

# Impact of Equity Futures Trading on Cash Market Volatility and Information Assimilation Efficiency: Evidence from India

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## Abstract

Present study analyzes the impact of futures trading on cash market volatility and information dissemination efficiency both on index as well as individual stocks trading at National Stock Exchange of India. Surrogate index has been used to control the impact of other market reforms introduced in India. Returns in the cash market have been observed to be asymmetric in nature and it has been found that after introduction of futures trading in the Indian capital market, cash market volatility has decreased. It has also been found that although information assimilation efficiency in the cash market after introducing futures trading remains inefficient but the role of new information in the price discovery process has increased. Furthermore, it has been observed that both volatility and daily returns are different across various trading days of the week but both returns and volatility are highly significant around the settlement day of the futures contracts.

**Keywords:** Conditional Volatility, Information Assimilation Efficiency, Settlement Effect, Information Spillover, Surrogate Index, Seasonality in Returns and Volatility

## Introduction

Derivatives trading world over has intensified the debate on the economic and social impacts of futures and options trading and it has encouraged researchers to analyze the

impacts of its introduction on the volatility and efficiency of the underlying cash market. Primarily, futures markets were introduced to provide a mechanism for managing price risk, which in addition are also believed to perform an informational exchange role for prospective price changes (Garbade and Sibley, 1983b; Brannen and Ulveling, 1984). One school of thought advocate that futures markets may help to improve market depth and reduce volatility, while others argue that due to more rapid dissemination of market-wide information and the presence of market makers in the futures market (besides cash market) might help to improve market depth (Bessembinder and Seguin, 1992; Gulen and Mayhew, 2000). Black (1976) further suggested that an increase in forecast information has been the prominent benefit from the opening of futures markets because when futures trading is introduced, public will have futures price as well as the spot price conveying information concerning current as well as prospective demand and supply forces in the equity market. Thus, organised futures markets are presumed to attract a set of traders who invest in information but do not necessarily take positions in the stock market (also see Brannen and Ulveling, 1984).

Traders who feel that they have better information can attempt to generate profits by trading in the futures market only, where the transaction costs for trading on such information are lower. Thus, commencement of futures trading will increase the quantity of information available to public and if futures trading results into increase in the amount of available information, its introduction could be accompanied with an increase in the volatility of the underlying stock price. This phenomenon is in consensus

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with Ross's (1989) theorem, which implies that increase in the rate of information flow manifests themselves in increases in stock price volatility.

Attanasio (1990) on the contrary, argued that lesser information causes stock prices to be more volatile than that in a market with full information. The economic rationale behind this argument lies in the information content of prices. Using the Grossman and Stiglitz (1980) model, Attanasio (1990) showed that in a market with asymmetric information and presence of noise, prices do not fully reveal private information. Attanasio (1990) further argued that noise gets "amplified" by the behaviour of uninformed traders and this will make prices more volatile than that in a situation of symmetric reactions. Similar argument has been raised by other financial economists, who mentioned that reduction in the amount of information available to agents could increase the volatility of exchange rates, relative to the corresponding model in which agents have full information. However, it has to be empirically examined as to how far the introduction of futures market has improved information efficiency and whether it has led to increase or decrease in spot volatility (for detailed discussion, see Thomas, 2006).

Voluminous literature (see Table 1) examining the impact of futures trading on cash market volatility suggests that there is mixed evidence on the hypothesis whether futures trading stabilizes or destabilizes the cash market. A comprehensive study on the subject by Gulen and Mayhew (2000) found that out of twenty five markets under examination, two markets i.e. U.S.A. and Japan experienced destabilizing impact of futures trading whereas in other markets either the cash market volatility declined or remained unchanged. Moreover, in seventeen countries they found that futures trading activity has helped to improve market depth, which resulted into the improvement of information dissemination efficiency and decrease in information asymmetry in the cash market. Another study by Altay-Salih and Kurtas (1998) (cited in Bologna and Cavallo, 2002) also found that seventeen out of twenty four indices under study observed decline in volatility after the advent of futures trading.

Furthermore, a strand of empirical literature in India (including Gupta, 2002; Gupta and Kumar, 2002; Thenmozhi, 2002; Bandivadekar and Ghosh, 2003; Nath, 2003; Raju and Karande, 2003; Shenbagaraman,

2003; Sah and Omkarnath, 2005; Karande, 2006; Singh and Bhatia, 2006; Thomas, 2006) has examined whether futures trading activity has caused any significant change in the nature of cash market volatility but the scope of these studies has been limited to the study of index derivatives only whereas in India, trading volume in individual stock futures market is multitude than that in index futures market. Therefore, in addition to study the impact of index futures trading activity on the volatility of underlying index, it would be more useful to examine the magnitude and nature of change in volatility and information dissemination efficiency of individual stocks because it is more convenient to take positions in individual stocks than executing program trading.

In this light, the present study is an attempt to examine whether equity futures trading has caused any change in the magnitude and nature of volatility and information dissemination efficiency of the Indian equity market. Further, discussion in the study has been organised into four sections; where first two sections describe sample design and sample period respectively, third section comments upon whether introduction of equity derivatives in the Indian capital market has caused any significant change in the information dissemination efficiency and magnitude and nature of Indian cash market volatility, and the fourth section concludes the discussion.

## Sample Design

Data used for investigating the change in magnitude and nature of volatility of the Indian equity market have been downloaded from the Indices and Equity segments of the National Stock Exchange of India's website and are secondary in nature. Universe of the study includes all those indices as well as individual stocks against which Futures and Options trading has been permitted in the F&O segment of the National Stock Exchange of India (NSE). There were three indices against which F&O trading was permitted as on December 31, 2006 but only NIFTY satisfied the sample selection criterion that underlying asset should have trading history of at least one trading year before the date of introducing derivatives trading against it. Sixty four individual stocks futures have been selected out of 150 individual stock futures trading as on December 31, 2006 subject to the individual stock futures selection criterion as mentioned below:

1. In order to avoid the potential bias of corporate action (namely, issue of bonus shares and stock splits) on the information dissemination efficiency of both equity stocks as well as individual stock futures contracts (because in the literature of Efficient Market Hypothesis<sup>1</sup>, it is an established fact that in addition to the price adjustment on record date, these corporate actions affect the portfolio value due to information leakage and other market imperfections prior to the record date as well), the present study considers only those individual stock futures, whose price series has not been during the sample period due to any corporate action (see Lamoureux and Lastrapes, 1990). The dates of stock split and bonus issue have been checked with Capitaline Database.
2. All those individual stock futures contracts, whose trading was banned by stock exchange authorities due to any reason<sup>2</sup>, won't form part of the sample size. This sample selection criterion negates the chances of including those individual stock futures contracts, whose trading was not continuous during sample period, which otherwise could be a potential factor responsible for inefficient price discovery (Campbell *et al.*, 1993).
3. All those stock futures contracts will be out of the scope of study, which do not observe continuous trading history of at least one year as on Dec. 2006. This sample selection criterion would help to secure sufficient data points (Nath, 2003) for investigating the information discounting speed of Indian equity futures market.

In addition to the sample selection criterion mentioned above, by following Nath (2003) all those equity stocks and Indices form sample of the study, which had trading history of at least one year before and after the date when futures trading was permitted on such equity stock or Index. Overall sample period covers ten years i.e. from January 1997 to December 2006. Since, index futures trading started as on June 12, 2000 therefore, maximum number of observations for NIFTY after the date of permitting futures trading were 1639 and for individual stocks 1283 because futures trading for individual stocks

was allowed only on November 9, 2001 (for detail see Appendix A).

Since, the futures trading covers the period when the equity stocks and indices observe options trading as well but the trading volume in options market was negligible, which was not expected to cause changes in the behaviour of underlying asset return volatility, therefore, the present study examine the impact of futures trading on equity stocks and indices only. Furthermore, past one decade has observed sea change in the Indian capital market, therefore, reforms other than introduction of derivatives trading may also have significantly affected the magnitude of cash market volatility. Thus, following Shenbagraman (2003), Sah and Omkarnath (2005) and Thomas (2006), CNX NIFTYJUNIOR / S&PCNX500 has been considered as surrogate indices to control the impact of other market-wide reforms on cash market volatility.

### Sample Period

Sample period of the study covers ten years (January 1997 to December 2006). Overall sample period has been subdivided into two trading regimes i.e. pre-futures trading regime and post-futures trading regime. As already mentioned, only those indices and individual stocks have been included in the sample of the study which had trading history of at least one trading year when derivatives trading was launched against it. Since, trading of Indian index futures contracts started in June 2000 and of individual stock futures contracts in November 2001, therefore, maximum number of observations prior to launch of futures trading could be 846 in case of NIFTY and 1202 in case of individual stock futures contracts (for detail see appendix A).

The daily closing prices of NIFTY and sixty four individual stocks have been downloaded from indices statistics and equity segment respectively from the website of National Stock Exchange of India. The daily closing price series for NIFTY and sixty four individual stocks understudy have been sorted and organised in Microsoft EXCEL Sheet and divided into pre and post futures trading period on the basis of the date of launch of futures trading on it.

Furthermore, previous one decade has brought sea change in the Indian capital market such as, screen based trading replaced open outcry trading system, demat accounts replaced share certificates, floor trading replaced

<sup>1</sup> See Fama (1970 and 1991) and Dimson and Mussavian (1998).

