# CHAPTER-VII

# SUMMARY AND CONCLUSION

The emergence and growth of market for derivative instruments can be traced back to the willingness of risk-averse economic agents to guard themselves against uncertainties arising out of fluctuations in asset prices. Derivatives are meant to facilitate hedging of price risk of inventory holding or a financial/commercial transaction over a certain period. They serve as instruments of risk management. By locking-in asset prices, derivative products minimize the impact of fluctuations in asset prices on the profitability and cash flow situation of risk-averse investors. By providing investors and issuers with a wider array of tools for managing risks and raising capital, derivatives improve the allocation of credit and the sharing of risk in the global economy, lowering the cost of capital formation and stimulating economic growth. Now that world markets for trade and finance have become more integrated, derivatives have strengthened these important linkages between global markets, increasing market liquidity and efficiency and are seen to be facilitating the flow of trade and finance.

The financial derivatives gained prominence in post-1970 period due to growing instability in the financial markets and became very popular, accounting for about two-thirds of total transactions in derivative products. In the recent years, the market for financial derivatives has grown both in terms of variety of instruments available, their complexity and turnover. Financial derivatives have changed the world of finance through creation of innovative ways to comprehend measure and manage risks.

India's tryst with equity derivatives began in the year 2000 on the NSE and BSE. Trading first commenced in Index futures contracts, followed by index options in June

2001, options in individual stocks in July 2001 and futures in single stock derivatives in November 2001. India's experience with the launch of equity derivatives market has been extremely positive. The derivatives turnover on the NSE has surpassed the equity market turnover. Since then, equity derivatives have come a long way. New products, expanding list of eligible investors, rising volumes and best of risk management framework for exchange traded derivatives have been the hallmark of the journey of equity derivatives so far. The present study has explored the basic institutional features of the derivatives market with special reference to singe stock futures market in India.

The futures contracts are a type of forward contract traded on organized exchanges and featuring highly standardized contract terms. The stock futures contracts are the financial instruments whose values are derived from the underlying individual stocks. The trading in single stock futures started on November 9, 2001. The growth of stock futures at NSE has risen from Rs.51,515 crores in 2001-02 to Rs. 5,195,247 crores in 2009-10. Highest percentage of stock futures trading was witnessed in the year 2002-03 (65.14%). This year particularly showed the market confidence in the single stock futures which accounted for 65% of the market share in derivatives turnover. On average, India's experience with the launch of stock futures derivatives market has been quite encouraging. The institutional environment of futures market segment includes a clearing house to guarantee all trades and margin system, designed to protect the financial integrity of the market place. This system allows the futures market to provide important economic functions viz. price discovery and risk transfer (i.e. Hedging). The futures market provide benefits to participating traders by reducing transaction costs, by providing a more efficient flow of information among traders, and by shifting risks

among them. Besides, the stock futures market is playing a major role in shaping price discovery and acts as major risk management tool for hedging against adverse price movement.

The role of price discovery potentially helps to improve the efficiency of the spot market. Trading in futures market establishes and makes visible both current and expected future spot prices. The efficacy of the hedging function is dependent on the price discovery process or how well new information is reflected in price. In general, futures markets are found to respond faster to new information than spot markets since the transaction cost is lower and the degree of leverage attainable is higher. The futures prices provides a good guide to future spot prices and reveal price information that helps society to allocate capital more efficiently.

The debate on the impact of futures trading on the spot market volatility has been abundant and the effect seems to be ambiguous. From the theoretical point of view, the impacts of futures trading on the volatility of the underlying spot markets are still controversial. One view is that introduction of futures market increases spot market volatility due to the fact that high degree of leverage benefits and low transaction costs in derivatives market are likely to attract larger uninformed traders. The lower level of information of futures market traders with respect to spot market traders is likely to increase the spot market volatility.

