euro Issues	Euro issues as % of Domestic Issues	Total issues as % Domestic Capital Formation
1991-92	16366	16366	4463			11.42
1992-93	23537	23286	1635	702	3.0	13.22
1993-94	44498	37044	7566	7898	21.3	24.37
1994-95	48048	41974	11174	6743	16.1	20.29
1995-96	36689	36193	13361	1297	3.6	11.64
1996-97	37147	33872	15066	5594	16.5	12.47
1997-98	42125	37738	30099	4009	10.6	12.26
1998-99	60192	59044	49679	1148	1.9	16.17
1999-00	72450	68963	61259	3487	5.1	15.81
2000-01	78119	73992	67500	4197	5.7	16.53
2001-02	74403	72061	64950	2342	3.3	14.76
2002-03	75241	71814	66948	3426	4.8	13.49
2003-04	74509	66405	59215	3098	4.7	10.27
2004-05	108650	105297	83405	3352	3.2	12.22
2005-06	134765	123419	96473	11352	9.2	12.80
2006-07	194958	177953	145571	17005	9.6	16.03

Source: National Stock Exchange, Securities Market in India- An Overview, Various Issues.

1.3.3 Secondary Market

The Indian stock market has experienced a process of structural transformation with operations conducted to standards equivalent to those in the developed markets in the post liberalisation period. As a result, it has grown exponentially measured in term of number of stock exchanges and their intermediaries, the number of listed stocks, market capitalisation, trading volumes and turnover on stock exchanges, and investor's population (see Table 1.3).

The key ingredients that underlie market quality in India's equity market are: (a) exchanges based on open electronic limit order book[24]; (b) nation-wide integrated

[24] A limit order is an instruction from a customer to a broker to buy a security at no more (or sell at no less) than a specific price. This gives the customer some control over the price at which the trade is executed, but may prevent the order from being executed •

market with a large number of informed traders and fluency of short or long positions; (c) no counterparty risk[25] and electronic settlement; and (d) Derivative trading[26]. Screen-based trading was introduced in 1996 in all stock exchanges for improving transparency and efficiency. The first exchange to be on open electronic limit order book was the National Stock Exchange from 1994 onwards. Now all the stock markets have shifted to open electronic order. All these measures have had a positive impact on the growth of the stock market, which can be seen from Table 1.3

Table 1.3: Stock Market Development in Post-Liberalisation Period

Year	No of Brokers	No of Listed Companies	Market Capitalization Ratio	Turnover Ratio	Value Traded Ratio	Transaction cost
1991-92	-	6480	57.4	56.8	9.7	-
1992-93	-	6925	32.4	37.0	8.5	-
1993-94	-	7811	45.6	50.9	23.2	-
1994-95	6711	9071	45.6	34.4	18.9	4.75
1995-96	8476	9100	47.0	39.7	18	-
1996-97	8867	9890	34.6	57.7	19.1	-
1997-98	9005	9833	37.7	154.1	59.2	-
1998-99	9069	9877	34.1	178.3	58.7	-
1999-00	9192	9871	84.7	173.3	107.1	0.60
2000-01	9792	9954	54.5	374.7	137.9	-
2001-02	9687	9699	36.4	119.6	41.3	-
2002-03	9511	9413	28.4	153.3	43.2	-
2003-04	9367	9347	52.3	138.6	61.5	0.45
2004-05	9128	9347	55.05	98.4	53.5	-
2005-06	9335	9377	85.5	79.0	66.6	-
2006-07	9443	9387	89.5	84.8	70.7	0.23

Source: NSE, Indian stock market Review, Various Issues.

The number of brokers has gone up from 6711 in 1994-95 to 9443 in 2006-07. At the same time the number of listed companies on Indian stock market also moved up from 6480 in 1991-92 to 9347 at the end of 2004. Market capitalization ratio, which is the indicator of size of the market in relation to economy increased from 57.4 per cent in 1991-92 to 84.7 percent in 1999-00 and thereafter increased to 89.5 per cent by end of

[25] The risk to each party in a contract, the counterparty will not live up to its contractual obligations. In most financial contracts, counterparty risk is known as "default risk".

[26] Derivatives are financial instruments and its value depends on the value of the underlying financial instruments. The main types of derivatives are futures, forwards, options and swaps. The main use of derivatives is to reduce risk for one party. The underlying assets could be equities, bonds, interest rate and exchange rate or indexes.

2007[27]. Over the same period turnover ratio has increased from 56.8 per cent to 374 per cent in 2000-01 and thereafter declined to 84.8 per cent in 2006-07. Value traded ratio also increased from 23.2 per cent in 1993-94 to 137.9 percent and thereafter declined to 70.7 per cent in 2006-07. This implies that liquidity situation of Indian stock market has improved in post liberalisation period. Further, transaction cost[28] declined from 4.75 per cent 1994-95 to 0.60 per cent at the end of 1999 and further to 0.45 % in 2003-04. In fact, in term of transaction cost, India ranks third after the US and Hong Kong (SEBI-NCAER, 2003). Automation of trading in stock exchanges has increased the number of trades and the number of shares traded per day, which, in turn, has helped in lowering transaction costs.

1.3.4 Foreign Institutional Investors and Indian Stock Market

Although, FIIs were allowed to invest in the Indian stock market from September 1992, however investment by them were first made in January 1993. FIIs net investment was positive until 1998 however, following East Asian crisis turned negative.

Table 1.4: FIIs Investment in Indian Stock Market (in US $ Million)

Year	Gross Purchase	Gross Sales	Turnover	Net Investment (in million $)	FIIs Turnover/ Total Turnover (%)
1993-94	5592	466	6058	1665	2.97
1994-95	7631	2834	10465	1503	6.42
1995-96	9693	2751	12444	2009	5.47
1996-97	15553	6979	22532	1926	3.49
1997-98	18694	12737	31431	979	3.46
1998-99	16115	17699	33814	-979	3.30
1999-00	56855	46733	103588	2135	5.01
2000-01	75950	64116	140066	2160	4.86
2001-02	49962	41217	91179	1846	10.18
2002-03	46172	44186	90358	522	9.33
2003-04	148514	99547	248061	10918	16.31
2004-05	216953	171073	388206	10172	23.02
2005-06	344978	301512	646490	9926	25.23
2006-07	520509	489668	1010177	6708	27.05

Source: SEBI Annual Report, Various Issues.

[27] A cross-country study has identified that in the case of India, the equity market size has expanded mostly because of changes in financial technology, followed by changes in macroeconomic fundamentals (Li, 2007).

[28] Transaction costs are of two types – direct and indirect. Direct costs arise from costs incurred while transacting a trade such as fees, commissions, taxes, etc. These costs are directly observable in the market. In addition, there are 'indirect' costs that are not directly observable but can be derived from the speed and efficiency of execution of trades.

The cumulated investment by FIIs reached $52 billion at the end of 2006-07, showing the confidence of FIIs on the Indian stock market (SEBI, 2008). Over the years, FIIs turnover has gone up and now it stands at 27% of total turnover in 2006-07 (see Table 1.4). According to Economic Survey (2007) FIIs share in the spot market was more than 27% of gross turnover of NSE and BSE, and 9% of all derivatives turnover. Presently share price discovery seems to take place in the derivative market. There is no doubt that FIIs are the biggest influential players in the Indian stock market but not the only player.

1.3.5 Institutional Arrangement and Infrastructure Changes

One of the major objectives of stock market liberalisation is to improve institutional arrangement and infrastructure of the stock market because it has direct consequence on efficiency and liquidity of stock market. Thus, in this section we assess the improvement in institutional arrangement and infrastructure of the Indian stock market. SEBI is the primary body responsible for regulation of the securities market, deriving its powers of regulator and enforcement primarily from the SEBI Act. Floor–based trading system (open outcry system) was replaced by automotive electronic trading in mid 1990s, on the ground that floor-based trading system is inefficient and less transparent. Now all the stock exchanges have adopted on-line screen based electronic trading, replacing the open outcry system. The deeply flawed account period settlement system was replaced by a T+2 rolling settlement, that is one of the most efficient systems in the world, and badla or carry-forward trading gave way to a rapidly developing derivatives market. Further, to improve functioning of the securities market, earlier physical transferring of shares was replaced by transfer of ownership of securities electronically by way of book entry (dematerialisation) under the Depositories Act, 1996. Virtually all trading takes place on a dematerialized basis through a central depository. Moreover, under demutualisation process all the stock exchanges are corporatized by separating ownership, management and trading membership of stock exchanges. A separation of above helps to prevent clash of interest, when safeguarding the investor's welfare.

In Table 1.5 we compare the institutional and infrastructure development indicators between Indian stock markets and developed economies. These indicators reveal that

the infrastructural facilities available in Indian stock markets and institutional arrangements adopted are comparable to developed stock markets such as USA, UK and Japan. The common features observed between these markets are central depository system, derivative trading, and adoption of international standards for accounting and auditing. Therefore, changing infrastructure and institutional character has major implication for protection of investors, trading costs, market liquidity and cost of resources raised from primary market.

Table 1.5: Institutional & Infrastructural Development Indicators

Development Indicators	Indian Stock market	Developed Stock Market*
Market Regulator	✓	✓
Governing law	✓	✓
Clearing and settlement	Electronic System	Electronic System
Settlement cycle	T+2	T+2
Existence of an international custodian	✓	✓
Foreign participation	✓	✓
Exchange control	No	No
Trading systems	Electronic System	Electronic System
Existence of a Central depository	✓	✓
Trading days	5	5
Reporting system	International Standard	International Standard
Derivative Trading	✓	✓
Investors protection	✓	✓
Demutualisation	✓	✓

✓ *Denotes the existence of related indicator. * Developed market such as USA, UK, JAPAN and Hong Kong etc.*

1.3.6 International Comparison of Indian Stock Markets

Although Indian stock market has grown rapidly since 1991, but where does Indian stock market stand in compassion to other developed and developing market? In this section we present a comparative picture of Indian stock market vis-à-vis developed markets (Table 1.6).

Table 1.6: International Comparison of Indian Stock Market

Country	Market Capitalisation Ratio			Turnover Ratio			No. Companies Listed		
	1996	2000	2007	1996	2000	2007	1996	2000	2007
India	34	54.5	200	19.1	138	84	9890	9922	9413
USA	115	358	149	97	250	234	8479	7524	5130
UK	151	130	157	50	97	270	2433	1904	2588
Japan	67	66.4	90	27.2	53	142	2453	2561	3888
Brazil	25.6	35.4	154	61.3	44.0	56	551	459	442
China	14	73.6	238	31.4	53	180	540	1086	1530
Germany	28	50.8	69	33	66	180	681	1022	658

Source: S&P, Emerging Stock Market Fact books, Various Issues.

It is evident that India has a turnover ratio, which is favourably comparable to other developed markets, and one of the highest in the emerging market. By the end of

2006, India ranked 15th in the world in term of market capitalisation, 18th in term of total value traded, 21st in term of turnover ratio and first in term of companies listed in stock market. However, while India's position has deteriorated in terms of turnover ratio (21st in term of turnover ratio as against 7th in 2002), it has improved in term of companies listed in stock market and market capitalisation ratio. India's share in worldwide market capitalisation increased from 0.41% in 1990 and to 0.45% in 2001 and further increased to 2.81 % in 2007.

Although Indian stock market has grown rapidly during last decade, its share with world market as a whole remains very low (Standard and Poor Fact book, 2008). Despite having large number of companies listed on its stock exchanges, India accounted only 1.16% of total turnover in 2007 (Standard and Poor Fact book, 2008). Although India ranked first in terms of listed companies, such high incidence of listing however is not a major advantage. Since it is the result of partly liberal listing requirement of earlier years (1991-1996), many of the listed companies with low equity base are mostly not traded on the stock market (Misra, 1997 and Saha, 1997). The low proportion of traded companies in total listed companies reflects the thinness of trading pattern and also the concentration of trade on few companies. Furthermore, the average company size listed in Indian stock market is quite low in comparison to developed countries as well as emerging countries. World ranking of average company size listed in Indian stock market was 80th out of 97 countries in 2000 and the position has improved to 64th out of 98 countries at the end of 2006.

1.3.7 International Integration of Indian Stock Market

Indian stock markets are now not only comparable to other stock markets, but also well integrated with rest of the world as seen from correlation coefficients[29]. The coefficient of correlation between Indian stock markets with global markets over two periods (April 1991 to March 2000 and April 2000 to March 2007) is presented in Table 1.7. The objective is to see how Indian stock markets integrating with world stock market over time. Although correlation in stock market returns across mature

[29] International integration has had a major impact on domestic stock market in term of market activity, volatility, efficiency, risk diversification and capital mobilization and allocation.

markets is significantly higher than across emerging markets, correlation of equity returns between emerging and mature markets has increased in recent years.

To sum up, we find that Indian stock market was dormant, underdeveloped and virtually non-existent in pre-liberalization period. As a result stock market had no role in economic growth. Following liberalisation of stock market, institutional structure has improved.

Table 1.7: Correlation of Global Stock Markets

Countries	India	USA	Malaysia	U.K.	France	Japan	Brazil
(April 1991 to March 2000)							
India	1.00						
USA	0.17	1.00					
Malaysia	0.16	0.17	1.00				
U.K.	0.21	0.36	0.11	1.00			
France	0.13	0.38	0.12	0.77	1.00		
Japan	0.22	0.13	0.17	0.25	0.25	1.00	
Brazil	0.18	0.40	0.18	0.28	0.22	0.26	1.00
(April 2000 to March 2007)							
India	1.00						
USA	0.43	1.00					
Malaysia	0.33	0.23	1.00				
U.K	0.48	0.85	0. 17	1.00			
France	0.44	0.75	0.22	0.77	1.00		
Japan	0.39	0.84	0.42	0.79	0.77	1.00	
Brazil	0.60	0.66	0.31	0.56	0.54	0.59	1.00

Source: Authors calculation

Transaction costs have declined. The primary and secondary segments of the capital market expanded rapidly, with greater institutionalisation and wider participation of domestic and foreign investors. Indian stock market is getting increasingly integrated with the rest of the world. Now, Indian stock market is comparable to developed stock markets in many ways such as; size, liquidity, infrastructure, risk management etc. This rapid rise in stock market growth has made stock market vital for capital mobilisation and allocation in Indian financial system. This has increased the role of stock market in influencing economic growth through capital mobilisation and allocation. This is the major objectives of this study.

1.4 Significance of the Study

While earlier studies have analysed some issues on the theme of stock market development and economic growth, an integrated approach to the analysis of this theme has not yet been attempted for India. Particularly, most of the studies have

ignored the transmission mechanisms from stock market development to economic growth. This is the main objective of the study. Moreover, the development of the stock market must be understood in relation with resource mobilization and the channelling of resources for corporate investment and its implication for economic growth. Yet there is hardly any systematic study available that views the development of the stock market in this broad framework. The present study is an attempt to fill this gap in the literature and may be seen as a contribution to the ongoing debate on financial liberalisation in India. In terms of theory and policy implications, the study assumes significance especially in the context of recent economic liberalisation in India.

1.5 Objectives of the Study

Against the above background, this study examines the role of stock market development in economic growth by examining three major channels, viz., liquidity, savings, and capital mobilization and resource allocation. The specific objectives of this study are:

1. To investigate the impact of financial liberalisation on stock market liquidity and volatility.
2. To examine the impact of stock market development on economic growth by examining its role in capital mobilization and efficiency of allocation.

1.6 Methodology[30] and Data Source

The period of our analysis is from 1979-80 till 2006-07. However, for firm level analysis the period of analysis is 1989-2007. For studying the volatility of Indian stock market, conditional variance models such as GARCH (Generalized Autoregressive Conditional Heteroscedasticity)/ E-GARCH (Exponential GARCH) model has been used. For testing structural break in volatility, Bai and Perron endogenous structural break point identification procedure is applied. In the exercise testing for economic growth, stationarity of all the variables are examined using Augmented Dickey Fuller tests. Autoregressive Distributed lag (ARDL) model is used to examine the cointegration between non-stationary variables. Vector error correction model (VECM) has been employed to examine the causality problem.

[30] Critical review of the different methodologies and the rationale for choosing a particular methodology is discussed in detail in respective chapters.

Various sources of data are used for the study. The study had mainly relied on secondary source of data such as: Annual report of Securities and Exchange Board of India (SEBI), RBI's (Reserve Bank of India), Report on Currency and Finance, Handbook of Statistics on Indian Economy, RBI Annual Reports, Economic Survey, and International Finance Corporations (IFC) Fact Books. The study also required information at the firm level. Firm level data has been collected from CMIE's electronic database known as PROWESS. Besides these, wherever necessary we resorted to various other sources such as World Bank Indicators, World Financial Exchange (WFE), Annual Report, and Bombay Stock Exchange Official Directory (BSEOD).

1.7 Chapter Scheme

Chapter 1 provides the introduction and analytical framework for the study. Chapter 2 gives a review of stock market development in pre and post liberalisation period and also analyses the impact of liberalisation on stock market liquidity. For this we estimate dynamic liquidity, which not only measures the depth, and breadth, but also resiliency of the market. Chapter 3 deals with the impact of stock market liberalisation on volatility, to test for counter arguments on the benefits of stock market liberalisation endogenous break test is employed to identify breaks in volatility and then relate that with stock market liberalisation. The analysis in Chapter 2 and 3 acts as a background for the analysis carried out in later chapters.

Chapter 4 examines the impact of stock market development on savings in India by using cointegration and causality. In chapter 5, we analyse the impact of stock market development on mobilization and allocation of capital. Chapter 6 explores the relationship between stock market development and economic growth in the light of endogenous growth theory by utilising cointegration and causality techniques and assesses the strength of different channels in contributing to growth. Finally, Chapter 7 provides a summary and conclusion of the study.

CHAPTER II

Impact of Stock Market Liberalisation on Market Liquidity

2.1 Introduction

Liquidity is one of the important indicators of stock market development because market liquidity dynamics is an important element for investors' decision making, developing efficient trading strategies and managing portfolio risks. Further, both theoretical and empirical studies indicate that stock market liquidity affects economic growth by increasing savings and allocating capital efficiently. Therefore, the objective of this chapter is to empirically examine the impact of stock market liberalization on market liquidity in India.

Stock prices are generally considered as leading indicators of future economic activity (Fama, 1981 and 1990; Pearce, 1983; Chen, Roll and Ross, 1986; Barro, 1990). This is true if current prices represent discounted value of expected dividend growth and that such assets are traded in deep and well-informed markets. In other words, stock market must be highly liquid[1] in order to consider stock price as leading indicator of economic activity. Therefore, stock market liquidity can be considered as a very important measure of stock market development and an important channel leading to growth. Further, it substantially affects the price discovery process in the market; and is therefore supposed to have a close relationship with market efficiency[2]. An improvement in market liquidity will enhance the extent to which available information is reflected in market prices, helping the stock market to perform the price discovery process smoothly. Increased efficiency improves the aggregation and transmission of information through price signals, and thus allows agents to make more informed investment decisions and spread their risk more effectively (Amihud, Mendelson and Lauterbach, 1997; Caprio and Demirgüç-Kunt, 1998). Liquidity is

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[1] A stock market is considered to be liquid if sellers (buyers) can quickly sell (buy) large amount of assets without adversely affecting its price. Thus a liquid stock market is characterized by having small transaction costs; easy trading and timely settlement; and large trades having only limited impact on the market price (Baker, 1996; Bernstein, 1987).

[2] In Finance theory, an efficient market is defined as "a market where all available information is reflected in prices" (Fama, 1965).

also desirable because it reduces the required return by investors and therefore increases security values and reduces cost of equity capital (Henry, 2000b). Efficient stock prices and yields provide benchmarks against which the cost of capital for and return on investment projects can be judged (Green, Maggioni and Murinde, 2000).

A stable market is also a concept closely related to market liquidity. A stable market, in this context, is defined as "a market where the probability of its price discovery function coming to a halt is quite small over sufficiently long periods of time" (Muranaga, 1999 p.2). Destabilization effect of the market caused by the decline in liquidity will materialize, when market participants lose confidence in the price discovery function of the market. If the market has insufficient liquidity under normal conditions, it is more likely that sudden shocks will lead to a destabilization of the market as whole by the rapid exhaustion of liquidity. Therefore, maintenance of sufficient liquidity under normal conditions would improve the market stability.

From above discussion it is clear that market liquidity is a major indicator of stock market development and has multiple dimensions and requires comprehensive set of measures. In this context, we have used a number of measures to capture various dimensions of liquidity, since there is no single theoretically correct and universally accepted measure to gauge the degree of market liquidity. This chapter is structured as follows: Section 2.2 addresses the concept of market liquidity. Section 2.3 deals with literature review. Section 2.4 gives a brief review of data source and methodology. Empirical results are presented in Section 2.5 and finally, we summarise the chapter in Section 2.6.

2.2 Concept and Dimension of Market Liquidity

For an individual market participant, a liquid market is generally defined as a market where a large volume of trade can be immediately executed with minimum effect on the price. From the viewpoint of the overall market, market liquidity is defined and measured in terms of the total volume and profile of effective supply and demand. The term "effective demand and supply" refers to each market participant's potential trade needs at a certain time which are not necessarily reflected in the observable order book profile or order flows. The reasons why effective supply and demand do not necessarily come to the surface include the existence of explicit trading costs such as taxes, brokerage fee and transaction fees, and implicit costs whose magnitude is

unknown as a result of the information asymmetry among market participants.[3] New effective supply and demand is induced by explicit decline in trading costs and reduction in information asymmetry. Generally, liquid markets tend to have five characteristics: (a) Tightness; (b) Immediacy; (c) Depth; (d) Breadth; and (e) Resiliency.[4] Tightness shows the difference between trade price and actual price, and is usually measured by the bid-ask spread. Smaller the spread higher is the tightness. So, tightness refers to low transaction cost. Immediacy represents the speed with which orders can be executed and, settled and thus reflects, among other things, the efficiency of the trading, clearing, and settlement system.

Depth refers to the existence of abundant orders; either actual or easily uncovered by potential buyers and sellers, both above and below the price at which a security now trades. Therefore, depth is defined as the absorptive power of order queues in every price grid. There would be infinite depth available at the market price in perfectly liquid market. Breadth means that orders are both numerous and large in volume with minimal impact on prices. Resiliency can be measured by the speed of convergence in the price level, after it has been disturbed by random price changes. Hence in highly liquid market, with respect to resiliency, price moves back immediately to their efficient level. These terms, however, are also to some extent overlapping. Most of the data do not fully correspond to these dimensions, which complicates their measurement.

2.2.1 Market Liquidity: Static vs. Dynamic Aspects

The channel by which market liquidity affects the price discovery process of the market has static and dynamic aspects. Earlier studies on market liquidity have mainly focused on the static aspects and have adopted indicators, which show market depth, such as volume turnover, frequency of trading, and bid-ask price spread. These proxies do not measure the true depth of the market, as they do not provide the information on the cost of trade. But in order to understand how market liquidity

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[3] Explicit cost refers to costs which are clearly known to the market participants before trade, while implicit costs refers to the costs that are unknown before the trade due to factors such as information asymmetry.

[4] For details see, for instance, Kyle (1985), Bernstein (1987), Hasbrouck and Schwartz (1988), Baker (1996) and Sarr and Lybek (2002) among others.

affects the price discovery process it is essential to consider the dynamic aspect of market liquidity. In other words, since effective supply and demand can only be recognized during the dynamic process of trade execution, we need to observe dynamic indicators such as price changes upon trade execution (market impact) and/or the convergence speed of the bid ask spread (market resiliency). These dynamic indicators reflect the actual result of the execution of transaction and the process by which information derived from such result is assimilated in the market. Especially while discussing market liquidity under stress, which has close links with market stability, it becomes essential to analyse such dynamic indicators as well as static indicators.

2.3 Literature Review

Liquidity is a major determinant of market viability and depends on the ability of the trading mechanism to match the trading desires of sellers and buyers. It arises from rules and market practices governing the trading process. Therefore, over the last 25 years, the subject of market microstructure has become a major area of research within the field of finance. However, surprisingly, most empirical research on market microstructure has been concerned with the major industrial countries, mainly the USA, UK and Japan.

Recently, renewed interest on microstructure as a subject has coincided with a period of establishment of new stock markets and liberalization of existing markets in many developing and transitional economies as their stock market were underdeveloped and liquidity was poor. The liberalisation of these "emerging" stock markets is typically characterized by institutional liberalisation, including modernization of trading and information systems, expanding stock market membership, revamping the regulatory framework, and opening access to foreign capital. The new market microstructure[5] offers advantages of speed and lower operating costs and has as its main objective the stimulation of market activity by attracting higher domestic and international order flows. It is argued that the entry of foreign investors is a more important factor than

[5] Most of the countries have switched from open outcry to electronic trading system. Electronic trading can contribute to market liquidity through its impact on fairness, speed of execution, access and costs (Harris, 2003).

internal market liberalisation (although the former may be predicated on the latter), which is followed by increased liquidity and enhanced efficiency in the price discovery process, with market volatility either remaining unchanged or declining (Kim and Singal, 2000; Ngugi, Murinde, and Green, 2002a, b). Liberalisation is aimed at improving stock market performance by increasing liquidity and transparency, enhancing efficiency, and reducing volatility and trading costs[6]. In this section, we restrict our review of literature to the impact of liberalisation measures on market liquidity.

Evidence from other countries, which have followed stock market liberalisation, show the revitalization process has a positive impact on liquidity and efficiency. These include studies on important markets such as Milan (Amihud, Mendelson and Murgia, 1990), Tokyo (Amihud and Mendelson, 1991), and Tel Aviv (Amihud, Mendelson and Lauterbach, 1997). Blennerhassett and Bowman (1998) report a fall in transaction cost following the liberalisation of New Zealand stock market. Majnoni and Massa (2001) report broadly positive impact of stock market liberalisation on liquidity and efficiency in the Italian stock exchange. Bortolotti, Jong, Nicodano, and Schindele (2007) found that privatization programme had positive impact on market liquidity for OECD countries during the period 1985-2000. However, studies on emerging markets[7] show mixed results[8]. Chang et al. (1999) found no change in liquidity or efficiency of the market following the introduction of liberalisation in Taipei. On the other hand, Bekaert et al. (2002) in a study of emerging markets found that stock markets tend to be more liquid after regulatory changes. Similarly, Gao and Kling (2006) also report positive impact of stock market liberalisation on market liquidity in the case of China. One major problem of the existing studies is that they use static

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[6] Theoretically it is argued that a change in the trading system, establishment of market regulator, and entry of foreign investors positively influences market liquidity and efficiency (Pagano and Röell, 1996; Demirgüç-Kunt and Levine, 1996; Richards, 1996).

[7] The term 'emerging market' was originally coined by International Finance Corporation (IFC) to describe a fairly narrow list of middle-to-higher income economies among the developing countries with stock markets in which foreigners could buy securities. The meaning of the term has since been expanded to include more or less all developing countries.

[8] One difficulty in studying emerging markets is that many of the stock exchanges are of recent origin and relatively few stocks are traded. Data from the pre-liberalisation era are often not adequate to carry out a full evaluation of the effects of liberalisation.

measures of liquidity such as turnover rate or value traded ratio and frequency of trading, which does not reflect the true market liquidity.

Studies on the impact of liberalisation on Indian stock market liquidity are few. Nayak (1999) has argued that not enough attention was given to market microstructure issues in the regulation of India's stock markets. The impact of the suspension and subsequent reintroduction of Badla[9] was studied by Berkman and Eleswarapu (1998). They found that introduction of Badla have increased market liquidity and noise in the market. Shah and Thomas (1996) compared market performance on the BSE between May-October 1994 and June-November 1995. The two key changes in this period were the commencement of trading at NSE and the introduction of electronic trading by NSE and BSE. They found the evidence of improvements in liquidity and efficiency due to the introduction of electronic trading, but their analysis relied on a direct comparison between the two time periods, and they acknowledged that this comparison did not permit a precise identification of the effect of electronic trading on its own. Shah and Sivaprakasam (2000) measured market liquidity by applying impact cost methodology[10] for the period February 1997 to July 1997. They found positive impact of electronig trading on market liquidity. Admittedly, this period is too short for a conclusive decision. Datar (2000) also attempted to measure market liquidity by applying an alternative measure of liquidity, namely, Coefficient of Elasticity of Trading[11] (CET) for the period starting from April 1998 to May 2000. According to him, CET as a measure of liquidity is better than impact cost. Again, the period of analysis is too short to assess the impact of market liberalisation on liquidity. Green et al., (2003) have examined the impact of on-line trading on market structure of BSE by using an event study method. They found that after introduction of Bombay on-line Trading (BOLT), the market structure in term of liquidity and efficiency has improved. However, most of the studies on India suffer from three

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[9] Badla was an indigenous carry-forward system invented on the Bombay Stock Exchange as a solution to the perpetual lack of liquidity in the secondary market.

[10] Market impact cost measures the impact of the trader's own action on the market price. It is defined as the ratio of price impact to trade volume standardised by the normal market size.

[11] Coefficient of Elasticity of Trading (CET) is defined as the ratio of % change in trading volume to % change in price.

major problems: (1) small sample size, (2) conclusions based on static indicators and (3) ignorance of pre-reform period.

2.4 Data Source and Methodology

The data for estimating dynamic liquidly indicators is collected from PROWESS database of Center for Monitoring Indian Economy (CMIE). For assessing the impact of liberalisation on market liquidity, the BSE Sensitive Index (Sensex) is the obvious choice because BSE provides data before pre-liberalisation, which we use to compare with post-liberalisation period. The Sensex consists of 30 most active shares. It currently accounts for roughly 50 per cent of the market value of BSE. Our period of analysis is from 1989 to 2007. Here we consider 1989-95 as the pre-liberalisation period and 1996-2007 as the post-liberalisation period[12]. For calculating dynamic liquidity, we followed the methodology paper by Sarr and Lybek (2002)[13], which show in detail how to calculate dynamic liquidity in financial markets. The procedures for the estimation of various indicators are presented in detail in appendix 2A.

2.4.1 Static Indicators

First we have analysed static liquidity indicators. In this regard, we have used three static liquidity indicators: Turnover ratio (i.e., the ratio of total turnover to market capitalization), value traded ratio (total turnover to GDP) and frequency of trading. The turnover ratio, which indicates level of trading activity relative to the size of the market, displays wide fluctuation. It was 59.9 per cent in 1980 and then declined to 34.4 per cent in the end of 1995 and thereafter improved to 178.3 per cent in 1999. It reached its peak in 2001 and since then it has declined to 81.8 per cent by the end of 2006-07. Value traded ratio, which is the indicator of trading activity in relation to the size of economy, also shows a similar trend. Both the ratios show that market liquidity, in fact, improved quite considerably in post-liberalisation period (see Table 2.1).

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[12] Our classification of periods is based on the commencement of automatic on-line screen based trading at BSE, which started in the year March 1995. Although liberalisation started from early 1992-93, we consider 1993 and 1994 as years marking transition (see Green et al., 2003).

[13] For details see, Sarr and Lybek (2002).

