CHAPTER 1

INTRODUCTION
Chapter 1: Introduction

1.1 Introduction to the Thesis:

Over the years, Indian stock market has become one of the most attractive markets to study. On the one hand, market efficiency cannot be denied only if the fluctuation in the market is very high, rather it is one of the most important parameters for a market to be efficient and it reflects the transparency of the market. On the other hand, excessive amount of volatility may cause destruction and which may lead to crashes or crises in financial markets. Hence, it is very important to model the volatility of a financial market. Since volatility is the most important characteristic of any stock market and so it must be looked into. The fluctuation of stock prices or the major stock indices are measured by the standard deviation or the volatility of the same. This study mainly focuses on the volatility of Indian equity market during the recent global recession, impact of some economic indicators on the volatility of Indian equity market, cross border volatility spillover from other countries to the Indian equity market, impact of introduction of derivatives, Union budget and Loksabha election on the Indian stock market and modeling volatility of the commodity derivatives market of India.

At the onset of the decade, which has been considered in this study, the Indian equity market was highly volatile as an effect of the 1997 Asian financial crisis. The Asian financial crisis started in July, 1997. Thailand was the origin where this crisis started and spread worldwide leading to an economic downturn. A major section of Southeast Asia and Japan were badly affected as this crisis spread over. India was not an exception to the effect of this financial contagion
either, and saw a meltdown in all its economic activities. However, by 1999 many researchers had forecast that almost all the Asian countries could recover from the severe effect of this crisis.

The main focus of this study is to understand the movement of volatility over the period starting from 2001 to 2010. During this period, another financial crisis took place in the last quarter of 2008, and, accordingly a chapter has been dedicated to understand the effect of this global meltdown on the Indian stock market with emphasis on some leading sectors. This financial crisis or recession, also known as the Great Recession, has been marked as one of the most devastating financial crises in the history of Indian/global stock market. The crisis was a result of the U.S. housing bubble, which affected the world’s economic activities drastically. As a result, Indian economy and the financial market were also affected by this global meltdown. But, since the FDI policy of the govt. of India is very rigid, the loss which was incurred by our country was less as compared to that of other countries, more specifically the U.S. Four leading sectors such as Steel, IT, Media and Mobile Communication have been taken into consideration for studying the effect of the recession on these sectors and, also the status of recovery of these sectors after the cessation of the recession. Since the recession took place in the last quarter of the year 2008 and the time series analyses which were employed in this study demanded a dataset for a long span of time, therefore the time period for the data has not been restricted up to 2010 rather it has been extended up to 2012.
Since, volatility of any market not only gets affected by some financial crises, also by economic indicators, this study also considers the effect of leading economic indicators of India on the Indian stock market. Economic indicators play a major role in understanding the economic scenario of a country. Leading economic indicators act as a predictor of the economic scenario beforehand since they start showing the changes before the actual economic scenario gets changed. This study gives immense importance to twelve economic indicators of India for their significant contribution to the volatility of the stock market indices. Volatility of the stock market index has been modeled by using a GARCH (1,1) model and then this volatility series has been taken as the dependent variable for the study. Application of Independent Component Analysis (ICA) for handling the multicollinearity problem has been tested in this study and it has been successfully established that ICA is an efficient tool to eradicate the multicollinearity in the variables which do not follow normal distribution. Moreover, there is no need to drop any of the variables due to multicollinearity. Since dropping a variable leads to the loss of information and loss of generality, it is better to go for eradication of the same rather than dropping a set of variables. This study has been able to give an alternative method to handle the multicollinearity by using an ICA.

The volatility of the stock market of any country is also affected by the volatility spillover from other emerging and developed countries. So, this study also gives an importance to the volatility spillover effect from other emerging and developed countries to the volatility of the Indian stock market. Many researchers have studied the volatility spillover effect on different countries (Hamao et. al., 1990, Theodossiou and Lee, 1993, Koutmos and Booth, 1995, Connolly and...
Wang, 2000, Bae et. al., 2000). Taking seven different stock exchanges from different countries, this study has tried to establish the co-movement of the Indian stock market with other emerging markets. A volatility spillover effect has been seen on the Indian stock market from different emerging and developed markets. A Polynomial Distributed Lag model has been used to analyze the data to understand the volatility spillover effect for the lagged variables.

This study also intends to study the impact of introduction of derivatives on the volatility of the Indian stock market and impact of the announcement of Union budget and commencement of the Loksabha election on the Stock market's volatility of India.

The study of any financial market is incomplete unless the derivatives market of that country is studied. India being an agricultural country, it is very important to study the volatility standards of the agricultural commodity market. Four different types of agricultural commodities have been taken for study, to understand the efficiency of the Indian commodity market and to analyze the influence of the commodity market on the Indian spot market. A Bayesian GARCH model with Student’s t innovations has been used to establish the efficiency of the market and it has been reported that the old news does not have any effect on the current news.

1.2 Literature Review:

1.2.1 Financial Crises and Stock Market Volatility:

Some of the studies considered contagion impact among different stock markets in the wake of Asian financial crisis 1997. The relationship among Istanbul and other prominent stock markets was investigated with particular reference to
financial crisis that began in Turkey in 1994, Asian financial crisis 1997 and Latin American crisis during 1998 - 2001 (Alper and Yilmaz 2004). This study confirms that international contagion prevails among stock markets. Stock markets of eight leading countries of Asia were explored and it was concluded that the efficiencies are badly affected by the Asian financial crisis in 1997 with an emphasis on the division of the total time span into two periods which are pre crisis and post crisis period and it was documented that Hong Kong market was found to have the highest amount of tremor due to the crisis (Lim, et al., 2008). The global financial crisis in 2008 has been marked as the greatest recession after the 1930s crisis. Considering this, few studies also assess the impact of this crisis on stock markets. Using EGARCH model response of stock return was studied and the volatility of Nigerian stock market was taken into consideration by some researchers (Olowe 2009). The results of the above study show that stock returns and its volatility in Nigeria are not affected by the adverse effect of this crisis. In contrast to this study, another paper is made on Nigerian stock market using some elementary statistical tools e.g. standard deviation and Analysis of variance. The data is divided in two periods i.e. pre and post recession period and this concluded that the volatility of the Nigerian stock market is increased in the post recession period (Adamu 2010). Stock markets of six gulf countries faced a negative pull during the recent financial crisis in 2008 but surprisingly it is also seen that recovery is achieved as soon as it reached the post financial crisis period (Ravichandran and Maloain 2010). Krugman (2009a) suggested the
researchers in the fields of economics and finance that they should be more cautious about the dynamics of the stock market and macro-economy.

It is not surprising that, for much of 2008, the severity of this global downturn was underestimated. Bezemer (2009) argued that a huge number of economists and financial analysts forecasted that there may be a possible recession during the time period from 2005 to 2007. Ample studies have been conducted as to study the effect of these crises on the economy (Sahu and Menon, 2011). The global uncertainties in recent times have also added to the market’s woes and the downgrade by the global rating agencies has proved sadistic to unnerve the investors’ confidence.