Conversely, the introduction of futures market trading reduces the spot market volatility because low cost contingent strategies and high degree of leverage benefits in futures market attracts larger speculative traders from a spot market to a more regulated futures market segment. This makes the spot market less volatile by reducing the amount

of noise trading. The proponents of 'market completion' hypothesis argue that futures trading helps price discovery, improves the overall market depth, enhances market efficiency, increases market liquidity and ultimately reduces informational asymmetries and thereby compresses spot market volatility.

An important function of futures market is to permit investors to reduce or control risk by transferring it to others more able or more willing to bear the risk. An investor can take a position in futures contracts to offset an exposure to the price of an asset. A short hedge is appropriate, if the exposure is such that the investor gains when the price of the asset increases and losses when the price of the asset decreases. If the exposure is such that the investor gains when the price of the asset decreases and losses when the price of the asset increases, a long hedge is appropriate. Hedging is a way of reducing risk. As such, it should be welcomed by most executives.

An important concept in hedging is basis risk. Basis is the difference between the spot price of an asset and its futures price. Basis risk is created by a hedger's uncertainty, as to what the basis will be at maturity of the hedge. Basis risk is generally greater for consumption assets than for investment assets. The hedge ratio is the ratio of the size of the position taken in futures contracts to the size of the exposure. It is not always optimal to use a hedge ratio of 1.0. If the hedger wishes to maximize the variance of a position, then a hedge ratio should be different from one. The optimal hedge ratio is the slope of the best fit line obtained when changes in the spot price are regressed against changes in the futures price. The hedgers need to hold a certain amount of futures contracts in order for them to hedge their spot assets on hand. Therefore, it is essential to estimate that how

many futures contracts should be seized for each unit of spot asset and hence it is important to estimate the appropriate hedge ratio.

From the theoretical perspective, the introduction of futures market makes a significant influence on corresponding spot markets. The movements of the spot market price have been largely influenced by the speculation, hedging, and arbitrage activity of futures markets. Therefore, the debate on the impact of futures trading on spot market volatility has become increasingly important research issue among academicians, regulators and investors alike.

In the light of foregoing discussion, the present study attempted to investigate the following objectives:

(i) To investigate price discovery and causal relationship between NSE spot and futures markets of eighty-three underlying stocks belonging to eleven sectors of India.

(ii) To examine the impact of introduction of futures trading on the spot market volatility of seventy-one underlying stocks of National Stock Exchange (NSE) that belonging to eleven sectors of India.

(iii) To estimate the optimal hedge ratios and hedging effectiveness of NSE equity futures market of eighty-three underlying stocks that belonging to eleven sectors of the economy.

The present study consists of seven chapters. By introducing the concept of derivatives, the first chapter briefly explains historical background of futures market segment in India with special reference to single stock futures market. Then it explores the concept of price discovery, volatility and hedging effectiveness of futures market. The

objectives of the study, data and methodology and scheme of the study are also presented in this chapter.

The second chapter deals the concept of derivatives market, types of derivatives, economic functions of futures market and traders in futures market. The futures markets provide benefits to participating traders by reducing transaction costs, by providing a more efficient flow of information among traders, and by shifting risks among them. Besides, the stock futures market in India has shown a remarkable growth both in terms of volumes and numbers of traded contracts. The equity futures market is playing a major role in shaping price discovery and acts as major risk management tool for hedging against adverse price movement. The theoretical models of futures price and hedging strategy and theories of hedging have also been discussed. This chapter also gives clear exposition about futures market. Futures market provides two social benefits. They are (i) price discovery, and (ii) risk management. In the price discovery, it has explored how the information transmits from one market to the other. The risk management system is referred to hedgers using futures contracts to control their spot price risk. This chapter also touches upon the brief history of derivatives trading in India and trading mechanism of stock futures market at National Stock Exchange (NSE).

In chapter-III, a review of the earlier literature relating to price discovery, volatility and hedging effectiveness of futures market was attempted.