Table 2.1: Static Indicators of Liquidity

Year	Turnover Ratio	Value Traded Ratio	BSE Trading Frequency*
1979-80	59.5	5.2	24
1984-85	34.5	1.9	25
1988-89	68.9	6.3	26
1989-90	65.9	7.3	31
1990-91	56.9	9.7	32
1991-92	56.8	9.7	37
1992-93	37.0	8.5	32
1993-94	50.9	23.2	33
1994-95	34.4	18.9	45
1995-96	39.7	18	47
1996-97	57.7	19.1	44
1997-98	154.1	59.2	37
1998-99	178.3	58.7	41
1999-00	173.3	107.1	38
2000-01	374.7	137.9	39
2001-02	119.6	41.3	28
2002-03	153.3	43.2	31
2003-04	138.6	61.5	35
2004-05	97.7	53.1	36
2005-06	78.9	66.9	37
2006-07	81.8	70.7	38

Source: Annual Reports of SEBI, Various Issues.

* Trading frequency for a given firm is defined as the percentage of days on which its share is traded on the BSE as a fraction of the total days that the exchange was open during the period.

The trend in the frequency of trading indicates that there is not much improvement in the liquidity position of the stock market in the post-reform period. In 1989-90, around 31 per cent of listed companies were liquid and their share increase marginally to 38 per cent in the end of 2006-07. The market still remains thinly traded and almost 60 per cent of listed companies' shares do not trade regularly. From the above static indicators it is clears that market liquidity in fact improved in the post-liberalisation period. However, all these static indicators suffer somewhat from dimensional distortion and need to be complemented by dynamic liquidity indicators. For example, turnover is a flow variable whereas market capitalization is a stock measure. Second problem with these measures is that the price effect may lead to an increase in the liquidity ratio by boosting the value of stock transactions even without a rise in the number of transactions or a fall in transaction costs. Further, liquidity may be concentrated among larger stocks. Therefore, these indicators neither reflects the state of effective supply and demand since it does not take into account price impact due to trading (actual or potential). Bhattacharya and Spiegel (1998) highlight the dangers of using unidimensional static proxies for liquidity like the turnover ratio or value traded

ratio. Muranaga and Shimizu (1999) suggest that market impact (price changes upon trade execution) and market resiliency should be considered as dynamic measures of liquidity to examine how market liquidity affects the price setting process.

2.4.2 Dynamic Liquidity Indicators

Dynamic indicators represent the true condition of the market because they take into account the effective supply and demand position of transactions. Dynamic liquidity measures can be classified into three categories (1) Volume based measures that distinguish liquid markets by the volume of transaction compared to the price variability, primarily to measure breadth and depth; (2) Price based measures that capture orderly movements towards equilibrium prices to mainly measure resiliency; (3) Market-impact measures that attempt to differentiate between price movements due to the degree of liquidity from other factors, such as general market conditions or arrival of new information to measure both elements of resiliency and speed of price discovery[14]. All these indicators are discussed in detail.

2.4.3 Volume Based Measures

Volume based measures are most useful in measuring the breadth and depth of the market. Markets that are deep tend to foster breadth since large orders can be divided into several smaller orders to minimize the impact on transaction. Turnover rate, which does not consider the effect of trade on price, could be reformulated to take into account the price impact of transaction. We have used two volume based liquidity measures to calculate liquidity, they are: (i) Amihud liquidity ratio[15] (L_{am}) and (ii) Hui-Heubel Liquidity ratio[16] (L_{hh}). L_{am} tries to capture the price impact of trading. In a liquid market the price impact of a unit trade is small, i.e. a buy (or sell) order causes a small increase (or decrease) in price irrespective of turnover. Amihud liquidity ratio relates the absolute change in price to trading volume. Lower L_{am}, higher the market depth and vice-versa. This liquidity indicator is a proxy for the (implicit) bid-ask spread. L_{am} is defined as:

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[14] No single measure, however, unequivocally measures all the aspects of liquidity, such as tightness, immediacy, depth, breadth and resiliency.

[15] For more on this issue see Amihud (2002).

[16] See Baker (1996) for detailed discussion.

$$L_{am} = D^{-1}\sum\{|R_t|/\text{Turnover Ratio}\} \quad (1)$$

Where $|R_t|$ is the absolute daily return (*that is, the percentage daily return, ignoring the sign*) and D is the number of trading days in a year.

On the other hand, L_{hh} attempts to capture the order dimension of market breadth, which relates the volume of trade to their impact on price, and thus also resiliency[17]. L_{hh} is calculated as an average of 5-day period in a sample to smooth volatility. Subject to data availability, the ratio could also be calculated on a daily basis to capture very short-term price movements. Lower the value of L_{hh}, higher is the liquidity of the asset and vice-versa. To be specific about the dimension of liquidity being captured, one would say that market has more breadth when L_{hh} is low. The L_{hh} ratio is defined as:

$$L_{hh} = [(P_{max} - P_{min})/P_{min}] / [V/(S^* \bar{P})] \quad (2)$$

Where P_{max} = highest daily price over last 5 days.

P_{min} = lowest daily price over last 5 days.

V = Total volume of trading over last 5 days

S = Number of shares outstanding

$\bar{P}$ = Average closing price of the instrument over a 5-day period.

The numerator in L_{hh} can simply be measured as the percentage change in the price of the asset over the 5-day period chosen. Conventional liquidity measures relate this price change to the simple volume traded in the denominator (V). The Hui-Heubel's liquidity ratio uses the ratio of the traded volume to the outstanding volume of the asset (essentially the turnover rate) in the denominator. Depending on data availability, other measures of trading volume can be used in the denominator (e.g., number of securities traded). Liquidity ratios in general can also be expressed in terms of the value or number of units traded in the numerator to the percent change for a given interval of time. In this case market has more breadth, the larger the number of trades to the percentage price change.

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[17] Because trading volume may shift significantly both during the day, week and month depending on trading patterns, for instance, announcement of new information. Hence volatility of turnover should be taken into consideration.

It is argued that the impact of trading a large volume of an asset on price depends on whether the volume traded is a high proportion of the asset held in the market, which L_{am} and L_{hh} would capture. Thus, if buyers or sellers suddenly want to trade a high proportion of the outstanding volume of an asset, a significant price change could occur because those trades may be indicting that new information has arrived in the market. The price movement should therefore not be assimilated with illiquidity. In other words, the price change is owing to large volume change following new information. As a result, one of the criticisms against L_{hh} and L_{am} is the fact that the relationship between price movements and volumes are not proportional. The ratios do not represent true market liquidity when large volume of trading takes place in proportion to total asset. In using the ratio to predict future relationships between the two variables, one may overestimate price change on large volumes and underestimate them on small volumes. Furthermore, there is no distinction between transitory and permanent price changes. Another problem with emerging markets like India is the high price volatility with low volume of trading. In that case, L_{hh} ratio will underestimate liquidity position. In order to overcome this problem we have calculated price-based measure, which is described below.

2.4.4 Price Based Measures – Market Efficiency Coefficient (MEC)

Bernstein (1987) noted "measures of liquidity when no information is hitting a stock must be more relevant than measures of liquidity when new information leads to new equilibrium values... thus, unrefined measures of liquidity may be nothing more than some kind of weighted average reflecting the frequency with which new information hits one stock as compared with another." There is necessity for an underlying structural model to identify the equilibrium price. In this context, Hasbrouck and Schwartz (1988) proposed the Market Efficiency Coefficient (MEC) to distinguish short-term from long-term price changes. There are two major advantages of using MEC: (a) volume of transaction does not play a role in the construction of this measure, and thus one does not have to worry about the misleading effect that volume has on conventional liquidity ratio; (b) this measure takes into account the need to distinguish between liquidity and efficiency in the market place, by factoring in both short-period and long-period price volatilities.

The MEC exploits the fact that price movements are more continuous in liquid markets, even if new information is affecting the equilibrium prices. Thus for a given permanent price change, the transitory changes to that price should be minimal in resilient markets. Assume that long period return is divided into T shorter intervals with ending transaction prices given by $P_0,...,P_t,...P_T$., the price relative over the long period may be described as the product of price relatives over the T shorter periods:

$$P_T/P_0 = P_1/P_0 \times P_2/P_1 \ldots \times P_T/P_{T-1} \quad (3)$$

Taking Logarithms of Equation (3) gives:

$$R_t = \sum_{t=1}^{T} R_{s,t} \quad (4)$$

Where R_t and $R_{s,t}$ are the long period logarithmic return and short-period logarithmic returns respectively. Price volatilities over long and short period are measured by variances $Var(R_t)$ and $Var(R_{s,t})$. Suppose long period is taken as one month and short period is taken as one day, then one month contains 20 trading days on an average. Hasbrouck and Schwartz (1988) show that in the absence of execution cost, and assuming informationally efficient markets, the variance of one-day return would be:

$$Var(R_s) = Var(R_t) / 20 \quad (5)$$

Where $Var(R_s)$ is called as implied variance of daily return. Thus MEC is then taken as the ratio of implied volatility to observed volatility:

$$MEC = Var(R_s)/Var(R_s) = Var(R_t)/(T*Var(R_s)) \quad (6)$$

Where, Var (R_t) = Variance of Logarithms of long-period returns,

Var (R_s) = Variance of Logarithms of short-period returns,

T = Number of short periods in each long period.

According to equation (6) price changes in any market are of two types permanent change (market price discounts all the available information), and transitory change (short period change in price which is not equilibrium price). T is used to assess the volatility of transitory price change. The ratio would tend to be closer but slightly below unity in more resilient markets, since short-term volatility is more than long-term volatility. If the value of the MEC is greater than unity (higher long term volatility) or substantially below unity (excessive short term volatility), it implies market is inefficient. Low price volatility, when a new equilibrium is being

established, is also related to the concept of orderly markets[18]. In our analysis, daily returns and monthly returns are considered as short period and long period respectively. Since on an average 20 trading days are there in a month, number of short periods in each longer period is 20. So equation 6 can be rewritten as,

$$MEC = Var(R_t) / (20*Var(R_s)) \quad (7)$$

By applying above equation (7) we have calculated MEC ratio for the period 1989-2007 (see Table 2.2).

2.4.5 Market Impact Measures – Market Adjusted Liquidity (MAL)

As noted above, liquidity ratios, such as L_{hh} and L_{am}, generally do not distinguish between transitory price changes from permanent ones warranted by new information. When new information becomes available in the market, even small transaction volumes could be associated with large change in price. For instance, new information triggering a financial crisis may not result in large turnover because transactors, as long as they are not cash constrained, may prefer to wait and see. To better capture the price movement mainly due to large volumes, i.e. breadth, the price movements due to significant new information should ideally be extracted.

According to Capital Asset Pricing Model (CAPM) risk associated with any assets can be divided into two parts, (a) systematic risk and (b) unsystematic risk. Systematic effect relates to a risk that cannot be diversified because it affects all securities in a systematic fashion. The degree of this effect is called the "*beta* of the stock", and refers to the regression coefficient of a stock's return on that of market. The higher the "*beta*," higher the systematic risk of that stock. The unsystematic risk is the risk that is specific to the stock in question, once the market risk is removed. Hui and Heubel suggested CAPM approach to calculate the market-adjusted liquidity for equities. According to CAPM,

$$R_i = \alpha + \beta_i R_m + u_i \quad (8)$$

Where R_i = daily return on the i^{th} stock

R_m = daily market return

β_i = regression coefficient, represents systematic risk

[18] Orderly and resilient markets provide for greater price continuity, which is a desirable feature of liquid markets.

u_i = stochastic random error term or unsystematic risk.

The regression residual is then used to relate its variance to the volume traded.

$$\hat{u}_i^2 = \gamma_1 + \gamma_2 V_i + e_i \quad (9)$$

Where $\hat{u}_i^2$ = estimated squared residuals from equation (8)

V_i = daily percentage change in rupee volume of trade

e_i = stationary random error

The market-adjusted liquidity (MAL) uses the residual of a regression of the asset's return on the return of the market portfolio (thus purging it from its systematic risk) to determine the intrinsic liquidity of the asset. The smaller the value of γ_2 coefficient in equation (9), smaller is the impact of trading volume on the variability of the asset's price and therefore, the asset is more liquid. It should be noted that lower the coefficient, the more breadth the market has.

2.5 Empirical Results

The estimated four liquidity ratios are presented in Table 2.2 and Figure 2.1. It is clear from both that L_{am} and L_{hh} show wide fluctuations but declining trends over period. L_{am} ratio decreased from 2.88 in 1990 to 2.46 in 1996 and thereafter it further declined to 0.46 in 2007. At the same time, L_{hh} ratio increased slightly from 0.24 in 1990 to 0.28 in the end of 1994-95 and thereafter declined to 0.16 in 2007. This downward trend suggests evidence of increased breadth indicating that large value trade does not impact prices. To compare the liquidity in pre and post-liberalisation period, we estimate average over 1989-95 and 1996-2007. The average value of both L_{hh} and L_{am} are lower in liberalisation period than in pre-liberalisation period, indicating improvement in market depth and breadth.

Similarly, MEC ratio also shows a similar trend to that of L_{am} and L_{hh}. The MEC ratio, which was 1.08 in 1990, increased to 1.3 in 1995. During the period (1990-95), MEC coefficient has constantly remained above one, indicating market inefficiency and lack of resiliency. Throughout this period the ratio remained above one with wide level of fluctuation, indicating an adjustment in the equilibrium price[19]. Thereafter

[19] It is pointed out that, large MEC values reflect the dampening effects on short-term price movements (due to various liberalization measures) which led to correlated but short-term price volatility. This results in long-term volatility being larger than short-term volatility and thus MEC values are larger than one.

this ratio declined to 0.85 in 2007 from 0.96 in 1997-98 indicating improvements in market resiliency, and adequate price discovery. The improvement hypothesis relies on the fact that the values of MEC greater than unity result from aspects of market operations that tend to stabilize prices inefficiently, while factors that induce excessive short-term volatility lead to an MEC substantially below unity. Thus, the transition of MEC from 1.59 to 0.85 did not result only from the average extreme MEC values, but resiliency and efficiency may also have improved. Similarly, standard deviation of MEC values also decreased from 1.27 in pre-liberalisation period to 0.93 in post liberalisation period, indicating that resiliency has improved.

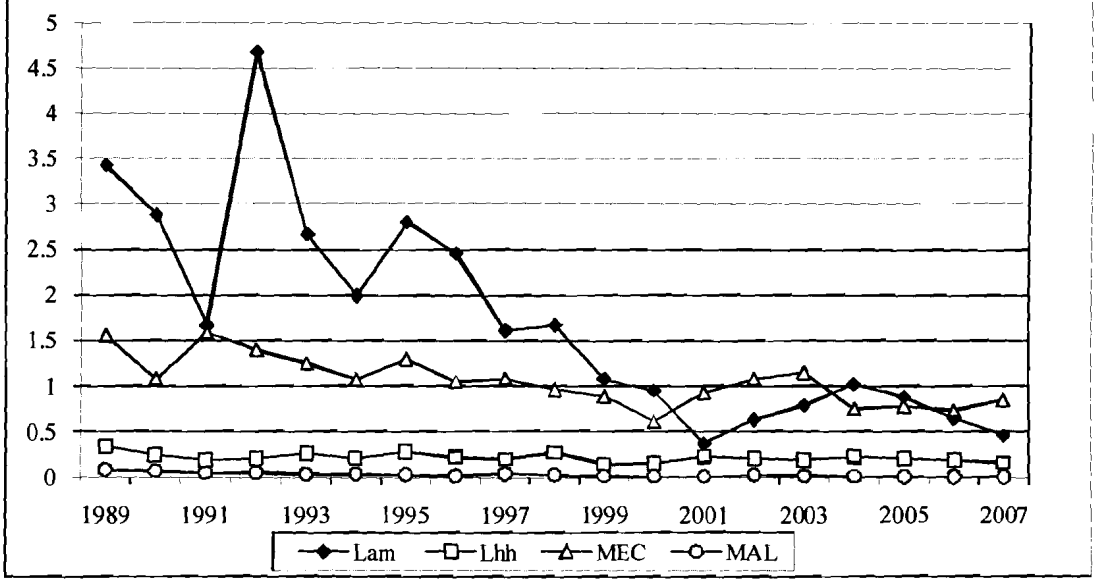
Table 2.2: Dynamic Indicators of Liquidity

Year	**Volume Based Measures**		**Price Based Measures**	**Market Impact Measures**
	L_{am}	L_{hh}	MEC	Market Adjusted Liquidity
1989-90	2.88	0.24	1.08	0.067
1990-91	1.67	0.19	1.59	0.054
1991-92	4.68	0.21	1.40	0.050
1992-93	2.67	0.26	1.25	0.032
1993-94	2.00	0.21	1.07	0.034
1994-95	2.80	0.28	1.30	0.025
1995-96	2.46	0.22	1.05	0.018
1996-97	1.61	0.20	1.08	0.039
1997-98	1.67	0.27	0.96	0.024
1998-99	1.08	0.14	0.89	0.014
1999-00	0.95	0.15	0.61	0.009
2000-01	0.37	0.23	0.93	0.008
2001-02	0.63	0.21	1.08	0.025
2002-03	0.79	0.19	1.15	0.016
2003-04	1.02	0.23	0.75	0.009
2004-05	0.88	0.21	0.78	0.006
2005-06	0.65	0.19	0.73	0.005
2006-07	0.46	0.16	0.85	0.005
Average (1989-95)	**2.87**	**0.23**	**1.27**	**0.042**
Average (1996-07)	**1.28**	**0.20**	**0.93**	**0.015**
T-test for equality	**4.24***	**2.11***	**2.78***	**4.76***

From Table 2.2 (column 5) it is clear that the coefficient of market adjusted liquidity is steadily declining over the period, indicating there is improvement in the market breadth, and hence market resiliency. The ratio, which was 0.067 in 1990, came down to 0.018 in the end of 1995-96 and then further declined to 0.005 at the end of 2006-07. The average value for the liberalisation period is smaller than pre-liberalisation period, indicating improvement in market breadth and resiliency. So as expected, the introduction of automatic nation-wide trading system, widening base of investors and

integration of Indian stock market with other stock markets has had a positive impact on market liquidity.

Figure 2.1: Indicators of Dynamic Liquidity



It is clear from above analysis that following stock market liberalisation; market depth, breadth and resiliency have improved. So it can be concluded that stock market liberalisation has improved market liquidity and hence resiliency of the Indian stock market.

2.5.1 Trend Analysis of Liquidity Indicator

To support the above hypothesis further, we also examine the trend exhibited by the liquidity indicators, by using OLS regressions on four liquidity ratios against a time trend. The estimated coefficients obtained from OLS regression using data for the entire sample period (1989 to 2007) are presented in Table 2.3.

Table 2.3: Time trend of Liquidity Variables (1989-2007)

Independent Variables	Dependent Variable			
	L_{am}	L_{hh}	MEC	MAL
Constant	3.22** (9.42)	0.23** (13.04)	1.35** (15.04)	0.05** (11.76)
Time variable	-0.16** (-5.27)	-0.003# (-1.76)	-0.03** (-4.26)	-0.003** (-7.24)
Adj. R^2	0.61	0.09	0.50	0.75
DW-stat	2.21	2.23	1.75	1.42

*** denotes significance at 1% and # denotes significance at 10% levels. Figures in the bracket are t-ratio.*

The results are in expected lines. The time trend is negative and significant for all liquidity indicators. This indicates that all liquidity variables are showing a decreasing trend over time, indicating improvement in market liquidity. This result corroborates the findings of section 2.5. Therefore, over the period, Indian stock markets have experienced increased levels of liquidity.

2.5.2 Market Liquidity Index

Given that all the dynamic liquidity indicators are correlated, and one indicator captures some aspect of liquidity, we develop an index of market liquidity by applying Principal Component Analysis (PCA) to capture different dimensions of liquidity in a single measure (see appendix Table 2B1). PCA analysis is appropriate because PCA performs a variance-maximizing rotation of the variable space, and it takes into account all variability in the variables. Prior to conducting the factor analysis we conduct sample adequacy test by using Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity. The Kaiser-Meyer-Olkin measure of sampling adequacy is an index for comparing the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients. The KMO statistic varies between 0 and 1. The KMO statistic should be greater than 0.5 for conducting a satisfactory factor analysis. In our case, the KMO statistics is more than 0.74, which indicates that component analysis can be safely conducted (see Table 2.4). Another indicator of the strength of the relationship among variables is Bartlett's test of sphericity. Bartlett's test of sphericity is used to test the null hypothesis that the variables in the population correlation matrix are uncorrelated (identity matrix). For factor analysis to work, we need some relationship between variables, and therefore we want this test to be significant. From Table 2.4, it is seen that the Bartlett's test of sphericity is significant. That is, its associated probability is less than 0.05. This means that the correlation matrix is not an identity matrix. Therefore, we can proceed to conduct a PCA analysis

Table 2.4: Sample Adequacy Test

KMO Test		0.74
Bartlett's test of sphericity	Approx. Chi. Square	65.23*
	significance	(0.00)

**denotes rejection at 1% level.*

Now we need to determine the optimal number of factors or principal components for analysis. Two main criteria are used. First, only those factors that explain a larger

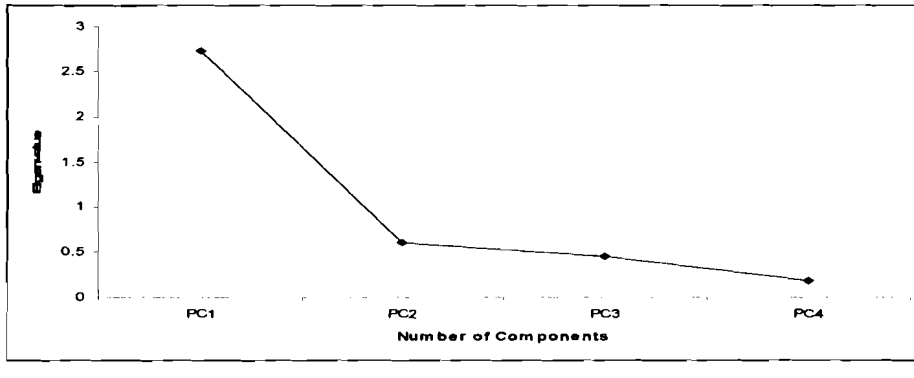
portion of the total variance than individual variables are extracted. In mathematical terms, this means that only factors with eigenvalues higher than one are retained. Table 2.5 shows total variance explained by four possible components. Note that only one component (first component) has eigenvalue greater than one and explains around 69% of total variance. Therefore, first principal component is selected for analysis. This criterion was proposed by Kaiser (1958), and is widely used in empirical analysis.

Table 2.5: Eigenvalues and Variance Explained by Principal Components

Principal Components	EigenValues	% of Variation	Cumulative Variation
1	2.73	0.69	0.69
2	0.61	0.14	0.83
3	0.46	0.11	0.94
4	0.19	0.06	1.00

The second criterion is to use 'scree' plot to determine the number of components for analysis. Scree Plot is a simple line segment plot that shows the fraction of total variance in the data as explained or represented by each components. Sharp breaks in the plot suggest the appropriate number of components or factors to extract. Based on scree plot also, we select the first component for analysis (see Figure 2.2).

Figure 2.2: Scree Plot



Next we identify the principal components and interpret them. For this purpose, we use Kaiser's varimax rotation criterion to orthogonally transform the original data. Rotation maximizes the loadings of each variable, on one of the extracted factors whilst minimizing the loading on all other factors. Therefore, rotation improves

interpretability of factors. The rotated components are presented in Table 2.6 using varimax option.

Table 2.6: Factor Loadings of Principal Components (After Rotation)

Liquidity Ratios	PC1	PC2	PC3	PC4
L_{am}	0.22	0.27	0.87*	0.17
L_{hh}	0.31	0.32	-0.17	0.88
MEC	0.15	0.88*	-0.06	-0.34
MAL	0.97*	-0.08	0.34	0.25

** denotes the highest factor loading of a principal component (PC). Rotation Method: Varimax with Kaiser Normalization converged after 4 iterations.*

The identified principal components or factors can be interpreted as follows:

(1) The first component (PC1) is positively correlated with all the liquidity measures. Since all types of liquidity have large positive factor loadings on the first factor, the first component can be readily interpreted as the general level of liquidity. Given the fact that, the first component is dominated by market adjusted liquidity (MAL), the first component captures the market depth. Further, the first component also measures the degree of commonality or systematic liquidity in equity market, which is very high.

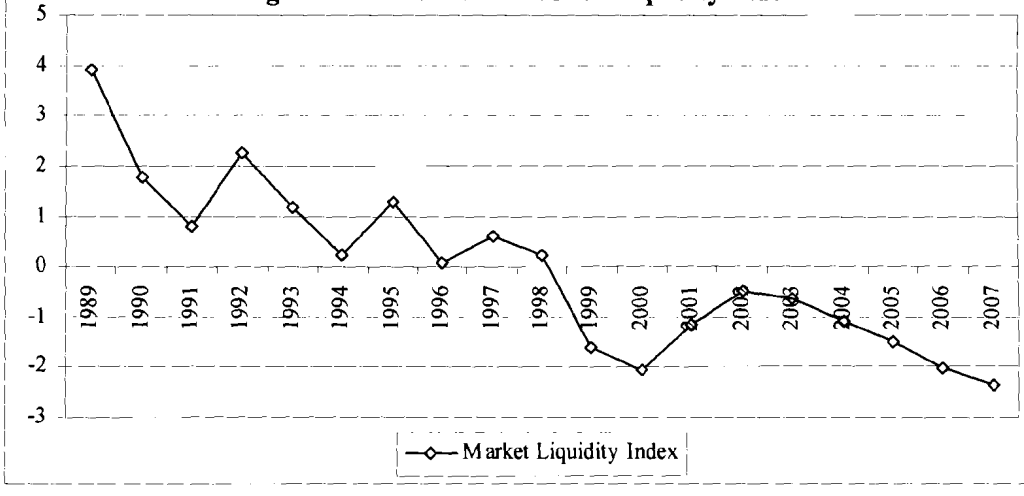
(2) The second component (PC2) is positively correlated with MEC and L_{hh} and negatively correlated with MAL. However, this component is dominated by MEC. Therefore, it captures the resiliency of the market.

(3) The third component (PC3) is the combination rising from liquidity measured by L_{am} and MAL and declining liquidity measured by MEC and L_{hh}. However, this component is identified with L_{am}. Therefore, it captures the depth and breadth of the market.

(4) The fourth and final factor (PC4) is positively related with high liquidity ratio measured by L_{hh} and MAL and low liquidity ratio represented by MEC. However, this component is identified with L_{hh}. Therefore, this component captures the depth and breadth dimension of the market.

Composite liquidity index[20] based on the first principal component is presented in Figure 2.3. The weights are given based on factor loadings. The index shows a steady downward trend over the period, indicating higher market liquidity over time. Lower the value of market liquidity index higher the liquidity and hence higher the depth, breadth and resiliency of the market. Market liquidity index clearly displays an improvement in market liquidity following the stock market liberalisation. Therefore, we find that liberalisation have improved liquidity and efficiency of Indian stock market.

Figure 2.3: Trends in Market Liquidity Index



2.6 Summary

Given the importance of stock market liquidity for economic growth, this chapter examined the impact of stock market liberalisation on market liquidity. Market liquidity has both static and dynamic aspects. The various dimensions of market liquidity such as – depth, breadth and resiliency cannot be measured by static liquidity measures. Therefore, one needs to estimate various dynamic liquidity indicators to capture the above aspects of liquidity. We estimated both static and dynamic indicators of market liquidity and have shown that dynamic liquidity indicators have an advantage over static liquidity indicators because it takes into account the price impact of trading. Both static and dynamic liquidity indicators suggest that market

[20] The index is negative from 1998-99 onwards because of scale transfer, by using the following method $X_{ij} = ((X_{ij} - X_m)/\sigma)$. This is necessary because the variables chosen for analysis are measured in a different scale, it is required to covert them into some standard comparable unit. However, we are concerned about the trend rather the absolute value of the index (see Appendix 2B).

liquidity has improved in the post-liberalisation period. In addition to this, we also developed a composite liquidity index by using principal component analysis in order to capture various aspects of liquidity. The results obtained are consistent with other empirical studies, suggesting that the liberalisation process in general improves liquidity of the stock market. Thus, we conclude that market liberalisation has had a positive effect on the breadth, depth and resiliency of the Indian stock market which has major implication for economic growth.

Appendix 2A

Estimation Procedure of Dynamic Indicators

(a) For estimating Amihud liquidity ratio, daily closing price of Sensex is collected for the period 1990-2007. The price series is then converted into log return series by following way: $R_t = \ln (P_t - P_{t-1})$, where R_t is the logarithmic return at time t, and P_t, P_{t-1} closing values of Sensex at time t and t-1, respectively. Then the liquidity ratio is calculated by taking the average absolute value of return to the product of number of trading days with turnover ratio.

(b) For estimating Hui-Heubel ratio (L_{hh}), weekly high and low of Sensex price is collected. Then percentage change in price is calculated. Finally, the ratio is estimated as percentage change in Sensex price to Sensex turnover ratio.

(c) For estimating MEC ratio, both daily and monthly closing price of Sensex are collected and then converted into log return series. Thereafter, the variances of daily return and monthly return are estimated. In our analysis, the short-period return is the daily return and the long-period return is the monthly return. Finally, the ratio of variance of monthly return to the variance of daily return is calculated and divided by 20 – where 20 represents average number of trading days in a month.

(d) The daily return (R_t) series is calculated by using opening and closing prices of Sensex to estimate Market adjusted Liquidity (MAL). R_t is regressed on R_m (market portfolio return) to obtain residuals. These residuals are then regressed on the variance of volume of trade to arrive at MAL.

Appendix 2B

Market Liquidity Index

The market liquidity index has been constructed using Principal Component Analysis (PCA). PCA is a multivariate choice method. This approach develops a composite index by defining a real valued function over the relevant variables objectively. The principle of this method lies in the fact that when different characteristics are observed about a set of events, the characteristic with more variation explains more of the variation in the dependent variable compared to a variable with lesser variation in it. Therefore, the issue is one of finding weights to be given to each of the concerned variables. The weight to be given to each of the variables is determined on the

principle that the variation in the linear composite of these variables should be the maximum. Therefore, the composite index is defined as

$$C_i = W_1X_{11} + W_2X_{12} + W_3X_{13} + \ldots\ldots + W_nX_{1n}$$

or $$C_i = \Sigma W_iX_{ij}$$

Where C_i is the composite index for the i^{th} observation, W_j is the weight assigned to j^{th} indicator and X_{ij} is the observation value after elimination of the scale bias. Since the variables chosen for analysis are measured in a different scale, it is required to convert them into some standard comparable unit by using following method $X_{ij} = ((X_{ij} - X_m)/\sigma)$, where, X_{ij} represents the original observations which are scale free, X_m is the mean of the series and σ is the standard deviation.

