Stock Market Development, Integration and Contagion:

An Empirical Analysis from the 'BRIC' Economies

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Dissertation Submitted to Jawaharlal Nehru University
for the Award of the Degree of Doctor of Philosophy in Economics

Krishna Reddy Chittedi

CENTRE FOR DEVELOPMENT STUDIES

Thiruvananthapuram

August 2012

13th August, 2012

I hereby affirm that this thesis, entitled **"Stock Market Development, Integration and Contagion: An Empirical Anaiysis from the 'BRIC' Economies"** being submitted to Jawaharlal Nehru University, New Delhi for the award of the Degree of Doctor of Philosophy in Economics, is a record of my own research work. It has not previously formed the basis of any degree, diploma, associateship, fellowship or other similar title or recognition.

Krishna Reddy Chittedi

Certified that this study is the bona fide work of Mr. **Krishna Reddy Chittedi**, carried out under our supervision at the Centre for Development Studies.

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Associate Professor

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……dedicated to my mother

...who taught me the value of hard work by her own example.

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Chapter	CONTENTS	Page No
1	**Introduction**	**1-18**
	1.1. Background of the Study	1
	1.2. Analytical Framework of the Study	2
	1.3. Stock Market and the Economy	5
	1.4 International Financial Integration and Financial Sector Development	6
	1.5 Financial Crises and Contagion	8
	1.6 Importance of BRIC stock markets	10
	1.7 Significance of the Present study	13
	1.8 Research Questions and Objectives	14
	1.9 Data and Methodology	16
	1.9.1 Nature and Source of Data	16
	1.9.2 Method of the Study	16
	1.10 Structure of the Study	18
2	**Financial Development and Instability: A Theoretical Perspective**	**19-52**
	2.1 Introduction	19
	2.2 Schools of Macroeconomic Thought	22
	2.2.1. The Classical Perspectives	22
	2.2.2. Neo-classical Perspectives	25
	2.2.3. Keynesian and Post- Keynesian Perspectives	27
	2.2.4. Neo-Keynesian Perspectives	31
	2.2.5. Monetarism	33
	2.2.6. New Classical Perspectives	34
	2.2.7. New Keynesian Perspectives and the Myth of Market Efficiency	36
	2.3 Capital Markets and Economic Development: Empirical Studies	39
	2.4 Summing up	47
3	**The Global Stock Markets: Retrospect and Outlook**	**53-115**
	3.1 Introduction	53
	3.2 The Historical Development of Stock Markets	56
	3.2.1 Development Indicators	60
	a) Market Capitalization	60
	b) Equity Issues	61

List of Tables

List of Figures

CHAPTER I

Introduction

1.0 Background of the Study

Today's stock market, both domestic and abroad, represents the culmination of a long term development in financial assets and the procedures by which they are traded. There is a strong tendency to see the development of the global securities market solely from the perspective of those who raised money through the issue of stocks and bonds. These required securities could easily and quickly be bought and sold without causing much variation of price, and only a few markets possessed that capability. In many ways the driving force behind the growth of the global securities market has not been the needs of governments, because their financial requirements could be met in a variety of different ways. But it was because of the desire by investors for an asset that was easily divisible, mobile, and flexible in terms of space and time, as well as delivering a return either through income or capital appreciation. Although shareholders cannot monitor all aspects of a firm's behaviour, they do monitor its performance in terms of profit it generates. If the shareholders are not satisfied with this performance, they sell their shares and the price will decline. A rival group could buy the lower-priced shares and run the company themselves. Thus management has a strong performance incentive to operate the firm for the shareholders' profit. Through the price mechanism, stocks perform the external monitoring role.

Securities became an asset and the securities market grew and thrived over the centuries despite all the setbacks it suffered and the attempts made by governments to curb or even destroy it. Securities were like money itself, an essential element within the fabric of life, and this made the global securities market an integral component of the modern world economy. While early markets traded shares of stocks in companies, something that continues to this day, modern stock exchanges allow for the trading of many more sophisticated

assets. With the advancing technology of trading, many stock trades today occur not on the floor but through an electronic connection between brokers and dealers. This increased sophistication of trading allows information to flow more rapidly and permits trades to be executed quickly (Geisst 2004).

1.2 Analytical Framework of the Study

A healthy national stock market has been considered essential for the national economic growth due to its different bundle of crucial services that stimulates the accumulation of capital and contributes for improvement in productivity. A strong financial system *ceteris paribus* promotes both financial and economic stability and facilitates economic growth. From the theories of Marx, Keynes, Schumpeter, Kalecky, Galbraith, Kindleberger, and Minsky it was observed that it is the finance which was initially provided the welcome liquidity and then disrupted the functioning of capitalist enterprise from the earliest combination of capitalism and finance at the end of the sixteenth century to its hubris at the end of the twentieth century. This was most notable in the case of the 1929 crash, the 1987 debt crisis and the subsequent emerging market[1] crises (Mexican crisis 1994–95 to Argentina 2001–02) at the end of the century and the recent USA subprime crisis. The central problem addressed by theories is the construction of 'optimal' portfolios, or the rational choice of financial investments. Government regulations that restrict rational investment choices and limited knowledge of investors are the only hindrances to this. And, these can be easily overcome by regulation and increased attention to mathematical financial modelling. Even though the financial system is increasingly unstable, the only concession made is

[1] The term "emerging markets" dates back to 1981 and it was invented by Antonie van Agtmael. He was trying to start a "Third-World Equity Fund" to invest in developing-country shares, but his efforts to attract money were being constantly rebuffed. "Racking my brain, at last I came up with a team that sounded more positive and invigorating: emerging markets. Third world suggested stagnation; emerging markets' progress, uplift and dynamism." Later in the 1980's the fast-growing economies of south –East Asia acquired the tag "Asian Tigers"- until they ceased to roar during the financial crisis of 1997-98. In 2001 Jim O'Neill, chief economist Goldman Saches came up with the acronym "BRIC" which is expected to enter the economic big league: Brazil, Russia, Korea and Mexico "Should not be really thought of as 'emerging markets' in the classical sense, as many still do. We regard these countries as a critical part of the modern globalised economy (The Economist Sept 20th 2008).

that prices may "rationally" move away from the "equilibrium" values but only on the basis that the market "adjusts" to equilibrium.

Keynes (1936) suggested that public access to financial markets should be, like access to Casinos, "inaccessible and expensive". Indeed, after the collapse of the Wall Street stock market in the 1930s, Keynes (1936: 159-160) suggested that the "introduction of a substantial Government transfer tax on all transactions might prove the most serviceable reform available, with a view to mitigating the dominance of speculation over enterprise in the United States".

The link between financial development and growth was first demonstrated in literature by Bagehot (1873) and Hicks (1969), who pointed out that industrialization of England was possible because of the use of the financial system to mobilize productive financial capital. 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. Faced with the reality of a much reduced supply of foreign funds from previous sources (such as commercial banks), governments in many developing countries are giving increased attention to capital market development as a way of improving domestic resource mobilization, enhancing the supply of long-term capital and encouraging the efficient use of existing assets. However, controversy does exist on the role of stock market as an indicator of future economic activity. Keynes and Kalecki can be reconciled, not by assuming a failure of competition in the financial arena where the market reigns supreme, but by recognizing the particular forms of the institutions of capitalism, as we know it, to be a necessary response to fundamental uncertainty

In the 'General Theory', Keynes commented that the stock market, as an institution is supposed to have a proper social purpose of capital development and directing new investment into the most profitable channels in terms of future yields (Keynes 1936: 159). Interestingly, the institution of the stock market is also favoured by the communist party in China, the former Chinese leader Zhao Zhi Yang providing a spirited defense of this institution particularly for a developing

communist country. Arguing in Marxist terminology, Zhao suggested that during the 'primary state of socialism', and the 'commodity production' stages of the development of a socialist economy, it is necessary to use various market forms, including stock market. Zhao argued that such institutions should not simply be regarded as a preserve of capitalism: socialism should also take advantage of them, whilst minimizing their harmful effects. He noted that a socialist country is better able to pre-empt the latter through regulation (Singh 1997).

The first comprehensive study on the relationship between stock market development and economic growth was made by World Bank research group (Levine (1996); Levine and Zervos 1998, 1996; Demirguc-Kunt and Maksimovic 1996; Demirguc-Kunt and Levine 1996a, 1996b). They investigated the compatibility of stock market development with economic growth and financial intermediaries, with some empirical evidence. They found that cross- country growth regressions suggested that the predetermined component of stock market development is positively and robustly associated with long-run growth. As per the cross - country analysis, the level of stock market development is positively correlated to the development of financial intermediaries and while stock market development induces substitution of equity finance, it facilitates more debt finance in developing countries. As the theory suggests, by bringing about a greater degree of portfolio and risk diversification, international financial integration may boost the propensity to save and invest and, through this channel, can foster growth (Obstfeld 1994; Deb and Mukherjee, 2008, Hardaker and Masoud 2012, Kirankabeş and Başarir 2012). These results support the complementary hypothesis, that stock market and financial institutions are generally complementary to each other and that they are growing simultaneously. Moreover, the ongoing debt crisis is serving to focus attention on the importance of equity rather than debt, particularly in financing risky projects with long gestation periods.

1.3 Stock Market and the Economy

The recent developments in domestic stock markets, as well as their prospects, would be difficult to understand without considering the trends in global stock markets. Studying how international stock markets have evolved helps not only for setting a benchmark to assess the performance of domestic markets, but also to understand the degree to which local developments are as a result of changes in international capital markets. The spectrum of financial services and instruments widened substantially. Stock markets of Emerging Market Economies (EMEs)[2] have emerged with the advent of new technology, globalization, deregulation and market integration around the globe.

Financial sector depth and activity in the developed economies have started to increase sharply in the early 1970s and boomed during the 1990s. Financial intermediation through financial institutions and security markets expanded at a remarkable rate. The capital allocation process in international capital markets increasingly appears to extend beyond the national boundaries. For global investors and country funds, a highly integrated world stock market indicates that the returns of securities are similarly priced internationally. Further, it implies that the domestic economy is opened up to international competitive pressures, which helps to raise efficiency. It is also very likely that the existence of a domestic securities market will deter capital outflow and provide attractive investment opportunities within the domestic economy. A developed stock market successfully monitors the efficiency with which the existing capital stock is deployed, and thereby significantly increases its average return. As much as the stock market enlarges the financial sector, promoting additional and more

[2] According to Standard & Poor's Global Stock Markets Fact Book (2009: 58) the term "emerging market" implies a stock market that is transition, increasing in size, activity, or level of sophistication. Further, it classifies a stock market as "emerging" if it meets at least one of several general criteria : (i) it is located in a low or middle-income economy as defined by The World Bank(GNI per capita for an economy should exceed the World Bank's upper income threshold for at least three consecutive years. This three-year minimum limits the possibility that the GNI per capita level is biased by an overvalued currency) (ii) it does not exhibit financial depth; the ratio of the country's market capitalization to its GDP is low, (iii) there exist broad based discriminatory controls for non-domiciled investors, or (iv) it is characterized by a lack of transparency, depth, market regulation, and operational efficiency.

sophisticated financing, it also increases opportunities for specialization, division of labour and reductions in costs of financial activities[3].

There are also other developmental benefits associated with the existence of a stock market. First, the stock market provides a fast breeding ground for the skills and judgment needed for entrepreneurship, risk bearing, portfolio selection and management. Secondly an active stock market serves as an 'engine' of general financial development and may in particular, accelerate the integration of informal financial systems with the institutional sector. Securities directly displace traditional assets such as gold and stocks of produce, or many indirectly provide portfolio assets for unit trusts, pension funds and similar financial institutions that raise savings from the traditional sector. Third, the existence of stock market enhances the scope and provides institutional mechanisms for the operation of monetary and financial policies.

1.4 International Financial Integration and Financial Sector Development

In the late 20th century, the forces of supply and demand led to an inevitable growth in the importance of securities. Whether from the perspective of those issuing stocks and bonds, such as governments and business, or from those buying them, including individuals and financial institutions, securities were seen increasingly as either a cheap and convenient means to raise finance or as attractive assets in terms of returns and flexibility. There is also the need to recognize the divergence between the role and importance of a securities market located in major financial centre and those serving the interests of local investors in local companies. Absolute growth in the value of securities in circulation was reflected in their rising importance within the world economy. The empirical evidence clearly shows that more developed countries have deeper and more efficient financial systems, including capital markets (Beck, Demirgüç-Kunt, and Levine 2001). On one hand, financial development may increase efficiency in the mobilization and allocation of resources, allowing countries to grow faster. On

[3] More detailed discussions on this issue are provided in Chapter 3.

the other hand, some authors argue that finance responds almost automatically to the changing demands from the real sector and therefore financial development simply follows economic growth and has very little effect on it. A number of mechanisms can be identified through which financial integration promotes the development of the domestic financial system[4]. The main reasons for this phenomenon includes,

- Financial intermediaries may reduce the costs of acquiring and processing information, as a consequence improving resource allocation and fostering growth. Without intermediaries, each investor would face the large and (mostly) fixed costs of evaluating business conditions, firms, managers, and so forth in order to allocate the savings.

- Increased liquidity constitutes a mechanism for diversification of risk (risk management device), therefore making market participants more prone to invest.

- Financial development may also affect economic growth by reducing the transaction costs associated by collecting savings from disparate investors, thereby increasing savings, exploiting economies of scale, and overcoming investment indivisibilities.

- By having a common trading platform, the high cost of continuous investment in technology updates could be shared among merged/integrated exchanges. It improves the flow of information about activities of companies, which result in the improvement of corporate control and eventually to better corporate governance. In other words, the organizational and managerial structure of the corporations becomes more effective.

International stock markets have grown rapidly in both developed and emerging markets due to gradual dismantling of regulatory barriers. Theoretically,

[4] See Levine (2005) for a detailed discussion.

integration of capital markets is ideal and preferable to segmentation, although there are reservations concerning the feasibility of full-scale integration (Dornbusch, 1988). Several arguments are presented for the desirability of international stock market integration. Based on competitive auction-model, Akdogan (1995) pointed out that in case of no barriers to capital movement, stock market integration leads to a more efficient allocation of the world's resources, and capital will seek higher returns to investment, moving from capital market where capital is relatively abundant to another where it is relatively scarce. These characteristics of capital markets enable the competitive auction-model to function more effectively to economically equilibrate the markets.

1.5. Financial Crises and Contagion

In the economic environment of the information age, the performance of the stock market is considered an important indicator of the health of a nation's economy. Typically, the performance of any stock market is reflected through stock market index/prices. When the stock market tumbles, investors and others become nervous about the weakness of the economy. When the stock market is strong and steady, everyone would sense economic prosperity. The common investor understands that stock market investment is not completely risk-free. Investment risk is quite different from other types of gambling risk, because investment decision making process deals with risk management rather than just taking a blind risk. Risks are usually to be understood as systematic assertions on which an investment decision is based.

Financial markets can function as a vehicle through which resources can flow to places where they are most productive. This eases constraints facing capital starved nations and fosters a more efficient allocation of investment across countries. However, events like the in Mexico, Asia, and Russia as well as the subprime crisis in the US have directed attention towards the potential drawbacks of financial integration for developing countries.

Generally, any potential gain from the international diversification of a portfolio is inversely related to the extent of stock market integration. A low correlation between returns of national and overseas indices allows investors to minimize portfolio risk through international diversification. But diversification and contagion are different sides of the same coin: greater financial integration (especially if not done carefully) increases the risk of adverse contagion in the event of a large negative shock. An analysis of financial integration should weigh the costs with the benefits and designing the financial architecture that minimizes the downside risk while preserving as much of the upside potential as possible.

The international transmission of financial shocks is not a new phenomenon. The terms and conditions of access to international markets for emerging markets are naturally influenced by events in both mature and emerging markets. The timing and virulence of the current crisis do not seem to be adequately explained by the fundamental[5] problems facing many of the countries and markets concerned, particularly in Emerging economies. The so-called 'contagion'[6] effect of the crisis drew a lot of attention to the linkages among emerging stock markets yet reducing volatility and contagion has been an important stated objective of recent reforms.

Contagion refers to the transmission of a crisis from one economy to the others, and has been an important feature in the past financial crisis episodes. It is striking to see from the experience of previous episodes of financial crises, how an initial country-specific shock was rapidly transmitted to markets of very different sizes and structures around the globe. The timing and virulence of financial crises often seem quite unrelated to the fundamental problems facing

[5] 'Fundamentals' refer to macroeconomic indicators, the choice depending on the analysts concerned. Gross domestic product (GDP) growth and the employment rates, government budget deficit, and the economy's current account deficit, both in relation to GDP, top the list. However, there is considerable disagreement regarding the definitions of the fundamentals, how the fundamentals might differ across countries, and the mechanism that link the fundamentals to asset returns.

[6] The detailed definitions of contagion are shown on the World Bank's website: http://www1.worldbank.org/economicpolicy/managing%20volatility/contagion, Also see Nouriel Roubini's website, http://www.stern.nyu.edu/globalmacro. It was accessed on February 9th, 2009.

the countries and markets concerned. It is not uncommon to find crises triggering severe attacks on other currencies, despite the weak linkages of trade and capital flow linkages among the economies concerned. This has prompted a surge of interest in solving the contagion puzzle. Given what the economic and financial instability contagion entails, it is useful to develop an understanding of how shocks can be transmitted between countries, so that steps can be taken to reduce financial contagion, especially in emerging markets which are more fragile, and particularly need stability in order to develop and grow (Cheunga et al. 2010).

In general, we know the kind of effects which a slowdown in growth brings about. First, exports, foreign investments (direct and portfolio) and Official Development Assistance (ODA)[7] flows suffer, reflected in slower growth. Secondly, this means poverty-reduction effects of growth also suffer. Thirdly, government revenue is adversely affected, limiting the fiscal space available to governments. Unlike developed countries, the base for taxes, especially indirect taxes, is narrower in developing countries and tax revenue drops relatively more when there is a slowdown. Even without including off-budget items (such as oil and fertilizer bonds), illustrates the limited fiscal space the government possesses. Fourthly, there are differential spatial effects, since those who are more integrated and connected with global and national markets suffer more. The rural sector, particularly in rice and wheat growing irrigated areas, seems to have offered some kind of a cushion to India in the growth slowdown. (Kumar et al. 2009).

1.6 Importance of BRIC Stock Markets

According to the World Bank, the four biggest emerging markets are Brazil, Russia, India and China (BRIC). These countries made a critical transition from a developing country to an emerging market. Each of them is important as an individual market and the combined effect of the group as a whole will change

[7] It is official financing or other forms of assistance, given by governments to developing countries to promote and implement development.

the face of the global economics. The BRICs come under the largest twenty countries in the world and they are projected to be among the most powerful economies within the next 50 years (Wilson and Purushothaman, 2003; Tamos Fingar 2008). For instance, Brazil and India underwent official equity market liberalization in May 1991 and November, 1992, respectively, and have continued the reform process since then. Major institutional reforms have been implemented in Russia and China including the reopening and establishment of new stock exchanges.

Access to international capital markets has increased as corporations from each BRIC countries have issued Depository Receipts (DRs)[8]. Depositary Receipts (DRs), which include American Depositary Receipts (ADRs)[9] and Global Depositary Receipts (GDRs)[10], are negotiable U.S. securities that generally represent a non-U.S. company's publicly traded equity. Although typically denominated in U.S. dollars, Depositary Receipts can also be denominated in Euros. Depositary Receipts can trade on all U.S. stock exchanges as well as on many European stock exchanges. The increasing demand for Depositary Receipts

[8] Depositary Receipts are created when a broker purchases a non-U.S. company's shares on its home stock market and delivers the shares to the depositary's local custodian bank, and then instructs the depositary bank, such as the Bank of New York Mellon (BNYM), to issue Depositary Receipts. In addition, Depositary Receipts may also be purchased in the U.S. secondary trading market. They may trade freely, just like any other security, either on an exchange or in the over-the-counter market and can be used to raise capital.

[9] A depositary receipt is a negotiable certificate that usually represents a foreign company's publicly traded equity or debt. Depositary Receipts are created when a broker purchases the company's shares on the home stock market and delivers them to the depositary's local custodian bank, which then instructs the depositary bank to issue Depositary Receipts. Depositary Receipts may trade freely, just like any other security, either on an exchange or in the over-the-counter market. Also known as GDRs (Global Depositary Receipts.)

[10] GDRs, same as ADR but typically not registered with the U.S. SEC on Form F-6, and are therefore generally restricted in terms of resales. ADRs are publicly available to U.S. investors on the national stock exchange or in the over-the-counter market; ADRs are privately placed and resold only to Qualified Institutional Buyers (QIBs) in the U.S. QIB PORTAL market; and GDRs are generally available in one or more markets outside the foreign company's home country, although these may also be known as ADRs.

is driven by the desire of individual and institutional investors to diversify their portfolios, reduce risk and invest internationally in the most efficient manner possible. The BRIC equity markets have experienced extremely high growth in 2007 briefly transformed the Chinese (Shanghai and Shenzhen) and Indian (Bombay and NSE) stock markets to the fourth and fifth largest world equity markets respectively by the end of 2007 (World Federation of Exchanges, 2008; Merrill Lynch, 2008). Emerging markets issuers accounted for 58% of DR trading value and 61% of DR trading volume globally. The four BRIC countries alone accounted for 49% of the global value during 2010. DR capital raising transactions were dominated by issuers from China and India (BNYM 2010).

According to Standard & Poor (2008) among the top 40 countries by Market Capitalization, 22 were from the developed markets while the other 18 were from the emerging market economies. In 2008, the United States ranked first in terms of traded value of US $ 36,467 bn and also in terms of market capitalization of US $ 11,738 bn. The United Kingdom ranked second with the traded value of US $ 6,487 bn followed by Japan and then China. In terms of market capitalization, Japan was at second slot with a market capitalization of US $ 3,220 bn, followed by China. India ranked 13th both in terms of traded value (US $ 1050 bn) and market capitalization (US $ 645bn) for 2008. In this context, the study has considered three other major developed markets such as the USA, the UK and Japan to examine the linkages and effects from developed economies to the BRIC emerging economies. Neill and Anna (2009) projections suggest that the BRICs could account for almost 50% of global equity markets by 2050.

In general, the BRICS account for more than 40 per cent of the global population, nearly 30 per cent of the land mass, and a share in the world Gross Domestic Product (GDP) (in Purchasing Power Parity (PPP) terms) that increased from 16 per cent in 2000 to nearly 25 per cent in 2010, and is expected to rise significantly in the near future. If one compares the GDP in PPP terms for 2010, four economies figure among the G-20 top ten, with China, India, Russia, and Brazil, ranking 2nd, 4th, 6th, and 8th, respectively. In terms of contribution towards the

growth of PPP-adjusted global GDP of the world, these five economies accounted for 55 per cent during 2000–8, and their contribution is expected to rise in the coming years. However, as per the criterion of GDP at market prices, among the members of the G-20, China holds the 2nd position while Brazil, India, and Russia hold 7th, 9th, and 11th positions, respectively (Ministry of Finance, Government of India 2012).

1.7 Significance of the Present Study

As in developed markets, emerging markets also offer a wide range of financial instruments which can be bought directly both by domestic and foreign investors. Traditional securities and derivatives markets have developed rapidly and provided helpful supports to international trading activities. In emerging countries like BRIC in general and India in particular where the stock market is undergoing significant transformation with liberalization measures, the analysis of the nature of integration with other developed and emerging markets would not only give an idea of the possible gains to be reaped out of portfolio diversification from emerging markets, but may also provide some indication of the vulnerability of the country's stock market in case of a regional financial crisis and consequent reversal of capital flows from the region. The globalization of financial systems and the acceleration of information transmission have increased the risk of financial crisis, as a crisis in one country can spread to other countries and bring about worldwide crisis. The crises in Mexico, Asia, and Russia as well as the subprime crisis in the US were followed by a sequence of stock market and exchange rate crises in other markets. These financial collapses have driven researchers to ask how such shocks are transmitted internationally and why they have such intensity.

In addition to its severe effects in Asia, the crisis put pressure on emerging markets outside the region, and has contributed to virulent contagion and volatility in international financial markets. International investors need to understand the interdependence of emerging stock markets in order to realize the potential risks and rewards of global diversification. Likewise, policy-makers

need to understand the driving forces behind the emerging stock market interdependence, or contagion means capital outflows when capital is needed the most. This reduces the benefits of financial liberalization.

Further, the causes of such erratic behaviour may be traced to certain trading practices on emerging stock exchanges. High fluctuations of stock prices indices expose genuine investors to grave settlement risks, delays, hassles and poor quality of market services. Abnormally high or abnormally low prices (i.e, prices which deviate far from true values) should get corrected automatically and quickly through market forces themselves in market, which is normal. The behavioural characteristics (euphoria and despondency) of the stock market are going to be a serious problem for the economy in the coming years. This is because of the dependence of the country's future growth on the stock market, which is going to increase in pursuance of liberalization policy. It is therefore high time that systems and practices of the stock market are set right to ensure that it behaves more normally. It is therefore very crucial to test whether there is any comovement in the prices and if it is so, then what are the effects of integration between the countries, especially during crisis periods. Thus, a study on stock market integration and contagion, either theoretical, or empirical, carries a lot of significance. In this context, the present study has much more relevance for BRIC nations in analyzing the process and degree of integration and the contagion effects on those economies for the reason that the authorities have implemented financial policies that are designed to increase the rate of integration of local markets at par with the international markets

1. 8 Research Questions and Objectives

Are capital markets in emerging countries truly underdeveloped, or are they where they would be expected to be, given these countries' macroeconomic and institutional fundamentals? Can the extent of interdependence between the emerging markets be explained and what are the macro economic factors that can influence these emerging stock markets? These are difficult questions to answer, but the analysis in the remainder of this study helps to shed light on these issues.

This calls for an examination of linkages between emerging stock markets. Such an understanding will provide a better grasp of the functioning of the global stock markets, and allow investors and policy makers to ask additional questions such as: Is the level of interdependence among emerging stock markets remaining constant or is it increasing over time? What influence did the 1998 emerging market crisis and 2008 Subprime crisis have on the level of stock market interdependence? Did it cause a permanent or temporary increase in stock market interdependence or did it have no lasting effect? There is a need to understand the driving forces of fundamentals behind the emerging stock market interdependence, and effects of contagion. If the growth rate of a particular emerging market falls due to the current global economic downturn, will its stock market collapse along with all the other stock markets? In addition, if the influence of economic indicators can be estimated empirically, will it enable the policy makers and investors to analyze different scenarios, and predict the effect of certain macroeconomic changes on the correlation between stock markets? Thus, a study on stock market integration and contagion carries a lot of significance at the present context.

In the light of this background, the present study has five main objectives namely,

i) To appraise and analyze the theoretical, historical and institutional structure of modern stock markets.

ii) To assess the impact of macroeconomic variables on the BRIC stock market indices/prices.

iii) To examine the integration of the stock market among the BRIC (Brazil, Russia, India and China) nations in general and their integration with the major developed countries stock markets such as the US, the UK and Japan.

iv) To investigate the effects of contagion from the developed to emerging stock markets with specific emphasis on India.

1.9. Data and Methodology

1.9.1 Nature and Source of Data

This study uses the daily stock price indices for stock markets in the emerging countries namely, India, Brazil, Russia and China (BRIC), and for developed stock markets, namely the US, the UK, and Japan. The study covers the period 1997 to 2010. Different sources for the data have been used. The study depends on the following sources:

1. World Development Indicators data base 2010.
2. Reserve Bank of India (www.rbi.org).
3. The Ministry of Statistics and Programme Implementation.
4. Standard & Poor's Emerging Stock Markets Fact book, (Various issues).
5. www.econstats.com and www.bloomberg.org
6. Economic freedom of the world annual reports (www.freetheworld.com).

1.9.2 Method of the Study

This study reviews different financial and economic approaches that have been developed to measure development, integration and contagion of stock markets. By reviewing these approaches, the study covers a range of important literature on this issue.

In order to examine the stock market development, integration and contagion in global markets in general and BRIC countries in particular, firstly we analyze the history of global stock markets in different phases of their developments, volatile movements and crises. To achieve that end it is vital to place the development of securities markets in their appropriate historical setting and comparisons as an analytical tool in order to produce conclusions of value today. Comparisons are immensely valuable in trying to understand why financial systems diverge and to assess what are the implications of these divergences for economic performance.

As it is widely believed that the stock market reflects the economy so a necessity is felt to understand the effect of macroeconomic factors like money supply, exchange rate, industrial production, inflation, interest rate, fiscal deficit, foreign institutional investment in the capital market, foreign exchange rate etc. Then, the study empirically assesses how the macro economic variables impact on the BRIC stock market prices and what factors bring about volatilities in the stock prices in emerging stock markets. Autoregressive distributed lag (ARDL) approach is applied to explore the long-run and short relationships.

The second stage of the study, in order to examine BRIC stock markets integration with the markets of major developed countries and also among themselves employs the Johansen Juselius cointegration test for estimating the long-run cointegrating relationship. This study also explores the short-run and long run relationships for the stock markets in the BRIC and developed markets by applying Vector Error Correction Mechanism (VECM) approach. As a final step, tests for the causal or informational linkages between different pairs of markets are conducted using the Granger causality test, as this helps to understand the lead-lag relationship between pairs of markets. Further, in order to analyse how the development (including crisis) of developed country's stock market are impacting on emerging stock markets growth and sustainable development, the study examines the effects of contagion from the developed to emerging stock markets, applying the multivariate GARCH model proposed by Engle (2002), which is used to estimate dynamic conditional correlations (DCC) to capture the effects of contagion originating from developed countries. We also investigate the presence of asymmetric responses in conditional variances and correlations during these periods of negative shocks and apply the asymmetric generalized dynamic conditional correlation (AG-DCC) approach.

1.10. Structure of the Study

This thesis proceeds as follows.

Chapter 1 Introductory Background and Objectives of the Study

Chapter 2 Theoretical Aspects of Financial Development and Instability

Chapter 3 Historical Review of the Development and Crisis of Stock Markets in both developed and BRIC stock markets.

Chapter 4 analyzes how the macro economic variables impact on the emerging stock market prices, specially focused on Indian stock markets.

Chapter 5 presents a comprehensive discussion of the literature that has used cointegration approaches to examine stock market integration. It also presents an empirical analysis of the Global stock markets with reference to BRIC countries.

Chapter 6 empirically estimates Effects of Contagion from the Developed to BRIC Stock Markets.

Chapter 7 Summarizes major findings and conclusion.

CHAPTER II

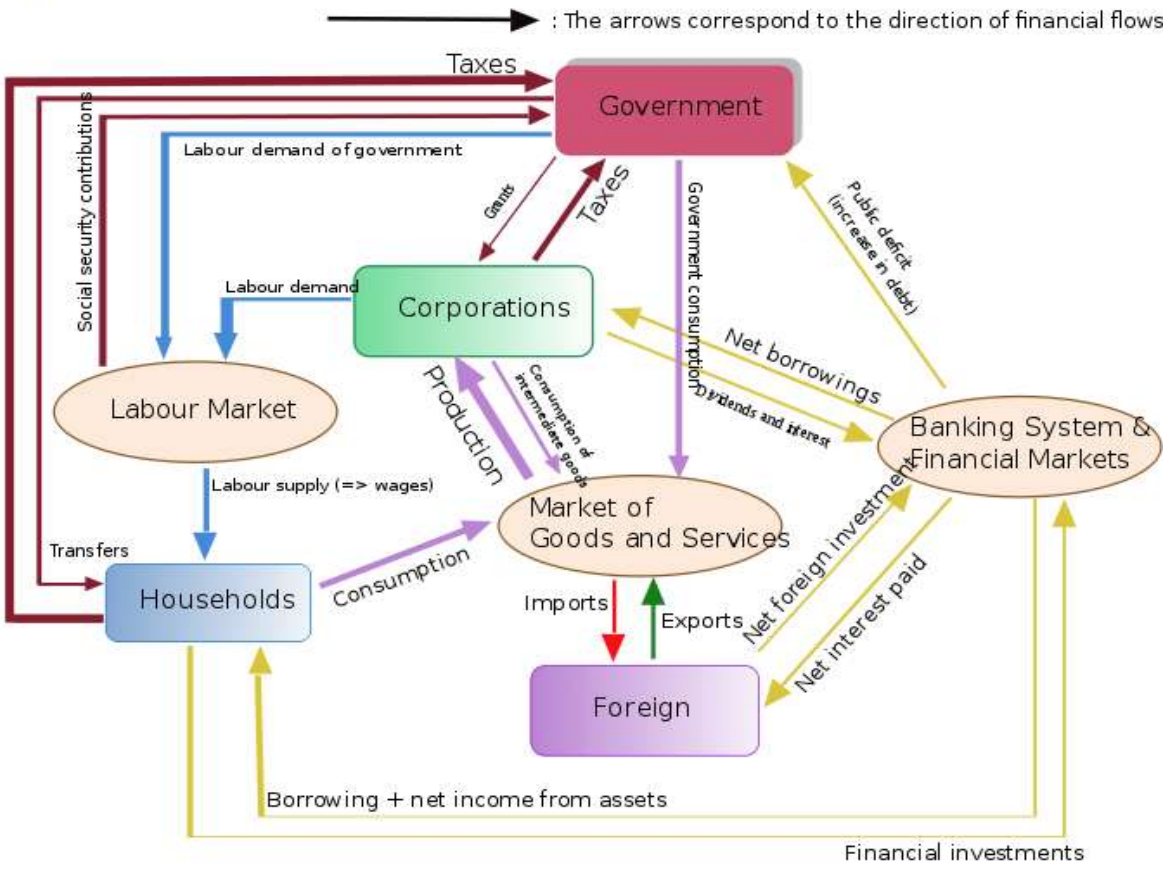
Financial Development and Instability: A Theoretical Perspective

2.1. Introduction

The aim of this chapter is to review the prevailing theories and empirical approaches of financial development and financial instability from a theoretical perspective. Many economists have explained the role of finance and financial instability in the market with the help of different finance theories. The concept of finance and financial instability theory involves studying the various ways by which businesses and individuals raise money, as well as how money is allocated to projects while considering the risk factors associated with them. In this context, seven major theories have been identified for consideration – Classical, Neo-classical, Keynesian, Post Keynesian, New classical, New Keynesian and the new theory of finance which is grounded in the economics of information. This chapter focuses on reviving a modeling tradition that provides a theoretical framework that throws light on recent financial market episodes and disturbances and their macroeconomic effects.

The financial sector mobilizes savings and allocates credit across space and time. It provides not only payment services, but more importantly products that enable firms and households to cope with economic uncertainties by hedging, pooling, sharing, and pricing risks. An efficient financial sector reduces the cost and risk of producing and trading goods and services and thus makes an important contribution to raising standards of living (Copeland 1955 and Goldsmith 1965, 1985).

Figure 2.1: ***Macroeconomic Circulation in an Open Economy***



Source: Davis (2009)

Figure 2.1 shows the macroeconomic circulation in an open economy in a simple flow diagram. The circular flow is a simplified picture of the economy. It divides the economy into four groups—households, businesses, government, and the financial sector. Households receive income from selling the factors of production (land, labour, capital) which they own. Households spend their income on goods and services produced by businesses. Businesses buy the factors of production from households and sell the products they produce back to households. Government receives revenue and spends money providing government goods and services and transfer payments. Financial institutions receive savings from households, businesses, and the government and invest these savings. This role is crucial for two reasons. First, an efficient financial sector assures the movement of savings to the most efficient investments. Investment increases labour productivity and the standard of living which means

a greater variety and quantity of goods and services are available, often at lower prices. Second, households do not spend all of their income. Some is saved. If household saving is not injected back into the circular flow in the form of investment, then income will fall and the country will have a recession.

In view of the importance of the financial sector to economic performance, it is not surprising that both financial institutions and financial markets are subject to regulatory scrutiny. Regulation can be beneficial to those who issue direct claims as well as to those who invest. It also benefits financial intermediaries and their customers if it can reduce expenditures on information gathering and monitoring. Moreover, maintenance of confidence in the safety and soundness of financial institutions is critical to macroeconomic stability (Guttentag and Herring 1987 and Santomero 1992). Even if the government attempts to maintain a stable macroeconomic environment, unanticipated shocks will inevitably occur, and so it is also important that the government foster a resilient financial infrastructure which can withstand volatility in financial market prices without amplifying the shocks to the real economy. This requires attention to the micro-economic structure of financial institutions and markets (Santomero 1991).

When financial institutions and financial markets are efficient, capital is allocated to the most promising projects which are expected to offer the highest, risk-adjusted returns. In addition, a wide array of financial instruments allows savers and investors to achieve their preferred trade-off between risk and return. Confidence in the financial system encourages investors to allocate their savings through financial markets and institutions rather than to invest in non-productive assets in order to hedge against inflation or the risk of financial collapse. As noted above such confidence requires not only some regulation, but also sufficient flexibility to adapt to market needs and opportunities. The financial instability and its spillover to the real sector have become a great challenge to macro-economic theory. The last few decades have seen major institutional changes which many have interpreted as the financialisation of capitalism and the triumphant return of finance capital dominating industrial

and commercial capital (Wehinger 2011). Critical comprehension of contemporary capitalism once again necessitates the development of a theory of finance capital both as an economic structure and as a more general social form of capitalism. In this context, the present chapter provides the theoretical literature on the relationship between finance and instability, classifying theories into Classical, Neo-classical, Keynesian, Post Keynesian, New classical, and New Keynesian schools of thought.

The remainder of the chapter is organised as follows: Section 2 provides overview of different school of macroeconomic thoughts; Section 3 provides brief picture of where does economic thinking stand today.

2.2. Schools of Macroeconomic Thought

2.2.1. The Classical Perspectives

The Classical School of economic theory began with the publication in 1776 of Adam Smith's monumental work, *The Wealth of Nations*. The classical theory is essentially the *laissez faire* belief of pure capitalism. In this view, business cycles are natural processes of adjustment which do not require any action on the part of government. Classical economists maintain that the economy is always capable of achieving the natural level of real GDP or output, which is the level of real GDP that is obtained when the economy's resources are *fully employed*. While circumstances arise from time to time that cause the economy to fall below or to exceed the natural level of real GDP, self-adjustment mechanisms exist within the market system that work to bring the economy back to the natural level of real GDP. According to Say's Law, when an economy produces a certain level of real GDP, it also generates the income needed to purchase that level of real GDP. In other words, the economy is always capable of demanding all of the output that its workers and firms choose to produce. Hence, the economy is always capable of achieving the natural level of real GDP.

Thomas Robert Malthus questioned the automatic tendency of a market economy to produce full employment (Teixeira et al. 2011). He blamed unemployment upon the economy's tendency to limit its spending by saving too much, a theme that lay forgotten until John Maynard Keynes revived it in the 1930s. Coming towards the end of the Classical tradition, John Stuart Mill parted company with the earlier classical economists on the inevitability of the distribution of income produced by the market system. Mill pointed to a distinct difference between the market's two roles: allocation of resources and distribution of income. The market might be efficient in allocating resources but not in distributing income, he wrote, making it necessary for society to intervene (Freeman 2011).

Pro-globalization arguments for the extension of market capitalism are fundamentally Smithian in their advocacy of a world –wide division of labour and free trade, with states largely restricted to the provision of public goods and the facilitation of the market mechanism (Wolf 2004). Adam Smith's invisible hand argument, contending that markets lead to efficient resource allocations, has had enormous influence (Stiglitz et al. 1999). Yet, in the past fifteen years, we have seen how circumscribed the conditions under which Smith's invisible hand theorem holds are. In particular, whenever markets are incomplete and information is imperfect - that is, essentially always markets are not even constrained Pareto optimal. Even Marx agreed that the division of labour, competition and trade were responsible for the hitherto unprecedented expansion of human welfare; but he believed that smith had misunderstood the nature of the 'invisible hand' and its eventual consequences (Kolakowski 1978). For Marx, the capitalist system was to be explained not simply by the technologically determined division of labour and market exchange, but rather, by the inherent inequality of power of capitalist property relations. Furthermore, the market's efficiency was ultimately negated by contradictory and eventually destructive tendencies.

Stock market has long been the popular symbol of capitalism, both to its critics and its proponents. Engels, for example, wrote in 1895 that the stock exchange

had become 'the most pre-eminent representative of capitalist production' (Marx 1906, Vol.III, pp. 1045-7). An ideal of widespread ownership of corporate shares is sometime advocated as 'people's capitalism'. Certainly, capitalism has long been associated with stock markets in popular function.

However, Marx's understanding of capitalism's instability is marked by underestimation of the role played by money in the crisis. Marx correctly identified the capitalist mode of production's distinctive Money–Commodity-Money (M-C-M)[1] circuit (Kolakowski 1978). But, in common with Adam Smith and most nineteenthcentury economic thinkers, Marx was less clear about the way in which capitalism is uniquely characterized by a banking system that can create an unlimited amount of credit- money that fuels the crises either through the financing of overproduction and/or speculation (Stiglitz et al. 1999). The nature of money and the relationship between currency and bank credit were the subjects of an intense debate in Britain during the first half of the nineteenth century. Theoretically, Marx tended to side with the 'metallist', or commodity, theories of money that were used to explain the gold standard. For Marx, bank credit merely represented 'real' money and Marx focused on its essentially dysfunctional role as 'fictitious capital' that exacerbated crises of overproduction (see Ingham 2004: 61-3). Marx did not pay attention to the potential role interest might play in the determination of production costs and prices. Such an effect could result in interest affecting both the inter-class and the intra-capitalist income distribution (Argitis, 2001).

Marx's view of the role of financial phenomena in the accumulation process might be summarized as follows: financial intermediation is an important and often dominating accelerator and destabilizer of the growth process (Stiglitz et al. 1999). Financial markets push the accumulation process forward in the upswing, driving it at a pace it could not otherwise attain, while they simultaneously give

[1] In Marx's circuit, M-C-M´, the ultimate aim of the individual capitalist is to increase his or her monetary wealth. The ultimate object of capital is to transform mere use-values into exchange-values and to convert surplus-value into profit through the well-known circuit, M-C-M´.

rise to the growth process a characteristic that Minsky (1982) calls 'fragility' and Marx, called' 'oversensitivity'(Crotty 1985). In Marx's scheme, adverse economic developments which might cause only a mild and temporary hesitation in an ongoing expansion in the absence of an oversensitive financial environment can generate a crisis and collapse in its presence. Moreover, semiautonomous disturbances in the financial sector can itself initiate a crisis if the system is oversensitive. And an overextended, oversensitive financial system can turn what might have been a mild downturn into a financial panic and depression.

2.2.2. Neo-classical Perspectives

Neo-classical theory is essentially equilibrium theory, and as a rule, a strong tendency towards equilibrium is explicitly or implicitly assumed. Prices are supposed to contain all the relevant information upon which decisions are to be taken. On account of the homogeneity of financial assets financial markets are considered most perfect. Given this, Walras considered the stock exchange the ideal market where the auctioneer can easily establish the equilibrium between supply and demand. In neoclassical theory money and finance are certainly important, though not fundamentally important. And if theory is compared with the real world events, then the relationship between money, the banking system, specifically bank credits, and financial markets and the markets in the real sector is not clear at all. In fact, money is notoriously unimportant in neoclassical theory, banks channeling the savings into the most profitable investment projects and financial markets simply seem to reflect what happens in the real markets (Bortis 2003).

The modern version of Say's Law states that the rate of interest brings saving and investment into equilibrium, implying that saving, whatever its amount, tends to get invested. In this view, the financial sector constitutes an extremely efficient market to direct saving to the most profitable investment projects. Share prices established at the stock exchange indicate growth possibilities to enterprises and, simultaneously, provide them with the

financial means to realize this growth. Saving thus governs investment and the rationality of individuals coincides with the rationality of the system. Hence utility and profit maximizing behavior of all individuals results in a general equilibrium which is also a social optimum. Prices summaries all the relevant information and lead the economic actors from disequilibrium to equilibrium. Or, in the case of rational expectations, economies are always in equilibrium and prices indicate equilibrium positions, around which estimated and realized prices and earnings are normally distributed. According to this theory, prices changes would reflect shifts in equilibrium positions; such shifts are supposed to be caused by external factors, which, if considerable in size, become external shocks (Bortis 2003).

Several problems have prevented the neo-classical theory of stock markets from becoming as well developed as the neo-classical theories of product markets and factor markets. One major problem stems from the frequent identification of the stock market as the 'capital' market, or at least as significant part of that market. There has been continuing problem in economic theory of multiple conceptual meanings of the term 'Capital'. Not only has this contributed significantly to the difference between economists' and non-economists' perceptions of the role and functions of stock exchanges as capital markets, but it has been a thorny issue among economists as well. Machlup (1940), for example, noted that the one word 'capital' was used for three concepts: the produced means of production, the funds made available for the construction of such goods and the funds already invested in such goods (pp. 8-9) and with in that context he described capital markets as having the function of facilitating the exchange of money capital against titles to real capital (Machlup 1940: 10-11). Others might argue, however, that the problem will be solved only when there is a single concept rather than two.

Fisher (1930) argued that cycles occur because of inconsistencies at any one time between a whole range of variables, such as investment, the capital stock, and industrial and agricultural prices. But serious 'over-speculation' and crises are

caused by the interaction between debt and 'the purchasing power of the monetary unit'. Irving Fisher on finance has tended to be obscured by the blow that his reputation suffered after his pronouncement, on the eve of the 1929 Crash, that 'stock prices have reached what looks like a permanently high plateau'. Shortly after the Crash, he published a book entitled *The Stock Market Crash – And After (1930)*, in which he argued that the stock market boom that preceded the Crash was justified by structural improvements that had taken place in the US economy during the 1920s. Mergers and acquisitions, he felt, allowed economies of scale to take place, along with scientific breakthroughs and innovations.

The modern neo-classical view of finance has been dominated by 'irrelevance theorems' associated with Modiglinai and Miller (1958, 1961). Modiglinai and Miller (1958) showed that in fully developed capital markets under neo-classical assumptions of perfect competition, no transaction costs and no taxation, even in a world of uncertainty, the stock market valuation of the firm is independent of its financing or dividend payout decisions. On the basis of certain further restrictive assumptions about expectations and the nature of uncertainty (and uniformity in expectations and the nature of uncertainty (e.g. uniformity in expectations held by all investors on the stock market), it was established that the market would value the firm's shares entirely on the basis of its earnings prospects; share prices would be invariant to the capital structure of the firm or to the extent to which it resorts to internal or external sources of finance based upon its investment plans.

2.2.3. Keynesian and Post- Keynesian Perspectives

The Keynesian school of thought began with John Maynard Keynes, who developed an alternative to the classical economic school as a result of the realities of the Great Depression in the 1930s. Keynes believed that wages and prices were resistant to downward pressure, so that the self-correcting mechanism could not kick in: lower wages and prices are the necessary incentive

for self-correction, in the classical view. Indeed, ever since Keynes' time, historical events have shown that wages and prices are indeed resistant to downward pressures. Since this self-correction would not occur, Keynes advocated government intervention, but only during times when the economy was in a recession or a depression. His advice was strong fiscal and monetary policies in order to correct the economy. A central conclusion of Keynesian economics is that there is no strong automatic tendency for output and employment to move toward full employment levels (Snowdon et al. 2005).

The Keynesian perspective on the role of finance in investment and economic growth is similar to the Modigliani and Miller view except that it takes a macroeconomic approach and assumes imperfect capital markets, especially in relation to the costs, the reliability and the availability of relevant information on equal terms to all the participants in the market. According to the Keynesian (1936) view, investment is essentially determined by "animal spirits", by businessmen's confidence and the expected demand. While in principle, the rate of interest, i.e. the cost of funds, matters, it is in practice regarded as being relatively insignificant compared to the demanded factors. By not recognizing the assumption of perfect markets, the Keynesian view finds the Modigliani and Miller's propositions inoperable in the real world. The propositions also run contrary to the traditional view described as the "pecking order" of finance that suggests that firms always prefer internal to external finance (Myers, 1984; Myers and Majluf, 1984). If they have to use external finance, they would prefer to employ debt whose cost is lowered by the tax advantage and only use equity finance as a last resort. A firm's capital structure and its dividend payout decisions would thus be important variables as they have an independent influence on its share price. Hence, the availability of the appropriate kind of finance could constrain a firm's growth or investment plans.

Keynes (1936: 159) did argue that speculation can have adverse effects on real economic outcomes. Keynes suggested that public access to financial markets

should be, like access to Casinos, "inaccessible and expensive". Indeed, after the collapse of the Wall Street stock market in the 1930s, Keynes (1936: 160) suggested that the "introduction of a substantial Government transfer tax on all transactions might prove the most serviceable reform available, with a view to mitigating the dominance of speculation over enterprise in the United States" and believed, that it required the creation of new, more powerful government institutions charged with controlling the outcomes of economic activity.

Keynes and Post Keynesians reject the classical ergodic axiom of efficient market theory to explain the financial market behavior. This is so since in an uncertain world future market valuations are always uncertain because the future is subject to sudden and violent changes and fundamentals do not provide a reliable guide to the future[2]. Thus, speculation is not an "anomaly", explained by the existence of foolish "noise traders"; on the contrary, it is a consequence of the operational way in which financial markets work in the real world. For Keynes and Post Keynesians, the outcome of speculation is ambiguous, because it can be disruptive with real consequences, devastating particular sectors as well as whole economies, once it creates speculative whirlpools; but at the same time it provides liquidity assets, an essential role of the financial markets.

In the Post Keynesian view (Lavoie, 1992; Davidson, 1994) the axiom of money neutrality does not work, because in a world under incalculable uncertainty, money – as the object that liquidates contractual commitments denominated in the money account – can be held as a safety asset in moments of greater uncertainty by its characteristic of transporting purchasing power over time[3]. So liquidity preference can grow if entrepreneurs and speculators have contractual obligations and there is some degradation in the state of confidence. As the state of confidence is subjective, there is room for diversity of opinions about the future. And, if there is diversity of opinions and organized markets designed to

[2] See, particularly, Keynes (1936, Chapter 12) and Davidson (1997, 1998).
[3] This idea is clearly developed in Keynes (1936, Chapter 17) and Davidson (1994, Chapter 6).

give liquidity to assets, then there will be several opportunities for speculative activities to emerge.

How does finance affect income and profit determination and distribution? Before turning to discuss these issues, let us first introduce finance in Kalecki's (1971) profit model, which is a gateway in Minsky's financial instability hypothesis. Kalecki in different parts of his work refers to the role of rentiers and financial leaders. However, he never considers any independent and major role of finance in production and especially in distribution. Following Marx's two class model, Kalecki conceptualizes finance capital as a section of capital and financial profits as a fraction of capitalist profits. In addition, his seminal analysis on the political business cycle possibly reveals his belief in the unity of interests between the two sections of capital. This might explain why monetary and financial forces are underestimated in Kalecki's work.

The Marxian problem of the realization of surplus-value plays a central role in Kalecki's principle of increasing risk. As capital accumulation proceeds, the volume of profits encounter barriers in terms of the increased demand for money required to finance investment in order to realize future profits. A falling rate of profit implies that the increase in the mass of surplus-value confronts problems of realization. In other words, an over-accumulation crisis emerges as markets are saturated. Kalecki's reflux theory of profits thus rejects the conventional neoclassical view that saving limits an investment. Instead, capital accumulation is limited by internal financing, which reflects the level of the firm's reserves; and by the state of liquidity in the economy as a whole which, in turn, affects the rate of interest (Toporowski, 1994: 23).

The central core of Keynes's and Kalecki's economics is effective demand theory, but their views differ with respect to the effectiveness of fiscal and financial policies. These differences come from their views about how the capital system works. Keynes grasped it as the system where money has a peculiar role as liquidity preference theory demonstrated. Whereas, Kalecki thought that the

system suffered chronically from shortages of effective demand due to institutional aspects intrinsic to the capitalist economy.

In a Post Keynesian view (Holt et al. 2001) the presence of uncertainty makes possible seeing the instability as an endogenous phenomenon, mainly in the case where markets participants are free to do what they want. In a global and uncertain world we cannot understand financial instability and speculative attack as "anomalies". On the contrary, they are expected and possible outcomes that emerge from the operation of global financial markets in a system where there is not a safeguard framework that exerts the role of an overall market maker.

2.2.4. Neo-Keynesian Perspectives

Neo-Keynesianism was developed in the first half of the 1950s under the influence of the deepening general crisis of capitalism and the related transition from monopoly to state-monopoly capitalism, the scientific and technological revolution, the economic competition between the two world systems, and the collapse of imperialism's colonial system. Faced with new historical conditions that made the rate of economic growth a matter of life and death for capitalism, neo-Keynesianism could not limit itself, as had J. M. Keynes' theories, to a consideration of the problems of anticrisis economic policy. Therefore, neo-Keynesianism focuses on the quantitative relationships of extended capitalist reproduction or, in neo-Keynsian terms—the problems of economic dynamics and economic growth, which serve as the chief theoretical foundation for the economic policy of state-monopoly capitalism (Palley 2005).

Neo-Keynesianism's point of departure is the chief premise of Keynesian economics: that capitalism has lost its spontaneous mechanism for restoring economic equilibrium and that, consequently, state regulation of the capitalist economy is necessary (Neary 1986). However, neo-Keynesianism calls for systematic, direct influence by the bourgeois state on the capitalist economy, whereas Keynesian theory advocates periodic, indirect influence on the economy.

In this respect, neo-Keynesianism reflects a more mature level in the development of state-monopoly capitalism. The maturation of state-monopoly capitalism has been accompanied by changes in the fundamental problems confronting the bourgeois conception of state regulation of the economy. The emphasis has shifted from the theory of employment, which is oriented toward anti crisis regulation of the economy, to theories of economic growth, whose goal is to find ways to ensure stable rates of economic development for the capitalist system.

Hicks (1989) developed a theory of endogenous money embedding evolutionary and quantitative endogeneity. He envisages monetary arrangements as evolving toward Wicksell's pure credit economy, with non-interest bearing money ceasing to be a reserve asset and all money becoming just a debt. His resolution of the excessive lending-price indeterminacy problem rests on lack of sufficient trustworthy borrowers. Hicks points out to the neo-Classical "myth" that all economic problems can be solved by the price mechanism. According to him, there is considerable scope for intervention. Modiglinai and Miller (1958) showed that in fully developed capital markets under neoclassical assumptions of perfect competition, no transaction costs and no taxation, even in a world of uncertainty, the stock market valuation of the firm is independent of its financing or dividend payout decisions. On the basis of certain further restrictive assumptions about expectations and the nature of uncertainty (e.g. uniformity in expectations and the nature of uncertainty and uniformity in expectations held by all investors on the stock market), it was established that the market would value the firm's shares entirely on the basis of its earnings prospects; share prices would be invariant to the capital structure of the firm or to the extent to which it resorts to internal or external sources of finance its investment plans.