<sup>2</sup> See Eligibility Selection Criteria for permitting and discontinuing the trading of Indices and Individual Stocks in F&O segment at NSE ([www.nseindia.com](http://www.nseindia.com)).

by Internet trading, badla trading has been banned, compulsory rolling settlement was introduced, fixed price issues were replaced by partial or complete book building issues in primary issue market, establishment of interconnected stock exchange etc, which in addition to the introduction of derivatives trading may also have significantly affected the magnitude and nature of cash market volatility and its information dissemination efficiency. Thus, similar to Shenbagraman (2003), Sah and Omkarnath (2005) and Thomas (2006), NIFTYJUNIOR / S&PCNX500 have been used as surrogate indices to control the impact of other market-wide reforms on cash market volatility. The choice of better surrogate index has been based upon the coefficient of  $R^2$ , F statistics and Schwartz Information Criterion (SIC). The daily closing values of NIFTYJUNIOR / S&PCNX500 have been downloaded from Index Statistics from the website of National Stock Exchange of India ([www.nseindia.com](http://www.nseindia.com)).

## Results and Analysis

The empirical literature<sup>3</sup> on information discounting

<sup>3</sup> Examination of information discounting efficiency of the Indian equity market has been a subject of debate for long. Barua (1981), Sharma (1983), Gupta (1985), Rao (1988) and Chaudhuri (1991) were few early works, which examined the weak form efficiency in the Indian capital market at different time frames, but they found contradictory results, which may be sample period or methodology specific. For instance, Barua (1981), Gupta (1985), Rao (1988) and Chaudhuri (1991) applied autocorrelation and runs test to examine the price independence. Barua (1981) found that the Financial Express Index does not conform to Efficient Market Hypothesis (EMH), whereas the daily closing prices of 20 (randomly chosen) stocks conformed the EMH. Sharma (1983) applied Autoregressive Integrated Moving Average (ARIMA) methodology to examine the independence of Friday's closing prices of 23 stocks traded on Bombay Stock Exchange for the period 1973-78 and found significant evidence in support of EMH.

Reddy (1997) further investigated the evidence of Efficient Market Hypothesis in Indian stock market and by using ARCH and GARCH methodology found no evidence of efficiency in the Indian stock market. Marisetty (2003) also observed inefficiency in information dissemination in Indian stock market and found that prices take 19 days to adjust to their intrinsic values. Further, he found that stock prices overreact to the information shocks before these adjust to their intrinsic values. Reddy (1997) and Marisetty (2003) attributes low speed of information dissemination to lesser use of technology for trading in the market. Pant and Bishnoi

efficiency in the Indian equity market suggests that it is still unable to properly discount the risk component contained in the new information set(s) (Nath and Dalvi, 2004). Various empirical studies at different times have suggested market reforms, execution of which has brought sea change in the Indian equity market over past one decade and introduction of derivatives market has been one of the important episodes in this reform process. As already mentioned that financial derivatives were introduced in the Indian capital market as risk management instruments, which along with the efficient price discovery function and management of risk contained in the portfolio of underlying securities, were expected to help correct exploitable mispricings (if any) because both markets are linked through efficient arbitrage process (Garbade and Sibley, 1983a and 1983b)<sup>4</sup>.

(2001) studied the behaviour of daily and weekly return of five Indian stock market indices (Viz, Sensex, BSE-100, BSE-200, NIFTY and NSE-500) during April 1996 to June 2001. By applying variance ratio test, they found mean reverting behaviour of Indian stock market indices and overreaction in unitary direction, which indicates the existence of arbitrage opportunities. Nath (2002) also observed mean reverting behaviour in NIFTY and refuted the existence of random walk in Indian stock market.

<sup>4</sup> From theoretical point of view, it has been argued that since futures markets enjoy higher degree of leverage than cash markets, hence, these are more likely to attract uninformed speculative investors and thus, destabilize the cash market by increasing the element of price volatility (Cox (1979) and Figlewski (1980)). For example, transaction costs in futures markets are typically lower and the capital committed for a futures transaction is much lower than that required for a cash market transaction in the same asset. Thus, the futures market may be an entry port for new information (Miller (1991)). Furthermore, cash and futures prices are linked through arbitrage process and the participation of arbitrageurs and portfolio insurers may create a spillover effect from futures market to the underlying asset markets. On the other hand, many financial economists have pointed out that futures markets help to improve the overall market depth, informativeness (which are important for efficient price discovery), allow the transfer of risk and may actually help to reduce cash market volatility, which will be reflected through reduced required rate of returns for portfolio managers (Powers (1970), Danthine (1978) and Schwartz and Laatsch (1991)).

Furthermore, it has been argued that profitable speculation from well-informed speculators tends to stabilize prices and uninformed speculators will be eliminated from the market quickly because Friedman (1953) argued that speculation is destabilizing is largely equivalent to saying that speculators are

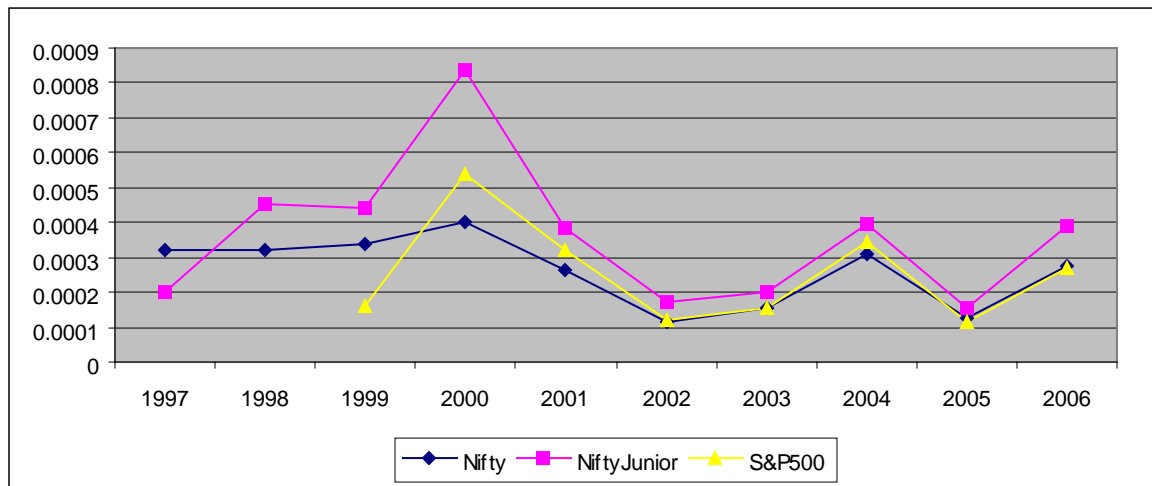
**Figure 1: Average Daily Volatility in the Indian Stock Market over Past Decade**

Figure 1 provides a glimpse of average volatility in the Indian equity market over a decade. Daily volatility of three indices (which constitutes most liquid stocks in the Indian capital market and is amongst the most diversified indices) has declined over the last decade. One notable observation in Figure 1 is that out of three indices, derivative trading has been permitted against NIFTY only, but the pattern of volatility of three indices is more or less same. Therefore, this notation makes it an interesting issue to examine whether financial derivatives have significantly affected the nature of volatility in the Indian capital market because introduction of F&O has been an episode in the overall reform process in the Indian capital market. Moreover, F&O segment in National Stock Exchange of India enjoys very good reputation amongst all global peer markets because it records highest daily trading volume in F&O segment.

Discussion on the impact of futures trading on cash market volatility has been started through descriptive statistics (see Table 2) of daily return series of NIFTY and sixty four individual stocks understudy. Maximum number of observations for NIFTY and individual stocks have been 2485 and minimum 685 for ESSAROIL, which confirms

loosing money, something which in the long-run at least cannot hold (Spyrou (2005)). Therefore, the issue whether derivatives trading causes change in information dissemination efficiency and magnitude and nature of volatility of cash market can't be resolved at theoretical level, because literature advocates both sides of arguments. Hence, this study is an attempt to explore whether huge trading volume of equity derivatives instruments in the Indian capital market destabilized or stabilized the Indian equity market.

the sample selection criterion suggested by Nath (2003) that series under examination should have traded for at least one trading year before and after the introduction of derivative instruments. Daily standard deviation of daily returns for NIFTY has been 0.016194 with mean returns 0.000580, which are negatively skewed and the coefficient of excess kurtosis is significantly different from zero. In addition, the coefficient of Jarque-Bera (2708.56) is statistically significant at 1% significance level, which implies that daily returns of NIFTY are non-normal. Similar observations for individual stocks in Table 2 are available; where HINDUNILVR observes minimum standard deviation of daily returns (i.e. 0.020445) and BONGAIREFN observes maximum standard deviation of daily returns (i.e. 0.042966). The daily mean returns of all individual stocks understudy are non-normal because the coefficient of Jarque-Bera test statistics for all individual stocks similar to NIFTY is statistically significant.

Further analysis of daily returns of Indian equity market by subdividing sample into two sub-samples named as pre-futures and post-futures sample period. The coefficient of standard deviation for NIFTY significantly declined from 0.019038 to 0.014516, which suggest that volatility in the Indian equity market after the introduction of derivatives trading has declined but these are only preliminary results and robust inferences may be drawn on the basis of detailed rigorous analysis conducted later. In addition to NIFTY, the coefficient of standard deviation significantly declined for forty six<sup>5</sup> individual equity stocks (71.88%),

5 (namely; ABB, ACC, ALBK, ALOKTEXT, ARVINDMILL, AUROPHARMA, BAJAJAUTO, BANKBARODA, BEL,

remained constant for eleven<sup>6</sup> individual stocks (17.19%) and increased for seven<sup>7</sup> individual stocks (10.93%). Therefore, overall descriptive statistics suggest that volatility in the Indian equity market has slashed after the introduction of derivatives trading.