Table 2B1: Correlation between Various Dynamic Liquidity Indicators

Lam	L_{am}	L_{hh}	MEC	MAL
L_{am}	1.00			
L_{hh}	0.57* (0.03)	1.00		
MEC	0.59* (0.027)	0.64* (0.022)	1.00	
MAL	0.76* (0.01)	0.57* (0.03)	0.68* (0.02)	1.00

*Figures in the brackets are p-values. *Indicates significance at 5% level.*

CHAPTER III

Impact of Stock Market Liberalisation on Volatility

3.1 Introduction

Previous chapter discussed the impact of stock market liberalisation on liquidity and we found that liberalisation has a positive impact on liquidity. In this chapter, we examine another important dimension of stock market development viz., impact of liberalisation on volatility. Specifically, we examine the shifts in stock price volatility and the nature of events that apparently causes shifts in volatility. This will enable us to identify whether the shifts in volatility of stock returns coincides with financial liberalisation in India.

Level of volatility is considered as a very important indicator of stock market development, because, it has implications for investment, corporate financing and financial stability in the economy. High level of volatility affects average portfolio risk, which in turn can significantly affect the return on investment and growth. For example, excess volatility weakens investor's confidence, resulting in reduction in investment[1]. High volatility may strain the stock market clearing and settlement infrastructure, causing a loss of investor confidence in the solvency of trade-counterparties, and thereby reduce market participation and liquidity. Lessons from financial crisis reveal that financial asset price variability has the potential to undermine financial stability of an economy. Increase in volatility leads to simultaneous increases in risk and to the extent that stock markets help to channel resources towards the most profitable investment through price signalling. Also, highly volatile stock prices cause misallocation of resources because prices do not correctly indicate return on investment.

Hence understanding volatility and its magnitude is central to risk management in the economy. Romer (1990) argues that increased uncertainty associated with financial distress was one of the driving forces behind the great depression. His arguments

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[1] Moreover, volatile stock markets in emerging economies are unable to carry out the roles they play in advanced economies such as monitoring, screening, and information gathering – which is how they enhance growth (Bekaert et al., 2003).

suggest that high volatility could negatively affect growth by affecting the cost and availability of investment capital. Eempirical evidence also shows that high volatility affects corporate financing. Schill (2003) examining the relationship between volatility and corporate financing for US, found that during the period of above normal market volatility, there was a 21 percent decline in the number of Initial Public Offerings (IPO). Increased market volatility generates greater underwriting fees and hence results in IPO under pricing. Relationship between volatility and economic variables are shown below.

Excess volatility → Economic Uncertainty ↑→ Market Risk ↑→ Financial Instability ↑→ Cost of Capital ↑→ Reduction in Investment → Economic Growth↓.

Based on this brief review, this chapter aims to estimate time varying volatility and its persistence in Indian stock market both in pre and post-liberalisation period. Basically, this chapter addresses two specific questions:

1. Has Indian Stock Market volatility changed through time? Is it more volatile in the liberalisation period?
2. Is there a relationship between changes in stock market volatility and stock market liberalisation?

The layout of the chapter is as follows: Section 3.2 provides the theoretical background. Section 3.3 outlines empirical literature. Section 3.4 presents methodology and data source and Section 3.5 discusses the results. Finally, Section 3.6 presents a summary of the chapter.

3.2 Theoretical Background

There are two schools of thought with divergent views on volatility. The economists in their fundamentalist approach argue that market movements can be explained entirely by the information that is provided to the market. This is called efficient market hypothesis[2] (EMH). According to EMH, change in information is the prime cause of change in stock price (Fama et al., 1969; Grossman and Stiglitz, 1980; among other). On the other hand, Popular Models Theory (PMT) argues that these

[2] A distinction is made between: (a) weak efficiency, where the market price includes all the information contained in historical prices; (b) semi-strong efficiency, where the market price includes, in addition to information in historical prices, other public information; and (c) strong efficiency, where the market price reveals both public and private information

movements have nothing to do with economic or external factors. Rather, it is the investor reactions, due to psychological or social beliefs, which exert a greater influence on the markets. The Popular Models Theory (popular models are a qualitative explanation of price) proposes that people act inappropriately to information that they receive. Thus, freely available information is not necessarily incorporated into a stock market price as argued by EMH (Shillier, 1981; La Porta et al., 1997).

If integration with the world markets makes the equilibrium process more efficient for stocks in emerging markets, it is reasonable to expect a drop in stock market volatility and a concomitant drop in expected returns. It is argued that, foreign investors are quick to react to changes in short-term economic outlook in emerging economies, making unrestricted capital flows very volatile. This volatility of capital flows may increase the volatility of the stock market. According to finance theory, stock market volatility could increase or decrease when markets are opened up (see for example Bekaert and Harvey, 1997, 2002 and 2003). Markets may become informationally more efficient leading to higher volatility as price quickly reacts to relevant information; also speculative capital may induce excess volatility. On the other hand, in the pre-liberalisation process, there may be large swings from fundamental values leading to higher volatility. However, after liberalisation, the gradual development and diversification of the market could lead to lower volatility. So there are conflicting views about the impact of financial liberalisation on volatility.

The model proposed by Tauchen and Pitts (1983) and subsequently used by Kwan and Reyes (1997), explains the impact of financial liberalisation on stock market volatility. Let us examine their model.

Let J (j = 1, 2, 3, ..., J) is the number of active traders in the market. In a day, the market passes through a sequence of distinct Walrasian equilibriums. The movement from the ($i\text{-}1^{nth}$) to i^{th} equilibrium in a given day is caused by the arrival of new information to the market. The desired net position, Q_{ij} for the j^{th} trader at the time of the i^{th} equilibrium is assumed to be a linear function of the following form:

$$Q_{ij} = \alpha[P_{ij}^{*} - P_i] \quad (j = 1, 2, \ldots, J) \qquad (1)$$

Where $\alpha > 0$ = Constant

P^*_{ij} = j^{th} trader's reservation price

P_i = current market price

A positive value for Q_{ij} represents a desired long position in a contract, while negative value represents a desired short position. In equilibrium,

$$\sum_{j=1}^{J} Q_{ij} = 0 \tag{2}$$

Condition (2) implies that the average of the reservation price clears the market:
Where $P^*_{ij} = P^*_{ij} - P^*_{i-1}$, j is the increment to the j^{th} trader's reservation price.
The price change can then be written as:

$$P_i = 1/J \sum_{j=1}^{J} P^*_{ij} \tag{3}$$

$$\Delta P = 1/J \sum_{j=1}^{J} \Delta P^*_{ij} \tag{4}$$

Assuming a variance – component model with an information component that is common to all traders, φ_i, and one that is specific to the j^{th} trader, ψ_{ij}, Equation (4) can be re-written as:

$$\Delta P_i = \Phi_i + 1/J \sum_{j=1}^{J} \psi_{ij} \tag{5}$$

The first two component of the price change are then derived as the following:

$$E[\Delta P_i] = 0 \tag{6}$$

$$Var[P_i] = \sigma^2_{\varphi} + \sigma^2/J \tag{7}$$

Equation (7) tells us that other thing being equal, an increase in the number of traders (J) tends to reduce the stock price variance, whereas an increase in the variance of information set (σ^2_{φ}) available to traders tends to raise the stock price variance. The number of traders (like FIIs and mutual funds) increases in the stock market following opening up of a stock market. At the same time information set available to traders also increases[3]. So, when number of traders increase it reduces the volatility of stock

[3] Financial liberalization allows domestic stock market to integrate with other stock markets. So, domestic market volatility is affected through transmission effect and contagion effects of a financial crisis.

price whereas when the size of the information set available to traders increase it raises the stock price volatility. The final outcome depends on relative strength of the two aspects, which is an empirical issue.

3.3 Empirical Literature

The effect of liberalisation on stock market volatility has generated considerable interest among both academicians and practitioners, and the turbulence of emerging market in last several years has only accentuated the importance of the issue for policy makers[4]. Nevertheless, the existing studies have yielded conflicting results on the expected impact of liberalisation. For example, De Santis and Imrohoroglu (1997) study the behaviour of volatility in some emerging countries and the effect of liberalisation on financial markets. They find significant evidence for time-varying volatility, but different effect of liberalisation on volatility across countries. Especially, they find that volatility decreased after liberalisation.

Huang and Yang (1999) analyse the impact of financial liberalisation on stock price volatility in ten emerging markets for the period 1988-1998. Using the similar reference dates of financial market liberalisation as done by De Santis and Imrohoroglu (1997), they find that the unconditional volatility of the stock markets in three countries (South Korea, Mexico and Turkey) increased after liberalisation, whereas it significantly decreased in another four countries (Argentina, Chile, Malaysia and Philippines). However, the conditional volatility of the markets of Brazil, South Korea, Thailand and Turkey experienced a significant increase, while that of the remaining six countries (Argentina, Chile, Malaysia, Philippines, Indonesia, and Mexico) experienced a decrease after liberalisation. Bekaert and Harvey (1997) analyse the International Finance Corporation (IFC), and World Bank data on 20 emerging markets, and report that volatility is higher in emerging markets than mature markets (as much as five times higher) and that returns are more persistent. In a recent paper, Kim and Singal (2000) analyse changes in the level and volatility of stock returns while opening to international capital markets. Their results

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[4] Considerable research has focused on stock market liberalization and stock market volatility (e.g. Bekaert and Harvey, 1997 & 2000; De Santis and Imrohoroglu, 1997; Aggarwal et al., 1999; Huang and Yang, 1999; Kim and Singal, 2000; Bekaert et al., 2002a; Kaminsky and Schmickler, 2003; Edwards et al., 2003; among others)

suggest that opening of the markets is good for domestic investors. Stock price tend to rise after liberalisation while volatility is observed to be non-increasing. Nilsson (2002) has explored whether stock market liberalisation can lead to excess volatility possibly on account of noise trading for Nordic stock markets. He finds evidence of higher expected return, higher volatility and stronger links with international stock markets characteristic of the deregulated period in all Nordic stock markets.

Financial liberalisation hypothesis predicts a decrease in volatility in stock price in the post-liberalisation period. However, the empirical evidences in this regard are, at best, mixed. For example, studies by Singh (1993), Grabel (1995), Levine and Zervos (1998), Kaminsky and Schmukler (2001), Nilson (2002), and Edwards et al. (2003) emerge with the conclusion that financial liberalisation increases stock market volatility. Whereas, Richards (1996), De Santis and Imrohoroglu (1997), Bekaert and Harvey (2000), and Kim and Singal (2000) do not notice any significant impact of financial liberalisation on volatility. In Indian context empirical evidence is also mixed. While Mohanty (1997), Samal (1997), and Pal (1998) found that volatility has increased; Demirguc-Kunt (1996), Pethe and Karnik (2000), Biswal and Kamaiah (2001) and Batra (2004) found volatility has declined. The above mixed result are due to different in sample size and time period used in the model.

While the predictions of theoretical models that analyse the impact of financial liberalisation on volatility are ambiguous, mixed empirical findings do not help much to theorise further. In this context, our study gives additional empirical evidence to the financial liberalisation and volatility debate.

3.4 Methodology

Beginning with the mean variance analysis of portfolio and asset returns, volatility has become the core of modern finance theory. For example, the capital asset pricing model (CAPM) of Sharpe (1964), Lintner (1965), and Mossin (1966) directly relate the change in the price of the asset to its own variance, or covariance between its return and the return on a market portfolio. In the early 1980s several studies suggested that there were deviations from the linear CAPM risk return trade-off, due to other variables that affect this trade-off. Fama and French (1995) find three variables, market equity, the ratio of book equity to market equity and leverage that capture much of the cross section of average stock returns. Since the introduction of

Autoregressive Conditional Heteroscedasticity (ARCH)/ Generalised ARCH (GARCH) type processes by Engle (1982) and others, testing for and modelling of, time-varying volatility (variance/covariance) of stock market returns (and hence the time-varying beta) have been given considerable attention in the literature. The ARCH/GARCH models are capable of incorporating a number of widely observed behaviour of stock prices such as leptokurtosis, skewness, and volatility clustering observed in emerging markets (Errunza et al., 1994).

The first such model introduced by Engle (1982), known as (ARCH). A typical ARCH model allows the conditional variance of the error term to vary over time, in contrast to the standard time series regression models, which assume a constant variance. So the ARCH model allows the conditional variance to depend on the past squared residuals of that variance in period t-1 and is modelled as a constant plus a distributed lag on the squared residual terms from previous period. Consider AR(1) model of return (R_t)

$$R_t = \delta + \psi R_{t-1} + u_t \qquad (8)$$

Where, R_t = return at period t, R_{t-1} = return at period t-1 and u_t = error term.
Equation (8) tells us that return in period t depends on its one period lagged value. The key idea of ARCH is that the variance (σ^2) of u_t at time t depends on the size of the squared error term at time t-1, that is on u_{t-1}^2. So

$$Var(u_t) = \sigma^2 = \gamma_0 + \gamma_1 u_{t-1}^2 + v_t \qquad (9)$$

Where, v_t is a white noise process. If the value of γ_1 is equal to zero, the variance is simply the constant γ_0. Equation (9) is called an ARCH(1) process. But by generalising it we can write an ARCH (p) process as follows:

$$Var(u_t) = \sigma^2 = \gamma_0 + \gamma_1 u_{t-1}^2 + \gamma_2 u_{t-2}^2 + \ldots + \gamma_q u_{t-q}^2 + v_t \qquad (10)$$

If the values of γ_1, γ_2, ..., γ_q is equal to zero, the variance is simply a constant γ_0. Otherwise, the conditional variance of u_t evolves according to the autoregressive process given by equation (10).

The ARCH formulation has several extensions. The most prominent of them being the Generalised ARCH or GARCH[5] model (Bollerslev, 1986), which explains the variance by two distributed lags, one on past squared residuals and the second on lagged values of variance itself to capture long-term influences. That is conditional variance of an Autoregressive moving average (ARMA) process. Now let the error process be such that

$$u_t = e_t h_t^{1/2} \tag{11}$$

Where e_t is a white noise process with 0 mean and constant variance and h_t is conditional variance defined as,

$$h_t = \sigma_t^2 = \omega + \alpha e_{t-1}^2 + \beta h_{t-1} \tag{12}$$

$$h_t = \omega + \sum_{i=1}^{q} \alpha e_{t-i}^2 + \sum_{i=1}^{p} \beta h_{t-i} \tag{13}$$

Equation (12) represents a GARCH (1,1) process and equation (13) represents a GARCH(p,q) process where h_t is the conditional variance, which follows an ARMA process. Equation (12) allows us to capture various dynamic structure of conditional variance. The size and significance of α indicates the magnitude of the effect imposed by the error term (u_{t-1}) on the conditional variance (h_t). In other words, the size and significance of α implies the presence of ARCH process in the error term. This is called volatility clustering. The significance of β is that it has information about the market structure in general as well as the information that influences the stock prices. The sum of $\alpha + \beta$ represents the change in the response function of shocks to volatility per period. If $\alpha + \beta = 1$, a current shock persists indefinitely in conditioning the future variance. If $\alpha + \beta > 1$, then the response function of volatility increases with time. If $\alpha + \beta < 1$, this means that shocks decay with time, and closer the unit value of persistence measure, the slower is the decay rate.

GARCH models have important limitations. For example, researchers beginning with Black (1976) have found evidence that stock returns are negatively correlated with changes in return volatility – i.e., volatility tends to rise in response to "bad news" and

[5] The generalized ARCH models, i.e. the GARCH models, have been found to be valuable in modeling the time series behavior of stock returns (French et al., 1987; Akgiray, 1989; Baillie and DeGennaro, 1990; Koutmos, 1992; Koutmos et al., 1993).

fall in response to "good news"[6]. GARCH models, however, assume that only the magnitude and not the positivity and negativity of unanticipated excess returns determine future variance. If the distribution of u_t is symmetric, the change in variance tomorrow is conditionally uncorrelated with excess return today. In equation (12), σ_t^2 is a function of lagged σ_t^2 and lagged e_t^2, and so σ_t^2 is invariant to changes in the algebraic sign of e_t's i.e., only the size, not the sign of lagged residuals determines conditional variance. So, this suggests that a model in which σ_t^2 responds asymmetrically to positive and negative residuals might be preferable for asset pricing applications. The second limitation of GARCH models is the non-negativity constraints on ω and α_i in equation (13), which is imposed to ensure that, σ_t^2 remains non-negative. These constraints imply that increasing e_t^2 in any period increases σ_{t+m}^2 for all $m \geq 1$, ruling out the random oscillatory behaviour in the σ_t^2 process.

A third drawback of GARCH modelling concerns the interpretation of the "persistence" of shocks to conditional variance. According to Nelson (1991), E-GARCH model overcomes some of the limitations of GARCH family of models[7]. The specification of E-GARCH model is as follows,

$$\ln h_t = \omega + \beta \ln h_{t-1} + \alpha_1 \left| e_{t-1}/\sigma_{t-1} \right| + \sigma_2 e_{t-1}/\sigma_{t-1} \qquad (14)$$

where $u_t = e_t h_t^{1/2}$ (as shown in equation 11)

$e_t \sim (0, 1)$

In this model β is the GARCH term that measures the impact of last period's forecast variance. A positive β implies volatility clustering indicating that positive return are associated with further positive changes in stock return and vice versa. α_1 is the ARCH term that measures the effect of news about volatility from the previous period on current period volatility. α_2 measure the leverage effect. If the coefficient of α_2 is significant then the positive shocks and negative shocks have different impact on

[6] The economic reasons for this are unclear. As Black (1976) and Christie (1982) note, both financial and operating leverage play a role, but are not able to explain the extent of the asymmetric response of volatility to positive and negative return shocks. Schwartz (1989a, b) presents evidence that stock volatility is higher during recession and financial crisis.

[7] Most of the earlier studies have used ARCH-GARCH model to estimate volatility of stock returns. However, as the stock returns in emerging markets like India are not generally drawn from a normal distribution. Therefore, asymmetric GARCH methodology is more appropriate.

volatility. Ideally α_2, is expected to be negative indicating "bad news" has higher impact on volatility than "good news" of the same magnitude. The sum of the ARCH-GARCH coefficients indicates the extent to which a volatility shock is persistent over the time.

3.4.1 Data Source

We use two stock market indices – the BSE Sensex and the IFC Global (IFCG) index to measure the volatility in stock prices. Both daily and monthly return series is used in our analysis. Sensex is the most popular market index widely used by researchers in India[8]. For daily data, our period of analysis is from 1985 to 2007. We have divided this period into two-sub periods such as pre-liberalisation (1985-92) and post liberalisation period (1993-2007). For monthly data, the period of analysis is from 1976-2006 for IFCG Data and 1979-2007 for BSE Sensex. The data have been collected from PROWESS database of CMIE as well as from Emerging Stock Market Fact books of S&P. For carrying out empirical analysis the price series are converted to return series in the following way:

$$R_t = \ln (P_t - P_{t-1})$$

Where R_t is the logarithmic return on security at time t, and P_t, P_{t-1} are closing value of Sensex at time t and t-1.

3.5 Empirical Results

3.5.1 Summary Statistics of Sensex Daily and Monthly Return

Summary statistics of daily and monthly return series for three periods (pre-liberalisation, post-liberalisation and whole period) are presented in Table 3.1[9]. It is clear that daily as well as monthly mean return is positive for all the periods. Further, return series is not normal as skewness is not zero for any period. It is positively skewed in the pre-liberalisation period and negatively skewed in post-liberalisation period and negatively skewed for full sample in case of daily return but positively skewed for full sample in case of monthly return. The kurtosis for all the period is

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[8] Nifty is another popular index based on a 50 firm portfolio. However as the data is available only from April 1996 onwards, it poses a restriction for our study.

[9] We consider both series since daily data generally suffer from"noise' content. Noise plays a big role in high frequency volatility persistence but in less frequent observations the noise content dies away. Monthly data series is ideal for the volatility analysis and therefore the results from monthly data readily qualify to be more reliable than daily data.

greater than 3, thereby indicating leptokurtic distribution. Mean returns for pre-liberalisation period is higher than that of post-liberalisation period for both daily return as well monthly returns. The standard deviation of return is higher in pre-liberalisation period for daily series, indicating stock return was more volatile in pre-liberalisation period. However, the return series in post-liberalisation phase show negative skewness, excess kurtosis and deviation from normality, which is consistent with the findings for other countries[10]. The non-normal frequency distributions of the stock return series deviate from the prior condition of random walk model[11]. One of the most common explanations for the non-normal distribution of stock return is that new information arrives infrequently and there is also a lack of diversification.

Table 3.1: Summary Statistics for Daily and Monthly Return

Period	Mean	Max.	Min.	S.D.	Skewness	Excess Kurtosis
Daily Return Series						
1985-1992	0.052	12.6	-13.01	1.44	0.22	201.55
1993-2007	0.020	6.07	-11.08	0.79	-0.23	5.17
1985-2007	0.023	12.6	-13.01	1.08	-5.87	200.1
1991-1992	0.059	8.73	-13.02	1.51	-7.17	77.53
Monthly Return Series						
1979-1992	0.68	19.13	-11.14	3.41	1.07	5.33
1993-2007	0.29	8.25	-7.48	3.28	-0.43	7.58
1979-2007	0.48	19.13	-11.14	3.35	0.52	4.81

Source: Authors calculation

Standard deviation for sub-period (1991-1992) is higher than any other period, indicating this period is most volatile in India. Similarly, for monthly series, standard deviation for pre-liberalisation period is higher indicating market was more volatile in pre-liberalisation period.

Before estimating GARCH/E-GARCH model to capture time varying volatility, necessary diagnostic statistics have also been computed and presented in Table 3.2.

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[10] Fama (1965) showed that the distribution of both daily and monthly returns of Dow Jones and NYSE indices depart from normality, and are skewed, leptokurtic, and volatility clustered. Campbell, Lo and Mackinlay (1997) concluded that daily U.S. stock indexes show negative skewness and positive excess kurtosis. Bekaert, *et al.* (1998) provide evidence that 17 out of 20 emerging countries examined had positive skewness and 19 out of 20 had excess kurtosis, so that normality was rejected for majority of the sample countries.

[11] The assumption of market efficiency implies that financial events are independent and identically distributed. That is, stock returns fit a Gaussian (normal) distribution (Bekaert *et al.*, 1998).

Table 3.2: Diagnostic Checking of Daily and Monthly Return Series

Period	BJ	LB	ADF	LM
Daily Return Series				
1985-1992	35678.74** (0.00)	42.42* (0.02)	-36.16* (0.02)	372.66** (0.00)
1993-2007	552.97** (0.00)	39.29* (0.03)	-36.07** (0.01)	164.85** (0.00)
1985-2007	30326** (0.00)	39.45* (0.03)	-49.81** (0.01)	356.00** (0.00)
1991-1992	2786** (0.00)	22.18** (0.00)	-31.23* (0.03)	21.21** (0.00)
Monthly Series				
1979-1992	227.34** (0.00)	18.45* (0.03)	-10.55* (0.04)	15.56* (0.03)
1993-2007	12.96** (0.001)	14.38* (0.04)	-12.29* (0.05)	14.34 (0.04)*
1979-2007	122.47** (0.00)	18.67* (0.03)	-12.53* (0.04)	17.45* (0.03)

Source: Authors Calculation

*** Significant at 1% level and * significant at 5% level.*

Notes: (1) Bera Jarque (BJ) Statistic is used to test whether the underlying distribution of returns is normal. (2) Ljung – Box (LB) Statistic tests whether residuals of returns are autocorrelated. (3) Augmented Dickey-Fuller (ADF) test for stationarity. (4) Lagrange Multiplier (LM) test statistic to test null hypothesis of no ARCH effect against alternative ARCH effect.

Here we assume that daily returns return follows a first order autoregressive process AR (1). The Bera-Jarque (BJ) statistics which measures normality of the distribution, exceeds critical chi-square value with 2 degree of freedom in all cases, and thereby rejecting the normality of the underlying distribution. In addition to BJ statistics, we also estimate Ljung-Box (LB) statistics to trace the presence of autocorrelation among residuals of the return. It is clear from Table 3.2 that in all the cases the presence of autocorrelation is significant. Hence, we could reject the efficient market hypothesis based on the Ljung-Box Q test that showed the residuals are serially correlated. The departure from the efficient market hypothesis for BSE suggests that relevant market information is only gradually reflected in stock price changes. The Augmented Dickey-Fuller (ADF) test indicates that return series are stationary in nature indicating Indian stock markets are weak efficiency. LM statistics also indicate the presence of ARCH disturbance in the squared residuals. This may lead us to conclude that return variance process is time varying and heteroscedastic in nature and hence ARCH formulation would be appropriate. Therefore, stock return volatility is estimated using GARCH/E-GARCH model and the Results are presented in Table 3.3 and 3.4.

The results in Table 3.3 suggest that GARCH (1, 1) coefficients are found to be significant and positive, thus implying that volatility is captured by GARCH (1, 1)

model. The significance of ARCH coefficient (α) in the model indicates the tendency of the effects of shocks to persist. The presence of ARCH effect in stock returns could be due to clustering of trade volumes, nominal interest rates, dividend yields, money supply, oil price index, etc. The ARCH coefficient is less than unity in every period indicating that volatility is not explosive. The sum of the coefficients of lagged squared disturbance (α) and that of past variance (β) is less than one indicating shocks die with time. For daily series, the sum is marginally higher in post-liberalisation (0.97) period than pre-liberalisation (0.91) period, thus indicating a marginal higher volatility in post-liberalisation. The mean volatility also indicates the similar pattern. It was 0.031% in pre-liberalisation period and increased up to 0.037% in post-liberalisation period.

Table 3.3: Estimation of AR (1) Model with GARCH (1, 1) process

Period	a_0	a_1	ω	α	β	Mean (%)
GARCH(1,1) model for Daily Series						
1985-92	0.026 (1.17)	0.097** (12.77)	0.004** (9.96)	0.038** (31.87)	0.878** (2121.72)	0.031
1993-07	0.033* (2.55)	0.134** (6.46)	0.02** (6.71)	0.145** (10.06)	0.83** (66.98)	0.037
1985-07	0.036* (2.84)	0.18** (11.18)	0.027** (22.8)	0.138** (17.88)	0.854** (127.16)	0.034
1991-92	0.037 (0.74)	0.151* (2.52)	0.031* (2.09)	0.052** (3.00)	0.94** (23.72)	0.061
GARCH(1,1) model for Monthly Series						
1976-92	0.45* (2.13)	-0.02 (-0.34)	0.104 (0.72)	0.057* (2.38)	0.93** (26.57)	0.117
1993-07	0.23 (1.67)	0.05* (2.24)	0.06* (2.01)	0.08** (3.45)	0.95** (18.45)	0.126
1976-07	0.297 (1.63)	0.015* (0.27)	0.143 (1.17)	0.051* (2.56)	0.94** (39.62)	0.118

*** Significant at 1% level and * significant at 5% level. Figures in parentheses represent t-ratios.*

For monthly series, volatility persistent is significantly evident for the whole period as well as for sub-periods. The ARCH coefficient (α) in the model is significant, indicating the tendency of the effects of shocks to persist. The sum (ARCH and GRARCH) of the coefficients is less than one for pre liberalisation and for the overall sample; however it is more than one in post-liberalisation. The mean volatility is marginally higher in post-liberalisation period than in pre-liberalisation period, indicating market is relatively more volatile in post-liberalisation period. However, Wald tests of null hypothesis of equality in volatility persistence ($\beta + \alpha$) for both periods is insignificant, indicating there is no statistically significant increase in volatility in liberalisation period.

As we have already discussed GARCH models take only magnitude not the sign of lagged residuals. Hence it ignores the leverage effect. Nelson's E-GARCH model overcomes this problem. So, we have estimated E-GARCH (1,1) model for the sample period (both daily data and monthly data). The results are reported in Table3.4.

Table 3.4: Estimation of AR (1) Model with E-GARCH (1,1) Process

Period	Mean (%)	ω	β	α_1 (ARCH Term)	α_2 (Leverage)
E-GARCH(1,1) Model for Daily Series					
1985-92	0.040	-0.02** (-6.4)	0.891** (215.09)	0.27** (13.73)	-0.013* (-2.95)
1993-07	0.047	-0.271** (-15.71)	0.93** (97.55)	0.21** (14.72)	-0.068** (-7.95)
1985-07	0.045	0.013** (40.22)	0.92** (265.06)	0.21** (22.36)	-0.036** (-8.91)
1991-92	0.083	-0.0126** (-4.08)	0.975** (31.05)	0.27** (4.44)	-0.106** (-8.29)
E-GARCH Model for Monthly Series					
1979-92	0.39	1.00 (1.60)	0.94** (52.34)	0.05** (3.44)	0.016 (1.35)
1992-07	0.45	-0.13** (-13.87)	0.97** (54.67)	0.07** (11.23)	0.08** (5.28)
1979-07	0.41	-0.03 (-1.39)	0.99** (151.33)	0.03* (2.32)	0.08** (11.82)

*** Significant at 1% level and * significant at 5% level. Figures in parentheses represent t-ratios.*

In June 1991, India adopted the Structural Adjustment Programme (SAP) following a balance of payment (BOP) crisis and then a series of economic as well as financial liberalisation measures were announced. So, we have sub-periods from June 1991 to end of 1992. This period is highly volatile compared to other period. Mean volatility is also very high during this period (0.08) than compared to other sub-periods. The sum of all coefficients is greater than the other periods. The leverage effect is significant for all the periods including sub-period (1991-92). As expected the coefficient of leverage is negative indicating bad news have higher impact than good news. The coefficient of β is positive and significant indicating volatility clustering. The coefficient of ARCH term α_1 is positive and significant. The sum of the ARCH-GARCH coefficients is more than one for whole sample, pre and post-liberalisation period, indicating that volatility increases with time. The sum of the ARCH-GARCH coefficients is higher in pre-liberalisation period (1.16) than in post-liberalisation period (1.14), indicating marginal decrease in volatility in post-liberalisation period.

For monthly data, the mean volatility is marginally higher for post-liberalisation period and leverage effect is significant but the sign is positive. The sum of the ARCH-GARCH coefficients is higher in post-liberalisation period (1.04) than in pre-liberalisation period (0.99), indicating marginal increase in volatility in post-liberalisation period. However, Wald tests of null hypothesis of equality in volatility persistence ($\beta + \alpha_1$) for both periods is insignificant, indicating there is no statistically significant increase in volatility in liberalisation period. Our result supports the empirical findings of De Santis and Imrohoroglu (1997), Bekaert and Harvey (2000) and Kim and Singal (2000) that financial liberalisation may not increases stock market volatility significantly. Now the task is to examine whether there is any structural break in volatility and relates this structural breaks with stock market liberalisation events. The next section examines this particular issue.

3.5.2 Structural Breaks in Stock Market Volatility

Many factors (negative and positive) such as economic shocks, political instability, wars and stock market liberalization measures affect unconditional variance of stock return. These types of shocks can cause abrupt breaks in the unconditional variance of stock market returns. Identifying these events associated with structural breaks[12] is important for accurately measuring stock market volatility. Recent studies show that presence of structural breaks in the series induces upward biases in estimates of the persistence of GARCH parameters (Lamoureux and Lastrapes, 1990; and Agrawal et al., 1999).