Agmon (1972) said that the global integration of the financial markets is very easily achieved by the inter-correlation among different stock markets. Hilliard (1979) reported that the information flow from one market to another is very important in terms of achieving the stability in the stock market of a particular country. Baig and Goldfain (1999) observed that the volatility was increased after the Asian Financial Crisis of 1997. Sheng and Tu (2000) identified a strong correlation among the developing countries and the developed countries. Ratanapakorna and Sharma (2002) found an evidence of co-movement of the volatility of stock markets of different countries. Jang and Sul (2002) also supported the result of the above researchers. King and Wadhwani (1990) showed that after the recession in 1987, the inter-correlation among the cross country volatilities was increased. They observed a stock financial contagion among different countries’ stock markets. Yang et al. (2002) showed
that the developing countries were affected by the volatility of the developed
countries after the 1997 financial crisis. Kim (2005) proved that the volatility of
the emerging markets increased manifold after the 1997 crisis. Caporale et al.
(2006) also reported the same in case of developing countries. Sarkar et al.
(2009) found a strong co-movement between the Indian stock market volatility
and a number of countries worldwide. Mukherjee and Mishra (2010) observed
that the U.S. stock market is highly significant in mobilizing the Indian stock
market. Yang et al. (2002) unlike other researchers studied the relationship
between the volatility of business cycles and found that Indian stock market is
highly affected by business cycles of other countries. Forbes and Rigobon (2002)
defined a financial contagion as the increment in the comovement of cross
border volatility of stock markets after a financial crisis. They also said that a
stable relationship among different countries is not a contagion but it can be
termed as mere interdependence. Calvo and Reinhart (1996) reported that
during the 1994 Mexican crisis, an increase in the strength of the relationship
among different countries was observed. Mishkin (1999) defined the 1997 East
Asian crisis as the biggest financial crisis ever. Hon et al. (2007) said that the
crash in the technological advancement in the year 2000 gave rise to the
increment in the correlation between the U.S. and other stock markets of different
on the stock markets of different countries and they reported a strong correlation
among the stock markets of different countries after this crisis. They studied the
impact of Asian financial crisis on twelve countries in the Asia Pacific region and
they found that the relationship among the South East Asian countries was more than the correlation among the North East Asian countries. They also said that the most dominant country in affecting the Asian countries was the US. Jang and Sul (2002) observed an increase in the inter correlation of the volatility of different countries after the Asian financial crisis. Ratanapakorna and Sharma (2002) also supported the result of the above researchers. They analyzed the financial markets of different countries as in Europe, Eastern Europe, Middle East countries; Latin America, Asia and the U.S. and they inferred that the relationship among them was not present in the long run. However, significant co-integration is experienced during the crisis period. Some causal relationships are observed during the 1997 Asian crisis where as there was no evidence of any causal relationships among these indices before the crisis had taken place. From the same study, another inference is drawn that during the 1997 crisis period, globalization was more in picture as European financial market directly affected the functioning of the U.S. market while rest of the markets were unable to directly affect the U.S. market but they did via European stock market. Jang and Sul (2002) observed the volatility spillover and co-movement of the stock market indices of seven Asian countries as soon as the 1997 crisis period started whereas there is no evidence of substantial increment in the correlation before the crisis had started. Yang et al. (2002) said the same thing. Kim (2005) critically examined the stock market cointegration during and after the Asian Financial crisis. Caporale et al. (2006) reported that this pattern was not recovered even after the crisis got over. International transmission of the 1997 financial crisis
using a bi-variate GARCH-BEKK model is examined. There are many researchers who studied the cross border volatility spillover but a very few researchers concentrated on the Indian stock market. Sharma and Kennedy (1977) found a strong inter-dependency among the U.S., U.K. and Indian financial markets.

Hansda and Ray (2002) studied the National Stock Exchange (NSE) and the NASDAQ/ New York Stock Exchange and they found that these exchanges are highly dependent on each other. Hansda and Ray (2003) observed a unidirectional causality from the NASDAQ/NYSE to NSE. Ten stocks which were registered in both NSE and NYSE showed interrelated pattern amongst themselves. Using Vector Auto regression Model (VAM) it is subsequently found that the causality among those stocks is both way. Mukherjee and Mishra (2010) reported a strong correlation structure among the Indian stock market and other cross boarder stock markets but very interestingly it is also validated by data analysis that the correlation structure is more powerful in case of the pair Indian stock market and the U.S. stock market. Sarkar et al. (2009) supported the result of the above researchers. Sinha et al. (2010) observed that after the global meltdown which took place at the end of the year 2008, the integration between the Indian stock market and the world financial market was increased. It is also ascribed that the recent growth and integration of the Indian stock market with the world market resulting due to the revival of foreign institutional investors’ (FIIs) interest in emerging market economies including India.
Although, almost all the studies have reported the increasing correlation among different financial markets worldwide but apparently it is also seen that the pattern of such co-integration varies over time. A number of researchers have also suggested that poor synchronization of business of a country is responsible for such a scenario.

When the global stock market is not under any kind of turmoil and it is relatively stable, i.e. there is almost no shock from the outsiders; country specific factors dominate the stock market of the same country. On the other hand, Bonfiglioli, Favero, (2005) said that when extensive global shocks occur, stock markets of different countries are affected via the cross-border channels of trade and capital flows. So from the past studies it can be precisely said that the stock market returns and volatility have shown quite a visible dependence on the global shocks.

Economic growth of a country is directly related to the growth of the stock market of the same country (Levine and Zervos 1996; Levine, 2002; Nieuwerburgh et al., 2006; Enisan and Olufisayo 2009). Ample number of researchers has devoted their time to study the behavior of stock exchange as stock exchanges show a complicated pattern of behavior. It has been observed that stock markets of any country are highly sensitive to the national and international events and the reaction to these stimuli is immediate. Stock exchanges are generally said to be the measuring tape of the financial condition of a country and that reacts to political, economic, national and international environment. This is why; volatility is one of the major characteristic of a stock
market for a researcher to understand the general health of a country’s financial market (Hameed and Ashraf, 2006). Recent global meltdown which occurred during the last phase of the year 2008 has affected all over the world. This recession is more devastating than the Asian financial crisis in 1997 and this recession in 2008 is being considered to be the greatest financial crisis after the great recession of 1930s (Llanto and Badiola, 2010). This crisis originated in United States in the second half of 2007 with the spark of subprime mortgage crisis and got worst momentum in the year 2008. Developing countries were awfully affected by this crisis and experienced a downward growth in their economies. From the beginning of this crisis net capital inflows of money and resources got reduced drastically. FDI investments and portfolio investments got shrunk at the onset of this recession especially in the developing countries (Iqbal, 2010). Sudden decline is experienced in cross boarder stock markets from the first month of 2008 (Usman, 2010). Some researchers have also studied the Pakistani stock markets as Pakistan is one of the most important stock markets of Indian subcontinent. More than sixty percent trading occurs in Karachi stock exchange (KSE) which makes this a prominent and leading stock market in Pakistan (Zaidi 2009).

1.2.2 Macroeconomic Indicators and Volatility of Stock Market:

It has been observed that, a large body of literature is devoted to the study of the stock market and its effects on macroeconomic variables. Scewert (1989, 1990) and a number of researchers attempted to understand the movement of the stock returns volatility with respect to the possible changes in the macro economy.
Many researchers found that there is no correlation between the movement of the volatility of the stock returns and the macro-economic volatility. Schwert (1989) analyzed the co-movement between the macroeconomic indicators' volatility and the stock market volatility for the U.S. for the period from 1857 to 1987. Financial asset volatility was found to be a good predictor of macroeconomic volatility. Fama (1990) said that there is a strong significant co-movement between the Industrial production and the stock returns in the U.S. from 1953 to 1987. Lee (1992) examined the correlation between the macroeconomic activities inflation and the stock returns applying a VAR model on the U.S. and reported that the stock market explains the economic activities and the inflation. Dropsy and Ibrahimi (1994) used the monthly data of eleven countries for the period from 1970 to 1990 and could not establish any causal relationship between the stock and derivatives market in these countries. Park and Ratti (2000) found that in case of the U.S., the monetary policies, inflation and the cash market are highly correlated amongst themselves. They used a VAR model on the data from 1955 to 1998 and observed that monetary policies could affect the stock market volatility and the amount of inflation. Kwon et al. (1997) studied the South Korean stock market for the period from 1980 to 1992 and then tried to find whether macroeconomic activities influence the movement of the cash market and they observed a positive impact of macroeconomic activities on the stock market volatility.

Aylward and Glen (2000) investigated the U.S., Japanese, Korean stock market and twenty other stock markets of different developing countries and they
found that the Korean market showed the highest sensitivity towards macroeconomic activities. They used the yearly prices for these countries for the period from 1951 to 1993. The ‘G-7’ countries showed more cohesive bonding between the stock market and the macroeconomic activities. Wongbanpo and Sharma (2002) examined the stock market for the five economic variables in the ASIAN-5 countries and they found that all these countries showed a significant change in the stock prices if the macroeconomic variables are changed. Mukhopadhyay and Sarkar (2003) established that after 1995 macroeconomic variables were significantly affecting the stock market. They also showed that money supply inflation and foreign investments could influence the cash markets of several emerging markets.