Although, the launch of derivatives trading seems to have depressed volatility in the Indian equity market, but the amount of information asymmetry has increased. The coefficient of Jarque-Bera is statistically significant for NIFTY as well as for sixty four individual stocks understudy, which implies that returns during both sub-samples were non normal. However, the Jarque-Bera coefficient has significantly increased for NIFTY and thirty four<sup>8</sup> individual equity stocks (53.13%), which provide preliminary evidence that in the Indian equity market, information may not be simultaneously available to all types of traders and market makers.

Rejecting the null hypothesis that returns of speculative assets do not follow normal distribution, suggests that information dissemination process is not efficient and returns are asymmetrically distributed among buyers and sellers. Significantly skewed returns imply that extremely divergent risk perceptions for same information set persists in the market, which might not have allowed Indian equity market returns to represent their intrinsic value. It further suggests that the Indian equity market fails to adequately discount the risk premium component contained in the new information set (relevant to market

equilibrium) travelled to the market. Asymmetry in the Indian equity market returns is not shocking because traders with varied trading interests interact in the market and react heterogeneously to the available information set<sup>9</sup> (Diagler and Wiley, 1999).

The risk-averse nature of traders in the market may be a prominent cause for asymmetric behaviour of the Indian equity market returns because when an investor confronts dilemma to choose between two investment instruments offering same rate of return, he/she prefers one with lower risk. Furthermore, the utility maximization portfolio objective of a trader implies that his/her utility function will always be concave if there are gains and convex if there are losses (Myers and Hanson, 1996; Lien, 2001a). Therefore, risk and loss aversion suggests that traders are rather more sensitive to losses than gains, which implies that they react asymmetrically to positive (expected gains) and negative news (expected losses) (Moolman, 2004).

Chalkley and Lee (1998) further argued that risk aversion encourage economic agents to react promptly on receiving bad news, while, it prevents them from reacting quickly when they receive good news. However, in speculative markets (like equity, derivatives, currency and commodity), it has been observed that volume on uptick (positive news) is always higher than the volume on downtick (pessimistic news), because in bull market traders consider every dip in the stock/ index as an opportunity to buy, which in turn causes speculative asset's returns to behave asymmetrically (for detail see Karpoff, 1987).

Last column in Table 2 on Descriptive Statistics of the Indian equity market provides significant information relating to the nature of volatility of the Indian equity market. The coefficient of standard deviation has been calculated by presuming that variance of daily returns of NIFTY and individual stocks understudy is time invariant. However, large body of empirical literature in

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BHEL, BILT, BONGAIREFN, CENTURYTEX, CESC, CORPBANK, DIVISLAB, GLAXO, GNFC, GRASIM, HCLTECH, HDFCBANK, HEROHONDA, HINDUNILVR, HINDPETRO, ICICIBANK, IDBI, IPCL, KTKBANK, LICHSGFIN, MRPL, MTNL, NATIONALUM, NEYVELILIG, PNB, POLARIS, RELINACE, SBIN, SCI, STAR, TATACHEM, TATAMOTORS, TATAPOWER, TATATEA, TITAN, UTIBANK AND VIJAYABANK)

6 (namely; ANDHRABANK, CHAMBLFERT, ESSAROIL, IFCI, IOB, JSTAINLESS, NAGARFERT, PATNI, RELCAPITAL, SRF AND TVSMOTORS)

7 (Namely; BANKINDIA, COLGATE, ESCORTS, GAIL, INDUSINDBK, ORIENTBANK AND SYNDIBANK)

8 (Namely; ACC, ANDHRABANK, BANKBARODA, BEL, BHEL, CENTURYTEX, CESC, COLGATE, DIVISLAB, ESSAROIL, GAIL, GRASIM, HCLTECH, HDFCBANK, HINDUNILVR, HINDPETRO, ICICIBANK, IPCL, JSTAINLESS, MTNL, NATIONALUM, ORIENTBANK, PATNI, PNB, POLARIS, RELCAPITAL, RELIANCE, SBIN, SCI, TATAMOTORS, TATAPOWER, TATATEA, TITAN AND TVSMOTORS)

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9 Increase in the Jarque-Bera coefficient may be due to the pattern of different traders in the Indian equity market, where more than 60% of total trading volume is driven by retail participants, however institutional investors trade only 10% of the total trading volume (who otherwise are sentiment drivers in the cash market). Since both equity futures and cash markets are linked through arbitrage process, hence heterogeneous trading profile of market participants may be significant factor for huge information asymmetry in the Indian equity market.

financial economics has observed that due to the presence of different market agents having heterogeneous risk perceptions, the volatility of daily stock returns vary over the period (Engle, 1982; Bollerslev, 1986 and 1992). Last column in Table 2 confirms the previous empirical findings that variance of daily stock returns in the Indian equity market is time variant and it may observe volatility clustering, which implies that large shocks of volatility initiated today will persist over the period and today's volatility will predict tomorrow's volatility.

Prior to pursue with the statistical examination of daily returns of NIFTY and sixty four individual stocks, it would be more appropriate to check whether series under examination contain unit roots as the estimated results from non stationary time series will be spurious (Gujarati, 2003, pp 806-07; Tsay, 2005, pp 56-66). Augmented Dickey Fuller Test (ADF) and Philips Perron Test (PP) under two set of assumptions i.e. testing whether daily return series under examination are stationary with drift and with drift and trend conditions have been applied on NIFTY and sixty four individual stocks. The results suggest that the daily returns of both NIFTY as well as, all individual stocks under examination are stationary<sup>10</sup>; hence, we can pursue with our statistical investigations and draw useful economic inferences.

Following these preliminary observations, daily returns of the Indian equity market have been modelled in the basic autoregressive process, because previous empirical studies in the Indian equity market suggested that daily stock/ index returns were significantly autocorrelated and depend upon their previous values, which implies that price discovery process in the Indian equity market was inefficient. Therefore, daily returns of the Indian equity market have been modelled in equations (1) and (2), where  $R_{S,t}$  = daily mean returns in the Indian equity market,  $R_{S,t-i}$  = lagged daily returns of the Indian equity market where the number of lags (t-i) have been chosen on the basis of Schwartz Information Criterion (SIC), Days = five dummies for trading days of the week with binary numbers 1 and 0 for trading day and other days respectively,  $\omega$  = intercept term of conditionally heteroscedastic variance equation,  $\varepsilon_{t-i}^2$  = ARCH term representing the impact of new information shock and  $h_{t-j}$  = GARCH term representing the impact of old information shock.

<sup>10</sup> In order to save space, the unit root test results are not reported but are available on demand.

$$R_{S,t} = \sum_{i=1}^p \alpha_i R_{S,t-i} + \sum_{t=1}^5 \gamma_t \text{Days}_t + \varepsilon \quad (1)$$

$$h_t = \omega + \sum_{i=1}^p \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^q \beta_j h_{t-j} + u_t \quad (2)$$

The conditional volatility as defined in equation (2) is determined by three effects namely the intercept term given by  $\omega$ , the ARCH term expressed by  $\alpha_i \varepsilon_{t-i}^2$  and the forecasted volatility from the previous period called GARCH component expressed by  $\beta_j h_{t-j}$ . Parameters  $\omega$  and  $\alpha$  should be greater than 0 and  $\beta$  should be positive in order to ensure conditional variance  $h_t$  to be non-negative. Besides this, it is necessary that  $\alpha_i + \beta_j \leq 1$ , which secures covariance stationarity of conditional variance. A straightforward interpretation of the estimated coefficients in equation (2) is that the constant term is the long term average volatility. Whereas,  $\alpha_i$  and  $\beta_j$  represents how volatility is affected by current (ARCH term) and past information (GARCH term) set(s) respectively. The robustness of estimated results of equation (2) has been checked through Langrage Multiplier (LM) test procedure; whose null hypothesis states that variance of the error term is time invariant. Therefore, statistically insignificant coefficient of LM test would suggest that estimated GARCH equation could successfully control the conditional heteroscedasticity of error term in mean equation (1).

Moreover, the magnitude of parameters  $\alpha_i$  and  $\beta_j$  in equation (2) determines the short-run dynamics of the resulting time series volatility. Large  $\beta_j$  suggests that an information shock to the conditional variance takes longer time to die out, thus, volatility will persist for longer time periods. Large GARCH error coefficient indicates that volatility reacts quite intensely to market movements. Therefore, if variance of error term in equation (1) is not constant, equation (2) will be attached to equation (1), hence the testing of null hypothesis that daily returns of the Indian equity market follow random walk, will be subject to the nature of stock/index return's volatility.

The estimated results<sup>11</sup> of equation (1) and (2) suggest that in case of NIFTY, daily returns are significantly

<sup>11</sup> In order to save space the estimated results of equation (1) and (2) are not reported in the study but are available on demand.

autoregressive upto order three, which in addition to dependence upon past returns suggest that pattern of daily mean returns revert over the period because the sign of estimated parameters of autoregression coefficient reverts at higher order, which suggests that there may be significant overreaction to the current information shock and is later offset by counter strategy(ies) undertaken by rational speculators; consequently market equilibrium will be restored and these observations are consistent with Marisetty (2003). Since the maximum order of autoregression for NIFTY as well as, individual equity stocks is three, it indicates that it takes three days to discount any information in the market (however, the order of autoregression varies from stock to stock), therefore, it can be said that the Indian equity market has not yet matured to instantaneously discount the risk component of new information shock. The study further finds significant evidence of volatility clustering, which suggests that movement in price variance once initiated tends to persist over the period and steadily declines. Information dissemination efficiency of the Indian equity market has further been critically examined by subdividing the total sample period into two sub samples i.e. pre-futures and post-futures periods.