The mechanism of locating endogenous structural breaks in a time series has been intensively researched area in the last few years (see, among others, Banerjee et al., 1992; Ghysels et al., 1997; and Bai et al., 1998). Most of the techniques in the above papers have been developed for estimating and locating the endogenous breaks in the mean parameters of trend models. However, as Bai and Perron (1998) mention, they can also accommodate changes in the variance. We use the general framework of Bai

[12] Although there are studies that have examined structural breaks in stock return volatility for emerging markets, hardly there is any study on India on this issue.

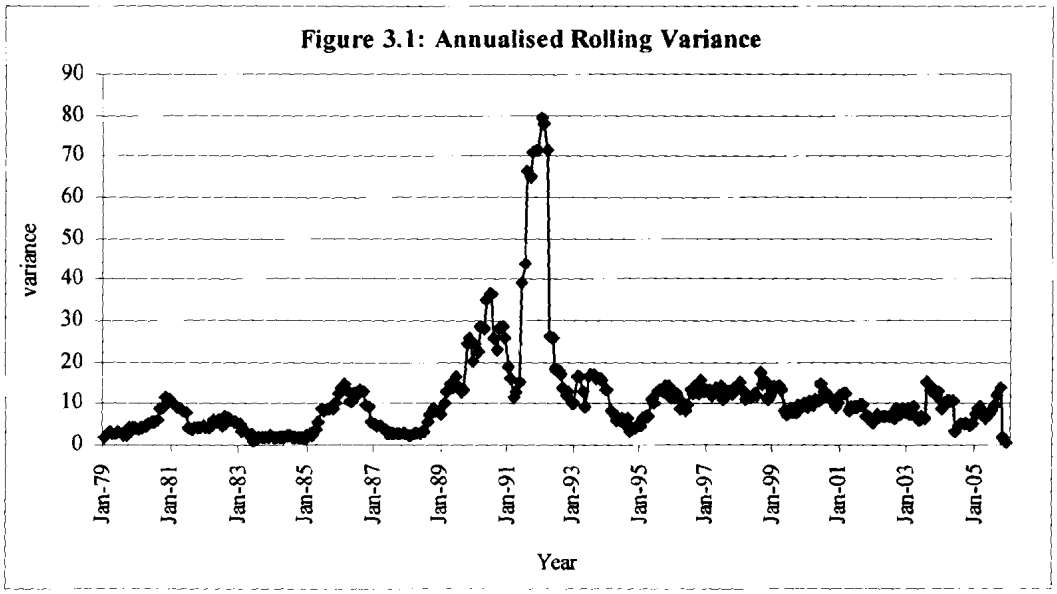
and Perron (1998, 2003) and their procedure of sequentially locating the breaks with its associated critical values[13].

As a first step we detect the shift in unconditional volatility. For this purpose we estimate 12-month rolling variance. The result is presented in Figure 3.1. The annualised rolling variance is calculated as follows:

$$\sigma^2 = \left[12 * \sum_{k=0}^{11} (r_{t-k} - \mu_{12})^2 / 11 \right] \qquad (15)$$

where μ_{12} is the sample mean over 12-month window. The formula is pre-multiplied by 12 for annualising the variance.

Figure 3.1: Annualised Rolling Variance



From Figure 3.1 it is clear that that the rolling variance shows a continuous increase in volatility until 1991-92, when it reached its highest level. Since then the volatility shows a downward trend. There is shift in unconditional volatility around the period 1991-93, during which most of the liberalisation measures took place. Since then, the volatility follows a downward trend till 2007.

[13] Bai and Perron endogenous break test has many advantages such as: it can be applied for both pure and partial structural breaks. It takes care of the problem of serial correlation and heteroscedasticity of errors, different distribution of regressors and errors across segments/sub-periods (Bai and Perron, 1998, 2003).

Though standard GARCH models are able to capture the time varying nature of volatility, they apparently fail to capture structural breaks in the series that are caused by low probability events such as a crash and / or political/ economic events. The GARCH model as discussed above can be modified to include sudden changes in the variance. Lastrapes (1989) and Lamoureux and Lastrapes (1990) have shown that when ARCH/GARCH models are applied to data that include sudden change in variance then the conditional variance may be found to strongly persist over time. According to them, high volatility persistence in GARCH models could be on account of structural changes in the variance process.

Table 3.5: Dates of Structural Breaks

Variables	No. of Breaks*	Brake Dates	Events
BSE Return Series	3	1989: 08	Bofors Scam
		1992:04	Harshad Mehta Scam
		2003:04	SARs effect
IFCG Return Series	3	2000:01	InfoTech Boom
		2001: 08	Terrorist attack on New York
		2003: 04	SARs effect
FII purchase	2	2003:06	
		2004:10	
FII sale	2	1999:09	General Election
		2003:12	
Market Cap.	2	1993:12	
		2003:10	
Turnover	2	1999:06	
		2001:02	Ketan Parekh Scam

**According to Bayesian Information Criteria (BIC) criteria all the break dates are significant.*

We follow the methodology of a combined GARCH[14] as given by Lamoureux and Lastrapes (1990) and followed by Aggarwal et al. (1999) and Batra (2004). The purpose is to test for the structural breaks and then to estimate the time of its occurrence. The structural change analysis is undertaken for unconditional variances in the BSE return series. We test the null hypothesis of no structural breaks against numbers of break points (m) in the series. Our result suggests that there are three structural break points in the BSE return series and IFCG return series, which is presented in Table 3.5.

[14] Lamoureux and Lastrapes (1990) and Aggarwal et al (1999) propose the use of the GARCH model with dummies for structural change in a time series.

It is clear that there is one break point (BSE return series) around liberalisation period (1991-93), which is associated with stock market scam. At the same time there is no structural change that is related to the entry or buying or selling by FIIs. So FIIs is not the source of persistent volatility. Rather, economic liberalisation in general and some political events have led to a structural shift in volatility as it is found from the break dates. In most of the cases we found that scams and international factors had led to structural breaks. Financial liberalisation and particularly, stock market liberalisation have not lead to a structural break in volatility for India. Similarly, significant developments in the market indicators such as turnover or market capitalization have not lead to volatility shifts in the stock returns.

E-GARCH model discussed in Section 3.4 could be reformulated to take into account the structural change by adding dummy variables. Equation (14) can then be rewritten as follows:

$$\ln h_t = \omega + \beta \ln h_{t-1} + \alpha_1 \left| e_{t-1}/\sigma_{t-1} \right| + \alpha_2 e_{t-1}/\sigma_{t-1} + \delta_1 d_1 + \delta_2 d_2 + \ldots + \delta_n d_n \quad (16)$$

Where d_1, d_2,..., d_n are dummy variables taking the value of one from each point of sudden change of variance onwards and zero elsewhere. We then compare the implied persistence of the model as in equation (16) using the restricted specification to that of the unrestricted specification in (14). Monthly return series is used for break point test. The results are presented in Table 3.6.

Table 3.6: Volatility with Structural Break Point Using Monthly Data

Period	Mean (%)	ω	α_1	α_2 (Leverage)	β	d_1	d_2	d_3
1979-07	0.31	0.125 (0.48)	0.071* (2.38)	0.04* (2.23)	0.65** (14.5)	1.44* (2.98)	-1.30 (-1.87)	0.697** (3.13)
1979-92	0.34	0.20 (0.69)	0.11* (2.86)	0.11* (1.98)	0.43* (2.62)	1.11* (2.77)	-0.34 (-1.68)	-
1993-07	0.29	0.13 (0.48)	0.06 (1.67)	0.06 (1.56)	0.54* (2.05)	-	-	1.23* (2.11)

*** Significant at 1% level and * significant at 5% level. Figures in parentheses represent t-ratios.*

Out of three dummies, two dummies have a positive and significant impact on volatility. The first dummy (1989:08) has a positive impact on volatility, and second dummy (1992:04) has negative impact. The third dummy (2003:04) has positive impact on volatility. The result also shows that there is a significant reduction in ARCH effect when large shocks are controlled for. But volatility is still persistent even after controlling for large shocks in case of full sample; it is not an explosive

series anymore. The sum of the ARCH coefficients has come down considerably (from 1.02 to 0.69) for the full sample. In pre-liberalisation period the sum of the ARCH coefficients has come down from 0.99 to 0.54 and for post-liberalisation period it declined from 1.04 to 0.60. There is also a marginal decrease in mean volatility for all the periods. Therefore, the above result suggest that the hypothesis that stock market liberalisation has increased volatility is untrue for India.

3.6 Summary

In this chapter we tried to examine the impact of financial liberalisation on stock market volatility. We take the view that the analysis of the change in the nature of volatility rather than the level of volatility can provide us with better insight on the effect of liberalisation. Accordingly, appropriate methodology is employed to capture the time varying nature of volatility and the link between the shifts in stock price volatility and the nature of events that apparently causes these shifts. Results of this exercise indicate that the distribution of stock return is not normal and ARCH effect is present. Further, the results also reveal that the nature of volatility has not changed dramatically after liberalisation. The lag structure of the GARCH process remains the same in both the periods. Also, volatility persistence is high for all periods and remains pretty much the same. From structural break analysis we found that there are three break dates and all the break points are related to economic and political events. None of the break dates is related to stock market liberalisation events. Therefore, our analysis reveals that liberalisation of the stock market or the FII entry in particular does not have any direct implications for the stock return volatility. The apparent link generally drawn between stock price volatility and the sudden withdrawal or heavy purchases by the FIIs i.e. the volatile FII investment in the stock market does not seem to be holding true for India. When large shocks in stock returns are controlled, there is significant reduction in ARCH effect; however the volatility is still persistent. Given the fact that the level of volatility does not show much change in pre and post liberalisation period, the expected negative impact of stock market volatility on investment, corporate financing and financial stability in the economy should not be significant.

CHAPTER IV

Stock Market Development and Its Impact on Savings

4.1 Introduction

In chapter 2 and 3 we have examined the impact of liberalisation on stock market liquidity and volatility. We find that the Indian stock market is now large and liquid and hence could influence savings and corporate investment. Therefore, this chapter examines the link between stock market development and savings[1]. In the theoretical literature it is argued that savings is an important macro channel (like liquidity) through which stock market development spurs economic growth (Pagano, 1993; Levine, 1997). Thus, the assessment of the impact of stock market development on level of savings may provide some insight which, in turn would be having implications for policy towards long-run economic growth[2]. It may as well be emphasized that we have a limited understanding regarding the relationship between stock market and savings mobilization, despite considerable amount of literature on stock market development and economic growth. This analytical chapter is motivated by the above consideration and intends to present a detailed analysis of the impact of stock market development on savings by analysing the determinants of savings.

The Rest of the chapter is structured as follows: in Section 4.2 we discuss the theoretical and empirical literature on savings behaviour. Section 4.3 discusses the composition of savings. Section 4.4 reviews the possible determinants of savings. Section 4.5 provides the details of the data source, methodology and measurement of variables. Results are discussed in Section 4.6 and finally we summarise the chapter in Section 4.7.

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[1] In the traditional and neo classical growth theory, it is argued that savings is one of the important variable for sustainable and long-term growth (see Harrod, 19439; Domar, 1946; Slow, 1956; and Swan, 1956)

[2] The impact of stock market development may have substitution effect on savings .i.e., holding shares instead of bank deposits. However, this substitution could affect economic growth if stock market mobilize and allocate funds relatively more efficiently than the other.

4.2 Literature Review: Theoretical Background

The impact of stock market development on savings[3] depends upon three factors: (1) how it affects the return on savings, (2) how it affects the riskiness of savings and (3) the response of individuals to changes in return and risk[4]. Various theoretical strands suggest that stock market development should raise the rate of return on savings for two reasons (Devereux and Smith, 1994; Obstfeld, 1994). First, as predicted by standard portfolio theory, addition of stocks to a portfolio of risk-free assets would raise the expected return of the portfolio. For example, if individuals were forced to hold a larger fraction of risk-free assets in their portfolio prior to stock market development, then the ability to increase the fraction of risky stocks in the portfolio should increase the expected rate of return. Second, if capital controls or the incompleteness of investment opportunities prevents individuals from holding their optimal portfolio of stocks, then liberalisation and expansion of the stock market would allow individuals to channel resources into their best uses through the purchase of shares. This reallocation of resources into more efficient uses should consequently lead to a higher rate of return on savings in the economy[5].

On the other hand, Further, Mauro (1995) shows that Japan and continental Europe have experienced high saving rates even though their stock markets have been relatively underdeveloped, while US and UK have been characterized by low saving and slower growth even though their stock markets have been well developed. He relates this fact to precautionary savings. His model based on endogenous growth model suggests that the existence of a stock market where investors can pool their risks is expected to reduce precautionary saving.

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[3] Stock market development has long-term and short-term effects on saving. Long term effects include improved saving opportunities through wider range of savings instruments with improved risk-return characteristics. Second, if stock market development has a favorable effect on the allocation of resources, this will generate increase in income that will in turn increase saving (Bandiera, et al. 2000). Stock market development may also affect savings in short-term through capital inflows. Higher capital inflows due to stock market opening may lead to a credit boom and surge in real income. This may have transitory effect on the volume of saving.

[4] Theoretically, financial reforms enhance the efficiency through which saved resources are channeled into productive use, although the effect on the quantity of savings is unsettled and depends on many factors.

[5] The effect of a change in the rate of return on savings is well known to be ambiguous because of offsetting income and substitution effects.

Theoretical models of financial market development and economic growth suggest that stock market development may reduce the riskiness of income and at the same time it would increase the rate of return (Levine, 1991; Bonser-Neal and Dewenter, 1999). Nevertheless, the theoretical effects of a change in risk on the savings rate are notably ambiguous and to a great extent depend critically on assumptions regarding preferences. For instance, Rothschild and Stiglitz (1971) show that risk and savings are positively related only if the coefficient of relative risk aversion is non-increasing and greater than one, a condition consistent with a precautionary motive for savings. The empirical implication of this argument is that the savings rate will be lower in countries with less risky sources of income. Alternatively, if the coefficient of relative risk aversion is non-decreasing and less than one, then savings and risk are inversely related. Whether savings increases or decreases with a change in risk therefore depends critically on the coefficient of relative risk aversion. The value of the coefficient of relative risk aversion is, however, a hotly debated subject in the literature, and empirical studies give a wide range of estimates (Alonso Rubio and Tusell, 1990; Choi and Menezes, 1992). Therefore, the above review shows that over all effect of stock market development on savings is ambiguous and it should be determined by empirical evidence.

4.2.1 Empirical Literature

Before proceeding to review the existing studies, it is pertinent to highlight that there exist very minimal evidence of a clear-cut relationship between financial liberalisation and the level of saving. The early financial liberalization literature (McKinnon, 1973; Shaw, 1973) argued that financial liberalisation may generate greater savings. Although there is empirical evidence that supports the M-S hypothesis that financial development has a positive net effect on saving (see Edwards 1996, Dayal-Gulati and Thimann 1997, Loayza et al, 1999), the impact of financial liberalization on savings is inconclusive (Bandiera et al., 2000). Bayoumi (1993) investigates the interaction between financial deregulation and household saving's behavior using regional data for UK in the 1980s. He concluded that financial deregulation was responsible for lowering the equilibrium level of saving by roughly 2.25 percent per year and making saving more dependent on changes in wealth, income and interest rates.

In a recent study, Bandiera et al. (2000, p. 7), notes that "the effect of financial liberalisation (including stock market) on private saving is theoretically ambiguous, not

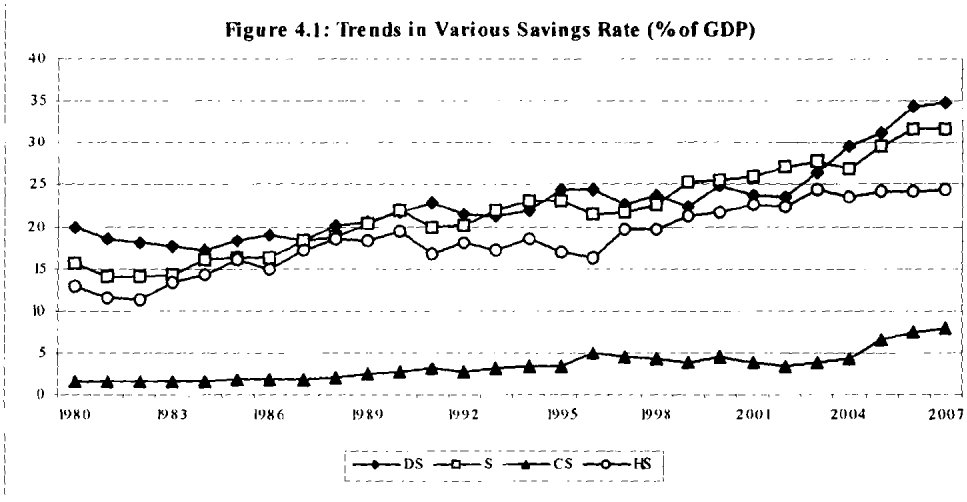
only because the link between interest rate levels and saving is ambiguous, but also because financial liberalisation is a multidimensional and phased process involving reversals." Indeed, Bandiera et al., (2000) found that the pattern of effects differs across countries. The relationship between financial liberalization index and savings were found to be mixed, that is, negative for Korea and Mexico and positive for Turkey and Ghana. Therefore, his arguments can be considered as a justification to undertake more country specific studies to verify the hypothesis regarding financial liberalisation and savings.

Some other studies (Levine and Zervos, 1996; Bonser-Neal and Dewenter, 1999) using stock market development indicators like market capitalization ratio, total value traded ratio and turn over ratio as proxies for financial sector development found some evidence for financial liberalisation stimulating savings in emerging markets. However, as pointed out by the authors themselves, due to limited sample size and due to the inclusion of some outlier countries in the sample, which can seriously bias the results, their conclusion, at best remain provisional. Granville and Mallick (2002) find that capital market development in UK has positive impact on national savings. However, there exists contrasting evidence. For example, Serres and Pelgrin (2003) find that private savings in OECD countries declined in 1990s due to rise in household financial wealth measured by strong rise in equity market. On the other hand, Catalan et al., (2000) find that contractual savings such as assets of pension funds and life insurance companies have positive impact on capital market development. By using granger causality approach they find that growth of contractual savings cause the development of capital markets for OECD and other advanced countries. In the Indian context, Nagraj (1996), Nagaishi (1999) and Nair (2004) have verified the role of stock market in domestic savings mobilization. Their study shows that stock market development has no significant impact on savings mobilization. However, these studies have suffered from considerable methodological problems. For example, Nagraj (1996) and Nagaishi (1999) do not provide any econometric evidence to support their claims. On the other hand, Nair (2004) uses only 30 observation and Johansen and Juselius (1990) methodology for cointegration. Therefore, the Nair study suffers from small sample bias associated with Johansen and Juselius methodology. Moreover, Nair (2004) has used financial sector liberalisation index as proxy for financial development instead of using stock market indicators such as market capitalization or liquidity variable. In

comparison, this present study uses Autoregressive Distributed Lag (ARDL) model which is suitable for smalls to find out the impact of stock market development on savings.

4.3 Total, Private and Household Savings rate: A composition analysis

Before examining the relationship between the stock market development and savings in India we analyse the savings behaviour in Indian economy to understand how the overall savings have moved and how its composition changed over the years. Domestic savings in India can be divided into private and public savings. Private savings further divided into household and corporate savings. The savings rates (savings to GDP ratio) for India have been increasing gradually over the period 1980-2007.



Source: Economic Survey of India, and Handbook of Statistics on Indian economy, Various Issues

Total savings rate (DS) averages around 23 per cent for the whole period, 19% for pre-liberalisation period (1980-92) and 26% for post-liberalisation period (1993-2007) (see Figure 4.1). Private savings (household savings plus corporate savings) rate shows a similar trend as in the case of total savings rate, averaging higher in post-liberalisation period. Corporate savings rate, which was averaging at 2% during pre-liberalisation period, more than doubled to around 5% in the post-liberalisation period[6]. Household savings in India quite high and is the major constituent of total savings (around 75 %).

[6] Public savings is not included in our analysis as it is affected by tax policy, expenditure management, centre-state relations, and public enterprise reform (Muhleisen, 1997).

4.3.1 Composition of Household Savings

The household savings can be divided into financial and non-financial or physical savings. In the pre-liberalisation period, Indian financial system was characterized by poor infrastructure and a low level of financial deepening[7]. Banking sector was dominant and interest rate repressed. Capital market was plagued by lack of liquidity, transparency and high transaction cost and domestic investors perceived investment in capital market was at high risk. As a result, physical savings in terms of agricultural land, housing, gold, jewellery and consumer durables dominated household savings. The financial sector reforms in India, introduced since early 1990s, have led to a series of financial innovations[8] which, ultimately lowered transaction costs and provided better returns to the investors. With more efficient financial intermediation and financial markets, greater opportunities for diversification across financial assets and market related returns, financial savings has gained increasing importance in the liberalisation era. The share of financial savings in total saving increased from 23.7 per cent in early seventies to 48.5 per cent in late nineties and thereafter declines to around 40 percent in 2007. During the same period, there has been a downward drift in the share of physical saving from 44.4 per cent in seventies to 33.3 per cent in nineties and increased to 41 per cent by 2007 (Table 4.1). This indicates the importance of household financial savings in total savings for India.

Table 4.1 Composition of Household Savings in India (% GDP)

Types of Household savings	1970	1975	1980	1985	1990	1995	2000	2007
Physical	6.5	6.8	8.0	5.9	9.2	6.7	10.3	12.3
Physical savings as % of total savings	47	37	38	35	42	32	48	36
Financial	3.0	3.0	5.0	7.2	7.8	11.9	10.8	11.8
Physical savings as % of total savings	21	28	32	49	43	37	43	37
Household Savings	9.5	9.8	13.0	13.1	17.0	18.6	21.1	24.1

Source: RBI, Handbook of Statistics on Indian Economy, Various issues.

[7] Financial deepening refers to an increase in the size of the financial system and in its role and pervasiveness in the economy.

[8] Major financial innovation in India includes on-line trading in stock market, on-line banking transactions, derivative trading, commodity exchange market etc.

Further, this trend also reflected in the household financial saving to GDP ratio. The household financial savings averaged about 10 per cent for the whole period, 6.5 % for pre-liberalisation period and 11 % for post-liberalisation period respectively. During the early 1990s there was a spurt in household financial savings following financial sector liberalisation but, during 1997-2001 it remained more or less stagnant. Thereafter it shows an upward trend indicating financial liberalisation in general and stock market liberalisation in particular have significant impact[9].

4.3.2 Share of Various Instruments in Household Financial Savings

The household financial savings in India consist of currency, bank deposits, investment in life insurance and mutual funds, claims on government, and invest in share and debentures. It is evident from Table 4.2 that bank deposits dominate the household financial savings, followed by insurance, mutual fund and claims on government both in pre and post-liberalisation period. However, share of bank deposit in total household savings, declined over time. Savings of the household sector in the form of shares and debentures (direct investment in the capital market) have remained at a low level, apart from the period 1990-91 to 1994-95 when it improved significantly, but declined subsequently. It is also of some interest to note that the share of savings in capital market instruments (shares and debentures) during 2000-01 to 2006-07 was lower than that in the early 1990s. Yet we find that the share of savings in capital market instruments is higher in the liberalisation period compared to the pre-liberalisation period. In addition to this, household indirect investments in capital market in terms of life insurance and mutual fund have gone up quite significantly since 1996, compensating the declining direct investment by households (Rao and Mishra, 2007). Further, recent evidence also suggest that significant proportion of corporate savings is also channelled to stock market (Planning Commission, 2006).

According to the Society for Capital Market Research and Development (1997) around 0.9 million household directly owned share in 1990 and their number mounted to 1.5 million and 20 million in 1993 and 1997 respectively. In addition to this, an

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[9] It is argued that development of stock market affect total savings through its impact on household financial savings by providing additional instruments for savings (Bonser-Neal and Dewenter, 1999).

estimated 15 to 20 million, or nearly 12%, of all households representing at least 23 million unit holders had invested in units of mutual funds. To a certain extent, this is a reflection of India's financial sector development in general, and stock market development in particular.

Table 4.2: Share of Various Instruments in Household Financial Savings

(Per cent)

Periods	Currency	Bank and Non-Bank deposits	Life Insurance and mutual fund	Units of UTI	Claims on Government	Shares and Debentures
1970-80	13.9	48.6	8.8	0.5	4.2	1.5
1981-91	11.9	45.0	7.9	2.2	11.2	3.9
1992-95	10.8	39.6	9.4	6.6	8.1	9.4
1996-2000	9.7	43.4	13.5	0.9	10.8	4.7
2001-07	8.9	40.9	17.6	-0.8	17.8	4.1

Source: Handbook of Statistics on the Indian Economy, 2007-08, RBI.
Notes: Includes investment in shares and debentures of credit/non-credit societies, public sector bonds and investment in mutual funds (other than UTI).

Therefore, based on trend analysis we find that India's savings rate has increased from 19% in the pre-liberalisation period to 26% in the post-liberalisation period with significant portion is coming from household and corporate savings. Further, composition of household savings has also changed in favour of financial savings from physical savings. More importantly, a significant amount of household financial savings is now invested in capital market either directly or indirectly.

4.4 Determinants of Savings Rates – A Review

Both theoretical and empirical work on savings indicate that the following factors affect savings: (i) level and growth rate of income, (ii) demographic variables, (iii) financial variables, (iv) uncertainty factors, (v) government policy variables, and (vi) external variables[10].

(i) Level and Growth rate of income (GY): Keynes had postulated that consumption (and therefore also savings) is linearly related to income per capita. Other consumption theories (life-cycle and permanent income) provide similar conclusions. Among the growth theories, while the neoclassical growth models (Solow, 1956) imply that higher

[10]For comprehensive surveys on the determinants of savings, see Deaton (1989), Schmidt-Hebbel (1996), and Loyaza et al (2000).

savings rate will lead to higher steady state levels of income (or output) per capita; the endogenous growth theory suggests that higher savings rates would lead to higher levels of growth of income per capita. Thus, in general, both income per capita and its growth rate should be included as explanatory variables. We have used the real per capita income (RPC) and growth rate of income (GY) in our analysis. The expected sign of the coefficient of income per capita, RPC, is positive, that of GY is inconclusive (Carroll and Weil, 1993; Mason et al., 1995).

(ii) Demographic Factors: Aggregate savings is affected by the age distribution of the population - if the share of inactive or dependent population is high, the savings ratio will be low. We use the age dependency ratio (ADR), as the share of dependent age population (aged below 15 or over 64 years) to the working age population (aged 15 to 64 years), as a reasonable proxy to capture this effect. The expected sign of the coefficient of ADR is negative since more dependents lead higher consumption and reduce savings (Edwards, 1996; Schmidt-Hebbel et al., 1996).

(iii) Financial Variables: Development of financial sector may also affect savings rate. The previous literature on savings functions (Dayal and Thimann 1997 and Edwards 1996) has found a positive impact of financial sector development (M2/GDP ratio) on savings. Deeper financial markets and prudential regulations of financial institutions improve the savings rate by offering a wider variety of financial instruments to channel savings and also by providing more security to savers. Following Demirguc-Kunt and Levine (1996) and Levine and Zervos (1998), we include three major stock market indicators namely, market capitalisation ratio (MC), turnover ratio (TR), and value traded ratio (VTR) as proxies for financial development indicators[11]. The expected sign of MC is positive but that of TR and VTR is inconclusive (Levine and Zervous, 1998; Bonser-Neal and Dewenter, 1999).

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[11] Using the Stock market as a proxy for financial market development has several advantages. (i) Stock market development represents an important aspect of financial market development, as it acts as an alternate vehicle for raising capital and thereby, it gives individuals an opportunity to diversify their risks and potentially increase the returns on their savings. (ii) Long series data on the stock market facilitate a comprehensive study on the relationship between financial development and savings behaviour. (iii) Since the stock market's role in financial market development can be different from and complementary to that of the banking sector, a study on the impact of stock market development may provide new insights on the effects of financial market development, not provided by studies based on banking sector proxies or other proxy measures.

(iv) Uncertainty: An increase in the inflation rate (INF) can impact income and wealth negatively, and lower savings. It can also lower the real interest rate which can have an ambiguous effect on the savings rate. Further, an increase in variability of inflation rate (which usually accompanies a higher level of inflation) is often treated as a proxy for macroeconomic uncertainty. The increased macro uncertainly due to increase in inflation rate may induce people to save more for precautionary motives. Therefore, analytically, the overall impact of an increase in inflation on the savings rate is ambiguous and also an empirical question (Edwards, 1996; Schmidt-Hebbel and Serven, 1999).

(v) Policy Variables: The early financial liberalisation literature (McKinnon, 1973; Shaw, 1973) argued that raising real interest rates to market levels would generate greater savings and thus speed up economic growth. Analytically, an increase in interest rates will have an ambiguous effect on savings because of a positive substitution effect towards future consumption and a negative income effect due to increased real returns on saved wealth. Empirically, some studies such as Giovannini (1985) have found savings to be insignificantly related to real interest rates while others (e.g., Fry, 1995) have found a small but positive interest rate elasticity of savings. In view of this controversy in the literature, it is of interest to evaluate the impact of real interest rates on savings in India. The real interest rates on bank deposits (RD) is the relevant rate of real returns for most households and even for firms in developing countries like India where bank deposits are the principal form of financial assets.

(vi)External Variables: Greater availability of foreign savings may encourage consumption, especially of imports, and reduce savings. Therefore, foreign and domestic savings are likely to be substitutes. The foreign savings rate (FSY) is estimated here as the negative of the current account balance as percent of the GDP. The expected sign of co-efficient of FSY is negative (Agrawal et al., 2009).

On the basis of theoretical and empirical review, the savings function can be specified as:

$$S = S\,(GY, RPC, ADR, SMD, INF, RD, FSY) \qquad (1)$$

$$\text{Where } GY \underset{<}{\overset{>}{-}} 0,\ RPC > 0,\ ADR < 0,\ SMD > 0,\ INF \underset{<}{\overset{>}{-}} 0,\ RD \underset{<}{\overset{>}{-}} 0,\ FSY < 0$$

Similarly, household financial savings can be specified as

$$FS = S\ (GY, RPC, ADR, SMD, INF, RD, FSY) \quad (2)$$

$$\text{Where } GY \gtrless 0,\ RPC > 0,\ ADR < 0,\ SMD > 0,\ INF \gtrless 0,\ RD \gtrless 0,\ FSY < 0$$

4.5 Data Source, Methodology and Measurement of Variables

4.5.1 Data Source

The data on Private Savings Rate (S), Household Financial Savings (FS), Foreign Savings (FSY), rate of inflation (INF), Real Per Capita Income (RPC) and growth rate of income (GY) are obtained from the various issues of the Economic Survey of India. The data on Real Interest Rate (RD) and Stock Market indicators are collected from the Handbook of Statistics on Indian Economy, RBI. The information on total population and population aged below 15, 15 to 64 and 65 years and above were taken from World Development Indicators, 2008 and are used to compute the dependency ratio (ADR).