The globalization and liberalization of the countries by FDI, cash flows, technological advancement and their impact has been a very interesting topic to the researchers. Shamsuddin and Kim (2003) reported that the correlation among different financial markets of different countries is very important for the financial markets to be less volatile. They also said that the economic growth and the financial market should be observed very carefully by the policy makers of any country. Fama (1990) observed that the overall performance and financial performance of a company is influenced by the macroeconomic variables. Liu and Sinclairb (2008) also found that stock prices, dividends and the expected returns of a company are dependent on the behavior of macroeconomic variables. Oskooe (2010) also found the same conclusion. Schwert (1989, 1990) observed that the economic activities are highly influenced by financial market.
Silva (2002) said that business cycles can be directed by the financial system. Scharler (2008) found that economic activities can be stabilized by the changes in the interest rate liquidity and cash market. Rousseau and Vuthipadadorn (2005) studied the relationship between the GDP growth and the stock market and they found that if the GDP increases then the stock prices also increases.

Antonios (2010) suggested that risk diversification can be one of the major causes to control the operation system of banks and the growth of GDP. Wu et al. (2010) reported that the stock market liquidity negatively influence the economic growth in short run and positively in the long run. They also said that the firms face high risk and low growth at the time of a financial crisis in the short run. However, the financial crises do not have any effect on the financial institutions in the long run. Diebold and Yilmaz (2008) concluded that economic growth is dependent on the volatility of a stock market. They used an AR (3) model and its disturbance term for analyzing the volatility. Caporale and Spagnolo (2003) also reported a one directional influence of stock market volatility to the volatility of economic growth. They used a GARCH BEKK model to analyze the data and concluded the inter-correlation between them. Leon and Filis (2008) observed a two way relationship between the stock market volatility and the GDP growth. They said that a sudden change in the GDP growth will affect the volatility of the stock market and vice versa. They applied a VAR model and conducted their study. Ahn and Lee (2006) predicted a volatility clustering in the stock market volatility. They applied a bivariate GARCH model to find the co-movement between the above variables. The above studies concentrated on the
volatility of a single country at a time but the issue of cross border volatility was not addressed by these researchers. Trew (2006) said that there is still a need to study the factors behind the inter-correlation between the economic and financial growth of a country.

Stock prices can influence the economic output and that can be estimated by three different theoretical propositions. Tobin (1969) was the first who said that there is strong correlation between these two variables. He introduced a new coefficient which is known as Tobin’s Q. Tobin’s Q is calculated by taking the ratio of the market value of current capital to the cost of replacement of capital. So, when the share prices are high, then the Tobin’s Q is also high so, he said that this will lead to more and more investment. Modigliani (1971) suggested that GDP is one of the major factors which may influence the performance of the stock market. The more is the security prices, the more is the individual wealth. Bernake and Gertler (1989) said that stock prices can be influenced by firm’s balance sheets. The collateral of a firm is one of the factors which drive the ability of a firm to borrow and this happens because of the irregularities of the information in credit markets. If the stock price of a firm is increased, the value of collateral offered by that firm will also increase. Kiyotaki and Moore (1997) supported the results of Bernake and Gertler. Campbell (1998) analyzed the empirical relationship between the stock prices and the outputs by using a log-linear asset pricing model. He used the output as the exogenous variables and the log price dividend ratio as the endogenous variable in a regression model and he established that the outputs have insignificant impact on the movement of
the stock prices in case of France, Japan, the U.K., Germany and the U.S. His work suggested that there is a very weak possibility that the stock prices will be driven by the output. Binswanger (2004) contradicts Campbell’s results. He studied stock markets of seven countries which are France, Italy, Germany, Canada, Japan, the U.S. and the U.K. and he used a regression model with real GDP and some other variables as the explanatory variables. He found that there is a significant impact of the explanatory variables on the stock prices. Stock and Watson (2001) studied just the reverse i.e. influence of the stock prices on the output variables and he found a very weak relationship. Humpe and Mcmillan (2005) examined the stock markets of the U.S. and Japan and tried to observe whether macroeconomic variables have significant contribution to the movement of stock market indices. They used a log linear regression model and then established that industrial production in case of both the countries was found to be statistically significant. Schwert (1989) examined the correlation between the economic activities and the stock prices. He found that the volatility of the stock market is impacted by the volatility of the economic activities. He showed that during the financial recession the volatility of stock market has been increased by 189%. Vast literatures have emerged studying the relationship between the stock prices and the macroeconomic variables and this topic remained inconclusive. Rogoff (2009) stated that the decrease in volatility of the macroeconomic indicators can be said to be an indicator of structural changes and improved macroeconomic policies. Bernanke (2004) showed that such financial crises give
rise to the volatility of the stock returns and resulting to which a sharp recession is experienced.

1.2.3 Cross Border Volatility and Stock Market:

ARCH model was used to see the reaction of Karachi Stock Exchange (KSE) to nuclear donations made by India and Pakistan (Javed and Ahmad 1999). They concluded that the Indian nuclear detonation made adverse impact on stock return and its volatility of the Indian stock market while Pakistan’s nuclear test increased the volatility of stock return as well as trade volume. GARCH and EGARCH models were used to examine the information based effect on conditional volatility in Japanese stock market (Miyakoshi 2002). The results infer that ARCH effect is eliminated from conditional volatility of concerned stock prices when trade volume is included in the model. The efficient market hypothesis was observed to be violated in Jodanian stock market (Omet et al., 2002). An augmented GARCH model with the introduction of a dummy variable used for the 9/11 incident was used and concluded that KSE of Pakistan got contaminated by this event and had a drastic fall in the trend of volatility of stock returns (Hameed and Ashraf 2006). Intra-day transactions and trade volumes have been found to be good predictors of conditional volatility of Saudi Arabian stock market (Alsubai and Najand 2009). This study also shows that volatility spillover effect from large to small firms is pronounced. The effect of different financial crises during the last two decades on stock markets has also been explored by different researchers.
1.2.4 Econometric Models to Estimate Volatility:

Volatility clustering, leptokurtic distribution and asymmetric distribution have been proven to be the characteristics of the stock market data by many researchers. It has also been observed that volatility clustering is one of the major characteristics of stock market data. Mandelbrot (1963) and Fama (1965) proved that leverage effects, leptokurtosis and volatility clustering are some of the very important characteristics of stock returns. Black (1976) was also not an exception to this. He also concluded the same. Vast literature has emerged addressing different aspects of the stock market. Conventional econometric models for financial data analysis are based on the underlying assumption that the residue is having constant variance i.e. homoskedasticity but in reality, it has been seen that homoskedasticity is not feasible. Here comes the necessity of a model which takes care of the fact of Heteroskedasticity. One of the most celebrated econometric models which address the problem of Heteroskedasticity is given by Generalized Autoregressive Conditional Heteroskedasticity (GARCH) (Engle 1982). Furthermore, a family of GARCH models has been developed which have been extensively used to examine volatility in stock markets. Using GARCH model, it has been examined whether there is any impact of the holy month ramadhan on the Pakistani stock market or not and found that there is no significant effect of the same on the stock market but the volatility of the stock market got reduced during the month of ramadhan (Hussain 1998).

Engle (1982) proposed the model Autoregressive Conditional Heteroskedasticity (ARCH) which takes into account the conditional variance of
the error term and the squared error term in the recent past of an autoregressive model. Bollerslev (1986) introduced the Generalized ARCH model which takes the conditional variance, lagged squared error term and lagged values of conditional variance. After them, a variety of GARCH models have been introduced by adding some conditions to it. Nelson (1991) proposed the EGARCH model or Exponential GARCH model, Glosten, Jagannathan and Runkle (1993) proposed the GJR GARCH model and Zakoian (1994) introduced the positively biased errors and negatively biased errors into the GARCH model. Prior to the introduction of the ARCH family models, researchers and practitioners were not very comfortable in studying the volatility of stock returns but introduction of these models increased the importance of the studies in the volatility of the stock market. Hsieh (1989) observed that there is a dependence structure in the data points of a time series. He established that the performance of the GARCH model is better than that of an ARCH model. Taylor (1994) said that GARCH (1,1) performed better than ARCH model. Similar inference has been drawn by Brook and Burke (2003). Frimpong and Oteng (2006) confirmed the same observation by their study. Olowe (2009) found that GARCH models are able to find the autoregressive feature of the conditional volatility whereas ARCH models are unable to do so; hence in terms of estimation of volatility, GARCH models were better. Campbell and Hentschel (1992) reported that volatility clustering can be better understood by GARCH family of models than the ARCH family. Braun et al. (1995) confirmed the results of Campbell and Hentschel. Bekaert and Harvey (1997) said that in case of emerging stock
markets asymmetric GARCH models are better performer in terms of capturing the asymmetry in the stock returns. Aggarwal et al. (1999) also reported the same results in case of emerging markets. Lebaron (2006) was able to capture the time varying volatility in stock market data.