Tobin (1958) showed how investors should divide their funds between safe liquid assets and risky assets and proposed a framework for asset allocation that is intuitively appealing. Tobin suggested a breakdown of the portfolio selection problem into stages at different levels of aggregation- allocation, first among and

then within, asset categories. The asset mix should reflect the degree of risk tolerance of the investor. The optimal portfolio of risky assets, however, should be independent of the risk preferences of the investor. This proposition, known as the separation theorem, provides a basis for identifying the efficient portfolio and clarifies the task of portfolio selection.

However, Keynesianism was wiped out by *Monetarism* (Friedman) in the mid 1970s on the account that an increase in the quantity of money would not lead to lower interest rates and higher levels of investment and employment, but would simply result in inflation.

2.2.5. Monetarism

Monetarism embraced a range of different theoretical perspectives, whose common theme was that of the need to maintain monetary stability to ensure smooth operation of the market and achieve full employment equilibrium. Monetarist ideas are represented in the writings of Friedman (1960, 1968, and 1969) and Friedman and Schwartz (1963). In the 1960s and 1970s, the approach was viewed as an alternative to Keynesianism, with different implications on how policy should be conducted. The counter-revolutionary Milton Friedman was keen to emphasize that he sought to resurrect an older tradition, the quantity theory of money, as a tool for theoretical and empirical research that viewed money as the root-source of major economic calamities, chief driving factor behind cyclical instabilities, and the determinant of the secular trend in prices. Friedman observed that the quantity theory tradition had fallen into disrepute in the context of the Great Depression and explanations of that traumatic event which characterized the monetary policy as a passive factor in bringing it about had an impotent cure once it had arisen.

Friedman put much weight on empirical analysis and the approach was often grounded only informally in theory—even if some of his works, such as the theory of the consumption function in Friedman (1957), is concerned with what we would call micro - foundations. The central canons of Monetarism include the

following: i) Sticky prices, while possibly important in generating short-run non-neutralities, are unimportant for monetary policy. ii) The quantity theory of money is an essential building block. There exists a demand function for money which is an empirically stable function of a few variables.

2.2.6. New Classical Perspectives

The basic tenet of the New Classical School of thought is the policy ineffectiveness proposition in which it is postulated that no systematic stabilization policy either fiscal or monetary has any real influence on the economy, except on nominal variable. According to them, policy can only have a real effect if it is unanticipated. Their methodology is to built on the tradition of sophisticated mathematical general equilibrium model in which all individual economic agents are assumed to be rationally optimizing. And this is the approach encountered in the standard classical business cycle theory (Alege 2009).

The New Classical model is built around certain assumptions including the Friedman's market-clearing, imperfect information as well as the assumption of rational expectations. The latter is based on the belief that people make their best forecasts of the future based on all data currently available rather than having to learn and catch up with the current situation. In rational expectation models individuals are forward-looking and they adjust their expectations to their best forecasts of the future. With rational expectation, errors in expectations occur only randomly and independently. What is important to business cycle theory is the behavior of the supply curve. In this respect, a distinction is generally made between local and aggregate supply curve (Alege 2009).

In effect, an individual will be willing to supply more if the price of his/her product rises relative to the general price level. In this case, it is assumed that individual knows the price of one's own product but as a result of information, asymmetrically could not directly observe the price of other products- a situation generally described as "Lucas Island". Consequently, once there is any price

change, then the individual must infer whether it is a local or an aggregate price shock. Given the possibility of an individual making incorrect guesses, the economy is bound to deviate from the natural level of GDP and generate business cycle. Such circle known as real business cycle, RBC, results from "agents' willingness to trade-off work and leisure between the present and the future since there was an anticipated change between the current and future real wage rate" (Snowdon et al. 2005). The RBC theory emphasizes micro-economic foundations of the macroeconomy to highlight the possible existence of cycles in a generally equilibrating economy.

The first wave of new classical economics was monetarism, and its most notable proponent was Milton Friedman. Friedman's (1957) early work on the permanent income hypothesis was not directly about money or the business cycle, but it certainly had implications for business cycle theory. It was in part an attack on the Keynesian consumption function, which provided the foundation for the fiscal policy multipliers that were central to Keynesian theory and policy prescriptions. If the marginal propensity to consume out of transitory income is small, as Friedman's theory suggested, then fiscal policy would have a much smaller impact on equilibrium income than many Keynesians believed.

Robert Lucas extended Friedman's argument. Lucas (1976) argued that the mainstream Keynesian models were useless for policy analysis because they failed to take expectations seriously; as a result, the estimated empirical relationships that made up these models would break down if an alternative policy were implemented. Lucas (1973) also proposed a business cycle theory based on the assumptions of imperfect information, rational expectations, and market clearing. In this theory, monetary policy matters only to the extent to which it surprises people and confuses them about relative prices. Following Sargent's (1979) contribution, rational expectationists, who also adhered to the principle of equilibrium theorizing, became known collectively as the new classical school. As the label infers, the new classical school has sought to restore classical modes of equilibrium analysis by assuming continuous market clearing

within a framework of competitive markets. The assumption of market clearing, which implies perfectly and instantaneously flexible prices, represents the most controversial aspect of new classical theorizing.

The development of the New Classical macroeconomics brought about the revival of business cycle theory. The New Classical paradigm tried to account for the existence of cycles in perfectly competitive economies with rational expectations. It emphasized the role of imperfect information, and saw nominal shocks, in the form of monetary misperceptions, as the cause of cycles. The New Classical theory posed a challenge to Keynesian economics and stimulated the development of both the New Keynesian economics and Real Balance Cycle theory (Kydland and Prescott 1982 and Long and Plosser 1983). The New Keynesian economics has generally accepted the idea of rational expectations, but emphasized the importance of imperfect competition, costly price adjustment and externalities and considered nominal shocks as the predominant impulse mechanism (Stadler 1994). But unlike the new classical predecessors, the real business cycle theories omitted any role of monetary policy, unanticipated or otherwise, in explaining economic fluctuations. The emphasis switched to the role of random shocks to technology and the intertemporal substitution in consumption and leisure that these shocks induced.

During the 1990s, the debate between new classical and new Keynesian economists led to the emergence of a new synthesis among macroeconomists about the best way to explain short-run economic fluctuations and the role of monetary and fiscal policies. The heart of the new synthesis is the view that the economy is a dynamic general equilibrium system that deviates from an efficient allocation of resources in the short run because of sticky prices and perhaps a variety of other market imperfections.

2.2.7. New Keynesian Perspectives and the Myth of Market Efficiency

New Keynesian philosophical foundation is rooted in the Keynesian mainstream. However, its main difference lies in the methodological approach to analyzing

business cycle phenomenon. It assumes the existence of (1) involuntary unemployment (2) monetary non-neutrality and (3) short-run inflexibility of wages and prices. The proponents of this school rely on sticky wages and prices to explain the existence of involuntary unemployment and why monetary policy is non-neutral on economic activities. Gordon (1990) provides a coherent theoretical explanation for the sluggish behaviour of prices and these include menu costs and aggregate-demand externalities: prices do not adjust spontaneously to clear market because information is costly; the presence of staggering prices phenomenon; possibility of coordination failure resulting into recession; and presence of efficiency wage theory which is defined as a function of the wage received.

The theoretical model of NKS is based on rational expectations and microeconomic foundation and usually summarized in three equations that depict the optimizing behavior of economic agents in the economy. These are the aggregate demand curve or the traditional Keynesian IS curve; the aggregate supply which takes the form of money demand relationships; and forward-looking version of the Phillips curve. In general, NKS characterizes the dynamic behavior of output, inflation and nominal interest rate.

The NKS share common features with the earlier generations of RBC by retaining the idea that technology shocks can be quite important in shaping the dynamic behaviour of key macroeconomic variables (Ireland, 2004). The proponents of this school believe that other shocks might be important and in particular that the presence of nominal price rigidities "helps determine exactly how shocks of all kinds impact on and propagate through the economy". Their popular model is the dynamic stochastic general equilibrium model (DSGEM).

Thus, based on formal DSGEM, NKS proponents have been examining quantitatively and with the aid of econometric methods the features and business cycle fluctuations of an economy. In general, their results have reinforced the conclusion that nominal shocks are as well important as technology shocks. In

spite of its small size, the DSGEM is popular among researchers including Mankiw (1989), Clarida, Gali and Gertler (1999) and Negro et al. (2007).

Until the Keynesian revolution in mainstream economics in the wake of the Great Depression, classical and neoclassical explanations (exogenous causes) were the mainstream explanation of economic cycles; following the Keynesian revolution, neoclassical macroeconomics was largely rejected. There has been some resurgence of neoclassical approaches in the form of real business cycle (RBC) theory. The debate between Keynesians and neo-classical advocates was reawakened following the recession of 2007.

This Global financial crisis that got into swing in 2007––2008 could be considered in the terminology of Rasmus (2010, 136-145) as an "Epic Recession" that should be understood in contrast to a "Normal Recession". Unfortunately, very few heeded warnings disseminated by Wray (2003) of a coming and ""perfect fiscal storm:" an outcome he conjectured would result from relying upon private and not public debt for driving a "Goldilocks' expansion". Descriptively, this maleficent business cycle has led toward a destabilization of our capitalistic system, contributing to increases in economic insecurity through inducing declines in incomes and purchasing power for millions of people. Unlike normal recessions, Epic Recessions of the current type 2007-10 are driven in the short run by processes of debt – deflation – default and the interaction of these process with conditions of financial and consumption fragility. But the long-run causes of Epic recessions are rooted in the origins of financial and consumption fragility – i.e. the rising debt, debt repayment and declining income. In the long run the major causes of rising debt and declining income were derived from the growing relative shift toward speculative forms of investing, their negative consequences for investing in real assets, and the global money parade's access to ever increasing availability of liquidity and credit (Rasmus 2010).

Given this theoretical review, we now turn to the next section in which empirical evidences relating to financial development and instability are considered elaborately.

2.3. Capital Markets and Economic Development: Empirical Studies[4]

The core of modern finance can be encapsulated in four components, namely: the efficient market hypothesis (EMH), the tradeoff between risk and return encapsulated in the Capital Asset Pricing Model (CAPM), the Modigliani-Miller Theorem (M and M) and the Black Scholes-Merton approach to option pricing. The efficient market hypothesis is the basis for the three other components of the core. It was formulated initially in its strong form stating that asset prices fully reflect all available information. This excludes the possibility that trading systems such as the stock market 'based only on current available information … have expected profits or returns in excess of equilibrium expected profit or return' (Fama, 1970: 384).

Fama (1970) defined 'efficient markets' as existing when trading systems based on available information fail to produce profits in excess of the market's overall rate of return. Fama reported on three different sets of tests of market efficiency: the weak form in which price behavior contains no information useful for predicting future price's behavior; the semi-strong form in which public information has already been impounded in prices; and the strong form in which all information, including inside information, has been impounded in prices. Fama (1991) changes the three categories of market efficiency to return predictability, event studies and private information. 'Return predictability' refers to whether future returns (or prices) can be predicted based on current information. If the market is efficient, future returns will be predictable. 'Event studies' refer to a particular method of testing whether asset prices reflect efficiently the information being released. If the market is efficient, asset price

[4] More details of studies provided in every chapter in the section of review of literature.

will quickly reflect the newly released information and trading based on private information will not yield abnormal profits.

In financial theory the relationship between risk and return focuses on the explanation of the risk premia (the difference between expected returns and the riskless rate of interest) analyzed by the Capital Asset Pricing Model (CAPM) which is an extension of Markowitz's (1987) mean-variance portfolio model. Markowitz's model argues that, given the risk-averse characteristics of agents, they focus only on the mean and variance of their returns. In particular, investors chose portfolios to minimize the variance of returns, which is the measure of risk, for a given expected return and maximize expected returns for a given risk (Fama and French, 2004). Markowitz showed that in a world in which the capitalist economies experience business cycles that are not synchronized with each other, a portfolio of financial investments may be stabilized by holding financial assets in markets whose cycles are not correlated with each other.

The CAPM analyzes the relationship between risk and return under conditions of market equilibrium. In the CAPM model portfolio optimizing agents meet in the marketplace, their interaction drive prices to market equilibrium and they agree on the joint distribution of asset returns. The importance of CAPM is that it allows financial markets to quantify the risk of a portfolio. In the late 1970's, however, the validity of CAPM was seriously questioned, mainly Roll (1977) both on conceptual and empirical grounds (Roll and Ross 1980). During the mid 1970's, Ross (1976) developed an alternative pricing model called Arbitrage Pricing Theory (APT). The core idea of Ross's APT is that only a small number of systematic influences affect the long-term average returns on securities. APT includes multiple factors that represent the fundamental risks in asset returns and thus the prices of securities. The final pillar of modern finance is the Black-Scholes-Merton option-pricing model. An option is defined as a contract between a buyer and a seller that gives the buyer the right but not the obligation to buy or sell a particular underlying asset within a certain time period at a specified price (i.e., the strike price or the price at which the contract can be exercised). The

underlying asset in question can include common stock, property, or a physical commodity. Central to option pricing theory is the determination of the cost or value of the option. The value can depend on many factors including the current market price of the underlying asset, the exercise price of the option, the maturity date of the option contract, the speculative premium of the option (estimated deviation with respect to the price of the underlying asset over the life of the option), and the risk free interest rate. Using these variables, as noted by Taleb (2007: 278-79), Black, Scholes and Merton "improved on an old mathematical formula and made it compatible with Gaussian general financial equilibrium theories." The formula already existed, but was not compatible with the risk free general equilibrium environment, and that was the contribution of Black, Scholes and Merton. Their model showed that it was possible to construct a riskless portfolio through dynamic hedging, that is, by taking positions in bonds (cash), options, and the underlying stocks. According to their reasoning changes in the value of the option would be offset by equal changes in the value of the underlying stock and cash.

The four building blocks of modern finance were developed separately, at different stages of the thinking in financial economics, under different circumstances and for different purposes (Fox, 2009). Nonetheless, these four theorems share, in the main, a common set of fundamental assumptions. These theorems assume some form of existence of perfect capital markets – no taxes, no transactions costs and even in case of M and M there would be no danger of bankruptcy – that agents have equal access to information and capital markets; agents and prices adjust rapidly and continuously to new information and that decisions are made solely on the basis of expected values and standard deviations of the returns on the portfolios and that all agents have homogenous expectations. Their conceptual similarity allows these to be articulated to form a coherent framework of analysis with definite implications for the practice of finance. However, over the years, the empirical evidence for the EMH has been shown to be less and less convincing, to the point that Eugene Fama, the high priest of market efficiency, suggested that markets produce consistent mistakes,

even though that may not imply that a professional investor would be capable of beating the market. Shiller (1981) has shown, for example, that even though financial theory argues that stock prices are the current value of expected dividends, the evidence shows that the former are considerably more volatile than the latter. The critiques of financial theory within the mainstream are based on what has been called behavioral finance. Behavioral finance argues that some features of asset prices are most plausibly interpreted as deviations from fundamental value, and that these deviations are brought about by the presence of traders who are not fully rational. A long-standing objection to this view that goes back to Friedman (1953) is that rational traders will quickly undo any dislocations caused by irrational traders[5]. Friedman's line of argument is initially compelling, but it has not survived careful theoretical scrutiny. In essence, it is based on two assertions. First, as soon as there is a deviation from fundamental value – in short, a mispricing – an attractive investment opportunity is created. Second, rational traders will immediately snap up the opportunity, thereby correcting the mispricing. Behavioral finance does not take up issue with the second step in this argument: when attractive investment opportunities come to light, it is hard to believe that they are not quickly exploited. Rather, it disputes the first step. When an asset is wildly mispriced, strategies designed to correct the mispricing can be both risky and costly, rendering them unattractive. As a result, the mispricing can remain unchallenged.

Theories based on asymmetric information have flourished extensively in the literature and address the labour and consumer goods as well as capital markets. Asymmetric information leads to problems of adverse selection ('sorting effects') and moral hazard ('incentive effects'). As noted above, Keynes recognised these effects as a source of lender's risk. They are well illustrated in Akerlof's celebrated example of the market for second-hand cars (Akerlof, 1970). The market price of a car known by the seller to be in perfect condition is discounted

[5] Irrational traders are often known as "noise traders", rational traders are typically referred to as "arbitrageurs".

to the price of the average car because the buyer cannot be sure of its quality. Conversely the seller who knows he has a 'lemon' has an incentive to withhold this information. In this case asymmetric information provides an economic basis for the costs of expert inspection and purchased warranties to overcome the asymmetry. If such counter-measures are not available, high-quality sellers may stay out of the market and the poor quality of the remaining supply may lead ultimately to complete market failure. This insight has been applied extensively in the theoretical finance literature. Stiglitz and Weiss (1981) had developed a theory of credit rationing based on lemons when lenders share in the risk of default. Such 'risky debt' contracts are the optimal investment contract under asymmetric information, compared with either equity or secured debt. The proposition is that the price (interest rate) affects the nature of the transaction and therefore may not also clear the market. The interest rate affects the riskiness of the loan portfolio through adverse selection[6] and moral hazard[7]. Consequently the lender treats the willingness to pay a higher interest rate as a signal of poor loan quality and prefers to ration credit rather than raise interest rates to a market clearing level. In these circumstances a firm with adequate cash flow may make an investment where a firm dependent on external finance (and unable to issue new equity) will not. Financial quantities such as cash flow can therefore influence real investment decisions and the price mechanism cannot clear the market. In summary, asymmetry of information offers one explanation of the new equity issue discount and thereby creates a potential role for finance as an influence on investment.

Shifting attention to the empirical front, it is found that plenty of literatures are recognized relating economic growth with different financial sectors. Financial development creates enabling conditions for growth through either a supply leading (financial development spurs growth) (Rajan and Zinglas 1998) or a demand following (growth generates demand for financial products) channel.

[6] Adverse selection means that lenders are unable to discriminate between borrowers in terms of the riskiness of their projects.

[7] Moral hazard means borrowers undertake higher risk projects with borrowed funds than they would with their own money, since the lender bears part of the cost of failure.

This is due to the fact that the anticipation of future growth in the equity market is possible when the present value of future growth opportunities is capitalized in the equity market (Rajan and Zingales, 1998).

The literature on finance and economic development has taken a new form by incorporating endogenous growth and endogenous financial institutions referred to as second generational growth models (provided by Greenwood and Jovanovic, 1990; Bencivenga and Smith,1991; King and Levine 1993; Roubini and Sala-i-Martin 1992 and so on). In particular, the literature on finance in endogenous growth models suggests various rationales for the existence of financial institutions. The main components are some form of uncertainty, costly information, transaction costs, and economies of scale in information collection. But none of these can explain the emergence and spread of financial intermediaries during the process of economic development. The endogenous growth literature, associated with the work of Romer (1986, 1990) and Lucas (1988), constructs models in which agents make decisions that fully determine the economy's steady state of growth rate. Later on, emphasis shifted towards the increasing role of stock markets in the process of economic development (For instance Ajtw and Jovanovic 1993; Saint Paul 1992). The first comprehensive study on the relationship between stock market development and economic growth was made by the World Bank research group (Levine and Zervos 1996; Demirguc-Kunt and Maksimovic 1996; Demirguc-Kunt and Levine 1996a, 1996b). They investigated the compatibility of stock market development with economic growth and the compatibility of stock market development with financial intermediaries. They estimated cross country growth regressions and observed that the predetermined component of stock market development is positively and robustly associated with long-run growth. They also observed that, the level of stock market development is positively correlated with the development of financial intermediaries and while stock market development induces substitution of equity finance for debt finance in developing countries it facilitates more debt finance in developing countries. This suggests that the stock market and the financial institutions are generally complementary to each other

and grow simultaneously. Kyle (1984) and Holmstrom and Tirole (1993) show that a liquid stock market increases incentives for getting information about firms and leads to improved corporate governance. A growing theoretical literature suggests that a well-developed stock market may promote risk diversification, liquidity, information processing, and capital mobilization and that these services may accelerate long-run growth (See, Levine (1991), Greenwood and Smith (1997) Obstfeld (1994)).

The notion of financial liberalization has also been under criticism from Neo-structuralist (Taylor 1983; Van Winjnbergen 1983; Buffie 1984; Lim 1987) as well as modern economists because it has implicit assumptions about perfect information and perfect markets. These models feature curb markets of developing economies, indigenous banks intermediate between savers and investors. Neo- Structralists view these markets as 'often competitive and agile' (Taylor 1983, 92). Thus new literature on corporate finance looked at the neo-liberal approach and financial liberalization on the basis of the cost disadvantages of external finance due to asymmetric information. McKinnon-Shaw (1973) argued that financial repression not only depresses savings but also leads to inefficient allocation of resources and, therefore, financial sector reforms have been advocated. As a result, a series of measures have been initiated towards financial sector reforms (including stock market reforms) since early 1990s. McKinnon-Shaw argument of financial liberalization underwent many changes in recent years[8].

Another facet of criticism related to financial liberalization is the volatile financial markets in developing countries. Financial institutions and markets have become principal channels through which national sovereignty is being challenged. Corporate finance system has been vulnerable to speculative investments

[8] The most basic tenet of economics is that market equilibrium entails supply equaling demand; that if demand should exceed supply, prices should rise; decreasing demand and/or increasing supply until demand and supply are equated at the new equilibrium price. So if prices do their job, rationing should not exist. However, credit rationing in the fact exist. They seem to imply an excess demand for loanable funds (Stiglitz and Weiss 1981).

creating huge problems of non-performing loans and vanishing of listed companies from stock markets. Moreover, many developing countries are increasingly under surveillance of international financial institutions that is creating impediments to their national and societal developing goals.

Although the arguments on the potential negative impact of volatility on growth appear to be very convincing, Levine and Zervos (1998) do not find any significant relationship between volatility and growth in the sample countries over the period considered. They measure volatility as a 12-month rolling standard deviation estimated on stock returns and compare this estimate on the rate of growth and obtained no significant results. As theory suggests, international financial integration, by bringing about a greater degree of portfolio and risk diversification, may boost the propensity to save and invest and, through this channel, can foster growth (Obstfeld 1994; Devereaux and Smith 1994). Mayer (1988) points out that those large stock markets in general are unimportant sources of corporate finance. Shleifer and Summers (1998) and Morck, Shleifer, and Vishnys (1990) suggest that stock market development may hurt economic growth by easing counterproductive corporate takeovers. However, the failed liberalization attempts in many developing countries forced the neo-liberal school to reconsider the question of financial liberalization.

Following the seminal works of Engle and Granger (1987), Johansen (1988) and Johansen and Juselius (1990), numerous studies beginning with Taylor and Tonks (1989), Kasa (1992) and, subsequently, Masih and Masih (2005), Chowdhry (1997) and Chowdhry et al (2007), among several others in the applied finance literature, have used the cointegration hypothesis to assess the international integration of financial markets. Until Taylor and Tonks (1989) and Kasa (1992), studies were relied on correlation and regression analyses to gauge the nature of price convergence and international portfolio diversification across markets (Levy and Samat (1970), Agmon (1972), Solnik (1974) and Panton et al (1976). Taylor and Tonks (1989) showed that the cointegration technique is useful from the perspective of the international capital asset price model. Even, cointegration

approach is applied for examining the relationships between economic variables and stock markets from an empirical viewpoint. Chen, et al. (1986) provided the basis for the view that a long-term equilibrium relationship exists between stock prices and macroeconomic variables, and Granger (1986) verified this notion through cointegration analysis. A simple statement of the cointegration approach is that a set of time series variables is said to be cointegrated if they are integrated of the same order and a linear combination of them is stationary (Maysami and Koh 2000). Such linear combinations would then point to the existence of a long-term relationship between the variables (Johansen and Juselius 1990). The advantage of cointegration analysis is that through building an error correction model, the dynamic co-movement among variables and the adjustment process towards long-term equilibrium can be examined. Granger causality analysis, cointegration test, factor analysis and the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models have been widely employed in empirical studies of stock market integration.

Kanas (1998) provided an empirical investigation of volatility spillovers across the three largest European stock markets using the multivariate exponential GARCH model. He found evidence of volatility spillovers between these stock markets. The study found that spillovers were asymmetric in the sense that bad news in one market had a larger effect on the volatility of another market in comparison to that of good news. Thus, many researchers investigated asymmetric effects in conditional covariances (see for example, Koutmos and Booth, 1995, Christiansen, 2000, Filetti, Hotta and Zevallos 2008) for individual stocks, equity portfolios, and stock market indices using different approaches.

2.4. Summing up

The framework introduced below concentrates on institutions and economic structures and the influence or impact the finance has on the instability of a market economy. Institutions and structures form a changeable economic environment that provides the link between phases of good and poor economic

performance in a country or the economic performance among different countries. It is worth noting that the relation between institutions, structures and finance is a very complicated issue, subject to many influences and constraints rooted in the history, hence its complete investigation is beyond the scope and the limits of our analysis in this section.

We have seen throughout this history of the big three (Adam Smith, Marx and Keynes) that each economist has at times stood taller than the other two. During times of strong economic performance, Adam Smith has been on top; during crises and depression, Keynes and Marx have stood out. Since the end of World War II, we have seen a gradual advance in esteem for the founder of modern economics, Adam Smith, and this despite occasional monetary crises, recessions, natural disasters, terrorist attacks, and complaints about inequality, trade deficits, and wasteful government programs.

We have come a long way since Adam Smith proposed that the path to economic growth, prosperity, and social justice lies in nations' granting citizens the maximum freedom possible to pursue their public and private interests under a tolerable system of justice. But Adam Smith's system of natural liberty has been challenged in every generation since his Wealth of Nations was published in 1776. Today is no exception. Keynesian and Marxist thinking still carry a strong voice today. If a country falls into a military conflict, a deep slump, or other crisis, the Keynesian model immediately comes to the forefront: maintain spending at all costs, even if it means significant deficit financing. The misleading Keynesian notion that consumer spending, rather than saving, capital formation, and technology, drives the economy, is still very much in vogue in the halls of government and in financial circles. Countries such as China and Japan are criticized for saving too much; Keynesians insist that they need to stimulate "domestic demand" if they hope to advance. Fear that a *laissez-faire* global financial world is subject to unexpected and debilitating crises is common among both Keynesians and Marxists. They also express deep concern that the entrepreneurs, speculators, and the wealthy class in general are benefiting more

from the new global economy and the political process than the middle and lower classes. “Tax cuts help the rich more than the poor” is a common refrain. Critics of the market also constantly complain about growing inequality of income, wealth, and opportunity, despite claims on the contrary by free-market economists.

In a Keynesian-Schumpeterian approach expectations cannot be explained by economic models – as in the case of rational expectations. They depend on social and political processes which are beyond the scope of narrow economic modelling. Keynes and Kalecki can be reconciled, not by assuming a failure of competition in the financial arena where the market reigns supreme, but by recognising the particular forms of the institutions of capitalism, as we know it, to be a necessary response to fundamental uncertainty. Neo-classical theory admits the possibility of such a discount as a second order market imperfection, reflecting a temporary divergence of expectations between managers and investors. New Keynesian theory predicts a new issue discount arising from asymmetric information about the value of assets-in-place, and suggests this also may be intermittent. Post Keynesian theory emphasises imperfect competition as the source of the new issue discount but relies mainly on the empirical evidence of a limited net inflow of external equity to the corporate sector. The existence of a substantial gross flow of new issues of equity would appear to undermine the premises of both New Keynesian and Post Keynesian theory, and to support the neo-classical assumption, shared by Keynes, that the supply of equity finance to large companies is elastic. This would not however explain the limited role of equity finance for capital formation.

Today, central bankers enjoy far more discretion than Keynes would have ever dreamed of granting them, while the risks associated with discretion as emphasized by Friedman are completely ignored. As a result, at least some central bankers appear to be faced with distorted incentives that encourage an asymmetric and inflation obsessed approach to monetary policy, based on some

fiction that whatever they might be doing can at worst have negative real effects that are minor and very short-lived as long as general prices remain stable.

After 1950s, with a more passive financial system, critical finance theorists like Kindleberger and Galbraith could only expound their views as a history of capitalism's past. Minsky, commenced his considerations with the historical question 'Can "It" Happen Again?' ('It' being the disastrous slide into depression that followed the 1929 Crash), before the rise of finance in the 1960s inspired his reinterpretation of Keynes. Since the 1960s, capitalism has come to be dominated by the conjuncture in finance, rather than by the circumstances of the money markets per se. With that rise of finance, Minsky came to be the most widely known exponent of an analytical approach to how finance disturbs the economy. In his later work, Minsky made sporadic use of ideas he found in the business cycle theories of Michal Kalecki. The role of uncertainty and expectations in price determination for assets, and Marx's dialectical analysis of the commodity is clearly consonant with Minsky's theory of systemic fragility, and it provides a unified basis for Minsky's analysis of capitalism's two price levels.

Mainstream economists working in the neoclassical tradition, as opposed to the Keynesian tradition, have usually viewed the departures of the harmonic working of the market economy as due to exogenous influences, such as the State or its regulations, labor unions, business monopolies, or shocks due to technology or natural causes. Contrarily, in the heterodox tradition of Jean Charles Léonard de Sismondi, Clement Juglar, and Marx, the recurrent upturns and downturns of the market system are an endogenous characteristics of it. The 19th century school of Underconsumptionism also posited endogenous causes for the business cycle, notably the paradox of thrift, and today this previously heterodox school has entered the mainstream in the form of Keynesian economics via the Keynesian revolution. Keynesian views have been challenged by real business cycle models in which fluctuations are due to technology shocks. This theory is most associated with Finn E. Kydland and Edward C. Prescott.

They consider that economic crisis and fluctuations cannot stem from a monetary shock, but only from an external shock, such as an innovation.

Free-enterprise capitalism was inherently unstable and could be stuck at less than full employment indefinitely unless the government intervened to increase "effective demand" and restore its vitality. As James Tobin put it, the "invisible" hand of Adam Smith required the "visible" hand of Keynes (Breit and Spencer 1986: 118). Friedman concluded differently: "The fact is that the Great Depression, like most other periods of severe unemployment, was produced by government mismanagement rather than any inherent instability of the private economy" (1982: 38). Furthermore, he wrote: "Far from the depression being a failure of the free-enterprise system, it was a tragic failure of government" (1998: 233).

Instability is built into capitalist financial markets, a historical fact incorporated in the financial market theories of Keynes, Minsky, Marx and others. In recent decades, financial innovation, perverse bonus-driven compensation systems, rising leverage and global integration led to reckless financial market expansion and excessive risk-taking that generated a series of dangerous financial crises. Government intervention to shorten and limit the depth of these crises in turn created moral hazard that induced even greater risk-taking that accelerated the long-term financial explosion. Nevertheless, there is no doubt that radical financial market deregulation was a necessary condition for the generation of a secular financial expansion this long and this strong, and for the creation of a global crisis as severe as the one we are still living through.

The mainstream approach to theory suggests that the resulting policy issue be addressed in terms of moral hazard: the unintended effect of insurance as encouraging the taking on of increased risk (where there is some limit on the scope for monitoring that risk) (see further Dow, 2011). In spite of the term 'moral', the issue is one of rational optimizing behavior, under asymmetric information. Because such behavior is not 'other-regarding', it is opportunism. It

may be regarded implicitly as immoral because, by impeding markets from finding the social optimum, the outcome is a reduction in social welfare; but because this outcome is an unintended consequence, it may not be regarded as immoral. Finally, since some social conventions involve moral judgment, e.g. as to standards of fairness, it is important for economic theory also to be able to address such considerations. Notions of fairness effectively fall outside the realm of rationality in the mainstream framework (Akerlof and Shiller, 2009). Nevertheless, much of the public policy discourse surrounding the crisis has focused on issues of fairness. This is the evidence of the other-regarding behavior analyzed by Adam Smith. Neo-Keynesians have contributed extensively to the new field of "behavioral economics," which questions the efficiency/rational expectations model of the Chicago school, and proposes ways to counter the tendency of individuals to make financial mistakes, such as undersaving, over-consuming, and underperforming the stock market averages. See, for example, Richard et al. (2004) and Shiller (2005). However, not all behavioral economists are Keynesian (See Siegel 2005).

At the broadest level, new Keynesian economics suggests—in contrast to some new classical theories—that recession is a departure from the normal efficient functioning of markets. The elements of new Keynesian economics—such as menu costs, staggered prices, coordination failures, and efficiency wages—represent substantial deviations from the assumptions of classical economics, which provides the intellectual basis for economists' usual justification of *laissez-faire*. In new Keynesian theories recessions are caused by some economy-wide market failure. Thus, new Keynesian economics provides a rationale for government intervention in the economy, such as countercyclical monetary or fiscal policy. This part of new Keynesian economics has been incorporated into the new synthesis that has emerged among macroeconomists. The study thus opted for the New Keynesian School (NKS) of thought approach as the theoretical base of this study.

CHAPTER III

The Global Stock Markets: Retrospect and Outlook

3.1. Introduction

The aim of this chapter is to provide the historical information about the functioning and the characteristics of the markets considered in the analysis. The number of empirical studies (Levine, 1996, Rajan and Zingales 1998, Vazakidiset al. 2011) suggests that financial markets can be regarded as an engine of growth. However, the empirical evidence (Caprio, 1997, Mishkin, 1996, Aghion et al. 2004) also shows that crisis-like developments in the financial markets have occurred with increasing frequency in recent years, and that such phenomena at least temporarily limit the scope for economic development. How can one explain the fact that a sector which can be regarded as being at least partially responsible for a successful course of economic development is at the same time considered to be responsible at least for triggering crises, which slow down economic development, often causing ground to be lost which takes years to regain the economy? These are quite profound questions which attempt to reveal the vulnerability of the present phase of capitalist evolution and the inherent instability of deregulated financial markets. In this context, present chapter addresses the various questions like how the stock markets were started and developed. What are the crises and crashes faced across the global stock markets? What we can learn from the past episodes of crisis or crashes, are needed to be addressed to hone our understanding regarding the stock market. These are major questions of continuing significance as stock exchanges around the world search for a mode of ownership and control that satisfies all. Clearly there is a world of difference between the developed stock markets (For example, the New York Stock Exchange) on the one hand and a stock exchange located in emerging markets on the other, even if only in coping with a hugely different turnover (see Table A1).

Stock exchange usually is thought of as a physical location where traders meet face-to-face to trade in stocks. In such an open outcry market, traders announce prices at which to buy stock, or prices at which they are willing to sell. When the two prices match, then stock trade will be executed. Watch any of the financial news networks' wrap of stock market activity, and often a reporter is found on the floor of the exchange, surrounded by people scurrying around and those people are engaged in trading stocks. The stock exchange only obtained a formal constitution and a building of its own at the beginning of the nineteenth century, but by that time organised dealing in stocks and shares had been going on for well over a hundred years. The supply of suitable securities was provided first by the formation of joint-stock companies. It was not until the late sixteenth century that in the most popular form of organisation, no member in a joint stock company, could demand payment of his share from the company; but each member could without the others' consent, transfer his share to another person, and thereby introduce a new member. The value of a share in a joint stock was always the price which it would fetch in the market; and this may be either greater or less, in any proportion, than the sum which its owner stands credited for in the stock of the company (Morgan and Thomas, 1969). As the joint-stock company evolved, it brought together larger funds, for longer periods of time. These expanded resources made ventures such as ongoing trade with India or Russia possible because investors' capital could purchase an entire fleet of ships that investors did not need to monitor individually. Hence an investor merely needed capital, and not specific skills, to invest and realize profits. The newer form of organization made it possible to draw in on the non-merchant wealth to these long-distance ventures on an unprecedented scale. The first joint-stock company of this type is considered to be the Russia Company, established in 1553. Between 1575 and 1630, 6300 people participated in various ventures in the Great Britain alone (Lavelle 2004).

A full understanding of the past can inform present and future decisions, through the ability to identify those features and their consequences are most

important. To achieve that end, it is vital to place the development of securities markets in their appropriate historical settings and use comparisons as an analytical tool in order to produce conclusions of value today. Comparisons are immensely valuable in trying to understand why financial systems differ to assess what the implications of these differences were for economic performance. It is thus essential to identify these financial centres, recognize how they have developed, and assess the position they occupied within the global economy. There must be constant recognition of such situations and circumstances because they help to explain why differences exist between countries over time and the relative importance of the stock markets. This can be seen from the experience of the twentieth century where the importance of stock markets varied both chronologically and spatially. Though no comparisons are ever ideal, because there are so many variables at work, the very attempt to compare and contrast can be especially revealing about the causes and consequences of particular organizational traits.

This study does not aim to rank or analyse each and every incident in the global markets over the last two centuries. Such a task would in any case be impossible, due to the lack of documentation available prior to the mid-twentieth century. Instead, this study is to undertake a historical and comparative analysis of the major developments and crisis of global stock markets in historical perspective with particular emphasis on the evaluation of the stock markets and dynamics of their rise and decline.

In view of the above discussion the rest of the chapter is divided into five sections. The first section gives an overview of historical background of the global stock market. The second section analyzes the institutional structure of modern stock exchange. The third section describes the performance of Bulls, Bears, bubbles and crashes while the fourth section presents a brief outline on the relevant histories of the four major stock markets in the emerging countries. The chapter concludes in the fifth section.

3.2. Historical Development of Stock Markets

The development in domestic stock markets, as well as their prospects, would be difficult to understand without considering the development of global stock markets. This section first outlines the main developments in the international major stock markets and then describes emerging stock market developments.

Stock markets have played different roles in individual countries at different times, reflecting the way they are organized, their relationship to other parts of the financial system, and the effects of government intervention. Stock exchanges are also called bourses. The origin of the term "bourse" is from the Latin word "bursa" meaning bad, because in the 13th in the Belgian town of Bruges, the sign of a purse was hung on the front of the house where merchants used to meet. Another version of the story has it that in the late 13th century commodity traders in Bruges (Now Belgium) gathered inside the house of a man called van der Burse, and in 1309 they institutionalized the informal meeting and gave the name the "Bruges Bourse". The idea spread quickly around Flanders[1] and neighbouring regions soon opened in Ghent and Amsterdam. The Bruges Bourse can technically be called the first exchange (Aran and Patel 2006). Unofficial markets where shares were traded became popular across Europe through the 1600s. During those days buildings were less in number; there were more open spaces with large leafy evergreen trees under which people could easily assemble and there were coffee houses. These proved to be the convenient birthplaces of several major stock exchanges in the world. Brokers would meet under the trees or outside or in the coffee houses to do the trading. The Amsterdam stock exchange was created in 1602 outside a coffee house in Amsterdam. It became the first official stock exchange when it began trading shares of the Dutch East India Company , was the first company to issue stocks and bonds. In 1688, the trading of stocks began on a stock exchange in London. By early 1700s, there were fully

[1] A medieval country in northern Europe that included regions which are now parts of northern France and Belgium and south-western Netherlands.

operational stock exchanges in France and England followed by the United States in the later part of the century[2].

This history of the global securities market divides into main six distinct periods. The first period begins in the twelfth century and culminates in 1720. In this early period stock markets emerged as a distinct entity within the financial system of many European countries, trading mainly government debt. By the seventeenth century Amsterdam had become the principal centre for securities trading, with considerable activity in both domestic and foreign stocks. This volume of activity generated a group of specialist intermediaries who developed many of the modern techniques of stock exchange dealing, such as time bargains, price lists, and dealing for the account. These were then copied in other stock markets, especially London in the eighteenth century, aided by the migration there of a number of Amsterdam brokers. However, what Amsterdam lacked was any formal organization of this stock market.

The second period from 1720 lasted until the end of the Napoleonic wars in 1815. During most of the eighteenth century the stock markets made many advances in terms of organization and importance, with Paris leading the former and Amsterdam the latter, though London was gaining rapidly on both fronts. The basis of this market remained government debt created for military purposes, whether for the constant conflicts within Europe or the expenses incurred in gaining independence from colonial masters, as in the case of the United States. These debts were increasingly organized in a transferable form suitable for trading in the stock markets. Stock markets also developed outside Europe in the newly independent United States. However, in the era of revolution and warfare that plagued Europe between 1789 and 1815 most of these gains were lost, with London being almost the sole beneficiary. Paris and London traded exclusively in their own government's debts and the shares issued by their own joint-stock

[2] http://www.yuhsg.org/webpages/hurst/files/history%20of%20wall%20street.pdf

companies, Amsterdam increasingly provided a market for securities from around the world (Michie 2006).

The third period covers the years from the end of one major European war in 1815 to the beginning of the next in 1914. This century witnessed the arrival of the global securities market on the centre stage of financial systems, playing an important role within an ever expanding number of countries around the world. The global securities market not only facilitated the mobilization of long-term capital for both national and world economic development but it also imparted liquidity and mobility to the monetary systems of the world. An integrated global economy resulted with the railway and the stock exchange as the symbols of the age.

The fourth period covered the years from the outbreak of the First World War in 1914 to that of the Second in 1939, with the virtual collapse of the international economy in between. Within those 25 years, the achievement of the past century was largely lost or reversed. Inflation and defaults played havoc with the value of securities whilst government controls at home and abroad restricted the freedom of markets to operate. The Wall Street Crash in 1929 and the European financial and monetary crises of 1931 were turning points in the history of the global securities market, ushering in an era of regulation and even suppression. In the fifth period, from 1945 until 1970, the global securities market was in retreat both domestically and internationally, with many countries entirely dispensing with stock exchanges. Such was the degree of control exercised by governments that a stateless international market appeared in the shape of the Eurobond market.

The final period from 1970 onwards saw a revival in the fortunes of the global securities market. On the domestic front the attack on restrictive practices, beginning in New York in the 1970s, followed by a general move towards regulation rather than control, saw securities markets revive as important components of national financial systems. Internationally, the relaxation and then

abandonment of controls on financial flows saw the re emergence of the global securities market as a key element within an increasingly integrated world economy (ibid).

The first part of the nineteenth century witnessed an expansion of credit in the United States, which had resulted due to the substitution of bills of exchange for silver, in the triangular trade between the United States, China, and the Great Britain. The United States had a bilateral trade deficit with China and China had a bilateral trade deficit with the Great Britain. Previously, the United States bought silver from Mexico which was then shipped to China to finance the U.S. trade deficit; then the silver was shipped to the Great Britain to finance China's trade deficit. The institutional innovation was that the American merchants sent sterling bills of exchange to China in payment for goods, and the Chinese in turn then shipped these bills to the Great Britain to finance its trade deficit. The transactions costs involved in making cross-border payments using bills of exchange were much smaller than those which involved the shipment of silver. The result of this innovation was that the silver stayed in the United States and was added to the U.S. money supply (Temin 1969).

One of the many different institutional avenues for the expansion of credit that occurred in France in 1882 was based on a system of fortnightly clearing of stock exchange transactions which provided credit to speculators through a system of delayed payments called reportage. A grace period of fourteen days were given to the buyers to pay for their purchase of stocks, so in effect they got interest-free loans until the date of payment (although the value of the loans may have been reflected in the prices paid for the stocks) (Jean 1960). Similarly the expansion of credit in the call money market in the New York helped finance the stock market boom in the late 1920s. The catalyst for the expansion of credit in the United States in 1893 was the addition of silver coins to the U.S. money supply. In 1907, the increase in the supply of credit resulted from the expansion of loans by the trust companies. In the years before and after World War I, the international credit base was expanded by the development of the gold-exchange standard

that facilitated the financing of a much larger volume of international trade with the existing stock of monetary gold. After World War II, the development of negotiable certificates of deposit (CDs) contributed to the expansion of credit. In the 1950s and the 1960s the large U.S. banks adopted the practice of liability management which meant that the growth of their deposits depended on the pace at which they wanted to increase their loans; under the earlier practice of asset management the growth of their loans depended on the growth of their deposit liabilities. Liability management enabled the banks to be much more aggressive in managing the growth of their loans and their deposits (Kindleberger et al. 2005).

3.2.1. Development Indicators

The study faced major problem to obtain reliable sources for analyzing the historical[3] evolution of stock market development. However, as measures of stock market activity, we use three variables: market capitalization, number of listed companies and gross fixed-capital formation raised via equity, and liquidity as considered by earlier studies Demirguc –Kunt and Levine (1996a), Levine and Zervos (1998), Rajan and Zingales (2003) and Yartey (2008). Justifications of using these variables are as follows:

a) Market Capitalization

Market capitalisation ratio (MCR) is considered as a measure of stock market size. The MCR is defined as the value of listed shares divided by GDP. Market capitalisation is computed using the value of the equity securities only: the stock market price per share is multiplied by the number of shares that are outstanding (that is, by the number of issued shares not held by the company itself). In terms of the economic significance, market capitalisation as a proxy for market size is positively related to the ability to mobilise capital and diversify risk. It can be employed to reflect a country's credit level and economic growth. This is due to

[3] For more details about historical data sources, see Rajan and Zingales (2003) (Authors of this paper shared with me all the data sources which they have collected from various sources).

the fact that the anticipation of future growth in the equity market is possible when the present value of future growth opportunities is capitalized in the equity market.

A more stable measure of the importance of the equity market is the total market capitalization. Stock market capitalization to GDP ratio is a statistic used to judge whether a stock market is over or undervalued. Usually if a stock market capitalization to GDP ratio is greater than 100%, then it means that the market is overvalued and if it is a ratio of around 50%, then it means that the market is overvalued and a ratio of around 50% means the market is undervalued[4]. 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.

b) Equity Issues

One measure of the importance of equity markets is the fraction of investments that are funded through equity issues. The proxy used is the ratio of equity issues by domestic corporations to gross fixed capital formation (GFCF) during the year. But the drawback of this measure stems from the well-known cyclicality of equity issues. A disproportionate amount of equity issues are concentrated during boom years (Choe et al., 1993). This can bias cross-country comparisons to the extent where stock market booms are not contemporaneous across economies. It also biases the time-series comparisons if one of the reference years is a boom year. To minimize the problem, we average issues over a number of years when we have easy access to annual data.

[4] Individuals interested in buying company stocks usually channel savings or other forms of wealth into stocks. In other words a stock market is an efficient channel for savings into the wider economy. This also proves the fact that economic performance and market capitalization cannot be divorced from each other. Also market performance is heavily dependent on the strength of the economy since companies expansion based on demand for their products and individuals need to be financially buoyant to buy shares. This is why stock markets are declared overvalued when market capitalization to GDP ratio approaches 100%. It has the appearance of a stock market that is divorced from reality because GDP is the anchor for stock market performance.

c) Number of Companies Listed

A final indicator of the importance of equity markets is the number of publicly traded domestic companies per million of population. Listing in a stock exchange refers to the admission of the securities of the company for trade dealings in a recognized stock exchange. The securities may be of any public limited company, Central or State Government, quasi-governmental and other financial institutions/corporations, municipalities, etc. Securities of any company are listed in a stock exchange to provide liquidity to the securities, to mobilize savings and to protect the interests of the investors. It is argued that, the number of listed companies does not give any outstanding rationale to measure the size of the market. For example, the number of listed companies in the Indian stock market is ostensibly more than that of many developed markets such as, Germany, France, Japan and Hong Kong etc. But it does not mean that the size of the Indian stock market is comparable to all these developed markets. The presence of large number of illiquid shares symbolizes weakness of the market. In sum, any indicator has its own drawbacks.

d) Liquidity

In generally terms, "liquidity" refers to the ability to easily buy and sell securities. A comprehensive measure of liquidity would quantify all the costs associated with trading, including the time costs and uncertainty of finding a counterpart and settling the trade. We use two measures for market liquidity: (i) the value traded ratio and (ii) turnover ratio. The value of shares traded as a percentage of market capitalization-is also a measure of liquidity as well as of transactions costs.

(i) The Value Traded Ratio

The value- traded ratio measures the organised trading of equities as a share of national output and therefore should positively reflect liquidity on an economy – wide basis. The value traded to GDP ratio complements the market capitalization ratio. Although market capitalization may be large, there may be little trading.

Together, market capitalization and total traded/GDP inform us about market size and liquidity.

(ii) Turnover Ratio

Turnover equals the value of total shares traded divided by market capitalization. High turnover is often used as an indicator of low transaction costs. A small but active market will have small market capitalization but high turnover. The turnover ratio complements the ratio of value traded to GDP, because turnover is related to the size of the market and the value traded ratio to the size of the economy. A small, liquidity market will have a turnover ratio but a small value trade ratio.

Considering above the variables study attempted to measure the level of stock market development of major developed and emerging countries for a period ranging from 1913 to 2010. The BRIC countries are our main focus of attention, though some very active and major developed markets have been considered as benchmark for comparative analysis. The relevant data for the study has been collected from various sources like the as Rajan and Zingales (2003) for historical and pre liberalization period (1913 to 1990)[5] and for post liberalization period (1990 to 2010) from Emerging Stock Market Fact Book (Standard & Poor's), and World Development Indicators.

3.2.1.1. Stylized Facts for the Period 1913 to 1990

The countries selected for the analysis are India, China, Russia, and Brazil for the emerging economies and the US, the UK and Japan for the developed markets.

[5] The data used in the study (Table 3.1, 3.2, and 3.3) is based on Rajan and Zingales (2003). Their study is restricted to only domestic companies while measuring the stock market capitalization. At the beginning of the twentieth century, London and Paris attracted foreign listings. More recently, New York also attracted many foreign listings. Rajan and Zingales were interested in knowing how the financial and legal institutions in a country help the domestic industries in raising funds. Whereas Kennedy (1989) argues that the country's financial sector's ability to fund foreigners may not imply an ability to fund domestic firms. Moreover, study focus reduces the possibility of mechanical correlations in our tests. This is why the study limits to domestic companies.

The growth of stock exchange in the pre-reform period in major developed and emerging countries has been listed in the table 3.1-3.3. Table 3.1 shows that in most of the countries, stock market capitalization was relatively bigger to that of GDP in 1913 than in 1980. Only by the end of the 1990s did it seem to exceed its 1913 level. Equity issues are also an important source of funds for the corporate for both 1980 and 1990 in most of the countries (see Table 3.2). After normalizing the data by the Gross Fixed Capital Formation (GFCF), it can be noted here that the corporate investments represent a much smaller proportion of the GFCF in 1913 than in 1990. Further, 1913 shows a relatively biased downward trend than the year, 1990.

Table 3.1: Evolution of Stock Market Capitalization over GDP

Country	Year							
	1913	**1929**	**1938**	**1950**	**1960**	**1970**	**1980**	**1990**
Brazil	0.25						0.05	0.08
India	0.02	0.07	0.07	0.07	0.07	0.06	0.05	0.16
Russia	0.18							
UK	1.09	1.38	1.14	0.77	1.06	1.63	0.38	0.81
US	0.39	0.75	0.56	0.33	0.61	0.66	0.46	0.54
Japan	0.49	1.2	1.81	0.05	0.36	0.23	0.33	1.64
Source: Rajan and Zingales, (2003: Table 3)								

Table 3.2: Evolution of Fraction of Gross Fixed-Capital formation rose via Equity

	Year							
Country	**1913**	**1929**	**1938**	**1950**	**1960**	**1970**	**1980**	**1990**
Brazil				0.2	0.19	0.19	0.06	0.01
India						0	0	0
Russia	0.17							
Japan	0.08	0.13	0.75		0.15	0.03	0.01	0.02
UK	0.14	0.35	0.09	0.08	0.09	0.01	0.04	0.06
US	0.04	0.38	0.01	0.04	0.02	0.07	0.04	0.04
Source: Rajan and Zingales, (2003: Table 4)								

Table 3.3 reflects that during 1913 to 1980 most of the countries witnessed approximately the same number of listed companies per million people[6]. In spite

[6] It is the number of domestic companies whose equity is publicly traded in domestic stock exchange divided by the population in millions.

of the explosion of financial markets during the late 1990s, some countries did not surpass the level of 1913. However, in general, one can note that the rich countries had developed stock markets as early as in 1913, but the degree of development varied widely.

Table 3. 3: Evolution of Number of Listed Companies per million People

	Year							
Country	1913	1929	1938	1950	1960	1970	1980	1990
Brazil	12.43	9.85	5.17	41.02		4.32	4.06	3.86
India	0.82	1.81	2.59	3.13	0	0	3.11	7.31
Russia	2.02							
Japan	7.53	16.65	19.48	9.15	8.35	15.19	14.8	16.76
UK	47.06						47.22	29.63
US	4.75	9.72	9.16	8.94	9.33	11.48	23.11	26.41

Source: Rajan and Zingales, (2003: Table 5)

By our measures, countries that were financially developed in 1913 did not necessarily continued to be so. In 1913, equity issues appeared to be more important in France, Belgium, and Russia than in the United States. Thus, by this measure, some continental European markets seem to be as developed as the US market at that time. The data on market capitalization in Table 3.1 confirms this impression. While the UK had a high capitalization in 1913, Belgium, France, Germany, and Sweden were all ahead of the United States. Thus, over a long period, the relative ranking of countries according to financial development seems more volatile than ranking them according to the economic development.

While we cannot date the recovery of the market development indicators, though, the turning point lies somewhere in the 1970s or 1980s. Over the 1980s and 1990s, the countries who were reporting the average ratio of stock market capitalisation to GDP have increased four times, whereas there was only a fraction of increase for the GFCF via equity. The number of listed domestic companies shows a more modest increase (30 per cent).

The poor relative performance of emerging market stocks from the end of 1975 through 1990 seem to contradict the popular belief among many investors that emerging market securities are an attractive asset with high expected rates of

return. The underperformance of emerging market assets in the overall time period is largely attributable to poor relative performance over the last few decades, where the emerging markets were substantially smaller and less developed than they currently are.

