An Empirical Study on Impact of Index Futures Trading On Spot Market in India

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Abstract

In this paper, an attempt is made to investigate the effect of futures trading on the volatility and operating efficiency of the underlying Indian stock market by taking a sample of selected individual stocks. Specifically, the study examines whether the index futures trading in India has caused a significant change in spot price volatility of the underlying stocks and how the index futures trading has affected market/trading efficiency in the Indian futures and stock markets. The effect of the introduction of futures trading is examined using an extended period of June 1995 to May 2009.We employ an event study approach to test whether the introduction of index futures trading has resulted in significant change in volatility and efficiency of the stock returns. The study compares spot price volatility changes before and after futures trading is introduced in the stock indices. The result shows that the introduction of Nifty index futures trading in India is associated with both reduction in spot price volatility and reduced trading efficiency in the underlying stock market. The results of this study suggest that there is a trade-off between gains and costs associated with the introduction of derivatives trading at least on a short-term perspective. This paper offers a unique contribution in examining the impact of introduction of index futures trading in NSE Nifty index and the index futures covering a period since introduction of index futures in Indian Capital Market. The results suggest that the market would have to pay a certain price, such as a loss of market efficiency for the sake of market stabilization. Hence, a desirable market policy for derivatives trading would be one that would preserve market stabilization while still not damaging market efficiency in the underlying spot market.

Key Words: Futures, Financial Engineering**,** NSE Nifty, Event study, Market Efficiency.

JEL: G13, G15.

INTRODUCTION

The rapidity with which corporate finance, banking and investment finance have changed in recent years has given birth to a new discipline that has come to be known as Financial Engineering. Financial engineering involves the design, the development, and the implementation of innovative financial instruments and processes, and the formulation of creative solutions to problems in finance. The last decade has witnessed the introduction of 'derivatives' as an innovative financial instrument in the Indian markets. Derivatives are financial instruments that derive their value from the underlying, which can be a stock index, a stock, a commodity like pepper or even a complex parameter like the interest rate. Derivatives give you a choice to trade on the underlying at a fraction of a cost i.e. Derivatives are leveraged products. The term "derivative" indicates that it has no independent value, i.e. its value is

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entirely "derived" from the value of the underlying asset. Financial engineers have played a tremendous role in investment and money management, and are heavily involved in risk management. Derivatives are instruments of risk hedging. As instruments of risk management, these generally do not influence the fluctuations in the underlying asset prices. However, 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. A derivative contract or product, or simply "derivative", should be distinguished from the underlying asset, i.e. the asset bought/sold in the cash market on normal delivery terms. Common derivatives include options, forward contracts, futures contracts, and swaps. In this paper, we study the impact of introduction of futures contracts on stock indices and its effect on the underlying spot market in India.

THEORETICAL BACKGROUND

The Indian capital market has witnessed a major transformation and structural change from the past one decade as a result of ongoing financial sector reforms initiated by the Government of India. One of the major objectives of these reforms was to bring the Indian capital market up to a certain international standard. Due to such reforming process, one of the significant step taken in the secondary market is the introduction of derivative products in two major Indian stock exchanges viz. National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) , with a view to provide tools for risk management to investors and to improve the informational efficiency of the cash market. Though the onset of derivative trading has significantly altered the movement of stock prices in Indian spot market, it is yet to be proved whether the derivative products have served the purpose as claimed by the Indian regulators.

Derivatives are financial instruments that are linked to a specific financial instrument or indicator or commodity and through which specific financial risk can be traded in their own right. The value of a financial derivative is derived from the price of an underlying item, such as an asset or an index. Derivative products includes futures, forwards, options and swaps, and these can be combined with each other or traditional securities and loans to create hybrid instruments. These instruments are used for risk management by hedging i.e. taking opposite position in the futures market. A futures contract is a type of derivative instrument or financial contract in which two parties agree to transact a set of financial instruments or physical commodities for future delivery at a particular price. In other words, a future contract is a standardized agreement between the seller (short position holder) of the contract and the buyer (long position holder), traded on a futures exchange, to buy or sell a certain underlying instrument at a certain date in the future, at a pre-set price. The future date is called the delivery date or final settlement date. The pre-set price is called the futures price. The price of the underlying asset on the delivery date is called the settlement price.

