Chapter – I
Introduction

1.1 Background

Risk is inherent in human affairs and affects all economic agents in the economy. The word ‘risk’ refers to the possibility of loss, damage, or any other undesirable event. Risk can be measured and managed. Some risk such as damages due to fire or theft can be handled by paying premium to the insurance companies. Risk can be also reduced to a larger extent by diversification. However, the risk arising from macroeconomic fluctuation that affects all the participants in the economy can neither be insured nor diversified away. In this context, derivatives have become increasingly important to manage risk by various financial institutions like banks, corporate firms, asset management companies, governments and investor round the world.

Derivative markets were small until the 1970s. However, with the breakdown of Bretton Woods system in 1973, there was a sudden increase in the volatility of exchange rates and interest rates thereby making it necessary for firms and investors to find ways to reduce these risks. Besides, the publication of Black and Scholes (1973) option pricing model brought a revolution in the financial markets and laid the basis for the spectacular growth in derivatives markets. Other developments in the economic environment such as ongoing globalization process, the deregulation of several industries and the spectacular growth in international trade and finance, advancement in telecommunication and information technology in recent years have also increased the demand for derivative products.

On the domestic front, there has been a paradigm shift in policy stance of the government with regard to resource allocation in the economy since 1980s. The direct influences on resource allocation by the State were diminished and a greater role has been given to the market. One of the main aspects of these reforms has been the development of the financial markets as an alternative vehicle to determine the allocation of capital in the economy. The financial sector of India and in particular securities markets attracted sharp attention from policy makers in the aftermath of Harshad Mehta Scam of 1992. This led to some initiatives with respect to the equity and debt markets in the following years.
Financial sector liberalization in the strict sense started in India since the early 1990s after the balance of payments crisis of 1991. *Narasimham Committee Report on Financial System* submitted its report in September 1992, which laid the foundation of these far-reaching reforms. Financial market reform was an integral part of financial sector reform that brought gradual improvement in the functioning of the Indian stock markets. These reforms were aimed at enhancing competition, transparency, and efficiency in the Indian financial market. The reform of the Indian stock market has brought paradigm shift in the functioning and structure of the market. These reforms were guided by two broad themes—structural transformation and speedy access to information. On the one hand, massive institutional reforms were undertaken to improve the functioning of the market that resulted in greater participation by not only individual but also by institutional investors. On the other hand, advances in information technology facilitated computerization on large scale and internet trading facilitated trading from any part of the country.

Few notable developments in this direction were permission to the private sector to enter into the mutual fund industry earlier dominated by Unit Trust of India (UTI) since 1992-93; since September 1992 foreign institutional investors (FIIs) were permitted to invest in the Indian capital market based on the recommendations of *Narasimham Committee Report on Financial System*; Indian companies were also allowed to raise funds abroad through GDRs and ADRs. The Indian capital market integrated more with the world market since 1999 when companies based in India started to list on foreign stock exchanges, especially in the NASDAQ. Besides this, certain institutional reform such as setting of the National Stock Exchange and Securities and Exchange Board of India (SEBI), introduction of on-line trading system by NSE for the first time in the country in June 1994 in debt segment and in November 1994 in equity segment, establishment of National Securities Clearing Corporation (NSCC) and National Security Depository Limited (NSDL) in 1996, abolition of ‘Badla’ transaction and introduction of rolling settlement of ‘T+5’ in January, 1998 which subsequently become ‘T+2’ to improve cash market operation. All these developments have considerably changed the functioning of the Indian stock market.
As a part of ongoing capital market reforms, derivatives trading started in India in June 2000 after the securities market regulator of India, Securities and Exchange Board of India (SEBI) approved trading of derivatives products in May 2000. SEBI allowed two premier stock exchanges in the country viz. the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE), and their clearing house/corporation to commence trading and settlement in approved derivative contracts. Based on the recommendation of L.C. Gupta Committee Report on Derivatives who recommended phased introduction of derivatives in the Indian market, SEBI first approved trading in index futures contracts based on S&P CNX Nifty Index and BSE Sensex Index. This was followed by trading in options based on these two indices and options on individual securities. The trading in index options commenced in June 2001 and those in options on individual securities commenced in July 2001. Futures contracts on individual stock were launched in November 2001.

The driving force behind introducing futures and options instruments was that they will enhance the functioning of the capital market. In general, the volume of cash market, its volatility and efficiency and liquidity are greatly enhanced with trading of these products. This led to the development of the overall economy because the association between financial deepening and economic growth is a well established fact in economics.