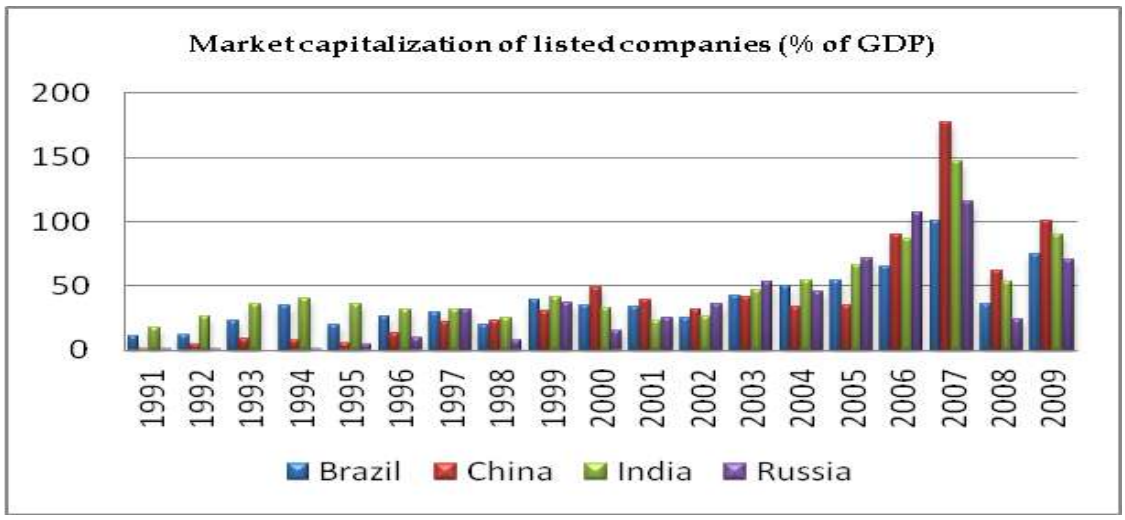
3.2.1.2. Stylized Facts for the Post Liberalization Period (1990 to 2010)

Figure 3.1-3.4 shows the market capitalization, listed stock companies and turnover ratio of same countries for the last two decades. The stock markets worldwide have grown in size as well as in depth over the years. As can be observed from (Appendix tables 3.2-3.3), the market capitalization of all listed companies in the developed and emerging economies taken together stood at US $ 48.71 trillion in 2009 up from US $ 34.88 trillion in 2008. In terms of market capitalisation, nearly all the countries showed an increase in the year 2009 as compared to the period 2008. The share of the US in the worldwide market capitalization remained at 30.9% at the end of 2009 as it was at the end of 2007 (Global Stock Market Fact book 2010). The stock market capitalisation for some developed and emerging countries is shown in figure 3.1-3.2.

Figure 3.1

Source: Global Stock Market Fact book 2010

Figure 3.2

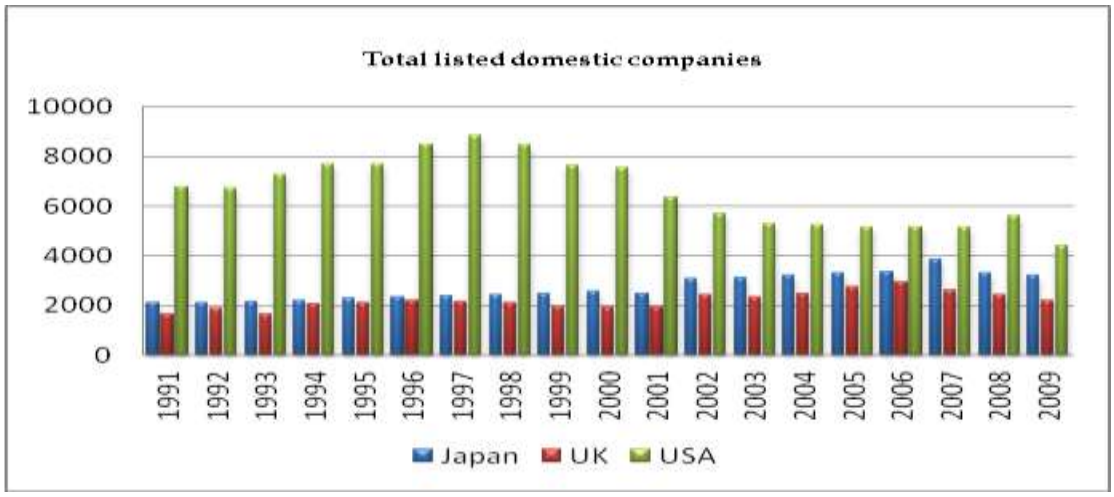


Source: Global Stock Market Fact book 2010

According to country wise data the market capitalization of all listed companies taken together of all markets stood at US $ 64.56 trillion in 2007 up from US $ 53.38 trillion in 2006. In 2007, the United States reported the highest market capitalization of US $ 19,947,284 million followed by China at US$ 6,226,305 million and Japan at US $4,453,475 million. The BRIC economies have recorded a significant annual increase of 236.53 % trading value from US $ 3,042,480 million in 2006 to US $ 10,238,740 million in 2007. The share of the BRIC economies in total traded value of emerging economies has witnessed a huge increase from 36.98 % in 2006 to 62.58 % in 2007. The contribution of the BRIC economies in total world market turnover has increased to 10.36% in 2007 from 4.51% in 2006. The BRIC economies have contributed a share of 59.79 % of the market capitalization of the emerging economies during 2007. The contribution of the BRIC economies in total world market capitalisation has got augmented from 9.39 % in 2006 to 16.91 % in 2007. But the market capitalization of all listed companies taken together stood at US $ 35.81 trillion in 2008 i.e. nearly 44.53% below the market capitalization of US $ 64.56 trillion in 2007. The market capitalization touched 6.62% in 2008, below the level reached in 2004. The turnover of all markets taken together has grown from US $ 39.62 trillion in 2004 to US $ 80.51 trillion in 2008. However, compared to 2007, the turnover fell by 18.52%. The US alone had accounted for about 45.29 % of

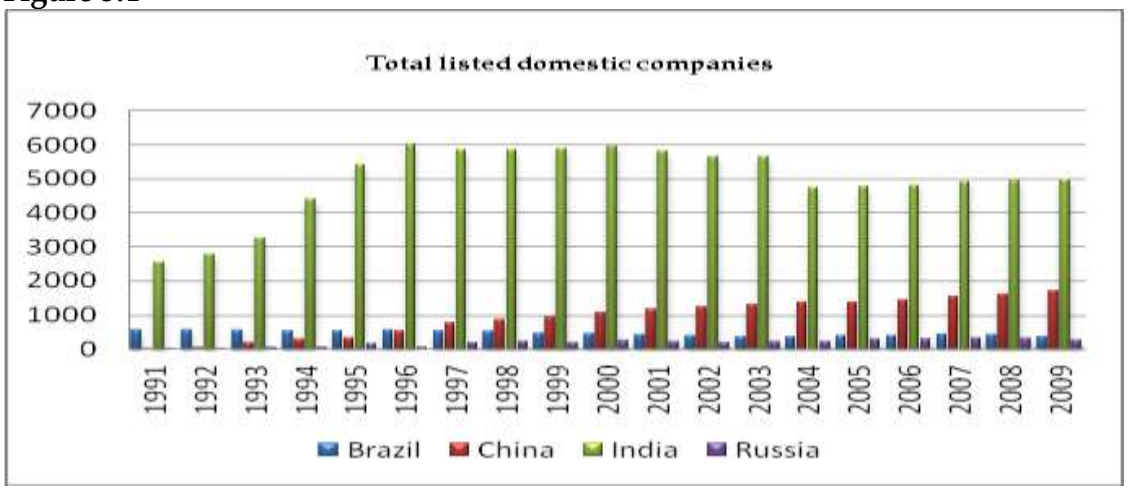
worldwide turnover in 2008 as compared to its share of 48.85% in 2004. The share of India in the total world turnover increased from 0.95% in 2004 to 1.30% in 2008.

Figure 3.3



Source: Global Stock Market Fact book 2010

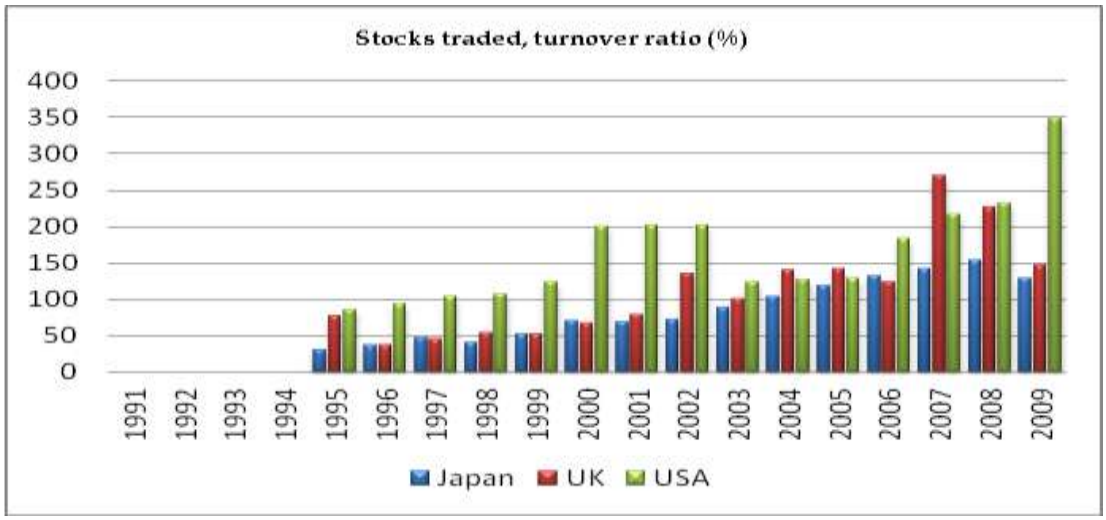
Figure 3.4



Source: Global Stock Market Fact book 2010

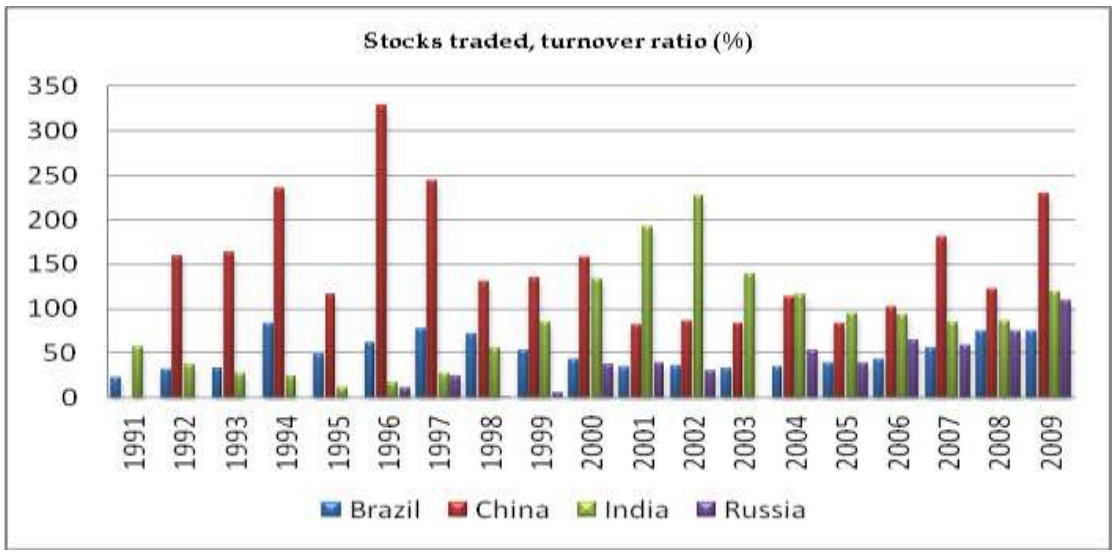
Following the implementation of reforms in securities market in the past years, the Indian stock markets have stood out in the world ranking. India has the distinction of having the largest number of listed companies followed by the United States, Canada, Spain, Japan and the United Kingdom. As per the Global Stock Market fact book 2010, India ranked 11th in terms of market capitalization and in terms of turnover ratio as of December 2009. India posted a turnover ratio of 119.3% at end 2009.

Figure 3.5



Source: Global Stock Market Fact book 2010

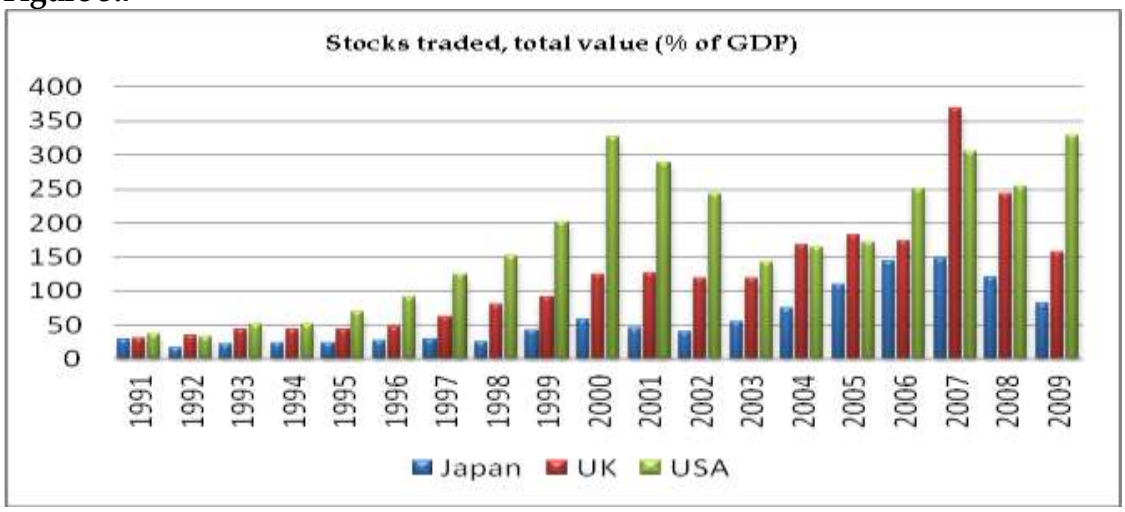
Figure 3.6



Source: Global Stock Market Fact book 2010

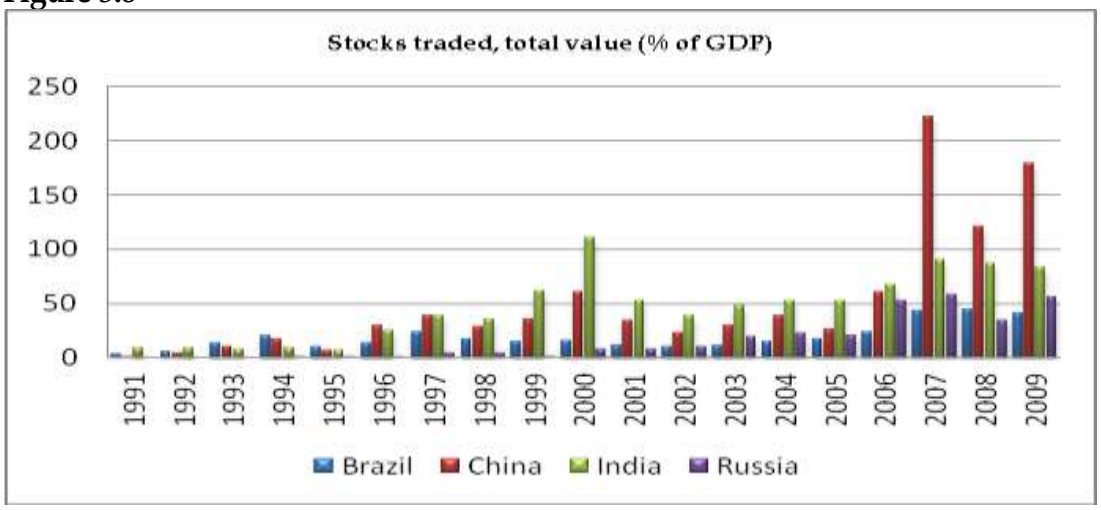
However, in terms of turnover of all the countries, the share of the US in the worldwide market capitalization remained at 30.9% at the end of 2009 as it was at the end of 2007. The stock market capitalisation for some developed and emerging countries is shown in figure 6-8.

Figure 3.7



Source: Global Stock Market Fact book 2010

Figure 3.8



Source: Global Stock Market Fact book 2010

However, neither the emerging countries nor the developed economies were able to surpass the levels of growth as witnessed in the market capitalization and turnover during the year 2007. This is clearly shown in Annexure Tables 3.3-3.6. Taking a longer term perspective over the past few years, the BRIC stock market performance still looks impressive, irrespective of the sell-off during the credit crisis. The equity indices of the BRIC countries are still much higher than those in 2003. Since 2003, the BRIC markets have risen from around 2% of global market capitalization to 9% by the end of 2009, completely recovering from their pre-crisis levels.

3.3. Stock Markets in the Emerging Economies

Share trading occurred in many parts of the European colonies overseas, and many "emerging markets" in fact have long historical roots. They expanded along with their counterparts in the industrial core of the world economy during the period of the European growth from 1843 to 1873, following the building of railroads and the opening of new territories. Among these older exchanges, the Stock Exchange of Buenos Aires (Argentina) was formally established in 1854, the Bombay Stock Exchange (India) was established in 1875, the Alexandria (Egypt) Stock Exchange was established in 1883, and the Johannesburg (South Africa) Stock Exchange was established in 1887. Of the colonial exchanges that continued to function, much of the activity centred on trades of transnational corporations that governments had encouraged (or forced) to list shares. The Indian government was the first such state to insist that wholly owned subsidiaries of transnational firms' list their shares locally and to establish the ownership requirements for Indian nationals. (Lavelle 2004).

3.3.1. Brazilian Stock Market

Founded on August 23, 1890 by Emilio Rangel Pestana, the "Bolsa de Valores de São Paulo" (São Paulo Stock Exchange, in English) had a long history of services provided to the stock market and the Brazilian economy. Until the mid-1960s, Bovespa and the other Brazilian stock markets were state-owned companies, tied with the Secretary of Finances of the states they belonged to, and brokers were appointed by the government. After the reforms of the national financial system and the stock market implemented in 1965/1966, Brazilian stock markets assumed a more institutional role. But in 2007, the Exchange demutualized and became a for-profit company.

Brazilian Stock markets are, and have long been, very large within the context of the developing countries. Brazilian market capitalization in terms of percentage of the GDP in 1998 (20.6 percent) was slightly below the median for the set of

important emerging countries (21.99 percent), but this ranking is partly due to the very sophistication of Brazilian financial markets (Wheatley 2006). As of June 2007, the value of opened companies has reached nearly 100 percent of the GDP, comparing to 38 percent in 2000 and 19 percent in 1998. Between 2000 and 2005, this ratio increased from 32 percent to 70 percent in India and from 15 percent to 72 percent in Russia, for instance. There is considerable potential for Brazilian corporate share and other capital markets development. It seems quite likely that Brazil will become/continue to be a leader among emerging market countries in corporate governance reform. As shown above, there are now enough domestic interests aligned so as to benefit from changes in this direction to keep pushing it forward. Brazil has some of the largest institutional investors, in terms of total assets, in the developing world, which is among the reasons that international corporate governance activists will continue to try to recruit Brazilian allies [Ness & Armijo, (2002)]. As minority investor protections continue to improve, foreign and domestic capital could find corporate shares more attractive.

3.3.2. Russian Stock Market

The case of Russia is particularly interesting, as the country being once the leader of the Soviet bloc. It had to create the stock market in the midst of its transition from the planned system to the market economy, during the times of severe economic crisis. The first trade in Russian stocks was executed in late 1994 as the initial phase of Russia's mass privatization was drawing to a close. The two main stock trading platforms in Russia which we have considered as the oldest, albeit smaller are the RTS and the MICEX. The Moscow-based Russian Trading System (RTS) was established in the second half of 1995. By the end of 2006, the RTS market capitalization of traded stocks was about USD 165billion, while total value of trading was over USD 16billion. In 2006, the number of listed and traded stocks was near 300, but the relatively low yearly turnovers placed the RTS below other regional markets like the Warsaw Stock Exchange and the Budapest Stock Exchange. The outbreak of Asian crisis in July 1997 saw the RTS main index at record levels, and volatility increasingly significant. The MICEX

equity index was not yet calculated at that time, but since late 1997 the paths of both indicators have been very similar, as many of the main companies are traded in both markets. The index remained at high levels until the end of the year, when the sharp decline started. Amid the Russian financial crisis, causing Ruble devaluation and surge of volatility, the indices showed a loss of over 90 percent of their USD value in the following year. Aftermath of the crisis, volatility has decreased substantially despite being sparked by a series of events, including the troubles of Yukos in late 2004. Over the longer term, the main indices grew steadily till about 2001, and accelerating further in 2005, to reach a cumulative return of above 1000 percent in the last 5 years and gaining over 65 percent in USD terms in 2006 alone, the second highest return after the Chinese markets.

A very important characteristic of both the MICEX and the RTS is their heavy reliance on large natural resource and energy companies. In 2006 this dependency increased further as global commodity prices surged, resulting in top three MICEX companies (Gazprom, Rosneft and Lukoil) making up over 47 percent of total capitalization. As for the RTS, in terms of market capitalization at the end of 2006, the (same) top 3 companies, including the energy/ resource sector, amounted to 45 percent of the total market capitalization. Moreover, these stocks also tend to be the most liquid. In the RTS, the top 4 traded companies, all from the resource/energy sector, accounted for over 75 percent of annual (2006) trade value in USD (Koźluk 2008).

3.3.3. Indian Stock Market

Earliest records of securities trading in India are available from the end of the eighteenth century. Before 1850, business was conducted in Mumbai in shares of banks and the securities of the East India Company. The business was conducted under a sprawling banyan tree in front of the Town Hall, which is now in Horniman Circle Park. In 1850, the companies Act was passed and that heralded the commencement of the joint stock companies in India. In 1874, the Dalal Street became the prominent place for meeting of the brokers to conduct the business.

The brokers organised an association on 9th July 1875 known as "Native Share and Stock Brokers Association" to protect the character, status and interest of the native brokers. That was the foundation of the Stock Exchange, Mumbai. In 1928, the present premises were acquired surrounded by Dalal Street, Bombay Samachar and Hamam Street. A new Building, the present location, was constructed and was occupied on 1st December 1930 (CDSL 2010).

Over the last 125 years, the Indian securities market has evolved continuously to become one of the most dynamic, modern and efficient stock markets in Asia. Today, Indian markets conform to international standards both in terms of structure as well as operating efficiency. Today India has two national exchanges, the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE). Each has fully electronic trading platforms with around 9400 participating broking outfits. The National Securities Clearing Corporation (NSCC) is the legal counter-party to net obligations of each brokerage firm, and thereby eliminates counter-party risk and possibility of payments crises. It follows a rigorous 'risk containment' framework involving collateral and intra–day monitoring. The NSCC, duly assisted by the National Securities Depository (NSDL), has an excellent record of reliable settlement schedules since its inception in the mid-nineties. The Securities and Exchanges Board of India (SEBI) has introduced a rigorous regulatory regime to ensure fairness, transparency and good practice. For example, for greater transparency, the SEBI has mandated mandatory disclosure for all transactions where total quantity of shares is more than 0.5 percent of the equity of the company. Brokers disclose to the stock exchange, immediately after the trade execution, the name of the client in addition to trade details; and the Stock exchange disseminates the information to the general public on the same day (Allen et al. 2007).

The development of the capital market is influenced by many factors like the level of savings with the public, per capital income, purchasing capacity, and the general condition of the economy. The capital market smoothens and accelerates the process of economic growth. From just 75 percent in 1995, India's debt and

equity became 130 percent of the GDP by the end of 2005. Indian stock markets with over 9,000 listed companies and serviced by approximately 7,500 stock brokers caters to more than 20 million shareholders through 23 recognized stock exchanges. In terms of market capitalization, it occupied the highest position among the emerging markets. Average daily trading volumes have jumped from Rs. 17 crores in 1994-95 when the NSE started its Cash Market segment to Rs.11,325 crores in 2008-09. Similarly, market capitalization of listed Indian firms went up from Rs.363,350 crores at the end of March 1995 to Rs. 2,896,194 crores in March 2009. Indian equity markets are today among the most deep and vibrant markets in the world (ISMR 2010).

3.3.4. Chinese Stock Market

The rise of China's stock market is fascinating because of the strangeness of the size the market has apparently assumed in such a short space of time. To restructure the state-owned sector has long been a thorny problem for the government.

Shanghai was the first city in China where securities business was developed. Stock trading in Shanghai traces its roots back to the 1860s. In 1891, the Shanghai Share brokers Association was established as the embryo of China's stock bourses. Later in 1920 and 1921, the Shanghai Security Goods Exchange and the Shanghai Chinese Security Exchange commenced operations respectively. By 1930s, Shanghai had emerged as the financial center of the Far East, where both Chinese and foreign investors could trade stocks, debentures, government bonds and futures. In 1946, Shanghai Securities Exchange was created on the basis of Chinese Security Exchange, but ceased operations three years later in 1949 (SSEFB 2009).

For more than 30 years after 1949, China was a centrally planned economy in which virtually all enterprises were state-owned or collectively owned. Investments were centrally planned and funded by government fiscal grants as well as by loans from the state-owned mono bank system as dictated by the

government's central credit plan. In the late 1980s, as part of enterprise reforms that took place during China's gradual transition to a market economy, local governments in China started experimenting with selling shares of collectively owned enterprises directly to domestic individuals in order to raise equity capital. Curbed trading of enterprise shares soon began and was quickly followed by over-the-counter (OTC) trading in more organized but still informal exchanges (Wong 2006). The rise of China's stock market during the 1990s was nothing short of breathtaking. The modern stock exchanges in Shanghai (SSE) and Shenzhen (SZSE) were set up in late 1990 and 1991 respectively, in order to provide capital for the reform of state-owned companies and reduce the banks' burden of providing various types of financing. To this day, they remain relatively inaccessible to the international investors due to participation and capital account restrictions. During the past 15 years, the main composite indexes evolved similarly across the two markets: trending strongly upward in the early 1990s, until early 1993. Government intervention caused the index to recover sharply, followed by a 1.5 year recession, which ended in 1995. The year 1996 brought a steady rise in the indexes, while 1997 somewhat more stabilized and the isolation of the Chinese market prevented large immediate repercussions of the Asian crisis and the Russian financial crisis. Mid-1999 marked the start of a two-year speculative bubble, amid a general slowdown in the economy. Mid 2001 saw the beginning of a 4 year slump, triggered by new rules on previously non-tradable state-owned shares, which led to halving of the indexes and finally came to an end in mid 2005. Since then, both markets have been soaring at unprecedented rates. The emergence and subsequent development of the stock market in China is largely related to the state-owned enterprises (SOEs) reform. SOEs account for over 90% of all Chinese listed firms. During the 1990s, the government has fully embraced the stock market and has increasingly relied on it as the key mechanism for the SOE reform and for more efficient allocation of investment funds (Koźluk 2008).

Notably, there are different categories of shares traded on the exchanges, the two most important being the A-shares, which are quoted in Chinese currency (RMB), and Bshares quoted in the USD (Shanghai) or Hong Kong dollars (Shenzhen). The A-shares (often referred to, especially in the older literature, as 'domestic-only' shares) are available to mainland investors and, since the introduction of the QFII (Qualified Foreign Institutional Investor) scheme in October 2004, they are also being available to a very restricted number of foreign institutional investors. The A-shares constitute a vast majority of the market, in terms of both capitalization and trading volume along with its growing importance in the SOE reform. The stock market has developed remarkably in terms of the number of firms listed, total market capitalization, and total trading volume. Today, the number of listed firms exceeds 1,000. Only the largest and the best performing SOEs are qualified for listing. By the end of 2001, more than half of the 520 largest and the most strategic SOEs in China were already listed. As a result, the listed firms as a whole constitute an increasingly significant portion of the Chinese economy. The total sales of listed firms accounted for about 16% of the GDP by the year 2001. In terms of total market capitalization, China ranks as the second largest in Asia, only behind Japan (Economist, 6/1/2000, 2/6/2003). Total market capitalization as a ratio of the GDP had increased from 5% in 1990 to over 194.2% at the end of 2007. In 2008, the total turnover on the SSE was RMB 27,184.203 billion, down 28.47% from the previous year. Stock transactions were RMB 18,042.995 billion, representing 66.37% of SSE's total turnover. By the end of 2008, SSE recorded a total of 79.7287 million trading accounts. Of the total, 75.5369 million were A-share accounts, 1.4714 million were B-share accounts and 14.3026 million were mutual fund accounts. In 2008, the total amount of equity funds raised was RMB 89.291 billion, ranking SSE at number eight globally and number two in Asia[7] (SSE fact book 2009).

Once the stock markets moved beyond informal and irregular markets their organizational form becomes significant. The unique circumstantial feature of

[7] As of 2009 the first largest stock market in Asia is that of Japan.

each stock market is that it interacts with other components of the financial system and so contributing to its further development.

3.4. Institutional Structure of Modern Stock Exchanges

In the 20th century, stock exchanges have greatly expanded the market size, volume of transactions and speed of operations, but the basic structural form has remained relatively unchanged. Traditionally stock exchanges have been a centralized location where buyers and sellers meet physically and, depending on the demand and supply of a particular equity, prices are set. This is the "open outcry" system where the prices of different stocks are set by openly calling out loud. Here each specialist specializes in a particular stock, buying and selling in a verbal auction. The traditional open outcry system is slowly giving way to electronic exchanges. Electronic trading systems are screen-based and buyers and sellers need not be physically present[8] on the trading floor.

The basic function of the stock market is to provide an institutional arrangement for transferring ownership of shares that represent partial ownership of public corporations. Because the items traded are existing shares, stock market transactions are therefore referred to as the 'secondary market'. According to Baumol (1965), the flexibility and speed of response of capital allocation mechanism affects directly the adaptability of our productive mechanism, and thereby bears on long-run prospects of our entire economy. The relevance and stability of stock markets are allocators of the capital in the economy, and according to Baumol this, is for the following reasons: stock markets (i) make the process of transfer of funds simple and easy; (ii) permit long-term investment to be financed by individuals who can lend funds; (iii) mobilize small savings from a large number of people, which otherwise cannot be used for investment purposes; (iv) guide business management by offering information about current cost of capital which is important in determining the level of investment.

[8] Buyers and sellers are connected by computers over a telecommunications network.

3.4.1. The Primary Market

Primary market provides opportunity to issue new IPOs or stocks (Initial Public offerings). Through new IPO issues, Government as well as corporate sectors would raise resources to meet their requirements of investment. They may issue the securities at face value or discount/premium and these securities may take a variety of forms such as equities, debt etc. They may issue securities in domestic market and/or international market.

3.4.2. Secondary Market

Secondary market refers to a market, where securities are traded after being initially offered to the public in the primary market for listed firms in the stock exchange. Majority of the trading is being done in the secondary market. Secondary market comprises of equity and debt market. For the general investors, the secondary market provides an efficient platform for trading of securities. For the management of company, secondary equity market serves as monitoring and control activity by enabling and implementing incentive-based management contacts and aggregating information (via price discovery), guiding management decisions. A liquid secondary market is a critical component in a successful initial public offering (IPO).

3.4.3 Stock Exchange

The institution of stock exchange is expected to facilitate the channelization of savings especially from the household sector to meet the investment requirements of the productive sectors of the economy. It is primarily by ensuring a market place, which provides liquidity to capital market instruments through fair and transparent trading practices[9]. Stock Exchange is a market for the trading of publicly held company stocks or shares and associated financial instruments (including stock options, convertibles and stock index futures). Traditionally such markets were open-outcry where trading occurred on the floor

[9] Report of the High powered study Group on Establishment of New Stock Exchange (Pherwani Committee Report), June, 1991. pp. 59-62.

of an exchange. These days the markets are cyber-markets with buying and selling occurring via online real-time matching of orders placed by buyers and sellers. Stock exchange are formed, sponsored, and financially supported by member firms that are securities dealers offering brokerage and market-making. These member firms need the organized market to support their financial activities. In contrast, dealers 'take positions', buying and selling stocks on their own with the expectation of making profits by the differences between their 'bid' prices and their 'ask' prices. Brokers and dealers may be individuals or incorporated business firms that are referred to as 'brokerage firms' or 'brokerage houses'.

The more recent institutional changes have been largely in response to improvements in communications technology; innovative ways of utilising the exchanges (For example, computerized trading strategies). Now let us take a brief look on the new innovations undertaken by the modern stock exchange.

3.5. Innovations in the Modern Stock Exchange

3.5.1. Securitization

Securitization is the process in which certain types of assets are pooled so that they can be repackaged into interest-bearing securities. The interest and principal payments from the assets are passed through the purchasers of the securities.

In its most basic form, the process involves two steps. In step one, a company with loans or other income-producing assets—the originator—identifies the assets it wants to remove from its balance sheet and pools them into what is called the reference portfolio. It then sells this asset pool to an issuer, such as a special purpose vehicle (SPV)—an entity set up, usually by a financial institution, specifically to purchase the assets and realize their off-balance-sheet treatment for legal and accounting purposes. In step two, the issuer finances the acquisition of the pooled assets by issuing tradable, interest-bearing securities that are sold to the capital market investors. The investors receive fixed or floating rate payments from a trustee's account, funded by the cash flows generated by the reference

portfolio. In most of the cases, the originator services the loans in the portfolio, collects payments from the original borrowers, and passes them on—less a servicing fee—directly to the SPV or the trustee. In essence securitization represents an alternative and diversified source of finance based on the transfer of credit risk (and possibly also interest rate and currency risk) from issuers to investors.

Securitization got its start in the 1970s, when home mortgages were pooled by the U.S. government-backed agencies. Starting in the 1980s, the other income-producing assets began to be securitized, and in recent years the market has grown dramatically. In some markets, such as those for securities backed by risky subprime mortgages in the United States, the unexpected deterioration in the quality of some of the underlying assets undermined investor's confidence. Both the scale and persistence of the attendant credit crisis seem to suggest that securitization—together with poor credit origination, inadequate valuation methods, and insufficient regulatory oversight— could severely hurt financial stability (Jobst 2008).

3.5.2. Derivatives Exchanges

Derivative is a product whose value is derived from the value of one or more basic variables, called bases (underlying asset, index, or reference rate), in a contractual manner. The underlying asset can be equity, forex, commodity or any other asset. For Example, wheat farmers may wish to sell their harvest at a future date to eliminate the risk of a change in prices by that date. Such transaction would take place through a forward or futures market. This market is the "derivative market", and the prices of this market would be driven by the spot market price of wheat which is the "underlying'. Derivative contracts have several variants. The most common variants are forwards, futures, options and swaps.

Derivatives exchanges exist to trade futures and options and other derivative financial instruments that transfer financial risks. Organized derivatives exchanges in the U.S. include the Chicago Board of Trade and the Chicago mercantile Exchange. Other major exchanges in the world are the London International Financial Futures Exchange (LIFFE) in London, the the *Singapore* International Monetary Exchange (SIMEX) in Singapore, and the MATIF in Paris. Derivatives exchanges aggressively identify financial risk exposures and introduce new trading arenas for futures and options that will allow financial insurance (Scott 1999).

The derivatives business has been increasingly shaping destiny of all capital markets (including commodity and any other derivation of traded products). Since the early 1970's, the first foreign exchange futures revolutionized the world of finance and helped fuel a brave new vision of deregulation which has continued to bring increasing price transparency to the world. Yet, despite the vast size of the derivatives business both on exchanges and the OTC, it is not uncommon for observers and even insiders, to believe that the cash markets are driving innovation. While there can be speculation involved in derivatives (just like any other market), the fact remains that the core of the derivatives business exists to provide a dynamic degree of risk transfer and hedging for all sorts of enterprises, across all assets class. This flexibility is what gives derivatives the power to drive the capital market revolution (Young 2003).

3.5.3. Information Technology

International telecommunications systems now link markets around the world with instantaneous communications. Technology is rapidly turning the stock exchanges into a seamless global market, which is open for 24 hours a day. The rapidly increasing capacity and declining cost of communications and computer systems make these trends sure to continue. The emergence of multinational corporations with presence throughout the world is also hastening the integration of stock markets. The integration of the stock market means that

multinational enterprises and their products and services become known to investors throughout the world, reducing the information barriers that have in the past inhibited international securities trading. Significant obstacles remain, because international standards and effective international regulatory protections are not yet developed. The need of large institutional investors for cross-national investments to diversify or to hedge their portfolios is another strong driver (U.S Congress 1990).

Alternative trading systems (ATSs)[10] have evolved in recent times. ATSs[11] trade listed stocks, but they connect buyers and sellers directly. ATSs usually deal in bulk orders and therefore are used increasingly by institutional investors. Since ATSs are in direct competition with stock exchanges, trading costs are substantially lower. Moreover, they provide real- time execution as well as access to equity markets worldwide. However, ATSs do not provide services to retail investors (Aran and Patel 2006).

3.6. Performance: Bulls, Bears, Bubbles and Crashes

The terms, bull" and "bear" date from the early years of the eighteenth century; the first references noted in the Oxford English Dictionary were 1714 and 1709 respectively, and both the words were commonly used during the time of the South Sea Bubble. Their origin is obscure. One possibility is that "bear" came from the seventeenth century proverb "you must not sell the skin till you have shot the bear"; "Selling the bear's skin" being contracted to "selling a bear" and "bear" then passing from the transaction to the person making it. Another suggestion is that "bear" is a corruption of a "a la baisse "since the bear was a speculator for a fall. No one seems to have offered any plausible explanation of

[10] The Key distinction between stock exchange and ATSs is that, in case of ATSs the transactions done are based on private law contracts, not on stock exchange law.

[11] ATSs offer investors wider trading opportunities by providing extended trading hours, access to equity markets worldwide and innovative types such as financial instruments from the private equity segment. Moreover, ATSs facilitate after-hours trading and well-informed traders can benefit immensely.

"bull" though one writer flippantly suggested that it referred to their surliness when their speculations went wrong (Morgan and Thomas 1969).

From the beginning of exchanges, stock prices have been extremely volatile. Daily, weekly and monthly fluctuations have always occurred, but the phenomenon that has attracted the most attention is the great bubbles that inevitably burst and end in crashes. In the financial world, risk and catastrophe come in irregular cycles witnessed by every generation. Greed, hubris and systemic fluctuations have given us the tulip mania, the South Sea bubble, the land booms in the 1920s and 1980s, the U.S. stock market and the great crash in 1929, and the October 1987 crash, 2008 subprime crisis, to name just a few of the hundreds of ready examples (White 1996).

3.6.1. Early Bubbles and Crashes

Stock market crashes are preceded by speculative stock market bubbles. A speculative bubble is a period of unsustainable price rises and abrupt price declines. The prices' abrupt decline is called a stock market crash. Asset price bubble refers to the discrepancy between the real value and the actual listing of a share (Gilles and Leroy 1992), while bubble according to an economist's interpretation is a broader economic phenomenon, where the continuous rise of share prices is motivated by the investors' expectations of further increase. This interpretation also assumes macroeconomic consequences (Kindleberger 1991).

The Mississippi Bubble in France, the South Sea Bubble in England and similar bubbles in Holland and Germany during the years 1719 and 1720 were parts of the first international stock market speculative boom and bust in Europe. The legacy of those episodes was substantial.

a) Tulip Mania

The tulip[12], a flower native to central Asia, created quite a ruckus upon reaching the shores of Europe in the mid-1500s.The history of tulips goes back for several centuries; it was not until 1593 when the first bulbs were planted at the Botanical Gardens Leiden, Holland. Thus, tulips became famous in Europe. What we now call the "tulip mania" of the seventeenth century was the "sure thing" investment during the period from the mid-1500s to1636. Before its devastating end in 1637, those who bought tulips rarely lost money. People became too confident that this "sure thing" would always make them money and, at the period's peak, the participants mortgaged their houses and businesses to trade tulips. Within a few years these very colourful spring flowering bulbs rapidly gained popularity. The craze was so overwhelming that some tulip bulbs of a rare variety sold for the equivalent of a few tens of thousands of dollars. In 1637, the market crashed and as a result many people who had spent their entire savings were ruined. Before the crash, any suggestion that the price of tulips was irrational was dismissed by all the participants (Sornette 2003).

Tulip mania spread to a lesser extent to the other parts of Europe. But, the prices of tulips sheered up very high in regions where the bulbs became scarce. When the bubble burst, prices quickly stabilized. Today, only the rarest of tulips are extremely expensive, and most gardeners can afford to plant these graceful and attractive bulbs. When a bout of mad spending over a single item attracts public attention, it is often compared to tulip mania in the news. People caught up in such trends may struggle to accept it, but they stand to lose substantial sums of money when the craze for the item subsides. Israel (1995) wrote that the tulip-mania should be viewed against the background of the general boom and as a mania of 'small-town dealers, tavern-keepers and horticulturalists' with the wealthy for the most part making money in other ways. This perspective

[12] There were many different types of tulips; some exotic and some garden varieties. The tulip bulbs are subject to cobweb-like growth behaviour; once planted, a bulb may develop for six to eight months before it begins to bloom. And each bulb may produce many little bulbs.

undermines one of Garber's points that there could have been no tulip-mania because there was no depressed aftermath (Robert et al 1994).

b) The Mississippi and South Sea Bubbles

The South Sea Company was founded in 1711, on the expectation that peace between Spain and England after the end of the War of the Spanish succession would produce profitable trading opportunities with the "South Seas" (Spanish America). The Company's trading activity remained intermittent and unprofitable throughout the 1710s. In 1719, a new scheme was launched — the conversion of government debt into equity of the South Sea Company. Debt holders of the 1710 lottery loan were offered the option to convert their holdings into company shares. The government agreed to make interest payments to the company instead of to debt holders. As old (and illiquid) loans were swapped for liquid company shares, debt holders gained. The government negotiated a lower rate of interest, and the South Sea Company made a modest profit. The 1719 equity-for-debt swap is generally seen as Pareto-improving.

In England and France, bubble promoters were engaged in profitable patriotism. They hoped to lighten the burdens of debt that England and France had run up—mostly in fighting wars against each other—by converting public debts into shares of private companies: the South Sea Company in England and the Mississippi Company in France. The promoters' profits would come from puffing up the costs of the shares and unloading them at high prices. In a few months of frenzied trading backed by substantial money and credit creation, Mississippi Company shares rose to twenty times par value and South Sea shares climbed to ten times par. The French bubble collapsed in the spring of 1720, and the English bubble was deflated late in the summer as share prices tumbled in short order back toward par.

The 1720 South Sea and Mississippi bubbles were related, and stoked by monetary expansion in the two countries that supported a high head of

speculative steam. Speculation starting in the securities of the South Sea Company and the Sword Blade Bank in England and in those of the Mississippi Company and John Law's banques in France spread rapidly to other ventures and to commodities and land; many of these other ventures were swindles. The South Sea Company was brought down by its attempt to suppress rival speculations, bringing proceedings under the Bubble Act of June 1720 against York Buildings, Lustrings, and Welsh Copper. The effort boomeranged. The spread of speculation from one object to another, to generalize the rise of prices, occurred because the speculators that sold South Sea stock when prices were approaching their peak purchased banks and insurance stocks and country houses. So closely linked were the several markets that in time the price of land began to move with the South Sea Bubble quotations. In France land prices rose in the fall of 1719 as speculators started to take their profits from the Mississippi Bubble (Kindleberger 2005).

c) The Railroad and Civil War Eras (1840-70)

Within forty years of being established, Wall Street was known as the playground of those who had set their sights upon becoming rich and powerful. Between the 1830s and the Civil War, a new generation of trader-speculator appeared who made his predecessors look tame by comparison. The War of 1812 had forced the Treasury to borrow and had introduced the wealthy merchants to the bond business. The Mexican war of 1846-48 and the Civil War would also play pivotal roles in American financing and would help develop the financial markets. Most of the emerging companies coming to market were local: their appeal usually was found in the regions in which they operated. The New York Stock and Exchange Board traded only those that had New York interest or those with broader appeal. The marketplace still was not national in the true sense. But selling war bonds during both conflicts would force the market and its selling methods to become more national. In the 1830s, many new investment houses emerged to help investor's trade shares and foreign exchange and raise capital for new companies and entrepreneurs. For example, Nathaniel Prime, one of the

early members of the stock exchange in New York, established Prime, Ward and King in 1826 as a private bank. About the same time, John Eliot Thayer established a similar operation in Boston, which later would become Kidder, Peabody and Company (Gessist 2004).

All of the new developments in technology and manufacturing continued to lead investors to the marketplace. For all of the successes, many found the experience less than pleasant. In 1839 the New York Stock and Exchange Board listed 144 stocks, almost half of which were banking institutions. Twenty years later, the number had actually declined by some thirty companies. Those that remained were stronger financially than they had been earlier, but the decline is striking in a period that would suggest even greater growth. The reasons for this odd phenomenon can be attributed to the Wall Street's three old bogeys—panic, inflation, and fraud. In the later 1850s the United States became a victim of its own success.

The West became more explored and developed and the gold rush continued. As the population moved westward, so too did banks, and the western territories became overpopulated with small chartered banks, many of which naturally issued their own bank notes. By 1857, the enormous amount of gold mined in California caused many of the banks to issue an excessive number of notes. Prosperity was beginning to cause money inflation, which showed a spiralling effect. The boom atmosphere caused imports to increase. Building projects mushroomed in all over the country; many financed with borrowed money. A relatively large bubble was expanding that would burst in 1857. The actual panic began in August when the Ohio Insurance and Trust Company failed, causing widespread confusion. About $5 million of liabilities were left unpaid. The effects spread far beyond Cincinnati, the company's headquarters, and soon were felt by insurance companies in the New York, the nation's insurance capital. As they made cash demands on their banks, the banks reacted to cover their own positions. In October, eighteen banks in the New York City suspended specie

payments[13]. As a result of which, nearly twenty thousand New York workers lost their jobs. The panic that blew into New York was called the "western blizzard" because of its western origins. But contrary to common sense, Wall Street enjoyed the blizzard. Many short sellers prospered. Only a few were accustomed in making money at the expense of others and they continued to do so by anticipating the panic. Then after the banks suspended specie payments, the marketplace surprisingly turned around and began to rise. The resilience of the marketplace and the traders' ability to make money under such confusing circumstances surprised many commentators of the day. It has been noted that "nothing but the final conflagration will put an end to the Wall Street speculations and the Wall Street swindles. An ordinary earthquake does not trouble the operators at all." The fallout on Wall Street was predictable. The stock market collapsed on September 24, 1869, a day that became known as "Black Friday." Dozens of brokers failed as a result. This proved to be particularly inauspicious for the New York Stock Exchange (NYSE), which had formally changed its name during the Civil War in 1863. In January 1869 it had moved to require its listed companies to register their shares with it in order to prevent companies like Schuyler's and Kyle's from over issuing common shares. Many of the stronger bankers, including Jay Cooke, mounted rescue operations to save others who were tottering on the brink. The shakeout did nothing to enhance the reputation of the exchange, which had been in the forefront of the Gould's manipulations for some time. But the wrenching changes it caused for Wall Street in general and Cooke in particular would force Cooke ultimately to make decisions that would lead to the bankruptcy of his firm within a few years (Gessist 2004).

[13] The redemption of the U.S. paper-money by banks or the Treasury in metallic (usually gold) coin:. Except for a few periods of suspension (1814–15, 1836–42, and 1857), Americans were able to redeem paper-money for specie from the time of the ratification of the Constitution (1789) to the onset of the Civil War (1861). The suspensions had occurred during periods of war or economic crisis. With the outbreak of hostilities between the North and the South, the federal government again suspended specie payments late in 1861.

d) The 1929 Crash

Thousands packed the streets of the New York City's financial district. Anxious investors had heard rumblings throughout the day about mass panic on the Wall Street, with rampant selling of stocks causing values to plummet. Rumours swirled around the crowd like snowflakes in a blizzard. The date was Tuesday, October 29, 1929—what would forever be known as the "Black Tuesday."

The great bull market of the 1920's ended in great stock market crash. During the boom from 1921 to 1929, stock prices quadrupled while industrial production only doubled. In contrast, during the boom period 1896-1907, both stock prices and industrial production doubled (Sobel 1965).The Great crash of 1929 was different than the previous stock market panics not only because it was much bigger and affected a larger portion of the public than earlier crashes, but also because it was not related to a banking crisis. From the spring of 1928 until the autumn of 1929, stock prices surged.

Between 1913 and 1919, Germany's national debt rose 20-fold from 4.9 billion marks to 92.8 billion; that of Britain rose tenfold from £0.7 billion to £7.5 billion, and that of France rose fivefold from 33 billion francs to 151.1 billion. In Italy, a late entrant to the war, the national debt rose fivefold from 15.1 billion lira to 74.5 billion, whilst in Japan, it almost doubled from 2.7 to 4.1 billion yen. Even neutral nations experienced a rapid rise in their national debt as governments took advantage of the inflationary environment to borrow funds to finance increased expenditure caused by the war, such as the disruption to trade and resulting economic distress. The long-term debt of the Dutch government doubled from 1,140 guilders in 1914 to 2,183 in 1919. It was not only in Europe that government borrowing came to dominate the issue of securities, throughout the British Empire dominion governments sold securities to their own people in order to support the war effort in Europe (Kindleberger 1984).The New Zealand government issued a loan for £2 million in 1915, which was absorbed by local investors (Grant 1997). Similarly, between 1915 and1918 the Canadian

government raised $2.1 billion domestically (Armstrong 1997). Although the United States did not enter the war until 1917 the increase in its national debt was one of the most spectacular financial situations, reaching $25.5 billion in 1918 compared to $1.2 billion in 1914 (Scott 1965).

The stock market crash of 1929[14] had devastating and long lasting effects, unlike those depressions that had come before, which passed fairly quickly. The 1929 crash joined other factors in triggering the Great Depression. It was a decade-long period of economic downturn that affected virtually every resident of the United States and spread throughout the world.

e) The Crash of October 1987

From the market opening on October 14, 1987 through the market close on October 19, major indexes of market valuation in the United States declined by 30% or more. The crash of October 1987 and its Black Monday on October 19 remains one of the most striking drops ever seen in stock markets, both by its overwhelming amplitude and its sweep over most markets worldwide. It was preceded by remarkably strong "bull" regime epitomized by the following quote from The Wall Street Journal on August 26, 1987, the day after the 1987 market peak: "In a market like this, every story is a positive one and any news is good news. It's pretty much taken for granted now that the market is going to go up". Investors were largely unaware of the forthcoming risk happenings (Grant 1990).

It is interesting to quantify the relative weight of various participants during these volatile times. Based on the Federal Reserve's Flow of Funds Accounts of the US analyzed by Fung and Hsieh (2000), the market value of the U.S. corporate equities stood at U.S $3,511 billion at the end of September 1987. The major owners were households (49 percent), private pension funds (21 percent), mutual

[14] After large gains were made in the market in the early September 1929, some economists made positive predictions for the final quarter of the year. One of these fortune-tellers was Irving Fisher, an economics professor at Yale University, who said on October 17 that prices had reached "what looks like a permanently high plateau." Don Nardo (1997).

funds (7 percent), state and local government retirement funds (6 percent), bank personal trusts and estates (6 percent), foreigners (6 percent), insurance companies (5 percent), and brokers and dealers (less than one percent). In the last quarter of 1987, households had been the largest sellers, with sells worth U.S.$19.6 billion, followed by the rest of the world, with sells worth U.S.$7.5 billion, brokers and dealers, U.S.$4.8 billion, and mutual funds, U.S.$3.0 billion. These sells were almost fully balanced by purchases of equities back from investors by the U.S. corporations for the amount of U.S. $30.2 billion (Sornette 2003).

Another dip in the market came in the fall of 2000, when stocks within the technology sector lost more than $3 million in value. This drop was caused by rampant buying of "dot-com" stocks—the name for companies that did business solely on the Internet. The slowdown led to a worldwide recession in the spring of 2001. On September 11, 2001, the day of the terrorist attacks on New York City and Washington, D.C., the industrial average fell by 684 points and the market was closed for six days.

f) The Dot-Com Bubble

The latter half of the 1990s brought on the Dot-Com bubble, an intense period of investment in Information Technology (IT) companies. Starting in 1994, many investment ideas were spawned by Internet innovation that fed investors' euphoric expectations about income prospects. Thus, during the boom, a lot of dot-com start-ups were formed and gained easy financing through initial public offerings (IPOs) even though they hadn't, in many cases, shown a profit or, in some cases, earned a dime. The NASDAQ Composite Index, which primarily comprises tech stocks, rose 170% from the fall of 1998 to March 2000, whereas the Dow Jones Industrial Average (DJIA) index only gained 39% during the same period. For individual stocks, the boom was stronger: Yahoo!, for instance, rose from its IPO price of $1.08 to $108 on December 31 1999. The dot-com bubble officially burst on March 10, 2000 as the NASDAQ peaked at 5,048.62. There are

several possible explanations for the subsequent collapse of the NASDAQ. One possibility is enormous sell orders for major tech stocks (CISCO, dell, etc) that happened to be processed simultaneously on the Monday after March 10th. This initial batch of selling sparked a chain reaction of selling that fed on itself. Another theory involves the accelerated technology spending for the Year 2000 problem (Y2K)[15] switchover. After the New Year had passed, businesses and individuals found themselves with all the equipment they needed for a while, thus business spending declined. Another theory is that the bubble burst because of the poor performance of online retailers during the 1999 Christmas season. This was the first indication that the strategy of many Internet companies was flawed and this evidence was made public in March when annual and quarterly reports of public companies are issued (Okin 2005).

g) Global Financial Crisis[16]

The US subprime crisis (2008) happens to be more serious as the synchronization effect has been larger because of globalization of the financial markets. The crisis, which started in the financial system, has been having adverse effect on the real economy. The heat of the US financial crisis has definitely been felt across the major economies of the world starting from Europe, Asia and even in some of the state controlled economies.

According to McKinsey's Mapping Global Financial Markets (October 2008), global financial assets rose from US$12 trillion in 1980 to US$196 trillion in 2007. Global cross-border capital flows more than doubled between 2002 and 2007, with foreign investors holding one in four debt securities and one in five equities. While in 2000 only 11 countries had financial assets of more than 350% of gross

[15] The Year 2000 problem (also known as the Y2K problem, the Millennium bug, the Y2K bug, or simply Y2K) was a problem for both digital (computer-related) and non-digital documentation and data storage situations which resulted from the practice of abbreviating a four-digit year to two digits. Y2K is a numeronym and was the common abbreviation for the year 2000 software problem. The abbreviation combines the letter Y for "year", and k for the SI unit prefix kilo meaning 1000; hence, 2K signifies 2000.

[16] Full Details and empirical analysis will be provided in subsequent chapters of the study.

domestic product (GDP), 25 countries had deepened their financial markets to the same extent by 2007. In the period from 1986 to 2006, the US financial sector as a whole increased its share of corporate profits from 10% to 30%, while its outstanding debts grew from 20% of GDP in 1980 to 116% in 2007 (Blankenburg and Palma 2009).