The estimated coefficients of equation (1) and (2) are based upon the assumption that both positive and negative information shocks would have symmetric effect upon conditional volatility of daily returns in the Indian equity market. However, empirical literature finds strong arguments against this assumption, therefore, Nelson (1991) by taking into account the asymmetric relationship between positive and negative asset returns, proposed an Exponential GARCH (EGARCH) model, which is based upon the logarithmic expression of conditional volatility in the Indian equity market returns. Therefore, if the stock returns are asymmetric and the large positive and negative information shocks observe leverage effect, EGARCH model (i.e. equation (3)) may provide better picture of the movement of index/stock returns as compared to those estimated through GARCH process in equation (2). The order of GARCH terms has been decided on the basis of SIC and in order to check the robustness of applied model, Langrage Multiplier (LM) test procedure was undertaken; whose null hypothesis states that variance of error term is homoscedastic, not heteroscedastic.

$$H_t = \gamma_1 + \gamma_2 \left| \frac{\epsilon_{2t-1}}{h_{t-1}} \right| + \gamma_3 \frac{\epsilon_{2t-1}}{h_{t-1}} + \gamma_4 h_{t-1} \quad (3)$$

EGARCH(p,q) results reported in Table 3 suggests that the daily returns of NIFTY and sixty four individual equity stocks are significantly autocorrelated and mean returns over different trading days of the week are significantly different, which may help an informed speculator to draft investment strategy and earn extra normal profits. In addition, the estimated coefficients of EGARCH(p,q) model as reported in Table 3 suggest that there is significant leverage effect between positive and negative news travelled to the market because  $\gamma_2$  is statistically significant for NIFTY as well as sixty four individual equity stocks and traders heterogeneously react to both information shocks. In addition, there was no significant difference in the leverage relationship between positive and negative information shocks in the Indian equity market when full sample period was subdivided into two sub samples i.e. pre-futures and post-futures sample periods as reported in Table 4 and 5 respectively. Therefore, overall findings from results estimated in Tables 2 through 5 suggest that the Indian equity market is not efficient in weak form, weekend effect is persistent, volatility clustering is prominent and traders heterogeneously react to positive and negative information shocks, however, new information shock has gained more importance in the price discovery process than that in the pre futures trading era.

After investigating whether, futures trading caused any significant change in the information dissemination process of the Indian equity market, an attempt has been made to measure whether the magnitude of volatility in the Indian equity market has changed because futures trading may cause either stabilizing or destabilizing effect. In order to examine this phenomenon, a dummy with binary numbers 0 and 1 for pre-futures and post-futures sample periods respectively has been introduced in the conditional variance equation (2) and it has been modified to equation (4) where;  $\delta$  measure whether equity futures trading could cause any significant change in the cash market volatility. Sign of estimated  $\delta$  will suggest the direction of change in conditional volatility in the Indian equity market. If estimated  $\delta$  is significantly negative, it will suggest that conditional volatility in the Indian equity market has declined and vice-versa and insignificant  $\delta$  would imply no change in the amount of volatility.

$$h_t = \omega + \sum_{i=1}^p \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^q \beta_j h_{t-j} + \delta DF + v_t \dots \dots \dots (4)$$

Furthermore, as observed in Table 2 and Table 3 through Table 5, there is significant information asymmetry present in the Indian equity market; therefore, the impact of futures trading on cash market volatility has been studied by incorporating  $\delta$  in equation (3) to modify it to equation (5). The estimated results as reported in Table 6 show that  $\delta$  is significantly negative in case of NIFTY and forty two<sup>12</sup> (65.63%) individual equity stocks, and  $\delta$  is statistically insignificant in Table 11 for nine<sup>13</sup> (14.06%) individual equity stocks, which provides further support to earlier findings that futures trading could help to reduce the cash market volatility. Empirical findings that derivatives trading has lead to decrease in the volatility of the Indian cash market are consistent with Gupta and Kumar (2002), Thenmozhi (2002), Bandivadekar and Ghosh (2003), Nath (2003), Raju and Karande (2003), Shenbagaraman (2003), Sah and Omkarnath (2005), Karande (2006), Singh and Bhatia (2006) and Thomas (2006).

$$H_t = \gamma_1 + \gamma_2 \left| \frac{\varepsilon_{2t-1}}{h_{t-1}} \right| + \gamma_3 \frac{\varepsilon_{2t-1}}{h_{t-1}} + \gamma_4 h_{t-1} + \delta DF \quad (5)$$

Moreover, besides the introduction of equity derivatives in the Indian capital market, previous one decade has brought sea change in the Indian capital market and introduction of equity derivatives has been one of most important episode in the whole reform process. Therefore, it would be a biased statement if on the basis of estimated results as reported in Table 6, it is concluded that futures trading in the Indian capital market has dampened the cash market volatility because other microstructure reforms might also have affected the nature and magnitude of cash market volatility.

12 (Namely; ABB, ACC, ALBK, ALOKTEXT, ARVINDMILL, AUROPHARMA, BAJAJAUTO, BEL, BHEL, BILT, BONGAIREFN, CENTURYTEX, CESC, CORPBANK, DIVISLAB, ESSAROIL, GLAXO, GRASIM, HCLTECH, HDFCBANK, HEROHONDA, HINDUNILVR, ICICIBANK, IDBI, IPCL, KTKBANK, LICHSFIN, MRPL, MTNL, NATIONALUM, NEYVELILIG, POLARIS, RELIANCE, SBIN, SCI, STAR, TATACHEM, TATAMOTORS, TATAPOWER, TATATEA, UTIBANK AND VIJAYABANK)

13 (Namely; ANDHRABANK, BANKBARODA, CHAMBLFER, GAIL, JSTAINLESS, ORIENTBANK, PATNI, PNB AND TITAN)

Thus, in order to investigate whether active futures trading could cause significant changes in the amount of volatility in the Indian equity market, equations (1) has been modified to include daily returns of a surrogate index (see equation (6)), which will control the impact of other microstructure reforms. Two surrogate indices i.e. NIFTYJUNIOR and S&PCNX500 have been considered and the choice of better index will be dependent upon the period of trading of a particular equity stock and the degree of association with NIFTYJUNIOR and S&PCNX500. Estimated results of equation (6) through equations (5) (with different set of assumptions that traders symmetrically or asymmetrically react to both positive and negative news respectively) have been reported in Table 7.

$$R_{S,t} = \sum_{i=1}^p \alpha_i R_{S,t-i} + \sum_{t=1}^5 \gamma_t Days_t + \zeta RI_t + \varepsilon \quad (6)$$

Estimated results in Table 7 suggest that conditional volatility in the Indian equity market after controlling the impact of other microstructure reforms has declined because the coefficient of dummy for futures trading is significantly negative in case of NIFTY as well as fifty two (81.25%) individual equity stocks. However, the coefficient of dummy for equity futures trading has been found significantly positive in case of seven (10.94%) individual equity stocks<sup>14</sup>. One notable observation is that the coefficients of dummy for futures trading in Tables 7 are comparatively larger than those reported in Table 6, which suggests that active futures trading in the Indian equity market could significantly dampen the cash market volatility and these observations are consistent with Gupta and Kumar (2002), Thenmozhi (2002), Bandivadekar and Ghosh (2003), Nath (2003), Raju and Karande (2003), Shenbagaraman (2003), Sah and Omkarnath (2005), Karande (2006), Singh and Bhatia (2006) and Thomas (2006).

## Conclusion

A comprehensive study on the subject conducted by Gulen and Mayhew (2000) found that out of 25 markets under examination, 2 markets i.e. U.S.A. and Japan experienced destabilizing impact of futures trading whereas in other

14 (Namely; COLGATE, ESCORTS, IFCI, INDUSINDBK, NAGARFERT, RELCAPITAL AND SYNDIBANK)

markets either the cash market volatility declined or observed no change. A strand of empirical literature in India has examined whether futures trading activity has caused any significant change in the nature of cash market volatility but the scope of these studies is limited to the study of index derivatives only. However, in India, trading volume in individual stock futures market is many times higher than that in index futures market.

Therefore, the present study has been conducted to examine the impact of futures trading activity on the volatility and information dissemination efficiency of cash market (including both index as well as individual stocks). Daily volatility of three indices (i.e. NIFTY, NIFTYJUNIOR and S&PCNX500, which constitutes most liquid stocks in the Indian capital market and are amongst the most diversified indices) has been found to decline over the last decade. Despite the fact that F&O trading has been permitted on NIFTY only, the pattern of change in volatility of three indices is more or less same, which suggests that introduction of futures trading may not have significant impact on the market wide volatility in the Indian equity market.

Daily returns of NIFTY and all individual stock futures contracts have been found to be non-normally distributed, which implies that similar to the futures market, traders in cash market asymmetrically react to the information shocks. Further analysis of daily returns of the Indian equity market has been done by subdividing the overall sample into two sub-samples (which are named as pre-futures and post-futures sample period). Both unconditional as well as conditional volatility of NIFTY and individual stocks has been found to be significantly declined during post futures trading period, which suggests that the derivatives trading has stabilized the Indian equity market.