1.2 Financial Development and Economic Growth

The relation between financial development and economic growth is not difficult to comprehend. Economic historians cite the case of England, United States and Japan as prime examples to lay emphasis on the significance of finance for development. Stiglitz (1998) describes the financial sector as ‘the brain of the economy’. The significance of the financial system is evident from the function it performs. The financial system offers various financial services -wholesale, retail, formal and informal - to consumers, businesses, and other financial institutions in an economy. The financial system embraces not only banking system and securities markets but also insurers, credit unions, microfinance institutions and moneylenders. The development of the financial system is critical for the growth and development of the economy.
Financial development means various things. It may mean improvement in the efficiency and competitiveness of the financial sector. It may also refer to an increase in the availability of financial services in the market. Another meaning of financial development is the increase in the type of financial institutions, which operate in the system. In addition, it is also increase in intermediation through the financial sector and an increase in the allocation of capital by private financial institutions to private sector enterprises. Financial development also means to move towards financial liberalization from regulated interest rate regimes, improvement in the regulation and stability of the financial system and gaining access to financial services by increasing numbers of the population.

Economists like Gurley and Shaw (1955), Goldsmith (1969), and McKinnon (1973) have emphasized the relationship between finance and growth. According to these economists, finance is central to the economic activity and hypothesized that differences in the quantity and quality of services provided by financial institutions partially explain differences in growth rates across countries. McKinnon (1973) observed that less developed countries depend heavily on self-finance. Little household savings goes to organized business activities. Capital markets are underdeveloped and fragmented. Banks are heavily regulated in order to serve rural areas through compulsory directed lending to the priority sectors. Rest of the economy is financed by moneylenders, pawnbrokers, and cooperatives, a phenomenon defined as financial repression. McKinnon maintains that financial repression is associated with substantial costs in the form of loss of economic prosperity and advocate financial liberalization that can help in breaking the confines of self-finance and channel the external funds to its most efficient use. The increase in efficiency of bank lending is a necessary condition, according to MacKinnon, to enlarge the real size of the monetary system which alleviates financial repression. The reform of monetary system can stimulate growth by raising saving propensities and the quality of capital formation.

The debate about whether financial development follows or induces growth has been replaced by an almost consensual belief that sustained economic growth follows from financial development (Wachtel, 2001). Also, according to the World Bank financial development 'contributes significantly to growth', 'is central to poverty reduction, directly benefits the poorer segments of society' and 'is associated with improvements in income distribution' (World Bank, 2001). Nevertheless, the view fostered by the World Bank on
the nature of relationship and on the direction of causality is not supported by a large part of empirical literature.

Theoretical and empirical works on the relationship between finance and development along with performance of emerging market economies in neighbourhood such as Malaysia, Indonesia, South Korea, Singapore, Hong Kong, Thailand provided thrust to financial liberalization program in India. The beginning of economic reforms in 1991 under the Structural Adjustment Programme (SAP) heralded a new era in the economic history of this country. Before 1991, the heavy hand of the government was omnipresent in economic life of this country. A paradigm shift in policy stance of the Government was noticed in the wake of severe balance of payment crisis. The need for economic reform in India had become apparent much earlier in the light of East Asian experience which achieved high rate of growth by following policies that emphasized export orientation and the encouragement of the private sector. In the 1980's, India made a move in this direction, but it was not until 1991 when balance of payment crisis hit the country which provided real thrust for a paradigm shift from government's regulated regime to a more open economy with a bigger role for the private sector; more reliance on market forces and a restructuring of the role of the government.

From the very beginning, reform of the financial sector was recognized, as an integral part of the economic reforms initiated in 1991. Reform of the financial sector was on agenda even before the onset of economic reforms in 1991. In 1991, the Government of India appointed a high level Committee on the Financial System to make comprehensive recommendations for reforms. This Committee on the Financial System under the chairmanship of M. Narasimham submitted its report in November, 1991. A number of recommendations were made in the report for reform in the banking sector and also in the capital market. A second report was also submitted by Mr. M. Narasimhan in the year 1997 that signaled the need for the second phase of Financial and Banking Sector Reforms in India.

Equity derivatives in India was started as a part of capital market reforms to hedge price risk resulted from greater financial integration between nations in the 1990's. Introduction of derivatives in India was recommended by the L.C. Gupta Committee Report on Derivatives in 1997 in a phased manner.
1.3 Statement of the Problem

Since 1990, the Indian financial system has become increasingly global in nature. It was exposed to the global financial market through channels of financial integration, development in information technology and telecommunication. The growing link among the financial markets have genesis in the increased globalization of capital. This phenomenon started in the 1980s and 1990s in the developing countries and the financial markets of these countries increasingly integrated with each other in recent years. Many countries dismantled trade restrictions and liberalized their financial markets that facilitated substantial cross border movement of funds due to foreign direct investment and portfolio investment.