Its origins were in the United States (US) subprime housing finance market, which showed signs of trouble in the first half of 2007. Initially, this seemed to be a crisis of rather limited scope and many thought that countries would be able to "decouple" from the events in the US. But after Lehman Brothers collapsed in September 2008, the crisis spread rapidly across institutions, markets, and borders. There were massive failures of financial institutions and a staggering collapse in asset values in developed and developing countries. The April 2009 Global Stability Report produced by the International Monetary Fund (IMF) estimates that write-downs in developed markets could reach US$4 trillion and those in emerging markets could amount to US$ 800 billion or 7 percent of banking assets. Nonetheless, there was wide heterogeneity in stock markets' reactions around the globe with some countries showing higher comovement with the US than others.

3.5.2 Stock Frauds and Swindles[17]

The collapse of an asset price bubble always leads to the discovery of fraud and swindles. Enron began its tumble into bankruptcy within a few months of the peak in the U.S. stock prices. At about the same time, the MCI WorldCom began a series of announcements about some financial accounting mishaps that eventually culminated in the largest bankruptcy ever; the firm had overstated investments and understated expenses by $10 billion. The junk bond market collapsed after the increase in interest rates toward the end of the 1980s and the sharp decline in stock prices in October 1987. Swindles, fraudulent behaviour,

[17] Swindles that involve falsified statements about the value of inventories can be tested when the promises are made.

defalcations, and elaborate hustles are part of life in market economies, more so in some countries than in others. The McKesson Robbins scandal of the late 1930s involved the use of forged warehouse receipts as collateral for loans. Billie Sol Estes, the Texas plunger of the 1960s, falsified the number of fertilizer tanks he had under lease and borrowed against the assumed larger number. Tino De Angelis stung American Express by using tanks of 'salad oil' in the 1960s as collateral for loans; Tino knew that that oil was less dense than water and he floated a six-inch layer of salad oil on top of twenty feet of water (Kindleberger 2005).

The great bull market of the 1920's and, a number of stocks in the NYSE were manipulated by insiders and pools or syndicates that bulled the prices up, and then unloaded on gullible buyers. As an example, Billy Durant and his associates manipulated the price of the RCA stock, leading to a wild episode in which the stock was being exchanged at the rate of 500,000 shares per day, 100,000 more than what was officially available. Durant and crowed pushed the price from 85 to 420, and were able to sell out before prices fell (Thomas 1967). In1929, massive pools manipulated more than 100 stocks on the NYSE. But the manipulation did not end with the great Crash of 1929. From June to October 1933, Joe Kennedy's pool manipulated Libby – Owens –Ford stock, first selling short to depress the price and, then creating fictitious market activity to boost the price. The manipulation was very profitable for Kennedy (Cormier 1962) who ironically was appointed by Roosevelt as the first SEC chairman.

In Indian stock market, Harshad Mehta known as the "Big Bull of the trading floor" was a stockbroker and is alleged to have engineered the rise in the BSE stock exchange in the year 1992. He and his associates drew off funds from inter-bank transactions and bought shares heavily at a premium across many segments, triggering a rise in the Sensex. When the scheme was exposed, the banks started demanding the money back, causing the collapse. The broker was dipping illegally into the banking system to finance his buying. The amount that was involved in this scam was approx. Rs. 5000crs. Indian stock market faced

similar kind of other major scams like Ketan Parekh scam[18], the UTI scam[19] and the 2008 satyam scam[20], which had very negative impact on the market (Basu and Dalal 1993).

3.7. Summary

The inference from the above analysis is that the expansion of credit is not a series of accidents but instead is a systematic development that has continued for several hundreds of years as the participants in financial markets sought to reduce both the costs that are the cost of transactions and of holding liquidity and money balances. The development of new substitutes for the existing monetary or financial system seems to occur periodically in response to different changes in the institutional arrangements but the process is still continuing.

The increase in the supply of credit and more buoyant economic outlook often led to economic booms as investment spending increased in response to the more optimistic outlook. Because there was greater availability of credit household spending increased thereby, personal wealth surged.

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[18] Ketan Parekh, a Mumbai based stock broker had large borrowings from the Global Trust Bank during its Merger with the United Trust of India Bank. He got a loan of about Rs.250 Crores from the Global Trust Bank's Chairman Mr.Ramesh Gelli who was asked to quit later. This rigged the scrip's of the Global Trust Bank,Zee Telefilms, HFCL, Aftek Infosys, Lipin Laboratories and Padmini polymers. The prices of the selective shares constantly increased due to rigging .The investors who bought the share at higher prices thought that the market prices were genuine.Soon after the discovery of the scam of 1999-2000, the price of the stocks came down to the fraction of value at which they were purchased. The investors lost heavily. Even the banks faced a tremendous loss. Ketan Parekh was arrested in the year 2002.

[19]The Unit Trust of India is the largest mutual fund in the country created in 1964.From the UTI, Small investors funds were used to promote big business houses, shower favours to politicians, and invest huge amounts in junk bonds all for a fat commission. Mr. P.S. Subramanyam the chairman of the UTI was a key player in the Ketan Parekh scam. Huge amount of the UTI funds were channelled into the infamous K-10 list of Keten Parekh stock, such as Himachal Futuristic, Zee Telefilims, Global Tele, DSQ, etc. The UTI continued to buy these shares even when their market value began to crash in the mid-2000 in order to prop up the share values of these stocks. This whole story led to the ultimate decline of the fund.

[20] Mr.Ramalinga Raju,the former Chairman and Chief Executive of the Satyam company had admitted that he had manipulated the balance sheet for several years to show huge inflated profits and fictitious assets.The estimated fraud was Rs.700 Crore billion.,One of the highest committed frauds since 1996.

One of the earliest bubbles reviewed in this chapter was the Dutch 'tulip-mania' of the 1630s in which the buyers received credit from the sellers. The South Sea Bubble in London and the Mississippi Bubble in Paris both occurred in 1720; each was associated with a new financial institution that arranged for sharp increases in the supplies of credit. Just as the national markets were connected, so the speculation was likely to be connected by the underlying credit conditions. But when a crisis like that of 1847 arises from objects as disparate as railroads and wheat, there is some basis for suggesting that the crisis is accidental in origin unless the monetary weakness that feeds them is systematic. Some crises were triggered by the concern that particular borrowers had become over-extended. Occasionally several crises occurred relatively within few years of each other, however, the pattern was that these crises were infrequent, often not more than once a generation. However, the length of time between each crash is shortening.

The market's development was transformed by several notable episodes of boom and bust. Using the four major market breaks of the twentieth century as a guide, the market survived each downfall, often gaining additional regulatory oversight. In 1907 this took the form of a central bank, a Federal Reserve, established in part to stabilize financial markets. The famous Crash of 1929 dramatically changed how the government regulates the securities market with the instalment of new market and trading regulations. These changes were so significant that most form the foundation for current regulations. The 1987 crash led to regulators trying to figure out how to keep ahead of the technology of trading. Their answer was to institute circuit breakers that stop trading when the markets get too hectic. And after the 2000 downturn, the focus has been on corporate fraud as companies tried to artificially inflate earnings and, therefore, stock prices.

The implosion of a bubble has been associated with declines in the prices of commodities, stocks and real estate, and often these declines have been associated with a crash or a financial crisis. Some financial crises were preceded by a rapid increase in the indebtedness of one or several groups of borrowers

rather than by a rapid increase in the price of an asset or a security. With the global financial crisis faced by the world economy between 2007 and 2009, it becomes very important to have a better understanding of this phenomenon and take appropriate measures. However, conventional market theory fails at explaining the reasons for crashes. We have seen that bubbles are created by an irrational enthusiasm on the part of investors about the prospects of a company or the willingness to follow a global trend like the Dutch during the Tulip Mania. The features of these crises are never identical and yet there is a similar pattern. The increase in prices of commodities or real estate or stocks is associated with euphoria. The appearance of a mania or a bubble raises the policy issue of whether governments should seek to moderate the surge in asset prices to reduce the severity of the ensuing financial crisis that occurs when asset prices begin to decline. Time and again, crises have underlined the importance of ensuring compatibility in the development and growth of the financial system and the real economy. If development is not in tandem, economic development could be retarded by a backward financial system. Similarly, if financial sector activity runs way ahead of real economic activities, the euphoria of rising asset prices would lead to a boom and bust scenario. Balance is the key to maintaining macroeconomic stability and financial stability. Emerging stock markets can learn from the experience of the financial crisis and understand the functions and risks of new financial instruments and their market dynamics and inter-linkages, the need for transparency and disclosure, and the importance of ensuring that there are no gaps in supervision.

We barely scratched the surface of the stock market's history; a detailed treatment would (and does) fill volumes. The foregoing provides a glimpse into the development of the global stock markets, from its humble beginnings in the late 1700s to the key institution that it is today. Not only the market changed as new technologies came along, but it also changed as regulators sought to protect investors and establish orderly markets.

Appendix 1

Table A3.1: Selected Dates in the Development of International Financial Markets: Chronology of Notable Events

C2000BC	Babylonian temples are used as deposit facilities for the rich. Funds are used by merchants for international trade.
500-300 BC	Greeks finance commercial ventures with joint-stock capital. Facilities are available for dealing with foreign currency payments.
Roman Empire	Bills of exchange are used to finance international trade. The Romans provide the first code of law for financial markets.
Middle Ages	Feudal system of government reduces the volume of cross-border transactions.
1215AD	In England, the Magna Carta hails the arrival of a new period of mercantilism
14th century	England becomes a haven for free traders
15th century	Foreign exchange booths are set up in Western Europe (e.g. at Frankfurt in 1402).
16th century	The Frankfurt stock exchange is founded, trading mainly in bills of exchange.
17th century	Holland establishes banks and a securities exchange. The Lombard bankers of Italy boost trade and industry. Many banks and securities exchanges are founded to meet the needs of international traders.
18th century	Rothchilds international banking houses are established. Further establishment of banks, securities exchanges and international banking houses.
19th century	Britain exports large volumes of capital-mainly to the USA. Joint-stock companies pave the way for the industrial revolution
1850	Swiss stock exchange founded in Geneva
1851	Amsterdam Stock Exchange Association forms to regulate share trading in the Amsterdam exchange, one of the worlds oldest.
1857	A major financial panic hits Wall Street with the collapse of the Ohio Insurance & Trust Company.
1867	The stock ticker, invented by Edward A. Calahan, is introduced. The ticker provides investors outside of New York with current prices on the exchange.
1878	Japanese stock exchange set up in Tokyo
1891	Stock exchange set up in Hong Kong.
1896	The Wall Street Journal publishes the Dow Jones Industrial Average (DJIA) for the first time. The index is comprised of twelve stocks and has an initial value of 40.74.
1897	Many countries, including Russia, fix their currency values in relation to gold-the gold standard.

20th century	London becomes leading international centre for bill-brokers and bond issuers.
1912	Britain's foreign lending exceeds £300 millions A consortium of foreign banks helps finance the Canton Hankow Railroad in China
1914	Outbreak of First World War. Federal Reserve System established in USA. 90 per cent of international capital movements are in the form of portfolio investments. USA has a strong export position and enormous capital market facilities.
1916	Investment Dealers Association (IDA) is founded in Canada to maintain professionalism in the stock market.
1919	USA has $6.5 billion invested abroad (excluding war loans to the Allies). West Germany and the Allies sign the Versailles Treaty.
1920	West Germany is the world's largest international borrower. The first meeting of the League of Nations is held in Paris.
1921	West Germany and America sign the Peace Treaty in Berlin
1920s	USA is main supplier of non-resident capital. Large capital movements aid stabilization and re-construction programmes in Europe
1929	Wall Street Crash Total international debt is back to pre-war levels.
1930	Bank for International Settlements is established
1931	World economic collapse leads into the depression of the 1930s All major countries abandon the gold standard
1933	The Glass-Steagall Act is passed in the USA to create a distinction between commercial and investment banking.
1934	The Securities and Exchange Commission is set up in the USA to control and regulate the stock exchange Japanese stockmarkets merge to form the Japanese Securities Exchange under government control.
1936	The Tripartite Agreement (between Britain, France and the USA) encourages movement towards international monetary cooperation.
1938	Liquidations and depreciation of portfolio investments reduce the value of US gross overseas investment to below 1930 values.
1930s	Many restrictions on international trade and financial markets. Wholesale defaults on loans by debtor countries Total collapse of international financial markets.
1943	Women are allowed to work on the trading floor for the first time in NYSE history.
1944	The International Monetary Fund (IMF) is set up after the conference at Bretton Woods, New Hampshire
1945	The World Bank (IBRD) is set up. Following the Second World War, international capital movements

	occur at a faster pace.
1946-50	Foreign exchange markets are exposed to post-war inflationary pressures and controls.
1948	The Japanese stock exchange reorganizes itself along the lines of the New York stock exchange.
1949	Many countries devalue their currencies as the US gold stock reaches $25 billions. Stockmarkets are inaugurated at Tokyo, Osaka and Nagoya (Japan).
1950	The European Payments Union (EPU) is established by recipients of the European Recovery Plan (The Marshall Plan) to facilitate multilateral payments within Europe
1951	The OEEC (Organisation for European Economic Cooperation) adopts a Code of liberalization under which member countries pledge to abolish restrictions on agreed transactions and payments.
1954	Kenya sets up a stock exchange in Nairobi.
1956	The World Bank sets up the International Financial Corporation (IFC)
1958	The European Payments Union (EPU) is established with the advent of the European Economic Community (EEC). Financial markets in Europe revive. Prevention of Fraud (Investments) Act passed in the UK.
1960	Gold prices reach $40 per ounce. Central banks of major countries intervene in the London market to hold down gold prices. The London gold pool is set up. The International Development Association (IDA) is set up by the World Bank. 19 firms (ten from Singapore) set up the Malayan stock exchange along the lines of the Sydney stock exchange.
1961	The Organisation for Economic Cooperation and Development (OECD) comes in existence.
1962	IMF emergency fund set up ($6 billion) under the General Agreement to Borrow (GAB).
1963	The US levies an Interest Equalisation Tax (IET) on foreign borrowing. The first Eurodollar bond is issued. Japan joins the OECD.
1964	West Germany announces the Kuponsteur tax to be paid by foreign holders of German internal bonds. The first Euro Deutsche-mark bond is issued.
1966	An OECD working party report draws attention to the usefulness of an international capital market.
1967	An EEC report (*The Development of a Euopean Capital Market*) emphasizes the need for links between national financial markets. The EEC's *Tenth General Report on Activities of the Community* suggests movement towards a freer European capital market with harmonized institutional and legal standards.

	IMF outlines a plan for establishing Special Drawing Rights (SDRs).
1968	The Association of International Bond Dealers (AIBD) is established to increase order in the international bond markets. Foreign bond issues in Europe and the US are ten times the level of 1958 issues.
1969	IMF establishes a buffer stock financing facility and the first Amendment to the Articles of Agreement goes into effect.
1960s	The dollar is the main stabilizing factor in foreign exchange markets. The productive capacities of many countries are reestablished.
1970	The Securities Investor Protection Act is passed in the USA. The IMF opens up its Special Drawing Rights (SDR) department. SDRs are used to supplement gold and dollars for national reserves on the basis of 1 SDR= $1.
1971	The Deutsche-mark and Dutch guilder are floated.
1972	EEC countries introduce the 'snake in the tunnel' whereby foreign exchange fluctuations between members' currencies are minimized. The International Money Market (IMM) opens in Chicago (16 May). The pound sterling is floated for a short period from 23 June when British international reserves are at a peak. Denmark withdraws from the European Monetary Agreement but rejoins later in the year.
1973	Swiss franc floated (23 January) OPEC countries quadruple the price of oil The external debt of non-oil developing countries reaches #130 billion
1974	The USA removes the Interest Equalisation Tax and relaxes controls on capital exports. France withdraws from the European System of joint-floating exchange rates (10 July). The IMF redefines the value of the SDR. The new SDR reflects the value of 16 major currencies rather than just the dollar.
1975	The first Eurobond denominated in SDRs is issued.
1976	IMF members meet in Jamaica and agree to let market forces determine exchange rates.
1977	EEC produces the Code of Conduct Relating to Transactions in Transferable Securities.
1977-78	US dollar exchange rates experience a sharp decrease.
1978	The IMF's Articles of Agreement are amended (The Second Amendment). Following its fall, the dollar recovers after dealings with the IMF and in the international financial markets. Floating rate notes (FRNs) which depend on LIBOR (the London Inter-Bank Offered Rate) are introduced in the Euromarkets.
1979	The 'snake in the tunnel' joint-float is replaced by the European Monetary System (EMS).

	The European Monetary Fund is set up (March) with objectives similar to those of the IMF. Members are Belgium, Denmark, West Germany, France, Neterlands, Italy, Ireland and Luxembourg. The first EMS realignment. Deutsche-mark revalues (late September). The International Banking Act is passed in the USA eliminating many differences between regulations on US and foreign operating in the USA. The UK removes all exchange restrictions (23 October) The Perouse Commission examines methods to improve the Paris stockmarket.
1970s	Equity markets become increasingly internationalized. Most countries move to a system of floating or managed foreign exchange rates.
1980	Switzerland lifts all exchange restrictions on Swiss franc denominated deposits of non-residents. In the USA, the Depository Institutions Deregulation and Monetary Control Act is passed-phasing out interest rate ceilings. IMF emergency fund is increased to $7.1 billion (SDR 6.4 billion). Japan passes the New Foreign Exchange Law. Non-OPEC countries record massive trade deficits. Foreign currency assets of banks in the European Eurocurrency market exceed $750 billion. Gross volume of international banking flows exceeds $1,300 billion.
1981	The method for calculating the SDR is changed. The new SDR is based on the currencies of the five countries with the largest export performances from 1975 to 1979 (JS$, DM, yen, £ sterling and French franc). The IMF enters into a borrowing agreement with the Saudi Arabian Monetary Agency (SAMA). Greece joins the EEC. EMS realignment. Deutsche-mark and guilder revalued, French franc and lira devalued (October). EEC establishes a pool for financing member countries through their balance of payments difficulties. The first 'droplock' bond is issued in the Euro-market. International Banking Facilities are authorized in the USA, which allow banks to conduct approved international transactions without being subject to interest rate and reserve requirements.
1982	Belgium, Denmark and Luxembourg devalue their currencies

	against other EMS currencies. Brazil and Argentina are unable to meet their foreign debt obligations. Mexico is unable to maintain debt servicing payments and closes its foreign exchange markets. The IMF lends Mexico SDR 3.6 billion to rectify the situation. The London International Financial Futures Exchange (LIFFE) opens to provide a service similar to that of the IMM in Chicago. EMS realignment. West Germany and Netherlands revalue their currencies. France and Italy devalue (June).
1983	OPEC members lower the price of oil from $34 per barrel to $29 per barrel. Australia and New Zealand devalue their currencies (7 and 8 March). The external debt of non-oil producing developing countries reaches above US $650 billion. Total outstanding debt of the LDSs reaches $750 billion. The IMF increases its funds quotas from around SDR 60 billion to SDR 90 billion. The World Bank sets up a Special Action Program to aid less developed countries. The IMF lends Brazil the equivalent of SDR 4.96 billion. EMS realignment: West Germany, Netherlands and Belgium revalue their currencies. France, Italy and Ireland devalue (late March). Japan, President Regan visits Tokyo with a 'liberalization package' (November) Japan (December). Many restrictions on Euroyen bonds are lifted. Japanese banks are allowed to issue Euroyen loans to domestic or foreign borrowers. Foreign banks are allowed to provide trust banking services. Foreign financial institutions are allowed to lead-manage Euroyen bond issues. Japanese authorities consider lifting withholding taxes.
1984	The US repeals the withholding tax on US bonds held by non-residents. The method for calculating the ECU currency basket is revised (2 July). Norway devalues the krone by 2 per cent. Australia introduces a deregulation programme to allow entry to foreign banks and remove certain exchange controls. UK agrees that the London stock exchange will eventually abolish fixed commissions allows banks to buy into stockbroking firms. London stock exchange begins trading in currency options. In Europe, 23 (of 24) OECD countries allow entry of foreign banks to domestic markets. Sweden, the remaining OECD country intends to allow foreign banks entry in 1986.

	Japan invests over $20 billion per year in foreign securities.
1985	Portugal and Spain join the EEC. Bank of Korea takes steps to equalize the treatment of foreign and domestic banks in Korea. In France, liberalization leads to the emergence of a Eurofranc market. Portugal and Norway allow entry of foreign banks.
1980s	Governments with low reserves find t increasingly difficult to counter currency market forces. Technical developments allow money to be transferred across national frontiers at the speed of light. Fast growing Asian economies (Taiwan and South Korea) permit ownership of equity by foreigners via investment funds for non-residents. Stockmarkets in Egypt and Turkey begin to revive. Pressure increases for Saudi Arabia to remove restrictions on equity investment. In Japan, pressure mounts for further deregulation of markets. Sweden and Finland set up free share registers to allow free trading by foreigners in domestic equities.
1986	Japan's asset price bubble begins to emerge
19 Oct 1987	U.S. stock market crashes. Dow Jones Industrial Average falls by 23 percent.
1989-1990	Japan's asset price bubble begins to burst.
29 Dec 1989	Japanese stock Nikkei 225 Index reaches all-time high of 38,957.
1 Jan 1990	Kula Lumpur Stock Exchange operates as an independent exchange following the delisting of Malaysian-incorporated companies from the Stock Exchange of Singapore and the delisting of Singapore-incorporated companies from the KLSE.
2 Jan 1990	Singapore launches the Central Limit Order Book, a new OTC market for Malaysian stocks and six other foreign stocks.
Dec 1992	Indonesia's Bank Summa fails. Thailand establishes the Bangkok International Banking Facilities.
1 Jan 1994	NAFTA between Canada, Mexico and the United States comes into effect. China unifies its 'dual' exchange regime into a single one.
April 1994	Mexico joins the OECD.
9 Dec 1994	Japan's Tokyo Kyowa and Anzen credit cooperatives fail.
1994	IMF begins to recommend that Thailand relax its foreign exchange policy.
Mid-Jan1995	Speculative attack on the Thai baht as well as other ASEAN currencies following Mexcian peso crisis.
17-Jan1995	Earthquake hits Kobe, Japan.
1 Feb 1995	IMF announces Mexico rescue package totalling around US$50 billion from the IMF, United States, BIS and other commercial banks.

July 1995	Japan's Cosmo Credit Cooperative suspends operations.
Aug1995	Japan's Kizu Credit Cooperative and Hyogo Bank fail.
Sept 1995	Japan's Daiwa Bank announces loss of US$1.1 billion due to fraud at its New York branch.
March 1996	Japan's Taiheiyou Bank fails.
May 1996	Thailand's Bangkok Bank of Commerce is taken over because of a bad loan.
Late July 1996	First major speculative attack on the Thai baht after the Mexican peso crisis.
Oct 1996	Dow Jones Industrial Average breaks 6,000, Alan Greenspan makes 'irrational exuberance speech'.
Nov1996	Japan's Hanwa Bank is ordered to suspend operations.
23 Jan1997	South Korea's Hanbo Steel, the 14th largest chaebol, fails.
Jan-Feb 1997	Second major speculative attack on the Thai baht after the Mexican peso crisis.
5 Feb 1997	Thailand's Samprasong becomes the first large Thai company to miss payments on foreign debt.
March 1997	South Korea's Sammi Steel, on 26th largest chaebol, FAILS. IMF urges Thailand to introduce greater exchange rate flexibility promptly. Bank of Thailand, the Thai central bank, orders 10 finance companies in Thailand to increase their capital. Finance One, largest Thai finance company, collapses.
8-15 May 1997	Third major speculative attack against the Thai baht after the Mexican peso crisis.
27 June 1997	Bank of Thailand suspends operations of 16 insolvent and liquidity-strapped finance companies. Hong Kong's Hand Send Index peaks at 15,196 before the handover of Hong Kong to China.
Early July 1997	South Korea's Kia, an automotive group, eighth largest chaebol, experiences financial difficulties.
1 July 1997	Hong Kong returns to China after 156 years of British colonial rule.
8 July 1997	Second major speculative attack on the Malaysian ringgit in 1997. Bank Negara Malaysia's central bank, intervenes to defend the ringgit.
11 July 1997	The Philippines allows the peso to float and requests assistance from the IMF. Indonesia widens its trading band for the rupiah from 8 percent to 12 percent.
5 Aug 1997	The Bank of Thailand suspends 42 additional finance companies as part of the IMF-guided rescue plan.
7 Aug 1997	Hong Kong's Hang Seng Index peaks at 16,673 after the return of Hong Kong to China.
14 Aug 1997	Indonesia abandons the rupiah's trading band and allows the currency to float freely.

	New Taiwan dollar comes under speculative attack.
Oct1997	South Korea discovers that Korea banks have unreported offshore short-term borrowings of more than US$60 billion.
20 Oct 1997	Hong Kong dollar comes under speculative attack. Hang Seng Index suffers four consecutive days of losses.
23 Oct 1997	Hong Kong's 'Black Thursday'. Overnight interest rates rise to 280 percent briefly. Hang Seng Index falls by 1,211 points or 10.4 percent to close at 10,426.
31 Oct1997	Indonesia signs the first IMF Letter of Intent. A highly publicised impasse between President Suharto and the IMF begins.
1 Nov 1997	Indonesia government closes 16 banks, including three connected with the President's family-Bank Andromeda, Bank Industri and Bank Jakarta.
5 Nov 1997	IMF announces Indonesian rescue package totalling around US$23 billion from the IMF, Asian nations, other multilateral agencies and Indonesia's own external assets.
17 Nov 1997	Japan's Hokkaido Takushoku Bank collapses under the weight of bad loans. First of Japan's big banks to fail.
21 Nov1997	South Korea calls in the IMF.
24 Nov 1997	South Korea's 'Black Monday'. Korean won slides and KOSPI closes at a 10-year low at 451. Japan's third largest broker of stocks and securities, Yamaichi Securities, collapses.
25 Nov 1997	Japanese yen falls to ¥127.45 to the U.S. dollar. Nikkei-225 plunges by 5.1 percent to close at 15,868.
4 Dec 1997	IMF announces Korean rescue package totalling around US$55 billion from the IMF, other multilateral agencies and bilateral sources.
9 Dec 1997	South Korea suspends the operation of five additional involvement merchant banks, bringing the total suspended to 14, and takes majority stakes in Korea First Bank and Seoul Bank.
11 Dec 1997	Moody's downgrades South Korea's sovereign debt rating from A3 to Baa2. Moody's also downgrades the credit ratings of 31 Korean issuers.
19 Dec1997	Japan's Toshoku Ltd., a foodstuffs trader, fails. One of the country's largest postwar bankruptcies.
29-30 Dec1997	G-10 banks agree to roll over short-term loans to South Korea banks.
1 Jan 1998	Malaysia strengthens prudential regulations. Thailand appeals to the IMF to ease fiscal tightening.
12 Jan 1988	Hong Kong investment bank, Peregrine Investments, fails because of loan exposure in Indonesia. Hong Kong's CA Pacific Securities, a midsized stockbroker, goes into voluntary suspended operations.
26 Jan 1998	Indonesia Bank Restructuring Authority is established. A blanket

	guarantee for all liabilities and assets of banks incorporated in Indonesia is introduced.
14 Feb 1998	54 Indonesian banks are brought under IBRA.
31 March 1998	Philippines agrees to a three-year Standby Arrangement with IMF. Indonesia closes seven small banks, and IBRA takes over seven banks.
4 April 1998	South Korea successfully launches its first international bond issue since the crisis.
27 May 1998	Russian financial system shows increasing signs of real trouble.
June 1998	New Taiwan dollar falls to an 11-year low.
13 July 1998	Malaysia announces a RM7 billion fiscal stimulus package to boost economic growth.
19 Aug 1998	Russia officially defaults on its Treasury Notes.
21 Aug 1998	Russia's economic crisis shakes world markets.
31 Aug 1998	Dow Jones Industrial Average plunges by more than 500 points.
1 Sept 1998	Malaysia introduces capital controls. KLCI plunges to 262.7 points, its lowest point since 2 July.
2 Sept 1998	Long Term Capital Management announces huge losses. World markets shaken.
23 Sept 1998	Federal Reserve of New York puts together a US$3.75 billion bailout package for LTCM.
Sept 1998	Brazil goes into crisis.
Oct 1998	The Exchange Fund Investment Limited is established to advise the Hong Kong government on the orderly disposal of the substantial portfolio of Hong Kong shares it acquired in August 1998.
Late 1998	Japan begins to systematically manage its banking crisis. Asian Crisis shows sings of abating.
15 Jan1999	The Brazilian government allows the real to float freely.
6 April 1999	Malaysia releases a white paper on the Malaysian crisis.
Nov 1999	The Tracker Fund of Hong Kong, an Exchange Traded Fund, is launched as the first step of the Hong Kong government's plans in disposing of the stocks it acquired in August 1998.
10 March 2000	All time high of NASDAQ Composite Index of 5,132, marking peak of dot-com stock market bubble.
28 July 2003	The Independent Evaluation Office of the IMF releases its evaluation report on the IMF's handling of the crises in Indonesia, South Korea and Brazil.
Summer 2005	Between 1997 and 2006, U.S. house prices rise roughly 120 percent. House prices begin to peak in late summer 2005, as the Fed raises the Fed Funds rate by 5 steps of 25 bps in 2004 and 8 steps of 25 bps

	in 2005, bringing the Funds rate to 4.25 percent at the end of 2005.
5 March 2007	HSBC reports loss of US$1.8 billion on portfolio of sub-prime loans.
First Quarter 2007	S&P/Case-Shiller house price index records first-ever U.S. nationwide price decline since 1991.
March-2 April 2007	More than 25 subprime lenders file for bankruptcy, including New Century Financial, the largest
14-22 June 2007	Two Bear Stearns-managed hedge funds announce losses of US$1.4 billion in subprime loans.
10-12 July 2007	Credit ratings agencies downgrade subprime mortgage bonds and CDO tranches.
30 July-1 Aug 2007	Germany's IKB announces losses. KfW, its main shareholder plus other banks up €3.5 billion rescue fund.
31 July- 9 Aug 2007	American Home Mortgage Investment Corporation announces and files for Chapter 11. BNP Paribas freezes redemption for three investment funds, due to impossibility to value.
9-10 Aug 2007	ECB injects €95 billion to fund overnight liquidity in European banks, and Federal Reserve injects US$38 billion into U.S. banks.
13-17 Sept 2007	U.K. mortgage lender Northern Rock suffers liquidity problems, then a bank run (first in 140 years in the U.K.) and requires deposit guarantee by U.K. Treasury. U.S. Fed cuts interest rates by 50 basis points.
9 Oct 2007	Dow Jones Industrial Average peaks at 14,164.
11-19 Oct 2007	Rating agencies downgrade subprime bonds. Shanghai A-share Composite closes at peak of 6,092.
Sept-Dec 2007	Banks reveal large credit losses. Merrill Lynch announces credit losses of US$8.4 billion. Merrill CEO and Citigroup CEO step down.
12 Dec 2007	Central banks from five currency areas announce measures to provide liquidity for financial institutions for year-end.
2 Jan 2008	Crude oil price rises above US$100 per barrel.
15 January 2008	Citigroup announces fourth quarter loss of US$9.8 billion due to write-down of US$12.5 billion of convertible preferred capital.
21-31 Jan2008	Federal Reserves cuts 75 bps and 50 bps, respectively, within 10 days, citing weaknesses in markets.
24 Jan 2008	Societe General, one of the largest French banks, announces loss of €4.9 billion (US$7.2 billion), due to a rogue trader, requiring a capital call of €5.5 billion or US$8 billion.
17 Feb 2008	U.K. Treasury announces nationalization of Northern Rock.
16 March 2008	Bear Stearns runs into liquidity problems and is sold to JPMorgan, with New York Fed backing loans of up to US$29 billion. Fed establishes Primary Dealer Credit Facility. Gold price hits peak US$1,011.25 per ounce on 17 March.
1 April 2008	UBS Chairman steps down after write-down of US$19 billion, on top of write-down of US$10 billion in December 2007.

8 April 2008	IMF Global Financial Stability Report estimates that world-wide credit losses may total as much as US$945 billion.
3 July 2008	Oil price hits peak of US$146 per barrel (Brernt Crude).
11 July 2008	U.S. Treasury announces plan to rescue Fannie Mae and Freddie Mac, the two largest agencies that own or guarantee about 45 percent of US$12 trillion mortgage market in the United States.
Late July 2008	Institute of International Finance estimates that in the year up to June 2008, global financial system suffered US$476 billion in credit losses and raised US$354 billion in new capital.
7 Sept 2008	U.S. Government places Fannie Mae and Freddie Mac in conservatorship, with Treasury promising to take enough shares to keep the two GSEs with positive net worth.
8 September 2008	Global stock markets react favourably to Fannie Mae bailout, but computer problems shut down London Stock Exchange on Monday, 8 September, causing funds to not being able to exit their positions.
10 Sept2008	Korean Development Bank pulls out of talks to invest in Lehman Brothers, causing Lehman shares to plunge 30 percent.
12 Sept 2008	U.S. Senate discloses that several large investment banks and brokerages, including Morgan Stanely, Lehman Brothers, Citigroup and Merril Lynch, marketed allegedly abusive transactions that helped foreign hedge fund investors avoid billions in U.S. taxes. Lehman shares fall more than 50 percent since Monday.
13 Sept 2008	Barclays Bank backs away as buyer for Lehman. People's Bank of China cut rates for first time in six years.
14 Sept 2008	Global consortium of banks announces a US$70 billion pool of funds to help troubled financial institutions. Bank of America takeover of Merrill Lynch at US$29 per share, a premium of US$17.05 at market close on Friday, 12 September, but less than one-third of US$100 a share in early 2007.
15Sept 2008	158-year-old investment bank Lehman Brothers (fifth largest in United States) files for Chapter 11 bankruptcy protection, partly because of US$30 billion in toxic real estate. Total debt amounts to US$613 billion. Fed provides larges U.S. insurer AIG US$85 billion support, in exchange for warrants for 79.9 percent equity stake. AIG CEO Willumstad is replaced. AIG's share price drops over 95 percent to just $1.25, from a 52-week high of $70.13. AIG had provided market with $446 billion of credit default swaps. U.S. stocks suffer biggest one-day decline since 11 September 2001.
17 Sept 2008	Goldman Sach's earnings declines 70 percent in third quarter earnings. Russian shares fall 20 percent in one day, and oil price falls to $90 per barrel. Panic grips markets as investors flee to safety. Putnam announces closure of a large money market fund because of

	heavy redemptions. US.S money markets funds are $3.4 trillion business.
18 Sept2008	Central banks continue to flood markets with liquidity support in wake of stock market slide globally. Fed boosts its U.S. dollar swap line with foreign banks by $180 billion as financial shares drop. SEC and FSA ban short selling of financial shares until January 2009. HBOS, one of the largest U.K. mortgage lenders, is rescued by takeover by Lloyds TSB, a large U.K. bank.
19Sept 2008	China cuts stamp tax and Central Huijjin will buy back shares in large banks as A-share index falls 70 percent since beginning of the year. Russian Government pledges $20 billion to prop up stock market. U.S. Treasury moves to increase capital of Fed as, out of $888 billion in assets, some $380 billion are committed to mortgage rescue operations. Fed holdings of Treasuries have dwindled to under $480 billion from $800 billion a year before. U.S. Government pledges $50 billion to guarantee money-market funds.
20-21 Sept 2008	U.S. Treasury Secretary proposes $700 billion rescue fund to buy toxic residential and commercial mortgage-based assets from banks. Troubled Asset Relief Program (TARP) would be subject to legislative approval. Fed approves transformation of Goldman and Morgan Stanely into bank holding companies, ending era of investment banks.
22 Sept 2008	Japanese bank Mitsubishi UFJ buys 10-20 percent stake in Morgan Stanely for $8.39 billion. Nomura Securities pays $225 million for Asian operations of Lehman Brothers. Shinsei Bank forecasts net loss for fiscal first half due to provisions for exposure to Lehmans and European asset-backed securities.
25 Sept 2008	Bank run on Bank of East Asia in Hong Kong (BEA), a reflection of nervousness in Asia arising from credit crisis fallout. Investors in Hong Kong and Singapore have lost money because they bought Lehman Brother's minibonds through banks. Moody's downgrades BEA from stable to negative after the bank announces an investigation into a HK$93 million trading loss on equity derivatives on 18 September. The bank also had exposures to Lehman Brothers and AIG of HK$423 million and HK$50 million,

	respectively. President Bush speaks to the nation on financial crisis.
26 Sept 2008	Washington Mutual, the largest U.S. savings and loan with US$307 billion in assets, is sold to JPMorganChase for $1.9 billion. Depositors will still be insured, but shareholders will lose their money. Warren Buffet invests $5 billion in Goldman Sachs. Governments of Belgium, Netherlands and Luxembourg rescue Fortis, the Belgian-Dutch banking and insurance group. It has €871 billion in assets at end of 2007 and paid €24 billion to buy ABN-Amro's retail operations.
29 Sept 2008	Rescue of Belgium bank Dexia. Ireland guarantees all deposits of its six largest banks, followed by other governments.
30 Sept 2008	U.S. Congress approves US$700 billion rescue plan, after initial rejection on 29 September. Dutch Government acquires Fortis Nederland.
3 Oct 2008	German Government rescue Hypo Real Estate. BNP Paribas takes over Fortis operations in Belgium and Luxembourg.
6 Oct 2008	Icelandic Government takes control of Glinter and Landsbanki.
7 Oct 2008	U.K. Government announces provision of capital to U.K. incorporated banks. Coordinated interest rate cut of 50 bps by Fed, ECB and Bank of England.
8 Octr 2008	European governments announce measure to inject capital into European banks of up to €1 trillion. United States announces $250 billion injection into nine largest banks, leading to the Dow Jones Industrial Average soaring by 11 percent for the largest point gain ever.
13 Oct2008	Dutch Government injects $10 billion into ING.
19 Oct 2008	Fed creates Money Market Investor Funding Facility.
21 Oct 2008	U.S. House Oversight Committee questions Alan Greenspan, who admits to partial error.
24 October 2008	Barack Obama elected President of the United States.
4 Nov 2008	China announces RMB4 trillion (US$586 billion) stimulus package.
11 Nov 2008	U.S. Government increases aid to AIG to $150 billion, including $40 billion equity stake.

Source: Ayling (1986); Sheng (2009); and Rik and Hein (2007).

Table A3.2: Top 20 Countries by Market Capitalisation, 2008

Rank	Country	Total Market Capitalisation (US $ mn)	Rank	Country	Total Market Capitalisation (US $ mn)
1	US	1,17,37,646	11	Switzerland	8,62,663
2	Japan	32,20,485	12	Australia	6,75,619
3	**China***	27,93,613	**13**	**India***	6,45,478
4	UK	18,51,954	**14**	**Brazil***	5,89,384
5	France	14,92,327	15	Italy	5,20,855
6	Honkong	13,28,837	**16**	**Korea***	4,94,631
7	**Russia***	13,21,833	**17**	**South Africa***	4,91,282
8	Germany	11,07,957	18	Netherlands	3,87,906
9	Canada	10,02,215	**19**	**Taiwan***	3,80,923
10	Spain	9,46,113	20	Sweden	2,52,542

Note: * denotes as emerging country

Source: S&P Global Stock Markets Fact book 2008

Table A3.3: Market Capitalization of Listed Companies (% of GDP)

Country	Brazil	China	India	Russian Federation	Japan	United Kingdom	United States
1991	10.51	0.53	17.83	0.05	90.69	93.57	68.78
1992	11.60	4.33	26.51	0.05	63.71	84.91	71.42
1993	22.68	9.22	35.50	0.00	69.37	117.38	77.77
1994	34.60	7.78	39.57	0.04	78.14	114.11	72.21
1995	19.20	5.78	35.70	4.01	69.88	121.66	93.40
1996	25.84	13.29	31.57	9.50	66.63	142.70	109.30
1997	29.32	21.66	31.26	31.66	52.05	146.89	137.06
1998	19.07	22.69	25.27	7.60	64.71	163.07	154.71
1999	38.84	30.53	40.98	36.86	104.08	195.22	180.50
2000	35.08	48.48	32.18	14.99	67.64	174.41	154.68
2001	33.64	39.55	23.10	24.85	54.98	147.17	137.50
2002	24.55	31.85	25.83	35.95	54.26	115.64	106.53
2003	42.46	41.51	46.56	53.49	71.90	132.20	130.79
2004	49.77	33.12	53.80	45.28	79.86	127.85	138.19
2005	53.80	34.59	66.06	71.75	104.05	134.12	134.91
2006	65.30	89.31	86.27	106.85	108.34	155.54	145.66
2007	100.32	177.61	147.56	115.61	101.73	137.85	142.37
2008	35.97	61.63	53.16	23.82	65.90	69.55	81.69
2009	74.26	100.46	90.01	69.99	66.66	128.60	105.76

Source: World Development Indicators 2010.

Table A3.4: Total Listed Domestic Companies

Country	Brazil	China	India	Russia	Japan	United Kingdom	United States
1991	570	14	2556	13	2107	1623	6742
1992	565	52	2781	26	2118	1874	6699
1993	550	183	3263	51	2155	1646	7246
1994	544	291	4413	72	2205	2070	7692
1995	543	323	5398	170	2263	2078	7671
1996	551	540	5999	73	2334	2171	8479
1997	536	764	5843	208	2387	2157	8851
1998	527	853	5860	237	2416	2087	8450
1999	478	950	5863	207	2470	1945	7651
2000	459	1086	5937	249	2561	1904	7524
2001	428	1160	5795	236	2471	1923	6355
2002	399	1235	5650	196	3058	2405	5685
2003	367	1296	5644	214	3116	2311	5295
2004	357	1384	4730	215	3220	2486	5231
2005	381	1387	4763	296	3279	2759	5143
2006	392	1440	4796	309	3362	2913	5133
2007	442	1530	4887	328	3844	2588	5130
2008	432	1604	4921	314	3299	2415	5603
2009	377	1700	4955	279	3208	2179	4401

Source: World Development Indicators 2010.

Table A3.5: Stocks traded, Turnover Ratio (%)

Country	Brazil	China	India	Russia	Japan	United Kingdom	United States
1991	22.03	-	56.78	-	-	-	-
1992	31.51	158.9	36.96	-	-	-	-
1993	32.58	164.03	27.46	-	-	-	-
1994	83.37	235.18	24.15	-	-	-	-
1995	47.85	115.86	10.52	-	30.9	77.1	85.7
1996	61.07	329.03	17.36	11.1	37.1	36.8	92.8
1997	77.23	244.17	27.14	24.4	47.2	44.4	103.2
1998	70.95	130.12	56	0.02	40.3	53.4	106.2
1999	52.97	134.18	84.45	5.9	52.5	51.9	123.5
2000	43.48	158.29	133.64	36.9	69.9	66.6	200.8
2001	34.5	81.3	191.4	39.1	67.9	78.4	201.3
2002	34.95	85.68	225.82	30.06	71	135.4	202.51
2003	32.43	83.34	138.54	-	87.99	100.58	122.81
2004	34.85	113.29	115.47	52.98	103.46	140.53	126.54
2005	38.31885	82.54	94.2	39.02	118.77	141.87	129.10

2006	42.92873	101.96	93.07	64.06	132.14	123.81	182.80
2007	56.2	180.1	84	58.9	141.6	270.1	216.5
2008	74.27364	121.29	85.18	75.02	153.22	226.85	232.26
2009	73.90906	229.60	119.34	108.5	128.8	146.4	348.58

Source: World Development Indicators 2010.

Table A3.6: Stocks traded, Total Value (% of GDP)

Country	Brazil	China	India	Russia	Japan	United Kingdom	United States
1991	3.28	0.22	8.65	-	28.86	29.86	36.72
1992	5.26	3.95	8.43	-	16.86	35.08	33.11
1993	13.10	9.85	7.89	-	22.07	43.17	50.80
1994	20.05	17.44	8.46	0.07	23.56	43.76	50.79
1995	10.30	6.84	6.16	0.12	23.47	44.09	69.58
1996	13.35	29.90	24.76	0.76	27.01	47.43	91.74
1997	23.24	38.79	38.52	4.01	29.39	61.01	123.82
1998	17.38	27.93	35.61	3.87	24.60	80.18	151.23
1999	14.87	34.81	61.90	1.45	42.33	91.70	201.54
2000	15.71	60.20	110.78	7.82	57.72	124.21	326.30
2001	11.76	33.89	52.17	7.47	44.59	126.53	288.22
2002	9.56	22.93	38.86	10.46	40.15	118.46	243.54
2003	10.94	29.06	47.51	18.77	53.75	118.85	142.53
2004	14.10	38.74	52.58	22.11	74.48	168.32	163.85
2005	17.48	25.98	51.83	20.84	109.78	182.75	170.99
2006	23.37	60.18	67.27	51.99	143.32	173.90	249.45
2007	42.82	222.27	89.84	58.04	148.41	368.86	304.15
2008	44.42	120.69	86.46	33.71	120.31	243.63	253.79
2009	41.30	179.67	83.11	55.46	82.74	156.47	327.83

Source: World Development Indicators 2010.

CHAPTER IV

Macroeconomic Factors and Stock Prices in the BRIC Countries

4.1. Introduction

Emerging stock markets continue to show wild fluctuations, often unrelated to the real economy. The market crisis is a phase of such wild behaviour. Such a phenomenon is neither new nor isolated. It may be noted that the amplitude of fluctuations in the state of Indian stock market from euphoria to despondency has been regularly high, especially after liberalization. Such wild movements show the extent of irrationality of the Indian stock market behaviour. An important task for the policy makers is to rectify such erraticism which has become a characteristic of the Indian stock market. The basic aim of this chapter is to understand the price behaviour or linkages between macro variables and stock prices.

The theoretical motivation for undertaking the study on the effect of macroeconomic variables on stock prices can be discussed as follows. The economic environment is composed of the micro and macro level variables which may either be formed logically on economic fundamentals or by many subjective factors which are unpredictable and non quantifiable. It is generally perceived that domestic economic variables play a seminal role in the overall performance of stock markets[1]. The security price movements are closely related to economic activity level. In today's globally integrated world, information access is easy and universal. According to the Efficient Market Hypothesis (EMH) (Fama, 1970), an efficient capital market is one in which stock prices change rapidly as the new information becomes available (Maysami et al. 2004). Several studies have found a correlation between changes in world economy and macro economic variables. These studies also suggest that the movement of stock market indices is highly

[1] But in the era of globalisation and integration of world economies the impact of global economic variables cannot be ignored.

sensitive to the changes in the fundamentals of the economy and to the changes in the expectation about future prospects (Ahmed, 2008). Stock price fluctuations are as old as the stock market themselves. And yet those prices are essential factors in investment decisions, which are fundamental to the economy. Corporate investment is much more volatile than aggregate gross domestic production (GDP), and it appears to be an important driver of economic fluctuations (Akerlof et al. 2009).

Stock prices provide the key price signals to managers regarding corporate investment choices. These prices also serve as a measure of performance for past investment decisions. Economic theory tells us that in a well-functioning and rational stock market, changes in stock prices reflect both revised expectations about future corporate earnings and changes in the discount rate at which these expected earnings are capitalized[2]. Corporate profits are an important part of gross national product (GNP) and are also likely to be positively correlated with other components of GNP (Fisher et al 1984).

The relations between exchange rate movements and stock prices are based on the rise in the domestic interest rate that leads to capital inflows and makes the exchange rate appreciate. This currency appreciation has a negative effect on stock prices of export dominant industries because of reduction in exports, while currency appreciation boosts the stock market (positive effect on stock prices) for import of dominant industries due to increase in imports. The weakness of Rupee has cascading effect on equity returns of investors who buy stocks with dollars. In the absence of full convertibility, Foreign Institutional Investors (FII) has to convert their dollars into rupees to buy stocks here and do the reverse while selling. FII investments bring in global liquidity into the equity markets and raise the price-earnings ratio and thereby reduce the cost of capital domestically. FII Investment inflows help supplement domestic savings and smoothen inter-temporal consumption. Numerous studies have been conducted in developed

[2] Strictly, it is not "corporate earnings" but wet cash flow, which is for distribution to the current Stockholders" which is capitalized in stock prices. The two are, of course, closely related, especially at an aggregate level.

capital markets with regard to the relationship between stock prices and interest rates. The results of most of the studies suggest that stock and bond returns are predictable and that one can be used to forecast the other. In general, whenever the interest rate on treasury securities rises, investors tend to switch out of stocks, causing stock prices to fall.

The effects of inflation on the returns of financial assets have been an important theoretical issue for many years. The basic theoretical concept in this area is commonly attributed to Fisher (1930), who had postulated that the nominal interest rate fully reflects the available information concerning the possible future values of the rate of inflation. This hypothesis has received wide acceptance among economists and has played an important role in the monetary theory, finance and macroeconomics. Moreover, economic theory suggests that stock prices should reflect expectations about future corporate performance, and corporate profits generally reflect the level of economic activities. If stock prices accurately reflect the underlying fundamentals, then the stock prices should be employed as leading indicators of future economic activities and not the other way around. Therefore, the causal relations and dynamic interactions among macroeconomic variables and stock prices are important in the formulation of the nation's macroeconomic policy. All the above considerations motivated to conduct this research study in the Indian context.

Section 2 provides theoretical framework of the study. Section 3 discusses about the existing literature. Section 4 deals with the conceptual, methodological issues and the data sources. Section 5 presents and discusses about the empirical results. Finally, Section 6 provides concluding remarks.

4.2. Analytical Framework

Stock market plays a vital role in every country's economic growth and development. A healthy and flourishing stock market has been considered relevant for national economic growth which channelizes capital toward investors and entrepreneurs. In the '*General Theory*', Keynes commented that the stock market, as an institution is supposed to have proper social purpose of

capital development and directing new investment into the most profitable channels in terms of future yields (1936, p. 159). But in the analyses of aggregate economics activity presented in *'Treatise'* and *'The General Theory'*, stock prices merited attention because of their indirect influence on the instability of the aggregate economy. In *'Treatise'*, Keynes' discussions on prices of securities were in terms of how they affected overall price stability through their influence on the level of new investment. Stock prices were important factors in the theory of aggregate demand through their influence on the levels of both investment and consumption. In the Volume of the Treatise, prices of new investment goods were influenced by stock prices. When stock prices rise, price levels of new investment tend to rise which stimulates investment (1971a, p226). Keynes argued that the decreasing levels of stock prices that began with the market crash of 1929 did cause disinvestment on the working capital and promoted profit deflation by discouraging investment (1971b:176).

In Volume II of the '*Treatise*', Keynes noted that rising stock prices have the same effects on the ability of companies to raise capital with decrease in the interest rate. The very high stock prices in the late 1920s, at the time when short-term interest rates were also high, 'offered joint stock enterprises an exceptionally cheap method of financing themselves…it was cheaper than any previous time to finance new investment by the issue of common stock. By the spring of 1929 this was becoming the predominant method of finance' (1971b:174-5). In the *General Theory*, Keynes explained the influence of rising stock prices on the level of new investment within the theoretical framework of investment as a function of the marginal efficiency of capital and the current interest rate. With interest rates held constant, a rising marginal efficiency of capital stimulates investment, in the same way that a lower interest rate stimulates investment if the marginal efficiency of capital is held constant.

Theoretically, equity prices should be related to future economic activity movements because a firm's projected earnings growth depends on the health or weakness of the economy. If we think of the stock market as a forward predictor of economic activity, then the fundamental value of a firm's stock must be equal

to the discounted expected cash flow (dividends). Expected dividends, in turn, should reflect real economic activity as measured by the GDP or industrial production. However, stock prices are affected by other important variables such as market interest rates (which influence the firm's risk premium and discount rate) and inflation (which directly influences the market interest rates). Thus, movements in these (and other) variables should be linked to changes in business conditions and capture variations in a firm's future cash flows (and thus stock prices) (Laopodis 2011).

Empirical researchers have tried to identify determinants of stock prices. The studies on stock prices are mainly twofold. First, contemporary financial theory asserts that stock prices are closely related to the movements of macro variables (Ferson and Harvey 1991, Rao et al. 2000). This is because the stock prices reflect fundamental information about the macro economy. Therefore, the identifying factors that affect stock prices is an imperative task on various counts. Another approach to explain the stock prices is to assume the relationship between stock prices in one market or a group of markets and international economic environments such as stock prices and inflation and interest rates in other related economies including developed markets.

Specifically, this chapter investigates the inter-temporal relationship between these two magnitudes, that is, their short- and long-run behaviour, and draw inferences about the possible common economic forces driving these magnitudes. This will be accomplished by searching for evidence of cointegration between these series for each variable and see if they share a common stochastic (long-run) trend despite having short-run fluctuations (deviations). The importance of a statistically significant long-run relationship (or error-correction term in the VEC) lies in the recognition that the series share a common stochastic trend and thus tend to revert the equilibrium after some short-run fluctuations. Therefore, this could be interpreted as the stock market abiding by the fundamentals and not wandering on its own over time. But what is the economic rationale for, and interpretation of, in terms of presence of cointegration between equity prices and economic activity? Simply, a rise in economic activity generates positive forecasts

for higher earnings and profits of firms which, in turn, might consider raising dividend payouts to shareholders. Thus, the firm's stock fundamental value would be in line with expected earnings and dividends or economic fundamentals.

4.3. Review of Literature

The literature of the effects of macroeconomic variables on stock returns dates back to the late 1930s. Studies were focused more on developed stock market and few studies are available on emerging capital markets context and the existing literature shows strong relationships between the macroeconomic variables (For ex: Exchange rate, Interest rate, Inflation, Index of Industrial production(IIP), money supply, and Foreign Institutional Investment (FIIs) etc.) and stock prices.

The literature reveals various theoretical reasons for explaining and linking the behaviour of stock prices with the key macro economic variables. For instance, Friedman (1988) suggests 'wealth effect and substitution effect' as the possible channels through which stock prices might directly affect money demands in the economy. He expected that the wealth effect will dominate and thus the demand for money and stock prices will be positively related.

The theoretical basis to examine the link between stock prices and the real variables are well established in economic literature (see Baumol (1965) and Bosworth (1975). Dynamic linkages between stock markets and macroeconomic variables are equally important. However, such linkages have been investigated only recently and extensively for developed markets (Mukherjee and Naka 1995; Lee 1992). Dynamic linkages in the emerging markets of less developed countries have been ignored, though with few exceptions. Such relationships are considerable, however, mainly due to the over whelming influence of governments on the economic activity. Emerging Stock markets still have low volume of trade, and company-specific information is not always timely or of high quality (Bekaert and Harvey 1998; Muradoglu et al. 1998). Therefore, stock markets are prone to be influenced by economic policy. Again, the relationship is assumed to be unidirectional, from macroeconomic variables to stock returns.