Although, the launch of derivatives trading seems to have depressed the volatility in the Indian equity market, but the magnitude of information asymmetry is found to have increased, which suggests that different set of traders may be reacting to same information set(s) differently. Furthermore the daily returns have been found to be significantly autoregressive both for NIFTY as well as individual stocks, which implies that the Indian equity market is not efficient in weak form. However, the findings of GARCH (p,q) suggests that the role of new information in the price discovery process has increased after the launch of futures trading. Moreover, the findings

also indicate mean reversion in the daily returns, which suggests that traders may be significantly overreacting to the current information shock, which is later set-off by counter strategy(ies) undertaken by rational speculators; consequently the market equilibrium would be restored.

Findings also suggest that daily returns are seasonal over the trading days of the week and consistent with the previous studies, present study also finds that Monday and Friday returns are significantly different from daily returns on other trading days of the week, which implies that weekend effect does persist in the Indian equity market and it draws its explanation from dynamic human nature suggesting that positive information is disclosed during week days, whereas sources wait for the weekend to disclose negative news so as to allow the market to absorb the shock on weekend or at the most during morning trading session on Monday. Tuesday dummy is significant for thirteen individual equity stocks; Wednesday dummy is significant for forty and Thursday dummy for ten individual stocks respectively, which may be due to the settlement and time-to-maturity effects.

The study also finds significant evidence of volatility clustering in the Indian equity market, which suggests that movement in price variance once initiated tends to persist over the period and it steadily declines, which supports the findings that the speed of information dissemination is very low. Nonetheless the coefficients of ARCH and GARCH have varied over pre and post futures periods but futures trading could not eliminate volatility clustering in the Indian equity markets.

Moreover, besides the introduction of equity derivatives in the Indian capital market, previous one decade has observed sea change in the Indian capital market<sup>15</sup> and introduction of equity derivatives has been one of the most important episodes in whole reform process. Therefore, it would have been a biased statement if on the basis of estimated results of GARCH(p,q) and EGARCH(p,q) equations (with dummy for futures trading), it is concluded that futures trading in the Indian capital

15 (such as, screen based trading replaced open outcry trading system, demat accounts replaced share certificates, floor trading replaced by internet trading, badla trading has been banned, compulsory rolling settlement was introduced, fixed price issues were replaced by partial or complete book building issues in primary issue market, establishment of interconnected stock exchange etc.)

market has dampened the cash market volatility because other microstructure reforms might also have affected the nature and magnitude of cash market volatility. Thus, in order to investigate whether active futures trading could cause significant changes in the amount of volatility in the Indian equity market a surrogate index has been included in the mean equation to control for the impact of other reforms. Estimated results suggest that conditional volatility in the Indian equity market after controlling the impact of other microstructure reforms has declined because the coefficient of dummy for futures trading is significantly negative in case of NIFTY as well as fifty two (81.25%) individual equity stocks, however, dummy for equity futures trading was significantly positive in case of seven (10.94%) individual equity stocks.

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**Table 1: Empirical Evidences on the Impact of Futures Trading on Cash Market Volatility**

Author (Year of Study)	Market Understudy	Symbols	Sample Period	Change in Volatility	Change in Information Efficiency	Time-to- Expiration
Powers (1970)	U.S.A.	Pork Bellies and Live Beef	Jan. 1958 to Dec. 1965 and Jan. 1961 to Dec. 1968	Decline	N.E.	N.E.
Edwards (1988)	U.S.A.	S&P500 and Value Line Index	Jan. 1973 to Dec. 1986	Decline	N.E.	Increase but weak evidence
Herbst and Maberly (1991)	U.S.A.	S&P500	June 1984 to Mar. 1990	N.E.	N.E.	Decrease
Hodgson and Nicholls (1991)	Australia	AOI and SPI	Feb. 1981 to June 1987	No Change	N.E.	N.E.
Antoniou and Foster (1992)	U.K.	Brent Crude Oil	Jan. 1986 to July 1990	No Change	Improvement	N.E.
Bessembinder and Seguin (1992)	U.S.A.	S&P500	Jan. 1978 to Sept. 1989	Decline	N.E.	No Change
Lee and Ohk (1992)	Australia, Hong Kong, Japan, U.K. and U.S.A.	AOI, HSI, Nikkei225, FTSE100 and Value Line Index	100, 250 and 500 days before and after the date of listing <sup>1</sup>	No effect on AOI, Decrease in case of HIS and increase in case of Nikkei225, FTSE100 and Value Line Index	Improves	N.E.
Antoniou et al. (1998)	Germany, Japan, Spain Switzerland, U.K. and U.S.A.	Dax100, Nikkei225, IBEX35, Swiss MI, FTSE100 and S&P500	Nov. 1987 to Oct. 1993, Sept. 1985 to Aug. 1991, April 1989 to March 1995, Nov. 1987 to Oct. 1993, May, 1981 to April 1987 and June 1979 to May 1985	Decline in Germany and Switzerland, Increase in U.S.A. and No change in Japan, Spain and U.K.	Improvement	N.E.
Dennis and Sim (1999)	Australia	BHP, NAB, NCP, CRA, WBC, WMC, BTR, ANZ, MIM	June 1993 to April 1995	No Change	N.E.	N.E.

Contd...

Author (Year of Study)	Market Understudy	Symbols	Sample Period	Change in Volatility	Change in Information Efficiency	Time-to-Expiration
Gulen and Mayhew (2000)	U.S.A., U.K., Australia, Canada, Hong Kong, Japan, Sweden, Finland, Netherlands, France, Denmark, South Africa, Switzerland, Germany, Chile, Spain, Austria, Norway, Belgium, Italy, Hungary, Israel, Malaysia, Korea and Portugal	S&P, AOI, FTSE100, TSE300, Hang Seng, Nikkei225, OSE 50, Topix, OMX, HEX, AEX, CAC40, KFX, ALL SHARES, SMI, DAX, IPSA, IBEX35, ATX, OSE, BEL20, MIB30, BSI, MAOF25, KLCI, KOSPI200 and PSI-20	Jan. 1973 to Dec. 1997 <sup>2</sup>	Mixed	Improvement	N.E.
Bhar (2001)	Australia	AOI and SPI	Jan. 1989 to Dec. 1998	No Change	Increase	N.E.
Board et al., (2001)	U.K.	FTSE100	Jan. 1988 to Dec. 1985	No Change	N.E.	N.E.
Kan (2001)	Hong Kong	HSI	Mar. 1989 to Dec. 1992	N.E.	N.E.	No Change
Mckenzie et al., (2001b)	Australia	ANZ, BHP, RIO, FBG, MIM, NAB, NCP, PDP, WBC, WMC	Jan. 1990 to June 1998	Decrease	Mixed	N.E.
Rahman (2001)	U.S.A.	30 stocks comprising DJIA <sup>3</sup>	April to June 1997 and April to June 1998	No change	N.E.	N.E.
Yu (2001)	U.S.A, U.K., France, Japan, Australia and Hong Kong	S&P500, FTSE100, General Share Index, AOI and HSI	500 days before and after futures trading	Increase in U.S.A, France, Japan, Australia and no change in U.K. and Hong Kong	N.E.	N.E.
Arago and Fernandez (2002)	Spain	IBEX35	Jan. 1993 to Dec. 1999	N.E.	N.E.	Increase

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Author (Year of Study)	Market Understudy	Symbols	Sample Period	Change in Volatility	Change in Information Efficiency	Time-to-Expiration
Bologna and Cavallo (2002)	Italy	Fib30 on Mib30	Jan. 1990 to Dec. 1997	Decline	Improvement	N.E.
Darrat et al., (2002)	U.S.A.	S&P500	Nov. 1987 to Nov. 1997	No Change	N.E.	N.E.
Gupta (2002)	India	Nifty and Sensex	June 1998 to June 2002	Decline	N.E.	N.E.
Lafuente (2002)	Spain	IBEX35	Dec. 1993 to Dec. 1996	Increase	N.E.	N.E.
Pilar and Rafael (2002)	Spain	IBEX35	Oct. 1990 to Dec. 1994	Increase	Improvement	N.E.
Bandivadekar and Ghosh (2003)	India	Nifty and Sensex	Jan. 1997 to March 2003	Decrease in Nifty	Improvement	N.E.
Chatrath et al., (2003)	U.S.A.	S&P500	Jan. 1986 to Nov. 1996	Mixed	N.E.	N.E.
Chow et al., (2003)	Hong Kong	HIS	Jan. 1990 to Dec. 1999	N.E.	N.E.	Increase
Hetamsaria and Sovan Deb (2003)	India	Nifty	June 1999 to Aug. 2003	Decline	Improvement	N.E.
Illueca and Lafuente (2003)	Spain	Ibex35	Dec. 1993 to Dec. 1996	No Change	N.E.	N.E.
Nath (2003)	India	Nifty and 20 Individual Stocks <sup>4</sup>	Jan. 1999 to Oct. 2003	Decline	N.E.	N.E.
Raju and Karande (2003)	India	Nifty Futures and Nifty Index	Jan 1998 to Oct. 2002	Decline	N.E.	N.E.
Soydemir and Petrie (2003)	U.S.A.	DJIA	Mar. 1999 to Aug. 1999	Decline	N.E.	N.E.
Shenbagaraman (2003)	India	Nifty	Oct. 1995 to Dec. 2002	No Change	Improvement	N.E.
Thomas and Thenmozhi (2003)	India	Nifty	Oct. 1995 to Oct. 2003	Decline	Improvement	Decrease
Alkeback and Hagelin (2004)	Sweden	OMX	Jan. 1988 to Dec. 1998	N.E.	N.E.	Increase
Bae et al., (2004)	Korea	Kospi200	Jan. 1990 to Dec. 1998	Increase	Improvement	N.E.
Pok and Poshakwale (2004)	Malaysia	KLSE CI	Oct. 1993 to July 2001	Increase	Improvement	N.E.
Ryoo and Smith (2004)	Korea	KOSPI200	Sept. 1993 to Dec. 1998	Increase	Improvement	N.E.
Spyrou (2005)	Athens	FTSE/ASE-20	Sept. 1997 to Sept. 2003	Decline	N.E.	N.E.