4.5.2 Methodology

It is well known by now (see Engle and Granger, 1987; Banerjee et al., 1993) that when the variables of interest exhibit unit roots, the classical econometric tools break down. Thus, in order to decide on the appropriate estimation procedure for the savings function and to test for the direction of causality, one needs to first consider the order of integration of the relevant variables and then decide on the appropriate estimation procedure to use. For determining the long-run relationship, we use the Pesaran and Shin (1998) Autoregressive Distributed Lag (ARDL) method, which has been further extended by Pesaran et al. (2001). ARDL cointegration approach, also known as bounds testing, has certain econometric advantages in comparison to other single cointegration procedures. They are as follows: (i) all variables are assumed to be endogenous; (ii) the long and short-run parameters of the model in question are estimated simultaneously and coefficients are adjusted for structural breaks; (iii) the ARDL approach to testing for the existence of a long-run relationship between the variables at levels is applicable irrespective of whether the underlying regressors are purely I(0), or purely I(1), or fractionally integrated; and (iv) the small sample properties of the bounds testing approach are far superior than that of multivariate cointegration. The existence of the long run relationship is confirmed with the help of an F-test which tests whether the coefficients of all explanatory variables are jointly different from zero. The usual critical values are applicable for the F-test when all variables are I(0). However,

different and higher critical values (provided in Pesaran and Pesaran, 1998) are applicable when all or some of the variables are I(1) (see Appendix 4A). Causality between savings rate and stock market indicators are addressed by using VECM (Vector Error Correction Method), which is discussed in detail in Appendix 4A.

4.5.3 Measurement of Variables

Total Domestic Savings (DS), Private Savings (S), Household Financial Savings (FS), and Corporate Savings (CS) are measured as ratio of GDP. The foreign savings rate (FSY) is measured as the negative of the current account balance as percentage of the GDP[12]. The real interest rate on bank deposits is taken as RD[13]. Dependency ratio is measured by the proportion of population aged below 15 and above 65 years to total population. We use three major stock market indicators namely, market capitalisation as ratio of GDP (MC), total turnover as ratio of total market capitalization (TR), and value of total turnover as ratio of GDP (VTR). Since MC, TR, and VTR are highly correlated we develop a stock market index[14] (SIND) using principal component analysis (see Table 4A1). We also include interaction dummy variable (D93*SIND) to assess the effect of stock market liberalisation on savings. The dummy (D93) takes the value of zero before 1993 and one after 1993. It is inferred that if the coefficient of D93*SIND turn out to be positive and significant then stock market liberalisation have had a positive impact on savings.

4.5.4 Stock Market Index (SIND)

Stock market development index is developed using principal component analysis which we have discussed in chapter 2. First we started PCA analysis with sample adequacy test by using the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity. The KMO sample adequacy test is 0.68 which is more than 0.50, indicating component

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[12] This is because capital account balance and current account balance are mirror image of each other.

[13] The real interest rate is obtained as the difference of nominal deposit interest rates (proxied by the simple average of interest rates on fixed deposits of various maturities of 1 to 5 years duration.) and inflation rate.

[14] The number of listed companies is also another indicator of the size of the stock market. But we do include in the index due to some conceptual problems. First, although India ranks first in term of listed companies, but many companies (around 60%) do not trade regularly. Second, this measure is highly influenced by regulation and competitive factors and not clearly linked to macroeconomic variables.

analysis is appropriate. Further, Bartlett's test of sphericity also rejects the null of identity matrix (see Table 4.3). Therefore, we can proceed to conduct a PCA analysis.

Table 4.3: Sample Adequacy Test

KMO Test	0.68
Bartlett's test of sphericity	
Approx. Chi. Square	77.64*
significance	(0.00)

**denotes rejection at 1% level.*

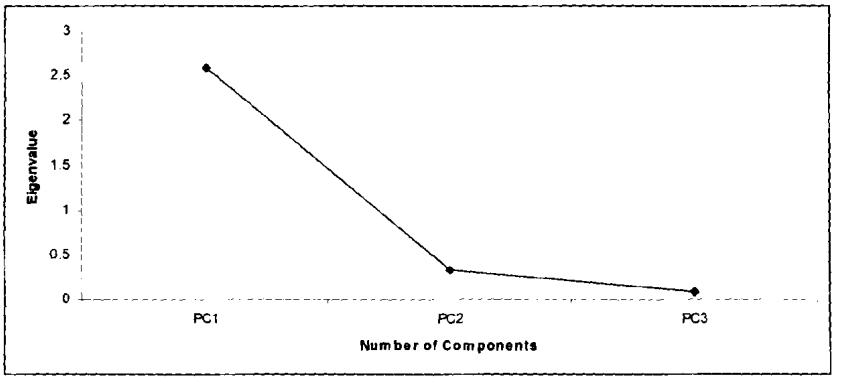
Next we select the optimal number of factors or principal components by using two main criteria. First, only factors that explain a larger portion of the total variance than individual variables are extracted. In mathematical terms, this means that only factors with Eigen values higher than one have been retained. Table 4.4 shows total variance explained by three possible components.

Table 4.4: Eigen Values and Variance Explained by Principal Components

Principal Components	Eigen Values	% of Variation	Cumulative Variation
1	2.59	0.85	0.85
2	0.32	0.14	0.99
3	0.08	0.01	1.00

Note that only one component (first component) has eigenvalue greater than one and explains around 85 % of total variance. Therefore, first principal component is selected for analysis. Second, we also use 'scree' plot to determine the number of components. Based on scree plot, we also select first component for analysis (see Figure 4.2).

Figure 4.2: Scree Plot



Next we identify the principal components and interpret them. For this purpose, we use Kaiser's varimax rotation criterion to orthogonally transform the original data. Rotation

maximizes the loadings of each variable on one of the extracted factors whilst minimizing the loading on all other factors. Therefore, rotation improves interpretability of factors. The rotated components are presented in Table 4.5 using varimax option.

Table 4.5: Factor Loadings of Principal Components

Stock Market Indicators	PC1	PC2	PC3
MC	0.36	0.91*	-0.19
TR	0.91*	-0.34	0.18
VTR	0.63	0.58	0.58*
Total variance explained	55	35	10

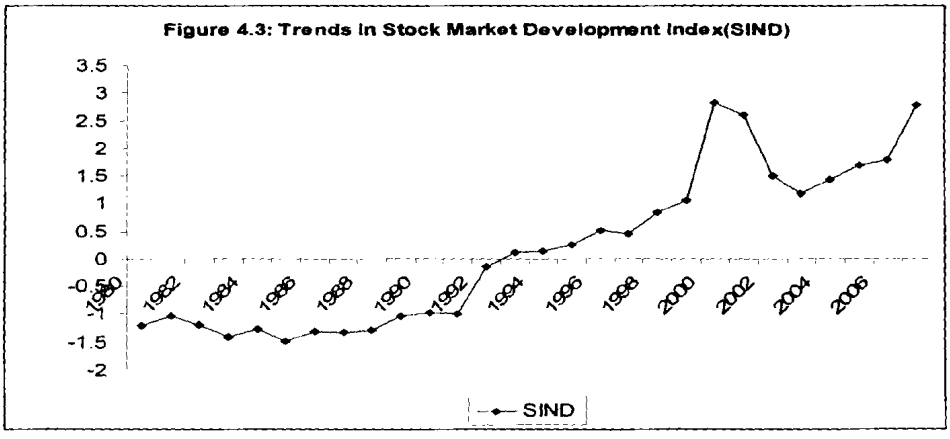
** denotes the highest factor loading of a principal component (PC. Rotation Method: Varimax with Kaiser Normalization converged in 4 iterations.*

The principal components are analyzed as follows:

(1) The first component (PC1) explains around 55% of total variance and is positively correlated with all the stock market indicators but dominated by turnover ratio. Therefore, the first component can be interpreted as the general level of stock market development.

(2) Factor two (PC2), which explains an additional 35% of variance, captures market capitalization ratio. It is negatively related with turnover ratio. Therefore, second component is related to market size.

(3) The third component (PC3) is responsible another 10 % variance and combines rising value traded ratio and turnover ratio and declining market capitalization. However, this component is identified with value traded ratio (VTR). Therefore, it measures market liquidity in relation to economy.



Stock market development index (SIND) developed based on PCA analysis (weight is given based on factor loading) is presented in Figure 4.3. The index was stagnant till 1992 and thereafter it show upward trend, indicating positive impact of financial liberalisation on stock market in India.

4.6 Empirical Results

In order to avoid spurious results, we first establish the integrating properties of each variable using ADF unit root test. The testing procedures are based on the null hypothesis that a unit root exists in the autoregressive representation of the series. The results of ADF unit root are presented in Table 4.6.

Table 4.6: Result of the Augmented Dickey Fuller Test for Unit Root

Variables	Level		First Differences (With constant only)	Order of Integration
	With Constant	With Constant and Trend		
S	1.44	-1.32 (2)	-4.21(0)**	I (1)
FS	-0.21	-156 (1)	-3.25(1)*	I(1)
FSY	-0.54	-2.45 (3)	-5.88(0)**	I (1)
ADR	1.21	-1.06 (1)	-3.84(1)**	I(1)
RD	-3.46*	-	-	I (0)
SIND	-1.12	-2.13	-4.35**	I(1)
INF	-4.48**	-	-	I(0)
GY	-4.65**	-	-	I(0)

Notes: Figures in brackets denote the optimum number of lags used ** and *denotes that null hypothesis that the variable concerned is non-stationary is rejected at 1% and 5% level respectively.

The result suggests that we have a mix of both I(0) and I(1) variables. GY, INF and RD are I(0), and rest of the variables are I(1). Since we have a mixture of I(0) and I(1) variables, we examine the long-run cointegrating relationship between savings rate and other explanatory variables by estimating equation (1) and equation (2) using the Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1998). The results of cointegration test using F-statistics are presented in Table 4.7.

Table 4.7: ARDL Test for Cointegration

Stock Market Indicator	Dependent Private savings	Dependent Household financial savings
	Computed F Statistics	Computed F Statistics
SIND	5.84**	4.63*

Note: ** and *denotes significance at 1% and 5% levels, respectively.

The F-test statistic for private saving denoted as (F_S) is used to examine the existence of a stable long-run relationship. The null hypothesis of non-existence of a stable long-run relationship is rejected if F-statistic for the null hypothesis, H_0: $a_1 = a_2 = a_3 = \ldots = 0$, is

sufficiently high, otherwise the alternative hypothesis of the existence of a stable long-run relationship, H_1: $a_1 \neq a_2 \neq a_3 \neq \ldots \neq 0$, is accepted. The estimated F-statistics for the appropriate parsimonious form, for (F_S) is found to be 5.84, which is higher than the upper bound critical value at 1% level. Thus, the null of non-existence of a stable long-run relationship is rejected at 1% level. Similarly for the household financial savings ratio (FS), the estimated F-statistics F_{FS} is found to be 4.63 which is significant at 5% percent level, and therefore, it rejects the null hypothesis regarding the non-existence of a stable long run relationship. Thus, we find that both private savings and household financial savings have a stable long-run relationship with relevant explanatory variables including stock market index.

4.6.1 Long Run Coefficients of Stock Market Indicators

Since there is a long-run equilibrium relationship between savings rate and other variables, we estimate long-run coefficients using ARDL technique. The lag length of the long run savings function has been selected on the basis of Schwartz-Bayesian Criteria (SBC)[15]. Diagnostic test are used to ensure that it is the best model and there is no misspecification bias in the model. The diagnostic tests include the test of serial autocorrelation (LM), heteroscedasticity (ARCH test), omitted variables/functional form (Ramsey Reset). The variable RPC though important, is dropped from the estimations as it is highly correlated with ADR. Similarly, INF is dropped from final estimation as it is found to be insignificant. The estimated long-run coefficients for equation 1 and 2 are provided in Table 4.8. Results indicate that all the variables have expected sign. It is clear that the coefficient of stock market index is positive and significant, even after controlling the effects of other determinants of savings. The positive sign of this coefficient suggests that for a 1 per cent rise in stock market index, the ratio of private saving to GDP rises by around 0.13 per cent and the ratio of household financial saving to GDP rises by around 0.16 percent. Therefore, the results indicate that the stock market has positive impact on both private savings and household financial savings rate in India. This positive response may be indicative of the broad shift towards equity investment, particularly the indirect investment by households. The long-run coefficients of the dependency rate are negative and statistically significant,

[15] Pesaran and Smith (1998) argue that the Schwartz-Bayesian Criteria (SBC) should be used in preference to other model specification criteria because it often has more parsimonious specifications; the relatively small sample data in this study reinforces this point.

implying that a decline in the dependency rate increases both the private and household financial savings rates in India.

Table 4.8: Long-run Coefficients of Private and Household Financial Savings Rate

Explanatory Variables	Dependent Variable PSY	Dependent Variable FSY
Constant	65.65*** (12.47)	7.73*** (4.13)
ADR	-0.54*** (-8.58)	-0.31*** (-3.43)
FSY	-0.72***(-5.42)	-0.43 (-0.88)
RD	-0.14** (-2.32)	-0.24** (-2.12)
SIND	0.13** (2.08)	0.16*** (3.39)
GY	0.21*** (3.52)	0.21** (2.48)
D93*SIND	1.12 (0.58)	2.11** (2.46)
Adj.R^2	0. 68	0.59
DW Statistics	1.89	1.58
Model Selection Criteria (SBC)	(1,0,1,2,1,2.1)	(1.2,1,1,0,1,1)
LM	1.67 (0.18)	1.45 (0.22)
ARCH Test	2.01 (0.16)	1.09 (0.29)
RESET	0.17 (0.41)	0.21 (0.28)

*** *Significant at 1% level,* ** *significant at 5% level.*

The real interest rate is found to have a significant negative coefficient in both the models: total and household financial savings rates. The growth rate of GDP has a positive and significant impact on private savings and household savings. More importantly, the sign of the interaction dummy is positive and insignificant for private savings rate, but significant for household financial savings rate. Therefore, stock market liberalisation has significant positive impact only on household financial savings. However, the coefficient of the stock market is very small compared to dependence ratio, foreign savings and growth rate of GDP, suggesting stock market development has minor impact on savings rate.

Long-run coefficients of MC, TR and VTR

The long-run coefficient of MC, TR and VTR are obtained by multiplying the coefficient of stock market index with the respective factor loading of the individual indicator. The results are presented in Table 4.9. It is clear that market size (MC) has a smaller impact than liquidity.

Table 4.9: Long-run coefficients of MC, TR and VTR

Stock Market indicator	Long-run coefficients (Private savings)	Long-run coefficients (Household Financial savings)
MC	0.067	0.083
TR	0.078	0.09
VTR	0.083	0.10

The foregoing analysis suggest that private savings rate in India is determined by real interest rate, age dependency ratio, growth rate of GDP, foreign savings and stock market. These results provide evidence that stock market development is positively linked to the private savings rate in India. However, the liberalisation dummy in the form of stock market liberalisation does not seem to have any significant effect on private savings rate. Similarly household financial savings rate is found to be determined by real interest rate, age dependency ratio, public savings rate, growth rate of GDP and stock market indicator like market capitalization ratio. Overall, the study finds a positive, significant link between savings, stock market size and liquidity. However, the relative impact of stock market development on savings is less, compared to foreign savings, real interest rate, age dependency ratio and growth rate of income.

4.6.2 Causality between Savings and Stock Market Development

So far we have seen that the savings rates in India are positively associated with the stock market development indicators like size, liquidity, and overall index. However, the direction of causality between the savings rate and stock market development is also of considerable importance for development policy. Recent literature on savings and stock market development deals with causal relationship along three lines. (1) Stock market development stimulates savings; (2) savings promotes stock market development; (3) a circular relationship that stock market development and savings growth simultaneously affect each other. In the literature there is a controversy over the direction of causality between savings and stock market development. Some analyses suggest that stock market development has causal influence on savings. That is, a deliberate creation of stock market increases investment. This hypothesis is supported by Levine and Zervos (1998), Levine (1997) and Greenwood and Smith (1997).

Some analyses postulate a causal relationship from savings to stock market development. This hypothesis stresses the passive role of stock market. In this view stock market development is the consequences of over all economic development. For example Garcia and Liu (1999) and Yartly (2008) show that savings growth propels stock market development. The third view stresses the reciprocal relationships between stock market development and savings growth. Higher savings rate makes the development of stock market and the establishment of an efficient stock market permits

faster savings growth. Therefore, stock market development and savings growth positively influences each other in the process of economic development.

In this section, we present the empirical evidence on the direction of Granger causality between savings and stock market. The causality results between stock market, private and household financial savings is captured through a vector error correction mechanism (VECM). Results are reported in Table 4.10 and Table 4.11.

Table 4.10: Causality between Gross Private Savings Rate and Stock Market

Null Hypothesis	Optimal Lag	Θ =0: t-statistic (P-value)	$\Sigma\beta_i$ = 0: F-statistic (P-value)
SIND → PSY	2	-2.06* (0.04)	3.97* (0.03)
PSY → SIND	1	-2.67** (0.00)	0.75 (0.55)

*Note: ** indicates significance at 1% level, * significance at 5% level. Figures in the bracket indicate p-values. RD and GRY are not included in the causality test as these variables are I(0).*

We have used the Akaike Information criterion to select the lag length of the VECM. In the VECM procedure, there are two sources of causation: through the lagged dynamic terms (short-run causality) and through the lagged ECM term (long-run causality).

It is clear from Table 4.10 that there exist a bi-directional causality between stock market index and gross private savings rate, indicating a complementary relationship between stock market and savings in India. From the results it could be inferred that causality runs from stock market index to savings through lagged ECM term, as well as through dynamic terms, whereas, reverse causality from savings to stock market index is exhibited only through ECM term (long-term causality). Therefore, VECM causality result suggests a bi-directional causality between private savings rate and stock market.

Table 4.11: Causality between Household Financial Savings Rate and Stock Market

Null Hypothesis	Optimal Lag	Θ =0: t-statistic (P-value)	$\Sigma\beta_i$ = 0: F-statistic (P-value)
SIND → FSY	2	-2.91*** (0.01)	1.04 (0.32)
FSY → SIND	2	-2.21* (0.03)	0.67 (0.36)

*Notes: *** indicates significance at 1% level, ** indicates significance at 5% level, and * indicates significance at 10% level. Figures in the bracket are p-values. RD and GRY are not included in the causality test as these variables are I(0).*

In Table 4.11 we present the causality between household financial savings rate and stock market index. The result indicates that there exists a bi-directional causality between stock market index and household financial savings rate through the lagged ECM terms.

To sum up, we find a two-way causality running between stock market and private savings rate. Similar result is also obtained for household financial savings rate. Thus, in India there exist a complementary relationship between savings and stock market. The results suggest that further development of stock market might lead to higher savings and investment. In complementary, higher savings will lead to higher stock market development.

4.7 Summary

Theoretically, it is argued that, stock market development affects economic growth by encouraging higher savings by providing investors with an additional financial instrument. In this chapter we have examined the role of stock market in savings mobilisation for India over the period 1980-2007. We estimate models for the private savings rate and household financial savings rate by using an ARDL model. We use stock market development index to capture the link between stock market development and savings. In order to capture the impact of stock market liberalisation, we have used an interaction dummy variable. From composition analysis, we find that the impact of stock market on savings is partially true as household financial savings has gone up substantially in post-liberalisation and significant amount of this is invested in stock market through direct and indirect method.

Cointegration results show that there exists a stable and long-run equilibrium relationship among the two saving rates and age dependency ratio, interest rate, stock market, foreign savings, etc. Further, results also suggest private savings rate in India is mainly determined by the real interest rate, age dependency ratio, and stock market development. The study finds that stock market development has a positive impact on gross private savings. However, stock market liberalisation does not affect private savings rate as the coefficient of interaction dummy variable is found to be insignificant. As regards to the household financial savings rate, it is found that real interest rate, age dependency ratio, foreign savings, growth rate of income and stock

market have a significant impact. However, in contrast to private savings, it is that stock market liberalisation has a positive and significant effect on household financial savings.

We have also undertaken a causality analysis between stock market and savings as it is relevant for policy. The results indicate a two-way causality (feedback relationship) between savings and stock market development in India. Overall, we find that stock market development is one of the major important vehicle through which savings could channelled to corporate investment. Given the positive relationship between stock market development and savings, it is necessary to test whether stock market has become one of the important sources of financing for corporate investment and this hypothesis is examined in the next chapter.

Appendix 4A

ADF Unit Root Test

The Augmented Dickey Fuller or ADF test (see Dickey and Fuller, 1981) is based on the following regression:

$$\Delta X_t = \alpha_0 + \alpha_1 t + \beta X_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta X_{t-j} + \varepsilon_t \qquad (1)$$

where Δ is the difference operator and ε_t is stationary random error. The null hypothesis is that X_t is a non-stationary series and it is rejected when β is significantly negative. The constant and the trend terms are retained only if they are significantly different from zero. The optimal number of lags, k, is determined by minimizing the Akaike Information Criterion (AIC).

ARDL Method

For determining the long-run relationship, Pesaran and Shin (1998) have developed the ARDL method. This procedure is appropriate for stationary variables as well as for a mixture of I(0) and I(1) variables. The existence of the long-run relationship is confirmed with the help of F-test that tests whether the coefficients of all explanatory variables are jointly different from zero. The usual critical values are applicable for the F-test when all variables are I(0). However, different and higher critical values (provided in Pesaran and Pesaran, 1998) are applicable when all or some of the variables are I(1).

The augmented ARDL model can be written as follows

$$\alpha(L) y_t = \mu_0 + \sum_{i=1}^{k} \beta_i(L) x_{it} + u_t \qquad (2)$$

Where $\alpha(L) = \alpha_0 + \alpha_1 L + \alpha_2 L^2 + \ldots + \alpha_t L^t$

and $\beta(L) = \beta_0 + \beta_1 L + \beta_2 L^2 + \ldots + \beta_t L^t$

where μ_0 is a constant; y_t is the dependent variable; L is the lag operator such that $L^i x_t = x_{t-i}$. In the long-run equilibrium $y_t = y_{t-1} = y_{t-2} = \ldots = y_0$ and $x_{it} = x_{it-1} = x_{it-2} = \ldots = x_{i0}$. Solving for y we get the following long run relation:

$$y = a + \sum_{i=1}^{k} b_i x_i + \gamma_t$$

$$\text{where } a = \frac{\mu_0}{\alpha_0 + \alpha_1 + \ldots + \alpha_t}$$

$$b_i = \frac{\beta_{i0} + \beta_{i1} + \beta_{i2} + \ldots + \beta_{it}}{\alpha_0 + \alpha_1 + \alpha_2 + \ldots + \alpha_t}$$

$$\gamma_t = \frac{u_t}{\alpha_0 + \alpha_1 + \alpha_2 + \ldots + \alpha_n}$$

The error correction (EC) representation of the ARDL method can be written as follows

$$\Delta y_t = \Delta\hat{\alpha}_0 - \sum_{j=2}^{p} \hat{\alpha}_j \Delta y_{t-j} + \sum_{i=1}^{k} \hat{\beta}_{i0} \Delta x_{it} - \sum_{i=1}^{k} \sum_{j=2}^{q} \beta_{i,t-j} \Delta x_{i,t-j} - \alpha(1,p) ECM_{t-1} + \mu_t \qquad (3)$$

$$\text{where } ECM_t = y_t - \hat{\alpha} - \sum_{i=1}^{k} \hat{\beta}_{i0} \Delta x_{it} \qquad (4)$$

where Δ is the first difference operator α_j, and β_{ij}, are the coefficients estimated from Equation (3) and $\alpha(1,p)$ measures the speed of adjustment.

On the basis of this specification, they suggest a bound test procedure for the existence of a long-run relationship between y_t and x_t in the form of Wald/F-test statistics with the null as H_0: $a_1 = a_2 = a_3 = \ldots = 0$, as against the alternative as H_1: $a_1 \neq a_2 \neq a_3 \neq \ldots \neq 0$ thereby allowing for the possibility of a degenerative long-run relationship between y_t and x_t under the alternative. Since Wald statistics for restrictions on coefficients that cannot necessarily be written as coefficients on I(0) regressors have a non-standard limiting distributions, Pesaran et al. (2001) derive the asymptotic distribution of the proposed test statistics under the above null and its asymptotic distribution for the polar cases of $\{x_t\}$ being I(0) and being I(1), respectively. The corresponding results provide the basis for the critical values tabulated in Pesaran et al. (2001) for the two polar cases which in turn represent bound covering all possible classification of the regressors in to I(0); I(1), cointegrated and fractionally integrated processes. One set assumes that all variables are I(0) and the other assumes they are all I(1). If the computed F-statistics falls above the upper bound critical value, then the null of no integration is rejected. If it falls below the lower bound, then the null cannot be rejected. Finally, if it falls inside the critical value band, the result would be inconclusive.

The Vector Error Correction (VECM) Procedure for I(1) Variables:

Granger (1988) points out that if there exists a co-integrating vector among variables, then there must be causality among these variables, either in one direction. Granger

(1986) and Engle-Granger (1987) also provide a test of the direction of causality, which takes into account information provided by the co-integrated properties of variables. The vector error correction model (VECM) suggested by them estimates relations as follows:

$$\Delta Y_t = \eta + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \sum_{j=1}^{p} \beta_j \Delta X_{t-j} + \Theta(Y - \kappa X)_{t-1} + u_t \quad (5)$$

$$\Delta X_t = \eta' + \sum_{i=1}^{p} \gamma_i \Delta Y_{t-i} + \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \Phi(Y - \kappa X)_{t-1} + u_t' \quad (6)$$

where the lagged ECM terms $(Y-\kappa X)_{t-1}$ are the lagged residuals from the co-integrating relation between Y and X and more generally, X can be a vector of variables. As Engle and Granger (1987) and Toda and Phillips (1993) have argued, failure to include the ECM term will lead to mis-specified models which can lead to erroneous conclusions about the direction of causality. Thus if Y_t and X_t are I(1) and co-integrated, causality tests can be carried out using (5) and (6). There are two sources of causation of Y_t by X_t, either through the lagged dynamic terms ΔX_t if all the β_i are not equal to zero, or through the lagged ECM term if θ is non-zero. Similarly, X_t is Granger caused by Y_t either through the lagged dynamic terms ΔX_t if all the γ_i are not equal to zero, or through the lagged ECM term if Φ is non-zero. Thus, this procedure has the additional advantage of identifying the source of causation in the form of either short-run dynamics or disequilibrium adjustment.

Table 4A.1: Correlation between Savings and Other Variables

Variables	S	FS	ADR	RD	FSY	RPC	GY	MC	TR	VTR
S	1									
FS	0.92	1								
ADR	-0.88	-0.90	1							
RD	0.44	0.53	-0.51	1						
FSY	-0.51	-0.47	0.58	-0.22	1					
RPC	0.97	0.89	-0.97	-0.49	-0.54	1				
GY	0.51	0.44	-0.51	0.18	-0.13	0.56	1			
MC	0.58	0.56	-0.56	0.49	-0.44	0.47	0.40	1		
TR	0.77	0.46	-0.50	0.61	-0.30	0.56	0.56	0.75	1	
VTR	0.65	0.67	-0.62	0.56	-0.43	0.83	0.49	0.66	0.93	1

Table 4A.2: Factor Loadings of Original Values (PC1)

Liquidity Indicators	Factor Loadings
MC	0.53
TR	0.60
VTR	0.64

CHAPTER V

Stock Market Development and the Financing of Corporate Investment

5.1 Introduction

In the previous chapters (2 and 3) we have discussed about the impact of financial liberalisation on stock market development. We found that after financial liberalisation, the depth of Indian stock market has increased and its infrastructure now is comparable to developed stock markets. Market liquidity has improved and volatility has not increased significantly. In chapter 4, we examined the relationship between stock market and savings and the results indicate that there is a long-run relationship between the two and stock market development has positive impact on level of savings. Thus, in this chapter we examine the role of the stock market in channelling savings for corporate investment i.e., stock market as a source for financing corporate investment. This issue is very important because stock market may affect economic growth by financing corporate investment which accounts for more than 60% of total investment in India. Therefore, this chapter has two goals: (1) to investigate the role of stock market in capital mobilization and (2) to what extent the mobilized capital is allocated efficiently. In other words, we are concerned with the effect of efficiency in capital allocation, on economic growth.

A theoretical explanation of stock market development influencing the choice of finance by firms can be found in the arguments of Subrahmanyam and Titman (1999), Demirgrüç-Kunt and Maksimovic (1996) and Booth et al (2001). They argue that as equity markets become more developed, they would become a viable option for corporate financing[1]. It is argued that the development of stock market is expected to reduce the market imperfections and induce equity financing by reducing the cost of equity capital through risk diversification and providing higher liquidity service (Henry, 2000b).

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[1] Although this issue is very important, very limited empirical studies are available and most of them are on developed economies and cross-country analysis (Demirguc-Kunt and Maksimovic, 1996, Giannetti, 2003, Agarwal and Mohtadi, 2004)

The issue of bank vs. stock market financing is also very important while analysing corporate financing choices. In this context, the important question is how does stock market development affect bank financing? Theoretically, there are two possible hypotheses: complementarities and substitutabilities. Empirical studies on this aspect suggest that in the initial stage of stock market development both equity finance and debt finance complements each other. But as stock markets became large and deep, equity finance substitutes bank finance (Demirgrüç-Kunt and Maksimovic (1996), and Pagano et al. (1998)).

This chapter is organized in the following way: Section 5.2 surveys the theoretical literature on corporate finance. Section 5.3 deals with the empirical literature on stock market as a source of financing for corporate investment. Section 5.4 deals with the different sources of financing for the firms. Section 5.5 empirically investigates the relationship between bank financing and equity financing. Section 5.6 deals with the allocative role of stock market. Finally Section 5.7 provides the summary.

5.2 The Theory of Corporate Finance

5.2.1 Irrelevance Proposition

The most widely cited theory of corporate finance is the Irrelevance Proposition by Modigliani and Miller (1958). This states that in the presence of perfect and complete capital markets, and in the absence of taxation and transaction cost, corporate valuation and cost of capital are independent of firms' capital structures[2]. With taxes favouring debt, firms would tend to choose 100% debt structure. The major outcome of this theory is that the acceptance of the presence of tax, transaction cost, information asymmetry, agency cost, and the existence of financial intermediaries.

5.2.2 Static Trade off Model (STO)

In corporate taxation, debt and equity are given different treatment. While interest payments (cost of debt) are generally allowed to be treated as part of costs, dividend payments (cost of equity) are not. Because of this, the relative cost of debt decreases.

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[2] Capital structure refers to the way a corporation finances its assets through some combination of equity, debt, or hybrid securities (Modigliani and Miller, 1958).

To the extent of its deductibility, interest payments thus shield profit (known as interest tax shield) which increases the value of firms. Therefore, by increasing more of debt a firm can increase its value since interest payments can be deducted from taxable corporate income. It is also argued that use of excess debt would lead to the situation of bankruptcy and is not beneficial in the presence of non-interest tax shield. The balancing of these bankruptcy costs against tax gains of debt finance gives rise to an optimal capital structure.