From the past literature it is seen that GARCH model has been extremely successful in estimating and forecasting volatility but the pitfall of this model is that it cannot capture the scenario of skewness in the stock returns. The standard models have the underlying assumption that the log of the stock return series are the member of a independent and identical Gaussian distribution but in reality and in a number of empirical studies it has been observed that Normal distribution is not able to explain the nature of the data. Mandelbrot (1963) said that homogeneity cannot be expected in case of stock returns so the possibility of following Normal distribution by such data series is very low. He suggested that Paretian model can be used for the analysis but this type of model has an assumption of infinite variance which is a bit difficult property to be handled by any researcher. Fama (1965) took the stock returns of the U.S. and analyzed it and found that leptokurtic trend is found in the data and he also found that large volatility is followed by large volatility and similarly small volatility is followed by small volatility. He also reported that the risks associated with high priced stock and risks associated with low price stocks come to the investors as two different threats. The investors don't treat these risks to be of the same kind. Lai (1991) said that the investors have a preference for the positively skewed stock return series. Theodossiou (1998, 2001) used a Student's t and asymmetric GED
models to model the distribution of the logarithmic stock returns. Harvey and Siddique (1999) said that it is an unrealistic demand that the stock returns are IID Normal and they said that there is a need to understand the proper distribution of the stock returns. Satchell (2004) said that the mean and variance of the stock returns are not as powerful parameter as the skewness for the investors to understand the risk in a particular stock. Olowe (2009) said that it is better to use non-normal distributions than the normal distributions in case of logarithmic stock returns.

Jayasuriya (2002) modeled the volatility of stock returns by using an asymmetric GARCH model. He tried to study the impact of stock market liberalization on the volatility of fifteen stock markets of different countries for the period from December 1984 to March 2000 and observed that in case of Nigeria no volatility clustering was there. The positive changes were followed by negative changes and negative changes were followed by positive changes in the volatility. On the contrary to this study, Ogum et al. (2005) studied the stock markets of Kenya and Nigeria and using an exponential GARCH model, they found that in Nigerian stock market asymmetric volatility is present whereas in case of Kenya it has been seen that positive shocks have greater impact on the volatility than the negative one. They also reported that the conditional volatility is self dependent in the recent past as they observed that the GARCH parameter was statistically significant. Okpara and Nwezeaku (2009) studied forty one Nigerian companies for the time span starting from 1996 to 2005. Employing an EGARCH model, they found that the idiosyncratic risks have a significant effect
on the movement of the stock returns of those companies taken under their study. The modeling and forecasting volatility has always been a very interesting subject to the researchers. Huge number of statistical models has been used to grade the models according to their efficiency by different researchers but no way could it be said that a particular model is the best. Pindyck (1984) argued that increasing volatility suggests decreasing trend in the stock price. Whitelaw (1994) showed that the future returns are dependent on the lagged variance of the error term of the auto regressive model. Koutmos and Saidi (1995) found that the existence of positively biased estimates is lengthier than the negatively biased one. Koutmos (1999) supported the above result and he also observed the same. Lee et al. (2001) investigated for the time varying volatility in case of four Chinese stock exchanges and he reported that volatility in case of those four exchanges of China was found to be very persistent in nature. Balaban et al. (2003) using a symmetric and an asymmetric loss function showed that Exponential smoothing model performed the best if symmetric loss function was taken and ARCH family models performed the best if asymmetric loss function was taken. They tried to forecast the fourteen stock markets of different countries. Alberg et al. (2006) used an asymmetric GARCH model in the Tel Aviv stock exchange data for the period from 1992 to 2005 and they found that EGARCH model performed the model in forecasting the TASE data series. Tudor (2008) used the data of Roman stock exchange and applied the EGARCH, GARCH-M and a standard GARCH model and showed that EGARCH is the best performing model in case of Roman stock exchange.
Akgiray (1989) applied ARCH models on the American stock market and studied the behavior of volatility of the same whereas Corhay and Rad (1993) tried to find out the efficiency of the ARCH models in describing the stock price behavior of the European stock markets since European stock markets are much smaller than the American one. They used the data for the France, Germany, Italy, the U.K. and the Netherlands and they found that the GARCH (1,1) model outperformed the higher ordered GARCH models and the ARCH models in case of all the stock markets taken under their study except Italy. They used Akaike’s Information Criterion (AIC) and the Schwartz’s Bayesian Information Criterion (SBC) to compare the GARCH (1,1), GARCH (2,1) and GARCH(2,2) models and they found that the GARCH(1,1) model was the best in terms of Goodness of Fit. GARCH (1,1) showed the smallest value for both the criterions and so they reported that GARCH (1,1) model is the best for the goodness of fit. They also tried to examine the forecast error for all these models by studying a one step ahead forecast and they found that the lowest forecast error is associated with the GARCH (1,1) model and hence they concluded that GARCH (1,1) is the best among the lot in terms of forecasting also. Kroner et al. (1995) said that these models ignore the expectations of the market and rely on the past values which are considered to be one of the major drawbacks of these models. Although they agreed that GARCH (1,1) model gives the best forecasting in terms of low forecasting errors but implied volatility can be used to forecast with better precision. They used six different methods to forecast volatility and they are two types of the Time series and the combined model (COMB), three types of the
implied standard deviation (ISD). They used the futures and options prices of cocoa, corn, cotton, gold, silver, sugar and wheat for the period from January 1987 to November 1990. The smallest Mean Squared Forecast Error (MSFE) was found in case of GARCH model while GARCH and COMB both the models were found to be reasonably good in terms of forecasting except for the commodity silver. However, they also said that although GARCH models are found to be the best models, but when the combined model is used it is to be noted that the combined model is more efficient than any other models available in the literature. They also said that their result is in parity with the results of Day and Lewis (1992) and Lamoureux and Lastrapes (1993). Dunis (1996) split the volatility forecast into five categories which are large up, large down, small up, small down and no change. The threshold boundary above large and below small movements were decided as a confirmation filter. Dunis and Gavridis (1997) determined the initial volatility positions only considering the buying option contracts which mean that the threshold was set only on the basis of buying a contract. These contracts are taken to have a one month expiry and these contracts are held unless the period of expiration is over. They said that this strategy is not an optimum strategy since there is a significant drop in the values of the option during its life time. They also tried to explore the possible outcomes if the holding period comes down to five or ten trading days. They tried two different strategies so as to avoid a number of positions to be accumulated at the same point of time. These strategies allowed one position in a month and two positions in a week which is to be triggered. Dunis and Gavridis (1997)
forecasted the option prices by using a GARCH (1,1) model but not using the combined model as suggested by Korner et al. Six different exchange rates were used for their study and those are USD/DEM, USD/JPY, USD/CHF, GBP/DEM, GBP/USD and DEM/JPY for the time period starting from 2\textsuperscript{nd} January 1991 to 30\textsuperscript{th} August 1996. A GARCH (1,1) model was used to find one month volatility forecast. The volatility positions were decided by buying or selling at-the-money one month forward contracts and then a threshold was set by the condition that if the forecasted volatility was less than or greater than the implied one-month volatility by more than the amount at which the initial volatility was set. Dunis et al. (2000) found that the combined model which consists of GARCH and implied standard deviation performed the best in forecasting the volatility of the returns of currencies. Kroner et al. concluded that the history of the time-series contains information about future volatility which is not captured by market expectations. This suggests that options markets are inefficient and/or the option-pricing formula they used was incorrect. They again said that ‘This implies it is possible that our volatility forecast can be used to identify mispriced options, and a profitable trading rule could be established based on the difference between the ISD and the COMB volatility forecast’.