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Author (Year of Study)	Market Understudy	Symbols	Sample Period	Change in Volatility	Change in Information Efficiency	Time-to- Expiration
Vipul (2005a)	India	Tatapower, Telco, Acc, Tisco, Sbi, Satyam, Bhel, Ranbaxy, L&T, Ril, Infosys, ITC, HIL And Hpcl	Nov. 2001 to April 2004	N.E.	N.E.	No Change
Yang et al., (2005)	U.S.A.	Corn, Soybeans, Sugar, Wheat, Cotton, Hog and Cattle	Jan. 1992 to Dec. 2001	Increase	N.E.	N.E.
Chou et al., (2006)	Taiwan	TX, TE, TF, MTX and TXO	Sept. 1998 to Dec. 2002	N.E.	N.E.	No Change
Floros and Vougas (2006)	Greece	FTSE/ASE-20 and FTSE/ASE Mid 40	Sept. 1997 to July 2001 and Dec. 1999 to July 2001	Decline and Increase	Improvement	N.E.
Karande (2006)	India	Castroseed Futures	Sept. 1982 to April 1997	Decline	Marginal Improvement	N.E.
Singh and Bhatia (2006)	India	Nifty	Oct. 1995 to March 2005	Decline	Improvement	Negative
Thomas (2006)	India	Nifty	Nov. 1995 to Aug. 2003	Decline	Improvement	Positive
Vipul (2006)	India	Nifty, ACC, INFOSYS, RIL, SATYAM, TELCO and TISCO	Jan. 1998 to June 2000 and Jan. 2002 to June 2004	Decline	Improvement	N.E.
Kumar and Mukhopadhyay (2007)	India	Nifty	June 1999 to June 2001	Decline	Improvement	N.E.

Where: ADEX= Athens Derivatives Exchange, AOI= All Ordinary Share Price Index, AOIF= All Ordinary Share Price Index Futures, BIFFEX= Baltic International Freight Futures Exchange, BP= British Pound, BPI= Baltic Panamax Index, CD= Canadian Dollar, DJIA= Dow Jones Industrial Average Index, DM= Deutsche Mark, FDAX= Deutscher Aktienindex Index Futures, HSIF= Hang Seng Index Futures, IPC= Mexican Price and Quotations Index, JY= Japanese Yen, KLCI= Kuala Lumpur Composite Index, KLFI= Kuala Lumpur Futures Index, MMI= Major Market Index, MSCI<sup>a</sup>= Malaysian Stock Composite Index, MSCI<sup>b</sup>= Morgan Stanley Capital International Inc. Taiwan Index, NCE= National Cheese Exchange in Green Bay, N.E.= Not Examined, NSA= Nikkei Stock Average Index, ODAX= Deutscher Aktienindex Index Options, SF= Swiss Franc, SGXMSCI= Morgan Stanley Capital International Inc. Taiwan Index Futures, SPI= Share Price Index Futures, TAIEX= Taiwan Stock Exchange Capitalization Weighted Stock Index, TAIFEX= Taiwan Stock Exchange Capitalization Weighted Stock Index Futures, TBI= TSE Banking and Insurance Sector Index Futures, TSE= TSE Electronic Sector Index Futures, TF= Tracker Fund, Wisconsin, U.K.= United Kingdom, USD= U.S. Dollar.

\*Source: Compiled from Various Studies.

**Table 2: Descriptive Statistics of the Indian Equity Market**

Symbol	Period	Count	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	LB2 (10)
NIFTY	Full	2485	0.000580	0.016194	-0.343366	8.068283	2708.56*	385.95*
	Pre	846	0.000527	0.019038	0.137669	6.165248	355.83*	
	Post	1639	0.000607	0.014516	-0.879177	9.559887	3149.88*	
ABB	Full	2485	0.000759	0.024492	-0.248483	6.796140	1517.68*	279.69*
	Pre	2062	0.000371	0.025071	-0.232508	6.803165	1261.28*	
	Post	423	0.002651	0.021370	-0.268521	5.991708	162.83*	
ACC	Full	1896	0.000950	0.027536	-0.093732	6.015080	720.94*	439.80*
	Pre	614	-0.000340	0.037250	-0.010985	4.340872	45.93*	
	Post	1283	0.001566	0.021382	-0.092397	5.356102	298.58*	
ALBK	Full	1020	0.002129	0.028878	-0.227404	8.839506	1458.03*	413.76*
	Pre	597	0.003509	0.033108	-0.254047	8.121192	658.81*	
	Post	423	0.000181	0.021425	-0.400098	5.155237	93.15444	
ALOKTEXT	Full	1747	0.000644	0.037838	0.519336	5.853411	671.20*	370.72*
	Pre	1351	0.000778	0.040617	0.536258	5.425764	395.99*	
	Post	396	0.000186	0.026267	0.013198	5.279381	85.74*	
ANDHRABANK	Full	1432	0.001590	0.028892	0.113150	8.091032	1549.53*	208.99*
	Pre	598	0.002669	0.028228	0.0743624	7.743928	615.86*	
	Post	834	0.000817	0.029350	-0.282616	8.201579	951.31*	
ARVINDMILL	Full	2485	-0.000364	0.034334	0.624050	6.187858	1213.53*	154.01*
	Pre	1671	-0.000604	0.036373	0.866155	6.151363	900.39*	
	Post	814	0.000129	0.029726	-0.296732	5.452369	215.92*	
AUROPHARMA	Full	788	0.000926	0.026677	0.278892	9.280545	1305.33*	141.84*
	Pre	381	-0.000410	0.028536	0.037450	10.79583	964.89*	
	Post	407	0.002177	0.024781	0.670738	6.263333	211.11*	
BAJAJAUTO	Full	2243	0.000650	0.022428	0.204978	5.208237	471.44*	244.03*
	Pre	960	-0.000581	0.025698	0.348623	4.959078	172.97*	
	Post	1283	0.001571	0.019589	0.051150	4.767955	167.65*	
BANKBARODA	Full	2446	0.000455	0.032829	0.079575	7.283693	1872.76*	652.30*
	Pre	1612	0.000392	0.033327	0.336376	5.419554	423.61*	
	Post	834	0.000578	0.031864	-0.487934	11.57154	2586.22*	
BANKINDIA	Full	2404	0.000471	0.031764	0.117727	5.430756	597.40*	381.33*
	Pre	1570	-0.000151	0.030488	0.244832	5.147523	317.38*	
	Post	834	0.001643	0.034023	-0.075824	5.679784	250.35*	
BEL	Full	2361	0.001411	0.038332	0.298382	4.448819	241.53*	627.00*
	Pre	1384	0.001015	0.045788	0.303427	3.342498	28.00*	
	Post	977	0.001971	0.024116	0.136815	7.306565	758.05*	
BHEL	Full	2485	0.000950	0.029846	-0.132853	6.407114	1209.27*	401.62*
	Pre	1202	-0.000293	0.035104	0.051977	3.926836	43.56*	
	Post	1283	0.002116	0.023849	-0.488844	13.27623	5696.35*	
BILT	Full	2485	0.000197	0.033228	0.425505	5.661631	808.50*	378.30*
	Pre	2078	0.000227	0.034732	0.488936	5.293093	538.07*	
	Post	407	4.61E-05	0.024162	-0.679305	8.249777	498.68*	
BONGAIREFN	Full	2481	0.000463	0.042966	0.715880	8.497838	3336.55*	563.67*
	Pre	2074	0.000886	0.045708	0.708900	7.759756	2131.51*	
	Post	407	-0.001693	0.024569	-0.567617	9.057925	644.20*	
CENTURYTEX	Full	2245	0.001041	0.037808	0.190017	4.615448	257.51*	334.54*
	Pre	1821	0.000659	0.038566	0.291847	4.269499	148.13*	
	Post	423	0.002685	0.034351	-0.397168	6.900903	279.32*	