5.2.3 The Pecking Order Theory (POT)

In the POT model, financial market imperfections are central. Transaction costs and asymmetric information link the firm's ability to undertake new investment to its internally generated funds. Mayer and Majluf (1984) point out that high quality firms can reduce the costs of informational asymmetries by resorting to external financing[3] only if financing cannot be generated internally. According to the POT, retentions are the most efficient way to finance. However, if external finance is needed, firm will choose debt over equity.

5.2.4 Agency Cost Theory (ACT)

According to agency cost theory, potential conflict of interest between inside and outside investors determines an optimal capital structure that trades off agency costs (costs due to conflict of interest) against other financing costs. Jenson and Meckling (1976) identify two types of conflict: (1) conflict between shareholders and managers and (2) conflict between debt holders and equity holders. Conflict between shareholders and managers arise because managers hold less than 100% of the residual claim. For example, managers can put in less effort in managing firm resources and may be able to transfer firms resources to their own, personal benefit, e.g., by consuming "perquisites" such as corporate jets, plush offices, building "empires," etc. Holding constant the manager's share in the firm, an increase in the debt will increase the manager's share of the equity and mitigate the loss from the

[3] The term "external finance" is used to indicate those sources of funds outside of a firm, including both domestic and foreign finance.

conflict between the manager and shareholders. This mitigation of the conflict between managers and equity holders constitutes the benefit of debt financing[4].

Conflict between debt holders and equity holders arise because debt contract gives the equity holders an incentive to invest sub-optimally. More specifically, if an investment yields large returns well above the face value of the debt, equity holders capture most of the gain. When the investment fails, because of limited liability, debt holders bear the consequences. As a result, equity holders may benefit from "going for broke," i.e., investing in very risky projects, even if their value decreases. Such investments result in a decrease in the value of the debt. The loss in value of the equity from poor investment can be offset by the gain in equity value captured at the expense of debt holders. This effect, generally called the "asset substitution effect," is an agency cost of debt financing[5]. So an optimal capital structure can be obtained by trading off the agency cost of debt against the benefit of debt as discussed above.

5.2.5 Financial Constraint Theory

Firms finance their investment activities through internal cash flows and external funds. With the capital market imperfections, firms cannot obtain external funds on the same conditions as internal funds. This is especially the case for small businesses or firms in new growth industries which, depend on loans from banks as the only available source of external finance (Gertler and Gilchrist, 1994). These firms are bank dependent because they cannot easily switch to commercial papers or the equity market if there is no available credit. Therefore, the extent and the terms to which external finance is provided affect corporate investment and real economic activity (Greenwald and Stiglitz, 1993).

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[4] Another benefit of debt financing has been pointed out by Grossman and Hart (1982). According to them, if bankruptcy is costly for managers, perhaps because they lose benefits of control, reputation, then debt can create an incentive for managers to work harder, consume fewer perquisites, arrive at better investment decisions, etc., because this behaviour reduces the probability of bankruptcy.

[5] Myers (1977) points out another agency cost of debt. He observes that when firms are likely to go bankrupt in the near future, equity holders may have no incentive to contribute new capital even to invest in value – increasing projects. The reason is that equity holders have to bear the entire cost investment, but the returns from the investment may be captured mainly by the debt holders. Thus, larger debt levels results in the rejection of more value – increasing projects.

As it is clear that existing literature on capital structure are focused on the role of tax, information asymmetry, firm's characteristics and market imperfection in firms' choice of financing pattern. It overlooks an important factor influencing financing choice of firms i.e., development of stock market. The finance literature suggests that stock markets are very important even in those economies in which a well-developed banking sector already exists (Demirguc-Kunt and Maksimovic, 1996; Subrahmanyam and Titman 1999; Giannetti, 2003; Agarwal and Mohtadi, 2004). This is because equity and debt financing are in general not perfect substitutes and stock market may play a key role in the management of conflicts between different stake holders. As a result of the different attributes of debt and equity, the development of markets that facilitate the issuance and trade of equity should be reflected in the financing decisions of individual firms.

5.3 Stock Market Development and Corporate Financing Pattern: An Overview

In a series of papers, Mayer (1988, 1990, 1994) tries to find out the role of the structure of financial system (bank vs. market based) in influencing the financing pattern of corporate sector for 8 industrialised countries during the period between 1970 and 1985. He found that internal sources (retentions) are the dominant source of finance in all countries. Companies do not raise substantial amount of resource from the securities market in any country. On a net basis, the contribution of securities market is only about 13% in USA, negative for Germany and the UK. Despite having well developed capital markets, according to Mayer (1988), in case of UK and USA, stock market has made the lowest net funding contribution among the five countries covered. Using the methodology of Mayer (1988), Corbett and Jenkinson (1994) examined how investment is financed in Germany, Japan, the United Kingdom, and the United States. They find the overwhelming importance of internal finance in all countries covered in their study. They also find that, compared with Germany, bank financing appears to be more important in the United Kingdom and the United States, even though the United Kingdom and the United States are traditionally considered to have a market-based financial system.

As regards studies based on developing countries and balance sheet data, have found equity financing is one of the major source of corporate investment(IFC, 1991; Singh and Hamid, 1992; Glen and Pinto, 1994; Singh, 1995; Demirgüç-Kunt and

Maksimovic, 1996; Cobham and Subramaniam, 1998; Pal, 2001). In contrast to this Samual (1996) and Cobham and Subramanian (1998) argued that stock market play a limited role as a sources of finance for Indian firms. In broad terms India would classified as a bank –oriented economy based on role played by the commercial bank. Both studies agree with the fact that external sources are the important sources of finance for firms in developing countries. Pal (2001), using PROWESS database for the period 1989-1998, found that external finance is more important as a source of finance for Indian firms. Although, the importance of stock market has declined as a source of finance after 1995-96, it still contributes significantly in the financing of Indian firms. However, debt financing remained an important source of finance for Indian firms.

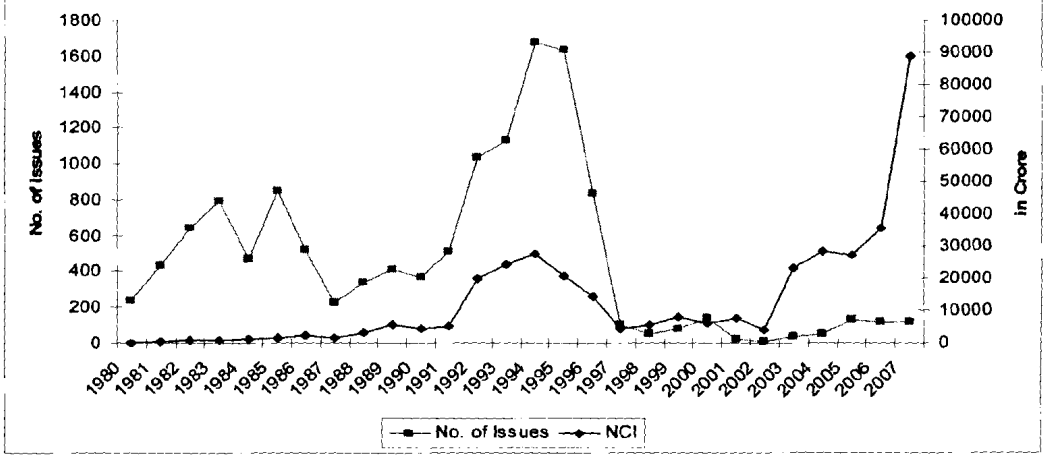
Studies on emerging African stock markets also suggest that corporate sector rely more on stock market as a source for funds. For example, in Mauritius, the stock market financed about 9 per cent of total asset growth with retained earnings and external debt contributing 30 and 61 per cent respectively to the financing of total asset growth between 1992 and 1999 (Lalchand, 2001). In Ghana, the stock market financed about 12 per cent of total asset growth of listed companies between 1995 and 2002. In South Africa, external equity financed 18 per cent of total assets growth between 1996 and 2000 (Glen and Singh, 2003; Yartly, 2006). In Zimbabwe, external finance contributed 75.4 per cent of total funds and internal finance provided the remaining 25 per cent during 1990-1999. Equity financing was the most important source of long-term finance at 7.8 per cent (Mutenheri and Green, 2003).

To sum up, the above discussion reveals the fact that, there are significant differences in financing pattern of firms of developed and developing countries. Firms of developing countries tend to rely more on external finance than their developed country counterparts, where a firm heavily depends on internal funds. Contribution of equity market, as a source of finance, is much higher in the developing countries than developed countries, particularly in reform period. This different result is due to stages of financial development, requirement of external financing by firms and nature of data used in the study.

5.4 Performance of Primary Market

Before analysing the role played by stock markets in mobilising capital for corporate investment, we investigate the performance of primary market in a macro context. Primary market acts as a direct link between investors, and issuers with investment records[6]. Therefore, in this section we analyze the performance of primary market. The amount of capital raised by corporate sector and number of issues from primary market during the period 1980-2007 is presented in Figure 5.1. Stock market was not a major source for financing in 1980s for private corporate sector as limited amount of capital was raised by way of new capital issues. Control on pricing and value of new issue, lack of liquidity, transparency and high transaction cost in capital market played a major role in limiting new issues during pre-reform period. Following widespread financial sector reforms in the early 1990s, activity in primary market increased. This trend continued upto 1996-97. However, from 1997-98 there has been a steep decline in both the number of new issues as well as the amount of money raised through them. However, from 2003-04 the primary market again picked up as substantial amount is raised from primary market as seen from Figure 5.1.

Figure 5.1: No. of issues and amount raised from Primary market



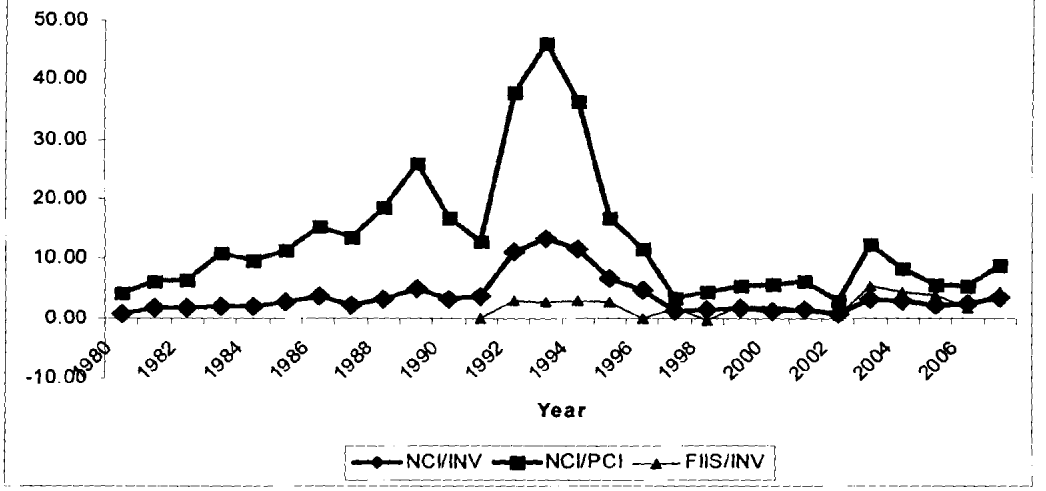
Source: RBI, Hand Book of Statistics on Indian Economy, 2007-08.

Further, the importance of new capital raised from primary market is judged in relation to total investment and private corporate investment. Resource mobilisation

[6] The scope of stock market includes primary and secondary markets. Both are important for resource mobilization and the effective allocation of scarce capital, however, primary market is the place where corporate sector directly raise capital for their investment.

as ratio of total investment (NCI/INV) has increased from around 2 per cent in mid 1980s to over 10 per cent in early 1990s and thereafter it has declined to around 3 per cent at the end of 2007-08. Similarly, new issues as ratio of private corporate sector investment has increased from 11 per cent in 1985-86 to maximum 45 percent in 1993-94 and thereafter it declined to only 9 per cent in 2007-08 (see Figure 5.2)

Figure 5.2: Ratio of New capital issues (NCI) to Investment (INV) and Private Corporate investment (PCI)



Source: Authors Compilation.

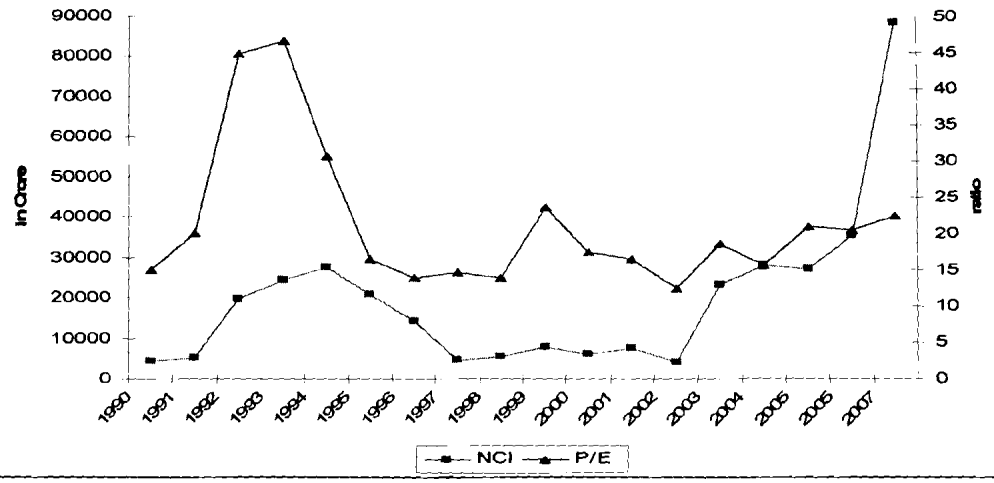
Further, FIIs net investment as ratio of total invest has also increased from 2 % in 1994-95 to above 4% in 2007-08, showing the importance of foreign capital in augmenting domestic capital for India. The hypothesis that liberalization of stock market may reduce the cost of equity capital thereby influences firms to raise long-term capital from primary market. This hypothesis is tested for Indian market. The cost of equity capital can be measured by Price Earning ratio (P/E) of a company[7]. A company's P/E ratio is computed by dividing the current market price of a company's stock by that company's per share earnings. Cost of capital (k) is related with the P/E ratio according to the formula:

[7] Equating the cost of capital to a firm with its price/earning ratio is an approximate measure. This simplification does not include the role of expected growth in earnings. Also, as Singh (1995) points out, the cost of capital is a complex issue as a firm's shareholders may have different interests and circumstances.

$$k = \frac{1 - POR}{P/E} + g \qquad (1)$$

where k is the cost of equity capital, POR is the payout ratio[8] and g is the growth rate of earnings. Thus for given earnings growth prospects, the lower the P/E, the higher the cost of capital. The relationship between P/E ratio and new capital issues is presented in Figure 5.3. It is seen that there is strong relationship between the two. In the early 1990s following stock market liberalisation the average P/E ratio has increased from 15 to 47 in 1993-94 and declined sharply after 1996-97. Thereafter, it never touched the early 1990s level. Therefore, the hypothesis that the stock market liberalisation reduces cost of equity capital is partially true for India.

Figure 5.3: Relationship between New Capital Issues(NCI) and P/E ratio



Further, we carry out causality test between monthly P/E ratio and new capital issues (NCI) during January 1993 to March 2007. Since both the variables are I(1), Granger Causality is conducted at first difference. The application of Granger Causality test on the first difference of these variables shows that the null hypothesis that P/E ratio does not Granger cause NCI ratio is rejected when three months lag is used. This implies that a change in P/E ratio Granger causes a change in the NCI. However, the reverse hypothesis that change in NCI does not Granger cause change in P/E ratio cannot be rejected. Therefore, cost of equity is one of the important factor that influences new capital issues in India.

[8] The amount of earnings paid out in dividends to shareholders.

In addition to this, another important issue is that the development of private placement market[9] in India from mid-1990s. This is the main reason for the decline of new capital issues since mid-1990s. In private placement market, securities are offered to limited numbers of investors through merchant bankers. These investors are selected clients such as financial institutions, corporates, banks, and high net worth individuals. The private placement is getting popular because it offers cost advantages in raising resources and minimising under-subscription. The firms are also not required to divulge the use of funds mobilized from the private placement market. Moreover, private placement does not require detailed compliance of formalities, rating, and disclosure norms as required in public or right issues. Although private placement market is cost-effective and less time-consuming, it lacks transparency[10]. The resources raised through the private placement market, amounted to Rs.13,361 crore in 1995-96, and increased to Rs.212,015 crore in 2007-08 (see Table 5.1).

Table 5.1: Share of Public and Private Sector in Private Placement Market

Year	Total amount raised (in Rs. crore)	Private placement as ratio of investment	Share of Private Sector (in %)	Share of Public Sector (in %)
1995-96	13361	4.22	14.47	85.53
1996-97	15066	4.94	4.29	95.71
1997-98	30099	8.25	16.21	83.79
1998-99	49679	12.53	9.71	90.29
1999-00	61259	12.02	1.40	98.60
2000-01	67839	13.35	14.51	85.49
2001-02	64879	11.77	19.42	80.58
2002-03	66948	10.82	23.34	76.66
2003-04	63901	8.66	9.72	90.28
2004-05	83409	8.37	17.77	82.23
2005-06	93468	7.48	15.67	84.33
2006-07	145571	9.69	21.56	78.34
2007-08	212015	11.59	61.2	38.8

Source: Handbook of Statistics on the Indian Securities Market, SEBI, Various Issues.

At the same time resources raised through the private placement as the ratio of investment increased from 4 per cent in 1995-96 to more than 11 per cent at the end if 2007-08. Currently, the size of the private placement market is estimated to be more

[9] Studies that try to look into the financing pattern of corporate sector in 1990s have not highlighted this aspect (See Singh, 1995; Nagraj, 1996; Samuel, 1996; Cobham and Subramaniam, 1998; Pal, 2001).

[10] This market has largely been an unregulated market, although in September 2003, SEBI introduced a set of rules to bring it under some regulation.

than three times of the public issues market. So, to some extent, growing private placement markets compensate the subdued condition in the new issue market. Therefore, from the above analysis, it is found that the importance of primary market for financing of corporate invest has increased considerably in the liberalised period.

5.4.1 Source of Financing: Firm Level Analysis

This section studies the corporate financing pattern of Indian firms for the period 1989-2007 by using annual balance sheet data of listed companies from PROWESS database of Centre for Monitoring Indian Economy (CMIE) to supplement the findings of pervious section. We compare the financing pattern of various samples (companies constituting the Sensex, BSE-100, BSE-500, high and low quality). Table 5.2 gives a brief description of the classification of samples. The selection of the sample proceeded in various steps. In the first step all the firms are selected. In the second step, firms which have key variables like fresh capital (excluding bonus issues), share premium, debenture/bonds, fixed deposits, borrowings and debt-equity ratio are selected. In the third step, firms having more than 3 years of observation are kept. All the ratios for sources of funds calculated from PROWESS are weighted averages of company-wise ratios. The number of firms selected for analysis is given in Appendix 5A.

Table 5.2: Brief Description of the Selected Samples

Sample	Characteristics
Sensex	A set of large companies used by Bombay Stock Exchange to calculate the 'BSE Sensex 30 index' Contains companies from both manufacturing and other sectors.
BSE-100	A set of 100 large companies listed in BSE.
BSE-500	A group of medium companies listed in BSE.
High Quality	high-quality firms are defined as being old, profitable and low-risk[11]
Low Quality	low-quality firms refer to those that are relatively new and unprofitable and high-risk
Large Companies	Companies having market capitalisation of 100 crore or above classified as large companies
Small Companies	Companies having market capitalisation below 100 crore are grouped as small companies.

The mean value of the percentage share of external finance across firms of different categories is computed for each year. The results are discussed below. Table 5.3 demonstrate that external financing remain as a dominant source of financing for all

[11] Risk is defined as the variance in profitability based on five-year period.

the companies. Though there is slight decline in its share in post 1996 era, on an average basis external finance accounted for more than 60% of firm's total financing for all the samples. The rise in internal financing since 1996 may be related rise in corporate profit as indicated by rising corporate savings since mid-1990s (see chapter 4).

Table 5.3: External Source of Financing[12] by Sample Groups (in %)

Year	BSE-Sensex	BSE-500	High quality	Low quality	Large Companies	Small Companies
1988-89	59.35	60.29	59.53	62.19	62.75	66.44
1989-90	55.45	64.09	64.25	66.09	65.51	69.22
1990-91	59.57	66.05	66.94	65.95	63.19	65.14
1991-92	62.62	69.44	68.25	68.44	69.90	63.88
1992-93	69.69	74.79	75.08	76.79	77.40	72.50
1993-94	80.53	67.54	79.67	68.40	71.08	71.59
1994-95	73.51	69.30	80.09	68.17	66.21	71.95
1995-96	66.55	65.60	67.00	65.20	63.30	68.77
1996-97	68.13	61.54	59.77	59.68	62.39	66.71
1997-98	66.70	57.44	50.62	56.44	60.91	56.30
1998-99	60.11	59.65	58.27	58.33	58.65	62.98
1999-00	58.26	55.26	69.76	57.76	68.67	63.00
2000-01	64.27	52.38	69.68	51.18	62.78	60.01
2001-02	63.86	52.84	67.72	53.84	51.40	54.87
2002-03	54.83	55.21	64.28	57.21	55.23	58.25
2003-04	56.72	60.30	64.14	64.30	56.32	60.26
2004-05	62.86	62.84	65.72	65.84	60.85	64.75
2005-06	64.83	63.21	64.28	57.21	63.23	58.25
2006-07	66.72	60.79	65.14	63.30	66.32	64.26
Average	63.90	62.42	66.93	62.67	64.02	64.59

Source: CMIE PROWESS Database

In the previous analysis, samples were taken on a cross section basis from all the industries. The intention was to get a picture of the financing pattern of the corporate sector as a whole. However, the samples were of overlapping nature and the possibility of bias due to strong presence of a few companies in all the samples cannot be ruled out. To eliminate that source of bias, this study briefly investigates the industry specific financing pattern of the Indian corporate sector.

In Table 5.4, we represent the share of external finance in total finance for various industry groups. It is evident that external source remained the major source of finance for all the industry groups for the period 1989-2007. From the above analysis, it can be concluded that: Indian firms, irrespective of their size, industry and quality

[12] In this study, external financing is defined as long-term domestic and foreign debt, equity, and trade credit, while total funds are defined as external funds plus retained earnings and depreciation.

are more reliant on external sources for their financing needs. These findings go against the hypothesis advocated by the Pecking Order theory (POT). To understand how the development of stock market in India has influenced the financing pattern, it is important to investigate the different components of external finance that have changed over the years. Hence, in the next section we present a detail analysis of this issue.

Table 5.4: Share of External Financing by Industry Groups (in %)

Year	Manufacturing	Mining	Power	Service	IT*
1988-89	58.45	55.65	60.21	62.55	63.44
1989-90	61.03	59.23	63.01	66.15	64.98
1990-91	64.69	62.79	66.03	69.05	66.42
1991-92	69.01	65.56	80.81	67.79	71.73
1992-93	68.73	64.14	69.16	70.33	74.65
1993-94	69.12	69.39	64.72	72.43	64.61
1994-95	69.95	66.18	67.41	76.03	61.36
1995-96	70.91	61.74	62.33	76.10	58.48
1996-97	64.11	58.23	59.36	74.33	59.00
1997-98	58.59	64.95	60.60	67.84	53.67
1998-99	58.45	62.27	62.68	61.06	65.77
1999-00	63.65	57.44	58.80	67.57	71.56
2000-01	67.65	58.32	57.16	67.30	68.53
2001-02	69.68	56.21	58.34	59.68	56.89
2002-03	62.25	54.62	59.83	58.91	58.31
2003-04	59.71	62.82	60.10	53.42	59.62
2004-05	63.86	65.64	63.84	62.72	62.84
2005-06	64.83	65.55	63.21	64.28	60.21
2006-07	66.72	64.08	61.37	64.15	63.30
Average	**64.81**	**61.83**	**63.52**	**66.40**	**63.60**

Source: CMIE PROWESS Database
**IT denotes Information and Technology.*

5.4.2 Capital Markets as a Source of Finance

Capital market is (as defined by the PROWESS database) an aggregate of finance raised through four channels. They are (a) Fresh capital (excluding bonus issues), (b) Share premium, (c) Debenture/bonds, and (d) Fixed deposits. Table 5.5 represents the share of capital market in total financing for various groups of companies. It is clear that from 1992, funds raised from capital market increased till 1994-95 and then capital market as a source of finance has declined in general. Thereafter it never touched the pre 1996 level, although capital market as a source of financing is increasing since 2003-04. However, on an average 12% of fund was raised through capital market during the pre-liberalisation period (1989-92). However, the share of capital market in total finance almost doubled to 22% during post-liberalisation period

(1993-2007), indicating capital market is now one of the major sources of external financing for corporate sector.

Further, we find that there is no major difference between small firms and large firms as far as capital market as the source of financing is concerned. Similar trend also is found for high quality and low quality companies. Therefore, size and quality does not have any significant difference in source of financing. Though the samples cover a wide range of companies, the figures reveal that there is a similarity in financing pattern across samples.

Table 5.5: Capital Market Share in Total Finance by Sample Groups (in %)

Year	Sensex	BSE-100	BSE-500	Large	Small	High Quality	Low Quality
1988-89	12.54	11.45	6.85	8.45	9.34	10.456	7.45
1989-90	11.50	12.9	14.3	13.0	7.5	15.7	10.3
1990-91	13.79	12.4	13.5	12.6	9.3	11.7	12.2
1991-92	11.07	15.1	12.2	14.0	14.5	15.1	10.3
Avg.(1988-92)	**12.23**	**13.46**	**11.71**	**12.01**	**9.91**	**13.24**	**10.06**
1992-93	25.23	22.3	31.6	25.8	25.5	34.9	26.1
1993-94	58.66	46.2	36.0	35.9	30.9	42.2	33.5
1994-95	48.19	36.6	34.9	34.6	32.1	41.4	40.8
1995-96	35.43	17.0	21.5	20.5	26.9	23.4	31.3
1996-97	13.58	18.9	15.1	21.7	19	19.7	18.8
1997-98	13.77	12.4	13.6	16.1	12.3	20.1	12.4
1998-99	17.76	14.9	11.1	11.3	11.1	16.3	12.7
1999-00	14.18	18.7	16.5	16.3	15.3	25.6	14.4
2000-01	22.52	26.0	13.4	17.3	13.3	26.1	13.6
2001-02	18.72	20.0	12.9	16.8	12.8	13.2	9.3
2002-03	13.58	15.4	11.3	13.9	10.5	12.8	8.8
2003-04	22.80	14.9	14.1	13.2	9.8	13.8	11.4
2004-05	23.45	18.8	16.77	15.43	12	15.2	14.34
2005-06	24.65	20.12	22.34	18.7	15.5	20.7	17.68
2006-07	23.56	23.45	20.25	20.5	18	22.5	22.34
Avg. (1993-2007)	**25.20**	**21.88**	**19.42**	**19.49**	**17.84**	**23.27**	**19.4**

Source: CMIE PROWESS Database.

On the other hand, Table 5.6 presents the share of capital market in total financing for various industrial groups. It is evident that, service sector, power sector and information and technology sector have raised around 25% funds from capital market during the period 1993-07. But manufacturing and mining sector have raised 21% and 18% from capital market respectively. One thing to note here is that all the industries have raised more funds from capital market during post-liberalisation period than pre-liberalisation period.

From the above, it can be said that capital market has become a major source of financing for corporate investment during the post-liberalisation period. As mentioned before, capital market as a source is an aggregation of several instruments. Therefore, we need to break-up the capital market source to find out the exact contribution of stock market. This issue is analysed in next section.

Table 5.6: Capital Market Share in Total Finance by Industry Groups (in %)

Year	Manufacturing	Mining	Power	Service	IT
1988-89	10.23	11.2	11.8	8.56	13.2
1989-90	11.6	14.8	17.2	14.0	11.7
1990-91	10.5	16.7	23.2	15.7	6.8
1991-92	13.0	19.1	29.2	17.4	11.5
Avg (1988-1992)	**11.08**	**15.95**	**20.35**	**13.92**	**10.8**
1992-93	28.5	22.0	39.7	17.5	23.6
1993-94	40.8	36.9	42.7	44.0	32.8
1994-95	44.2	28.5	43.1	48.4	39.4
1995-96	26.3	17.8	19.1	40.8	12.6
1996-97	17.4	12.2	23.4	29.5	12.5
1997-98	13.0	13.3	26.4	21.6	15.3
1998-99	9.5	11.2	22	18.2	12.0
1999-00	17.8	10.4	13.2	30.3	28.3
2000-01	13.1	11.3	14.3	29.7	36.8
2001-02	14.3	13.4	19.1	14.1	25.7
2002-03	15.3	10.3	13.9	13.1	29.2
2003-04	17.3	14.5	18.6	16.2	31.7
2004-05	16.78	15.6	18	18.5	27.7
2005-06	20.45	18.9	21.9	16.7	23.6
2006-07	22.45	21.5	21.8	20.2	24.0
Avg (1993-2007)	**21.08**	**17.19**	**24.99**	**24.86**	**25.01**

Source: CMIE PROWESS Database

5.4.3 The Stock Market as a Source of Finance

Table 5.7 represents the trends in stock market financing (S), debt financing (D) and borrowings (B) for various samples. It is clear that borrowings are the major source of finance followed by stock market and then debt market.

Second, there is no difference among various sample companies as far as equity financing is concerned. Third, while equity finance has become one of the most important financing sources next to loans, the equity market has not proved a stable source during 1993-2007. Although equity financing has been highly volatile during post-liberalisation period, on an average it remains higher (13%) than pre-liberalisation period (6%).

Table 5.8 displays the contribution of stock market, debt market and borrowings on the basis of firm's character such as size and quality. There is not much difference in the financing pattern between high-quality firms compared with low quality firms as well as on the basis of size. High quality companies raised 17% from equity market whereas their counterpart raised 15% during the period 1993-2007. In all the categories stock market financing more than doubled in the post-liberalisation period. Generally it is perceived that high-quality firms have better performance and good and transparent management. Such firms could issue equity at high prices owing to their reputation for good and transparent management and the large expected corporate earnings (hence, capital gains). This makes it cheaper for them to raise funds from the equity market than from bank loans (Shirai, 2004). However, this hypothesis does not hold for India. Low-quality firms are also able to equally access to capital market. This implies that there could be the presence of information asymmetry in Indian stock market. Investors are not able to differentiate between low-quality and high-quality firms. This issue needs further investigation.