Habibullah et al. (2000) examined the lead-lag relationship between stock prices and five macroeconomic variables, namely, interest rate, price level, national income, money supply, and real effective exchange rate in Malaysia. By employing the Toda- Yamamoto long-run Granger causality test, they found that interest rates lead to stock prices.

4.3.1. Exchange Rate

The relationship between the macroeconomic variables and the equity prices has been tested in many empirical studies. Literature reveals that asset pricing theories do not specify the underlying macroeconomic factors that influence equity prices. Such studies include Fama(1981), Nath and Reddy (2004), Rangel (2011) and Chittedi (2011a). In retrospect of the literature, a number of hypotheses also support the existence of a causal relation between stock prices and exchange rates. Several studies have been conducted to examine the effect of changing exchange rates on the stock prices. There are two theories about the dynamic relationship between exchange rates and stock prices – the traditional and portfolio approaches – which have been discussed for a long time, yet have not resulted in any consensus. The traditional approach claims that a depreciation of the domestic currency makes local firms more competitive, leading to an increase in their exports and consequently higher stock prices. This implies a positive correlation between exchange rates and stock prices. The inference from the above traditional approach suggests that exchange rates lead stock prices. The portfolio approach, on the contrary, argues that an increase in stock prices induces investors to demand more domestic assets and thereby causes an appreciation in the domestic currency, implying that stock prices lead exchange rates and they are negatively related.

Frank and Young (1972) conclude that there is no definite or uniform pattern of stock price reaction to exchange rate realignment. Aggarwal (1981) concludes his study on the relationship between stock prices in the US capital markets and the floating value of dollars. In his study, he shows that the value of the US dollar and the US stock prices are positively correlated for the period of 1974 – 1978. Mookerjee and Qiao (1997) discovered that bi-directional causal relationship

between stock returns and changes in exchange rate exist in the Tokyo market. In Hong Kong, there is a strong connection between exchange rates and stock return. On the other hand, there is no connection between changes in stock prices and exchange rates in the Singapore market. Phylaktis and Ravazzolo (2005) suggest that stock and foreign exchange markets are positively related and that the US stock market acts as a conduit for these links. Furthermore, these links are not found to be determined by foreign exchange restrictions. Finally, through the application of recursive estimation the evidence shows that the financial crisis had a temporary effect on the long-run comovement of these markets. Ajayi and Mougoue (1996) studied the dynamic relationship between stock prices and exchange rates, employing a bivariate error-correction model. They investigated both the short-run and the long-run relationships between the two variables in the major eight stock markets, including Canada, France, Germany, Italy, Japan, Netherlands, the United Kingdom, and the United States. The results revealed that an increase in domestic stock prices had a negative short-run effect on the value of the domestic currency. Yet, sustained increases in the domestic stock prices in the long run will appreciate the domestic currency, since the demand for the currency will be driven up. Abdalla and Murinde (1996) investigated the interactions between exchange rates and stock prices in India, Korea, Pakistan, and the Philippines using Granger causality, and using monthly data over the period from January 1985 to July 1994. Unidirectional causality is observed from exchange rates to stock prices in all countries except the Philippines.

4.3.2. Interest Rate

The interest rate is the appropriate indicator of the cost of capital, even in an uncertain environment. In theory, the relationship between interest rates and stock prices is negative. This is due to the cash flow discounting model according to which, present values of stocks are calculated by discounting the future cash flows at a discount rate. If the discount rate increases, then present values of stocks decline and vice versa. This discount rate is a risk adjusted required rate of return and equal to the level of interest rates in the economy. Therefore, an increase in interest rates lowers the present values of stocks directly. Even a

relatively small rise in interest rates can have a major effect on present values if it is spread out over several years. In addition, rising interest rates reduce cash flows by reducing the profitability of firms. Due to these two reasons, present values of stocks decline and so do current stock prices. The inverse holds true as well (Panda 2008). The effects of interest rates changes on a stock's intrinsic value, which are more complex than outlined earlier because of the existence of other economic variables that interact with interest rates in determining a stock's value. In addition, if the inflation rate is quite high and real, then interest rates do not exist and the investors are unlikely to move their funds from the stock market to the bond market in response to an increase rate of interest. Hence, the negative relationship between interest rates and stock prices is not necessarily true. However, it is important to note that although the negative relationship between interest rates and stock prices is not automatic or perfect, in the long run, it is unavoidable. Panda (2008) showed that there is a long-run relationship between interest rates and stock prices. A unidirectional long-run causality is found from interest rates towards stock prices. The short-run causality is found from long-term interest rates to stock prices. However, the short-run causality between long-term interest rates and the National Stock Exchange (NSE) NIFTY stock index is found to be bidirectional. In the short-run, long-term interest rates negatively affect stock prices whereas short-term interest rates are found to affect stock prices positively. In addition, the Bombay Stock Exchange (BSE) SENSEX stock index is found to be more responsive to changes in interest rates than the NSE NIFTY.

4.3.3. Inflation

The importance of inflation as a determinant of common stock prices has its origin dating back to the works of Fisher (1930). The well known Fisher hypothesis states that investors will, on average, are fully compensated for erosion in the purchasing power. The Fisher hypothesis enjoyed a significant support till 1960s (Nelson, 1976). The 1970s marked a turning point in this respect as massive empirical evidence from the US has found a negative relation between inflation and common stock returns. For example, Bodie (1976) used the data on

the New York Stock Exchange-Listed companies for the period of January1953 through December 1972 to examine the effectiveness of common stock as a hedge against inflation. He finds a negative relationship between stock returns and inflation. Solink (1983) conducted an international study comprising several western bourses. His results also reject the Fisherian assumption that real returns are independent of inflationary expectations. In India, Mayya (1977), Barua and Raghunathan (1982), and Bhole (1980) had analyzed the data to determine relationship between return on equity shares and inflation. They concluded that investments in the Indian stock markets provide either little or no hedge against inflation.

Stock prices are clearly of great interest to investors. In a year of virtually continuous inflation, there has been an understandable interest in the relationship between changes in prices in general and changes in the prices of common stocks. The common belief, derived in part from the writings of Keynes (1930)[3] and Fisher (1925)[4] is that inflation is advantageous to owners of common stock because it reduces the burden to corporations of servicing and repaying their debt. A second line of argument, derived from Hamilton (1952)[5] states that stockholders receive additional benefits from inflation because, typically, prices for the products which corporations sell, rise before and faster than wage rates. Durai and Bhaduri (2009) examined the relationship between stock returns, inflation and output for the post-liberalization period in India employing the wavelet methodology. The study employed monthly data from 1995:1 to 2006:7 to test the hypothesis. The results from wavelet analysis of decomposition for the expected and unexpected components of inflation gave a mixed picture. In short-run, the expected component of inflation was insignificant, while in the medium and long-run, the expected component was found to be negatively significant with the real stock returns. It showed a very strong negative relationship in the long-run as the unexpected component was found to be insignificant.

[3] John M. Keynes, A Treatise on Money, vol.2 (New York, N.Y.: Harcourt and Brace, 1930)

[4] Irving Fisher, the Purchasing Power of money (rev.ed., New York, N.Y.: The McMillan Co., 1925).

[5] Hamilton, Earl, "profit Inflation and the Industrial Revolution, 1751-1800," Quarterly journal of Economics, vol.56 (February 1942),pp 256-73; and "prices as a factor in Business Growth," Journal of Economic History, Vol 12 (Fall 1952), pp.325-49.

4.3.4. Money supply

The price of a stock is determined by the present value of the future cash flows. The present value of the future cash flows is calculated by discounting the future cash flows at a discount rate. Money supply has a significant relationship with the discount rate and, hence, with the present value of cash flows, there are competing theories on how money supply affects stock market prices. Sellin (2001) argues that the money supply will affect stock prices only if the change in money supply alters expectations about future monetary policy. He argues that a positive money supply shock will lead people to anticipate tightening monetary policy in the future. The subsequent increase in bidding for bonds will drive up the current rate of interest. As the interest rate goes up, the discount rates go up as well, and the present value of future earnings decline. Bernanke and Kuttner (2005) argue that tightening of the money supply would increase the risk premium that would be needed to compensate the investor for holding the risky assets. They believe that tightening the money supply symbolizes slowing down of economic activity, which reduces the potential of firms to make a profit. Investors would be bearing more risk in such a situation and, hence, demand more risk premium. The risk premium makes the stock unattractive, which would lower the price of the stock.

4.3.5. Foreign Institutional Investments (FIIs)

India opened its stock market to foreign investors in September 1992 and has, since 1993, received portfolio investment from foreigners in the form of foreign institutional investment in equities. It is possible for foreigners to trade in Indian securities without registering as an FII, but such cases require approval from the RBI or the FIPB (Foreign Investment Promotion Board). The FII generally concentrate in secondary market. While it is generally held that portfolio flows benefit the economies of recipient countries, policy--makers worldwide have been more than a little uneasy about such investments. Portfolio flows – often referred to as "hot money" – are notoriously volatile compared to other forms of capital flows. Investors are known to pull back portfolio investments at the slightest hint of trouble in the host country often leading to disastrous

consequences to its economy. They have been blamed for exacerbating economic problems in a country by making large and concerted withdrawals at the first sign of economic weakness (Chakrabarti 2001).

There are two extreme views of the impact of institutional investors on stock prices. While the negative view is more predominant, there is a positive side too. The concern about institutional investors is that they destabilize stock prices, increasing long-term volatility. This view rests on the premise that swings in institutional demand have a larger effect on stock prices than swings in individual demand, as institutional trades are usually larger. Dornbusch and Park (1995) argue that foreign investors pursue strategies that make stock prices overreact to changes in fundamentals. They say that foreign investors indulge in positive feedback trading, i.e., their trades are affected by past returns. Buying when prices have increased and selling when they have fallen would lead to herding. Conceptually, the term "herding" refers to the aspect of aligning of one's behaviour to the behaviour of others, while "feedback trading" relates to trading on the basis of historical prices – this is highlighted by Kallinterakis and Ferreira (2005). Herding is a phenomenon commonly attributed to foreign investors – indicating that their trades are highly correlated. In other words, they buy and sell the same stocks at the same time. If foreign investor's trade as a group i.e. indulges in Herding, then they could destabilize the market by throwing the market into disarray. Douma et al. (2006) provide empirical evidence that the FIIs in India, invest in large, liquid companies, which enable them to exit their positions quickly at relatively lower cost.

4.3.6. Index of Industrial Production (IIP)

The direction index of industrial production and stock prices are positively related because increasing in index of industrial production an the increase in production of industrial sector which increases profit of industries and corporation. When Share prices increases output also increases, it means there is a positive relation between share prices and output.

Study by Fama (1981) found that the growth rate of industrial production had a

strong contemporaneous relation with stock returns. A study by Chen, Roll and Ross (1986) based on the US stock portfolio indicated that future growth in industrial production is a significant factor in explaining stock returns, hence, suggesting a positive relationship between real economic activities and stock prices. Study by Ray et al. (2004) found that economic growth helps to increase the corporate earnings, improving present value of the firm and it also increases the national disposable income, which should lead to more investment in the stock market. The opposite is the cause for a falling stock market. In a study by Chakravarthy (2006), index of industrial production and inflation Granger cause stock price but stock price does not cause either of the two. So the causation is unidirectional. In another study by Ahmad (2008) shows that the movement in stock prices causes movements in index of industrial production. Stock prices leads to economic activity. Growth rate of real sector is factored in the movements in stock prices.

4.3.7. Gold Prices

Smith (2001) examined the short-term and long-term relationships between four gold price series and six different US stock price indices over the 1991-2001 time period. He found no bilateral long-term relationship, or cointegration, between a gold price series and a stock market index. There was, however, some evidence of a negative short-term Granger causality running from the US stock index returns to gold returns, but not the reverse. The domestic gold price in India is continuously increasing due to its heavy demand in the country. There are several reasons as to why gold has high demand in India. The first reason is security; gold offers full security as long as it is retained by central banks. There is no credit risk attached to gold. Secondly, gold is able to maintain its liquidity even at times of crisis situations like high global inflation or political turbulence. The third reason for holding gold is to build a diversified portfolio. Gold also has taken the role of an asset of last resort. World Economic History shows that countries have repeatedly used gold as security against loans when they have had difficulties with their Balance of Payments and have felt the need to borrow on the international capital markets.

In Volume II of the '*Treatise',* Keynes described most of people as being too timid, greedy, impatient or nervous about their investments to take long views. There is also the element of 'animal spirits[6]'. Keynes' (1936) explains the behaviour of people while making investments, especially in the stock market. He said that investors are taken away usually by their "animal spirits" and "herd mentality" for investing in the stock market. People work and invest on the basis of their "instinct" which is by and large formed by the economic and social and political environment around them. Hence one cannot even rule out the role of economic activities and information fed to the market completely. It is admitted by the economists also in a very hushed manner that it is not that the real value of our output has gone down but just the "animal spirits" have been dimmed and our expectations that stock markets are overvalued compared to the historic period and considering of further rise in real value seems to be unlikely. And any economy needs these "animal spirits" or the optimistic attitude along with the calculated risks and investments to come out and excel and progress. This was also supported by Taleb (2007) and Akerlof and Shiller (2009) studies. "The Keynesian beauty contest is the view that much of investment is driven by expectations about what other investors think, rather than expectations about the fundamental profitability of a particular investment. Keynes' points are relevant in the context of modern literature on stock markets in developing economies. Most of the studies in the area have been conducted for developed economies though recent literature deals with emerging markets.

4.4. Nature of Data

The study investigates the nature of the causal relationships between stock prices and the key macro economic variables in India for the period April, 1994 to July, 2010 using monthly data. The data was collected for India from www.rbi.org.in.

[6] In the original use of term, in its ancient and medieval Latin from *spiritus animalis, the word animal means "of the mind" or animating."* It refers to the basic mental energy and life force. But economics animal spirits has acquired a somewhat different meaning; it is now an economic term, referring to a restless and inconsistent element in the economy. It refers to our peculiar relationship with ambiguity or uncertainty. Sometimes we are paralyzed by it. Yet at other times it refreshes and energizes us, overcoming our fears and indecisions. Animal spirits- confidence, fairness, corruption, and antisocial behavior, and money illusion (Akerlof and Shiller 2009).

We have taken this period, as stock market reforms in India gained momentum after 1994 and many regulatory changes were introduced (stock exchanges have introduced online trading and set up clearing houses/ corporations. A depository has become operational for scripless trading and the regulatory structure has been overhauled with most of the powers for regulating the capital market vested with the SEBI. The variables identified for the study have been derived from both theory and practice. In this study we have used major macroeconomic indicators such as Money supply (M3), Real Effective Exchange Rate (REER), Index of Industrial Production (IIP), Foreign Institutional Investment (FIIs), Call Money Rate (CM), Wholesale Price Index (WPI), Gold Prices (GP), and Bombay Stock Exchange (BSE) Sensex in India. Gold price is included in the model as an additional variable, to examine whether gold price contains any additional significant information about price movements. Since gold is an important saving instrument in India, and is very often used as a hedge against inflation, it is expected that gold may be looked upon as alternative asset for those holding idle money, for speculative purposes.

In case of Brazil, it is used in the monthly averages of the Sao Paulo Stock Exchange, Bovespa index as a measure of stock prices and macro variables such as the Index of Industrial Production (as a proxy for the GDP), Real Effective Exchange rate (as a proxy for Exchange rate), Wholesale Price index, Treasury Bill Rate (as an interest rate (TB)), and M3 (money supply) considered for the analysis. Monthly data series for the period from April 1994 to July 2010 is used in this study.

For China, the Index of Industrial Production (as a proxy for the GDP), Real Effective Exchange rate (as a proxy for Exchange rate), Lending rate (as an interest rate (LR)) and monthly averages of the Shanghai Stock Exchange (SSE) and Composite index is taken as a measure for stock prices. Monthly data series for the period from August 1995 to July 2010 is used in this study.

For Russia, the Index of Industrial Production (as a proxy for the GDP), Real Effective Exchange rate (as a proxy for Exchange rate), Interbank Rate (as an interest rate), M2 (money supply) are taken as a measure of stock prices. The

Russian Trading System (RTS) index (Russian Trading System Stock Exchange) was considered to examine the relationship between stock price and macro economic variables during December 1996to July 2010.

The data was collected for Brazil, China and Russia from the International Financial Statistics (IFC). The stock price indices, representing different countries, are selected based on the importance of index. Due to data constraints we need to drop some important variables (For Ex: gold prices, FIIs and WPI) and the actual period of study also differs for different countries, based on the availability of the data.

4.5. Empirical Methodology

Autoregressive distributed lag (ARDL) approach and Toda and Yamamoto Granger causality test have been applied to explore the long-run and short-run relationships. Cointegration and error-correction approaches are used in this study to examine the short-run and long-run relationship macroeconomic variables and stock prices. There are many techniques available in economic literature to investigate cointegration relationship among macroeconomic variables. For bivariate analysis, Engle-Granger (1987), and Fully Modified Ordinary Least Square (FMOLS) procedure of Phillips and Hansen (1990) have been prominent. For multivariate cointegration, the techniques of Johansen (1988); Johansen and Juselius (1990); and Johansen's (1995) have been popular. In the present study, the auto regressive distributed lag (ARDL) approach to cointegration, developed by Pesaran et al. (2001) has been used. This approach, also known as the ARDL bounds the test approach, which is preferred over other conventional cointegration tests, as it has several advantages over other conventional tests [See Emran et al. (2007)].

Investigation of a cointegration relationship using the ARDL approach does not necessitate testing for a unit root. But this is on account of the fact that bound test is based on the assumption of variables being I(0) or I(1). Therefore, the implementation of unit root tests for the ARDL approach might still be necessary in order to ensure that none of the variables are integrated of order two [I(2)] or

beyond. To that end, we apply different unit root tests to both real effective exchange rate and nominal exchange rate. The standard augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests have been criticized for its low power in distinguishing between unit root and a near unit root process (Campbell and Perron, 1991). Therefore, we have also performed Kwiatkowski, Phillips, Schmidt and Shin (KPSS) (1992) unit root test, as it is more powerful and reliable for small sample data sets as in our study

4.5.1. Unit Root Tests

The initial step in the estimation involves determination of the time series property of each variable individually by conducting unit root tests. The most popular unit root test is the ADF (Augmented Dickey-Fuller, 1979) test. The test simply includes AR (1) process:

$$Y_t = kY_{t-1} + e_t \qquad (4.1)$$

4.5.1.1. Dickey and Fuller (1979) Test

This DF test considers three different regression equations that can be used to test for the presence of a unit root

$$\Delta Y_t = \gamma Y_{t-1} + e_t \qquad (4.2)$$

$$\Delta Y_t = a_0 + \gamma X_{t-1} + e_t \qquad (4.3)$$

$$\Delta Y_t = a_0 + \gamma Y_{t-1} + a_{1t} + e_t \qquad (4.4)$$

The three regressions differ depending upon the concerns of the presence of the deterministic elements, a_0 and a_1. Equation (4.2) is a pure random walk model, Equation (4.3) adds an intercept or drift term and Equation (4.4) includes both a drift and linear time trend.

Where γ =k-1; If k=1, the series contains a unit root. In this test, the null hypothesis is H_0 : k =1, in which case it is said that Y_t has a unit root. The

alternative is H_1: k < 1. If the alternative hypothesis is correct, then Y is stationary. But if the null hypothesis is correct, then the variable is non-stationary.

4.5.1.2. The Augmented Dickey-Fuller Test

The ADF test simply includes AR (k) terms of the ΔY_t term in the three alternative models.

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-1} + e_t \qquad (4.5)$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta i \Delta Y_{t-1} + e_t \qquad (4.6)$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + a_{2t} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-1} + e_t \qquad (4.7)$$

The three regressions differ depending again upon the concerns of the presence of the deterministic elements, a_0 and a_{2t} . If γ=0, then the series contains a unit root, because γ is defined as γ =k-1; this is equivalent to testing k=1 as in the DF test given above.

4.5.1.3. Phillips-Perron (PP) Test

Phillips and Perron used non-parametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms**.** PP proposes a non-parametric method of controlling higher-order serial correlation in a series. The test regression for the PP test is AR (1) process:

$$\Delta Xt = \alpha + \beta X_{t-1} + \varepsilon t \qquad (4.8)$$

The PP-test makes a correction to the t-statistic of the β coefficient from the AR (1) regression to account for the serial correlation in ε. The correction is non parametric since it uses an estimate for the sect sum of ε at frequency zero that is

robust to heteroskedasticity and auto correlation of the unknown form. Phillip Perron test is similar to the ADF test with the only difference that ADF adds lagged difference term to take care of possible serial correlations, while Philip-Perron test uses non-parametric statistical methods to take care of serial correlation in the error terms. Test statistics of both tests are similar.

The test results of ADF and PP are achieved assuming the presence of unit root (non stationarity of the variable) in the null hypothesis (H_0) and no unit root (stationarity of the variable) in the alternative hypothesis (H1). In this regard, decisions are made based on the calculated statistics and McKinnon's critical value in comparison with the critical values. A variable is considered non stationary if its calculated value is less than the Mackinnon's critical value and we justify the existence of a unit root. On the other hand, a variable is considered stationary if its calculated value is higher than the critical value and this confirms the absence of unit root.

4.5.1.4. The Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) Test

Kwiatkowski, Phillips, Schmidt and Shin (1992) proposed an alternative test where stationarity is the null hypothesis and the existence of a unit is the alternative. This test is referred to as the KPSS test. This method considers models with constant terms, and either with or without a deterministic trend term. The basic idea is that a time series is decomposed into the sum of a deterministic time trend, a random walk and a stationary error term (typically not white noise). The null hypothesis (of trend stationarity) specifies that the variance of the random walk component is zero. The test is actually a Lagrange Multiplier test and computation of the test statistic is fairly simple. First, run an auxiliary regression of Y_t upon an intercept and a time trend t. Next, save the OLS residuals e_t and compute and compute the partial sums $S_t = \sum_{s=1}^{t} e_s$ for all *t*. Then the test statistic is given by

$$KPSS = \sum_{t=1}^{T} S_t^2 / \sigma^2 \qquad (4.9)$$

Where σ^2 is an estimator for the error variance. This latter estimator σ^2 may involve corrections for autocorrelation based on the Newey-West formula. The KPSS results only provide the asymptotic critical values tabulated by the KPSS. The KPSS test provides an alternative to the DF/ADF/PP tests in which the null hypothesis is stationarity. Note that in contrast to the other two tests, rejection of the null hypothesis suggests presence of unit root. The KPSS test is estimated and found to contain a unit root when the test statistics is less than the critical values at the estimated level of significance.

4.5.2. Auto Regressive Distributed Lag (ARDL) Cointegration

The ARDL approach ensures estimates that satisfy the small sample properties. Further, this approach effectively corrects for possible, the endogeneity of explanatory variables. Yet another advantage of this approach is that it is applicable irrespective of whether the underlying regressors are purely $I(0)$, or purely $I(1)$ or a combination of the two. In addition, both short-run and long run effects can be simultaneously estimated. Econometric software such as Microfit 4.1 and Eviews 7 are used to do the analysis.

The ARDL is a general dynamic specification model which uses the lags of the dependent variables and the lagged and contemporaneous values of the independent variables through which, the short-run effect can be directly estimated, and the long-run equilibrium relationship can be indirectly estimated. In the first step in the ARDL bounds testing approach estimate by the Ordinary Least Square (OLS) in order to test for the existence of a long-run relationship among the variables by conducting a F-test for the joint significance of the coefficients of lagged levels of the variables, i.e., the null hypothesis of no cointegration is defined against the alternative. The asymptotic distributions of the F-statistics are non-standard. Two sets of asymptotic critical values are provided by Pesaran et al. (2001). The first set assumes that all variables are $I(0)$ while the second set assumes that all variables are $I(1)$. If the computed F-statistic is greater than the upper bound critical value, then the null hypothesis of no cointegration is rejected regardless of whether the series is $I(0)$ or $I(1)$ and we

may conclude that there exists a steady state equilibrium between the variables. Alternatively if the computed F-statistic is less than the lower bound critical value, then the null hypothesis of no cointegration is not rejected regardless of whether the series is $I(0)$ or $I(1)$. But a conclusive inference cannot be made without knowing the integration order of the series, if the computed F-statistic lies between the upper and lower critical values.

In the second step, once cointegration is established, then the conditional ARDL long run model can be estimated and then the restricted version of the equation is solved for the long-run solution. The ARDL specification is also based on the assumption that the error terms are serially uncorrelated. It is therefore important that the lag order (p) of the underlying VAR is selected appropriately. There is a delicate balance between choosing p sufficiently large to mitigate the residual serial correlation problem and, at the same time, sufficiently small so that the conditional Error Correction Mechanism (MCM) is not unduly over-parameterized, particularly in view of the limited time series data. Therefore, the robustness of results is determined by the appropriate lag length considering the serial autocorrelation problem.

The third stage entails the estimation of the error correction equation using the differences of the variables and the lagged long-run solution, and determines the speed of the adjustment of returns to equilibrium. The orders of the lags in the ARDL model are selected by the Schwarz Bayesian criterion (SBC), before the selected model is estimated by the ordinary least squares. Finally, we examine the stability of the long-run coefficients together with the short-run dynamics based on Pesaran and Pesaran (1997) and therefore we apply cumulative sum of the recursive residuals (CUSUM) and CUSUM of squares (CUSUMSQ) (proposed by Brown et al, 1975) test.

Although, investigation of a co-integration relationship using the ARDL approach does not necessitate testing for a unit root, as Ouattara (2004) argues, in the presence of $I(2)$ variables in the relationship might render the F-statistics of Pesaran et al. (2001) as invalid. This is on account of the fact that bound test is

based on the assumption of variables being $I(0)$ or $I(1)$. Therefore, the implementation of unit root tests for the ARDL approach might still be necessary in order to ensure that none of the variables are integrated of the order two [$I(2)$] or beyond. To that end we apply different unit root tests (ADF, PP and KPSS) to the macro variables and stock prices.

4.6. Empirical Results and Analyses

Prior to the testing of cointegration, we conducted a test of order of integration for each variable using Augmented Dickey-Fuller Test (ADF), Phillips-Perron Test (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. The results on variables at level are given in table 4.1, which on the whole shows that the variables under study may be considered integrated of order one, i.e., $I(1)$ with a very few exceptions, such as call money rates and the FIIs for India. However, note that in these two cases also, all the three tests fail partially; for example, both the ADF and PP tests without intercept and constant; and the KPSS test with intercept[7]. With our preliminary conclusion that the variables in general are integrated, we consider that the tests in the first difference of the variables (Table 4.2) confirm that all the variables are $I(1)$ and both the ADF and PP tests are rejecting the unit root null and the KPSS tests fail to reject the stationarity null in contrast to all the variables in all the test formulations.

[7] It is important to note that the star (*) attached to the results indicates different conclusions for the ADF and PP tests, a star indicates rejection of the unit root null, where as for the KPSS test, it indicates non rejection of the stationary null.

Table 4.1: Unit Roots Tests Results at levels (Macro Variables and Stock prices)

	Augmented Dickey-Fuller Test			Phillips-Perron Test			KPSS Test	
Variables	I*	IC**	WIC***	I*	IC**	WIC***	I*	IC**
a) India								
Call money rates	-2.89*	-8.15*	-1.34	-7.39*	-8.73*	-2.41	0.88	0.08*
WPI	1.50	-0.97	4.74	1.66	-0.68	6.30	1.72	0.42*
IIP	-2.24	-2.46	0.66	-2.27	-2.42	-0.96	1.59	0.11
Sensex	-1.80	-1.81	-1.19	-1.90	-2.04	-1.24	1.27	0.33
Nifty	-0.27	-2.29	1.19	-0.19	-2.22	1.23	1.40	0.33
Gold prices	3.13	0.57	4.14	4.16	1.14	4.42	1.29	0.40*
M3	0.83	-1.66	2.79	1.03	-1.73	2.79	1.73	0.22
FIIs	-4.99*	-11.59*	-4.31*	-11.85*	-12.22*	-11.19*	0.60	0.04*
REER	-3.20**	-3.13**	-0.16	-3.04**	-2.95	-0.18	0.26	0.10
b) Brazil								
REER	-1.54	-1.44	0.25	-1.35	-1.21	0.28	0.39	0.36
IIP	-1.17	-3.57*	1.42	-1.15	-3.82*	1.46	1.66	0.17
M3	-1.67	-6.23*	3.97*	-4.13*	-13.35*	3.83	1.73	0.24
TBRATE	-1.53	-3.52*	-0.96	-1.54	-3.87*	-0.96	1.44	0.06*
WPI	-0.88	-3.98*	1.51	-3.67*	-7.48*	2.14	1.73	0.28
Bovespa	-1.83	-4.26*	1.39	-2.26	-4.30*	1.68	1.62	0.11
c) China								
REER	-1.95	-1.96	1.02	-1.78	-1.82	1.10	0.25	0.20
IIP	-3.53*	-3.72*	-0.59	-10.07*	-10.32*	-0.66	0.42	0.15
LR	-2.67	-2.03	-2.14	-2.57***	-1.96	-2.04	0.84	0.34
SSC Composite	-1.87	-2.12	0.76	-1.95	-2.36	0.65	0.98	0.11
d) Russia								
REER	-1.19	-2.59**	0.36	-1.09	-2.32	0.47	1.02	0.17
IIP	-0.88	-2.98**	1.17	-1.42	-4.63*	1.17	1.50	0.19
IBR	-2.93	-3.52*	-1.67	-2.70	-3.50	-1.50	0.90	0.30
M2	-1.60	-0.67	1.89	-1.27	-0.48	7.26	1.58	0.20
RTS	-1.10	-2.59**	0.32	-1.23	-2.34	0.46	1.27	0.13

*Note: * With Intercept ** with Intercept and Trend *** without Intercept and Trend*

Test critical values for ADF and PP test:

** Indicates the level of significance at 1 %. (-3.431833),*

*** indicates the level of significance at 5 % (-2.862081)*

**** Indicates the level of significance at 10%, (-2.567101).*

Asymptotic critical values for KPSS test:

**Indicates the level of significance at 1 %. (0.739000),*

*** indicates the level of significance at 5 % (0.463000)*

**** Indicates the level of significance at 10%, (0.347000). (Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1))*

Table 4.2: Unit Roots Tests results in the First difference (Macro variables and Stock prices)

	Augmented Dickey-Fuller Test			Phillips-Perron Test			KPSS Test	
Variables	I*	IC**	WIC***	I*	IC**	WIC***	I*	IC**
a) India								
Call money rates	-13.04*	-13.02*	-13.07*	-25.07*	-25.05*	-25.14*	0.04*	0.02*
WPI	-8.44*	-8.64*	-5.11*	-8.61*	-8.73*	-7.03*	0.14*	0.05*
IIP	-6.12*	-5.30*	-5.42*	-14.17*	-14.27*	-14.20*	0.21*	0.10*
Sensex	-4.70*	-4.56*	-4.78*	-4.63*	-4.56*	-4.72*	0.15*	0.12*
Nifty	-10.64*	-10.69*	-10.55*	-10.64*	-10.68*	-10.60*	0.17*	0.04*
Gold prices	-13.05*	-13.83*	-12.53*	-13.04*	-13.91*	-12.61*	0.13*	0.10*
M3	-10.45*	-10.51*	-1.96*	-14.02*	-14.23*	-7.25*	0.18*	0.09*
FIIs	-12.05*	-12.12*	-12.09*	-102.71*	-102.51*	-101.36*	0.10*	0.09*
REERE	-11.72*	-11.72*	-11.75*	-11.68*	-11.69*	-11.71*	0.08*	0.04
b) Brazil								
REER	-10.99*	-11.01*	-11.01*	-10.89*	-10.91*	-10.91*	0.19*	0.08*
IIP	-14.36*	-14.33*	-14.26*	-14.37*	-14.33*	-14.26*	0.02*	0.02*
M3	-12.29*	-12.12*	-5.41*	-18.69*	-18.97*	-12.98*	0.61*	0.22*
TBRATE	-14.70*	-14.66*	-14.68*	-14.70*	-14.66*	-14.68*	0.03*	0.03*
WPI	-9.68*	-9.39*	-9.59*	-13.41*	-12.80*	-11.62*	0.21*	0.10*
Bovespa	-10.14*	-10.08*	-9.42*	-9.64*	-9.45*	-9.17*	0.14*	0.07*
c) China								
REER	-10.10*	-10.07*	-10.04*	-10.02*	-9.99*	-10.01*	0.15*	0.15*
IIP	-11.87*	-11.82*	-11.90*	-39.33*	-39.16*	-39.27*	0.08*	0.07*
LR	-11.15*	-11.35*	-10.94*	-11.24*	-11.37*	-11.17*	0.38*	0.12*
SSC composite	-10.60*	-10.59*	-10.56*	-10.97*	-10.95*	-10.96*	0.07*	0.05*
d) Russia								
REER	-9.52*	-9.55*	-9.54*	-9.50*	-9.49*	-9.52*	0.13*	0.06*
IIP	-4.32*	-3.82*	-3.55*	-17.07*	-18.00*	-16.79*	0.05*	0.04*
IBR	-13.46*	-13.42*	-13.49*	-15.24*	-15.20*	-15.19*	0.07*	0.05*
M2	-3.53*	-4.05*	-4.71*	-13.44*	-13.54*	-11.12*	0.20*	0.16*
RTS	-9.42*	-9.40*	-9.42*	-9.44*	-9.41*	-9.45*	0.06*	0.06*

*Note: * With Intercept ** With Intercept and Trend *** Without Intercept and Trend*

Test critical values for ADF and PP test:

** Indicates the level of significance at 1 %. (-3.431833),*

*** indicates the level of significance at 5 % (-2.862081)*

**** Indicates the level of significance at 10%, (-2.567101).*

Asymptotic critical values for KPSS test:

**Indicates the level of significance at 1 %. (0.739000),*

*** indicates the level of significance at 5 % (0.463000)*

**** Indicates the level of significance at 10%, (0.347000). (Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1))*

4.6.1. Auto Regressive Distributed Lag model (ARDL) Analysis

In order to implement the ARDL test, we have to determine the appropriate lags as the results are very sensitive to the lag length. To ensure comparability of results for different lag lengths, all estimations were computed over the same sample period and so lag order of 1 is selected based on the lowest value of the Akaike Information Criterion.

After deciding the optimal lag order, the results of F-statistics are reported in table 4.2. The calculated F-statistics for joint significance are all above the upper bound critical value (Pesaran et al., 2001) at 5% level of significance in the case of all the four countries considered. These results are tentatively confirming the existence of long-run equilibrium relationship among the variables used for all the individual BRIC Stock markets.

Table 4.3: F- Statistics of Cointegration between Macro Variables and Stock Prices

Variables	Computed F -Statistics	Inference
India		
SENSEX, FIIS, REER, CALLMON, WPI, IIP, GOLD, M3	8.180*	Cointegrated
Brazil		
REER, IIP, M3, TBRATE AND WPI	6. 174*	Cointegrated
China		
REER,IIP, LR and SSC composite	4. 166*	Cointegrated
Russia		
REER, IIP, M2, IBR and RTS	5. 148*	Cointegrated

Note: Pesaran et al. 2001, the critical values are estimated with the assumption of unrestricted intercept term with no trend.
** Indicates the level of significance at 10%, (2.72 -2.72)*
*** indicates the level of significance at 5 % (3.23-4.35)*
**** indicates the level of significance at 1 %. (4.29 - 5.61) (Pesaran tabulated lower and upper band values are given parentheses).*

Table 4.4: Estimated Long Run Coefficients between Macro Variables and Stock Prices

ARDL(1,0,0,0,0,0,0)*: India			
Regressor	Coefficient	Standard Error	t-Ratio [Prob]
REER	-0.081	0.073	-1.102 [.272]
IIP	-0.004	0.010	-0.426 [.670]
M3	3.076	1.493	2.060 [.041]
WPI	-0.698	0.326	-2.139 [.034]
CM	-0.010	0.014	-0.718 [.474]
GP	-0.015	0.009	-1.714 [.088]
FIIS	0.015	0.006	2.550 [.012]
CONSTANT	-4.4	2.319	-1.897 [.059]
ARDL(1,1,0,1,0,0)*: Brazil			
REER	0.538	0.539	0.998 [.319]
IIP	-3.425	3.201	-1.070 [.286]
M3	0.626	0.615	1.018 [.310]
WPI	0.830	1.179	0.704 [.482]
TBRATE	-0.964	0.467	-2.063 [.040]
CONSTANT	7.990	13.553	0.589 [.556]
ARDL(1,0,0,0)*: China			
REER	-7.015	11.084	-0.632 [.528]
IIP	-1.239	1.418	-0.874 [.383]
LR	-0.675	1.491	-0.452 [.651]
CONSTANT	42.584	55.456	0.767 [.444]
ARDL(1,1,0,1,0,0)*: Russia			
IIP	6.207	3.386	1.833 [.069]
REER	-0.964	2.416	-0.399 [.690]
M2	-0.254	0.427	-0.594 [.553]
IBR	-0.146	0.249	-0.586 [.558]
CONSTANT	-16.878	9.332	-1.808 [.072]

***ARDL model selected based on Akaike Information Criterion; the significant lag lengths are given in brackets.**

We further probe into the long run and the short run dynamics. The results of the long run coefficients are presented in Table 4.4. For India, it is evident from the table that the coefficient of Foreign Institutional Investment (FIIs) is significant at 5 % indicating the existence of long run relationship between Sensex and FIIs. Similarly, Money Supply (M3), and inflation (WPI) coefficients are significant at 5% while and coefficient of Gold prices is significant at 10% level. It implies that money supply, inflation and gold prices have the long-run relationship with the Sensex. In other words, the results indicate that FIIs, Money Supply, Inflation and Gold Prices are the only macroeconomic variables which affect the Sensex in the

long run. The results facilitate the investors in taking informative and effective investment decisions by estimating the expected trends of the important macro variables. Similarly, the Central bank (Reserve bank of India) should consider that significant impact of money supply on stock prices. According to efficient market hypothesis, stock markets respond to the arrival of new information which comes randomly. Hence, macroeconomic policies should be designed to provide stability to the stock market. Due to increase in the volume of foreign institutional investment (FII), inflows in recent times have led to concerns regarding the volatility of these flows and its impact on the stock markets. The significant relationship between Sensex and FIIs calls for a policy regulation on FIIs. Traditionally equities have been regarded as a good hedge against inflation because of the fact that equities are claimed against physical assets whose real returns should remain unaffected by inflation. Investors need to know whether equities can serve as a hedge against inflation. If a company is able to sustain its profit margin despite high inflation, then the stock price is likely to hold. If the high inflation sustains, at some stage it will lead to a chain reaction across the economy, pushing up interest rates and even affecting demand. An increase in interest rates will push up borrowing costs for corporate while lower demand will hurt growth in revenues. This is likely to impact sentiment for the stock market as a whole. Traditionally, gold has been more attractive than bank deposits, stocks and bonds. In developing countries, people have often trusted gold as a better investment. According to Opdyke (2010), the international investors sought a safe haven investment as gold during the global recession in the history. Moreover, during the global financial instability gold may pull the interest of investors, because there will be a little chance of getting better returns in the stock investments due to fragile economic and financial positions in the global economy.

In the case of Brazil, only the Treasury bill rate (TBR) has impact on Bovespa. It means that interest rates (TBR) have an impact on stock prices, especially in the long run. Zhou (1996) found that long-term interest rate explains a major part of the variation in price-dividend ratios and suggests that the high volatility of the stock market is related to the high volatility of long-term bond yields and may be

accounted for by changing forecasts of discount rates. While in the case of China, no variable appears to be significant. In Russia, the only variable namely, Index of Industrial production has impact on Russian stock market at 10 percent level. The Index of industrial production, which has been taken as a proxy of national income, should increase the corporate earnings enhancing the present value of the firm and it also increases the national disposable income, which should lead to more retail investment in the stock market. The opposite will cause a fall in the stock market. As we mentioned earlier, due to data constraints we had to drop some important variables (For Example: gold prices, FIIs and WPI etc.). In this scenario, empirical results are not unexpected for China and Russia, as other macroeconomic variables may have a major role in the determination of stock price expectations.

In order to capture the short-run dynamics of the model, error correction mechanism was applied and the results are reported in the Table 4.5. The ECM coefficient estimated in the model shows how quickly/ slowly variables return to their equilibrium values. The ECM coefficients should be statistically significant with a negative sign. The results show that the ECM term, has negative sign and is statistically significant at 5 percent level, ensuring that long-run equilibrium can be attained in the case of India and Brazil only. The magnitude of the coefficient of the ECM term suggests that adjustment process is highly significant for India and quite moderate for Brazil. Thus, about 84 percent of disequilibrium of the previous month shock is adjusted back to equilibrium in the current month for India and about 9 percent for Brazil. The ECM term of China and Russia are not statistically significant, which shows that the macro economic variables do not have impact on stock prices even in the short-run. Perhaps, the omitted variables may have had some say on the result. Remember we have already mentioned the data limitation problems in the case of these two countries. Further research into the relationship between these (for example: gold prices, FIIs and WPI etc.) macroeconomic variables and stock prices is thus warranted.

Table 4.5: Error Correction Representation for the BRIC Stock Markets

ARDL(1,0,0,0,0,0,0)*: India			
Regressor	**Coefficient**	**Standard Error**	**t-Ratio [Prob]**
dREER	-0.068	0.063	-1.088 [.278]
dIIP	-0.004	0.008	-0.427 [.670]
dWPI	-0.589	0.285	-2.066 [.040]
dM3	2.597	1.296	2.004 [.046]
dCM	-0.009	0.012	-0.713 [.476]
dGP	-0.013	0.007	-1.774 [.078]
dFIIS	0.013	0.005	2.401 [.017]
dCONSTANT	-3.714	2.001	-1.856 [.065]
ecm(-1)	-0.844	0.078	-10.836 [.000]
ARDL(1,1,0,1,0,0)*: Brazil			
dREER	0.463	0.123	3.744 [.000]
dIIP	-0.295	0.193	-1.529 [.128]
dM3	1.469	0.217	6.744 [.000]
dTBRATE	-0.083	0.033	-2.473 [.014]
dWPI	0.071	0.088	0.804 [.422]
dCONSTANT	0.688	0.963	0.714 [.476]
ecm(-1)	-0.086	0.035	-2.415 [.017]
ARDL(1,0,0,0)*: China			
dREER	-0.121	0.115	-1.054 [.293]
dIIP	-0.021	0.012	-1.753 [.081]
dLR	-0.011	0.027	-0.418 [.676]
dCONSTANT	0.736	0.523	1.407 [.161]
ecm(-1)	-0.017	0.015	-1.104 [.271]
ARDL(1,1,0,1,0,0)*: Russia			
dIIP	0.438	0.228	1.914 [.057]
dREER	0.944	0.295	3.193 [.002]
dM2	-0.017	0.031	-0.576 [.565]
dIBR	-0.010	0.018	-0.558 [.577]
dCONSTANT	-1.191	1.047	-1.137 [.257]
ecm(-1)	-0.070	0.043	-1.620 [.107]

***ARDL model selected based on Akaike Information Criterion**

Finally, to ascertain the goodness of the fit of the selected ARDL model, the stability and the diagnostic tests are conducted. Table 4.6 shows that, the models of diagnostic test statistics in genral fulfils the conditions of no specification errors, structural stability, normality of residuals and homoskedasticity at 5% level. However, that the serial correlation tests are only marginally significant (not significant at 10 percent level) except for India.

Table 4.6: Diagnostic Tests

Country		India		Brazil		China		Russia	
Item	Test Applied	χ^2-value	Prob	χ^2-value	Prob	χ^2-value	Prob	χ^2-value	Prob
Normality	test of skewness and kurtosis	1.07	0.30	1.56	0.21	0.51	0.475	0.64	0.42
Serial correlation	Lagrange multiplier test	10.37	0.58	19.65	0.07	20. 58	0.069	18.98	0.08
Heterosced asticity	White test	0.12	0.72	0.18	0.66	0.13	0.71	3.56	0.08
Functional Form	Ramsey's RESET test	2.39	0.11	17.68	0.19	7.60	0.102	27.66	0.09

The structural stability test is conducted by employing the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ). Figures from 4.1 to 4.4.1 (Appendix 1) present plots of both the CUSUM and CUSUMSQ test statistics that fall inside the critical bounds of 5% significance. The stability tests further confirm the stability of the estimated coefficients.

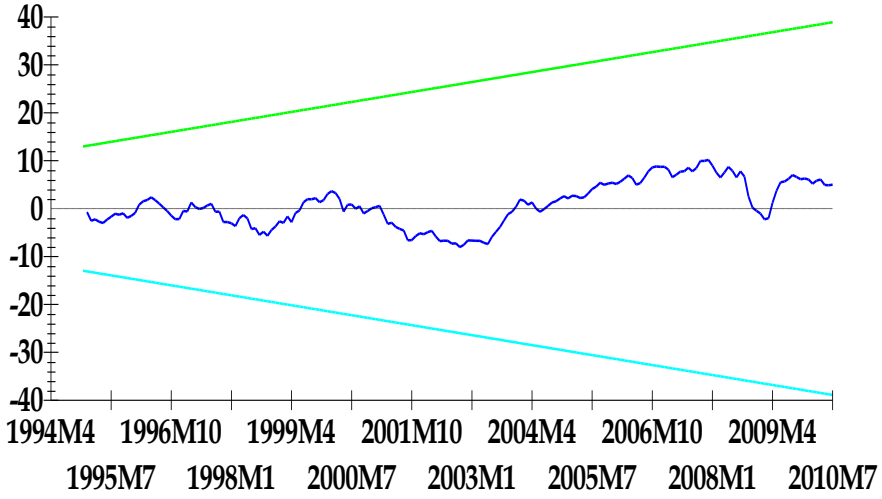
4.7. Conclusion

This study examines the relationship between the stock prices and the macroeconomic variables in the BRIC economies. The empirical evidence shows that long-run and short-run relationship exists between macro economic variables and stock prices, but this relationship was not consistent for all of the BRIC countries. These results reveal that identification of direction of relationship between the macroeconomic variables and stock market behaviour facilitates the investors in taking effective investment decisions as by estimating the expected trends in the macro economic variables and can allocate their resources more efficiently. The policy implication of the above is that the BRIC stock markets are not responsive to changes in a majority of macroeconomic factors in spite of the sizable proportion of stock market capitalization as a share of the country's GDP. Hence, predicting stock prices and returns via changes in the macroeconomic performance becomes precarious and this affects economic forecast, planning and growth. It may be suspected that the BRIC Stock markets might be sensitive to global macroeconomic factors or other salient issues in the BRIC countries environment, which of course warrants further investigation.

According to the Keynes (1936) stock prices are not completely determined by the economic fundamentals, but investors 'animal spirits' constitutes an additional source of stock price fluctuations. Shiller (1989), Thaler (1994) and Akerlof et al. (2009) also argued that 'market psychology (speculation)' plays a significant role in the pricing of assets. In addition, Brock (1998) observed in that financial markets cannot be attributed completely to the economic fundamentals, but that the 'psychological state of the market' may lead to sudden, large changes in stock prices triggered by news about changes in fundamentals of the economy. It means that stock market is influenced by speculative trading-buying stocks only because stock prices are expected to rise in near future, with the intention of selling quickly to realize capital gains. Stock market investors will have to decide whether the value of their shares is driven primarily by the rational estimation of future corporate earnings or macroeconomic fundamentals or whether speculative manias drive the value of their investments. This in turn suggests that the theories of Keynes, Galbraith and Shiller can provide valuable guidance to investors in this era.

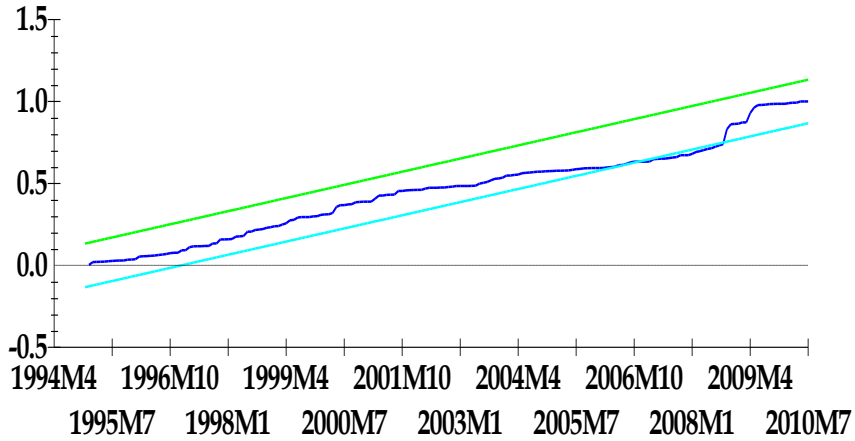
Appendix 4.1

Fig: 4.1: Plot of Cumulative Sum of Recursive Residuals of India



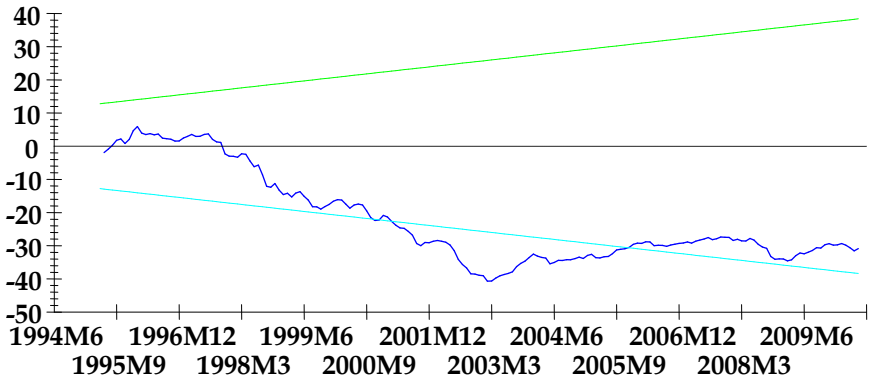
The straight lines represent critical bounds at 5% significance level

Fig:4.1.1: Plot of Cumulative Sum of Squares of Recursive Residuals of India



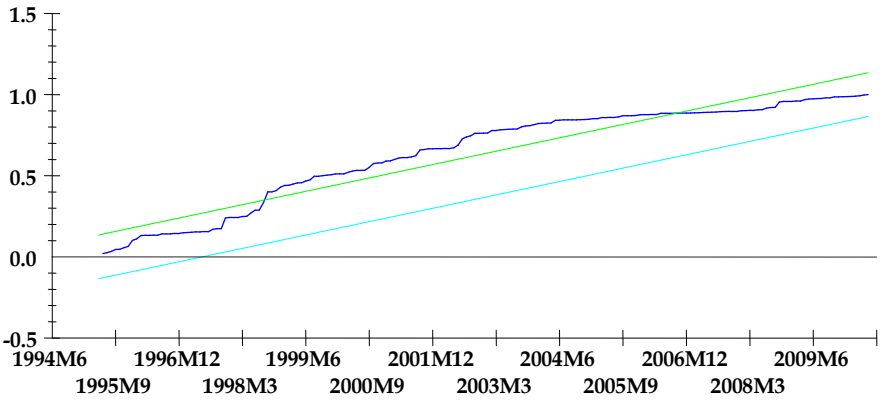
The straight lines represent critical bounds at 5% significance level

Fig: 4.2: Plot of Cumulative Sum of Recursive Residuals of Brazil



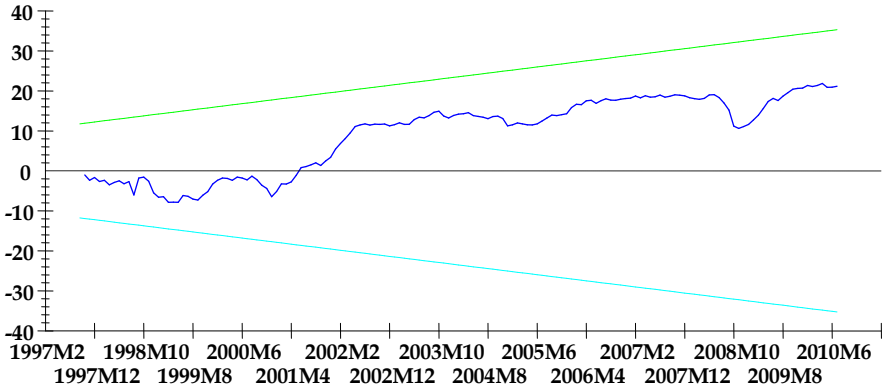
The straight lines represent critical bounds at 5% significance level

Fig: 4.2.1: Plot of Cumulative Sum of Squares of Recursive Residuals of Brazil



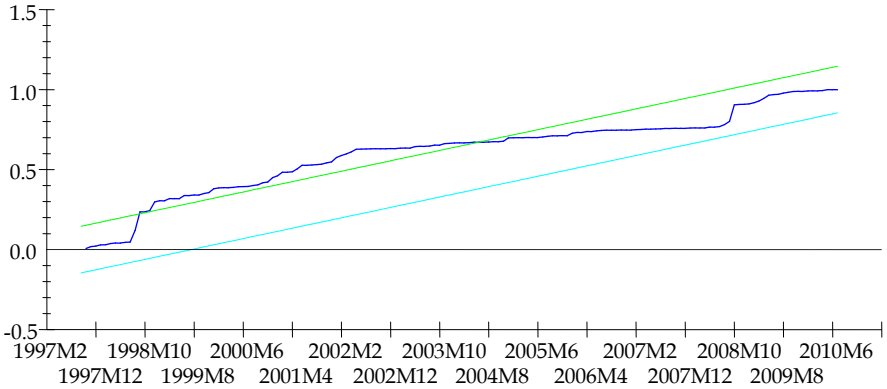
The straight lines represent critical bounds at 5% significance level

Fig: 4.3: Plot of Cumulative Sum of Recursive Residuals of Russia



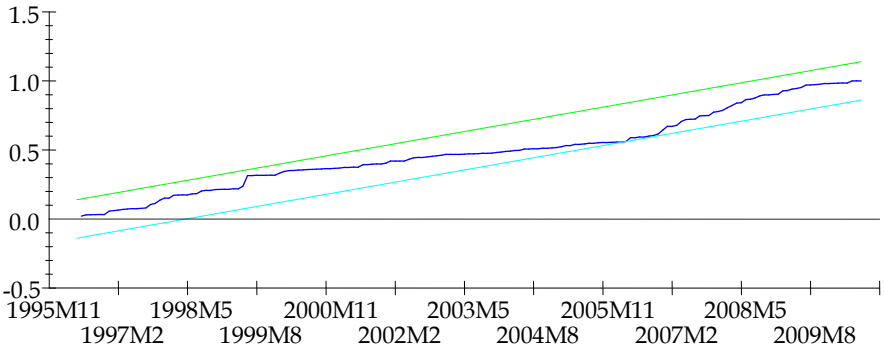
The straight lines represent critical bounds at 5% significance level

Fig: 4. 3.1: Plot of Cumulative Sum of Squares of Recursive Residuals of Russia



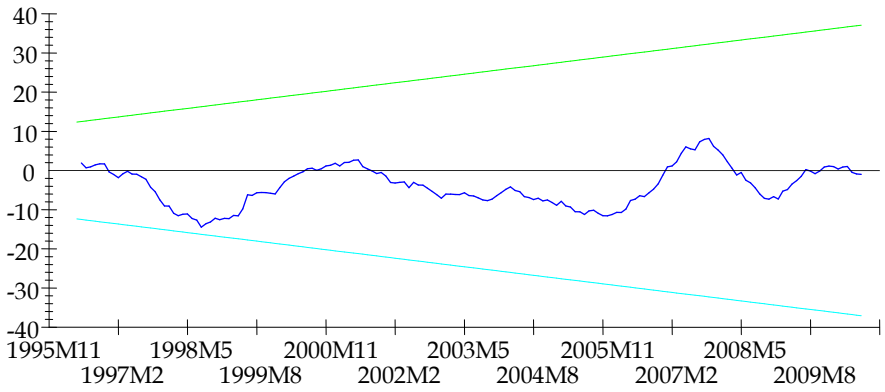
The straight lines represent critical bounds at 5% significance level

Fig: 4.4: Plot of Cumulative Sum of Squares of Recursive of Residual of China



The straight lines represent critical bounds at 5% significance level

Fig: 4.4.1: Plot of Cumulative Sum of Recursive Residuals of China



The straight lines represent critical bounds at 5% significance level

CHAPTER V

Study of Common Stochastic Trend and Cointegration in the Emerging Stock Markets

5.1. Introduction

The preceding chapter has concluded that macroeconomic variables are not playing major role in determining the stock prices. However, in the era of internationalization of stock markets, greater accesses to global stock markets can affect macroeconomic volatility. Bracker et al. (1999) found that macroeconomic variables were significantly influenced by the extent of international stock market integration. In this context the present chapter examines the integration between the stock markets of the BRIC and other major developed stock markets**.**

It has been presumed that the stock market meets the needs and requirements of both the credit and finance of the business community. The pace of economic development is conditioned, among other things, by the rate of long-term investment and capital formation which again is conditioned by mobilization, augmentation, and channelization of investible funds. Therefore, the stock market as a financial intermediary is expected to serve a very useful vehicle for pooling of the capital resources of the country and making them available to the investors. Currently, those markets that are not subject to government legislation are leading the movement towards the integration of stock markets.