1.2.5 Derivatives and Political Issues on Volatility:

There are a large number of literatures where the effectiveness of the derivatives market has been taken into account for conducting study in different types of countries, be it a developed country or be it a developing country. The correlation between the capital market and the derivatives market has been tested by a
huge number of researchers. The efficiency of a derivatives market gives rise to the price discovery of the commodities. Stoll and Whaley (1990) suggested that the cointegration between the futures and spot prices gives rise to exact price discovery and this price discovery helps a stock market to be more efficient and at the same time, the farmers and the buyers are also benefited by this. They also said that the commodities corn, orange juice and wheat showed highly efficient market for the futures and spot prices. Garbade and Silber (1983) reported that due to the constrained nature of the inventory and transportation of commodities, the supply of the commodities become restricted. They suggested that the cointegration between the spot and futures market in case of commodities will be evident in the long run but the Cointegration may not be observed in the short run. They undertook the study by taking the commodities gold, silver, corn, oats and wheat and they found that the spot and futures prices for the agricultural commodities are not cointegrated in the short run but they are cointegrated in the long run whereas the futures and spot prices for gold and silver were highly correlated both in the short run and in the long run. McKenzie and Holt (1998) tested the efficiencies of the U.S. futures markets for the commodities corn, soybean and cattle. Their study reported that the futures markets for all these commodities are both efficient and unbiased in the long run. Aulton et al. (1997) studies the spot and futures market for the commodities potatoes and wheat and they established that there is no interdependence between the spot and futures market for potatoes but they also reported that the Cointegration does exists in case of the commodity wheat. Silvapulle and Moosa
(1999) concluded from their study that in case of the commodity crude oil, the futures prices took the leading role in mobilizing the stock market. They used two types of statistical analyses, one is a linear and the other one is a non linear testing for finding the interdependencies and they found that although in case of linear model, the futures prices led the spot one but the non linear models suggested that there is a two way relationship between the spot and futures market. Kellard et al. (1999) showed that in case of the commodities live cattle and the soybeans, a long run efficiency of the spot and future market exists but in the short run there was no efficiency found. Zapata et al. (2005) found that there is a strong correlation between the export and the futures prices of the commodity sugar and they also said that the informational efficiency in case of the commodity sugar can be used to reduce the market risk. They also said that any information which affect the spot market, will also affect the futures market and the vice versa. Asche and Guttormsen (2002) also studied the relationship between the spot and futures market and they suggested for the gas oil, that the futures prices play a leading role to motivate the movement of the cash market.

There are a number of literatures in which the researchers observed that there is an increasing trend in the liquidity of the cash market. Some studies also reported that after the introduction of the derivatives market, the informational efficiency of the stock market has been increased manifold. Stein (1987) reported that introduction of the stock market has a significant impact on the behavior and characteristics of a stock market. A number of researchers claimed that the
informational transparency has been increased in the capital market due to the introduction of the futures market.

Powers (1970) reported that after the introduction of the derivatives market, the volatility was significantly lower than earlier. Cox (1976) reported that the volatility of the stock market is affected by the introduction of the futures market. Figlewski (1981) said that the movement of the characterizing indices of the capital markets was impacted after the introduction of the futures market. Schwarz and Laatsch (1991) found a decreasing trend in the volatility of the stock prices after the introduction of the derivatives. Chan et al. (1991) studied the S&P 500 index and index futures and they suggested that there is a strong correlation between them. They also claimed that knowing the movement of any one of the markets, the other one can be predicted. They studied these two markets for the period from August 1984 to December 1989. Rafael (1996) examined the Ibex index of Spain for the period from October 1990 to December 1994 and applying GJR-GARCH, EGARCH and standard GARCH models, he observed that the volatility of the disturbance term decreased after the entry of the derivatives market in the Spain.

Silvapulle and Moosa (1999) found causal relationship in one direction and both directions applying Granger Causality and nonlinear causality test respectively. They studied the spot and futures prices of crude oil and found a significant interdependence between them. Rahman (2001) used the data of DJIA index and after application of GARCH (1,1) model; he found that the entry of the futures market could not significantly change the movement of the stock
exchange. Ferretti and Gilbert (2001) applied GARCH (1,1) model, VECM and many other regression models to study the effect of the entry of futures on the capital markets and they reported that the volatility of the cash market has been significantly lower than that before the introduction of the futures in the Indian stock market. Thenmozhi (2002) found that as soon as the futures market entered India, the stock market was stabilized significantly. Gupta (2002) examined the Indian financial market by taking two leading stock exchanges those are Bombay Stock Exchange and National Stock Exchange for the periods from June 1998 to June 2002. He inferred that there was a declining trend in the volatility of the Indian stock market as soon as the futures market was introduced in India. Bologna and Cavallo (2002) applied a GARCH (1,1) model on the stock prices of the Italian stock market and found that the disturbance variance is significantly reduced after the introduction of the derivatives market in the Italian stock market. Chiang and Wang (2002) examined the stock market of Taiwan using a GJR-GARCH model and they concluded that introduction of futures could make the stock market of Taiwan stable.

Zapata et al. (2005) showed that the futures price of the sugar is caused by the stock prices of sugar. They used a Granger causality test and found the causal effects between them in case of New York Stock exchange (NYSE). Alexakis (2007) observed no dependence between the FTSE 20 index and the introduction of the derivatives market. On the other hand, Drimbetas et al. (2007) studied the FTSE/ASE 20 index by using an EGARCH model and reported that the stock market became more efficient, as far as the transfer of information is
concerned, on the basis of the interference made by the options and futures market. Asche and Guttormsen (2002) showed that there is a trend that the futures prices of gas oil lead the stock prices of the same. They also observed that the futures contracts with lengthier expiry lead the contracts with shorter expiry. Irwin et al. (2007) analyzed the markets for corn, soybean and wheat and tried to find the change in the liquidity, convergence and volatility of these contracts.

Very few researches have addressed the impact of political issues on the volatility of a stock market. Kim and Mei (1999) studied the Hong Kong stock market and found that Heng Seng Index is highly dependent on some political events. Bailey and Chuang (1995) took the case of Mexico and studied the impact of fluctuations of exchange rate and some political risks on equity returns and found that these factors significantly influence the equity market. Kim and In (2002) reported that some U.S. and Australian news have significant effect on the Australian stock market. Fukuda and Kano (1997) found the East Asian equity market to be more correlated to the overall price level of the U.S. than that of Japan. Pan et al. (2006) used a Ganger co-integration test within Markov Switching framework and then found that six out of seven East Asian countries are having dynamic linkage between exchange rates and the stock prices. Gemill (1992, 1995); Cohen (1993); Roberts (1994); Freeman et al. (2000); Leblang and Bernhard (2000a and 200b) McGillivray 2000, 2002; and Martin and Moore (2003) studied the role of political uncertainties, election system and partnership on the movement of volatility of the stock market. Blomberg and Hess (1997);
Roubini and Cohen (1997) also studied the political uncertainties and its impact on the stock price volatility. Lobo and Tufte (1998); Herron et al. (1999) also supported the results of the above literatures. These researchers used ARMA, GARCH, Markov switching models and EGARCH for understanding the correlation between the volatility of the stock prices and different economic attributes. Turner et al. (1989); Simonato (1992) and Norden and Schaller (1993) established that Markov-Switching models are better models than the linear and non-linear GARCH models in terms of forecasting the future prices. Sola and Timmerman (1994); Kim et al. (2002) supported the results of the above researchers. Cohen (1993) and Alesina et al. (1997) said that if the electoral dynamics change, then it is obvious that the exchange rate, bond prices and stock prices will be extremely affected. Herron (2000); Freeman et al. (2000) and Gemill and Saflekos (2000) documented the same results.

Wang and Ke (2005) studied the futures market for the commodities wheat and soybeans and revealed that there is a long-term and a short-term relationship between the spot and future prices of these commodities. Thomas and Karande (2001) studied the Indian commodity market with a special attention to the commodity castor. They observed that the futures prices dominated the spot prices. They also observed that the commodities, which are based on the export, did better than the commodities which are based on agriculture. Ramaswami and Singh (2006) tried to identify the price innovations of soya oil futures and they found that hedging is possible at National Board of Trade. They also said that the efficiency of the spot market became higher after the
introduction of index futures. Iyer and Mehra (2007) found that the futures for Chana and Copper had a significant role to play in the efficiency of the cash market. In case of Nickel, they found that spot prices of Nickel led the futures prices of the same on the contrary to this, in case of Gold and Silver they observed a high correlation between the spot and future markets. Morgan (2000) said that the low volatility in the prices of agricultural commodities does not give the farmers to enjoy high income and on the other hand high volatility does not help them in increasing their income.