Equity derivatives trading started on June 9, 2000 with introduction of stock index futures by Bombay Stock Exchange (BSE). National Stock Exchange (NSE) also commenced its trading on 12 June, 2000 based on S&P Nifty. Trading on NIFTY futures was introduced on the 12th of July 2000.Trading on stock futures was introduced in the NSE in the 9th November, 2001. Subsequently, other products like stock futures on individual securities, index options and options on individual securities were introduced.

DERIVATIVES TRADING IN INDIA

In the Indian context the Securities Contracts (Regulation) Act, 1956 (SCRA) defines "derivative" as a security that is derived from a debt instrument, share, loan whether secured or unsecured, risk instrument or contract for differences or any other form of security, same as a contract which derives its value from the prices, or index of prices, of underlying securities. Derivatives are securities under the SCRA and hence the regulatory framework under the SCRA governs the trading of derivatives.

The National Stock Exchange (NSE) introduced stock index futures and options on the NSE's index of 50 stocks (S&P CNX NIFTY) in June 12, 2000 and June 4, 2001 respectively. Subsequently single stock futures were launched on November 9, 2001. An important step for the preparation of the futures and options trading is the construction of an underlying index. The NSE had constructed the S&P CNX NIFTY (containing 50 stocks) keeping in mind the need to design a market index which will be diversified and well liquid. Since its construction it has been professionally managed to keep pace with the changes in the economy. The composition of Nifty has been subject to continuous change since its construction due to addition and deletions from the list over the years. While India's derivatives markets have grown dramatically since their introduction, they are still in an early development stage. In this regard implications from a carefully designed and executed study will not only help assess the economic usefulness of derivatives markets but they will also help build a more effective market operation system in India. Derivatives trading commenced in India in June 2000 after SEBI granted the approval to this effect in May 2000. SEBI permitted the derivative segment of two stock exchanges, i.e. NSE and BSE, and their clearing house/corporation to commence trading and settlement in approved derivative contracts. To begin with, SEBI approved trading in index futures contracts based on S&P CNX Nifty Index and BSE-30 (Sensex) Index. This was followed by approval for trading in options based on these two indices and options on individual securities. The trading in index options commenced in June 2001 and trading in options on individual securities would commence in July 2001 while trading in futures of individual stocks started from November 2001 There was a spurt in volumes in November 2001 when stock futures were introduced. It is believed that India is the largest market in the world for stock futures.

MOTIVATION FOR THE STUDY

In the last decade, many emerging and transition economies have started introducing derivative contracts. Policy makers and regulators in these markets are concerned about the impact of futures on the underlying cash market. One of the reasons for this concern is the belief that futures trading attract speculators who then destabilize spot prices. Since futures encourage speculation, the debate on the impact of speculators intensified when futures contracts were first introduced for trading, beginning with commodity futures and moving on to financial futures. Before further regulations are introduced, it is essential to determine whether in fact there is a causal link between the introduction of futures and spot market volatility. It, therefore becomes imperative that we seek answers to questions like: What is the impact of derivatives upon market efficiency and liquidity of the underlying cash market? To what extent do derivatives destabilize the financial system, and how should these risks be addressed? Can the results from studies of developed markets be extended to emerging markets?

NEED FOR THE STUDY

It had long been argued that a very undesirable feature of the Indian stock market was the mixing of cash and futures trading. Such mixing was caused by the existence of the 'badla system', combined with long settlement cycles. All this has been ended by the package of reforms implemented after the stock market crisis of March 2001. These reforms comprise the abolition of badla, the adoption of rolling settlement and finally the introduction of individual stock futures. There is need for assessing the resulting new situation which is still in transition but some useful experience has been gathered over the last few months. Such assessment has to be based on an examination of the nature of inter-relationships, both direct and indirect, between the operation of the futures market and the cash markets. An important aspect to study is the migration of most of the speculative activity from the cash market to the futures market which provides easier facilities for speculation. Also, in the presence of individual stock futures trading, the relevance of regulation of short selling and margin trading in shares is likely to be lost. Much rethinking on regulatory policies would be needed as a result of individual stock futures in order to steer the market's over-all development on the right lines.