On a global scale, the main international lenders are the industrially advanced countries such as the United States (US), the United Kingdom (UK), Japan and those that are in the Western Europe. In these countries the markets are highly developed and mature, which provide links to overseas productive opportunities and channels for foreign-destined businesses and portfolio capitals. The world's main borrowers

include rapidly expanding countries with fast developing industries and ample natural resources (such as Brazil, Russia, India, China and some other economies) and require overseas capital for industrial development. These less developed countries (LDCs), historically, have not proved attractive places for global capital. They acquire their development funds through official channels and through international organisations such as World Bank, which provide a link with the international stock markets.

This study contributes to the literature on international financial integration by investigating the interdependence of the major stock markets in emerging economies (Brazil, Russia, India, and China)

The study is important for a number of reasons. First, the four countries represent the highest stock market capitalization among the emerging economies. All markets are open to foreign investment, have implemented free market reforms, and have changed drastically over the past decade. They have been following common policies, such as harmonised trading practices, encouraging cross-border listing of shares, developing computerised trading systems and promoting greater inter and intra regional trade. These efforts, benign as they may be, have important implications for market efficiency, risk diversification and asset allocation.

Second, this study analyses not only the linkages that exist among the BRIC countries, but also those between the BRIC markets and the major developed markets (the US, the UK and Japan). It examines both long run relationships and short term dynamics.

The rest of the chapter is arranged as follows: Section 2 gives a theoretical analysis of the study. Section 3 gives a brief review of the existing literature relevant to the study. Section 4 presents sources of data and methodology. Section 5 presents the results of the empirical exercise. Section 6 concludes with a summary of the findings.

5.2. Theoretical Underpinnings

5.2.1. The Demand for Cross-border Borrowing and Investment

The demand for international borrowing and investment can be approached from different viewpoints. Traditionally, investors and borrowers tend to look, first, at domestic financial opportunities and, second, at overseas possibilities. In recent years, however, there are increasingly strong motives for lenders and borrowers to consider global opportunities more seriously. According to Ayling (1986), these motives may be divided into two main categories.

The first one can be seen as the economist's point of view, which is mostly inspired by the benefits of high level integration. For example, one explanation behind global investment from economic theory is the 'comparative advantage'. The comparative advantage theory has often been put forward to support the case for free trade, but it applies to capital markets too. It means that suppliers and users of capital should constantly seek out the most profitable opportunities no matter what their geographical location is. Since the nature of capital varies in terms of price, riskiness and other characteristics, the global markets should perform the function of bringing together suppliers of capital with particular characteristics with potential users of capital, who finds those characteristics suitable for their needs. De santis and Gerard (2006) state two widely accepted economic benefits of integration: first the better sharing of risks; and second, the increase of the potential economic growth.

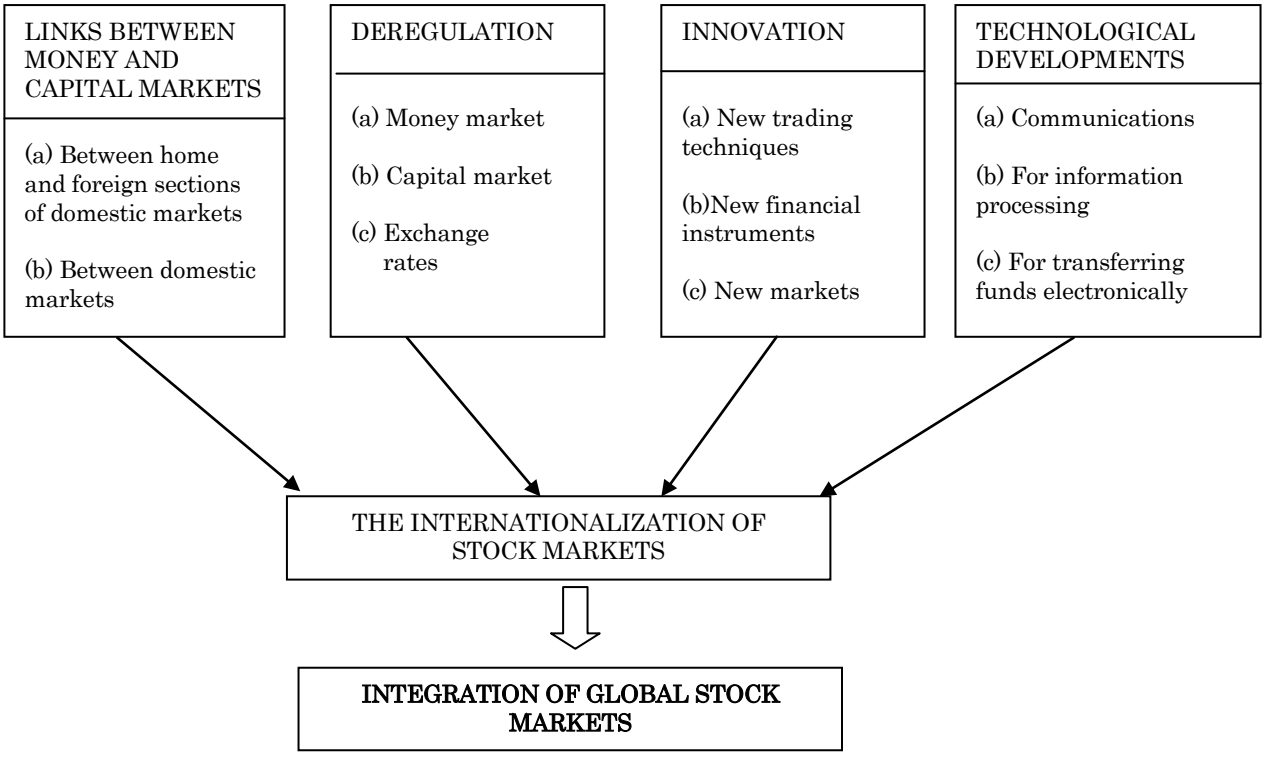
The second can be seen as the investor's point-of-view based approach which is mostly inspired by the possibility to lower portfolio risk via diversification, i.e., diversification possibilities exist if markets are not highly integrated. The domestic market may be inadequate to supply the needs and speculative motives of the domestic financial community. Borrowers and investors may be forced, or simply prefered, to use foreign markets where the range of new issues, secondary markets, financial assets and instruments are much wider than in the home country. Investors

are more likely to try to invest abroad for the first of these reasons if their domestic market is in the underdeveloped stage with only a narrow range of securities and financial instruments available.

As a result of these basic needs, the world's stock markets have become increasingly attuned to international financial transactions. The needs, aspirations and fears of investors and borrowers across the world have become entangled in a complex international financial system. Conflicting and complementary interests are becoming increasingly difficult to distinguish as the financial markets respond rapidly to the needs for liquidity and security of global financial transactions. The pace of the process now looks set to transform the scale of international financing and the nature of the world financial system (Ayling 1986).

The process of internationalization of global stock markets appears to be as a result of four main forces: (a) The increased links between money and capital markets; (b) moves towards deregulation; (c)innovation in financial markets; and (d) breakthrough in information and communication (as illustrated in figure 1)

Figure 5.1: The Main Influences Leading to the Internationalization of Stock Markets



One of the two factors that have made markets practically and institutionally more integrated is the rapid development in information communications technology. Investors in different locations can now follow more closely what happens elsewhere in the world than they could in the 1960s or 1970s. On-line data and information availability and the use of high technology information monitoring systems have enhanced remarkably the opportunities for international portfolio investors. Traders can buy and sell stocks, bonds, bills, currency, forwards, futures, and options on virtually any organized market in the world (Networks such as Reuters and Telerate provide services to their international customers for a fee). Controls of any type would put at risk the integration of international securities markets. Regulation of the listing of securities and accounting disclosure requirements are crucial aspects of any international investment activity.

In general, a country is integrated into the world stock markets if (a) capital is free to move into and out of the country and (b) the country's assets are substitutes for those of the other countries. Since most emerging economies impose some restrictions on capital mobility, and since none can claim that all of its assets are perfect substitutes for those of other countries, stock market integration is a matter of degree. A zero capital flow is consistent with perfect capital market integration if expected returns are continuously equal and there are no disturbances in capital markets. However, there are disturbances in the real world, and it is through capital flows that differences in expected returns between integrated capital markets arbitraged away, and one can reasonably expect that countries with a high degree of capital market integration will experience international flows.

Capital flows to the emerging market economies (EMEs) can be attributed to a variety of push and pull factors. The pull factors include overall improvement in macroeconomic management and macroeconomic stability accompanied by reduction in inflation and opening up of the capital account in varying degrees. The major push

factor is the stance of monetary policy in the advanced economies characterized by low interest rates, perceived low financial returns, and the resulting risk mispricing.

Thus, swings in monetary policy in the advanced economies have led to cycles and volatility in capital flows to and from the EMEs over which the EMEs have little control. Innovations in information technology have also contributed to the increased two-way movement in capital flows globally. Overall, in response to these factors, capital flows to the EMEs have grown over time since the early 1980s, but have been associated with increasing volatility (CGFS 2009).

Table 5.1 shows that there was an increase in capital flows between 1997 and 2008. Brazil, Russia, India and China show significant increase in gross flow of capital over a period of time. Emerging economies have experienced both "floods" and "sudden stops" of capital flows. Net capital flows to India increased from as low as US$ 2.5 billion in 1997 to US$ 34.5 billion in 2007, the year just before the crisis. In the same period, capital flows to Brazil increased from US$ 5 billion to US $ 26.5 billion, followed by China from US$ 5.6 billion to US $ 18.6 billion and Russia from US$ 1.2 billion to US $ 18.5 billion. This increasing capital flow might be because of relaxed regulatory measures, for example, firms being allowed to borrow abroad up to $500 million (which include loans or bonds issued abroad in foreign currency denominations) through "external commercial borrowing" with automatic approval by the government with effective from February 2004. Indian firms were allowed to invest overseas as well to reap the benefit of expanding market size and technology (effective from February 2004).

The global financial crisis had a pronounced impact on net capital flows to the developing countries in 2008. Portfolio equity inflows turned sharply negative. China was the only developing country to receive a sizeable net inflow of portfolio equity in 2008, but at $8.7 billion it was well below half the $18.5 billion recorded in 2007. India and Russia were the hardest hit: both countries experienced outflows of

$15 billion in 2008 compared to the net inflows of $35 billion (India) and $19 billion (Russia) in 2007.

Table 5.1: Portfolio Investment, Equity (BoP, current billion US$)

Country/ Year	Brazil	China	India	Japan	Russian Federation	United Kingdom	United States
1997	5.09	5.65	2.55	27.00	1.26	7.84	67.03
1998	-1.76	0.76	-0.60	16.11	0.71	63.17	41.95
1999	2.57	0.61	2.31	103.88	-0.28	103.35	112.28
2000	3.07	6.91	2.48	-1.28	0.15	191.74	193.60
2001	2.48	0.84	2.95	39.10	0.54	22.56	121.46
2002	1.98	2.24	1.06	-16.69	3.92	2.31	54.06
2003	2.97	7.72	8.21	87.77	0.42	32.60	33.98
2004	2.08	10.92	9.05	98.28	0.27	3.59	61.78
2005	6.45	20.34	12.15	131.31	-0.10	12.45	89.25
2006	7.71	42.86	9.50	71.43	6.48	-18.34	145.48
2007	26.21	18.51	34.98	45.45	18.67	25.24	275.63
2008	-7.56	8.72	-15.03	-69.69	-15.00	72.71	110.44

Note: Portfolio equity includes net inflows from equity securities other than those recorded as direct investment and including shares, stocks, depository receipts (American or global), and direct purchases of shares in local stock markets by foreign investors.

Source: Global Development Finance. International Monetary Fund, Balance of Payments database, and World Bank.

The growing integration of developing country economies into the global economy, and the increasing importance of their firms and households in international finance over the past decade, has brought enormous economic and financial benefits (World Bank 2007a). But the same developments have also widened the scope for economic turmoil when global conditions deteriorated. Indeed, the broad reach of the current crisis can be traced through the dense web of trade and financial linkages among countries. Developing countries are much more dependent on private capital inflows today than during the 1990s.

5.2.2. Benefits and Costs of Integration

The existence of comovement between the securities prices indicates the stock market integration. This comovement implies that one of the markets will help predict the other market's returns. In case of integration among all stock markets, the systematic risk (market risk) becomes an unsystematic risk (firm-specific risk), and this kind of risk can be diversified or eliminated away by investing on the security as part of diversifiable portfolio. It has been argued that corporate financial strategies depend on whether international stock markets are integrated or not. In case of integrated market, all firms can raise their capital with lower costs than their counterparts in a segmented market. Similarly, the capital budgeting decisions for firms normally depend on their exposure to international capital. It is the marginal cost of capital of a firm that uses capital from international sources, which is lower than the marginal cost of capital of a firm that uses only capital from domestic sources. The degree of market integration indicates the level of information efficiency in the presence of geographic boundaries and technological constraints. The idea behind integration can be summarized in a single word: the law of one price (LOOP). Hence, what is meant by the integration of stock markets is simply non-existence of differential risk premia for similar or identical financial instruments traded in different locations. A complete integration of stock markets implies the absence of arbitrage opportunities; that is, as markets become integrated arbitrage profits should tend to disappear. Therefore, risk premia differentials suggest some level of segmentation in stock markets, and source of risk premia differentials should shed some light into the causes of segmentation. There are two major motivations for conducting the study. First, equity market integration issue in international finance is one of the most important concepts. It is a prerequisite in justifying the pricing of securities in terms of different risk sources and long term sustainability of higher return. Second, the challenging context of emerging markets, which exhibit unique characteristics owing

to their transitory state in terms of changing market structure and time varying integration of their equity markets.

In the present context, the study has much more relevant for the BRIC nations in analyzing the process and degree of integration and the contagion effects on those economies for the reason that the authorities have implemented financial policies that are designed to increase the rate of integration of local markets with that of the international markets.

5.3. Review of Literature

In this section an attempt is made to present a review of the selected and recent studies relating to India and other countries that are relevant to the present study.

In the theoretical literature, capital market integration is derived from various postulates such as the law of one price (Cournot (1927)), extending Markowitz's (1952) portfolio selection theory, and the Capital Asset Pricing Model (CAPM), developed by Sharpe (1964) and Lintner (1965), which is the classic basis for early theoretical work on stock market integration. Measurement of stock market integration is categorized into two main streams: using the international capital asset pricing model (ICAPM), and using the cointegration approaches. Opposite to the CAPM, which assumes that markets are perfectly segmented, the ICAPM generally assumes markets to be perfectly integrated. According to this model, international stock markets are considered integrated if securities with the same risk characteristics are equally priced even if they are traded in different markets. A set of studies uses the ICAPM as a measure of stock market integration which includes the studies such as Solink (1974), Stulz (1981), Jorion and Schwartz (1986) and Buckberg (1995).

However, the result regarding the structure of world capital markets is inconclusive with conflicting findings. Errunza and Losq (1992) quote several studies and confirm the wide differences observed regarding integration issue of developed market. One

of the idiosyncrasies of stock prices is that over long period they tend to move together and follow a common upward trend (Azman-Saini et al. 2002). Many studies try to determine the number of common stochastic trends. If stock markets are integrated, then it is expected for the indices in these markets to display common trends. The existence of co-movements between the securities prices indicates stock market integration. This co-movement implies that one of the markets will help predict the other market's returns, as valid error correction representation exists.

In an attempt to analyze the benefit of international equity diversification for Australian investors, Allen and Macdonald (1995) found evidence of cointegration over the sample period between Australia and Canada, Australia and the UK, and Australia and Hong Kong. The results imply that Australians investors can have a potential long-run portfolio diversification gains in other countries where no evidence of cointegration have been found. The result of using Johansen maximum likelihood procedure suggests that Australian market is cointegrated with Germany and Switzerland markets. Kasa's (1992) findings of a unique common stochastic trend in a system of five stock markets held implications that these markets were perfectly correlated over the long-run (although there could be significant deviations over the short-term). In this respect, the analytical tool of cointegration lends itself quite conveniently to investigate the long-run relationships of stock market movements.

Ayuso and Blanco (1999) have shown that during the 1990's, the linkages between national stock exchanges seem to have increased. Not only the weight of foreign assets in agents' portfolio has increased but also the correlation between stock indices and the ability of each market return has increased to explain the behavior of returns on other markets. Taylor and Tonks (1989) employed the bi-variate cointegration technique (by Engle and Granger, 1987), and found a cointegration between the stock price index of the UK with that of the stock price index of the US, Germany, Netherlands and that of Japan, but only for the later period. No cointegration between

the stock price index of these countries was found in the former period, i.e., April 1973 to September 1979. Based on their empirical findings, they suggested the absence of long-term gain from diversification for the UK investors after the abolition of exchange controls. Choudhury, (1997) tried to investigate the long-run relationship between stock indices from six Latin American markets and the United States by using weekly data from January, 1989 to December, 1993. The study found the presence of a long-run relationship between the six Latin American indices (with and without the US index). Their error correction results also proved the significant causality among the stated indices. Gilmore (2002) has examined the short-term as well as the long-term relationships between the US stock market and other three Central European markets where it was shown that the markets are not cointegrated in the long-run.

Developed markets are anyhow becoming less effective in cross-country diversification. According to the studies of Christiansen (2007) and Kim et al. (2006) countries in the European Monetary union have been highly integrated after introducing Euro, but also the US markets are highly integrated with European markets. Neaime (2002) uses the Engle-Granger cointegration approach to analyze stock market integration among stock markets in the Middle East North Africa (MENA) region and between these markets and developed markets. The study finds a weak integration among the MENA markets and a strong integration between these markets and developed markets. Nath and Verma (2003) tested for cointegration between the Nifty, STI and Taiex and found no evidence in favor of cointegration. Chittedi (2010a, 2011b) showed that the results are somewhat mixed, however, the weight of evidence indicates that the stock market in India moves with the markets of the developed countries.

Raj and Dhal (2008) investigated the degree of integration of India's stock markets with two Asian regional equity markets (i.e. Hong Kong and Singapore) and three leading international markets (i.e. the US, the UK and Japan). Multivariate co

integration tests showed the existence of one cointegration relationship among these markets, whereas pair-wise cointegration tests between India and one of these markets rejected the hypothesis of cointegration.

Guidi (2010) explored the relationship between Indian and Asian (i.e. Hong Kong, Japan and Singapore) developed equity markets over 1999-2009. They applied Engle and Granger and Johansen cointegration tests and did not find evidence of cointegration between India and the Asian markets. Further using the Gregory-Hansen approach, he rejected the null hypothesis of no cointegration with structural breaks among these markets. Finally, from the empirical results he infers that the presence of an equilibrium relationship does limit the potential benefits for portfolio diversification of international investors aiming to share their investments among India and one of the other stock markets. However, Rockinger et al. (2001) and Anatolev (2005) argue that emerging markets have been an interesting option for investors, not just because they can offer outstanding return possibilities, but also because they can be used in diversification more effectively. This is due to their lower degree of integration with more developed counterparts.

In the spirit of the aforementioned papers, the literature focusing on the comovement of international stock markets has grown rapidly and includes, among others, Karolyi and Stulz (1996), Harvey (1995), Janakiramanan and Lamba (1998), Phylaktis (1999), Masih and Masih (2001), Caporale et al. (2010), Gklezakou et al. (2009), Syriopoulos (2007), Wong et al. (2005), Bose (2005), Arouri et al. (2007), Raj and Dhal (2009), and Chittedi (2010b) used different cointegration approaches to measure stock market integration among global markets. They reported mixed results regarding the existence of integration among these markets and linkages between these markets and developed markets such as the US and Japan. In the latest studies the most widely used model is theVAR and tests which are based on the VARs such as the Johansen cointegration test and Granger causality test.

The review reveals that the poor performance of international asset pricing models in large samples could be attributed to several factors. First, since tests of integration are also joint tests of market efficiency and an asset pricing model, the results are likely to be influenced by the degree of efficiency of national capital markets. Evidence suggests that the degree of market efficiency varies not only among emerging and developing markets but also among the developed countries' markets. Second, as Korajczyk and Viallet (1989) point out, the tests of traditional asset pricing models could be problematic even within a single country in the presence of asset pricing anomalies such as the size effect documented in capital market research. Such problems are likely to be severe when tests are conducted in a multi-country setting. Further, as Cho, Eun and Senbet (1986) had observed, it is plausible that the traditional asset pricing models such as the APT may only hold locally or regionally in segmented capital markets but not globally.

Some of the studies simply split the total sample period into two and there is no clear cut rule on how to split a sample. Thus, all the results drawn from these studies are not robust with respect to the choice of how to incorporate the break period into the tests. Thus by avoiding splitting of the sample period altogether, one can get around this pitfall by studying the evolution of the relationship overtime. All the studies based on simple correlation do also suffer from a limitation. National stock market data may display substantial serial correlation that may cause an understatement of true correlation between markets and lead to a conclusion that the markets are not integrated. Due to this statistical limitation, the degree of correlation can be either high or low, in the rates of return, which may not imply the international stock market linkages.

To empirically measure the interdependence of markets, most of the studies used Engle and Granger (1987) cointegration test. But in the context of a multiple cointegrating vectors, the Engle and Granger method may produce a complex linear combination of all such vectors that cannot be easily interpreted. In case of more than

two variables, their single approach can be misleading, particularly when more than one cointegrating relationship is present. However, the Johansen (1988) measure of cointegration, as applied by Nath (2003), Raj and Dhal (2008)[1] and Chittedi (2009) had overcome the above limitations and can estimate as well as test the presence of multiple cointegrating vectors.

The point of departure and importance of this study lies in the fact that it focuses on the Indian stock market, which has so far not included in the studies on stock market integration trends in Asia, as the Indian market was considered to be more or less insulated from the rest of the regional markets. However, in recent times, with the growing activities of foreign portfolio investors who track international indices and continuously move funds between markets, as well as further linkages with foreign markets through the route of ADR/GDR issues and other channels, correlation between Indian and global stock markets has increased significantly warranting a detailed in depth study and most of the emerging countries are trying to open-up their economies, especially their financial markets with the hope of achieving benefits and prospects of an integrated world financial economy.

5.4. Significance of the Study

A comprehensive study on the integration of various stock markets, located globally, assumes significance in the present context when there is rapid penetration of liberalization and globalization across the world. If stock markets of different countries are integrated, then investing in various stock markets would not generate any long term gain to portfolio diversification (Lin and Cheng 2008). That is why it is important for both investors as well as academicians to know whether stock markets are integrated or they work independently. In such situation, international investors need to understand whether emerging markets are integrated or not, in order to realize the potential risk and rewards of global diversification. The policy makers need

[1] For a discussion on the cointegration hypothesis, see Raj and Dhal (2008)

to understand the driving forces behind emerging stock market interdependence. Such an understanding will provide a better grasp of the functioning of the global stock markets, and allow investors and policy makers to ask various questions regarding the actual trend (i.e., constant, increasing, or decreasing) of interdependence among emerging stock markets; the impact of bi-lateral trade between two countries on their stock market interrelationship and the impact of fall in the growth rate, due to effects of global economic downturn, from one market to other markets (Pretarius 2002). Thus, a study on stock market integration, either theoretical or empirical carries a lot of significance.

5.5. Objective

Given the background of the study, the main objective of the analysis in the chapter is to examine stock market integration among the emerging and developed countries. The following is the specific objective of this study which would help in achieving the purpose.

i) To examine the integration of the stock market among the BRIC (Brazil, Russia, India and China) nations and their integration with the developed countries stock markets such as the US, the UK and Japan.

5.6. Nature of the Data and Source

The study has daily closing stock prices of DJIA, FTSE-100, NIKKEI-225, Bovespa, RTS, Sensex and SSE composite for the US, the UK, Japan, Brazil, Russia, India and China respectively taken from **www.econstats.com** during the period from January 1997 to June 2010. The validity of the data was checked from respective stock exchanges.

5.7. Methodology

The non stationary nature of data renders the application of Ordinary Least Squires (OLS) method inappropriate to establish any relationship among the variables as it generates spurious results due to the simple fact that classical assumptions underlying OLS are not met in such cases. Therefore when the variables contain a unit root, cointegration is used to establish long-run equilibrium relationship among them. Cointegration analysis requires using only those variables that are not stationary. In this study, Augmented Dickey-Fuller, the Phillips-Perron and the KPSS unit root tests are employed for checking the properties of the variables under study[2].

5.7.1 Granger Causality Test

Granger causality is a technique for determining whether one time series is useful in forecasting another. There are arguments for causation in either direction. To resolve such arguments statistically, one often uses the Granger causality test, which will decide the direction of influence between a pair of variables.

The Granger causality test, attempts to find out whether *X* (Granger) causes *Y* or *Y* (Granger) causes *X*, or whether there exists a bi-directional causality between X and *Y*. These three situations are descriptively indicated as $X \rightarrow Y$, $Y \rightarrow X$ and $X \Leftrightarrow Y$ respectively. The test is based on the following two regressions:

$$Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{i=1}^{p} \beta_i X_{t-i} + e_t \qquad (5.1)$$

$$X_t = \lambda_0 + \sum_{i=1}^{n} \lambda_i Y_{t-i} + \sum_{i=1}^{n} \gamma_i X_{t-i} + u_t \qquad (5.2)$$

[2] For more details about Unit root test please see chapter 4 methodology section.

Where Y_t and X_t are the variables to be tested for the direction of causality, e_t and u_t are white noise errors, and p and n are appropriate lag lengths to be determined. The Granger causality test involves estimating regressions (5.1) and (5.2) separately in a 'best' possibly way, each under two situations namely with and without zero restrictions and testing the joint significance of the estimated coefficients using F – test. Specially, to test whether '*X* does not Granger cause *Y*' require the null hypothesis. H_0: $\sum_{i=1}^{p} \beta_i = \mathbf{O}$ in equation (5.1).

The necessary condition for the applicability of Granger causality test is that the X and Y variables must be stationary. It is also necessary to choose appropriate lag lengths for the test. It is better to use more rather than fewer lag lengths since the theory is couched in terms of the relevant past information. The chosen lag length must be matched with the actual lag length. If it is less than the actual lag length, then the omission of relevant lags can cause bias and if it is more than the relevant lag length, then it causes the equation to be inefficient. To deal with this problem, Hsiao (1981) has developed a systematic autoregressive method for choosing appropriate lag length. Therefore, the appropriate lag length is one where the Akaike's Final Prediction Error (FPE) is lowest. Akaike information criterion (AIC) or Schwarz criterion (SC) or Likelihood Ratio (LR) criterion or Hannam-Quinn information criterion (HQ) is also useful for choosing the lag length.

5.7.2. Cointegration Tests

Prior to the development of cointegration theory and estimation procedures using non- stationary variables, econometric and time series models have been based on the assumption that the underlying data series are stationary. This stringent assumption on the data process has led to an error term 'spurious regression' in literature. Therefore, such series should be used for finding the association by running regression in the first differences of the variables. But differencing of non

stationary variables can lead to loss of valuable information (Sims 1977). Given this, there arises the need to preserve both long-run information present at the level variables as well as to check for spurious regression of the integrated variables. Both the incompatible objectives could be arrived at via implementation of cointegration technique.

Before any test for cointegration, it is necessary in the first place to ascertain that the concerned series are not $I(0)$, and also the exact order of integration since cointegration between two variables arises only when they are of the same order. Hence test for unit roots become mandatory. The concept of cointegration was introduced by Granger (1981) and Engle and Granger (1987). The most popular system method is Johansen and Juselius (JJ) cointegration method. The present study used two methods of cointegration namely Engle-Granger (1987) procedure and Johansen and Juselius (1990) procedure.

Engle and Granger (1987) proposed a two-step estimator for models involving cointegrated variables. The first step, Durbin-Watson Cointegrating Regression (DWCR), test is based on the DW statistic from the relationship between y_t and x_t and tests, on the null hypothesis that the residual u_t is I (1), whether DW is significantly different from zero using the critical values provided by Sargan and Bhargava (1983: Table 1). Also, the R^2 value will be very high for cointegrated variables. The second step directly examines residuals through an ADF test for unit root. Thus, given two variables y_t and x_t if they are indeed $I(1)$ processes, verified through some unit root tests, a simple method of testing whether they are cointegrated is to estimate the 'cointegrating regression':

$$y_t = \alpha + \beta x_t + u_t$$

and then test whether the residual u_t is $I(0)$ or not, using the t-ratio on u_{t-1} from the regression of Δu_t on u_{t-1} and lagged values of Δu_t in a way analogous to the unit root (ADF) testing discussed earlier. If u_t has no unit root, that is, the linear combination $u_t = y_t - a - \beta x_t$ is $I(0)$, then there exists a cointegrating relationship between y_t and x_t The DF and ADF tests in this context are known as Engle-Granger (EG) test or Augmented Engle-Granger (AEG) test.

Johansen (1988) maximum likelihood procedure estimates cointegrating relationship in a system of equations unlike single equation method of Engle and Granger. The Johansen and Juselius (JJ) test is computed in the following way. Suppose there are p variables that are considered being cointegrated. First, it is ensured that all the variables are of the same order of non stationary, and in fact are $I(1)$. The variables tested for cointegration are stacked into a p – dimensional vector (Y_t). Then, a p×1 vector of first differences, ΔY_t, is constructed, formed and estimated using the following Vector Auto Regression (VAR):

$$\Delta y_t = \Pi y_{t-k} + \Pi_1 \Delta y_{t-1} + \Pi_2 \Delta y_{t-2} + \ldots\ldots + \Pi_{k-1} \Delta y_{t-(k-1)} + u_t \qquad (5.3)$$

The rank of the matrix Π is tested. If Π is of Zero Rank (i.e. all the eigen-values are not significantly different from zero), then there is no cointegration, otherwise, the rank will give the number of cointegration vectors.

In simplified terms, Johansen test is a multivariate approach which allows for estimation of several cointegrating relationships at once and this characteristic has made it a rather popular method for testing of long-run relationship in literature. Since likelihood estimators can work with more than two variables which are integrated of the same order, Johansen methodology can capture all of the

cointegrating relationships among the selected set of variables and identify a number of cointegrating vectors via its test statistics.

There are two test statistics for cointegration under Johansen methodology: trace statistic (λ_{trace}) and the Max-Eigenvalue statistic (λ_{max}).

λ_{trace} is a joint test where the null hypothesis is that the number of cointegrating vectors is less than or equal to r against the alternative hypothesis that there are more than r.

λ_{max} conducts separate tests on every eigenvalue and the null hypothesis is that the number of cointegrating vectors is less is r against the alternative hypothesis that there are r + 1.

Johansen and Juselius provide critical values for the two test statistics (Johansen and Juselius 1990). If the test statistic is greater than the critical value from Johansen's tables, the null hypothesis that there are r cointegrating vectors is rejected against the alternative hypothesis that there are more than r (for Trace test) or that there are r + 1 (for maximum eigenvalue test). Johansen and Juselius (1990) recommend the second test as better. The present study uses two methods of cointegration namely Engle-Granger (1987) procedure Johansen and Juselius (1998) procedure.

The fundamental difference between the Engle – Granger and JJ approaches is that the former is a single- equation methodology whereas JJ test is a systems technique involving the estimation of more than one equation. The advantage of the Engle-Granger approach is its simplicity and its intuitive interpretability. However, it has a number of disadvantages, which includes its inability to detect more than one cointegrating relationship and the impossibility of validly testing hypotheses about the cointegrating vector.

5.7.3. Error Correction Model (ECM)

Cointegration and error correction modeling which retained low frequency information was suggested to deal with non-stationary data series. Error correction models, on the other hand, can retain the level information of the data and provide short run dynamics and also try to direct temporal causal relationships. ECM is a convenient model measuring the correction from disequilibrium of the previous period. A very important advantage of the ECM is the ease with which they can fit into the general-to-specific approach to econometric modeling, which is in fact a search for the most parsimonious ECM model that best fits the given data sets. Finally, the most important feature of the ECM is when the variables under examination are found to be cointegrated; the disequilibrium error term is a stationary variable (by definition of cointegration). The fact that the two variables are cointegrated implies that there is some adjustment process, which prevents the errors in the long-run relationship becoming larger and larger. Engle and Granger have shown that any cointegration has an ECM representation.

This is very useful when it is wished to test and incorporate both the economic theory relating to the long-run relationship between variables, and short-run disequilibrium behaviors. In the following ECM for example:

$$\Delta y_t = a_1 + \sum_{i=0}^{n} \beta_i \Delta y_{t-i} + \sum_{j=0}^{m} \gamma_i \Delta x_{t-i} - \theta(y_t - \lambda x_t)_{t-1} + e_t \qquad (5.4)$$

The short-run relationship is captured by the lagged terms of the Δx variable, where the current impact of Δx on Δy is captured by the γ_i coefficient, while the short run disequilibrium deviations are captured by the one period lagged error-term of the co integrating equation, with θ being the adjustment factor to equilibrium. θ of course takes values between zero to one, while it is obvious that the closest to one of the largest is the adjustment to equilibrium and vice versa.

5.8. Empirical Analysis

Generally, any potential gain from the international diversification of a portfolio is inversely related to the extent of stock market integration. A low correlation between returns of national and overseas indices allows investors to minimize portfolio risk through international diversification. Investors also should be aware that correlations are dynamic and varies overtime, changing the amount of portfolio diversification with given asset allocation (Cappilello et al. 2003). The benefit of international diversification is limited when national equity markets are cointegrated because the presence of common factors limits the amount of independent variation. Thus, an analysis of the long run comovement of national stock prices with that of overseas stock prices and the short run temporal relationship between the two is important for managing an international portfolio.

The evidence from Table 5.2 shows that the mean daily stock prices during the sample period have been high for the emerging economies except Russia. Overall, the mean daily stock prices are highest for Brazil, Japan, India and the UK. This finding indicates that considering the four emerging stock markets over the period from Jan 1997 to June 2010 had paid higher returns than the developed countries in our sample.

Table 5.2: Summary Statistics of Daily Stock Prices (Jan 1997 to June 2010)

	BRAZIL	CHINA	JAPAN	INDIA	RUSSIA	UK	USA
Mean	9.94	7.45	9.50	8.67	6.14	8.56	7.37
Median	9.76	7.35	9.53	8.46	6.18	8.58	7.35
Maximum	11.45	8.71	9.94	9.94	7.81	8.84	8.45
Minimum	8.46	6.91	8.86	7.86	3.65	8.09	6.66
Std. Dev.	0.66	0.39	0.25	0.58	0.98	0.16	0.35
Coefficient of Variation (%)	6.63	5.23	2.63	6.68	15.96	1.86	4.74
Skewness	0.38	1.24	-0.32	0.63	-0.14	-0.44	0.68
Kurtosis	1.95	4.014	2.04	1.98	2.22	2.09	3.54
Jarque-Bera	192.30	821.28	151.86	297.92	76.22	181.83	247.78
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.2 also indicates that emerging markets are relatively risky. The coefficient of variation has not shown a large variation but the variation is high in emerging markets compared to that of the developed markets. An investor in emerging markets should therefore be willing to accept volatile returns, i.e., there is a chance for large profits at the risk of large losses. The positive skewness coefficient for most of the stock indices implies that the frequency distribution of the return series is positively skewed or has longer tails to the right. The kurtosis[3] shows that the distribution of stock prices for China and the USA has fat tails (leptokurtic)[4], while Brazil, Russia, India, the UK, and Japan have less peak and have thinner tails (platykurtic). The leptokurtic and platykurtic shows that there is higher probability of extreme price movements than usual. Jarque-Bera[5] statistics for all the distributions show that none of them are normally distributed.

Table 5.3 and Table 5.3.1 carry the report on statistics of ADF, PP and KPSS tests for the variables on both levels and first differences. Log values of the variables are used in this study. Stock market indices, when measured in levels are not stationary as the value of the test statistics i.e. ADF, PP[6] and KPSS[7] are not significant. But when these variables are measured in first differences, it is evident that ADF, PP and KPSS statistics are statistically significant at 1 percent level. In contrast, unit root tests reject the same null hypothesis in the log first-differenced form of the series (which are the stock returns), which indicates that each stock market index is integrated of order one (i.e. $I(1)$) and hence one may proceed to test for cointegration among these series. After establishing that the variables are non stationary at levels and stationary at first difference, cointegration tests such as Engle and Granger (1987), Johansen (1988) and

[3] **Kurtosis -** measures the magnitude of the extremes. If returns are normally distributed, then the kurtosis should be three.

[4] If a random variable kurtosis is greater than 3, then it is said to be **leptokurtic**. If the kurtosis is less than 3, then it is said to be **platykurtic.**

[5] **JB** statistics is a joint test for s=0 and k=3. If p values for the test statistics is sufficiently low, then one rejects the hypothesis that distribution is normal.

[6] $\mathbf{H_0}$: Z is non- stationary, $\mathbf{H_1}$: Z is stationary (ADF,PP - rejection of H_0)

[7] $\mathbf{H_0}$: Z is stationary, $\mathbf{H_1}$: Z is non- stationary (KPSS – non-rejection of H_0)

Johansen and Juselius (1990) are employed. The existence of an error-correction term among a number of cointegrated variables implies that changes in the dependent variable are a function of both the level of disequilibrium in the cointegration relationship (represented by the ECM) and the changes in the other explanatory variables. This tells us that any deviation from the long-run equilibrium will feed back to the changes in the dependent variable in order to force the movement towards the long-run equilibrium. .

Table5.3: Unit Root test Statistics: Level

	Augmented Dickey-Fuller Test			**Phillips-Perron Test**			**KPSS Test**	
Variables	I*	IC**	WIC***	I*	IC**	WIC***	I*	IC**
SENSEX	-0.663	-1.430	1.302	-0.663	-1.429	1.304	6.472	1.123
NASDAQ	-2.072	-2.020	0.554	-1.904	-1.843	0.660	0.430	0.441
FTSX-100	-2.005	-2.097	-0.465	-2.054	-2.111	-0.132	0.579	0.553
NIKKI 225	-0.317	-0.616	-1.467	-0.911	-1.048	-1.888	1.897	0.732
BOVESPA	-2.015	-2.127	-0.303	-1.985	-1.025	-0.304	1.118	0.704
RTS	-0.952	-1.671	0.976	-0.970	-1.662	0.992	5.839	0.530
SSE composite	-1.157	-1.705	0.599	-1.323	-1.737	0.616	3.289	0.557

*Note: * With Intercept ** with Intercept and Trend *** without Intercept and Trend*

Table 5.3.1: Unit Root test Statistics: First differences

	Augmented Dickey-Fuller Test			Phillips-Perron Test			KPSS Test	
Variables	I*	IC**	WIC***	I*	IC**	WIC***	I*	IC**
SENSEX	-51.77*	-51.76*	-51.77*	-51.71*	-51.70*	-51.71*	0.087*	0.085*
NASDAQ	-59.94*	-59.93*	-59.94*	-60.43*	-60.43*	-60.43*	0.157*	0.091*
FTSX-100	-21.61*	-21.69*	-21.63*	-58.75*	-58.83*	-58.76*	0.228*	0.084*
NIKKI 225	-56.06*	-56.05*	-56.04*	-56.05*	-56.04*	-56.03*	0.098*	0.098*
BOVESPA	-54.88*	-54.89*	-54.89*	-54.90*	-54.92*	-54.90*	0.240*	0.095*
RTS	-51.14*	-51.14*	-51.13*	-51.14*	-51.14*	-51.1*2	0.100*	0.100*
SSE Composite	-42.05*	-42.05*	-42.05*	-56.63*	-56.62*	-56.63*	0.082*	0.082*

*Note: * With Intercept ** With Intercept and Trend *** Without Intercept and Trend*
Test critical values for ADF and PP test:
** Indicates the level of significance at 1 %. (-3.431833),*
*** indicates the level of significance at 5 % (-2.862081)*
**** Indicates the level of significance at 10%, (-2.567101).*
Asymptotic critical values for KPSS test:
**Indicates the level of significance at 1 %. (0.739000),*
*** indicates the level of significance at 5 % (0.463000)*
**** Indicates the level of significance at 10%, (0.347000). (Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1))*

5.8.1. Results of Cointegration

Cointegration tests are helpful while dealing with non-stationarity in the data and also examine the long-run relationship. As the unit root tests try to examine the presence of stochastic trend of time series, cointegration tests search for the presence of a common stochastic trend among the variables from the unit root test results. At levels all the variables are non-stationary *I*(0), whereas at first difference all the variables become stationary at *I*(1). This satisfies the condition to run cointegration test. The cointegration results are shown in Table A5.1 (Appendix) and Table A5.2 (Appendix). First one is trace statistics and other one is Maximum Eigen-value statistics. (Appendix) Table A5.1 shows that pair wise cointegration test results, considering India as the focal point is to understand the comovements between sample countries. We found that India and Brazil have one cointegrating vector, but none of the other pairs of countries had shown the presence of any cointegrating vectors. Further, we use different combinations of the (Appendix) Table A5.2, which is shown in the case of

combinations of (i) Brazil, Russia, India, China markets (ii) the United States, the UK, Japan and Brazil, which have at most 1 cointegrating vector, from both trace statistics and Maximum Eigen-value statistics. But we could not observe such cointegrating vectors from both trace statistics and Maximum Eigen-value statistics for any such combination as (i) the Untied States, the UK, Japan and India; (ii) the Untied States, the UK, Japan and China; (iii) the United States, the UK, Japan and Russia; (iv) the Untied States, the UK and India ;(v) the Untied States, Japan and India; and (vi) the UK, Japan and India. A lack of cointegration suggests that such variables have no long-run link and variables can wander arbitrarily far away from each other.

Finally, for all the countries together an empirical result of Maximum Eigenvalue indicates one cointegration equation at 5 percent level of significance. It also tells that Indian stock market has long-run equilibrium with other developing markets. In other words, Indian stock market has long-run relationship with other developed markets i.e. the USA, the UK, and Japan and the other BRIC markets. However, Trace test indicates rejection of null hypothesis at 5 percent significance level i.e. no cointegration vector. Since Dickey et al. (1991) recommend the maximum eigenvalue test as more reliable than the trace test; we base our conclusion on the maximum eigenvalue test.

There are several reasons why different countries' stock prices may have a significant long run relationship. The presence of strong economic ties and policy coordination between the relevant countries can indirectly link their stock prices over time. There are possibilities with technological and financial innovations that the advancement of international finance and trade, the geographical divide among various national stock markets, market liberalization measures, computerized trading systems, and increasing activities by multinational corporations work as factors contributing to such integration.

Table 5.4: Findings of JJ Cointegration Results
(JJ cointegration results are reported in Table A5.1 to A5.2)

Country	Cointegration Yes/No		Country	Cointegration Yes/No
The US / India	No		The UK, Japan, India	No
The UK / India	No		**BRIC**	**YES**
Japan/ India	No		The US, The UK, Japan, India	No
Brazil /India	**YES**		**The US, The UK, Japan, Brazil**	**YES**
China/ India	No		The US, The UK, Japan, China	No
The US, The UK, India	No		The US, The UK, Japan, Russia	No
US, Japan, India	No		**The US, The UK, Japan, BRIC**	**YES**

The conformity of JJ cointegration estimates of the possible combinations relating to the stock market indices using Engle Granger cointegration test results is reported in Table A5.3 (Appendix). The residual based cointegration tests results (Table A5.3 (Appendix)) only confirm the existence of integration between India and Brazil only, leaving other pairs out of cointegration.

With the emergence of emerging stock markets and liberalization of International stock markets in the recent years, there has been an increase in the investors' interest in the international diversification. This allows investors to have international shares to choose from as part of their portfolio assets, so as to enhance the reward-to-volatility ratio. This benefits would be limited if stock markets tend to move together in the long run.

5.8.2. Results of Error Correction Mechanism

From the above analysis, it is explained that the BRIC emerging stock markets have long-run relationship with other developing markets. But that does not mean that they have short-run equilibrium. There may an existence of short-run dynamics

among stock markets also. For finding short-run equilibrium, Error Correction Mechanism (ECM) has been adopted. Three types of inference, concerning the dynamics of the five markets, can be drawn from the Error Correction Mechanism results (appendix) Table A5.4.

The first one concerns whether the left-hand side variable in each equation in the system is endogenous or weakly exogenous. The second type of inference is about the speed, degree, and direction of adjustment of the variables in the system to restore itself to equilibrium following a shock to the system. The third type of inference is associated with the direction of short-run causal linkages among the five markets. The results estimated are furnished in the (appendix) Table A5.4. It is evident from the cointegration coefficients, that only Brazil appears to be exogenous i.e., shocks within Brazil do not influence the other indices in the system, whereas all other six countries' indices found to be weakly exogenous or endogenous, that is shocks in those economies do destabilize the equilibrium in other economies. From the coefficients of lagged values it is evident that in the case of the USA market, it is negatively related to the changes in the Japanese market. More precisely change in the Japanese market by one unit causes negative change in the USA market by 0.072 units. In the case of the UK market, it is significantly positively related to the changes in the USA market and negatively related to the changes in the Japanese market. The Russian market is found to be positively related to the Indian market.

5.8.3. Results of Granger Causality

As final step, test for the causal or informational linkages between different pairs of markets are conducted by using the Granger causality test. This test helps to understand the unidirectional or bidirectional causality interms of lead-lag relationship between the pairs of markets. Briefly, the Granger causality test, here, consists of running regressions of stock return (say, Indian) on its lagged values and then to see whether adding lagged values of the other stock market returns (say, the

US) can improve the explanatory power of the regression. Hence, if the coefficients of the lagged values of the US return are statistically significant, then it can be stated that the US stock return Granger causes the Indian stock return.

Table (Appendix) A5.5 (Brazil) shows that there is bi-directional relationship between Brazil and India stock returns and Brazil and China stock returns. The study found that there is a unidirectional relationship from Brazil to the UK stock returns and Brazil to Japan stock returns. On the other hand, there is no reverse causation from the UK and Japan stock returns to Brazil stock returns. Whereas, the US stock returns do not have any causality with Brazil index returns. Further, the study shows that Russian stock returns have impact on Brazil stock returns.

Table (Appendix) A5.6 (India) shows that there is a unidirectional causal influence on the Indian stock returns from the stock returns of the US, the UK and China. It is indicating the influence of the US, the UK and China stock markets on the Indian stock returns. It could also be observed that Japanese and Russian stock returns are getting influenced by the Indian stock returns.

Table (Appendix) A5.7 (China) indicates that there is a unidirectional causal influence of the Chinese stock returns with that of the stock returns of the US, the UK, and India. Whereas, Japan and Russia are not having any causality with the Chinese stock returns.

There is a unidirectional causal influence on the Russian stock returns from the US and the UK stock returns. It means that there is an influence of the US and the UK stock returns on the Russian returns. It is also observed that the Russian stock returns are getng influenced by the Indian stock returns. Whereas, Japan and China market returns are not having any causality with the Russian market returns. (Appendix Table A5.8 (Russia)).

The results shows that the US and the UK market returns are influencing Russian, Indian and Chinese, but the US and the UK market returns do not seem to exert strong influence on the Brazil market return. The Indian market return in turn leads among the BRIC markets and also seems to have had an influence on the Japanese market return. Brazil market return exerts a significant influence on the UK, Japan and Russian market returns.

Table 5.5: Findings of Granger tests
(Results of Granger tests are reported in Table A5.5 to A5.8)

Country	**Granger Causality with countries**		**Country**	**Granger Causality with countries**
US ⟹	India		BRAZIL ⟹	Japan
US ⟹	China		BRAZIL ⟹	China
US ⟹	Russia		INDIA ⟹	Russia
UK ⟹	China		INDIA ⟹	Japan
UK ⟹	India		INDIA ⟹	China
UK ⟹	Russia		JAPAN ⟹	No causal relation with any country
BRAZIL ⟹	UK		RUSSIA ⟹	India

***Note**: (⟹ Indicates unidirectional relationship)*

5.9. Summary and Conclusion

This chapter empirically investigates the long run equilibrium relationship between the BRIC stock markets and the stock market indices of three major developed countries by using multivariate cointegration. To assess the short run influence of one market on the other and to assess how many days each market takes to factor out the influence on the Indian stock market, we have used the Granger causality test. The cointegration test results can be used to address the issue whether regional integration is occurring, and/or whether the BRIC countries are integrated globally. The evidence from Table A5.1 and Table A5.2 show that a single stochastic trend suggests that the

BRIC economies move partially with the markets of other developed countries and also within themselves. The lack of strong links among the BRIC markets, and between their counterparts in developed economies presents an opportunity for portfolio diversification. With the exception of India/Brazil (Table A5.1), none of the pairs are cointegrated. The practical implication for investors is that they can gain by holding portfolios from different countries. But while such trends are under way, we are still far from a fully integrated world capital market. For now, the key feature of the international capital market is still a high degree of short-term integration combined with a strong tendency for most saving to remain and be invested in the country where the saving is done.

The returns and volatilities of the US, Chinese, and Indian equity markets may be related through trade and investment, so that any news about the US economic conditions which affect the US stock market are most likely to have implications for the global markets in general and the Chinese and Indian stock markets in particular. While the US trade linkages with Russian and Brazil are rather small, the equity markets of these three countries may be linked through the impact of the US economic conditions on the global demand for oil and commodities. This is likely to affect the Russian economy through its oil exports and the Brazilian economy via its commodities exports. Similarly, the US and the BRIC equity markets may be related through changes in currency exchange rates, which may affect the relative competitiveness of each country's products and may induce global portfolio managers to change the portfolio choice of their investments among the five equity markets. In addition, stock price movements driven by herd mentality and fads may be transmitted from the US equity market to the BRIC stock markets. Speculative and noise trading may lead to contagion effects across the five equity markets.