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Symbol	Period	Count	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	LB2 (10)
CESC	Full	2485	0.000672	0.035549	0.581401	5.965538	1050.59*	125.11*
	Pre	2078	0.000548	0.036998	0.697808	5.489874	705.41*	
	Post	407	0.001304	0.026995	-1.005436	10.95926	1142.88*	
CHAMBLFERT	Full	1249	0.000980	0.023569	-0.192946	12.82281	5029.12*	15.20*
	Pre	842	0.001163	0.023485	0.004671	15.78816	5737.43*	
	Post	407	0.000603	0.023766	-0.587181	6.924191	284.53*	
COLGATE	Full	2485	0.000192	0.021324	0.661278	8.064114	2836.46*	122.42*
	Pre	2062	-9.91E-05	0.020866	0.518466	6.529302	1162.56*	
	Post	423	0.001612	0.023403	1.113722	12.38593	1640.13*	
CORPBANK	Full	2261	0.000590	0.031295	0.203850	6.034215	882.98*	255.68*
	Pre	1854	0.000713	0.032024	0.263453	5.738867	600.93*	
	Post	407	2.99E-05	0.027763	-0.240405	7.828467	399.29*	
DIVISLAB	Full	949	0.003006	0.029362	0.346605	5.624578	291.38*	74.16*
	Pre	542	0.003133	0.031458	0.597370	4.827694	107.67*	
	Post	407	0.002838	0.026350	-0.242481	7.167875	298.57*	
ESCORTS	Full	2485	0.000106	0.034652	0.210845	5.196810	518.10*	323.00*
	Pre	2089	-1.33E-05	0.034036	0.259724	5.211901	449.34*	
	Post	396	0.000736	0.037772	0.009909	5.005441	66.37*	
ESSAROIL	Full	685	0.001790	0.040316	0.275189	7.254535	525.28*	154.29*
	Pre	278	0.002866	0.040253	0.438373	6.654346	163.59*	
	Post	407	0.001055	0.040392	0.165826	7.645242	367.80*	
GAIL	Full	1372	0.001021	0.025535	-0.027839	24.10791	25470.43*	549.11*
	Pre	558	0.001354	0.020487	0.293172	6.685877	323.86*	
	Post	814	0.000793	0.028494	-0.096822	25.00459	16423.79*	
GLAXO	Full	2243	0.000466	0.023609	0.281709	6.440371	1135.86*	319.40*
	Pre	1820	0.000303	0.024073	0.355440	6.479689	956.53*	
	Post	423	0.001164	0.021511	-0.143875	5.931004	152.87*	
GNFC	Full	2485	0.000543	0.031569	0.388310	6.392173	1253.89*	337.81*
	Pre	2078	0.000505	0.032133	0.439504	6.229076	969.70*	
	Post	407	0.000734	0.028553	0.011954	7.363435	322.89*	
GRASIM	Full	2485	0.000762	0.027613	0.071290	5.554863	677.96*	602.74*
	Pre	1202	-0.000344	0.033387	0.062205	4.205992	73.62*	
	Post	1283	0.001797	0.020758	0.320344	7.278296	1000.44*	
HCLTECH	Full	1517	2.34E-05	0.036647	-0.673570	8.606702	2101.67*	751.63*
	Pre	540	-0.002507	0.049727	-0.504180	5.701913	187.14*	
	Post	977	0.001422	0.026738	-0.517904	8.863298	1443.16*	
HDFCBANK	Full	2485	0.001303	0.025402	0.310197	10.29495	5549.96*	461.09*
	Pre	1651	0.001152	0.027016	0.349737	5.202650	367.41*	
	Post	834	0.001602	0.021870	0.165369	31.92987	29087.38*	
HEROHONDA	Full	1434	0.001185	0.024763	0.315186	5.502808	398.02*	195.93*
	Pre	457	0.001321	0.028295	0.727682	6.066169	219.35*	
	Post	977	0.001122	0.022941	-0.059697	4.405611	81.01*	
HINDLEVER	Full	1602	-6.66E-05	0.020445	-0.068445	7.074442	1109.37*	71.14*
	Pre	319	-0.000330	0.023712	0.331064	5.263532	73.93*	
	Post	1283	-1.08E-06	0.019558	-0.239142	7.747697	1217.21*	
HINDPETRO	Full	1789	0.000327	0.029871	-0.237403	11.36836	5236.92*	45.55*
	Pre	506	-0.000285	0.035924	0.187477	4.125746	29.68*	
	Post	1283	0.000568	0.027127	-0.593457	18.35743	12683.49*	
ICICIBANK	Full	2306	0.001255	0.031838	0.174241	5.578692	650.59*	915.55*
	Pre	1329	0.000835	0.037062	0.190887	4.658458	160.38*	
	Post	977	0.001825	0.022898	0.126029	5.811644	324.40*	

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Symbol	Period	Count	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	LB2 (10)
IDBI	Full	1455	0.000627	0.034446	0.418263	9.015756	2236.40*	437.00*
	Pre	1032	0.000979	0.036209	0.494484	9.211038	1700.87*	
	Post	423	-0.000232	0.029732	0.017206	6.377922	201.13*	
IFCI	Full	2485	-0.000420	0.039215	0.931787	8.755115	3789.03*	194.49*
	Pre	2089	-0.000475	0.039327	1.074794	9.224635	3774.72*	
	Post	396	-0.000133	0.038662	0.135840	6.112976	161.11*	
INDUSINDBK	Full	1372	0.000959	0.032290	-0.174409	7.521180	1175.50*	223.64*
	Pre	965	0.001508	0.030553	-0.104519	7.459670	801.45*	
	Post	407	-0.000343	0.036083	-0.241047	7.162200	297.73*	
IOB	Full	1509	0.001606	0.029297	-0.246172	8.572564	1967.73*	313.42*
	Pre	1086	0.001786	0.029534	-0.347740	9.713344	2061.26*	
	Post	424	0.001144	0.028708	0.035564	5.291377	92.63*	
IPCL	Full	2485	0.000341	0.031577	-0.578445	15.00200	15053.56*	115.61*
	Pre	1508	-0.000182	0.033681	-0.673534	12.62170	5930.94*	
	Post	977	0.001149	0.028018	-0.262617	20.81003	12923.80*	
JSTAINLESS	Full	707	0.000467	0.033961	0.108398	9.204339	1135.35*	141.52*
	Pre	300	0.000556	0.032569	-0.339113	8.663747	406.73*	
	Post	407	0.000402	0.034991	0.374484	9.437305	712.25*	
KTKBANK	Full	1038	0.000904	0.039456	-5.792365	114.2221	540822.70*	2.83
	Pre	642	0.000477	0.043828	-6.991029	119.9694	371218.90*	
	Post	396	0.001597	0.031129	0.754992	7.589341	385.14*	
LICHSGFIN	Full	2485	0.000413	0.027834	0.267166	6.584470	1359.91*	436.46*
	Pre	2062	0.000697	0.028966	0.303178	6.353429	997.76*	
	Post	423	-0.000970	0.021449	-0.370400	6.394477	212.76*	
MRPL	Full	1372	0.001285	0.035571	0.887082	10.04917	3020.60*	130.88*
	Pre	949	0.001964	0.038616	0.985086	9.492343	1820.19*	
	Post	423	-0.000239	0.027520	-0.051172	7.842779	413.54*	
MTNL	Full	2485	-0.000204	0.030139	0.088591	4.913069	382.20*	363.66*
	Pre	1202	-0.000449	0.033241	0.070203	4.023537	53.46*	
	Post	1283	2.52E-05	0.026921	0.130507	6.196911	550.00*	
NAGARFERT	Full	2485	-0.000118	0.031379	0.827003	8.887065	3871.76*	311.53*
	Pre	2089	-8.14E-05	0.031502	1.039624	8.992933	3502.43*	
	Post	396	-0.000310	0.030762	-0.382751	8.214146	458.26*	
NATIONALUM	Full	1920	0.001084	0.031521	-0.058559	7.075015	1329.56*	154.27*
	Pre	943	0.001289	0.035585	0.187867	6.182630	403.54*	
	Post	977	0.000886	0.027043	-0.611564	7.768881	986.70*	
NEYVELILIG	Full	1587	0.001391	0.036325	0.381362	9.682883	2991.67*	282.31*
	Pre	1164	0.002064	0.039011	0.426904	8.812714	1674.06*	
	Post	423	-0.000462	0.027573	-0.257005	11.90242	1401.49*	
ORIENTBANK	Full	2485	0.000404	0.027690	-0.183040	11.30378	7153.36*	610.65*
	Pre	1651	0.000471	0.026192	0.315530	6.009339	650.38*	
	Post	834	0.000272	0.030454	-0.804841	16.52180	6443.70*	
PATNI	Full	710	0.000812	0.024370	0.984611	9.262883	1275.09*	17.09***
	Pre	287	0.001174	0.025128	0.744036	6.174064	146.96*	
	Post	423	0.000567	0.023869	1.170163	11.80434	1462.76*	
PNB	Full	1168	0.002232	0.031401	-0.173081	8.138431	1290.80*	235.98*
	Pre	334	0.004645	0.036784	-0.096068	8.041121	354.18*	
	Post	834	0.001266	0.028934	-0.292825	7.392749	682.46*	
POLARIS	Full	1350	0.000296	0.039217	-0.313189	7.927471	1387.82*	150.35*
	Pre	373	0.000737	0.051433	-0.178665	6.219802	163.11*	
	Post	977	0.000127	0.033427	-0.471901	7.501344	861.10*	
RELCAPITAL	Full	2485	0.000952	0.034393	0.058412	5.752297	785.76*	533.37*
	Pre	2062	0.000567	0.034357	0.015533	4.795093	276.94*	
	Post	423	0.002827	0.034547	0.263252	10.29876	943.80*	