Chapter-IV empirically investigated the price discovery and causal relationship between NSE spot and futures markets of eighty-three underlying stocks that belongs to eleven sectors of India. Johansen's (1988) Cointegration and Vector Error Correction Model (VECM) were employed to examine the lead-lag relationship between spot and

futures market prices of eighty-three stocks in India. As a preliminary investigation, Augmented Dickey-Fuller (1979) and Phillips-Perron (1988) tests were employed to verify the stationarity of the spot and futures price series. Further, the necessary lag length of the data series was selected on the basis of Akaike's Information Criteria (AIC) and Schwarz Information Criteria (SIC). Once the spot and futures price series are found to be integrated in an identical order, we employed Johansen's (1988) Cointegration test to examine long-run relationship between spot and futures price series. After obtaining cointegration between spot and futures prices, price discovery and causality between the two markets are tested with the help of vector error correction model.

The data for the study consist of daily closing prices of spot and futures markets of eighty-three underlying stocks that are traded in National Stock Exchange (NSE). The selected underlying stocks belong to 11 sectors of the economy – Automobiles, Bank, Cement, Electrical Equipments, Fertilizers, Information Technology (IT), Oil & Gas, Pharmaceuticals, Power, Steel and Textiles. The data span for the study is from 27th May, 2005 to 26th March, 2009. The near month contract of stock futures has been used for the study as they are most heavily traded as compared to next month and far month futures contracts. All the required data information for the study has been retrieved from the website of National Stock Exchange (NSE), Mumbai.

Chapter-V explores empirically the impact of introduction of futures trading on the spot market volatility of seventy-one underlying stocks of National Stock Exchange (NSE) belonging to eleven sectors of India. Exponential Generalised Autoregressive Conditional Heteroscedasticity (EGARCH) model was employed to examine the impact of futures trading on the spot market volatility of selected underlying stocks of different

industry groups. Before employing EGARCH model, it is necessary to test nature of data series. Therefore, Jarque-Bera (JB) statistics and descriptive statistics of the spot returns series have been presented. Also, the Q-statistics of Ljung-Box is estimated for the returns and squared returns series to test the hypothesis of independence. Besides, the Engle (1982) ARCH-LM test has been presented to show the ARCH effects on the data. Finally, to check the robustness of EGARCH (1,1) model of each individual underlying stocks of different industry-groups, the present study conducted the Ljung-Box (1978) test on the squared standardized residuals. Further, the ARCH-LM (Engle, 1982) test was employed to test the absence of any further ARCH effects.

The data for the study comprises of daily closing price returns of seventy-one underlying stocks that are traded in National Stock Exchange (NSE). The selected underlying stocks belong to 11 sectors of the economy - Automobiles, Bank, Cement, Electrical Equipments, Fertilizers, Information Technology (IT), Oil & Gas, Pharmaceuticals, Power, Steel and Textiles. The study attempts to analyse return on all those stocks, on which futures trading has commenced from May 2005. Only those companies with a minimum of two years of data prior to introduction of futures trading on the underlying stocks have been included in the analysis. Based on this criterion, finally seventy one companies were identified and analysed. Besides, to address the issue of whether introduction of derivatives has been alone responsible in reducing volatility, we incorporated the daily closing price returns of surrogate index, namely S&P CNX 500 into mean equation of the EGARCH (1,1) model to control the additional factors influencing the market volatility. The S&P CNX 500 index serves as a perfect control factor because of derivatives products on this index are not available and as well it

represents about 92.57% of total market capitalization and about 91.17% of the total turnover on the NSE as on Sept 30, 2009. Due to paucity of data prior to 7 January, 1999 on surrogate S&P CNX 500 index, the empirical analysis in the present chapter was carried out for the period from 7 January, 1999 through 29 January, 2010. Besides, the trading of futures on individual securities, i.e., stock futures was commenced on National Stock Exchange from 9th November, 2001. However, most of the individual stocks considered for the present study are listed in futures market for different time periods. So the empirical analysis for the selected respective stocks in the present chapter was carried out for different time periods from 7 January, 1999 through 29 January, 2010. As a result, the number of time series observations for pre-futures and post-futures periods of individual stocks is found to be different in the present chapter. The near month contract of equity futures contract has been considered for the study as they are most heavily traded as compared to next month and far month future contracts. All the required data information for the study has been retrieved from the website of National Stock Exchange (NSE), Mumbai.