The impact of individual stock futures on a country's stock market is a pertinent issue of great concern and observation. The reason is that while many countries have flourishing markets in commodity futures, stock index futures, bond futures and currency futures, individual stock futures have not developed in significant way. The situation in India is different in as much as the volume of individual stock futures trading promises to be substantial in relation to the cash market. There is a distinct possibility that it may exceed the cash market trading within next few years. For this reason, India could be a good case study of trading in individual stock futures. Yet, such trading in India is still in its infancy and transition, even though it is growing faster. The advent of stock index futures has profoundly changed the nature of trading on stock exchanges. The concern over how trading in futures contracts affects the spot market for underlying assets has been an interesting subject for investors, market makers, academicians, exchanges and regulators alike. These markets offer investors flexibility in altering the composition of their portfolios and in timing their transactions. Futures markets also provide opportunities to hedge the risks involved with holding diversified equity portfolios. As a consequence, significant portion of cash market equity transactions are tied to futures and options market activity. However, it is yet to be known if the introduction of stock index futures has served the purpose claimed by the regulators.

The ultimate objective of this study is to create a deeper understanding of this new phenomenon especially in Indian scenario the specific Indian setting. It aims to find out whether the introduction and trading of individual stock futures has contributed towards the improvement of the cash market's functioning in terms of pricing efficiency, liquidity and stability through the informational role of futures trading.

OBJECTIVES OF THE STUDY

In this paper, we investigate the effect of futures trading on the volatility and operating efficiency of the underlying Indian stock market by taking a sample of individual stocks. Specifically, we examine two issues of interest:

a) whether the index futures trading in India has caused a significant change in spot market volatility of the selected underlying individual stocks; and
b) how the index futures trading has affected trading efficiency of the selected stocks.

LITERATURE REVIEW

Since the introduction of financial futures and options during the 1970s, the effect of financial derivatives trading on the underlying spot markets has been of great interest to both academics and practitioners. One of the primary issues widely investigated by finance researchers is whether futures and/or options trading increases the price volatility of underlying stock markets and thus leads to a destabilization of the markets. Previous studies document mixed evidence on the effect of futures trading in various market environments including the U.S. A number of previous studies have examined the effect of futures trading on the operation of U.S. stock markets. Harris (1989), Damodaran (1990), Lockwood and Linn (1990), and Schwert (1990), among others, report a positive relation between futures market trading and variances of the S&P 500 index stock returns, implying that volatility of the S&P 500 stock index increased after the S&P 500 index futures trading began. On the contrary, Santoni (1987) and Brown-Hruska and Kuserk (1995) find a negative correlation between S&P 500 futures trading volume and volatility of the S&P 500 index, indicating that an increase in futures volume leads to a decrease in spot market volatility. Still, studies by Edwards (1988a, 1988b), Grossman (1988), Conrad(1989), Smith (1989), Bechetti and Roberts (1990), Darrat and Rahman (1995), and Board, Sandman, and Sutcliffe (2001) show that futures trading has no significant, little if any, impact on spot market volatility. Bessembinder and Seguin (1992) provide some reconciling evidence that stock market volatility is positively related to unexpected trading activity, but negatively to expected trading activity of the S&P 500 index futures.

Several other studies examine non-U.S. markets, with mixed evidence.A study by Kyriacou and Sarno (1999) shows a significant positive effect of both contemporaneous and lagged futures volume for the U.K. FTSE 100 index on spot market volatility, while Jochum and Kodres (1998) and Dennis and Sim (1999) document little or no significant impact of futures trading on spot market volatility for the Australian market and for the three nations of Mexico, Brazil, and Hungary, respectively. Lee and Ohk (1992) find increased spot market volatility after the Nikkei 225 futures trading was introduced on the Singapore International Monetary Exchange (SIMEX). Employing different tests, Chang, Cheng, and Pinegar (1999) report that spot stock portfolio volatility increases, although by a relatively small degree, with the introduction of Nikkei futures on the Osaka Securities Exchange, but not with their introduction on the SIMEX. In a study of 25 countries, Gulen and Mayhew (2000) provide diverse evidence depending on the country studied that expected futures volume has a positive effect on spot market volatility in Denmark, Germany, and Hong Kong, but a negative effect in Austria and the U.K., and no effect in the remaining 18 countries.

Overall, the above studies show that the effect of futures trading on the volatility of spot markets varies depending on time period, model specification, and/or country examined. Considering the short history of futures and options trading and the presence of several market frictions and restrictions that might have hindered the efficient operation of Indian securities markets, a study of the effect of futures and options trading on spot market volatility and market efficiency is warranted for the Indian futures and stock markets.