Table 5.7: Comparison between Stock, Debt Market and Borrowings (in %)

Year	Sensex			BSE-100			BSE-500		
	S	D	B	S	D	B	S	D	B
1988-89	4.1	8.7	23.6	5.5	9.6	21.4	5.5	5.7	22.8
1989-90	4.5	7.3	25.2	6.4	6.5	23.3	7.6	6.7	23.6
1990-91	6.2	7.5	19.2	7.3	5.1	27.1	8.4	5.1	26.0
1991-92	6.9	7.1	26.0	12.1	3.0	30.6	9.4	2.8	34.2
Avg (1989-92)	**5.6**	**7.65**	**26.0**	**7.8**	**5.6**	**25.6**	**7.7**	**5.1**	**26.7**
1992-93	18.7	7.5	18	19.3	3	26.2	26.7	4.9	20.5
1993-94	45.5	4.1	19.9	25.2	5	16.9	32.2	3.8	19.4
1994-95	43.1	5.09	17.9	29.2	6.4	17.9	31.3	3.6	16.8
1995-96	19.2	6.2	23.6	17.3	2.7	24.3	13.7	7.8	21.7
1996-97	9.1	4.4	26.4	12.3	3.6	36.9	13.2	1.9	25.8
1997-98	8.5	5.2	25.5	8.5	3.9	23.5	11.2	2.4	26.5
1998-99	14.3	3.4	27.9	9.4	7.5	24.3	8.6	2.5	24
1999-00	11.2	3.9	24.4	6.2	4.5	27.3	9.5	7.0	22.9
2000-01	7.4	6.1	27.9	12.6	3.4	32.3	7.5	5.9	26.3
2001-02	8.2	5.5	27.2	9.3	5.7	28.2	8.3	4.6	29.7
2002-03	11.2	2.3	25.7	8.3	6.1	24.4	5.6	5.7	20.2
2003-04	12.1	5.7	29.1	6.7	8.2	24.1	8.4	5.7	22.3
2004-05	10.2	4.5	26.4	7.9	7.6	26.8	8.5	6.7	25.4
2005-06	14.3	4.7	25.7	8.9	3.4	28.7	6.7	8.8	23.4
2006-07	15.5	4.1	27.6	11.6	5.1	27.6	11.7	10.9	27.1
Avg (1993-07)	**16.56**	**4.85**	**24.9**	**12.8**	**5.1**	**25.8**	**13.5**	**5.5**	**23.4**

Source: CMIE PROWESS Database

Note: Stock market source (S): - Fresh Issues + share premium, Debt market (D): - Debentures/ bonds + fixed deposits, Borrowings (B): borrowing from Banks and other source.

Similarly, Industry-wise comparison of equity financing, debt financing and borrowing indicates that borrowings are the major source of financing for all the industries. Second most important financing source is stock market followed by debt market. There is no significant difference in financing pattern of various industries (Table 5.9). However, power, service and information and technology companies rely more on equity financing than mining and manufacturing companies.

Table 5.8: Share of Stock Market, Debt and Borrowings in Total Finance According to Size and Quality

Year	Large			Small			High Quality			Low Quality		
	S	D	B	S	D	B	S	D	B	S	D	B
1988-89	3.4	7.4	27.6	3.4	5.6	27.8	5.8	5.7	29.8	5.7	3.9	32.1
1989-90	5.3	6.1	24.0	4.7	2.9	31.8	6.7	8	27.5	6.6	3.7	28.2
1990-91	6.2	5.1	25.3	5.8	3.5	32.0	7.2	4.4	28.0	6.5	6.5	35.1
1991-92	7.4	5.3	25.9	12.9	2.7	31.9	9.7	5.4	29.9	7.6	2.5	34.5
Avg.(1989-92)	**5.6**	**6.0**	**25.7**	**6.7**	**3.7**	**30.9**	**7.4**	**5.9**	**28.8**	**6.6**	**4.2**	**32.5**
1992-93	21.7	4.1	22.6	19.6	3.9	24.9	27	7.9	28	21.8	5.2	18
1993-94	30.2	5.7	21.9	26.1	3.8	19.3	38.2	4	15.7	31	4.1	20
1994-95	31.2	3.4	18.7	29.1	3	22	37.8	3.6	21.3	37.3	3.4	22.5
1995-96	16.8	3.7	21.8	23.5	3.4	23.6	20.6	2.8	25.7	28.7	2.5	23.6
1996-97	18.1	3.6	18.7	15.4	3.6	24.9	14.4	5.3	34.7	14.1	4.7	30.8
1997-98	9.6	6.5	29.8	5.2	5.1	29	11.6	8.5	29.2	6.8	5.4	33.6
1998-99	7	4.3	28.5	4.3	6.8	26.7	8.2	8.1	24	4.8	7.9	33
1999-00	11	5.3	27.8	6.7	7.6	25.8	18.5	7.1	27.9	8.5	5.8	33.3
2000-01	9.5	7.8	29.6	7.7	5.6	25.5	15.3	10.8	25.5	10.8	2.8	24.8
2001-02	13.1	3.7	27.3	8.3	7.5	29.2	10.6	2.6	25.2	6	3.3	26.2
2002-03	7.5	5.9	27.5	5.7	4.8	29.1	6.7	6.1	28.7	7.1	3.7	25.7
2003-04	10.1	3.1	25.9	6.1	4.7	28.4	10.7	3.1	25.3	4.9	6.3	28.3
2004-05	12.13	3.3	23.7	9.7	2.3	23.5	9.8	5.4	29.8	8.6	5.9	27.7
2005-06	13.3	5.4	26.4	9.6	3.9	32.4	16.4	4.3	22.7	11.7	5.5	27.6
2006-07	17.4	3.1	26.5	11.8	3.6	29.6	18.7	3.8	30.5	15.2	4.3	32.6
Avg.**(1993-07)**	**15.25**	**4.7**	**25.1**	**12.6**	**4.7**	**26.3**	**17.5**	**5.6**	**26.3**	**14.8**	**4.7**	**27.2**

Source: CMIE PROWESS Database

To sum up we find that external financing is the major source of corporate investment in India. Second, both aggregate and balance sheet analysis support the hypothesis that stock market has emerged one of the reliable and important sources of corporate investment in post-liberalisation period. This hypothesis is applicable across samples and industry.

Table 5.9: Share of Stock Market, Debt Market and Borrowings in Total Finance by Industry

Year	Manufacturing			Mining			Power			Service			IT		
	S	D	B	S	D	B	S	D	B	S	D	B	S	D	B
1988-89	4.5	5.7	31.4	5.6	4.6	17.8	5.4	8.7	35.6	3.4	4.5	26.5	0.9	12.3	29.8
1989-90	6.7	4.9	27.1	19.8	1.2	15.2	7.0	9.9	38.7	8.7	5.3	27.4	1.5	10.2	27.2
1990-91	5.5	4.9	28.2	19.5	0.1	16.1	14.6	9.3	33.7	7.5	8.2	27.9	1.9	4.9	24.8
1991-92	10.2	2.7	24.5	18.5	0.7	24.0	12.6	17.9	44.0	9.8	7.5	37.7	4.2	7.3	27.7
Avg (1989-92)	**6.7**	**4.6**	**27.8**	**15.9**	**1.7**	**18.3**	**9.9**	**11.5**	**38.0**	**7.4**	**6.4**	**29.9**	**2.1**	**8.7**	**27.4**
1992-93	24.8	2.6	23	21.8	0.1	24.9	33	6.7	17.3	14.3	3.2	32.5	23	0.6	26.5
1993-94	34.2	5.3	22.7	16.0	0.9	18.9	34.5	8.2	21.1	36.0	8.0	22.9	32.5	0.3	20.5
1994-95	31.9	5.8	23.9	26.5	2.0	25.8	43	0.1	22.9	43.2	5.3	22.7	24.0	15.4	19.9
1995-96	18.7	4.3	28.4	16.8	0.6	20.5	13.3	5.8	26.1	32.3	8.5	26.0	12.4	0.2	16.2
1996-97	13.8	5.1	33.8	4.4	3.9	24.4	20.6	2.8	17.5	18.8	10.7	31.3	12.3	0.2	17.6
1997-98	6.5	7.1	36.8	10.0	1.4	20.3	17.3	9.1	35.4	7.6	14.0	22.5	11.1	4.2	31.2
1998-99	12.2	5.3	25.3	8.6	2.6	36.1	21.5	0.5	23.7	9.3	8.9	25.8	8.6	3.4	21.4
1999-00	11.4	4.4	24.5	4.4	2.7	25.2	10.4	2.8	28.9	23.3	7.1	22.6	22.7	5.6	18.1
2000-01	9.4	3.6	36.9	1.9	5.8	27.7	12.6	1.7	29.8	24.0	5.7	25.0	36.6	0.2	16.4
2001-02	11.4	3.9	26	2.2	6.1	25.6	8.3	10.8	24.4	7.2	6.9	24.3	20.6	5.1	15.3
2002-03	8.5	6.1	28.5	5.3	4.1	24.7	6.3	7.6	21.6	7.2	8.9	22.0	24.5	4.7	23.5
2003-04	12.2	5.3	23.1	4.6	3.2	33.8	15.1	3.5	24.5	10.4	5.8	18.9	26.8	4.9	19.3
2004-05	11.4	3.4	22.6	5.8	2.6	27.6	14.5	3.5	21.4	11.2	4.1	22.5	12.3	3.4	21.6
2005-06	12.4	5.6	27.5	7.9	3.7	27.8	16.6	5.3	23.4	10.8	4.3	21.4	15.4	4.2	23.7
2006-07	15.4	6.9	27.5	12.5	1.7	26.4	17.5	4.3	21.5	12.6	3.1	24.3	17.6	2.4	22.8
Avg	**15.7**	**4.9**	**27.3**	**9.7**	**3.2**	**25.7**	**19.1**	**4.9**	**23.9**	**18.3**	**7.2**	**24.3**	**20.2**	**3.7**	**20.9**

Source: CMIE PROWESS Database

5.5 Relationship between Bank Financing and Stock Financing: An empirical Analysis

In the previous section we analysed corporate financing pattern and found that equity financing has become an important source of financing for corporate sector investment in the post 1990s era. However, bank financing still remains the major source of corporate investment. So, the next question is what is the relationship between stock market financing and bank financing in the Indian context? In this section, we try to answer this question by using regression analysis. To find out the impact of stock market development and banking sector on firm financing pattern, we estimate determinants of debt-equity ratio as followed in previous empirical literature (see for example Demirgrüç-Kunt and Maksimovic (1996), Giannetti, (2003), and Agarwal and Mohtadi (2004)). We assume that the debt-equity ratio of the firm, D, is a function of a vector, X, of independent variables. These variables include the stock market and the banking indicators, among others. This may be formalized by the following equation:

$$D_t = \alpha + \beta_i X_t + \gamma_t + e_t \qquad (2)$$

Where γ_t represents time trend and e_t the stochastic term in the equation. Given any level of equity initially, D rises if the firm issues additional debt and falls if the firm issues additional equity. We use this model to determine the role of stock market and banking sector on the financing choice of firms. A negative coefficient for the stock market variable indicates that the firms leverage decreases with development in stock markets, i.e., the firms substitute equity for debt. On the other hand, a positive coefficient implies complementarities between stock market development and debt. If the coefficient is not significant, we can conclude that stock market development does not affect the financing choice of firms. More importantly, the issue of compliments or substitutes between bank financing and stock market financing can be addressed by considering the coefficient of the banking variables along with those of stock market.

Explanatory Variables

The possible a priori major determinants of debt-equity ratio discussed in the literature are explained below:

Stock Market (SIND): We use stock market index as an indictor of stock market development. The assumption behind this measure is that market capitalisation is positively correlated with the ability to mobilize capital and diversify risk in an economy (Demirguc-Kunt and Maksimovic, 1996). Similarly, liquidity is also important because it measures the transaction cost of the stock market and thinly traded stock market inhibit corporate going for public issue. As stock market develops and achieves greater efficiency in trading, this may attract investors to raise capital from stock market. Therefore, stock market development has significant impact on corporate financing.

Ratio of bank Deposit to GDP (BD): This ratio is also an indicator of the size of the banking sector. Higher is the ratio higher will be debt-equity ratio (King and Levine, 1993; Agarwal and Mohtadi, 2004).

Profitability (PR): Pecking order theory suggests that the relationship between profit and equity financing is negative. Since, as stated earlier, firm prefers internal financing and follows the sticky dividend policy. If the internal funds are not enough to finance financial requirements of the firm, it prefers debt financing to equity financing (Mayer and Majluf, 1984). Thus, higher profitability of the enterprise implies internal financing of investment and less reliance on debt or equity financing. Profitability is measures as the ratio of total operating income to total assets.

Growth Rate (GR): High growing companies generally get more access to market, which in turn affects the company in such a way, that it increases the external financing. This is based on the reasoning that a higher growth rate implies a higher demand for funds, and, ceteris paribus, a greater reliance on external financing (Sinha, 1992). It can reduce the interest cost and other cost associated with debt by increasing reliance on equity finance. Therefore, a positive relationship is expected between debt-equity ratio and growth rate of companies, which is measured as growth of total assets.

5.5.1 Correlation Analysis

First, we examine the hypothesis of substitutability or complementarily between stock market financing and bank financing by using Pearson correlation coefficients. The

correlation coefficients between equity financing and bank financing suggest that they ere negatively related for all samples indicating a substitute relationship between the two (Table 5.10). However, care must be exercised while interpreting the Pearson Correlation coefficients because they cannot provide a reliable indicator of association in a manner which controls for additional explanatory variables. Our main analysis will be derived from appropriate multivariate regression analysis.

Table 5.10: Correlation Coefficient between Bank Financing and Stock Financing

	Various Samples				
	Sensex	BSE-100	BSE-200	BSE-500	BSE-Listed
Correlation Coefficient	-0.56*	-0.34*	-0.22	-0.47*	-0.69*
	Manufacturing	Mining	Power	Service	I and T
Correlation Coefficient	-0.39*	-0.24	-0.42*	-0.36*	-0.57*

* denotes significant at 5% level.

5.5.2 Regression Analysis

Given the small sample size (19), ARDL model is used for estimation of equation 2. Prior to estimation, the times series properties of all the variables are examined using ADF test. It is found that we have mixture of I(1) and I(0) variables (see Table 5.11). Therefore, ARDL model is appropriate for cointegration analysis. Next, long-run equilibrium relationship is established using F-test. The F-test rejects the null of no-cointegration in favour of cointegration. Thus, we proceed further to estimate the long-run coefficients using the ARDL methodology. The results of the long run coefficients are presented in Table 5.12. The lag length of the long-run function has been selected on the basis of Schwartz-Bayesian Criteria (SBC). Further, diagnostic test are checked to ensure that it is the best model and there is no misspecification bias in the model. The diagnostic tests include the test of serial autocorrelation (LM), heteroscedasticity (ARCH), omitted variables/functional form (Ramsey Reset).

Table 5.11: Result of the Augmented Dickey Fuller Test for Unit Root

Variables	At level		At First difference	Order of Integration
	With Constant	With Constant and Trend Only		
Debt-equity ratio	-3.42*(1)			I (0)
SIND	-0.47 (2)	-1.35 (2)	-5.22** (0)	I (1)
BD	-2.46(0)	-1.45 (1)	7.34** (0)	I (1)
PR	-3.45* (2)			I (0)
GR	-4.89** (1)			I (0)

*Notes: Figures in brackets denote the optimum number of Lags used. ** and * denotes significance at 1% and 5% level respectively.*

Results of our estimation suggest that the banking and stock market variables have opposite effects on the financing choice of the firms: banking variables are associated with a rise in the debt/equity ratio, while stock market index is associated with a fall in that ratio. Thus, regression analysis supports the preliminary results of correlation coefficients.

Table 5.12: Determinants of Debt-Equity Ratio (1989-2007)

Independent Variable	Coefficients
Constant	-1.23* (-2.12)
Bank Deposit/GDP	0.23** (3.42)
SIND	-0.21* (2.64)
GR	0.07* (2.73)
PR	-0.05 (-1.23)
Adj. R^2	0.39
DW Statistics	1.32
Model Selection Criteria (SBC)	(1,0,1,1,1,)
LM	1.78 (0.27)
ARCH Test	1.03 (0.22)
RESET	0.17(0.46)
F-Statistics for Cointegration	4.45*

** *Significant at 1%;* * *significant at 5%.*

The results of long-run estimates suggest that coefficient of stock market index is negative and significant at 5% level; indicating debt-equity ratio falls with rise in stock market. The implication of this result is that firm substitute equity for debt with higher stock market activity. This indicates that there exists substitutability between bank financing and stock market financing in India. These results confirm the hypothesis that the stage of stock market development matters for corporate financing choices. These results are just opposite with the findings of Demirguc-Kunt and Maksimovic (1996) for the case of developing stock market.

The positive coefficient of Bank deposit to GDP ratio confirms that more development in this sector has been generally accompanied by more debt financing. The other determinants are observed to have the correct signs and significance in general. The coefficient of profitability is negative but it is not statistically significant. This is consistent with the pecking order theory that predicts a preference for internal finance rather than other external finance. Moreover, coefficient of growth is positive and statistically significant, indicating high growing firms have better access to both

bank financing as well as equity financing. Overall, the econometric evidence corroborates the findings of section 5.4.

5.6 Allocative Efficiency of Stock Market

The basic premise of stock market liberalisation is that stock market leads to economic growth through efficient allocation of resources. Thus, in this section we examine the allocative role of stock market. In Indian context, few studies have dealt with the allocative role of stock market (Shah and Thomas, 1997; Abiad et al., 2008; Oura, 2008; Dash, 2009). Shah and Thomas (1997) found that stock markets are more efficient in resource allocation than bank sector, thereby supporting the allocative role of stock market in enhancing economic growth. Oura (2008) examines the efficiency of the different segments of India's financial system using firm-level data over the period 1993-2005. He finds that equity financing is more efficient than debt financing in India. Abiad et al. (2008) documents evidence of a "quality effect" of financial liberalisation in general and stock market in particular on allocative efficiency using firm level data for five emerging markets: India, Jordan, Korea, Malaysia, and Thailand for the period 1973-1996. But, this study does not incorporate relevant years for India. Therefore, there is need for extending the analysis including financial liberalisation years with more detail. Using Abiad et al. (2008) methodology and more recent years (1988-2006), and PROWESS database, Dash (2009) finds that stock market development has positive impact on resource allocation across sectors and samples. In both studies dispersion of Tobin's Q[13] is taken as an indicator of allocative efficiency and a decline in the dispersion is observed in the post-liberalisation period[14].

Further, it is seen from table 5.13 that there exist significant negative correlation between stock market and dispersion of Tobin's Q[15]. This indicates the allocative efficiency of stock market. Thus, on the basis of this evidence, we conclude that stock

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[13] Tobin's Q is defined as the ratio of market value of the financial assets of a company to the replacement cost of the real asset.

[14] In Dash (2009), 1996-97 to 2005-06 is taken as post-liberalisation period.

[15] Data on dispersion in Tobin's Q ratio across firms is obtained from Dash (2009).

market development has positive impact on resource allocation and that may lead to higher economic growth.

Table 5.13: Correlation between Stock Market and Dispersion of Tobin's Q
(1989-2005)

Variables	MC	TR	VTR	SIND	Dispersion of Tobin's Q
MC	1				
TR	0.58**	1			
VTR	0.75**	0.91**	1		
SIND	0.52**	0.59**	0.62**	1	
Dispersion of Tobin's Q	-0.27*	-0.53**	-0.44**	-0.38**	1

*** and * denotes significance at 5% and 10% level.*

5.7 Summary

In this chapter we have analysed the role of stock market in financing corporate investment for pre-and post liberalisation period. The result shows that firms in our sample are relying more on external sources of finance and contribution of external finance has remained stable over the years. The importance of capital market as a source of finance has gone up during post-liberalisation period (1993-2007). Stock market has emerged as a major source of financing next to borrowings. Further, financing pattern of Indian corporate sector shows gross similarity across companies and samples. Results from the econometric analysis reveals that banking and stock market variables have opposite effects on the source of financing: banking variables are associated with a rise in the debt/equity ratio, while stock market variables are generally associated with a fall in that ratio. More importantly, evidence also suggests improvement in allocative efficiency of stock market in resource allocation. Overall, the evidence in this chapter suggests that the stock market development has positive impact on capital mobilization and allocation.

Appendix 5A

Table 5A.1: Sample Firms over the Years

Year	No of Firms
1988-89	556
1989-90	645
1990-91	567
1991-92	728
1992-93	667
1993-94	768
1994-95	876
1995-96	965
1996-97	927
1997-98	876
1998-99	986
1999-00	850
2000-01	766
2001-02	876
2002-03	687
2003-04	765
2004-05	756
2005-06	865
2006-07	886
Total	**15012**

Source: CMIE PROWESS Database.

CHAPTER VI

Impact of Stock Market Development on Economic Growth

6.1 Introduction

In the first chapter we reviewed the six channels through which stock market affects economic growth namely, creation of liquidity, diversification of risk, better information about firm, corporate control, augmentation of savings and efficient mobilisation of capital. We then compared the development of Indian stock market vis-à-vis other developed and emerging markets in the post-1990s era. We found that Indian stock market is comparable to developed and emerging stock markets in terms of market characteristics such as; size, liquidity, infrastructure facilities, risk management etc. With this background, we assessed the impact of financial liberalisation on market liquidity in Chapter 2, since liquidity is one of the important stock market channels that have impacts on economic growth. Based on event study analysis, we find that liberalisation has had a positive effect on the breadth, depth and resiliency of the Indian stock market.

In Chapter 3, we find that stock market liberalisation has no significant impact on market volatility compared to pre-liberalisation period. Based on the findings of Chapters 1, 2 and 3, we conclude that stock market liberalisation has a positive impact on the overall development of stock market in India. In Chapter 4, we analysed the impact of stock market development on savings mobilisation, which is another important channel through which stock market affects economic growth. Based on trend and econometric evidence, we find that the stock market development has positive impact on savings. In Chapter 5, we examined the role of stock market in channelling resource for corporate investment compared to banking sector. Results of that Chapter indicate that Stock market has emerged as a major source of financing for corporate investment, although banking sector remains a dominant source. More importantly, stock market channel is found to be allocative efficient. Therefore, in this chapter we examine the overall impact of stock market development on economic growth.

This chapter is organized as follows: Section 6.2 presents economic growth and stock market development in pre and post-liberalisation period. Section 6.3 presents the review of empirical literature. Section 6.4 discusses methodology, data source and choice of variables. Section 6.5 discusses the results and Section 6.6 summarises the chapter.

6.2 Economic Growth and Financial Sector Development in India

For about three decades after independence, India grew at an average rate of 3.5% (infamously labeled "the Hindu rate of growth") and then accelerated to an average of about 5.2% during the 1980's. The annual GDP growth rate then further accelerated to 6.7% during 1992-2007 (post-liberalization period), which was the second highest among the world's largest economies, behind only China's 10% and higher than any other income group. As shown in Table 6.1, during the period 1992–2007, India increased its gross domestic product (GDP) growth rates by roughly 1.5 percentage points per annum relative to the rates it had sustained in the 1980s. Despite higher economic growth in recent periods, India's per capita income is only better than low-income groups.

This higher growth trajectory is directly attributable to higher growth in service and industrial sectors. The share of value added in GDP shifted away from agriculture toward services from 1980 onwards. Due to higher service sector growth during 1990s and 2000s, now service sector accounts more than half of India's GDP. On the other hand, share of agriculture have declined from around 32% during 1980-91 to 23% during 1992-2007. This higher growth trajectory is directly attributable to the opening up of the economies and adoption of stabilisation policies.

The higher growth rate during the post 1991 period was also accompanied by rapid development in the financial system. While market capitalisation ratio increased by seven times (from 7% to 52%) during 1980-2007, value trade ratio increased by more than eleven times (from 4% to 45%) during the same period. Further, stock market growth for India has been faster than any other income group. Similarly, bank credit to private sector, which is used as the measure of banking sector development shows upward trend. Therefore, the policy question is: Is there any relationship between stock market development and economic growth?

Table 6.1: India's Economic Growth vis-a-vis Other Income Groups

Growth Indicator	India		Low Income		Middle income		High Income		World	
	1980-91	1992-07	1980-91	1992-07	1980-90	1992-07	1980-90	1992-07	1980-90	1992-07
GDP (In US$ billion)	213	474	157	239	3464	5901	17227	25330	20840	31469
GDP growth	5.27	6.75	3.15	4.4	3.2	4.9	2.8	2.5	2.9	3.0
Per Capita Income (in US$)	272	473	255	289	1015	1387	18891	25081	4423	5186
Share of Agriculture	31.5	23	37.5	31	19	12	3	2	5.9	3.8
Industry Share	26	27	22	24	38	36	34	28	35	29
Service sector Share	42	49	24	44	44	52	63	70	59	67
Market Capitalisation Ratio	7	52	NA	NA	12	40	55	92	55	84
Value Traded ratio	4	45	NA	NA	5	25	32	103	32	88
Bank Credit to Private sector	47	59	26	31	62	69	129	176	118	155

Source: World Development Indicators, World Bank (2009).

6.3 Review of Empirical Literature[1]

Although there have been numerous studies analysing the role of stock markets in economic growth, most of them have focused on developed economies, and only few have focused on less developed ones. Majority of research studies have solely focused on cross-country and country specific analysis. A brief review of empirical literature is given below.

There exists substantial cross-country evidence supporting the view, those countries with better-developed stock market and banking system, witness higher subsequent growth. Atje and Jovanovic (1993), using a data set for 39 countries over the period 1980 – 1988 found that, a strong, positive and statistically significant relationship exist between stock market and economic growth. Alternatively, Harris (1997) argues that Atje and Jovanovic results are not empirically robust. Harris (1997) analyzes data for forty-nine countries over the period 1980-91 using some of the explanatory variables such as GDP growth per unit of effective labour, investment as a percentage of GDP, growth of total employed labour, and the total value of shares traded in the

[1] For theoretical literature on the relationship between stock market and economic growth see chapter I.

stock market as a percentage of GDP. The study finds that the level of stock market activity has little explanatory power in the developing country sample and weak explanatory power for the developed country sample. Levine and Zervos (1998) conducted a similar analysis for 48 countries during 1976-1993 and demonstrated that various measures of stock market activity are positively correlated with measures of real activity and that the association is particularly strong for developing countries. Conditioning on a number of variables, including indicators of banking development, they conclude that stock markets provide different financial services from banks. They argue that stock markets may enhance growth through liquidity, which makes investment less risky, thereby enabling companies to enjoy permanent access to capital through liquid equity issues. Rousseau and Wachtel (2000) and Beck and Levine (2004) make an important contribution to the literature by using panel techniques with annual data to assess the relationship between stock market, banks, and growth. They show that both banking sector and stock market development explain subsequent growth, even after controlling for the reverse causality. Bekaert et al. (2005) found that stock market liberalisation leads to a one per cent increase in annual real economic growth over a five-year period in a broad cross-section of developed and emerging countries. Arestis, Demetriades and Luintel (2001) applying time series methods on quarterly data to five developed economies show that while both banking sector and stock market development explain subsequent growth, the effect of banking sector development is substantially larger than that of stock market development. However, the sample size used in this study is very limited and it is not clear whether the use of quarterly data and Johansen's (1988) vector error correction model fully abstracts from high frequency factors influencing the stock market, bank, and growth nexus to focus on long-run economic growth. On the other hand, Mohtadi and Agarwal (2004) reached similar conclusion by examining the long-run relationship between stock market and economic growth for 21 developing countries using panel data analysis from 1977 to 1997.

On other hand, some studies have found that stock market development could influence economic growth provided it achieves a threshold level of development (Adjasi and Biekpe, 2006; and Minier, 2001). For example, Adjasi and Biekpe (2006) find that low level of liquidity and higher volatility in African stock market has been a significant factor in hampering stock market development and consequently, retarding

economic growth. Similarly, Minier (2003) examines the relationship between stock market development and economic growth for 42 developed and developing countries over the period 1976-1993. Based on regression tree technique, though the study finds a positive relationship between stock market and economic growth it does not hold for countries with low level of stock market development.

In summary, previous empirical research has suggested a connection between stock market development and economic growth, but is far from definitive. However, conclusions from the above studies are based on cross-country regression analysis. It is well known that cross-country regression analysis exaggerates the result and suffers from measurement, statistical, and conceptual problem. For instance, the OLS regressions estimated by Levine and Zervos (1998) are potentially affected by simultaneity bias, and do not control for country fixed effects. Given the fact that cross-country studies are based on "one-size-fits-all" approach, for understanding the stock-growth nexus turning to a single country analysis might provide with accurate and unbiased information for designing and formulating policy analysis. Therefore, the present study focuses on country specific analysis that stock market development promotes economic growth for India. There are some econometric advantages in examining the role of stock market in economic growth for a country using the advanced time series method. The before said method is quite useful for addressing various econometric and theoretical issues such as causality and endogeneity.

Although the existing literature suggests that stock market development and economic growth are positively correlated, the direction of causality is not clear. Filer et al. (1999) investigates the causal relationship between stock market and economic growth for 64 countries including both developed and developing over the period 1985-1997. Results of this study indicate a two-way causality. On the other hand, Caporale et al. (2004) documents one-way causality from stock market to economic growth for five emerging countries.

In the Indian context there are few studies that examine the relationship between stock market and growth. Azarmi et al. (2005) examines the empirical association between stock market development and economic growth for the period 1981 to 2001. They found support for the hypothesis that stock market positively influences economic

development only for the pre-liberalisation period. However, a major problem with this study is that they do not test for cointegration among the variables. Sarkar (2007) examines whether there exists a long-run relationship between Indian share price movement and economic growth rate. Result of this study suggests that there exists no relationship between the economic growth rate and share prices. However, this study uses share price index instead of usual stock market development indicators like market capitalization ratio, turnover ratio, and value traded ratio. On the other hand, Deb and Mukherjee (2008) find a strong causal flow from stock market development to economic growth over 1996-2007 using bi-variate causality analysis. However, testing for causality in a bi-variate framework may lead to the problem of misspecification bias. Therefore, their results should be taken with caution.

From the above discussion, it is clear that stock market development affects economic growth positively. The results are robust, both for developed and developing countries. However, the positive effects of banking sector development on economic growth are much greater than those of stock market development. Further, the significance of stock market in economic growth may vary from country to country and stages of economic development.

Although there exist few studies for India, only few of them have adopted a unified economic model where both banking and stock development are simultaneously considered in a framework that caters for dynamics, feedbacks and endogeneity issues. In this study, we have taken care of the problem of stationarity and specification bias, which were part of earlier studies. Moreover, this study is different from other existing studies in four ways: (1) A longer time series data and hence the results are expected to be robust; (2) A recently developed bound test approach is applied to test whether a long-run relationship exists between stock market and economic growth; (3) A multivariate approach is used to examine the causal relationship between stock market and economic growth and (4) not only the role of stock market, the role of banking in economic growth is also examined[2].

[2] It is argued that bank sector development also affects economic growth independent of stock market channel (King and Levine, 1993; Levine et al., 2000; Beck and Levine, 2004).

6.4 Methodology, Data Source and Choice of Variables

We apply Autoregressive Distributed Lag (ARDL) test to cointegration procedure developed by Pesaran and Shin (1998) and further extended by Pesaran et al. (2001), for testing the existence of a long-run relationship between stock market and economic growth, as discussed in chapter 5. Further, VECM is used to find out the direction of causality between the two[3].