Chapter-VI investigated the performance of various hedge ratios estimated under different econometric models and compared them in terms of variance minimization criterion over the in-sample and out-of-sample periods for the eighty-three underlying stocks of National Stock Exchange (NSE) belonging to eleven sectors of the economy. This chapter employed OLS regression, VECM and time-varying MGARCH model to determine optimal hedge ratios of Indian equity futures. Then, the performance of the hedge ratios was compared to assess whether the more advanced time-varying hedge ratios calculated from Bollerslev, Engle and Wooldridge's (1988) Multivariate-GARCH

model could provide more efficiency than other constant hedge ratios from the regression model, and the Vector Error Correction Model. This chapter focuses on three different econometric methods for estimating the hedge ratios and testing it effectiveness for both forecasted in-sample and out-of-sample data. Lastly, the present chapter compares the hedging effectiveness of three types of hedge ratios over in-sample and out-of-sample periods.

The data for the study consist of daily closing prices of spot and futures markets of eighty-three underlying stocks that are traded in National Stock Exchange (NSE). The selected underlying stocks belong to 11 sectors of the economy - Automobiles, Bank, Cement, Electrical Equipments, Fertilizers, Information Technology (IT), Oil & Gas, Pharmaceuticals, Power, Steel and Textiles. The data span for the study is from 27th May, 2005 to 26th March, 2009. Out of total observations of the respective stocks, the last 30 observations were used to facilitate out-of-sample hedge ratio performance comparison. The near month contract of equity futures contract has been considered for the study as they are most heavily traded as compared to next month and far month future contracts. All the required data information for the study has been retrieved from the website of National Stock Exchange (NSE), Mumbai.

Finally, chapter VII summarizes arguments of the thesis and explores policy implications and future agenda of the research.

**7.1 Findings of the study**

i) The results of Augmented Dickey-Fuller and Phillips-Perron tests for the spot and futures markets price series of the respective underlying stock shows that the price series are stationary at their first difference, indicating that the spot

and futures price series of each individual stock are integrated at order one, i.e., I(1). The Johansen's cointegration test results confirm the existence of long-run relationship between the spot and futures prices of each underlying stock in India.

ii) By and large, the estimates of VECM results pertaining to lead-lag relationship between spot and futures market of the underlying stocks of respective industry groups show mixed evidence. The study results confirm that spot market leads the futures market in price discovery mechanism and spot prices tend to discover new information more rapidly than futures prices in the case of majority of the underlying stocks of respective 6 industry groups such as Automobiles, Cement, Electrical Equipments, Oil & Gas, Pharmaceuticals and Power.

iii) Following this, there exists feedback relationship between spot and futures market prices in majority of the underlying stocks belonging to 4 industry groups, namely Fertilizers, IT, Steel and Textiles. This implies that both the markets of underlying stocks of respective industries are found to play comparatively stronger leading role through price discovery process and said to be informationally efficient and reacts more quickly to each other.

iv) In the case of commercial banks, the study result reveals unidirectional causation runs from futures price to spot market price in most of the underlying securities. This indicates that information gets reflected first in the futures prices of those stocks and then it is transmitted to spot market prices,

implying futures market prices play the leading role and acts as an efficient price discovery vehicle.