1.2.6 Volatility of Stock and Commodity Market:
Agriculture, being the only source of our primary need i.e. food, is to be given attention. In case of agricultural commodities, price innovations are to be given the top most priority since the farmers and the buyers should not be deprived in anyway. Aizeman and Marion (1993), Rodrick (1999) and Ramey and Ramey (1995) reported that volatility is one of the factor which can affect the macroeconomic variables and in a way it may lead to poverty. Acemoglu et al., (2003) and Aizeman and Pinto (2005) reported that there is a causal relationship between the volatility and financial crises. They argued that higher volatility may lead to a financial crisis. So, it is extremely important to have a sound knowledge about the dynamics of the price variations not only because it will help the farmers but also it will be of immense help to the commodity market participants, be it in form of buyer or in form of investors. Some researchers attempted to find the government policies either to tackle this problem of variability or to protect their citizens from a significant loss due the price volatility. Deaton and Laroque
(1992) and Cashin and McDermott (2002) emphasized that agricultural commodities should be into the focus of the researchers. They studied the world agricultural prices for some commodities such as grains and dairy products for the period 2006-2009 and they observed that almost similar kind of variability is there during 2006-2008 but a sudden decline in the prices in the middle of 2008. They also attempted to investigate the reason for such a sharp decline in the prices of the agricultural commodities. OCED (2009) has reported that there are a number of different types of risks to which the agricultural products are exposed; those risks are weather, production, market, financial, institutional, personal and many more. The farmers are dependent on the market risk since they get the price against their products or pay for buying the seeds depending on the uncertainty prevailing in the market. Mathews (2010) said that the policy makers and the investors take keen interest on the agricultural commodities’ price volatility. A large number of researchers focused on the price changes and the possible factors responsible for the change in prices (Abbott and Borot (2009); Gilbert (2010); Gilbert and Morgan (2010)). The supply and demand dynamics are often studied by various researchers. Asian countries experienced a fast economic growth and for this a rapid change in the demand is observed and on the other hand, supply is limited due to the low investment in agricultural commodities and low inventory levels of the commodities. The increase in the production of bio-fuels may give rise to less supply and more demand for some particular food crops. The change dynamics can be better understood by looking at some macroeconomic and financial parameters. The oil price change, world
market money supply, exchange rates, value of the dollar and many other factors are responsible for the changes in commodity prices. The change in the climate and the trading policies of those countries which are actively participating in export and import of the commodities may also be considered as the influencing factors for the change in the prices of the commodities. Gilbert and Morgan (2010) said that there is a significant role of speculation of prices for trading on agricultural commodities. De Schutter (2010) also highlighted the same. OECD (2009), Galtier (2009) and Mathews (2010) investigated the government policies of different countries which can neutralize the risk of price volatility. They also tried to see whether these strategies help the farmers to combat with this situation or not. The transfer of risk can be made by using some market based instruments and this may reduce the world market price variations. Dehn et al. (2005) said that price volatility not only affects the developing countries but it has impact on other countries as well. There are a number of countries in which the governments are dependent on the export of commodities for the generation of revenue. It is not very easy to treat the price instability since the need of the producers and the consumers may vary widely and hence it is obvious that it is not a child’s play to invent a unique strategy to combat with the price variability. Gilbert (2006) studied the agricultural price instabilities and he showed that the volatility was found to be very low in the decade of 1960s, higher in the 1970s and again low in 1980s and 1990s. Although in 1980s and 1990s the volatility was low but not as low as in 1960s and 1970s. Galtier (2009) examined the developing countries and tried to find the efficiency of the developing countries in
respect of managing the risk of price volatility. They said that even in the lower portion of the democratic structure i.e. the household, there is a significant effect of the commodity price instability. It is now obvious that the farmers and the government are significantly affected by the price volatility of the commodities. Gilbert and Morgan (2010) studied nineteen agricultural products and they observed for the period 1970 to 2009 that the volatility was lower in 1990s and 2000s than the previous decades. But they observed that this scenario is not being supported only in case of the commodity rice. Most surprisingly, they observed that the volatility during 2006-2008 was in parity with the volatility in 1960s, 1970s and 1980s. Randal (1992) suggested some of the underlying principles to win in the stock market. He emphasized that although every year there has been some economic downturn may be with different degree but still there are some patient investors who make profits even after passing through all such hurdles. He also suggested that the investment in the equity market should not be made on the basis of some intuition or emotional activities. Gupta (1992) said that Indian stock market is a victim of wild guess and speculations. The speculative nature of the Indian investors has made a very few equities to be a part of the category of shares which are frequently traded and this leads to the negligence for the other stocks and for this the homogeneity of the market is questioned. Yasaswy (1993) exposed that the highly volatile shares can also give a steady growth and at the same time a very high risk is involved in investing into these kinds of shares. He said that the stock market will tend to be depressed if the economy and the fundamentals of the market are not healthy. Balcombe
(2009) reported that there is persistence of instability in the prices of agricultural commodities whereas Sumner (2009) found no persistence of volatility patterns. He studied the data for price of wheat and maize for the period from 1866 to 2008 and he found that the instability of prices matches only in the periods 2006-2008 and 1970s.