We analyse the link between stock market, bank development and economic growth over the period 1980-2007. Output is measured by, Real GDP (RGDP) (at 1999-2000 prices). We use three stock market development indicators: (1) size which is measured by Market Capitalisation as ratio of GDP (MC)[4], and (2) two liquidity indicators namely, Turnover Ratio (TR) and Value Traded Ratio (VTR). Increases in liquidity are particularly important in emerging markets, since they raise the confidence of both individual and portfolio investors in the value of information and risk diversification associated with trading on an organized exchange. This facilitates the transfer of surpluses from the short to long-term capital market and promotes growth in the number of firms and shares available to investors. If investments with longer gestation periods are ones that tend to achieve the best outcomes, these transfers are growth enhancing, since MC, TR, and VTR are highly correlated we develop a stock market index (SIND) using principal component analysis. The respective Eigen values and factor loadings are presented in Table 4.4 and 4A.2. (Refer to Chapter 4).

Stock market volatility (SMV) as an explanatory variable is also included. The reason is that higher volatility may affect economic growth negatively through misallocation of resources (Singh 1997; Levine and Zervos, 1998). Stock market volatility is measured as 12-month rolling standard deviation of Sensex.

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[3] This methodology is useful for evaluating questions of statistical causation within a single country, and offers an alternative to cross-country studies where the econometric identification comes primarily from between-country variation in the data.

[4] Market capitalization is the product of share price and the number of shares outstanding for all stocks traded on major exchanges, and should reflect the importance of financing through equity issues in the capital mobilization and resource allocation processes.

It is also argued that banking sector development[5] affects economic growth and its effect in the long-run is much higher than the stock market development (King and Levine, 1993; Levine et al., 2000; and Arestis et al., 2001). Therefore, it is necessary to net out the effect of banking sector on economic growth, to find the actual contribution of stock market to economic growth. We use domestic bank credit (BC) to private sector as a ratio of GDP as the indicator of banking sector development. Private credit includes all claims on the private sector held by banks, and as such reflects the size of the most important institutions in the intermediating sector in the economy. Higher levels of private credit are interpreted as higher levels of financing services and therefore greater financial intermediary development. On the other hand, export led growth hypothesis (EGH) argues that higher exports lead to higher economic growth because they lead to expansion of output and employment, facilitate greater competition and increase the pressure for innovation (Ram, 1987 and Krueger, 1998). Therefore, we include exports to GDP ratio (EXPY) as another control variable. All these variables except stock market index are transformed into logarithms. Similarly, to capture the impact of stock market reforms, we include dummy variable (D93), which takes the value of 0 before 1993 and 1 after 1993. Therefore, the specification of output function can be written as:

$$RGDP = f(SIND, SMV, BC, EXPY) \quad (1)$$

Where RGDP is real gross domestic product, SIND is stock market development index, SMV is stock market volatility, BC is bank credit to private sector and EXPY is export ratio to GDP.

The specification used in this study is of a log linear one. Taking logs on both sides the equation results in the following:

$$LRGDP_t = \alpha_0 + \beta_1 SIND_t + \beta_2 LSMV_t + \beta_3 LBC_t + \beta_4 LEXPY_t + \beta_5 D93 * SIND_t + \varepsilon_t \quad (2)$$

[5] According to Solow (1956) growth model, financial intermediaries promotes the accumulation of capital and increases the productivity of labour, leading to an outward shift and movement along the aggregate production isoquant. This implies higher levels of output and higher steady state growth rates. For these reasons, we believe that any study attempting to uncover the effects of stock market development on growth must take the traditional intermediating (i.e., banking) sector into account as a control.

Where L represents natural logarithm of the variables, t denotes time dimension and ε_t is the error term. The coefficients of SIND, BC and EXPY are expected to be positive and SMV to be negative[6].

6.4.1 Causality between Stock Market Development and Growth

One of the most enduring debates in economics is that whether financial development causes economic growth or is it the consequence of increased economic activity. Moreover, the "financial development-economic development puzzle" is complicated by yet another dimension, that the relationship is dynamic in nature. Schumpeter (1912) and Hicks (1969) argued that technological innovation is the main force behind long-run economic growth, and proposed that innovation causes the financial sector to extend credit to the entrepreneur. Endogenous growth literature suggest that financial development could influence economic growth by increasing the productivity of capital, or lowering intermediation costs, or by enhancing the saving rate. This is called "finance-led growth" hypothesis. Robinson (1952) and King and Levine (1993) on the other hand, suggest that economic growth creates demand for various types of financial services to which the financial system responds. This is called "growth-led finance hypothesis". The Keynesian thesis supports the growth-led finance hypothesis and contends that stock market does not matter for a country's growth.

The 'feedback' hypothesis suggests a two-way causal relation between financial development and economic performance (Patrick 1966)[7]. In this hypothesis, it is argued that a country with well-developed financial market could promote high economic growth through technological changes, product and service innovation. This in turn, will create high demand for financial services. Therefore, both financial

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[6] The above model specification, is based on the principles of some earlier studies (e.g. King and Levine, 1993; Levine and Zervos, 1998; Levine et al., 2000, Rousseau and Wachtel, 2001 and Beck and Levine 2004).

[7] He suggested two patterns in the relationship between financial development and economic growth. In the first pattern, called "supply-leading", financial development causes economic growth by allocating resources to more productive sectors. In the second pattern, called "demand-following", economic growth creates demand for developed financial institutions and services. According to Patrick, the creation of modern financial institutions, their financial assets and liabilities and related financial services are a response to the demand for these services by investors and savers in the real economy.

development and economic growth are positively interdependent and their relationship could lead to feedback causality (Luintel and Khan, 1992). Therefore, we expect four possibilities between stock market and economic growth: (1) stock-market led growth[8], (2) Growth led stock market[9] (3) two-way causality between the two and (4) no causal relationship between the two.

6.5 Empirical Results

The following ARDL model is estimated in order to test the long-run relation between economic growth and stock market indicators as well as two control variables, namely, bank credit ratio (BC) and export ratio (EXPY)

$$\Delta RGDP_t = \alpha + \sum_{t=0}^{r} \mu_{1t} \Delta RGDP_{t-1} + \sum_{t=0}^{s} \mu_{2t} \Delta BC_{t-1} + \sum_{t=0}^{u} \mu_{3t} \Delta EXPY_{t-1} + \sum_{t=0}^{v} \mu_{4t} \Delta SIND_{t-1} + \sum_{t=0}^{w} \mu_{5t} \Delta SMV_{t-1} + \mu_6 RGDP_{t-1} + \mu_7 BC_{t-1} + \mu_8 EXPY_{t-1} + \mu_9 SIND_{t-1} + \mu_{10} SMV_{t-1} + \xi_t \quad (3)$$

where Δ is the first difference operator, ξ_t is white noise error term.

There are two steps in testing cointegration relationship between economic growth and its explanatory variables. First we estimate Equation (3) by Ordinary Least Square (OLS) method. Second, the presence of cointegration can be traced by restricting all estimated coefficients of lagged level variables equal to zero. That is, the null hypothesis is $\mu_6 = \mu_7 = \mu_8 = \mu_9 = \mu_{10} = 0$ (no cointegration), against its alternative $\mu_6 \neq \mu_7 \neq \mu_8 \neq \mu_9 \neq \mu_{10} \neq 0$. If the computed F-statistics is less than lower bound critical value, then we do not reject the null hypothesis of no cointegration. Alternatively, if the computed F-statistics is greater than the upper bound critical value, we reject the null hypothesis of no cointegration and conclude that there exists steady state equilibrium between the variables of our study.

6.5.1 Unit Root Test

Before carrying out cointegration test, unit root test has been conducted and reported in Table 6.2. The testing procedures are based on the null hypothesis that a unit root exists in the autoregressive representation of the series. Optimal lag is selected on the

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[8] In this case stock market is viewed as the leading indicator of the economic activity in the country.

[9] Therefore, it suggests that stock market lags economic activity.

basis of Akaike Information criterion (AIC). It is clear that all the variables (except stock market volatility) are non-stationary at levels but stationary at first difference. Hence all variables are integrated of order one or I (1), except stock market volatility.

Table 6.2: Result of the Augmented Dickey Fuller Test for Unit Root

Variables	Level		First Difference (With constant only)	Order of Integration
	With constant	With constant and Trend		
RGDP	1.23 (2)	-0.98 (1)	-4.56 (1)**	I(1)
MC	-0.22 (1)	-1.23 (2)	-6.22(0)**	I(1)
VTR	-1.59 (2)	-2.34 (1)	-5.56(1)**	I(1)
TR	-1.21 (1)	-1.67 (3)	-7.57(2)**	I(1)
EXPY	0.93 (1)	0.76 (2)	-3.89(0)**	I(1)
BC	0.04 (2)	0.56 (1)	-6.05(0)**	I(1)
SMV	-3.45(2)*	-	-	I(0)
SIND	-1.12	-2.13	-4.35**	I(1)

Notes: figures in brackets denote the optimum number of lags used.
*** denotes significance at 1% and * at 5% level respectively.*

6.5.2 Cointegration Tests

Having found that all the variables are I(1) except stock market volatility, we investigate the existence of a long-run relationship between real output (RGDP), stock market index (SIND), real exports (EXPY) and banking sector (BC) within a multivariate framework using ARDL technique. The result is presented in Table 6.2.

Table 6.3: ARDL Test for Cointegration

Stock Market Indicator	Computed F -Statistics
SIND	5.21**

Notes: ** denotes significance at 1%.

As can be seen from Table 6.3, it is clear that there exist a long-run relationship amongst the variables when RGDP is the dependent variable because, it's F-statistic (5.21) exceeds the upper bound critical value at 1% level. Therefore, from the bound test it is clear that there exists a long-run cointegration relationship between real output and stock market index along with other explanatory variables. The order of lags of the first –differenced variables for equation (2) is usually obtained from unrestricted vector autoregression (VAR) by means of Akaike Information Criterion (AIC). Given that we are using annual observations, we experimented up to 2 lags on the first-difference of each variable and computed F-statistics for the joint significance of lagged levels of variables in equation (2).

6.5.3 Long-run Coefficients of Output

Given the existence of a long-run relationship, in the next step we used the ARDL cointegration method to estimate the parameters of equation (2) with maximum order of lag set to 2. The lag length of the long-run output function has been selected on the basis of Schwartz-Bayesian Criteria (SBC) Further, diagnostic tests were undertaken to ensure that it is the best model and there is no misspecification bias in the model. The diagnostic tests include test for serial autocorrelation (LM), heteroscedasticity (ARCH test), omitted variables/functional form (Ramsey Reset). The long-run estimates of equation (2) based on several lag criteria are presented in Table 6.4.

Table 6.4: Long-run Coefficients of Output Function

Variables	Dependant Real GDP
Constant	71.14** (2.12)
BC	0.54** (4.27)
EXPY	0.13** (2.86)
SMV	-0.05 (-0.48)
SIND	0.18* (2.67)
D93*SIND	0.05* (2.11)
Adj.R^2	0.76
DW Statistics	1.89
F-statistics (6, 21)	137
Model Selection Criterion (SBC)	(1,2,1,2,2,0)
LM	2.01 (0.19)
ARCH Test	1.11 (0.21)
RESET	0.17 (0.43)

***indicates the level of significance at 1%,*

** indicates the level of significance at 5%. Figures in the brackets indicate t-ratio.*

As it can be seen from Table 6.4, the coefficient of stock market index in output function is positive and significant, implying stock market development has positive impact on economic growth in the long-run. Further, we find that the impact of stock market reforms on economic growth is positive and significant as the coefficient of interaction dummy is positive and statistically significant at 5% level. Similarly, market volatility also does not suggest a reliable link to output as volatility coefficient is negative but insignificant.

The coefficient of banking development is positive and statistically significant. The magnitude of the coefficient of banking sector is much higher than the stock market, indicating banking sector has a larger growth impact than stock market in India. This can be explained by the fact that India's stock markets has not yet matured to the level (from both investors' and firms' perspectives) comparable to financial markets in other developed or newly industrialized countries. Moreover financial intermediaries remain till now the major source of investment credit in India as we found in chapter 5. Overall, these results suggest an independent link between growth and stock market and bank development and also both put together. Financial development is confirmed to be an ingredient of growth. Similarly, the impact of export ratio on output is positive and significant, indicating expansion of trade increases real GDP for India. Our results are also consistent with the findings by Levine and Zervos (1998); Arestis et al., (2001); Beck et al., (2004). This implies that the results are not supportive of the models that emphasize the negative implications of stock market development (Shleifer and Vishny, 1986; Grabel, 1995; Singh, 1997).

6.5.4 Long-run Coefficients of MC, TR and VTR

The long-run coefficient of MC, TR and VTR are obtained by multiplying the coefficient of stock market index with the factor loadings of MC, TR and VTR. The results are presented in Table 6.5. It is clear that the coefficient of liquidity (TR and VTR) is larger than market size (MC). A 10% increase in SIZE leads to a 1.0% increase in RGDP whereas a 10% increase in LIQUIDITY leads to a 1.08% increase in RGDP. Hence improvements in trading of shares or liquidity on Indian stock market will on the whole boost economic growth further.

Table 6.5: Long-run coefficients of MC, TR and VTR

Stock Market indicator	Long-run coefficients (Private savings)
MC	0.095
TR	0.108
VTR	0.115

6.5.5 Granger Causality Test

In this section we address the issue of causality in the framework introduced by Granger, using VECM (Vector Error Correction Method). This is important because identifying the direction of causality would help to formulate appropriate policy.

From the cointegration result it is found that there exist a long-run relationship between stock market and economic growth, implying a causal relationship must exist, by definition in at least one direction (Engle and Granger, 1987). The long-run relationship needs be validated by the VECM results. The results of the causality analysis using the vector error correction mechanism (VECM) are shown in Table 6.6. Akaike Information criterion (AIC) is used to select the optimal lag length of the VECM. It is clear that the null hypothesis of stock market development does not Granger cause economic growth has been rejected in favour of stock market-led economic growth. On the other hand, the null hypothesis of economic growth does not Granger cause stock market development has been rejected only at 10% level. The result indicates that an improvement in the performance of stock market leads to higher economic growth for India. Therefore, our result supports the feedback hypothesis indicating both stock market development and economic growth are positively interdependent in India. In other words, the Indian case supports the supply-leading phenomena in the short-run and both the supply-leading and demand-following cases (mutual causality) in the long-run.

Table 6.6: Causality between Stock Market and Economic Growth Using VECM

Null Hypothesis	Optimal Lag	Θ =0: t-statistic (P-value)	$\Sigma\beta_i$ =0: F-statistic (P-value)
SIND → RGDP	1(AIC)	-2.82* (-0.01)	3.13* (0.09)
RGDP → SIND	2(AIC)	-1.65* (0.07)	1.67 (0.22)

*Notes: SIND denotes stock market index, AIC in parentheses denote that the chosen lag length minimizes the Akaike Information criterion. ***, ** and * denotes significance at 1%, 5% and 10% level respectively. Figures in the brackets are p-values. SMV is not included in the causality test as this variable is I(0).*

6.5.6. Impulse Response Function[10] (IRF)

In addition to the above causality analysis, we have also examined the dynamic relationship among the concerned variables by using the impulse response function within the vector auto regression (VAR) framework. For the present analysis, this technique would be a useful tool enabling us to explain any complementary or substitution effect between stock market and RGDP. The result of orthogonalised

[10] Impulse response analysis is carried out at first different and the optimal lag length is selected using AIC criterion.

impulse function is presented in Figure 6A.1 (see Appendix 6A). It is clear from the Figure that a one standard deviation shock in stock market index leads to an immediate increase in RGDP and followed by an immediate fall. This process continues till fourth year where RGDP reaches its maximum. The upward movement of RGDP indicates that it is positively influenced by the increase of stock market development both in the short run and in the long run. On the other hand, a shock in RGDP leads to higher stock market development in the first year and fall in the next year. Thereafter, it reaches higher equilibrium position. This result confirms our bidirectional causality between SIND and RGDP discussed in section 6.5.4. In the case of banking sector, a one standard deviation shock in bank credit leads to higher RGDP in the first year and following. By the end of fifth, year it reaches maximum and thereafter it starts declining. Therefore, the impact of banking sector on growth is higher and lasts long period than stock market. Similarly, one standard deviation shock in stock market volatility (SMV) leads to reduction in RGDP till third year. Thereafter, it comes back to original position by fifth year, indicating stock market volatility has no significant impact on economic growth. In case of exports, a one standard deviation shock in export shock leads to higher RGDP for first four years and declines thereafter. Thereby the impulse response analysis corroborates the findings of regression and causality analysis.

6.5.7 Relative Strength of Various Channels of Stock Market

In this section, we examine the relative strength of savings, liquidity and capital mobilization[11] channel of stock market by using a vector auto regression (VAR) framework. A variance decomposition test is used in this context. The forecast error variance decomposition (FEVD) allows inference over the proportion of movements in a time series due to its own shocks versus shocks due to other variables in the system (Enders, 1995).

The results of the FEVD tests for up to 10-year horizon are reported in Table 6.7. The order of the VAR is fixed at two considering the number of observations and AIC criteria. It is clear from the table that savings channel is most important channel which

[11] Total value of capital mobilised through public offerings in the primary market.

is followed by liquidity channel, and then by capital mobilization channel in explaining the variation in output growth.

Table 6.7: Variance Decomposition of Real Output Growth

Per cent of forecast error variance in (years)	RGDP	Savings	Capital Mobilized	Liquidity (VTR)
1	94	3.04	1.11	1.61
2	89.05	5.08	2.75	3.11
4	78.95	8.77	5.15	7.13
4	66.6	13.67	8.45	11.67
5	57.5	16.7	11.45	14.35
6	50.05	19.76	13.43	16.75
7	47.27	20.76	14.35	17.68
8	38.21	22.56	15.67	19.87
9	35.43	25.95	16.86	21.36
10	33.14	27.06	17.05	22.75

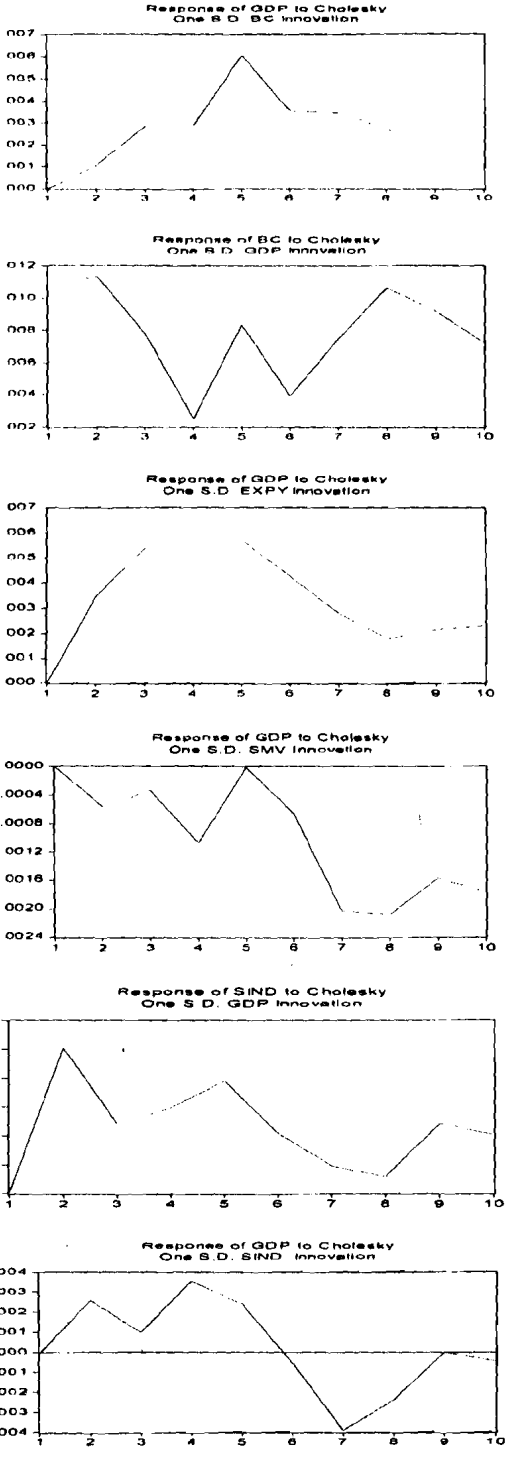
6.6 Summary

This chapter empirically examines the relation between stock market and economic growth in India using advanced time series techniques such as ARDL cointegration test and VECM causality analysis. Results from the analysis indicate that stock market development is an important ingredient of economic growth in India, but relatively with a lower magnitude as compared to other determinants of growth, particularly banking development. The results also indicate that stock market liquidity has higher impact on economic growth than its size effect. Further, the impact of stock market reforms (interaction term) on economic growth is positive and significant. From Granger causality test, it is found that there exist a two-way relation between stock market and economic growth, although causality from RGDP to stock market is weakly significant (only at 10% level), supporting the feedback hypothesis. In other words, the Indian case supports the supply-leading phenomena in the short-run and both the supply and demand-leading phenomena (mutual causality) in the long-run.

Further, the orthogonalized impulse response function analysis presented in the chapter corroborates with the causality analysis, and suggests that, the rapid growth experienced by the Indian stock market following the economic reforms since 1991 played a very substantial role in increasing the growth rate in India. More importantly, relative strength of stock market channel indicates that savings has the highest influence on growth followed by liquidity and capital mobilization.

Appendix 6A

Figure 6A.1 Impulse Response Function



CHAPTER VII

Summary and Conclusion

The Background

The present study has examined the impact of stock market development on economic growth in India by analysing three major channels of stock market, viz., liquidity, savings, and capital mobilization and efficient allocation of capital for the period 1980-2007. In contrast to earlier studies, this study tries to identify the relative importance of different channels of stock market; such a study assumes significance in the context of the ongoing debate regarding the benefits of stock market liberalisation in India.

The present study is motivated by four factors. First, although there exist empirical evidence that suggest stock market development affects log-run economic growth, the channel through which it works is not clear, particularly for developing country like India. Second, a number of studies have examined the effect of stock market development on economic growth, but, most of them adopt a simplistic cross-country approach. However, the relationship between stock market and growth varies across countries, depending on institutional characteristics and circumstances, and one cannot be sure whether the results of such cross-country studies, which are applicable to the "average country in the sample", apply to the country in question. Thus, country specific studies are also important. Third, following financial liberalisation (in early 1990s), market forces have increasingly assumed the role for resource mobilisation and allocation. Therefore, it is pertinent to evaluate the role of stock market in terms of resource mobilisation, and efficient allocation of capital, which is invariably linked and has several implications on economic growth. Fourth, although the link between stock market development and long-run growth is established, the direction of causality is not clear which has considerable importance for development policy.

The study begins with an assessment of stock market development following the liberalisation process. This analysis is followed by a critical assessment of liquidity and volatility in India. This preliminary investigation sets the background for examining the linkages between stock market and savings, financing for corporate

investment and allocation of capital. Finally, the relationship between stock market and economic growth is tested to infer the direction of causality. We also attempt to identify the channels through which stock market development leads to economic growth.

Empirical Analysis and Results

The analysis presented in Chapter 2 indicates that Indian stock market was very much dormant, underdeveloped and virtually non-existent in the pre-liberalisation period (1960-91). Trading and settlement infrastructure were considerably weaker. In fact trading on all stock exchanges was facilitated through open outcry and the settlement systems were paper based. While market intermediaries were largely unregulated the disclosure requirements were inadequate. Moreover, the regulatory structure was fragmented and administered by different agencies. Primary markets were not in the mainstream of the financial system. In term of size and liquidity, Indian stock market was smaller to most of the countries in the world (expect a few countries such as Pakistan and Turkey). Given the small size, poor liquidity and infrastructure bottlenecks, stock market was overlooked as an insignificant component of the financial system that played a limited role in resource mobilisation.

However, since the inception of the liberalisation process in the early 1990s, stock market has witnessed a significant improvement, in terms of various parameters such as size of the market, liquidity, transparency and international integration. The changes in regulatory and governance framework have brought about an improvement in investor confidence. While the size of the Indian equity market still remains smaller than many advanced economies such as the US, UK, and Japan, it's position is significantly higher than many other emerging market economies including Argentina, Brazil, Mexico, Philippines, and Thailand. Similarly, liquidity in Indian stock market is comparable to many developed stock markets such as USA, UK and Japan. Automation of trading in stock exchanges, reduction in transaction cost, higher investment by FIIs and mutual funds have contributed to the increased liquidity in Indian stock exchanges. This has major implication for risk diversification, savings mobilisation and financing of corporate investment.

Results also indicate that FIIs investment has increased steadily during this period. Moreover, the volume of trade in terms of FIIs has also increased and now accounts

for a much larger share than compared to other market participants such as mutual funds and retail investors. Our analysis further indicates that there is a significant positive correlation between monthly FIIs net investment and monthly BSE Sensex closing index. Also, the integration of Indian stock market with rest of the world market has been increasing over time, which, arguably, has major implication for risk diversification.

Theoretically, it is demonstrated that higher market liquidity is positively related with economic growth, progress in productivity, and expansion of capital accumulation. Therefore, stock market liquidity is considered as a key indicator reflecting its development. Stock market liquidity substantially affects the price discovery process in the market and therefore, it is expected to have a close relationship with market efficiency and market stability. Given the importance of market liquidity, in this study we compare market liquidity in pre-liberalisation with post-liberalisation period in Chapter 3. For analytical purposes, we estimate both static and dynamic liquidity indicators. Since effective supply and demand can only be recognized during the dynamic process of trade execution, we need to observe dynamic indicators such as price changes upon trade execution (market impact) and/or the convergence speed of the bid–ask spread (market resiliency). Results indicate that market liquidity significantly improved continuously throughout the post-liberalisation period. This result allows us to conclude that stock market liberalisation has a positive impact on market liquidity.

Volatility of stock prices is another empirical aspect of stock market development, which has received a considerable amount of attention in the literature. High level of volatility affects average portfolio risk, which in turn can significantly affect the return on investment and growth. For example, excess volatility weakens investor's confidence, resulting in reduction in investment. Therefore, in Chapter 4, we compared volatility and its persistence in Indian stock market both in pre and post liberalisation period. First we checked the distribution of return series and found that the return series are not normal. Given the fact that return series are conditional, we estimate time varying volatility by using E-GARCH model, which captures asymmetric impact on volatility and is regarded as an appropriate measure of volatility. Our results indicate that volatility persistence is high for all the periods;

however post-liberalisation period is marked with marginally higher volatility levels. Furthermore, by adopting a structural break analysis we found that there are three break dates and that all these break points are related to economic and political events. In other words, none of the break dates were found to be related to stock market liberalisation events. This finding reveals that liberalisation of the stock market or the FII entry in particular does not have any direct implications for the stock return volatility. When large shocks in stock returns are controlled, there is significant reduction in ARCH effect; however the volatility is still persistent. In conclusion, this analysis clearly suggests that financial liberalisation has sufficiently developed the Indian stock market to render a positive impact on savings, corporate finance and hence economic growth.

Chapter 5 also examines the link between stock market development and savings, because savings is yet another channel like liquidity through which stock market development spurs economic growth. We estimate private savings rate and household financial savings rate by using ARDL model, which is suitable for a mixture of I(0) and I(1) variables. Since three stock market indicators – market capitalisation ratio (MC), turnover ratio (TR), and value traded ratio (VTR) are highly correlated we construct a the stock market index (SIND) using principal component analysis. To account for the impact of stock market liberalisation, a slope dummy variable is used. Since all the savings rate and stock market index is I(1), the issue of causality is addressed by using Vector Error Correction Method (VECM).

Results unravel the existence of a stable and long-run equilibrium relationship between savings rates (private and household financial) and stock market development (the analysis is controlled for other determinants of savings). Coefficients of stock market development index is positive and significant, indicating that stock market development has positive influence on savings rate in India – a larger channel through which stock market development leads to economic growth. Although, stock market liberalisation does not have any significant effect on private savings rate, its effect on household financial savings rate is positive and significant as liberalisation slope dummy is positive and significant for household financial savings rate. Causality analysis between stock market and savings rates reveal the existence of a bi-directional causality. Therefore, both cointegration and causality result

support the hypothesis that there exists a significant positive relationship between stock market and savings rate in India.

Given the positive relationship between stock market and savings, capital mobilisation through stock market for higher corporate investment is examined in Chapter 6. In particular, this chapter analyses stock market as a alternative source of financing for corporate investment and it also examines the efficiency with which funds are allocated. The analysis of financing pattern of corporate sector indicates that external source is more valuable for Indian corporate sector for financing investment as compared to the developed countries. The results of the linkage between stock market development and corporate financing pattern indicate that capital market is now the second largest source of external financing after borrowings. Results also indicate that equity finance has become one of the most important financing sources next to loans. Financial pattern of Indian corporate sector is opposite to pecking order theory. Further, financing pattern of Indian corporate sector shows gross similarity across sample size, quality and industry. Findings of this study also suggests that stock market contributes to around 15% of total financing of corporate sector, which is comparable to the pattern observed in other developing markets.

The econometric analysis reveals that banking sector and stock market have opposite effects on the source of financing; while the banking sector is associated with a rise in the debt/equity ratio, the stock market development is associated with a fall in that ratio. This indicates substitutability between bank financing and equity financing. Further the allocative efficiency of stock market is measured by estimating dispersion of Tobin's Q. across the firms (lower the dispersion of Tobin's higher the allocative efficiency). Results indicate that there exist a significant negative correlation between stock market indicators and dispersion of Tobin's Q. This indicates that development of stock market would lead to higher allocative efficiency of capital.

Having examined the role of stock market in savings mobilisation, we empirically test the relationship between stock market and economic growth in Chapter 7, the study notices a long-run relationship between stock market and economic growth. Our result suggests that stock markets in India affect economic growth positively and significantly even after controlling the effect of banking sector. These results imply that the stock market can be viewed as an effective channel in mobilising and

allocating resources efficiently. Similarly, the effect of banking sector on growth is positive and significant. On the other hand, our result suggests that the impact of stock market liberalisation has a positive impact on growth. Therefore, theoretical prediction of stock market development on economic growth firmly holds ground in the Indian context. From Granger causality test, it is found that there exists a bi-directionality in relationship between stock market and economic growth, although causality from GDP to stock market is weak, supporting the feedback hypothesis. Further, relative strength of various channels is estimated by using variance decomposition method. Results indicate that savings has higher impact on growth followed by higher liquidity, and equity financing for corporate investment. The results are vigorous and robust, and indicate that stock market development is an important wheel for economic growth in India.

Concluding Remarks

In this concluding section, it can safely be argued that stock market development influences economic growth through higher savings and higher liquidity and by channeling the capital for higher corporate investment and allocating it efficiently. The findings of this study have valuable policy implications and offers considerable depth and insight regarding the possible linkages between stock market and the economy. The study also suggests for further development of the stock market albeit through simultaneous adoption of appropriate regulatory and macroeconomic policies.

Although, in the study three channels of stock market namely, liquidity, savings, and, capital mobilisation and allocation are discussed, issues such as diversification of risk through integration, cost of capital, and corporate governance, needs a careful scrutiny. In addition to these elementary issues, other aspects such as determinants of stock market, role and impact of derivative trading, and FIIs on stock market development is expected to shed further light on the subject. Therefore these are recommended for further research.

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