v) The study results indicate existence of significant asymmetric effects of information on volatility of spot prices in the case of majority of the underlying stocks belonging to industry groups such as Automobiles, Bank, Electrical Equipments, Fertilizers, IT, Oil and Gas, Pharmaceuticals and Steel.

vi) Besides, the estimates of EGARCH (1,1) model pertaining to impact of futures market on the spot market volatility of the underlying stocks of respective industry groups show mixed evidence. The introduction of futures market decreased the spot market volatility of most of the underlying stocks of all industry groups except Electrical Equipments and Steel industry groups. The volatility impact is positive in most of the underlying stocks of Electrical Equipments industry, and in the case of Steel industry, the impact is mixed in equal numbers.

vii) The variation in the evidences pertaining to price discovery mechanism and the impact of futures market on the spot market volatility of underlying stocks of different industry-groups may be due to the fact that selected underlying shares of different industry-groups are widely dispersed in terms of its industry/firm-specific activities and hence they are linked to the diversified industry/firm-specific information that disseminates in the market place.

viii) From the in-sample estimations, it was clear that the dynamic M-GARCH hedging strategy does seem to outperform the simple constant conventional OLS and error correction hedge strategies in majority of the underlying stocks

belonging to industry groups such as automobiles, bank, electrical equipments, IT, pharmaceuticals and textiles. This implies that risk aversion is the major goal of an investor, the dynamic M-GARCH model hedging strategy performs the best in reducing the conditional variance of the hedged portfolio. The investor's degree of risk aversion, in these cases, plays an important role in selecting the hedging method.

ix) Following this, another striking feature of the in-sample results is that the OLS hedge strategy performs better in reducing the risk of the hedged portfolio relative to other alternatives in most cases of industry groups such as cement, fertilizers, oil and gas, power and steel. This finding suggests that, in terms of risk reduction, a hedge strategy based on an unconditional variance hedge ratio estimated through OLS outperforms a strategy based on a minimum variance hedge ratio estimated using more advanced techniques such as the VECM and the M-GARCH approach.

x) From the out-of-sample estimations, it was clear that the dynamic M-GARCH hedging strategy outperform the other alternatives in majority of the underlying stocks belonging to industry groups such as automobiles, bank, cement, electrical equipments, fertilizer, IT, oil & gas and power. This implies that risk aversion is the major goal of an investor, the dynamic M-GARCH model hedging strategy performs the best in reducing the conditional variance of the hedged portfolio. The investor's degree of risk aversion, in these cases, plays an important role in selecting the hedging method.

xi) Besides, another striking feature of the out-of-sample results is that the VEC hedge strategy performs better in reducing the risk of the hedged portfolio relative to other alternatives in most cases of industry groups such as pharmaceuticals and steel. This finding suggests that, in terms of risk reduction, a hedge strategy based on an unconditional variance hedge ratio estimated through VEC outperforms a strategy based on a minimum variance hedge ratio estimated using conventional OLS regression and the M-GARCH approach. Following this, the OLS hedge dominates the other alternative models in the case of textiles industry.

xii) By and large, the comparison of both in-sample and out-of-sample hedging performances tell the conflicting story in most of the industry groups such as cement, fertilizer, oil & gas (except ONGC), pharmaceuticals (except CIPLA and DABUR), power (CESC and CUMMINSIND), steel and textiles respectively.

xiii) Besides, the comparison of in-sample and out-of-sample hedging effectiveness in the study indicates consistent evidence that the hedging strategies obtained from time-varying hedge ratio which minimizes the conditional variance performs better than the alternative models for majority of the underlying stocks of industry groups such as automobiles, banks, oil and gas, electrical equipments and IT. This finding implies that in selecting the most appropriate hedge ratio, the investor's degree of risk aversion, in these industry groups' cases plays a relatively important role. This suggests that that risk aversion is the major goal of an investor, the dynamic M-

GARCH model hedging strategy performs the best in reducing the conditional variance of the hedged portfolio.