This process of globalization has been accompanied by increasing volatility and uncertainty in prices of many commodities and in financial markets. As a result some business risks like price risk, foreign exchange risk etc., have grown in importance and a new generations of sophisticated risk management techniques and instruments have been developed. Management of these financial and commodity market risks is centered on the use of a new breed of financial instruments called derivatives. Financial derivatives – whose value is derived from the underlying asset, which can be stock, indices of stock – are designed primarily as risk management tools. Through the use of derivatives products, it is possible to partially or fully transfer price risk. Financial derivatives products initially emerged, as hedging devices against fluctuations in commodity prices and commodity-linked derivative remained the sole form of products for almost three hundred years. Trading in derivatives has now become an integral part of global financial markets. Recent decades have seen a singular rise in the growth and development of derivatives markets the world over. The growing financial link among the countries and globalization of finance prepared the ground for the introduction of risk management tools like derivatives in India. The need for derivatives was acknowledged as being necessary by some academicians and financial policy makers in the context of globalization in the early 1990s. Accordingly, derivatives were introduced as a part of capital market reforms to hedge price risk.

The very introduction of derivatives has been debated. One view was that the Indian market is not ripe for highly leveraged products like derivatives, the introduction
of which might heighten volatility in the underlying asset market. The other and opposite
view is that closer economic integration of the different countries of the world and
progressive deregulation of financial sector, together with large fluctuations in real
sectors of Indian economy in recent years, have exposed market players to different risks.
India would be, according to this view, at a disadvantage unless financial derivatives as
risk management tools are introduced. The latter would, it is argued, improve liquidity
and efficiency of the market by moderating volatility in the market for underlying assets.
Derivatives are also seen as an indirect inducement for raising savings and investment
rates in the economy by augmenting market participants who were shy of stock market in
absence of risk management products. Further, it was argued that speculative activities\(^1\)
shift from cash market to futures segment which can provide leverage to the speculator at
low transaction cost. Nevertheless, equity derivatives got a start with introduction of
index futures trading on Bombay Stock Exchange (BSE) on 9 June, 2000.

The present state of infancy of financial derivatives in India raises a number of
crucial issues for policy and analysis. The very introduction of financial derivatives has
been debated. One view is that the Indian market is not ripe for highly leveraged products
like derivatives, the introduction of which might heighten volatility in the asset markets
turning them into ‘casinos’. The other and opposite view is that closer economic
integration of the different countries of the world and progressive deregulation of
financial sector, together with large fluctuations in real sectors of Indian economy in
recent years, have exposed market players to different risks. India would be, according to
this view, at a disadvantage unless financial derivatives as risk management tools are
introduced. The latter would, it is argued, improve liquidity and efficiency of the market
by moderating volatility in the market for underlying assets. Derivatives are also seen as
an indirect inducement for raising savings and investment rates in the economy. It may be
too early to assess the full impact on the Indian financial system of financial derivatives.
Yet, it is of crucial importance for policy and, in particular, for the regulator (Securities
and Exchange Board of India) to understand the basic mechanism of this new market and
its interrelation with the underlying market. The present study seeks to focus on some of
these issues with reference to *equity derivatives* in India.

\(^1\) Indian stock markets is considered as one of the most speculative markets in the world as pointed out in
one of the important studies (Singh, 2001), ‘Tax Financial Speculation’, PIRC Briefing Paper, PIRC, New
Delhi. The volume of speculative trading in Indian financial markets was extremely high (Gupta, 1992).
1.4 Objectives

The introduction of equity derivatives in India is a nine year old market. Four derivatives instruments viz. index futures, index option, stock futures and stock option are traded on the Indian stock exchanges. The moot question is whether the introduction of these leveraged products in the Indian market performing their basic economic function of price discovery. Besides this, another important issue relating to the introduction of derivatives market is whether it has destabilized the underlying cash market. In other words, whether derivatives are playing their part as risk management tools and how it is befitting the underlying market in terms of pricing efficiency, liquidity and stability through the supposed informational role of derivatives trading. The objectives of this study are:

1. To determine the hedging effectiveness of index futures and stock futures.
2. To study whether futures market are performing their price discovery function.
3. To study whether introduction of futures and options have destabilized the underlying market.
4. To examine whether trading in futures market is done for hedging or speculation.
5. To examine whether market quality in terms of efficiency and liquidity have enhanced after the introduction of derivatives products.