1.2.7 Different Types of Risks:

Damodar (1993) said that ‘Futures’ can be treated as a tool for controlling the short term risk. Derivatives have been found to be a very important instrument for hedging the risk of investing in a portfolio. Yasaswy (1993) studied the intensity of the risks associated to the different types of financial instruments. Returns are relatively lower in case of defensive stocks whereas the cyclical stocks are associated with higher risks. There is another kind of stock which is known as growth stocks and these stocks offer medium level of returns so, it can be said that the growth stocks are better than the defensive stocks but worse than the cyclical stocks. The fluctuation of the growth stocks is sometimes extremely violent at the time of market booms or busts. The most important and lucrative strength of a growth stock is that it recovers very quickly even if it attains some drastic downfalls. Jhorion and Khoury (1996) surveyed the risk factors which are responsible for the behavior of financial markets. The domestic investment was found to be a subset of the decisions related to the global asset allocation and the evaluation of the domestic securities with respect to international factors was found to be impossible. They advised that the Investors should be aware of those factors which drive the stock prices and the correlation between the movements
of the stock prices and the exchange rates. They reported that the volatility of the financial markets has increased manifold over the last decade because of the economic unification in the Europe, the drive of the communist countries to explore the free market policies, oil price shocks etc. They said that there is a need for some strict risk controlling policies to arrest the problem of greedy fluctuations in the financial markets. Rajagopal (1996) emphasized the risk management in case of banks. He suggested that if some professional approach for managing risk will be taken, the banking institutions will be performing well in the long run. The probability and the time of a possible loss can be predicted by measuring the risk by various ways. Charles (1996) found the way to estimate the risk by estimating the cash flows of the securities. He also said that the investors should quantify the risk by measuring the standard deviation since standard deviation is the most efficient measure of variability in any data set. He reported that the returns of stocks and bonds have shown normal growth over the past twelve years. He opined that if an investor believes that the sixteen percent per year growth of blue chip stocks will continue in the long run, then that investor will fall in trouble. Godse (1996) explored two different methods for measuring the risk. Bhalla (1997) spotted the factors which influence the movement of the equity prices. He stated that the equity markets are more subjected to get affected by risks than the bonds. Ghosh (1998) studied different types of financial institutions and the risks influencing them. He said that the risk management strategies are different in nature for financial institutions, banks, non-banking institutions and manufacturing companies. Interest rate risk, foreign
exchange risk, market risk, country risk, liquidity risk are some of the risks which are responsible for the behavior of banks, non-banking organizations and financial institutions whereas the manufacturing companies get affected by business risk and financial risks. Subramanyam (1998) identified that proper risk identification, classification of risk and prediction of risks by some efficient managerial tools are to be practiced in banking organizations for managing the risks. The customers of the banks will be benefitted by the introduction of scientific and rational risk management procedures by the banks. Watsam (1998) gave an idea about the nature of the risks associated with derivatives, method to measure those risks and process to manage them. He proposed that risk is nothing but an uncertainty which can be numerically presented as the unexpected change in the price of a financial instrument. He opined that an organization which deals with derivatives will have to be accounted for some risks as in market risks, legal risk, debt /credit risk, operational risk etc. Ghose (1998) studied the different aspects of Value at Risk and he said that the Daily Earning at Risk (DEAR) and the Value at Risk are the two steps for measuring the market risk. He emphasized that modified duration approach is one of the best approaches for the measurement of the price sensitivity. Mall and Singh (1998) said the reduction of risk can be done by diversification and flexibility. They reported that diversification has two roles to play, one is to reduce the risk and the other one is to maximize the possibilities of high gains. They also stated that insurance can be treated as one of the way-out for reduction of risk. In case of agricultural business and insurance companies some efficient schemes can
reduce the risk. Banerjee (1998) reviewed the process of construction of a portfolio and he studied the fundamental analysis and technical analysis to understand the fact whether a particular stock is worthy enough to be included in a particular portfolio. The intrinsic value and the actual market price of a particular security are compared by the use of fundamental analysis. The value of a security is actually determined by the fundamentals of the industry, companies and the economy of a country. The fundamentals of the economy, industry and company determine the value of a security. Pujadas (1999) reviewed the different models of measuring risks. He stated that the assumptions associated to the risk measurement models are not realities. He also said that these models are unable to depict the true picture of the risk which is to be encountered by a security. Bishnoi (1999) studied the risk associated with the gilt funds. According to him, investors should not be over confident about the gilt funds rather they should keep close watch on these funds to estimate the interest rate and the risk associated to these funds. He said that investors should keep in mind that the risk premium is directly proportional to the risk associated to that particular security. The higher is the risk, the more is the risk premium. So, it is to be understood that the gilt funds which give on an average eleven percent return, must carry a high degree of risk. In an economic time series, it has been observed that the aggregation of cross section of the data series gives rise to the existence of long memory. Granger (1980) reported that the existence of long memory in the data will be perceived due to the aggregation of cross section of time series data. For the forecasting of volatility, Akigray (1989) found that
GARCH (1,1) is the best model among all the other models for forecasting the volatility. Different researchers used different data sets of different countries and reported different results. Pagan and Schwert (1990) took a study for forecasting the volatility of the U.S. stock returns using GARCH, EGARCH, Markov Switching model and three non-parametric models and concluded that EGARCH performed the best. Haubrich and Lo (1991) explained business cycles with the long memory pattern. Hamilton and Susmel (1994) and Cai (1994) introduced an explanatory variable for the regime switching component in the original ARCH model and studied the impact of regime switching on the stock returns. Brailsford and Faff (1996) reported that the GJR GARCH and GARCH models are better than other simpler models available for the prediction of volatility. They used the data of Australian stock index and concluded that the volatility can be better predicted by using GJR GARCH and GARCH models. Franses and Dijk (1996) compared the GARCH, QGARCH and GJR GARCH models for and then inferred that the standard GARCH model performed better than the non-linear GARCH models in forecasting European stock market indices. From the literature on forecasting volatility, it is clear that it is not very easy to forecast volatility. The performance of different models varies depending on the nature of the time series data taken under the study. Parkinson (1980) revealed some of the extreme value volatility estimators and he said that these estimators are based on the wide range of the change of prices whereas the usual volatility estimators use only the closing prices of a particular equity. The traditional estimators are not as efficient as these estimators but in terms of popularity, the traditional
estimators outperformed these kinds of estimators. Due to the discreteness of the prices, these estimators could not catch the interests of the researchers as compared to the traditional volatility estimators. However, Li and Weinbaum (2000) used the extreme value estimators and the traditional estimators on high frequency data and reported that the efficiency of the extreme value estimators is more than that of the traditional volatility estimators.

1.3 Research Gap:

Based on the above literature survey, the following research gaps are identified: There is a paucity of literature to observe the impact of recent global recession on specific industrial sectors. It has also been seen that Independent component analysis has never been used as a tool to combat with the problem of multicollinearity and moreover there is a very few literatures which apply this analysis on the stock market data. The review of literatures points out that there is a scope to see the volatility spillover effect on Indian stock market. The effect of introduction of derivatives, Union budget and Loksabha Election on the Indian stock market is another important area which has been identified as a research gap. One more research gap which has been identified is that the volatility of commodity stock and futures market has not been studied using a Bayesian GARCH model earlier.
1.4 Objectives:
Based on the Research gaps, we formulate the following objectives of the Study:

1.4.1 To study the overall scenario of the Indian stock market.

1.4.2 To study the impact of global recession on the Indian stock market with emphasis on some leading sectors.

1.4.3 To find the effect of leading economic indicators on the Indian stock market and to establish the Independent Component Analysis (ICA) as a tool for handling multicollinearity for stock market data.

1.4.4 To see the volatility spillover effect from seven different stock exchanges to the Indian stock market.

1.4.5 To find whether there is any effect of introduction of the Futures market, Union Budget and Loksabha Election on the volatility of the Indian stock market.

1.4.6 To model the volatility of the Indian Commodity market with emphasis on some agricultural commodities.

1.5 Hypotheses:

To fulfill the above objectives we formulate the following hypotheses:

1.5.1 $H_{0i}$: The Global Recession has no impact on the i$^{th}$ industrial sector, $i = 1,2,3,4$ (where 1 stands for Media Sector, 2
stands for Steel Sector, 3 stands for IT sector and 4 stands for the telecommunication sector).

1.5.2 \( H_{0j} \): The volatility of Nifty and the \( j^{th} \) economic indicator has no association between them, \( j = 1, 2, 3, \ldots, 12 \) (1 stands for CPI, 2 stands for GDP, 3 stands for IIP, 4 stands for IR, 5 stands for IIR, 6 stands for M1, 7 stands for M2, 8 stands for M3, 9 stands for IFER, 10 stands for E, 11 stands for BT, 12 stands for I).

1.5.3 \( H_{0k} \): There is no effect of the volatility of the \( k^{th} \) stock exchange on the volatility of the Indian stock market, \( k = 1, 2, 3, \ldots, 7 \) (1 stands for Jakarta, 2 stands for DAX, 3 stands for DOW, 4 stands for Malaysia, 5 stands for S&P, 6 stands for SSE, 7 stands for TSEC).

1.5.4 \( H_{0l.1} \): The introduction of the derivatives has no impact on the volatility of the Indian stock market.

\( H_{0l.2} \): The announcement of the union budget has no impact on the volatility of the Indian stock market.

\( H_{0l.3} \): Loksabha election of the country has no impact on the volatility of the Indian stock market.

1.5.5 \( H_0 \): Commodity Spot market prices and the Commodity Futures market prices are not cointegrated.
1.6 Data Sources and Methodology:

1.6.1 Data:
The time period for this study is taken to be 2001 – 2010. So, in majority of the cases the data have been restricted for this time period. But there are some chapters where this time period has been extended up to 1994 as the lower limit and up to 2012 as the upper limit of the time period. The proxy variable for the Indian stock market movement has been taken as the Nifty. Twenty different companies under four different industrial sectors have been taken as the representative of overall scenario of the business corporate in India. This study includes CPI, IIP, IIR, IR, E, I, BT, M1, M2, M3, IFER and GDP as the proxy for the economic scenario of India. Stock market indices of seven different cross border stock markets have been taken as the proxy variables for the respective stock market. This study also takes Multicommodity Exchange data for spot, futures and agricultural commodities.