DATA AND PERIOD OF STUDY

To investigate the effect of the introduction of futures trading, the sample period of June 1995 to May 2009 is chosen. Index futures trading were officially introduced on the NSE on June 12, 2000. The sample period is divided in to two periods- period I being the pre event phase (from 7th June 1995 to 9th June 2000) consisting of 2489 trading days and period II being the post event phase (from 13th June 2000 to 31st May 2009) consisting of 2475 trading days. The two phases are separated by the event day (t-day) i.e. 12th June. The study is entirely based on time series secondary data collected from website of National Stock Exchange (www.nse-india.com). The NSE provides a fully automated screen based trading system for futures and spot market transactions, on a nationwide basis and an online monitoring and surveillance mechanism

While choosing the sample of stocks for analysis, two rounds of screening were done. First from the 50 stocks included in the Nifty index (as on 31st May 2009), stocks which are common in their presence in the SENSEX (30), the index of the Bombay Stock Exchange (BSE) were selected. Secondly, the stocks which were added or removed in the NIFTY index at various times after the t-day were removed to reach get a portfolio of stocks which are present in the Nifty index throughout the entire period starting from the sample period till date. After going through the screening process we ended with a portfolio of 15 stocks which is our sample portfolio. The list of stocks include in the sample portfolio is given in Appendix.

RESEARCH METHODOLOGY

Two approaches have been widely used to analyze the effect of index futures trading on stock market volatility. One approach is to compare spot price volatility changes before and after futures trading is introduced. The other approach is to compare spot price volatility differences cross-sectionally between companies that are included in the underlying index and companies against which no futures are traded. While both methods have to meet certain conditions to be reliable, and one has some methodological advantages over the other. This study employs the former approach in a manner similar to Harris (1989) to ensure that our results remain robust regardless of the differences in possible cross-sectional determinants of stock price volatility.

Event study

Event studies measure the relationship between an event that affects securities and the return of those securities. Some events, such as a regulatory change in dividend policy or a stock split, are specific to individual securities. Event studies are often used to test the efficient market hypothesis. For example, abnormal returns that persist after an event occurs or abnormal returns that are associated with an anticipated event contradict the efficient market hypothesis. Aside from tests of market efficiency, event studies are valuable in gauging the magnitude of an event's impact.

A classical event study published in 1969 by Fama, Fisher, Jensen, and Roll examined the impact of stock splits on security prices. The authors found that abnormal returns dissipated rapidly following the news of stock splits, thus lending support to the efficient market hypothesis.

Model for empirical test

Cox (1976) demonstrates that if futures prices are quick to adjust to new information and if this process is transferred to the spot market through arbitrage mechanisms, spot market volatility and market efficiency would increase simultaneously. Ross (1989) shows that, under no-arbitrage conditions and when stock prices follow a martingale process, stock price volatility is proportional to the volume of information created, and stock return variance is equal to the variance of information flows. These two studies suggest that if more information is created as a result of futures trading and if such information is reflected quickly in spot prices, spot price volatility would increase following the introduction of futures trading.

Brorsen (1991) develops a theoretical relation between futures market's market frictions and spot price volatility and shows analytically that reducing market frictions would increase both market efficiency and the variance of short-run spot price changes. Results from his empirical tests using the S&P 500 stock index data support this hypothesis that with the two primary events of the deregulation of brokerage commission in May1975 and the introduction of S&P 500 futures contracts in April 1982, market efficiency improved, but at the same time daily spot price volatility of the S&P 500 stock index also increased. His results suggest that short-run market volatility can be reduced with any measure that increases market frictions such as increasing futures margins or increasing transaction costs for market traders. Since there exists more market frictions in the less developed markets such as the Indian securities markets, the association between market frictions and spot price volatility would be more evident in these markets. Drawing from the previous theoretical work, we show analytically the effect of market frictions on spot price volatility. Due to market frictions such as transaction costs and market regulations, actual prices in spot markets may not move quickly toward equilibrium prices even though equilibrium prices follow a random walk. If, due to these market frictions, price adjustments are not instantaneous but rather follow a partial adjustment process, then the relation between actual price (ϕ_t) and equilibrium price (ϕ_t*) at time *t* can be described in the following manner (Brorsen, 1991; Brorsen, Oellermann, & Farris, 1989):

$$\Delta \phi_t = \phi_t - \phi_{t-1} = \gamma\left(\phi_t^* - \phi_{t-1}\right) \tag{1}$$

$$\phi_t^* = \phi_{t-1}^* + u_t \tag{2}$$

Where $\Delta\phi_t$ is a price change, u_t is an uncorrelated random error term, and γ is a constant that has a value between 0 and 1. γ represents the rate of speed at which the actual price reaches the equilibrium price. If γ is 1, price adjustments are made instantaneously; otherwise, price adjustments are not instantaneous.