1.5 Data and Variables

To meet the above mentioned objectives, we mainly relied upon data from secondary sources. To test the hedging effectiveness of index futures and stock futures, we collected daily data on S&P CNX Nifty and Nifty from 12 June 2000 to 26 March, 2009. We also collected data on two sectoral indices, namely, Bank Nifty and Bank Nifty Futures and CNXIT and CNXIT futures from 1st January 2007 to 26 March, 2009. Besides this, we also collected data on 10 companies from 1st January 2007 to 26 March 2009. The names of companies are as follows:

1. Bharat Heavy Electricals Ltd
2. Bharti Airtel
3. ICICI Bank
4. ITC Ltd
Our second objective of the study is to see whether futures market performs its price discovery function. We conducted test at index level as well as firm level. For index level study, we collected data on S&P Nifty index and S&P Nifty futures from 12 June 2000 to 26 March, 2009. Price discovery of two sectoral indices viz. Bank Nifty and Bank Nifty futures and CNXIT and CNXIT futures are also studied. For firm level study, we collected data on 10 companies from 9 November, 2001 to 26 March 2009. To study the impact of futures and options trading on the volatility of the underlying market, we collected data on S&P CNX Nifty from 1st April 2000 to 31 March 2009. To study structure of volatility at firm level, we also collected data on 10 companies from 1st April 2000 to 31 March 2009. To test the fourth objective of our study, that is, whether trading in futures market is done for hedging or for speculation, the same data set for S&P CNX Nifty futures, Bank Nifty futures, CNXIT futures and data on 10 companies are used. For testing fifth objective whether introduction of derivatives have improved the market quality in terms of efficiency and liquidity, we collected data on S&P Nifty from 1 April, 1998 to 31 March, 2006. We also collected data for the above said period to examine efficiency and liquidity of 10 companies.

One of the key variables used is the return of various series. The continuously compounded return, which is, used in this study, is defined as follows:

\[ R_t = \ln \left( \frac{P_t}{P_{t-1}} \right) \]  

(1.1)

where \( P_t \) and \( P_{t-1} \) are the natural logarithm of closing prices on day \( t \) and \( t-1 \) respectively. \( R_t \) stand for returns. Return variable will be used to study the hedging effectiveness, price discovery and market efficiency.
Volatility of the market is another important variable. It is measured by computing the standard deviation of the daily returns. The daily returns based on closing prices were calculated by using equation (1). Finally, the daily volatility is computed as the square root of variance of the returns series. The variance is computed by using the following equation:

$$\sigma^2 = \frac{(R_{ij} - \overline{R})^2}{(n-1)}$$  \hspace{1cm} (1.2)

where $\overline{R}$ is the mean return over the period. Besides this, since the Indian stock markets is exhibiting time-varying volatility (Raju & Ghosh, 2004), we will use GARCH volatility in this study. We also tried with EGARCH and TARCH volatility conditioned upon past five days return which takes into account ‘good news’ and bad ‘news’. We know that stock market views ‘good news’ and ‘bad news’ differently and its impact on prices are different.

Another variable used in this study is the liquidity of the underlying market. The liquidity of the stock market refers to the ease with which stocks can be sold and purchased. There are various ways of measuring liquidity such as frequency of trading, volume of trading (number of shares traded), annual turnover (number of shares traded multiplied by price) and the ratio of total turnover to the market capitalization which can be used to make comparison across different markets or over time. This measure of liquidity is appropriate for our study to make a comparison before and after the introduction of the derivatives trading.

Open interest is a proxy for market depth in our study. It refers to the total number of contracts that have not yet been offset by an opposite transaction or fulfilled by delivery of the asset underlying a contract. Although each transaction has both a buyer and a seller, only one side of the transaction is included in open interest statistics. Open interest is a stock concept reflecting the net outcome of transactions on a given date. It is often interpreted as an indicator of the hedging or long-term commitment of traders to a particular contract. Open interest is generally smaller than turnover because a large number of contracts that are bought or sold during the course of the day are reversed before the end of the trading session.
1.6 Methodology

This study makes use of various econometric techniques to test the above mentioned objectives. The objectives of this study are varied and we have used different econometric tools keeping in mind the nature of problem at hand.

1.6.1 VAR and VECM Models

To examine the hedging effectiveness of index futures and stock futures, this study makes use of OLS, VAR and VECM model. To study the second objective, we employed the techniques of cointegration and error correction model. We will use Engle-Granger Error correction model as well as Johnston multivariate system.