Appendix

Empirical results tables

Table A5.1: Stock Market Prices for Multivariate Cointegration (Johansen and Juselius (J-J) India, Untied States, UK, Japan, Brazil, Russia and China

Country	Null Hypothesis H_0	Trace test Alternative	Trace test Statistics [Prob]	Max test Alternative	Max test Statistics [Prob]
US and India	r=0	r=1	9.544 [0.317]	r>=1	9.2585 [0.265]
	r<=1	r=2	0.285 [0.593]	r>=2	0.2856 [0.593]
UK and India	r=0	r=1	6.196 [0.672]	r>=1	5.446 [0.672]
	r<=1	r=2	0.749 [0.386]	r>=2	0.7492 [0.386]
Japan India	r=0	r=1	0.821 [1.000]	r>=1	0.677 [1.000]
	r<=1	r=2	0.144 [0.703]	r>=2	0.1445 [0.703]
Brazil India	r=0	r=1	**51.776 [0.000]***	r>=1	**51.245 [0.000]***
	r<=1	r=2	0.531 [0.466]	r>=2	0.531 [0.466]
Russia India	r=0	r=1	6.119 [0.681]	r>=1	6.097 [0.600]
	r<=1	r=2	0.021 [0.882]	r>=2	0.021 [0.882]
China India	r=0	r=1	5.857 [0.712]	r>=1	5.857 [0.631]
	r<=1	r=2	1.83E-0 [0.999]	r>=2	1.83E-0 [0.999]
US, UK India	r=0	r=1	18.101 [0.558]	r>=1	10.304 [0.715]
	r<=1	r=2	7.797 [0.487]	r>=2	5.780 [0.641]
	r<=2	r=3	2.016 [0.155]	r>=3	2.016 [0.155]
US, Japan India	r=0	r=1	4.138 [1.000]	r>=1	2.923 [1.000]
	r<=1	r=2	1.215 [0.999]	r>=2	1.061 [0.9998]
	r<=2	r=3	0.154 [0.694]	r>=3	0.154 [0.6943]
UK, Japan India	r=0	r=1	14.719 [0.798]	r>=1	13.289 [0.426]
	r<=1	r=2	1.430 [0.999]	r>=2	1.189 [0.999]
	r<=2	r=3	0.240 [0.623]	r>=3	0.240 [0.623]

* Trace and Max-eigenvalue test indicates 1 cointegration at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level , **MacKinnon-Haug-Michelis (1999) p-values

Table A5.2: Stock Market Prices for Multivariate Cointegration (Johansen and Juselius (J-J) India, Untied States, UK, Japan, Brazil, Russia and China

Country	Null Hypothesis H_0	Trace test Alternative	Statistics	[Prob]**	Max test Alternative	Statistics	[Prob]**
India, Brazil, Russia and China	r=0	r=1	**75.528**	**[0.000]***	r>=1	**61.569**	**[0.000]***
	r<=1	r=2	13.958	[0.843]	r>=2	10.347	[0.711]
	r<=2	r=3	3.610	[0.932]	r>=3	3.435	[0.913]
	r<=3	r=4	0.175	[0.675]	r>=4	0.175	[0.675]
Untied States, UK, Japan and India	r=0	r=1	18.026	[0.997]	r>=1	12.903	[0.890]
	r<=1	r=2	5.122	[1.000]	r>=2	2.721	[1.000]
	r<=2	r=3	2.400	[0.987]	r>=3	2.303	[0.982]
	r<=3	r=4	0.096	[0.755]	r>=4	0.096	[0.755]
Untied States, UK, Japan and Brazil	r=0	r=1	**71.302**	**[0.010]***	r>=1	**52.589**	**[0.000]***
	r<=1	r=2	18.712	[0.979]	r>=2	12.506	[0.839]
	r<=2	r=3	6.206	[0.997]	r>=3	4.418	[0.994]
	r<=3	r=4	1.787	[0.980]	r>=4	1.787	[0.980]
Untied States, UK, Japan and China	r=0	r=1	32.774	[0.569]	r>=1	16.557	[0.6181]
	r<=1	r=2	16.216	[0.696]	r>=2	10.901	[0.6571]
	r<=2	r=3	5.3151	[0.774]	r>=3	4.702	[0.7789]
	r<=3	r=4	0.6130	[0.433]	r>=4	0.613	[0.4336]
Untied States, UK, Japan and Russia	r=0	r=1	18.543	[0.996]	r>=1	12.825	[0.8944]
	r<=1	r=2	5.718	[0.999]	r>=2	5.290	[0.9932]
	r<=2	r=3	0.428	[1.000]	r>=3	0.378	[1.0000]
	r<=3	r=4	0.049	[0.823]	r>=4	0.049	[0.8238]
Untied States, UK, Japan, Brazil, Russia, India and China.	r=0	r=1	89.940	[0.868]	r>=1	**49.640**	**[0.020]***
	r<=1	r=2	40.300	[1.000]	r>=2	19.719	[0.974]
	r<=2	r=3	20.580	[1.000]	r>=3	10.664	[0.999]
	r<=3	r=4	9.916	[1.000]	r>=4	7.666	[0.999]
	r<=4	r=5	2.249	[1.000]	r>=5	1.905	[1.000]
	r<=5	r=6	0.344	[1.000]	r>=6	0.344	[1.000]
	r<=6	r=7	0.000	[0.988]	r>=7	0.000	[0.988]

* Trace and Max-eigenvalue test indicates 1 cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table A5.3: Results of Augmented Engel Granger Cointegration

Cointegration India with	Augmented Engle Granger Test		
	lag	ADF statistics	Critical value (10%)
US	0	-0.230	-2.567
	1	-0.323	-2.567
UK	0	-0.331	-2.567
	1	-0.077	-2.567
Japan	0	-0.815	-2.567
	1	0.413	-2.567
Brazil	0	**-6.874***	**-2.567****
	1	**-6.832***	**-2.567****
Russia	0	-1.641	-2.567
	1	-1.837	-2.567
China	0	-1.718	-2.567
	1	-1.545	-2.567

. * indicates 1% level of significance. . * *indicates 5% level of significance.

Table A5.4: Empirical Results of Error Correction Mechanism

Error Correction:	D(USA)	D(UK)	D(RUSSIA)	D(JAPAN)	D(INDIA)	D(CHINA)	D(BRAZIL)
CointEq1	0.000	-0.000	-0.000	0.000	-0.000	0.000	0.010*
	[0.353]	[-0.744]	[-0.369]	[1.440]	[-1.322]	[1.354]	[6.67325]
D(USA(-1))	-0.022	0.179*	-0.0254	0.262*	0.154*	0.010	0.012
	[-0.903]	[12.425]	[-0.758]	[15.721]	[7.457]	[0.382]	[0.185]
D(UK(-1))	-0.010	-0.126*	0.015	0.249*	0.102*	0.103	-0.035
	[-0.260]	[-5.090]	[0.268]	[8.673]	[2.875]	[2.270]	[-0.306]
D(RUSSIA(-1))	0.009	0.004	0.097*	0.003	0.019	-0.015	0.000
	[0.607]	[0.471]	[4.363]	[0.358]	[1.433]	[-0.898]	[0.004]
D(JAPAN(-1))	-0.071	-0.048*	0.005	-0.148*	-0.027	-0.035	-0.006
	[-2.217]	[-2.527]	[0.133]	[-6.752]	[-1.003]	[-1.021]	[-0.070]
D(INDIA(-1))	-0.012	-0.000	0.097	0.064	0.034	0.019	0.013
	[-0.444]	[-0.044]	[2.548]	[3.413]	[1.468]	[0.626]	[0.178]
D(CHINA(-1))	0.0151	-0.020	-0.024	-0.007	-0.012	0.039	-0.039
	[0.594]	[-1.362]	[-0.690]	[-0.448]	[-0.567]	[1.430]	[-0.574]
D(BRAZIL(-1))	0.001	0.009	0.007	0.010	-0.018*	0.027*	0.006*
	[0.204]	[1.807]	[0.636]	[1.786]	[-2.522]	[2.935]	[0.299]
C	5.09E-07	4.78E-05	0.000	-0.000	-6.99E-05	0.000	-0.001
	[0.001]	[0.172]	[0.649]	[-1.058]	[-0.175]	[1.357]	[-0.890]
R-squared	0.004	0.087	0.014	0.215	0.047	0.012	0.022
Adj. R-squared	0.000	0.083	0.010	0.212	0.043	0.008	0.018
F-statistic	1.146	22.965	3.542	66.137	12.028	3.016	5.628

Notes: Figures in parentheses are t values. * 1% level of significance, Lag length is chosen based on Akaike Information Criterion (AIC) and Final Prediction Error (FPE).

Table: A5.5: Granger Causality Tests: Lag 02 (BRAZIL)

Null Hypothesis	Obs	F-Statistic	Probability	Inference
UNITIED STATES does not Granger Cause BRAZIL	2788	1.580	0.206	Do not reject
BRAZIL does not Granger Cause UNITIED STATES		0.410	0.663	Do not reject
UK does not Granger Cause BRAZIL	2806	0.455	0.635	Do not reject
BRAZIL does not Granger Cause UK		12.651	0.000	Reject
JAPAN does not Granger Cause BRAZIL	2631	1.531	0.217	Do not reject
BRAZIL does not Granger Cause JAPAN		31.021	0.000	Reject
INDIA does not Granger Cause BRAZIL	2690	18.300	0.000	Reject
BRAZIL does not Granger Cause INDIA		3.730	0.024	Reject
RUSSIA does not Granger Cause BRAZIL	2956	7.858	0.000	Reject
BRAZIL does not Granger Cause RUSSIA		2.156	0.116	Do not reject
CHINA does not Granger Cause BRAZIL	2958	3.809	0.022	Reject
BRAZIL does not Granger Cause CHINA		9.849	0.000	Reject

Table: A5.6: Granger Causality Tests: Lag 02 (INDIA)

Null Hypothesis	Obs	F-Statistic	Probability	Inference
UNITIED STATES does not Granger Cause INDIA	2726	39.022	0.000	Reject
INDIA does not Granger Cause UNITIED STATES		0.010	0.990	Do not reject
UK does not Granger Cause INDIA	2750	15.404	0.000	Reject
INDIA does not Granger Cause UK		0.144	0.866	Do not reject
JAPAN does not Granger Cause INDIA	2575	0.269	0.764	Do not reject
INIDA does not Granger Cause JAPAN		26.733	0.000	Reject
BRAZIL does not Granger Cause INDIA	2690	3.730	0.024	Reject
INDIA does not Granger Cause BRAZIL		18.300	0.000	Reject
RUSSIA does not Granger Cause INDIA	2919	2.021	0.133	Do not reject
INDIA does not Granger Cause RUSSIA		7.062	0.001	Reject
CHINA does not Granger Cause INDIA	2919	4.343	0.013	Reject
INDIA does not Granger Cause CHINA		1.450	0.223	Do not reject

Table: A5.7: Granger Causality Tests: Lag 02 (CHINA)

Null Hypothesis	Obs	F-Statistic	Probability	Inference
UNITIED STATES does not Granger Cause CHINA	3043	3.666	0.026	Reject
CHINA does not Granger Cause UNITIED STATES		0.008	0.992	Do not reject
UK does not Granger Cause CHINA	3074	6.725	0.001	Reject
CHINA does not Granger Cause UK		2.200	0.111	Do not reject
JAPAN does not Granger Cause CHINA	2925	0.885	0.413	Do not reject
CHINA does not Granger Cause JAPAN		1.883	0.152	Do not reject
BRAZIL does not Granger Cause CHINA	2958	9.849	0.000	Reject
CHINA does not Granger Cause BRAZIL		3.809	0.022	Reject
RUSSIA does not Granger Cause CHINA	3331	0.469	0.626	Do not reject
CHINA does not Granger Cause RUSSIA		1.795	0.166	Do not reject
INDIA does not Granger Cause CHINA	2919	4.343	0.013	Reject
CHINA does not Granger Cause INDIA		1.450	0.235	Do not reject

Table: A5.8: Granger Causality Tests: Lag 02 (RUSSIA)

Null Hypothesis	Obs	F-Statistic	Probability	Inference
UNITIED STATES does not Granger Cause RUSSIA	3053	0.050	0.952	Do not reject
RUSSIA does not Granger Cause UNITIED STATES		1.055	0.348	Do not reject
UK does not Granger Cause RUSSIA	3067	3.304	0.037	Reject
RUSSIA does not Granger Cause UK		0.240	0.787	Do not reject
JAPAN does not Granger Cause RUSSIA	2906	2.238	0.107	Do not reject
RUSSIA does not Granger Cause JAPAN		0.317	0.729	Do not reject
BRAZIL does not Granger Cause RUSSIA	2956	2.156	0.116	Do not reject
RUSSIA does not Granger Cause BRAZIL		7.858	0.000	Reject
RUSSIA does not Granger Cause CHINA	3331	0.469	0.626	Do not reject
CHINA does not Granger Cause RUSSIA		1.795	0.166	Do not reject
INDIA does not Granger Cause RUSSIA	2919	7.062	0.001	Reject
RUSSIA does not Granger Cause INDIA		2.021	0.133	Do not reject

CHAPTER VI

Global Financial Crisis and Contagion: Evidence for the 'BRIC' Economies

6.1. Introduction

In the previous chapter, we found that the BRIC economies had integrated partially with the markets of other developed countries and also within themselves. This comovement can be attributed to the increasing market integration in relation to the close economic and financial links. The study of the behaviour of several stock markets has encouraged academicians, policy-makers and international fund managers to ascertain whether these markets are truly interlinked, interdependent, cointegrated and, therefore, contagious to each other.

Dynamic return links and volatility transmission across capital markets are of much greater interest to the financial community with the increasing trend of financial globalization throughout the world. If, for example, risk and volatility are found to spread from one market to another, then the portfolio managers and policymakers would have to adjust their actions to essentially prevent contagion risks in the event of market crashes or crises. This issue has been extensively investigated in the context of international asset markets (Forbes and Rigobon, 2002; Syriopoulos, 2007). These studies have found generally find evidence of significant return and volatility spillovers across markets, and argue that the degree of spillover is highly dependent on economic and financial integration.

Financial crises and contagion have attracted enormous attention among academics and practitioners in the last decade of the 20th century, of which the five major crises are: Mexican currency crisis in 1994–1995, Asian crisis in 1997, Russian default in 1998, Argentine crisis in 1999–2001, Brazilian stock market crash in 1997–1998 and the United States of America (USA) Subprime crisis 2008. Common to all these events was the fact that the turmoil, which had originated in

one market would extended to a wide range of markets and countries, in a way that was hard to explain on the basis of changes in fundamentals (Rodriguez, 2007). Generally, contagion refers to the spread of financial disturbances from one country to the other(s). There is an extensive literature on financial contagion during several crises of the 1980s and 1990s (see Dornbusch et al., 2000; Kaminsky et al., 2003, for excellent surveys).

The recent US subprime crisis (2008) has highlighted the risks of financial structures in a financially integrated world. The concatenation of events followed the same logic as in previous crises. The recomposition of the securities portfolio towards safer assets as well as the rearrangement of banking balances caused, on the one hand, the withdrawal of funds from emerging economies. This was particularly noticeable in the stock markets, where prices started to fall parallel to what was happening in developed economies. This process brought about pressures from exchange rates, which began to depreciate against dollar (Ferreiro et al 2011).

The 2007-08 financial crisis became apparent in the year 2007, though it had its roots in the closing years of the 20th century. The financial crisis happened in phases beginning with the sub-prime crisis in the US followed by collapse of one of the largest financial institution in the USA, the Lehman Brothers, unravelling of Credit Default Swaps (CDS) and recession of certain developed and developing economies. This pattern underpinned the internet boom and the folly of sub-prime lending, which characterized housing markets across the global economy in recent years, and which led to financial contagion and the subsequent credit crunch (See Krugman 2008). The depth of the current recession and the blazing speed with which it has propagated across countries far exceeds even the most pessimistic scenarios.

These financial collapses have driven researchers to ask how such shocks are transmitted internationally and why they have such intensity. In addition to its severe effects in Asia, the crisis put pressure on emerging markets outside the

region, and has contributed to virulent contagion and volatility in international financial markets. The so-called 'contagion' effect of the crisis drew a lot of attention to the linkages among emerging stock markets. Yet reducing volatility and contagion has been an important stated objective of recent reforms. According to Fischer (1998), reasons for revamping the international financial architecture and smoothing the global economy is as follows: i) The high degree of volatility of international capital flows to emerging markets and these markets' limited ability to deal with this volatility made the recipient country vulnerable to shocks and crises that are excessively large, frequent, and disruptive. ii) International capital markets appear to be highly susceptible to contagion. Thus proposals to reform the international financial architecture must be based on a thorough understanding of the causes and consequences of contagion. In this context, this chapter examines the extent of the current global crisis and its induced contagion effects through an empirical investigation of extreme financial interdependences of some selected emerging markets with that of the US.

The remainder of the chapter is organized as follows: Section 2 describes the analytical framework of the study. Section 3 provides review of past studies. Section 4 presents motivation and Objective of the study. Section 5 presents data and Methodology. Section 6 reports the empirical estimation results and tests the time- varying correlation coefficient. Finally, Section 7 contains the conclusion.

6.2. Analytical Framework

International capital flows steadily increased over the last couple of decades as many financial markets opened their borders to foreign investors. For example, inter-national portfolio investments have gradually grown from cumulative net flows in Japan, the UK, and the US of about one billion US dollars in the 1980s to about two billion US dollars in the 1990s. While most European and G-7 countries liberalized their stock markets in the early 1970s, many emerging countries opened their markets to foreign investors in the late 1980s and early 1990s (See, for example, Kaminsky and Schmukler (2001).

On the other hand, there was a contraction in credit to the emerging economies during the 2008 global financial crisis. Capital inflows towards stock markets dropped (See Chapter 5; Table 5.1). Yield differentials of international bonds increased, in some cases (for example, Russia, Turkey and South Africa) up to 800 average basic points. In the economies of Latin America and Central Europe the increase was lower, though the level was between 400 and 600 basic points. Local bond yields increased in the emerging economies with an increased dependence on foreign capital. Debt issuing ceased and the negotiation of the securities of these countries in the secondary market decreased. In addition, banks in the developed countries reduced their cross-border loans in, approximately, 1 per cent of the GDP of emerging economies (Bank for International Settlements, 2009). In addition, open capital accounts generate tendencies whereby capital movements occur because of unpredictable changes in investor confidence (Ghosh and Chandrasekhar 2008). This affects both the inflows and outflows in ways that the governments concerned cannot control.

It is obvious that the degree of openness of a country has an important bearing on the extent of integration of its financial market with global markets. India has pursued a policy of gradual liberalisation of capital movements while strengthening its financial sector infrastructure. Certain available measures help to gauge the degree of openness (or the degree of capital controls[1]) of countries across the globe; two such indicators are as follows:

[1] See for example, Bird and Rajan (2000) who note that restraints on capital movements can be divided into controls on capital account transactions per se (capital controls) and controls on foreign currency transactions (exchange controls). Capital controls can cover foreign direct investment (FDI), portfolio investment, borrowing and lending by residents and non-residents, transactions making use of deposit accounts and other miscellaneous transactions. Exchange controls regulate the rights of residents to use (remit or receive) foreign currencies and hold offshore or onshore foreign currency deposits. They also regulate the rights of non-residents to hold domestic currency deposits onshore. In addition, they may be defined to include taxes on currency transactions and multiple exchange rate practices, which are aimed at influencing the volume and composition of foreign currency transactions. Such capital controls may have different effects on the functioning of the economy, depending on their nature.

The first one is foreign ownership/investment restrictions[2].

This sub-component is based on the following two Global Competitiveness Report questions:

"How prevalent is foreign ownership of companies in your country?

1 = Very rare, 7 = Highly prevalent";

and "How restrictive are regulations in your country relating to international capital flows?

1 = Highly restrictive, 7 = Not restrictive at all".

The second indicator is Capital controls[3]. The International Monetary Fund reports up to 13 types of international capital controls. The zero-to-10 rating is the percentage of capital controls not levied as a share of the total number of capital controls listed, multiplied by 10. Table 1 provides indicators of the degree of capital market accessibility. It gives a sub-index of the Economic Freedom of the World (EFW) Index of economic freedom for a country, which indicates the degree of restrictions on international capital movements.

[2] Source: World Economic Forum, Global Competitiveness Report (various issues).

[3] Source: International Monetary Fund, Annual Report on Exchange Arrangements and Exchange Restrictions (various issues).

Table 6.1: Some Indicators of the Degree of Capital Market Accessibility

	2006			2007			2008			2009		
	FO/IR	**CC**	**ICC**	**FO/IR**	**CC**	**ICC**	**FO/IR**	**CC**	**ICC**	**FO/IR**	**CC**	**ICC**
Brazil	6.0	5.0	5.5	6.6	3.8	5.2	5.7	3.8	4.8	5.9	3.1	4.5
China	6.4	0.0	3.2	6.5	0.0	3.2	4.6	0.0	2.3	4.7	0.0	2.4
India	7.1	0.0	3.6	7.1	0.0	3.5	6.2	0.0	3.1	5.8	0.0	2.9
Russia	3.9	3.8	3.9	4.2	3.3	3.8	4.1	3.3	3.7	4.2	5.0	4.6
Japan	6.4	3.8	5.1	6.1	3.8	5.0	3.8	4.9	6.1	6.6	6.9	6.8
UK	8.5	8.5	8.5	8.2	8.3	8.3	7.7	8.3	8.0	8.1	8.3	8.2
USA	7.3	6.2	6.7	7.4	6.2	6.8	6.7	6.2	6.4	6.3	3.8	5.1

Source: World Economic freedom report 2011

Note: 1. *'Foreign ownership **(FO)** /Investment restrictions **(IR)'** refers '**Sub Index for access of citizens to foreign capital markets/foreign access to domestic capital markets/ foreign ownership restrictions (GCR)'.***

2. *'Capital Controls **(CC)'** refers to **'Sub index for restrictions in foreign capital market exchange/ Index of capital controls among the 13 IMF categories**.*

3. *'International Capital Market Controls '**ICC'** refers to '**EFW index for International Capital Market Controls'.***

India's EFW sub-index for "Access of Citizens to foreign capital markets/ foreign access to domestic capital markets/Foreign ownership restrictions" (based on the Global Competitiveness Report) has declined significantly between 2006 and 2009, from 7.1 to 5.8, on a scale of 10 for India. This declining trend follows, even for China (from 6.4 to 4.7) and the USA (from 7.3 to 6.3) between 2006 and 2009. However, according to the IMF, which considers 13 categories of capital restrictions, India is yet to remove any of the restrictions and has a score of zero. The IMF classifications are contained in the Annual Report on Exchange Arrangements and Exchange Restrictions. A country is classified as either "liberalized" (value of unity) or not (value of zero) in terms of liberalisation of the capital account, current account and requirements to surrender the export proceeds. India's overall EFW sub-index for international capital mobility is now above that of China. Table 1 indicates that due to the global financial crisis, almost all the countries have regulated and imposed restrictions on their financial market to protect their economies.

The financial crisis was felt in these economies at the end of 2008. The 'Emerging Markets Financial Stress Index' developed by the International Monetary Fund

(2009a) reveals that the intensity of the crisis in these countries was deeper than in previous times. The starting situation of emerging economies, therefore, did not reflect the same weaknesses as those observed in other recent crises, whether these were originated in advanced or developing economies. Its insertion in the global financial process had intensified though they had protected their position by means of the reserve accumulation, the attainment of trade surplus and the development of local and regional financial markets.

Although the U.S. subprime mortgage market was the first to absorb the devastating effects of the bursting global asset bubble, the turmoil had directly impacted most of the equity markets by the summer of 2007. Indeed, the crisis that broke by October 2008 had erased around US$25 trillion from the value of stock markets, seems largely to have been unexpected[4]. At the end of Q1 2009, global market capitalization had fallen 53% since its peak on October 31, 2007. Partly this was because it came on the heels of a seven-year period of high growth and originated in the USA; many had expected a global slowdown to start in the emerging markets. Both the initial destruction of financial wealth and the psychological shock of seeing many elite Wall Street firms on their knees, prompted numerous commentators to initially raise the spectre of the great depression. Although not the great depression, it is indeed true that the world was staggering from financial to economic crisis as the US, the EU, Japan and other high-income economies entered the recession at the end of 2008. Having decimated the Wall Street and then crippled the Main Street, the financial crisis seems like a hurricane about to sweep across the developing world (Evans et al. 2008).

[4] See Giles (2008). In its October 2007 World Economic Outlook, for instance, the IMF, although concerned about the subprime crisis in the US and its potential negative impact on slowing down growth, still assumed in its baseline forecasts that, 'market liquidity is gradually restored in the coming months and that the interbank market reverts to more normal conditions' (2007: xv).

The causes of the crisis have by now been widely analysed and dissected[5]. The phenomenon of global stock market contagion is now too familiar and serious to ignore and has become an integral part of the stock market activity. Contagion is not measurable in itself, but rather estimated from the residual of the comovement, which is not explained by the fundamentals. The definition of the term contagion varies widely across the literature. Referring to the World Bank classification we can distinguish three definitions of contagion viz., broad, restrictive and very restrictive definitions of contagion[6]. In broad definition contagion is identified with the general process of shock transmission across countries. The latter is supposed to work in both tranquil and crisis periods, and the contagion is not only associated with negative shocks but also with the positive spillover effects. In restrictive definition contagion has to be meant as the propagation of shocks between two countries (or group of countries) in excess to what should be expected to be explained by the fundamentals and besides considering the co-movements triggered by the common shocks. Contagion has been defined in the economics literature in many different ways, including as any transmission of shocks across countries. According to the modern market-based financial system, contagion can be transmitted through price changes and the measured risks and marked to market (or according to fair value) capital of financial institutions. When balance sheets are marked to market, asset-price changes will be reflected immediately on balance sheets and will trigger response from financial market participants. The most widely used definition in the literature is the very restrictive definition.

6.2.1. Impact of Global financial Crisis

The impact of the crisis was felt in almost all the economies of the world to varying degrees. During the initial phase of the crisis, the financial shock was

[5] For overviews of the causes and nature of the financial crisis, see Barth (2008), Felton and Reinhart (2008) and Taylor (2009).

[6] www.worldbank.org/economicpolicy/managing%20volatility/contagion/index.html. Accessed on February 27th, 2009.

transmitted to the real economy, primarily through the equity price channel and, in a more differentiated fashion, through the credit channel. The shock to international confidence had an immediate and sharp effect on capital flows to emerging markets, as investors reassessed risks and global capital flows collapsed. In addition to poor confidence and wealth effects, the fall in equity prices led to a rise in the cost of capital and dampened investment confidence.

In the initial phase of the crisis, the Indian economy remained relatively insulated, but witnessed a slowdown in the GDP annualized growth from around 7.5 per cent in the first half to 6.0 per cent in the second half of 2008, amplified by a sharp contraction in the performance of the manufacturing sector. The impact of the financial crisis on China took the form of a sharp drop in external demand, which in turn led to an economic slowdown, difficulties for businesses, and rising unemployment. Structural problems also became more evident. The outbreak and spread of the global financial crisis had a severe impact on China's financial and real estate markets, which were mainly reflected in the following: (i) The stock index fell in an accelerated manner. During the six months from May to October 2008, the Shanghai stock exchange composite index dropped over 50 per cent. (ii) Real estate prices continuously declined. Between July 2008 and February 2009, the average sales prices index for buildings in 70 medium-to-large cities in China fell by about 2 per cent cumulatively. (iii) Money supply and loan supply growth rate continued to fall. From May to November 2008, the year-on-year M2 growth rate fell by 3.3 per cent and loan supply growth rate for the same period remained low. (iv) From July 2008 to February 2009, the RMB's real effective exchange rate rose dramatically by 14.5 per cent, resulting in an unfavourable effect on China's exports. The sharp drop in China's exports lasted over a considerable period, and in the second half of 2008, 15 per cent of export firms were forced to reduce output or even shut down.

The global financial crisis inflicted significant loss in output in all the BRICS economies. In terms of real GDP growth, Russia witnessed the sharpest fall in growth on account of worsening oil prices exacerbated by a fall in other

commodities prices. Brazil, which had significant trade linkages with Mercosur, the US, the Euro zone, and China, also witnessed a fall in external demand. The real GDP growth rate fell to (–) 0.6 per cent in 2009 mainly due to external sector shocks.

However, the real GDP growth in India and China remained impressive even though they also witnessed some moderation on the face of weakening global demand. Large domestic demand and policy measures to move towards more domestic sectors-driven growth helped to achieve strong growth even during a period of shrinking external demand.

Table 6.2: Global Financial Crisis and the BRIC: Summary Indicators

	Brazil		Russia		India		China	
	2008	2009	2008	2009	2008	2009	2008	2009
Equity Market Indices (% change)	–57.6	121.3	–51.9	58.8	–65.1	100.5	–74.2	100.3
Market Capitalization (%GDP)	35.7	73.2	23.9	70.5	53.2	85.4	61.8	100.3
PE	7.9	17	–72.4	128.6	10.5	21.8	10.3	21.1
GDP Growth	5.2	–0.6	5.2	–7.8	7.3	5.7	9.6	8.7
Investment Rate/GDP	18.2	16.6	26.2	22.7	35.6	34.5	42.5	44.8
CPI Inflation	5.7	4.9	14.1	11.7	8.3	10.9	5.9	–0.7
Fiscal Deficit/GDP	–1.3	–3.2	4.3	–6.2	–7.4	–9.6	–0.4	–3
Gross Debt/GDP	64.1	68.9	7.8	10.9	72.6	74.2	16.8	18.6
CAD/GDP	–1.7	–1.5	6.2	4	–2.2	–2.1	9.4	5.8
Exports Growth	23.2	–22.7	33.1	–35.7	29.7	–15.2	17.3	–15.9
Imports Growth	43.4	–26.7	30.6	–34.3	40.3	–20.1	18.3	–11.3
Exchange Rate*	31.9	–25.5	5.1	–5.6	22.9	–3.7	–6.4	–0.1
Equity Market Indices (percentage change)	–57.6	121.3	–51.9	58.8	–65.1	100.5	–74.2	100.3
Market Capitalization (%GDP)	35.7	73.2	23.9	70.5	53.2	85.4	61.8	100.3
PE	7.9	17	–72.4	128.6	10.5	21.8	10.3	21.1

Note: PE = Price Earnings Ratio; CAD= Current Account Deposit; GDP= Gross Domestic Product.

Source: Ministry of Finance, Govt.of India - BRIC report 2012.

6.2.2. Policy Responses and Managing the Recovery by the BRIC[7]

The global financial crisis resulted in significant weakening of economic activity led by poor consumer and investor confidence. As a result, all the BRIC countries initiated fiscal stimulus measures.

Brazil: Brazil has featured high levels of reserve requirements, allowing the central bank to lower reserve requirements for macro-prudential purposes following the Lehman Brothers episode. In particular, to confront liquidity problems in the inter-bank market, the central bank reduced reserve requirements to support lending from large liquid banks to small illiquid banks. By introducing this liquidity provision mechanism during the crisis, the central bank was able to avoid financial stability problems in the system.

Russia: The authorities' efforts to stabilize the banking system during the fourth quarter of 2008 aimed to provide significant liquidity while keeping the exchange rate stable to offset the abrupt loss of foreign financing. Starting in April 2008, the government auctioned excess budgetary funds to banks, while the Central Bank of Russia (CBR) provided an ever-widening array of liquidity facilities, including long-term subordinated loans and uncollateralized loans, which had been provided under special federal laws. In 2008–9 the Bank of Russia broadened the range of assets that banks could use as collateral in refinancing the transactions and extended the terms of loans secured by the non-market assets, such as promissory notes, credit claims, or credit institution guarantees. The CBR also offered guarantees for inter-bank lending to qualifying banks, covering losses in the event that the licence of the counterparty was withdrawn. In March 2009, another bank recapitalization scheme was announced that entailed an exchange of preferred shares for government bonds. Adjustments in the interest rates were active tools in the Bank of Russia's response to the global financial crisis. The refinancing rate was increased in the second half of 2008. Then the Bank of Russia

[7] Ministry of Finance, Government of India - BRIC report 2012.

implemented a series of reductions in the refinancing rate: from 13 per cent in April 2009 to 7.75 per cent in June 2010. The CBR temporarily lowered the required reserve ratios in September and in October 2008.

India: The policy repo rate under the liquidity adjustment facility (LAF) was reduced by 400 basis points, from 9 per cent to 5 per cent. The policy reverse repo rate under the LAF was reduced by 250 basis points, from 6 per cent to 3.5 per cent. The cash reserve ratio (CRR) was reduced by 400 basis points from 9 per cent of net demand and time liabilities (NDTL) of banks to 5 per cent. The statutory liquidity ratio (SLR) was reduced from 25 per cent of NDTL to 24 per cent. The export credit refinance limit for commercial banks was enhanced to 50 per cent from 15 per cent of the outstanding export credit. A special 14-day term repo facility was instituted for commercial banks up to 1.5 per cent of NDTL. A special refinance facility was instituted for scheduled commercial banks (excluding RRBs) up to 1 per cent of each bank's NDTL as of 24 October 2008.

China: China made efforts to guide financial institutions to make remarkable credit planning. Since September 2008, the PBC has lowered the benchmark deposit and lending rates five times, from 4.14 per cent to 2.25 per cent and from 7.47 per cent to 5.31 per cent, respectively. To amplify liquidity in the banking system, the PBC had cut the RMB reserve requirement ratio of financial institutions four times in the latter half of the year 2008. Specifically, the reserve requirement ratio of large financial institutions was cut by 2 percentage points cumulatively, whereas that of small financial institutions was cut by 4 percentage points cumulatively. The 1-year central bank liquidity lending rate was cut from 4.68 per cent to 3.33 per cent. The rediscount rate was cut from 4.32 per cent to 1.8 per cent. At the same time, the PBC eliminated quantitative ceilings for financial institutions' credit lending and promoted greater support for SME lending to increase their credit supply and optimize the credit structure.

6.3. Review of Literature

An important strand of the empirical research on contagion uses conditional correlation analysis to test for shifts in linkages across financial markets during crisis periods. A set of papers examines contagion of financial markets by testing for higher correlation between markets during crises times, inter alia, Boyer, Gibson, and Loretan (1999), Forbes and Rigobon (2002), and Corsetti, Pericoli and Sbracia (2005). Subsequent studies refined this approach by addressing key features of the data generating process that affected the validity of these tests such as heteroscedasticity, endogeneity, and the influence of common factors. King and Wadhwani (1990) was the first study to employ this correlation approach in examining cross-market co movements. They found that the correlation between the London and the New York stock markets rose immediately after the 1987 U.S. market crash, but returned to pre-crash levels when the volatility fell. The causes of contagion can be divided conceptually into two categories (Masson 1998; Wolf 1998; Forbes and Rigobon 2000; Pritsker 2001):

The first category emphasizes spillovers that result from the interdependence among market economies. This interdependence means that shocks, whether of global or local nature can be transmitted across countries because of their real and financial linkages. Most empirical work seeks to explain the degree of comovements and the mechanisms for transmitting them—for example, how and under what conditions a speculative attack on a single currency is spread to other currencies on the basis of various fundamental relationships.

The second category involves a financial crisis that is not linked to the observed changes in the macroeconomic or other fundamentals but is solely the result of the behaviour of investors or other financial agents. Under this definition, contagion arises when a co movement occurs, even when there are no global shocks and interdependence and fundamentals are not the factors. A crisis in one country may, for example, lead investors to withdraw their investments from many markets without taking into account the differences in economic

fundamentals. This type of contagion is often said to be caused by "irrational" phenomena, such as financial panics, herd behaviour, loss of confidence, and increased risk aversion, but because these phenomena can be individually rational and still lead to a crisis, and so it is helpful to discuss each category in detail (Dournbusch et al 2000). On the other hand, the broad definition of the World Bank states that "Contagion is the cross-country transmission of shocks or the general cross-country spillover effects. Contagion can take place both during "good" times and "bad" times. Hence, contagion does not need to be related to crises. However, contagion has been emphasized during crisis times".

There are many theoretical explanations of financial contagion. Most of these studies either interpret excess co-movement as an equilibrium, by result of fully rational behavior of agents in market setting with frictions (such as information asymmetry, information heterogeneity, imperfect competition, wealth and borrowing constraints, risk-bearing capacity, etc.) or attribute excess co-movement to irrational decision-making by those same agents (such as herding, categorization, preferred habitat, etc.). For example, Valdes (1996) suggested that, since a crisis in one country can reduce the liquidity of market participants, investors may be forced to sell assets in another market to rebalance their portfolios in order to satisfy margin calls or to meet regulatory requirements.

Evidence of spillover and volatility transmission from one market to another is well established (see, inter alia, Engle, Ito and Lin, 1990; Hamao, Masulis and Ng, 1990). Further evidence on contagion and financial crises highlights the impact of events such as the Asian crisis and the Russian crisis on other markets across the globe (see, inter alia, Kaminsky and Reinhart, 1998; Edwards and Susmel, 2001; Bae, Karolyi and Stulz, 2003). In addition to these short run relationships, there is a body of evidence suggesting that capital markets share common trends over the long-term period (Kasa, 1992; Garrett and Spyrou, 1999). This suggests that for investors with long-term investment horizons, the benefits of international portfolio diversification could be overstated. Despite the existence of such long run relationships it is unlikely that the benefits of diversification will be eroded

since returns may only react very slowly to the trend. Indeed the benefits of diversification are likely to remain and hence accurate measurement of volatilities and correlations between markets is of great importance. Bekaert, Harvey, and Ng (2005) identified contagion as "excess correlation," that is, cross-country correlations of the model residuals during crisis episodes. However, pure correlation-based tests for contagion cannot be valid. Country specific regressors are needed to distinguish contagion from interdependence.

The Asian crisis contagion clearly receives the highest share of attention in the literature (e.g., Glick and Rose, 1999; Baig and Goldfajn, 1999; Sheng and Tu, 2000; Chiang et al., 2007; Kenourgios et al., 2011). On the other hand, little empirical investigation of the Russian default has been performed, while there is limited consensus regarding its contagious effects (for example, Gelos and Sahay, 2000, found no contagion, while Forbes, 2000, and Dungey et al., 2007, confirm the contagion effect). On the contrary, empirical evidence on the contagion of the Argentinean default in global financial markets is surprisingly scarce (e.g., Boschi, 2005). Although the literature on the international impact of the U.S. subprime crisis is still developing, only few studies focus on the EMEs. For example, Dooley and Hutchison (2009) provide evidence on the decoupling of emerging markets from early 2007 to summer 2008, but after that point confirms their recoupling due to the deteriorating situation in the U.S. financial system and real economy, while Aloui et al. (2011) found strong evidence of time-varying dependence between each of the BRIC equity markets and the U.S. markets.

Dornbush et al. (2000) shows that even fundamentals help predict spillovers and trade links as important factors. Common creditor and other links through financial centers transmit volatility from one country to another country at a particular point. The study suggests that comovements are unavoidable and that fundamental factors are important. To reduce risks of financial contagion, reforms will thus be necessary. Yang (2004) examined for evidence of contagion between selected the East Asian stock markets, thereby exploring the importance

of the linkages between stock markets as a transmission channel during the crisis. The study found that tranquil versus crisis periods, present evidence that no long term co-movements exist among the East Asian stock markets, but only short-term correlations exist. The Vector Auto Regressive (VAR) model further confirms this finding that shocks or impacts of innovations to a market are very short-lived (often as little as two days). Moreover, this study finds a substantial increase in the degree of interdependence after the 1997 crisis, and hence, reflects the presence of contagion effects in the region. Another interesting point here is that Taiwan is very independent from other markets – a finding that may be useful in explaining why Taiwan was less affected by the crisis. The results obtained in this paper also suggest that capital controls may have an impact on the inter-relationships between stock markets in the region.

Diebold (2008) examined both crisis and non- crisis periods for 19 global equity markets. The study found divergent behavior in return spillovers vs. volatility spillovers. Moving through the 1990s to the present, return spillovers display upward trend but no contagion, whereas volatility spillovers display no trend but strong contagion. The study concluded that while the increased integration of emerging stock markets to international financial system led to increased interdependence in returns during the 1990s, severe 14-volatility contagion took place as the emerging market economies were hit by major financial crises at the end of 1990s. Janakiramanan and Lamba (1998), Hisao (2003) Leong (2003) etc. are some of the important studies where the examination of the return spillover across the markets is the only concern. Apart from examining the degree of spillover among the markets, studies like Sheng (2009), Hashmi (2001), and Kim (2004) etc., have examined the effect of market crisis on the information spillover across the borders of countries. Though very little in number, studies like Brackeret al. (1999), Pretorious (2002) etc., have also focused on the possible factors affecting the spillover of information across the national equity markets across the world. Yu and Hassan (2008) have found large and predominantly positive volatility spillovers and volatility persistence in conditional volatility

between the Middle East and North Africa (MENA) and other world stock markets. The volatility spillovers within the MENA region are found to be higher than cross-volatility spillovers over all the markets.

Krugman (2009) described the crisis in 2008 in less ambiguous terms: "Let's not mince words: this looks an awful lot like the beginning of a second Great Depression". He believes that current crisis is ultimately the product of a global 'saving glut.' It does not represent a global accumulation and concentration of income and wealth by investors and corporations – i.e. massive pool of liquidity that is easily and relatively quickly moved around by investors to take advantage of speculative investment opportunities as they emerge, or to create the same opportunities by speculative shifting, but for him, it is simply "a vast excess of desired savings over willing investment". The causes (both short- and longer-term) of the current global economic and financial crisis have been discussed in a number of contributions, including Aiginger (2009), Eichengreen and O'Rourke (2009), IMF (2008, 2009, 2010), Ormerod (2010), and Solow (2009). Claessens (2009) highlights the multiple causes of the financial crisis and recommends reforms of the national and international financial reforms to present any future crisis. Most empirical work in the literature links high correlation with high volatility. The conjecture of persistent high correlation is also supported by empirical findings. The high volatility (which goes together with high correlation) is attributed to cyclical market wide factors rather than structural and firm-level factors. There is also empirical support that volatility is transmitted through price signals rather than other means.

While most of the existing methodologies focus on identifying contagion, it may be more useful for policymakers to explore what causes a particular economy to be more vulnerable to contagion than others, and whether economies which have experienced a crisis will become more or less vulnerable to contagion in future financial crisis. However, the existing studies suffer from certain limitations. First, there is a heteroskedasticity problem when measuring correlations caused by volatility increases during the crisis. Second, there exists a problem with the

omitted variables (such as economic fundamentals, risk perception and preferences) in the estimation of cross-country correlation coefficients due to lack of availability of consistent and compatible financial data, especially in emerging markets.

All the studies reviewed till now reveal that most of the studies mainly are based on developed countries context and there are only a few studies in emerging countries including the BRIC countries. Further, it has been observed from empirical studies that the financial sector reforms have been successful in bringing significant improvements in various market segments. Most of the studies confirm that when a security is listed in both developed and emerging stock markets, then the price of such security is mainly influenced by the shocks generated in the developed market.

6.4. Motivation of the study

We intend to examine whether contagion effects existed among these emerging markets (viz. Brazil, Russia, India and China) during the current financial crisis originated from the USA. If these markets are independent then investors in these countries can invest in different markets of the region to diversify their portfolio and the authorities in the region need not worry about any contagious effects if one market experiences any turmoil. The present chapter follows Forbes and Rigobon, (2002); Bekaert et al., (2005) studies, and uses an equivalently strict definition of contagion as the increase in the probability of crisis beyond the linkages in fundamentals, and the rapid increase in co-movements among markets during a crisis episode. The present study will help in understanding portfolio diversification strategy of international investors who operate in these markets.

6.4.1. Objective

The general notion is that if there is evidence of cointegration, then the markets are susceptible to shocks in other markets and, hence, the volatility in one market

does spill over to the other. In this context, the following is the specific objective of this study to understand the contagion effects from the USA to other major economics during the USA Subprime crisis.

- ❖ To investigate the effects of contagion from the USA to the BRIC emerging stock markets, the UK and Japan.

6.5. Data and Methodology

6.5.1. Nature of data

The study looks at daily closing stock returns of eight markets including Brazil, Russia, India, China, and the US for a period from 2nd January 1997 to 30th June 2010. The data is collected from www.econstats.com. The validity of the data was checked from respective stock exchange websites. The USA subprime crisis acts as a structural break. We have considered January 1st, 1997 till June 30th, 2007 as the pre-crisis period and July 1st, 2007 till December 31st, 2008 as the crisis period and January 1st, 2009, through June 30th, 2010 as the post-crisis period. When the first three moments for the three sub-periods are compared, it was found that the stock returns were generally higher during the pre-crisis and the post-crisis period. The stock indices used for the study are the most important benchmark indexes for each country. Accordingly, our data series consists of the daily index values of the DJIA, FTSE-100, NIKKEI-225, Bovespa, RTS, Sensex and SSE composite for the USA, the United Kingdom (UK), Japan, Brazil, Russia, India and China respectively. All the national stock price indices are in local currency, dividend-unadjusted, and based on daily closing prices in each national market. Following the conventional approach, stock returns are calculated as the first difference of the natural log of each stock-price index, and the returns are expressed as percentages. When data was unavailable, because of national holidays, bank holidays, or any other reasons, stock prices were calculated via simple interpolation techniques.

6.5.2 Methodology

The multivariate GARCH model proposed by Engle (2002), which is used to estimate dynamic conditional correlations (DCC), has three advantages over other estimation methods. First, the DCC-GARCH model estimates correlation coefficients of the standardized residuals and thus accounts for heteroskedasticity directly. Second, the model allows including additional explanatory variables in the mean equation to ensure that the model is well specified. Third, the multivariate GARCH model can be used to examine multiple asset returns without adding too many parameters. However, it does not account for the asymmetries in conditional variances, covariances, and correlations. Cappiello, Engle, and Sheppard (2006) recently proposed an asymmetric version of the Dynamic Conditional Correlation (ADCC) model to deal with the asymmetries in conditional variances, covariances, and correlations of two assets.

The present study tests the existence of comovement of the USA subprime crisis between the equity markets of the USA, the BRIC countries, the UK and Japan by multivariate dynamic conditional correlation, the GARCH model proposed by Engle and Sheppard (2001) and Engle (2002). Econometric software such as the RATs 7 and Eviews 7 are used to do analysis. Following Bollerslev (1990), Engle and Sheppard (2001) and Engle (2002) we start our empirical specification with the assumption that stock market returns from the k series are multivariate, normally distributed with zero mean and conditional variance-covariance matrix H_t. Our multivariate DCC-GARCH model can be presented as follows:

$$r_t = \mu_t + \varepsilon_t \qquad (6.1)$$

With $\varepsilon_t | \Omega_{t-1} \rightarrow N(0, H_t)$ where, r_t is the ($k \times 1$) vector of the returns, ε_t is a ($k \times 1$) vector of zero mean return innovations conditional on the information, Ω_{t-1}, available at time $t-1$ and for the bi-variate case, the conditional variance-covariance matrix (H_t) in the DCC model can be expressed as:

$$H_t = D_t R_t D_t \qquad (6.2)$$

where D represents a ($k \times k$) diagonal matrix of the conditional volatility of the returns on each asset in the sample and R_t is the ($k \times k$) conditional correlation matrix. Basically, the DCC-GARCH model estimates conditional volatilities and correlations in two steps. In the first step the mean equation of each asset in the sample, nested in a univariate GARCH model of its conditional variance is estimated. Hence, we can define D_t as follows:

$$D_t = (\sqrt{h_{it}} \ldots\ldots\ldots \sqrt{h_{kt}}) \qquad (6.3)$$

Where $h_{it,}$ conditional variance of each asset, is assumed to follow a univariate GARCH (p, q) process, given by the following expression:

$$h_{i,t} = \omega_i + \sum_{p=1}^{pi} \alpha_{i,p} \ \varepsilon_{i,t+1-p}^2 + \sum_{q=1}^{Qi} \beta_{i.q} h_{i,t-p} \qquad (6.4)$$

However, to insure non-negativity and stationarity some restrictions, such as:

$$\alpha_{i,p} > 0 \ , \ \beta_{i.q} > 0 \quad \text{and} \ \sum_{p=1}^{pi} \alpha_{i,p} \ \varepsilon_{i,t+1-p}^2 + \sum_{q=1}^{Qi} \beta_{i.q} h_{i,t-p} < 1$$

should be imposed. These uni-variate variance estimates are then used to standardize the zero mean return innovations for each asset.

In the second step, the standardized zero mean return innovations are assumed to follow a multivariate GARCH (m, n) process to illustrate the development of the time varying correlation matrix, R_t, which can be described as follows:

$$R_t = (diag(Q_t))^{-1/2} \ Q_t \ (diag(Q_t)^{-1/2} \qquad (6.5)$$

where

$$Q_t = (1 - \alpha - \beta)\overline{Q} + \alpha \mu_{t-1} \mu_{t-1}^{'} + \beta Q_{t-1} \qquad (6.6)$$

Q_t refers to a (k×k) symmetric positive definite matrix with $\mu_{it} = \varepsilon_{it} / \sqrt{h_{it}}$, $\overline{Q}$ is the ($k \times k$) unconditional variance matrix of μ_{it}, and α and β are nonnegative scalar parameters satisfying α + β < 1.

$$\text{Where } (diag(Q_t))^{-1/2} = diag\ (1/\sqrt{q_{ii,t}} \ .....1/\sqrt{q_{nn,t}}\ )$$

Finally, the conditional correlation coefficient *ρij* between two assets *i* and *j* is then expressed by the following equation:

$$\rho_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{ii}, t.q_{jj,t}}}, \quad i, j = 1,2,.....,n, and \ \ i \neq j \tag{6.7}$$

$$\rho_{12,t} = \frac{(1-\alpha-\beta)\overline{q}_{12} + \alpha\mu_{1,t-1}\mu_{2,t-1} + \beta q_{12,t-1}}{\sqrt{[(1-\alpha-\beta)\overline{q}_{11} + \alpha\mu_{1,t-1}^2 + \beta q_{11,t-1}]}\sqrt{[(1-\alpha-\beta)\overline{q}_{22} + \alpha\mu_{2,t-1}^2 + \beta q_{22,t-1}]}} \tag{6.8}$$

As per Engle and Sheppard (2001) and Engle (2002), the DCC model can be estimated by using a two – stage approach to maximizing the log - likelihood function. Let θ denote the parameters in D_t and Φ the parameters in R_t, then the log likelihood function is as given below:

$$I_t(\Theta, \Phi\ ) = [-\frac{1}{2}\sum_{t=1}^{T}(n\log(2\pi) + \log|D_t|^2 + \varepsilon_t^{'}D^{-2}\varepsilon_t)] + [-\frac{1}{2}\sum_{t=1}^{T}(\log(2\pi) + \log|R_t| + \mu_t^{'}R_t^{-1}\mu_t - \mu_t^{'}\mu_t)] \tag{6.9}$$

The first part of the likelihood function in equation (6.8) is volatility, which is the sum of individual GARCH likelihoods. The log – likelihood function can be maximized in the first stage over the parameter in D_t. Given the estimated parameters in the first stage, the correlation component of the likelihood function in the second stage (the second part of the equation (6.8) can be maximized to the estimated correlation coefficients.

The model described by Eqs. (6.5) and (6.6), however, does not allow for asset-specific news and smoothing parameters or asymmetries. Cappiello et al. (2006) modified the correlation evolution equation as

$$Qt = (\bar{P} - A' \bar{P} A - B' \bar{P} B - G' \bar{N} G) + A' \varepsilon_{t-1} \varepsilon'_{t-1} A + G' n_{t-1} n'_{t-1} G + B' Q_{t-1} B \tag{6.10}$$

where *A, B* and *G* are *k*×*k* parameter matrices, $n_t = I[\varepsilon_t < 0] \circ \varepsilon_t$ (I[·] is a k×1 indicator function which takes on value 1 if the argument is true and 0 otherwise, while "∘" indicates the Hadamard product[8]) and $\bar{N} = E[n_t n'_t]$. Eq. (6.9) is the AG-DCC model. In order for the Qt to be positive definite for all possible realizations, the intercept, $\bar{P} - A' \bar{P} A - B' \bar{P} B - G' \bar{N} G$ must be positive semi-definite and the initial covariance matrix Q_0 be positive definite. An asymmetric scalar DCC model of the following form:

$$Qt = (\bar{P} - a^2 \bar{P} - b^2 \bar{P} - g^2 \bar{N}) + a^2 \varepsilon_{t-1} \varepsilon'_{t-1} + g^2 n_{t-1} n'_{t-1} G + b^2 Q_{t-1} \tag{6.11}$$

A sufficient condition for Q_t to be positive definite is that the matrix in parentheses is positive semi-definite. A necessary and sufficient condition for this to hold is $a^2 + b^2 + \delta g^2 < 1$, where δ is the maximum eigenvalue $[\bar{P}^{-1/2} \bar{N} \bar{P}^{-1/2}]$.

The full diagonal version of a scalar A-DCC (the matrices A, B and G are assumed to be diagonal) of the following form:

$$Qt = (\bar{P} - \circ (ii' - aa' - bb')) \bar{N} \circ gg' + aa' \circ \varepsilon_{t-1} \varepsilon'_{t-1} + gg' \circ n_{t-1} n'_{t-1} + bb' \circ Q_{t-1} \tag{6.12}$$

where *i* is a vector of ones and *a, b* and *g* are vectors containing the diagonal elements of matrices A, B and G, respectively.

This AGDCC allows for series-specific news impact and smoothing parameter and permits conditional asymmetries in correlation dynamics. Moreover, this

[8] Element-wise matrix multiplication.

specification enables us to overcome the problem with omitted variables and is well suited to investigate the presence of asymmetric responses in conditional variances and correlations during periods of negative shocks. Furthermore, this model interprets asymmetries broader than just within the class of the GARCH models, since it does not assume constant correlation coefficients over the sample period. Ignoring the asymmetric frictions would lead to overestimating the benefits of international portfolio diversification in falling markets. (Kenourgios 2007).

6.6. Empirical Analysis

The summary statistics of stock-index returns in the UK, Japan, BRIC countries and the United States are presented in Table 6.3. This indicates that in the crisis period, emerging markets are relatively risky compared to the developed markets. Even during the crisis period, the BRIC markets are very highly risky compared to the developed markets. The stock returns variation (Coefficient of Variation) is large in emerging markets, and appears unrelated to fundamentals co-movement, consistent with noise trader risk[9]. An investor in emerging markets should therefore be willing to accept volatile returns, i.e., there is a chance for large profits at the risk of large losses. The negative skewness coefficient for the USA and Brazil implies that the frequency distribution of the return series has no longer tails to the right and also leptokurtic. Another noteworthy statistic of the stock-return series shown in Table 6.3 is a high value of Jarque-Bera. This suggests that, for these markets big shocks of either sign are more likely to be present and that the stock-return series may not be normally distributed.

[9] Investor who makes decisions regarding buy and sell trades without the use of fundamental data.