Since γ will decrease with an increase in market frictions, γ can be perceived as a measure of market operation/trading efficiency of an individual stock.

From Equations (1) and (2), stock return (R_t), or price changes (ϕ_t), can be expressed using γ in the following representation:

$$\phi_t = R_t = (1-\gamma) R_{t-1} + \gamma u_t \tag{3}$$

Since R_{t-1} and u_t in Equation (3) are independent, and the variance of R_t is equal to that of R_{t-1} unconditionally, the variance of R_t can be described as:

$$Var(R_t) = \gamma / (2-\gamma) Var(u_t) \tag{4}$$

Where Var(u_t) is the variance of equilibrium prices and has been often used as a measure of information flows in the market in several prior studies (e.g., Bae & Jo, 1999; Jones, Kaul, & Lipson ,1994; Ross, 1989; Skinner, 1989).

The partial derivative of Var(R_t))with respect to γ becomes:

$$\delta Var(R_t) / \delta\gamma = \left| 2 / (2-\gamma)^2 \right| Var(u_t) \tag{5}$$

The strictly positive sign of the derivative term of Equation (5) indicates a positive relation between market operation efficiency and spot price volatility. This implies that as efficiency of a market operating system improves or, equivalently, market frictions are reduced, the variance of spot price changes would increase. The level of market operation efficiency, γ in Equation (3), is related to various types of market friction such as transaction cost, price change limits, restrictions on short selling, investment ceilings, price rounding, and the role of market makers (Cohen, Maier, Schwartz, & Whitcomb, 1986; Scholes & Williams, 1977; Schwartz & Whitcomb, 1977). A firm's stock price volatility could be affected differently by these market friction factors due to different firm-specific characteristics. As Cox (1976) and Brorsen (1991) note, there are less market frictions in the futures market than in the underlying spot market. If futures prices adjust quickly to new information and the effect is transferred to the spot market through arbitrage between the two markets, then the futures market would function to help reduce market frictions in the spot market. Hence, market operation efficiency will be greater with the presence of the futures market than without its presence. Therefore, combined together

with the postulated positive relation between futures trading and spot market volatility, on the one hand, futures market trading in India is expected to increase spot market volatility, at least in the short run, while on the other hand increase the efficiency of the underlying spot market.

Effect of index futures on volatility

The following step wise procedure was undertaken to examine whether there is any significant change in the volatility of stock returns after the introduction of index futures trading-

- The event date (timing of occurrence) was ascertained.
- The daily closing prices in NSE of the securities 100 days prior and 90 days after the t-day (the day of occurrence of the event) are arranged. So the days preceding the event are labeled as t-100, t-99, t-98,…….,t-1; the event day, t; and the post event trading days, t+1,t+2, t+3,…..,t+90.
- The daily returns of the securities were calculated using the formula

$$\text{Security Return} = \frac{P_n - P_{n-1}}{P_{n-1}} * 100$$

Where

P_n = Today's closing price

P_{n-1} = Previous closing price

- The standard deviation of daily returns of the securities pre and post event is calculated.
- Then a t-test is done to see whether any significant change has taken place in the volatility of stock returns after the introduction of index futures.

Effect of index futures on market efficiency

The following procedure was adopted to examine the effect of introduction of index futures trading on the market efficiency- γ, for both pre and post event period was calculated was calculated using the equation (4), *i.e.*

$$Var(R_t) = \gamma / (2-\gamma) Var(u_t)$$

Where $Var(R_t)$ is the variance of daily security returns. $Var(u_t)$ is approximated as the variance in the security returns over the entire observation period γ is a measure of market efficiency. Finally the γ values for pre and post event period are subjected to paired sample t-test to examine the significance of change in the efficiency of the stock markets.

FINDINGS

Analysis of effect on volatility

Table-1 presents the value of standard deviation (volatility) for the pre-event and post-event period for the sample of 15 stocks. The standard deviation in the post-event period is relatively lesser for all the 15 stocks, indicating that futures trading introduction has a stabilizing effect on the underlying stock volatility.