**7.2 Implications of the study and Policy suggestions**

i) The study of price discovery mechanism suggests that hedgers can benefit from using the spot market prices that tend to discover the new information more rapidly than futures market prices in the case of majority of the underlying stocks of respective 6 industry groups such as Automobiles, Cement, Electrical Equipments, Oil & Gas, Pharmaceuticals and Power.

ii) Besides, the investors has to be very cautious when they involve in hedging process in the case of underlying stocks of 4 industry groups – Fertilizers, IT, Steel and Textiles – because, both the spot and futures markets are found to play comparatively stronger leading role through price discovery process and seem to be informationally efficient and reacts more quickly to each other.

iii) Moreover, the hedgers can make profit by using the futures market prices that tend to discover the new information more rapidly than spot market prices in the case of majority of the underlying stocks of Commercial Banks.

iv) From the study of volatility, it was found that there exist significant asymmetric effects of information on volatility of spot prices in the case of majority of the underlying stocks belonging to industry groups such as Automobiles, Bank, Electrical Equipments, Fertilizers, Information Technology, Oil and Gas, Pharmaceuticals and Steel. Also, the spot market returns of these industry groups exihibit to the high volatility persistence, implying that there is systematic way to exploit trading opportunities and

acquire excess profits. This provides an opportunity to the traders for predicting the future prices and earning abnormal profits.

v) The introduction of futures market decreased the spot market volatility of most of the underlying stocks of all industry groups except few. The following suggestions may be implemented to further improve efficiency, liquidity and reduce volatility:

a) Futures contracts on larger number of stocks can be introduced

b) Mini size (smaller value contracts) may be permitted

c) Efforts may be made to look at margin imposition system and reduce margins without compromising on the integrity of the market and

d) Right now institutional participation appear to be negligible in the total turnover. Therefore, efforts should be made to enhance their role in derivatives participation.

vi) The study indicates that the hedging strategies obtained from time-varying hedge ratio which minimizes the conditional variance performs better than the alternative models for majority of the underlying stocks of industry groups such as Automobiles, Banks, Oil and Gas, Electrical Equipments and Information Technology. This implies that in selecting the most appropriate hedge ratio, the investor's degree of risk aversion, plays a relatively important role. This suggests that that risk aversion is the major goal of an investor. The investors can use the time-varying optimum hedge ratio to minimize risk by holding a certain amount of stock futures contracts in order to hedge their spot assets on hand.

vii) Any regulatory initiative on futures market will have its desired impact on spot market. Therefore, regulators can take actions in the futures market such as reduction in contract size, changes in margins and others which will have their impact on the cash market.

viii) In the current scenario, investing in stock markets is a major challenge ever for professionals. Derivatives acts as a major tool for reducing the risk involved in investing in stock markets for getting the best results out of it. Awareness about the various uses of derivatives can help investors to reduce risk and increase profits. Though the stock market is subjected to high risk, by using derivatives the loss can be minimized to an extent. In particular, participating in stock futures market allows investors to diversify the market risk. Many professionals seek to hedge risk exposure of stock portfolios by using individual futures contracts. If an investor has no information about specific individual stock, then he can diversify and hold the position in other stock portfolios, so that loss in one stock will be altered by the gain in the other stock portfolios.

ix) Several initiatives have been taken over the last few years with a view to develop the skills of market intermediaries, educate the investors and promote high quality research in the securities market. Similarly, the SEBI has to take necessary initiatives in order to improve the skills and widen the knowledge base of people involved in the derivatives market. Besides, SEBI has to design and implement the entire gamut of educational initiatives, including education, training,

certification, research and consultancy in the area of F&O markets and allied subjects for derivatives market professionals in India and neighboring countries.

### 7.5 Agenda for Future Research

The main agenda for future research in this area are:

(i) The study can be examined further by taking hourly or minute-by-minute data.

(ii) Future researcher can also examine the issues identified in this study by taking stock options.