1.6.2 Methodology:
The following are the methodologies which have been used for the data analysis of this thesis: Johansen Cointegration Test, GARCH, t- Test, Chow Test, VAR, Augmented Dickey Fuller Test, Linear Model, Variance Inflation Factor (VIF), Independent Component Analysis (ICA), VECM, Polynomial Distributed Lag Model (PDL), TGARCH (1,1) model with dummy variables, Variance Decomposition Method, Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), Hannan Quinn Information Criterion (HQ)
1.7 Summary of the Thesis:

1.7.1 Global Recession and the Indian Stock Market:

The effect of the recent global recession on Indian stock market has been studied in the Chapter 3. The impact of the global recession has been studied with emphasis on some major sectors of industries, e.g. Steel, Media, Mobile communication and IT. Dividing the whole dataset into three strata those are Pre-Recession period, Turmoil Period and Post-Recession period, Vector Auto Regression have been employed to study whether the efficiency of the market is preserved or not. It is also needed to check whether the volatility of the Post-Recession period has increased compared to the Pre-recession period or not. Chow test is used to identify the change of point in the daily log return of Nifty values. This chapter intends to study the impact of global recession on the overall stock market volatility as well as the change in performance of twenty reputed companies, from four sectors, listed under the National Stock Exchange. An effort has been made to find out the status of recovery of those twenty companies after the global recession took place in the last week of October, 2008. These companies have been stratified into different classes depending upon their nature of activities. This chapter uses the methodologies such as two sample t test, Vector Auto Regression (VAR), Variance Decomposition Method, Chow test and Augmented Dickey Fuller Test. The objective of this chapter is to find out the level of elevation from the immense loss of the companies and resulting to which the significant loss of the small scale and large scale investors
on the stock market. This dataset has been divided into three parts: Pre-Recession Period, Turmoil Period and the Post-Recession Period. VAR model, t test and Variance Decomposition Method assert the recovery of the majority of companies during the Post Recession Period.

1.7.2 Macroeconomic Indicators and the Indian Stock Market Volatility and ICA as a Tool for Handling Multicollinearity:

In the chapter 5, the impact of economic indicators on the volatility of the Indian stock market has been studied. Volatility of the most characterizing indicator of the Indian stock market i.e. Nifty has been calculated by using a GARCH (1,1) model. Twelve economic indicators (CPI, IIP, IR, IIR, M1, M2, M3, IFER, E, BT, I) have been taken to see the effect of them on the GARCH volatility of the Indian stock market indicator i.e. Nifty. Since for GDP, only quarterly data is available, for rest of the indicators quarterly average have been taken for the study. While using the linear regression model taking GARCH Volatility of Nifty as the dependent variable and the twelve economic indicators as the independent variables, multicollinearity among most of the economic indicators (seven out of twelve) is experienced, so it is not possible to drop all of these variables. Analyzing the data it has been found that no economic indicators are following Normal distribution. To eradicate the multicollinearity, an Independent Component Analysis (ICA) has been adopted to get the independent components of those economic indicators which are showing high multicollinearity (VIF ≥ 5). After having the independent components of those seven economic indicators, a linear regression model has been fitted to the data. It has also been seen that GDP is significant neither in the linear regression
model before ICA nor after ICA. So, it is judicious to drop this independent variable (GDP) so as to increase the number of data points, since rest of the variables are having monthly data points. After taking the monthly data of the rest of the eleven indicators, the same set of analyses have been performed and has been seen that the result of the Independent Component Regression has been improved.

1.7.3 Cross Border Volatility Spillover on Indian Stock Market:

In the chapter 6, the cross boarder effect on the volatility of a country has been searched for since it is an important aspect of research. This chapter intends to study the volatility spillover from seven different stock exchanges (JKII-Jakarta Islamic Index (Jakarta), DAX-Europe (DAX), Dow Jones U.S. (DOW), FTSE Bursa Malaysia KLCI- KLSE (Malaysia), S&P 500 index from U.S. (S&P), SSE Composite Index Shanghai (SSE) and TSEC weighted Index Taiwan (TSEC)) to the volatility of Indian stock market. Volatility of each of the stock exchanges taken under the study is estimated by using a GARCH (1,1) model. The stock market indices of Europe, USA, Jakarta, Malaysia, Shanghai and Taiwan and the S&P 500 index from the U.S. have been taken to study the effect of these indices on the volatility of Nifty. A Polynomial Distributed Lag (PDL) model has been used to find out the relationship between Nifty and all other indices. The result of a Vector Error Correction Model (VECM) is again rechecked by the PDL. This study finds a significant causal relationship between the Indian stock market and majority of other markets. The present study focuses on some emerging markets such as Jakarta, Malaysia, Shanghai and Taiwan. To measure the volatility
spillover from the seven leading indices to the leading indicator of Indian stock market i.e. Nifty, at first the volatility of all of these indices are estimated by using a GARCH (1,1) model and then a Vector Error Correction Model (VECM) is fitted to the data and a significant co-movement between the Nifty and majority of the indices is found. Since, time series data does not always have a direct relationship with others on the basis of current data; they sometimes exhibit a relationship when a lagged variable is taken into consideration and they sometimes are not linearly related but the relationship may be non-linear as well and this is why a Polynomial Distributed Lag Model (PDL) is fitted on the data and a significant correlation is observed between the Indian stock market and other leading indicators except S&P 500 index.

1.7.4 Volatility of the Indian Stock Market with respect to some Eco-Political Indicators:

Although, introduction of derivatives may have significant impact on the volatility of the stock market but there are other potential factors as well which can equally impact the volatility of the stock market. The primary objective of the chapter 7 is to analyze the effect of some of the economic and political variables on the volatility of the Indian stock market. The proxy variable for the stock market has been taken to be the NSE S&P CNX Nifty. Three dummy variables have been constructed for introduction of futures markets in India, announcement of union budget every year and the occurrence of Loksabha elections, respectively. It has been assumed that the financial investors are a bit skeptical about investing in stocks in the period commencing from one month prior and one month after the
union budget has been announced. Hence, there is a chance that during this period every year, there is a change in the volatility of stock markets and so the dummy variable for budget has been made accordingly. Similarly for the Loksabha elections also, the dummy variable has been constructed accordingly. This chapter shows that the introduction of derivatives, announcement of union budget and commencement of Loksabha election have significant impact on the Indian stock market volatility.

1.7.5 Indian Commodity and Stock Market:

In the chapter 8, it has been attempted to study whether the commodity futures market provides information and subsequently whether it helps to reduce the volatility of the Indian spot market. The main purpose of this thesis is to study the characteristics of the Indian commodity futures market for studying whether the efficient functioning of the market depends on the pricing of the commodities. The MCX spot and future indices, MCX agricultural spot and future indices and daily Nifty returns has been used for the cointegration analysis to find out whether price formation is efficient or not. Secondly, for a collection of agricultural commodities traded on National Commodity Exchange (NCDEX), this thesis intends to test the efficiency of the Indian commodity market using cointegration analysis. Since, rice is a very important agricultural commodity for India, this thesis studies the commodity futures market for different qualities of rice, potato, wheat and masoor grain. The indices for these agricultural commodities have been taken from the National commodity Exchange. It also focuses to find out the information flow for these commodity futures using a GARCH model. Using
Bayesian estimation of GARCH (1,1) model with student – t innovation, the stationarity of the commodity spot and future market and the Indian stock market have been tried to be explored. It has been found that the commodity spot market indices and the futures market indices are cointegrated with each other.

1.8 Conclusion:

The 2008 Global recession had a downturn effect on the Indian stock market and on the four leading sectors which are Steel, IT, Media and Telecommunications. Although there was a ratcheting down effect of the Global financial meltdown 2008 on some leading companies but it has been concluded that these companies showed a significant recovery in terms of stability. It is fortunate to note that majority of the companies have shown a speedy recovery from the tickling down effect of the current downturn in the economy.

The leading economic indicators of India have a significant role to play in the movement of the Indian stock market. Independent Component Analysis has been successfully reported as one of the efficient tool to combat with the condition of multicollinearity for time series data which do not follow a normal distribution.

The political and financial scenario plays a vital role in the volatility of the Indian stock market.

There is a significant volatility spillover effect from seven different stock exchanges to the Indian stock market. A pair wise co-movement between the Indian stock market and the other stock exchanges is established in this study. A successful application of the Polynomial Distributed Lag (PDL) model is executed.
in case of lagged variables. The improvements in the results have been noticed after the employment of PDL model in the study.

The Indian commodity market has been established to be a stationary and efficient market. The commodity spot market and the commodity futures market are found to have a strong correlation between them. Bayesian GARCH prior estimation of the volatility of the Indian commodity market has enabled to understand the estimation of the posterior volatility.