Following hypothesis was taken for testing-

H_0: Introduction of index futures trading has resulted in significant change in volatility of the stock returns

H_1: Introduction of index futures trading has not resulted in significant change in volatility of the stock returns.

From Table 2, it can be observed that the mean of standard deviation of stock returns has decreased from 4.1241 (pre event) to 2.6595 (post event). So there indeed has been a decrease in volatility in the stock prices after the introduction of index futures trading. From table 3, it is very clear that at 95% (even at 99%) confidence level the change in volatility is highly significant. That means the null hypothesis (H_0) is to be rejected and (H_1) is true. In other words, we can say that the introduction of index derivative trading has resulted in a significant decrease in the volatility of the underlying stock prices.

Analysis of effect on efficiency

Efficiency means that all relevant information regarding a stock is reflected in its market price. Because market participants take advantage of even the smallest piece of information and include it into market prices, they eliminate the profit opportunities. Average forecasts, which lead to superior returns (Elton and Gruber, 1987).

There are three forms or levels of market efficiency in literature: the weak form (WFEMH), the semi-strong form (SSFEMH) and the strong form (SFEMH). The weak form efficiency is said to exist if all the information regarding past price movements is reflected in the current stock prices. Under this form, the information set is just historical prices that should offer no prediction of the future changes in prices. In this case no chart or analysis based solely on past prices can help to obtain abnormal profits. The semi-strong form is reached when all publicly available information is reflected in stock prices. Thus, one cannot make abnormal profits by looking at publicly available information such as stock price movements, volumes of trade, announcements of annual earnings, stock splits, and so on. The strong form on the other hand, exists if all information including nonpublic information is reflected in the stock price.

Following hypothesis was taken for testing-

H_0: Introduction of index futures trading has resulted in significant change in efficiency of the stock returns

H_1: Introduction of index futures trading has not resulted in significant change in efficiency of the stock returns.

From Table 5, it can be observed that the mean value of γ has decreased from 1.9783 in the pre event period to1.9691 in the post event period. As γ is considered to be a direct measure of market efficiency, we find a decrease in the efficiency of market after the introduction of index future trading compared to the period when there was no futures trading. Further from table 6, it can be seen that the decrease in efficiency is substantially significant at a confidence level of 95%. This means that the null hypothesis is to be rejected and H1 is true. In other words, we can say that the introduction of index futures trading has resulted in significant decrease in market efficiency.

CONCLUSION

This study examines the effect of futures trading on spot price volatility and market efficiency of the underlying stock market. Specifically, the study examines whether the index futures trading in India has caused a significant change in spot price volatility of the underlying stocks and how the index futures trading has affected market/trading efficiency in the Indian futures and stock markets. We employ an event study approach with market data for the period of June 1995 to May 2009. The result shows that the introduction of Nifty index futures trading in India is associated with both reduction in spot price volatility and reduced trading efficiency in the underlying stock market.

The results of this study suggest that there is a trade-off between gains and costs associated with the introduction of derivatives trading at least on a short-term perspective. Governments and authorities planning to promote or facilitate futures and options trading would need to pay careful attention to the market restrictions they bring in for the purpose of market stabilization. The results suggest that the market would have to pay a certain price, such as a loss of market efficiency for the sake of market stabilization. Hence, a desirable market policy for derivatives trading would be one that would preserve market stabilization while still not damaging market efficiency in the underlying spot market. The results of this study are crucial to investors, stock exchange officials and regulators. Derivatives play a very important role in the price discovery process and in completing the market. Their role in risk management for institutional investors and mutual fund managers need hardly be overemphasized. This role as a tool for risk management clearly assumes that derivatives trading do not increase market volatility and risk. Governments and authorities planning to promote or facilitate futures and options trading would need to pay careful attention to the market restrictions they bring in for the purpose of market stabilization.