Table 6.3: Descriptive Statistics on Stock returns

Pre Crisis Period (January 1997 to June 2007)						
	Mean	Std. Dev.	Coefficient of Variation (%)	Skewness	Kurtosis	Jarque-Bera
USA	-0.013	0.920	-7076.92	-0.193	7.066	1866.887*
UK	-0.007	0.480	-6857.14	0.126	5.634	783.404*
JAPAN	0.001	0.592	Not defined	0.172	4.987	455.107*
INDIA	-0.022	0.661	-3004.55	0.392	7.043	1898.462*
CHINA	-0.021	0.908	-4323.81	0.492	128.890	1773793.000*
BRAZIL	-0.029	0.964	-3324.14	-0.444	19.094	29075.470*
RUSSIA	-0.032	1.166	-3643.75	0.534	9.731	5198.369*
Crisis Period (July 2007 to December 2008)						
	Mean	Std. Dev.	Coefficient of Variation (%)	Skewness	Kurtosis	Jarque-Bera
USA	0.053	0.988	1864.15	-0.032	7.896	391.666*
UK	0.044	0.886	2013.64	-0.041	7.532	335.645*
JAPAN	0.078	1.021	1308.97	0.729	7.663	389.838*
INDIA	0.046	1.043	2267.39	0.248	4.610	46.339*
CHINA	0.083	1.097	1321.69	-0.160	4.095	21.276*
BRAZIL	0.039	1.223	3135.90	-0.130	7.138	280.787*
RUSSIA	0.094	1.688	1795.74	0.146	8.407	478.977*
Post Crisis Period (January 2009, through June 2010)						
	Mean	Std. Dev.	Coefficient of Variation (%)	Skewness	Kurtosis	Jarque-Bera
USA	-0.060	0.819	-1365.00	-4.533	56.588	47878.310*
UK	-0.010	0.574	-5740.00	0.677	9.080	628.990*
JAPAN	-0.005	0.657	-13140.00	0.027	3.813	10.763*
INDIA	-0.060	0.780	-1300.00	-1.491	18.835	4208.36*1
CHINA	-0.029	0.736	-2537.93	0.669	4.784	80.619*
BRAZIL	-0.048	0.747	-1556.25	-0.065	4.465	35.079*
RUSSIA	-0.048	0.901	-1877.08	0.108	4.105	20.528*

Note: *Indicate significance at 1% level

As a conventional way of understanding the contagion we have estimated the correlation between the equity markets of the USA and the UK, Japan, the BRIC countries (Table 6.4). From these tables, it can be see that during the crisis period, there exists a comparatively high correlation between the equity markets. Russia has much lower correlations with the US, the UK, Japan, Brazil, China and India. As would be expected the correlations with the US and the UK, Japan and the BRIC markets after the crisis are quite high but it is lower in the case of Russia

(-0.020). The mean of the correlation is varying between -0.008 to 0.420 with respect to the USA before the crisis. The highest correlation found between India and Japan is 0.209 and the lowest coefficient is between India and China, which is -0.020 before the crisis period. While the correlations during the crisis period range from -0.017 to 0.730, during the post crisis period, the correlation range from 0.043 to 0.675. These results clearly show that during the crisis period correlation are high among the markets.

Table 6.4: Stock Returns Correlation Matrix: Pre crisis Period

	INDIA	CHINA	JAPAN	BRAZIL	RUSSIA	UK	USA
INDIA	1.000						
CHINA	-0.028**	1.000					
JAPAN	0.209*	0.039*	1.000*				
BRAZIL	0.110*	-0.006*	0.140*	1.000			
RUSSIA	0.020	0.002	0.009	0.011*	1.000		
UK	0.167*	0.006*	0.270*	0.314*	0.006	1.000	
USA	0.062*	-0.008*	0.096*	0.420*	0.001	0.313*	1.000

Note: indicates significant correlation.

Table 6.4B: Stock Returns Correlation Matrix: Crisis Period

	INDIA	CHINA	JAPAN	BRAZIL	RUSSIA	UK	USA
INDIA	1.000						
CHINA	0.323*	1.000					
JAPAN	0.499*	0.346*	1.000				
BRAZIL	0.388*	0.176*	0.321*	1.000			
RUSSIA	-0.020	-0.119*	-0.018	-0.036	1.000		
UK	0.451*	0.144*	0.492*	0.636*	-0.027	1.000	
USA	0.265*	0.002	0.110*	0.731*	-0.018	0.476*	1.000

Note: indicates significant correlation.

Table 6.4C: Stock Returns Correlation Matrix: Post crisis Period

	INDIA	CHINA	JAPAN	BRAZIL	RUSSIA	UK	USA
INDIA	1.000						
CHINA	0.270*	1.000					
JAPAN	0.321*	0.299*	1.000				
BRAZIL	0.403*	0.188*	0.155*	1.000			
RUSSIA	0.035	0.005	0.001	0.045	1.000		
UK	0.407*	0.163*	0.218*	0.558*	0.040	1.000	
USA	0.287*	0.057	0.164*	0.676*	0.043	0.494*	1.000

Note: indicates significant correlation.

However, correlation coefficients across countries are likely to increase during highly volatile period (Chiang et al. 2007). It is well established that stock return correlations are not constant through time. Correlations tend to rise with economic or equity market integration (Erb, Harvey and Viskanta, 1994; Longin and Solnik, 1995; Goetzmann, Li and Rouwenhorst, 2005). They tend to decline in bull markets and increase during bear markets (Longin and Solnik, 2001; Ang and Bekaert, 2002). Longin and Solnik (1995, 2001) shows that correlations between markets increase during periods of high market volatility, with the result that correlations would be higher than average, exactly in the moment when diversification promises to yield gains. Consequently, such changes in correlations imply that the benefits to portfolio diversification may be rather modest during bear markets (Baele, 2005).

As already noted, the objective of this study is to investigate the dynamic conditional correlation mechanism among the BRIC, the UK, Japan and the US equity markets. Results of the multivariate DCC-GARCH model are reported Table 6.5 to 6.7. The multivariate DCC model applied in the analysis allows for time varying correlation structure. Parameter μ corresponds to the mean equation while ω, α and β represents the conditional variance of equity returns of the BRIC, the UK, Japan and the US equity markets, which are modeled by a separate univariate GARCH (1, 1) model. All parameters except China's GARCH coefficient are found significant and positive. Negative values of the GARCH coefficients were commonly thought of as resulting either from sampling error or model misspecification. However we have tried with other variations of GARCH specification but still the problem persists. So the negative and insignificant GARCH coefficient of China during the crisis period can be treated as zero, which then implies that the previous period volatility has no impact on the contemporaneous volatility of the asset. The significance of mean equation parameter μ shows the dependence of returns on their lag returns in the precrisis and postcrisis period except for Japan in the post-crisis period. But this parameter

μ is not significant during the crisis period for India, the USA, the UK, Japan, China and Russia.

Table 6.5: Results of the Multivariate DCC-GARCH model for the US, the UK, Japan and the BRIC Stock Markets during Pre-crisis

Parameters / Country	μ(Mean)	ω	α ARCH Parameters	β GARCH Parameters	$\alpha + \beta$ Persistence
USA(Nasadq)	0.0858* (3.458)	0.0074* (2.718)	0.0506* (10.307)	0.9464* (177.216)	0.977
UK (FTSE 100)	0.0590* (3.819)	0.0112* (4.083)	0.08578* (9.628)	0.9033* (96.661)	0.98
Japan(Nikkie)	0.0627* (2.854)	0.0263* (4.109)	0.0776* (8.977)	0.9099* (90.817)	0.98
India (Sensex)	0.1542* (6.610)	0.09958* (7.287)	0.1425* (13.566)	0.8183* (67.873)	0.96
China (SSE composite)	0.1285* (6.606)	0.2456* (26.605)	0.2882* (86.58)	0.7577* (221.941)	1.04
Brazil(Bovespa)	0.1690* (5.147)	0.1703* (6.944)	0.1176* (15.225)	0.8381* (68.372)	0.95
Russia(RTS)	0.2245* (6.527)	0.1764* (9.102)	0.1910* (18.042)	0.7970* (76.215)	0.98

- The value report in the parenthesis is t-statistics
- *indicates the parameter is significant at 5%, ** indicates the parameter is significant at 10%

Variance equation parameters α and β support our modeling technique, i.e., multivariate GARCH analysis, by revealing the presence of conditional hetroskedasticity in the time series. Again GARCH (1, 1) parameters are highly significant confirming the timevarying variance and covariance process as well as strengthening the use of multivariate GARCH modeling among the BRIC, the UK, Japan and the US equity markets.

Table 6.6: Results of the Multivariate DCC-GARCH model for the US, the UK, Japan and the BRIC Stock Markets during crisis Period

Parameters / Country	μ(Mean)	ω	α ARCH Parameters	β GARCH Parameters	$\alpha + \beta$ Persistence
USA(Nasadq)	0.0637 (0.882)	0.1762** (2.523)	0.1230* (3.845)	0.8499* (25.157)	0.97
UK (FTSE 100)	0.0502 (0.790)	0.2240* (3.034)	0.1733* (6.063)	0.7803* (22.670)	0.95
Japan(Nikkie)	-0.0691 (-0.859)	0.1838** (2.479)	0.1626* (5.938)	0.8067* (25.137)	0.96
India (Sensex)	0.1443 (1.476)	0.3031** (2.684)	0.1626* (5.938)	0.8020* (19.070)	0.96
China (SSE composite)	-0.1560 (-1.138)	7.4999* (4.899)	0.1175* (3.216)	-0.2741 (-1.258)	-.0.15
Brazil(Bovespa)	0.1645** (2.034)	0.6287* (4.064)	0.1306* (6.176)	0.7856 (0.031)	0.91
Russia(RTS)	-0.0389 (-0.293)	0.0987 (1.394)	0.1368* (3.937)	0.8192* (30.351)	0.95

- The value report in the parenthesis is t-statistics
- *indicates the parameter is significant at 5%, ** indicates the parameter is significant at 10%

Table 6.7: Results of the Multivariate DCC-GARCH model for the US, the UK, Japan and the BRIC Stock Markets during Post crisis Period

Parameters / Country	μ(Mean)	ω	α ARCH Parameters	β GARCH Parameters	$\alpha + \beta$ Persistence
USA(Nasadq)	0.2426* (6.169)	0.2172* (7.038)	0.4943* (38.502)	0.5046* (38.217)	0.99
UK (FTSE 100)	0.1989* (8.229)	0.0165* (7.000)	0.2814* (30.949)	0.7461* (129.354)	1.02
Japan(Nikkie)	0.0645 (1.065)	0.1058* (6.148)	0.1084* (9.971)	0.8440* (90.331)	0.95
India (Sensex)	0.1623* (2.973)	0.0078** (2.084)	0.0601* (38.612)	0.9343* (561.452)	0.99
China (SSE composite)	0.1296* (1.684)	0.1578* (10.430)	0.0691* (9.162)	0.8743* (137.127)	0.94
Brazil(Bovespa)	0.2481* (5.122)	0.1473* (9.657)	0.0966* (13.348)	0.8480* (133.741)	0.94
Russia(RTS)	0.2033** (1.942)	0.2809* (9.943)	0.0864* (8.873)	0.8469* (109.767)	0.93

- The value report in the parenthesis is t-statistics
- *indicates the parameter is significant at 5%, ** indicates the parameter is significant at 10%.

The sum of the two estimated ARCH and GARCH coefficients $\alpha+\beta$ (persistence coefficients) in the estimation process of the pre crisis , crisis and post crisis periods, except for China and UK, report less than yet nearby one, which is required to have a mean reverting variance process. In contrast, the sum up of these parameters for the China and UK is larger than one, suggesting that shocks to the conditional variance are highly persistent, i.e. the conditional variance process is explosive. This implies that the shock is always remembered in the case of China and UK and there is a tendency to dies out the same in other cases. However, there is evidence for volatility clustering in all series.

The maximum likelihood estimates of the dynamic conditional correlation (DCC) and asymmetry generalized conditional correlation (AGDCC) model for the BRIC, the UK, Japan and the US equity markets before crisis, during crisis and after the crisis are reported in Table 6.8.

Table 6.8: Results of the Multivariate DCC and AGDCC model for the US, the UK, Japan and the BRIC Stock Markets

Period	Symmetric model		Asymmetric model		
	a_i^2	b_i^2	a_i^2	g_i^2	b_i^2
Pre Crisis	0.0065**	0.7586*	0.0989*	-0.0044*	0.8810*
	(2.028)	(4.173)	(6.176)	(-14.892)	(16.213)
Crisis	0.0351*	0.7850*	0.0346	0.1518*	0.9354*
	(3.467)	(6.602)	(0.414)	(3.527)	(17.496)
Post Crisis	0.0146	0.7344*	0.0978**	-0.0018*	0.8205*
	(1.275)	(4.142)	(2.267)	(-5.234)	(43.435)

*** Significance at the 5% level.**

Table 6.8 reports the results from different parameterizations of DCC models estimated in order to confirm whether we should adopt a symmetric or an asymmetric model. All parameters are significantly different from zero. The g_i^2 term in the asymmetric model is always higher than zero, implying the presence of asymmetric movements. Furthermore, the asymmetric b_i^2 term is always higher than the symmetric b_i^2, providing further support to the use of the asymmetric DCC model in this study. Therefore, the results show that

conditional correlations among the crisis country and all others are much greater during extreme downside moves than upside moves. The estimated unconditional correlations among markets show that they increase significantly during the crises. Moreover, conditional correlations are substantially greater than unconditional correlations, supporting the presence of asymmetric contagion during the subprime crises.

The conditional correlations for the BRIC economies, Japan, and the UK equity returns with respect to the USA estimated from the bi-variate DCC model are plotted in Figure A6.1 (Appendix) for the pre crisis period from January 1997 to June 2007 and Figure A6.2 (Appendix) for the correlations of the equity market for the crisis period July 2007 till December 2008 and Figure A6.3 (Appendix) for the post crisis period from January 2009, through June 2010. While correlations indicate the degree of relationship between two returns, the covariance captures the amount of comovement between them. Thus, it is possible to determine whether changes in comovement are due to changes in the correlations between markets or simply due to volatility. There is clear evidence of considerable variation in dynamic correlations. Analyzing the time varying conditional correlations highlights that correlation with the US tends to increase and reach a maximum during the recent bear market from July 2007 to December.

6.7. Conclusion

This study investigated the correlated-information channel as a contagion mechanism for the subprime crisis of 2008, using data from equity markets of the BRIC economies, the UK, Japan and the USA. To provide a robust analysis of financial contagion, study was carried out to examine conditional correlation dynamics in a time varying asymmetric framework, applying DCC and AG-DCC model. Results confirm the existence of asymmetric contagion to Emerging Market Economies[10].

[10] These results are consistent with studies on Asian and Latin American economies (IMF, 2007c, 2008a, 2008b).

Stock market indices are observed to display a persistent and high correlation between them during and after high volatility periods. Moreover, using the AG-DCC model, we investigated asymmetries in conditional variances and correlation dynamics for all countries during crises periods. We found that conditional volatilities of equity indices returns show widespread evidence of asymmetry. The AG-DCC results provide further evidence for higher joint dependence during stock market crises. When bad news hits stock markets, equity correlation among the BRICs and the developed markets increases dramatically. This finding has important implications for international investors, as the diversification sought by investing in multiple markets is likely to be lowest when it is most desirable.

Consistent with the observations made by Bae et al. (2003) and Kallberg et al. (2005), our study provides evidence of contagion effects in these BRIC markets in the early stage of the crisis and then a transition to herding behavior in the latter stage. Here contagion and herding behavior are distinguished in the sense that contagion describes the spread of shocks from one market to another with a significant increase in correlation between markets, while herding describes the simultaneous behavior of investors across different markets with high correlation coefficients in all markets. It implies that in the early phases of the crisis, investors focus mainly on local country information, so that contagion takes place. As the crisis becomes public news, investor decisions tend to converge due to herding behavior, creating higher correlations. As more and more asset prices declined in neighboring countries due to the contagion effect spread through various channels, investors began to panic and withdraw funds from the BRIC economies. During this process, the convergence of market consensus and the stock returns in these economies showed a gradual increase in correlation. This phenomenon is identified during crisis period.

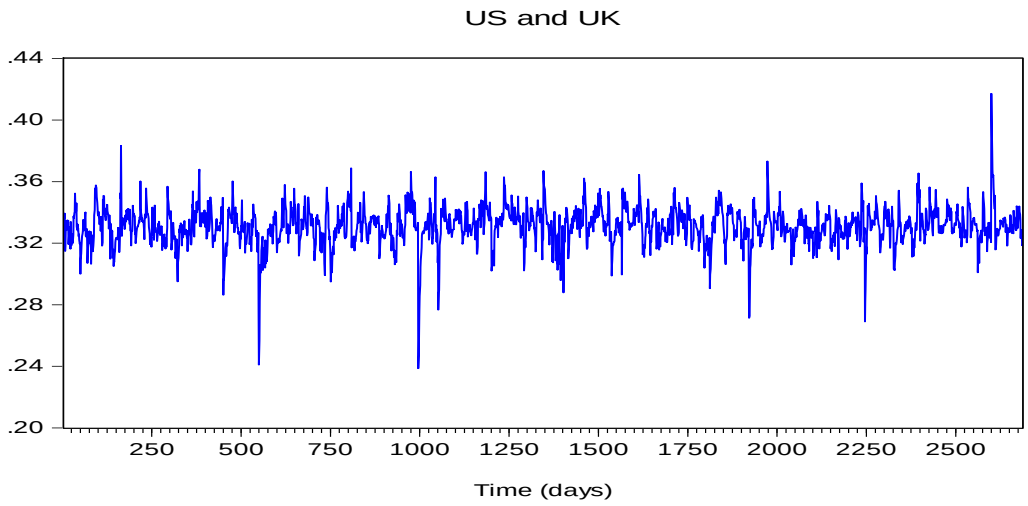
The USA crises hit global economies regardless of their economic integration, since cross-market correlation dynamics are driven by behavioral reasons, and due to shifting investor sentiment (increased risk aversion), causing significant

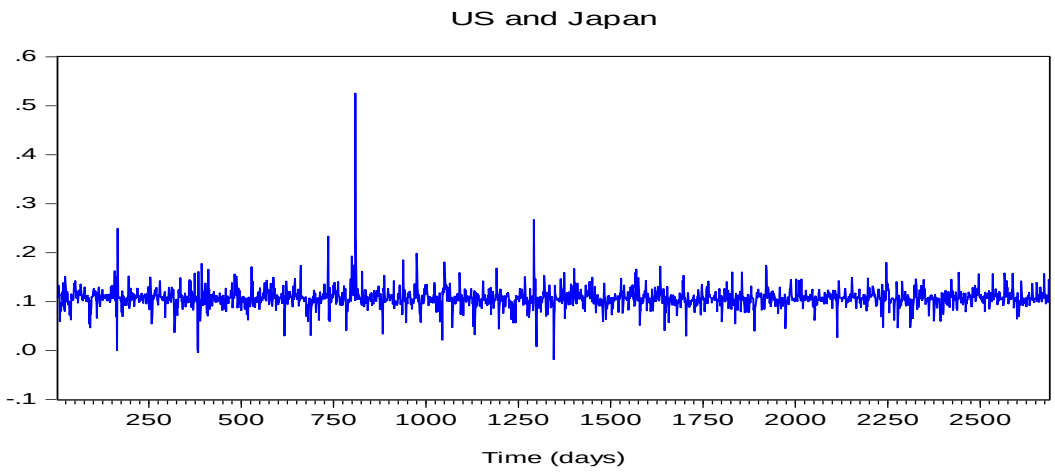
changes in the emerging countries' financial structures. The study findings have important implications for international investors and portfolio managers. Evidence on contagion implies that diversification sought by investing in multiple markets from different regional blocks is likely to be lower when it is most desirable. As a result, an investment strategy focused solely on international diversification seems not to work in practice during turmoil periods. Since countries and financial markets react differently to sovereign shocks, stocks from different emerging economies could provide advantages over debt-only or equity-only portfolios. The results also provide useful implications regarding the ability of policy makers and multi-lateral organizations to insulate or at least attenuate an economy from contagious effects.

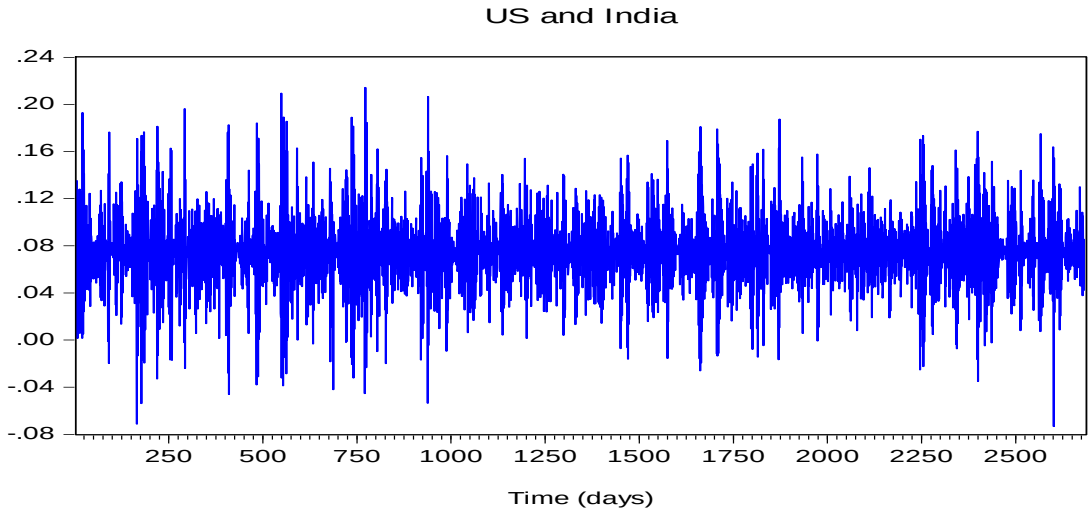
Finally, the subprime crisis raised the need for a revamped international financial architecture. The global contagious effects of this crisis and the rejection of the decoupling hypothesis for the EMEs question the resilience and sustainability of emerging-market policy performance. It seems that strong economic indicators in many EMEs before the crisis (high growth rates, massive foreign exchange reserves, balanced budgets) were not enough to decouple them from the crisis, because of their cyclicality and endogeneity. A consequence of the contagion on the EMEs would be the redirection of development loans by the World Bank, the IMF, and the regional development banks to the public sector, since those funds had been crowded out by private-sector lending throughout the boom decade (World Bank, Global Development Finance, 2008).

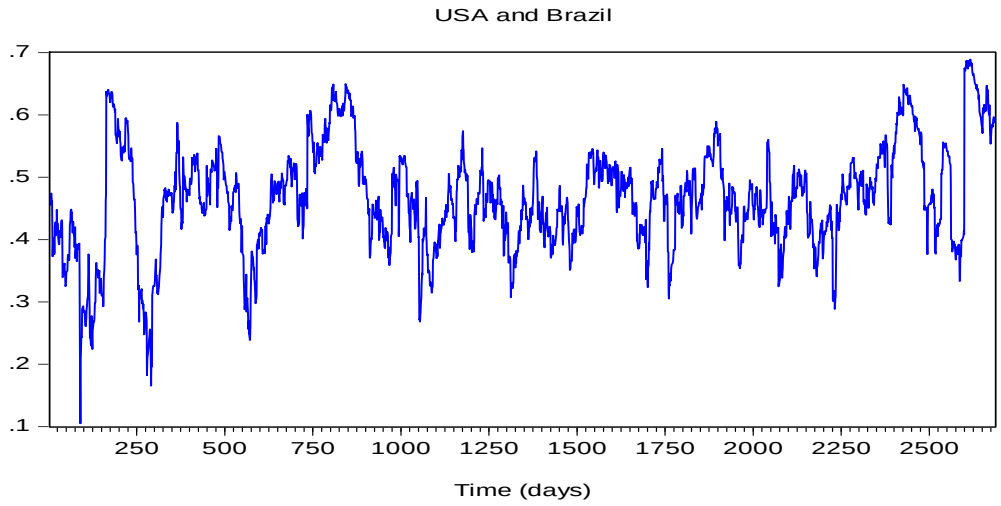
Appendix 1

Figure A6.1: Pre-Crisis Conditional correlation from Bivariate DCC-GARCH Analysis








USA and Brazil
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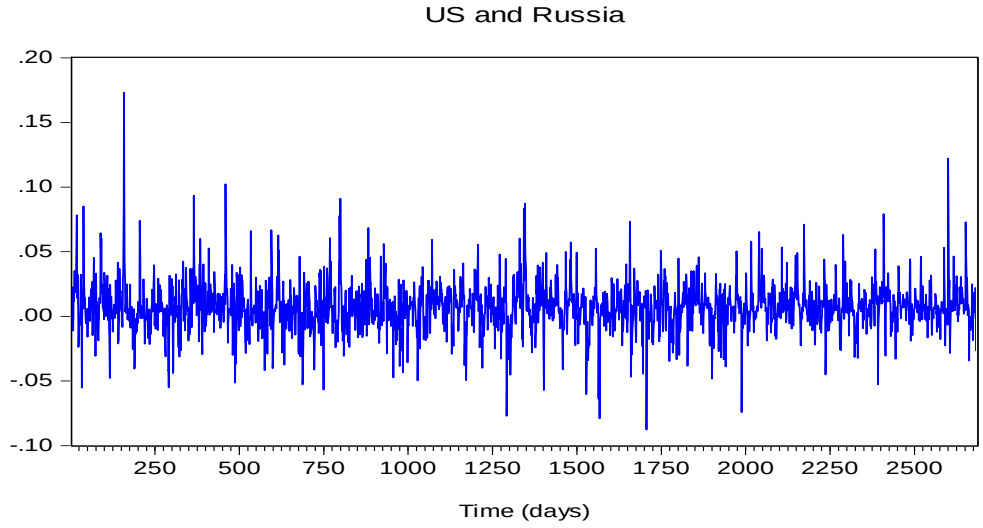
2250
2500
Time (days)


US and Russia
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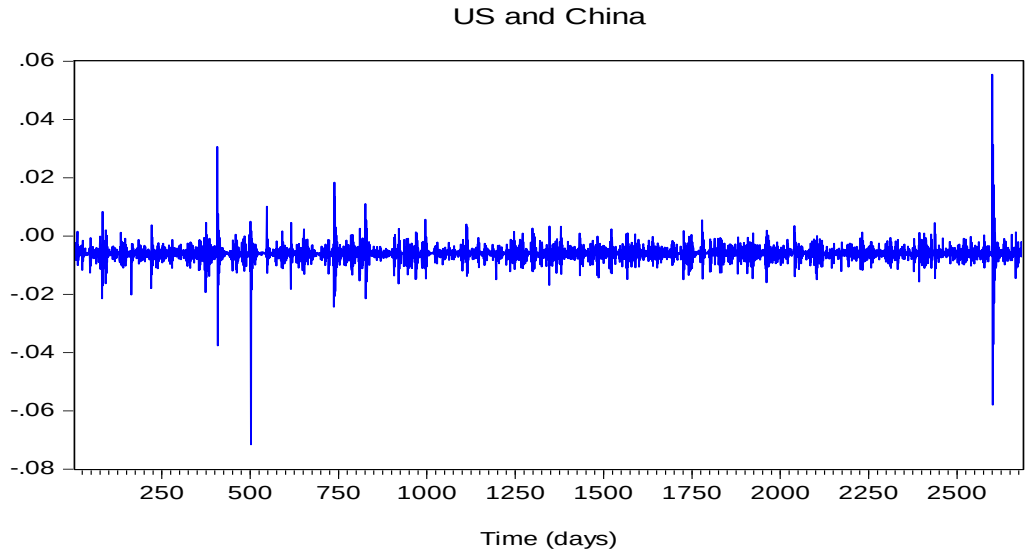
2500
Time (days)


US and China
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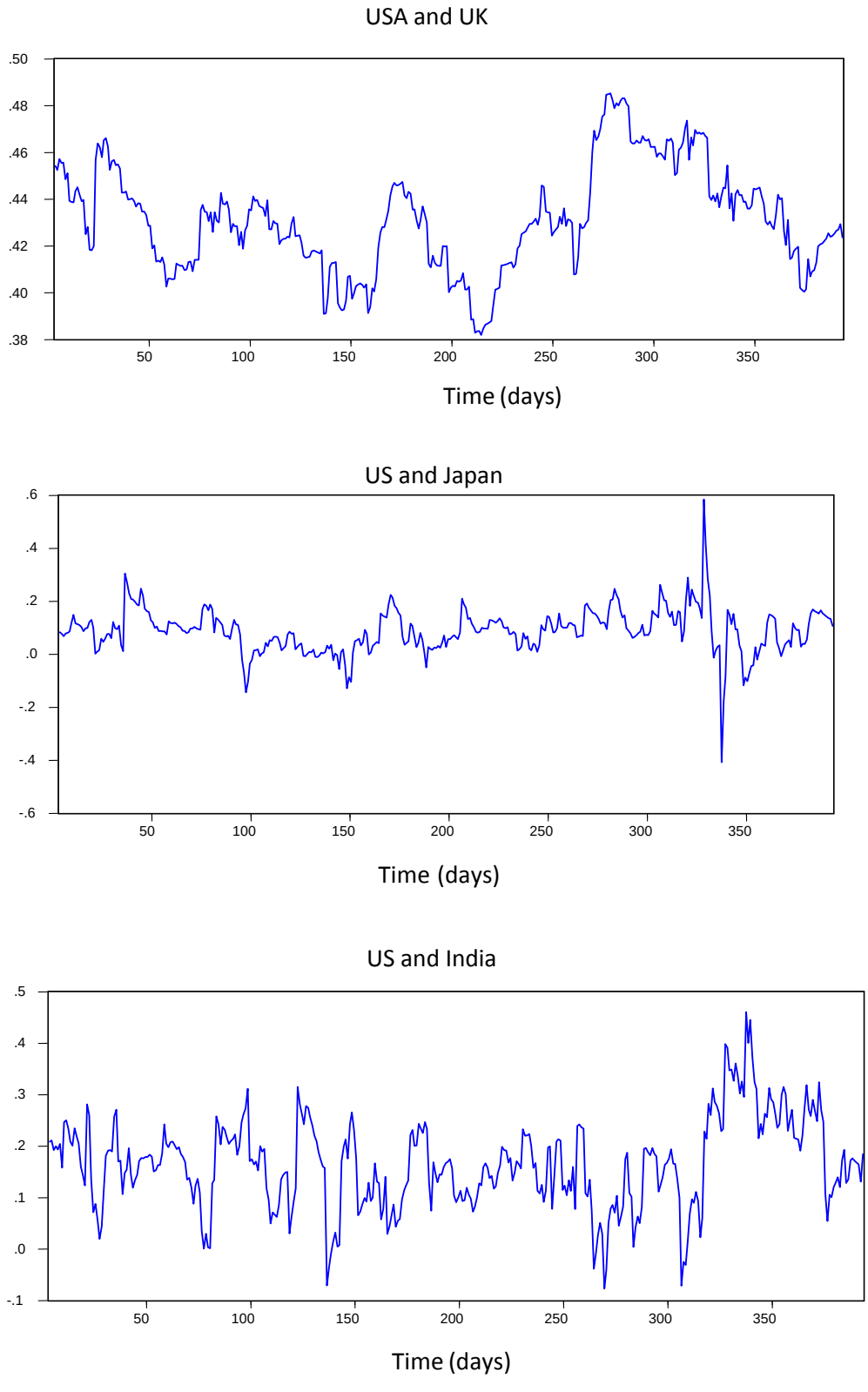
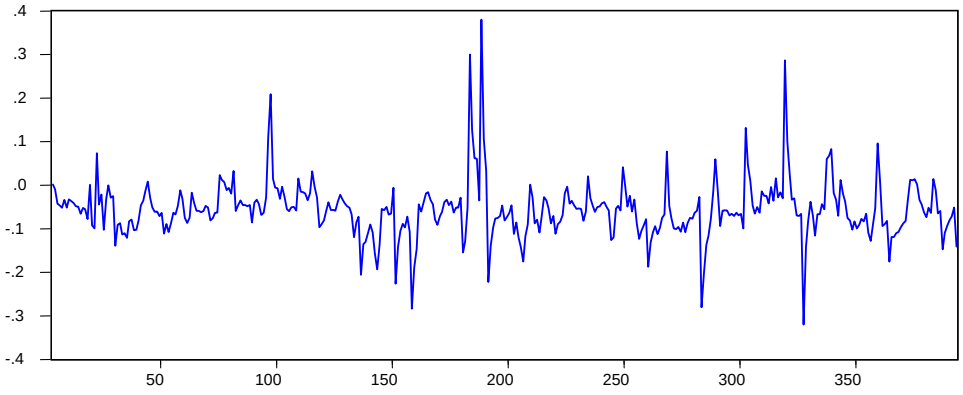
Time (days)

Figure A6.2: Crisis period Conditional correlation from Bivariate DCC-GARCH Analysis

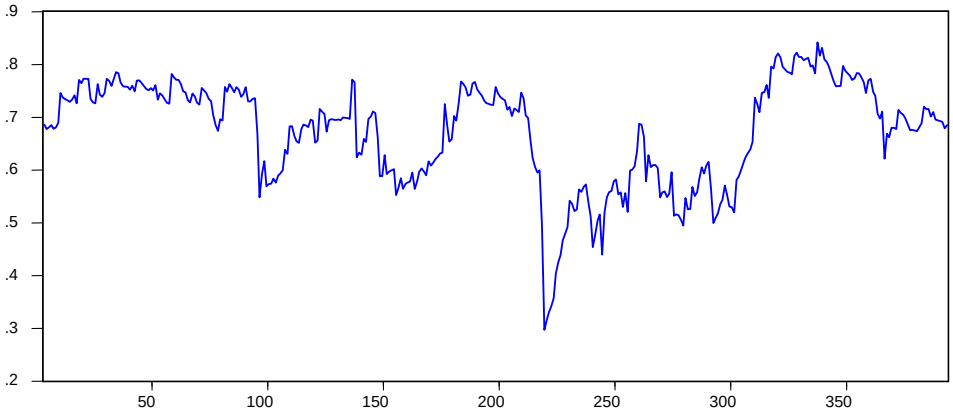


US and Russia



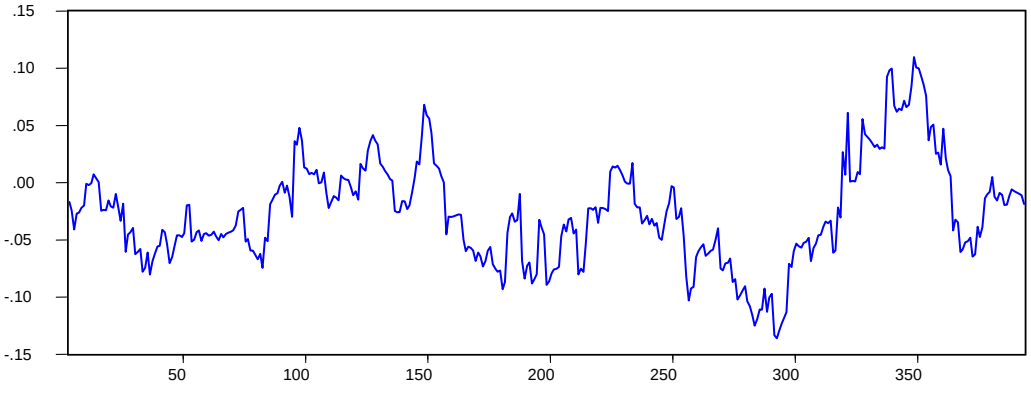
Time (days)

US and Brazil



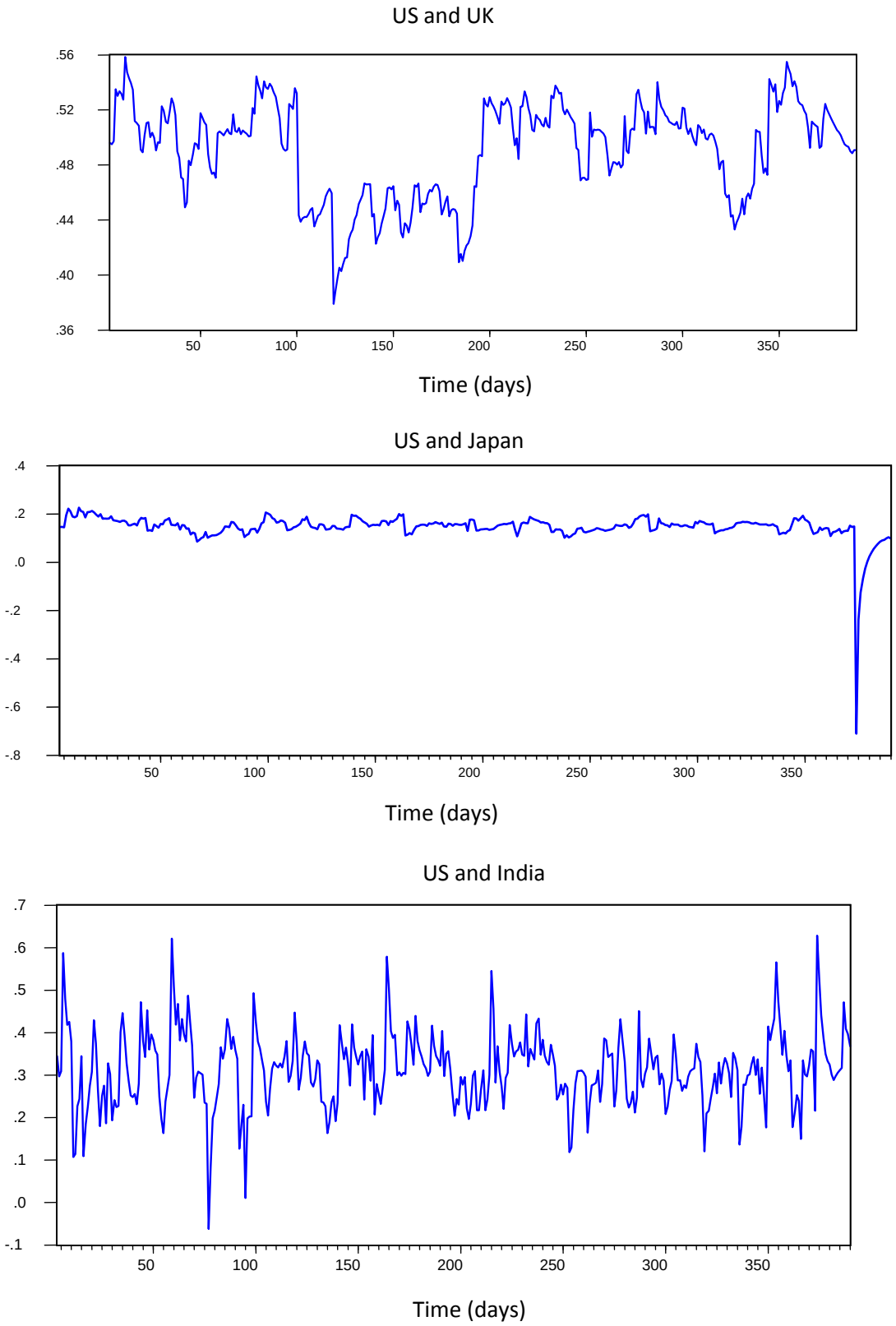
Time (days)

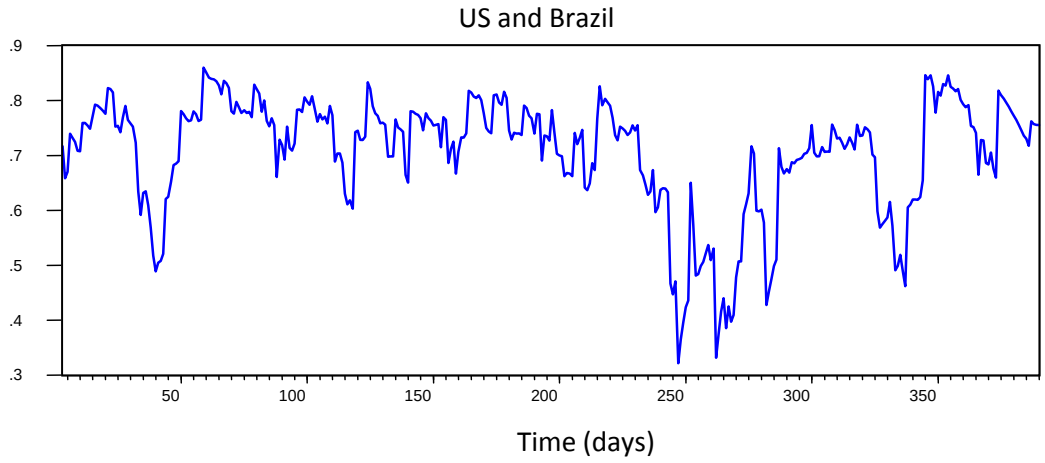
US and China



Time (days)

Figure A6.3: Post Crisis period Conditional correlation from Bivariate DCC-GARCH Analysis

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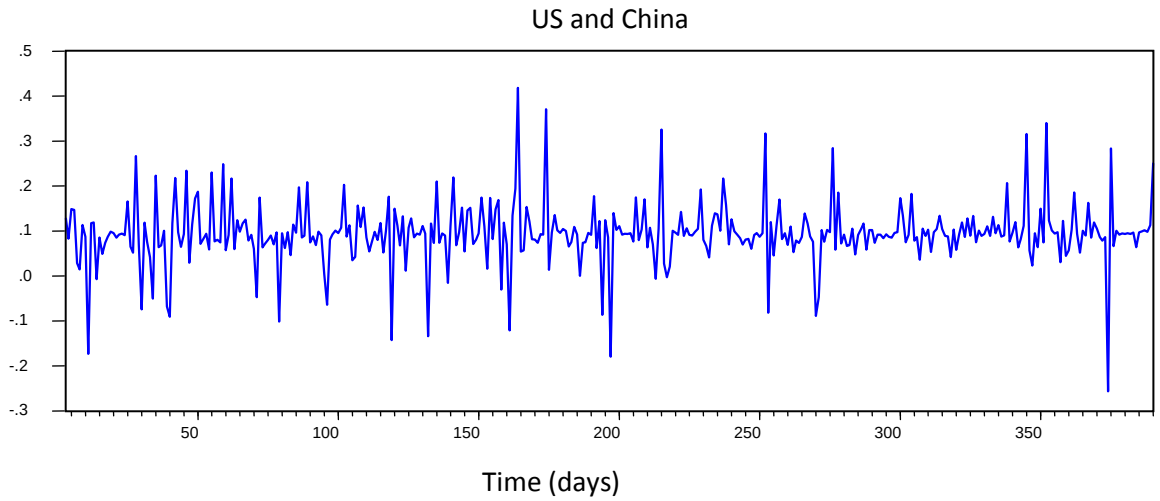
Time (days)


US and China
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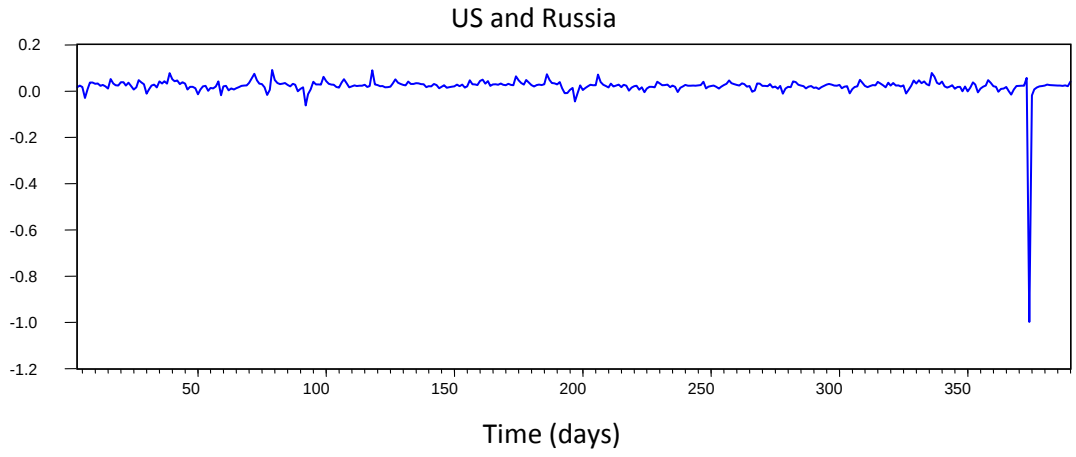
Time (days)


US and Russia
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-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
50
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200
250
300
350
Time (days)

CHAPTER VII

Conclusion

7.1. Summary

The stock market activity is one of the principal activities in the corporate world among the chain of activities, which got affected due to the financial crisis. When crisis affects the real activities, it affects the stock market, as profit expectation on financial investments would be lower. If financial investment would be affected, its impact would be felt on the real investment, as real investment would not increase. Once the real sector activity lessens, then that would affect the entire economy. Thus, it is mainly the expectation of the investors' works, which affects both the financial and the real investment in the economy.

In principle, stock markets are expected to accelerate economic growth by boosting the domestic savings and increasing quantity and the quality of investment. Emerging capital markets have evolved significantly over the last three decades and are undergoing constant innovation to improve liquidity and market micro-structure. Similar to the developed markets, they facilitate the allocation of available funds raising of capital and sharing risk both at national and international levels through their increasing integration process with world capital markets. A common consensus arising from past studies is that emerging markets offer higher expected returns supported by their high growth prospects, but they are more volatile than developed markets. This study has aimed at understanding the origins of the emerging stock markets, development, interlinkages and contagion effects of the markets as well as their prospects.

In this context, the present study has reviewed different financial and economic approaches that have been developed to measure stock market development, integration and contagion of stock markets. The study provided a historical and comparative analysis of the major developments and crisis of global stock markets in historical perspective with particular emphasis on the evaluation of the stock markets and dynamics of their rise and decline, which provides an insight into recent economic trends. These episodes share a theme: a perceived

fundamental change in the economy arouses euphoria and heightens expectations of return, leading to excess, fraud and collapse. Of course domestic and foreign investors may take some precautions when investing in stock markets because their high expected returns are usually accompanied by high risks. Another important point to point out is that both the bull and bear periods are frequently observed in emerging stock markets. The last serious bear market could be dated back to 1997 Asian financial crisis. Their 5 year long bull market (2003–2007) finishes with the recent fall in 2008 due to the global financial panic characterized essentially by extreme risk aversion, liquidity problems, and tight credit conditions an account of USA subprime crisis. This has resulted in high volatility and financial instability in global emerging markets. Nevertheless, past experiences show that bull markets are typically longer than bear markets, and the average increase during bull market is relatively more important than the average decline during bear market. It appears that emerging markets are very heterogeneous and exhibit numerous disparities in terms of market size, liquidity, financial depth, and development levels. Moreover, many new developments have taken place in the last three decades, bringing about significant changes in capital markets in both developed and developing nations. It has been observed that emerging stock markets continue to exhibit wild fluctuation, as a result of which it has acquired the characteristics of a 'bubble' market and not a market governed by economic fundamentals.

Taking a longer term perspective over the past few years, the BRIC stock market performance still looks impressive, irrespective of the sell-off during the credit crisis. The equity indices of the BRIC countries are still much higher than those in 2003. Since 2003, the BRIC markets have risen from around 2% of global market capitalization to 9% by the end of 2009, completely recovering from their pre-crisis levels. Among the top 40 countries by Market Capitalization, 22 were from the developed markets while the other 18 were from the emerging market economies. Rapid capitalization growth has been accompanied by surge in developing country equity issuance.

Although emerging stock markets have become more like developed – country markets in keyways, substantial differences remain. One important difference is that developing economy stock markets generally lack breadth, though the value of turnover increased substantially in each of the four (the BRIC countries) emerging stock markets from 1991 to 2010. In addition many developing country stock markets remain more volatile than their more developed counter parts.

Stock prices reflect fundamental information about the macro economy. Therefore, the identifying factors that affect stock prices are an imperative task on various counts. The results of empirical analysis of relationship between stock market prices and macroeconomic variables reveal that changes in the stock prices in the short run are random. In the case of India, the results indicate that FIIs, Money Supply, Inflation and Gold Prices are the only macroeconomic variables which affect the Sensex in the long run. For Brazil, only interest rates (TBR) have an impact on stock prices, especially in the long run. While in the case of China, no variable appears to be significant. In Russia, the only variable namely, Index of Industrial production has impact on Russian stock market. In general, study concludes that the BRIC stock market is not responsive to changes in majority of macroeconomic factors in spite of the sizable proportion of stock market capitalization as a share of the country's GDP. Hence, predicting stock prices and returns via changes in macroeconomic performance becomes precarious and this affects economic forecast, planning and growth. It thus becomes obvious that the BRIC Stock market might be sensitive to the global macroeconomic factors or other salient issues in the BRIC environment which of course warrants further investigation.

Stock markets in emerging market economies have developed dynamically in the recent years with regard to their risk-return with developed markets, indicating a higher degree of market comovement in the recent period. Unfortunately, financial crisis characterized by dramatic fluctuations in stock markets has been a common phenomenon in emerging countries. This fact reveals the need to investigate the integration between stock markets.

The empirical analysis of the study indicates that the BRIC economies move partially with the markets of other developed countries and also within themselves. It is to conclude that geographical proximity is neither necessary nor sufficient condition for the BRIC markets to be integrated. This would suggest that efforts at integrating the BRIC stock markets remain largely futile to date. A market is said to be integrated if it is efficient. If markets are inefficient, then the information regarding one market will not disseminate to the other market. When market integration is not present, arbitragers can make use of the imperfections in the market and can make huge profit. This may adversely affect the interests of small investors and institutions. In this case, both local and world risk factors are pertinent in pricing emerging market securities. On the one hand, emerging markets might remain segmented after liberalization if the removal of regulatory restrictions does not attract foreign investors in presence of significant indirect barriers. On the other hand, the measure of market integration must be, in some circumstances, time-varying insofar as emerging markets may evolve from the segmented state to integrated state through time and inversely.

Furthermore, the study has examined the effects of contagion from the developed to emerging stock markets with specific emphasis on India. The study has found evidence that the emerging BRIC markets are prone to financial contagion. Stock market indices are observed to display a persistent and high correlation between them during and after high volatility periods. Moreover, by using the asymmetric generalized dynamic conditional correlation (AG-DCC) model, we have found that conditional volatilities of equity returns show widespread evidence of asymmetry. The AG-DCC results provide further evidence for higher joint dependence during stock market crises. When bad news hits stock markets, equity correlation among the BRICs and developed markets increases dramatically. Our findings have important implications for international investors, as the diversification sought by investing in multiple markets from different regional blocks is likely to be lower when it is most desirable. As a result, an investment strategy focused solely on international diversification seems not to work in practice during turmoil periods. However this increased correlation does not lead to eliminate international diversification benefits as

emerging markets still outperform largely over the long-run, thanks to their reduced volatility. Finally, it should be noted that the existence of investment barriers and the importance of country specific risks may limit foreign participation even though these have been considerably diminished over time.

Stock markets have occasionally experienced sudden and large declines in security prices. A crucial feature of such sudden crash events is that they are contagious in nature and spread rapidly to other markets, potentially leading to global financial instability. Moreover, the impact of financial crashes may not be restricted to the financial sector only. Systemic crises in the banking sector or in the institutional investment sector may have substantial and unexpected spillovers on the real economy. In emerging markets, market capitalization, volatility, and returns have increased dramatically in recent years. While emerging markets are more volatile than developed markets, they tend to be relatively uncorrelated with each other and also with developed markets. Large capital outflows (or the sudden suspension of inflows) can take place, even if a country's fundamentals have not changed, because of sheer panic or contagion caused by the response of investors needing to cover losses arising from problems in other countries. Contagion says that there are externalities; and externalities need to be addressed by corrective taxation or regulation. In addition, concerted action is required to introduce national and international supervision and regulation of financial markets, while measures are also needed to achieve a rebalancing of the global economy such that it reaches its full potential, while also achieving an improvement in inter-country distribution of growth and development. In short, markets should serve people rather than determining their socioeconomic destiny.

Domestic and foreign investors may take some precautions when investing in emerging markets because their high expected returns are usually accompanied by high risks. They have also gone through serious financial crises during the 1980s and 1990s which might lead to dramatic losses and constraint investors to get out of the markets. The reduced volatility of emerging markets in the last decade has made more attractive their risk-return characteristics. This translates

into more sustainable returns that greatly improve their valuations compared to developed markets. It is important to note that structural reforms in emerging markets have provided a more stable and credible investment environment while national economies continue to grow at faster economic growth rate. The most important improvements include the greater transparency in government, corporate practices, and the regulatory changes in favour of a more flexibility for international portfolio investments. To conclude, the arrival of capital inflows depends on a rigorous monitoring of the banking and financial system as well as on sound macroeconomic policies of emerging market economies. Additionally, the investor's capital investment decision-making relies closely on the actual degree of financial liberalization. However, emerging countries have gradually removed barriers to international investments in an effort to make their capital markets more "investable". The appetite of foreign investors for emerging market assets have grown over time. Nowadays, the access to emerging markets is much easier than 20 years ago so that there is no distinction made between domestic and foreign shareholders.

Finance capital in the 21st century has become increasingly complex and volatile, and is clearly playing a greater role in the determination of crises, financial and real. Merely describing the empirical developments and evolution of the current financial crisis as it rapidly globalizes and spreads to the real economy in various ways is clearly of value.

7.2. Policy Suggestions

The main policy implications arising from the present study are:

1. The practical implication for investors is that they can gain by holding portfolios from different countries. The lack of strong links among the BRIC markets, and between their counterparts in developed economies presents an opportunity for portfolio diversification and arbitrage.

2. The policy should aim at reducing the vulnerability to a shock using both short-run adjustment of stock markets and long-run adjustment of linkage parameters. In order to discourage financial speculation and therefore to

reduce stock market volatility, an international tax on capital inflows is to be imposed, especially on short capital flows.

3. To the extent that full integration is not possible, future policies might need to consider ways in which liberalization can have spillover effects on all sectors of the economy, including those that are not directly linked to the international financial system.

4. For emerging market economies, some deregulation of the financial sector may be needed to enable it to facilitate growth, but the extent of deregulation needs to take account of global experience and local circumstances.

5. Preventing crises in emerging market economies requires not only the regulation of domestic financial systems, but also a consistent set of macroeconomic policies. The issue in regulation and supervision is often one of effectiveness, and not mere intensity. Effectiveness can be enhanced by a combination of early warning signals, preventive corrective actions, graded escalating scale of effective penalties and a wide range of instruments with discretion. Furthermore, a global system of crisis prevention should include international norms that help smooth capital movements, as well as institutions and international mechanisms that help compensate for private capital outflows.

7.3. Limitations of the study

Two additional clarifications are worth mentioning regarding the scope and caveats of our analysis. First, primary focus of the study is to assess the stock markets in the emerging economies. It does not explicitly address developments and issues in the banking sector, which is an important limitation, considering that financial systems in most emerging countries are dominated by banks. Fortunately, the literature on the banking sector in emerging economies in general, and developed economics in particular, is relatively abundant. The empirical work does not shed light, for example, on the question of whether stock

market development is impelled by rising aggregate savings, a reorientation of existing savings toward the financial system, a shift in financial savings away from banks and toward capital markets, or efficiency gains specific to capital markets. Though we recognize the relevance of, and interest in, these topics, we do not assess them in this study. An analysis of the impact of financial innovation, technology and reforms is another area for future research.

However, all these limitations should not overshadow the relative amplitude and value of our analysis, which covers (unlike most previous studies) key aspects of stock market development from a perspective that takes into account, for the outset and explicitly, salient implications of financial liberalization.

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