1.6.2 ARCH and GARCH Models

To examine the destabilizing effect of the introduction of the futures and option on the underlying or spot market, this study makes use of ARCH/GARCH technique. The financial market variables such as price often exhibit time varying volatility which is not accounted by the above mentioned technique. Therefore, we also employed ARCH and GARCH technique to model volatility before and after the introduction of the futures and option markets.

The basic least square model is based on homoscedasticity of the error terms. If this assumption of the classical linear regression model is violated then we confront the problem of heteroscedasticity. The direct consequence of this problem is that the OLS estimates are still unbiased but but the standard errors and confidence intervals estimated by conventional procedures will be too narrow, giving a false sense of precision. Autoregressive conditional heteroskedastic (ARCH) models first introduced by Engle (1982) revolves around this assumption of homoscedasticity. ARCH and GARCH instead of considering heteroscedasticity as a problem, it treated heteroscedasticity as a variance to be modeled. As a result, not only are the deficiencies of least squares estimates corrected, but a forecasting is calculated for the variance of each error term.

1.6.3 GARCH-M and BDS Test
For testing whether the introduction of futures and options have enhanced the quality of markets in terms of efficiency, we employed various tests to examine the efficiency of the market before and after introduction of futures and options like random walk model, serial correlation tests, GARCH-M model and finally BDS test.

Random walk model was first found by French Mathematician Louis Bachelier from the study of French commodity. However, this term was popularized by Malkiel (1973) in his celebrated work ‘A Random Walk Down Wall Street.’ This hypothesis asserts that the random nature of commodity or stock prices cannot reveal trend and therefore current prices are no guide to future prices. Economists have historically accepted the random walk hypothesis. Nonetheless, there are economists like Lo and Mackinlay (2002) who do not accept this hypothesis. They wrote the book A Non-Random Walk Down Wall Street, which asserts that there are trends in the stock market and they are somewhat predictable.

Randomness of a series is also tested by autocorrelation test. Autocorrelation refers to the correlation of a time series with its own past and future values. Autocorrelation is sometimes called ‘serial correlation’ which refers to the correlation between members of a series of numbers arranged in time. They are also termed sometimes as ‘lagged correlation’ and ‘persistence’. A guide to persistence in a time series is given by sample autocorrelation function which measures the correlation between observations at different times. We have already discussed foundation of ARCH/GARCH model earlier; GARCH-in-Mean is another model for testing market efficiency. The idea is that if risk premium is time dependent which implies autocorrelation in returns then it is a clear violation of market efficiency. Finally, BDS test which is a non-parametric method is also done to take care of non-linear dependences in data.
1.7 Limitations of the Study

Some limitations of data are worth noting. First, the study uses only National Stock Exchange data and trading on futures and option on BSE is not taken into consideration. NSE account for approximately 99.5% of the total trading on Futures and Options Segment while the BSE account for the rest, which is negligible. Thus, deleting the BSE from the analysis is not going to affect the result adversely. Second, this study has used daily data instead of ‘high-frequency’ data. The results may alter significantly with ‘high-frequency’ data. However, this attempt will help to answer some basic question relating to futures trading and its impact on the markets. The findings of the study may help to evolve appropriate policy regarding trading in futures and option in India.

It may be observed that the recent turmoil in the global financial market is often associated with a market collapse led by highly leveraged derivatives, especially in advanced economies such as the US. The present study, however, is not concerned with systemic macroeconomic or global forces that led to the crisis. Our purpose is strictly the micro structure and junctioning of the equity derivation in India.

1.8 Chapter Outline

The whole study is divided into seven chapters including introduction. Chapter II deals with ‘Derivatives Markets in India: A Survey’ which put forward the basic concept relating to derivatives market, common instruments traded in the market, history of these instruments and a brief overview of its trading in India. Chapter III is ‘Hedging Effectiveness of Index and Stock Futures Contracts’ which tries to assess the risk reducing capability of these index and stock futures contracts. Chapter IV is entitled as ‘Price Discovery in Cash and Futures Market’ which investigates the price discovery functions of the futures market. Chapter V is ‘Derivatives Trading, Information and Stock Market Volatility’ which explores the impact of futures and option market on the underlying market. Chapter VI is ‘Hedging and Speculation in the F&O Segment of NSE’ which studies whether trading volume is generated due to speculative demand or hedging purpose in the futures market. Chapter VII is ‘Market Quality’ which looks at market quality in terms of efficiency and liquidity before and after introduction of
derivatives trading. Finally, chapter VIII provides summary and conclusion of this study. Some additional information relating to commodity futures and highlights of L.C. Gupta Committee Report and Verma Committee Report are given out in special appendices to the thesis (See Appendix A through Appendix C). The main data set used for the thesis is provided in the Appendix D.