CONTRIBUTION OF PRESENT STUDY

The introduction of equity index futures markets enabled traders to transact large volumes at much lower transaction costs relative to the cash market. The consequence of this increase in trading volume in futures markets remains unresolved both on theoretical and an empirical front. The present study not only provides additional empirical evidence in this regard but also contributes to the literature in some aspects. All the previous studies except Bandivadekar and Ghosh (2003) mainly concentrated on the volatility behavior of S&P CNX Nifty on the presumption that turnover on BSE Futures and Options segment was negligible. Our study seeks to examine the behaviour of individual stocks in spot market after the introduction of derivatives trading in India. Further, our study makes an attempt to examine the behaviour of spot market dynamics to see whether market wide volatility had declined due to other improvements like screen-based electronic trading, rolling settlement of ‘ T+2’ and other institutional developments introduced in the Indian stock market in recent years. The results of this study are especially important to stock exchange officials and regulators in designing trading mechanisms and contract specifications for derivative contracts, thereby enhancing their value as risk management tools. One of the important reasons for introducing derivatives trading in India was high volatility of the Indian stock markets. The Indian stock market is one of the most volatile markets in comparison to other developed markets of the world. The advent of stock index futures has profoundly changed the nature of trading on stock exchanges. The concern over how trading in futures contracts affects the spot market for underlying assets has been an

interesting subject for investors, market makers, academicians, exchanges and regulators alike. These markets offer investors flexibility in altering the composition of their portfolios and in timing their transactions. In this regard, implications from a carefully designed and executed study will not only help assess the economic usefulness of derivatives markets but they will also help build a more effective market operation system in India.

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APPENDIX A
SAMPLE PORTFOLIO

1. ACC (Associated Cement Company)
2. BAJAJ AUTO
3. BHEL (Bharat Heavy Electrical Limited)
4. CIPLA
5. GRASIM
6. GUJAMBCEM (Gujrat Ambuja Cements)
7. HDFC BANK (Housing Development Finance Corporation bank)
8. HDFC FINANCE (Housing Development Finance Corporation Finance)
9. HEROHONDA
10. HINDLEVER
11. INFOSYS
12. ITC
13. RANBAXY
14. RELIANCE
15. SBI (State Bank of India)

APPENDIX B

TABLE 1

Standard deviation of Returns in Pre and Post event period

Scrip name	Standard Deviation (Pre-event)	Standard Deviation (Post- event)
ACC	4.371206726	2.898241586
BAJAJ AUTO	2.666184	1.634148
BHEL	4.283506108	3.198632109
CIPLA	4.311685	3.069714
GRASIM	4.741868	3.333149
GUJAMBCEM	3.769790738	2.892078032
HDFC BANK	4.29116	2.91789
HDFC FINANCE	4.25652	2.42986
HEROHONDA	3.52771	2.40991
HINDLEVER	4.01432	2.60001
INFOSYS	5.518247274	3.362834314
ITC	4.776415	2.386769
RANBAXY	3.96103	2.8248
RELIANCE	3.857949	1.957921
SBI	3.513768334	1.976482622

TABLE 2

Paired Samples Statistics

Period	No. of observations	Mean	Std. Deviation	Std. Error Mean
Pre event	15	4.1241	.6550	.1691
Post event	15	2.6595	.5221	.1348

TABLE 3
Comparison of standard deviations of pre and post event stock returns
(Two tailed t-test)

Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t-value	Degres of freedom	Significance (2-tailed)
			Lower	Upper			
1.4646	.4331	.1118	1.2247	1.7045	13.096	14	.000

TABLE 4
γ Values pre and post event

Scrip name	γ value pre-event	γ value post event
ACC	1.993	1.983
BAJAJ AUTO	1.900	1.860
BHEL	1.989	1.987
CIPLA	1.989	1.985
GRASIM	1.992	1.989
GUJAMBCEM	1.983	1.979
HDFC BANK	1.987	1.983
HDFC FINANCE	1.981	1.973
HEROHONDA	1.973	1.963
HINDLEVER	1.999	2.000
INFOSYS	1.994	1.992
ITC	1.985	1.976
RANBAXY	1.984	1.980
RELIANCE	1.966	1.947
SBI	1.959	1.940

TABLE 5
Paired Samples Statistics

Period	No. of observations	Mean	Std. Deviation	Std. Error Mean
Pre event	15	1.9783	2.417E-02	6.240E-03
Post event	15	1.9691	3.427E-02	8.848E-03

TABLE 6
Comparison of γ value pre and post event (Two tailed t-test)

Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t-value	Degres of freedom	Significance (2-tailed)
			Lower	Upper			
9.138E-03	1.034E-02	2.670E-03	3.410E-03	1.487E-02	3.422	14	.004