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Symbol	Period	Count	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	LB2 (10)
RELIANCE	Full	2265	0.000913	0.024736	-0.578045	14.40586	12403.73*	57.38*
	Pre	982	0.000493	0.028680	0.290447	4.618607	121.00*	
	Post	1283	0.001234	0.021235	-2.123821	35.26882	56629.44*	
SBIN	Full	2485	0.000650	0.024945	-0.081699	5.710825	763.65*	545.28*
	Pre	1202	-0.000178	0.028424	0.165592	4.279098	87.43*	
	Post	1283	0.001425	0.021156	-0.547174	8.450571	1652.20*	
SCI	Full	1996	0.001004	0.036261	0.634963	10.24724	4502.24*	111.04*
	Pre	1019	0.001059	0.041698	0.910487	8.065729	1230.34*	
	Post	977	0.000947	0.029565	-0.274902	14.10959	5036.65*	
SRF	Full	2474	0.000701	0.038792	0.388795	7.330717	1995.67*	450.47*
	Pre	2078	0.000680	0.038566	0.412972	7.254409	1626.22*	
	Post	396	0.000812	0.040007	0.273638	7.649872	361.69*	
STAR	Full	832	0.001504	0.034077	0.490515	8.363174	1030.50*	45.43*
	Pre	436	0.001915	0.037298	0.320082	8.164659	492.02*	
	Post	396	0.001051	0.030177	0.797588	7.669202	401.71*	
SYNDIBANK	Full	1751	0.001012	0.029024	0.351185	11.67374	5524.92*	319.81*
	Pre	937	0.000789	0.025946	1.178591	12.30591	3597.93*	
	Post	814	0.001269	0.032219	-0.164370	10.62297	1974.55*	
TATACHEM	Full	2485	7.03E-05	0.027153	-0.023309	6.271435	1108.36*	388.71*
	Pre	2062	-9.20E-05	0.028384	-0.020036	5.977102	761.63*	
	Post	423	0.000699	0.019852	-0.015621	6.872710	263.73*	
TATAMOTORS	Full	2485	0.000369	0.029947	-0.067170	4.270419	168.98*	459.72*
	Pre	1202	-0.001183	0.034879	0.004423	3.671481	22.59*	
	Post	1283	0.001823	0.024365	-0.065938	4.398663	105.51*	
TATAPOWER	Full	2485	0.000580	0.027071	-0.132735	7.904722	2498.13*	863.74*
	Pre	1202	-8.94E-05	0.030558	0.231211	5.870876	423.49*	
	Post	1283	0.001208	0.023330	-0.830785	11.71974	4212.24*	
TATATEA	Full	2485	0.000489	0.026163	0.206074	5.433312	630.66*	460.40*
	Pre	1202	-0.000246	0.030579	0.302512	4.303316	103.41*	
	Post	1283	0.001178	0.021198	0.005531	7.079898	889.85*	
TITAN	Full	2485	0.000898	0.035838	0.582342	5.759807	928.71*	97.43*
	Pre	2077	0.000482	0.036210	0.556890	5.229498	537.52*	
	Post	407	0.003019	0.033841	0.769987	9.227642	697.92*	
TVSMOTORS	Full	735	-0.000340	0.028904	0.076176	5.107169	136.69*	111.90*
	Pre	328	-0.001442	0.028020	0.131467	4.727882	41.75*	
	Post	407	0.000548	0.029602	0.029094	5.345453	92.35*	
UTIBANK	Full	2016	0.001646	0.032613	0.672987	9.016277	3192.61*	183.46*
	Pre	1593	0.001639	0.034182	0.758496	9.022448	2560.16*	
	Post	423	0.001672	0.025897	-0.159847	4.996393	72.05*	
VIJAYABANK	Full	1490	0.001075	0.030330	0.240237	9.400986	2558.05*	200.47*
	Pre	1067	0.001705	0.031979	0.097586	9.036944	1621.96*	
	Post	423	-0.000514	0.025673	0.819423	9.812972	865.43*	

Table 3: Information Dissemination Efficiency of the Indian Equity Market (Full Period) (Using EGARCH (p,q))

Symbol	AR(1)	AR(2)	AR(3)	AR(4)	MON	TUE	WED	THURS	FRI	C	ABS(I)	RESID/ SQRT	GARCH (1)	GARCH (2)	LM (10)
NIFTY	0.113828*	-0.029659	0.068789*	0.037441***	0.000689	-0.000514	0.002021*	0.000732	-0.000268	-0.762741*	0.230409*	-0.136455*	0.930629*	N.A.	0.55(0.86)
ABB	0.116921*	N.A.	N.A.	N.A.	0.002146*	0.000472	0.003087*	-7.59E-05	0.000198	-1.599087*	0.451987*	-0.000798	0.832920*	N.A.	0.46(0.91)
ACC	0.010715	-0.043231**	N.A.	N.A.	-5.06E-05	-0.000228	0.003096*	0.001767***	0.002566*	-0.431008*	0.259187**	-0.024830**	0.968490*	N.A.	0.84(0.59)
ALBK	0.100076*	N.A.	N.A.	N.A.	0.001565	-0.000275	0.003227**	0.004431*	0.001572	-0.642190*	0.272679*	0.053063*	0.940299*	N.A.	1.03(0.40)
ALOKTEXT	0.102724*	N.A.	N.A.	N.A.	0.003504*	0.000241	0.001238	0.000163	-0.001613	-0.460859*	0.32041*	0.035678*	0.957508*	N.A.	0.86(0.57)
ANDHRABANK	0.077424*	N.A.	N.A.	N.A.	-0.000311	0.001969	0.001535	0.000989	0.002810**	-0.713172*	0.328801*	-0.003162	0.934765*	N.A.	0.69(0.73)
ARVINDMILL	0.101419*	-0.067934*	N.A.	N.A.	0.002955*	-0.003991*	0.005549*	-0.003308*	-0.002080	-1.039529*	0.335627*	0.034114*	0.422896*	0.461477*	1.06(0.39)
AUROPHARMA	0.034695	-0.089802**	N.A.	N.A.	-0.002154	-0.000412	-0.000432	-0.001275	0.004380*	-2.049146*	0.384076*	-0.020079	0.760960*	N.A.	0.35(0.97)
BAJAJAUTO	0.019124	N.A.	N.A.	N.A.	0.002528*	-0.001112	0.001337	0.000892	0.000132	-0.777789*	0.245426*	-0.050768*	0.922798*	N.A.	0.31(0.98)
BANKBARODA	0.119021*	-0.040276***	N.A.	N.A.	0.001282	-0.003276*	0.005391*	0.000782	-0.000804	-0.962121*	0.294417*	-0.016034	0.893489*	N.A.	1.33(0.21)
BANKINDIA	0.088482*	N.A.	N.A.	N.A.	-0.000274	-0.002802**	0.005332*	-0.000791	-0.001815	-1.411170*	0.350076*	-0.007087	0.835883*	N.A.	0.45(0.92)
BEL	0.079921*	N.A.	N.A.	N.A.	0.001421	0.001072	0.003895*	0.002185**	0.001434	-0.153660*	0.101532*	-0.014205**	0.988719*	N.A.	1.41(0.12)
BHEL	0.060084*	-0.046545*	N.A.	N.A.	0.002838*	0.000218	0.002353**	0.000985	0.000681	-0.679675*	0.323900*	-0.073468*	0.542950*	0.396308*	1.23(0.37)
BILT	0.077458*	N.A.	N.A.	N.A.	0.001783***	-0.002207**	0.001698	0.000273	0.000581	-0.430657*	0.224876*	-0.001696	0.962352*	N.A.	1.10(0.36)
BONGAIREFN	0.079604*	N.A.	N.A.	N.A.	-0.001210	-0.004228*	0.008628*	-0.001965	-0.000292	-0.776044*	0.294460*	0.044883*	0.912724*	N.A.	0.80(0.63)
CENTURYTEXT	0.076715*	-0.059782*	N.A.	N.A.	0.006341*	0.000364	0.000950	0.001641	-0.000310	-0.721708*	0.265202*	-0.015928	0.922132*	N.A.	0.85(0.58)
CESC	0.079063*	N.A.	N.A.	N.A.	-0.002897**	-0.005150*	0.007143*	-0.001955	0.0006288	-1.844269*	0.298025*	0.015389	0.759400*	N.A.	0.25(0.99)
CHAMBLFERT	0.025824	-0.058747**	N.A.	N.A.	0.003340*	0.001711	-7.03E-05	0.001118	0.001007	-0.244128*	0.103882*	0.058508*	0.976810*	N.A.	0.24(0.99)
COLGATE	0.033686**	-0.053417*	N.A.	N.A.	7.81E-06	-0.000693	0.002614*	-9.68E-05	1.00E-05	-0.217720*	0.120740*	0.035786*	0.983216*	N.A.	1.24(0.24)
CORPBANK	0.050186**	N.A.	N.A.	N.A.	0.001053	0.000554	0.000971	0.000978	-0.001012	-1.002298*	0.338027*	-0.008350	0.892214*	N.A.	0.93(0.50)
DIVISLAB	0.111301*	N.A.	N.A.	N.A.	0.002812	0.003159	0.001037	0.003027	0.005631*	-0.764690*	0.241286*	-0.010491	0.918115*	N.A.	0.68(0.74)
ESCORTS	0.104531*	N.A.	N.A.	N.A.	0.001472	-0.002644**	0.005129*	-9.74E-05	-0.002877**	-0.656695*	0.236174*	0.008615	0.929664*	N.A.	1.05(0.40)
ESSAROIL	0.026174	-0.070669***	N.A.	N.A.	0.001456	-0.002250	0.003967	-0.001542	0.004330	-1.883144*	0.411194*	-0.049086	0.758854*	N.A.	0.46(0.91)
GAIL	0.051825***	N.A.	N.A.	N.A.	0.000370	0.000900	0.002253**	0.001397	-0.000524	-0.632947*	0.265561*	-0.033258*	0.942081*	N.A.	0.70(0.72)
GLAXO	0.028619	N.A.	N.A.	N.A.	0.001420	0.000799	0.000997	0.001398***	-0.000262	-0.718262*	0.252059*	-0.027742**	0.929687*	N.A.	0.60(0.81)
GNFC	0.051479*	N.A.	N.A.	N.A.	0.004799*	0.000706	0.002585**	-0.001141	0.001002	-0.523283*	0.191510*	0.013312	0.945401*	N.A.	0.21(0.99)
GRASIM	0.092587*	-0.034596***	N.A.	N.A.	0.000126	-0.000120	0.002970*	0.000765	0.000214	-0.410235*	0.268012*	-0.011999	0.269211*	0.702684*	1.36(0.13)
HCLTECH	0.020168	N.A.	N.A.	N.A.	0.000758	0.001207	-0.000689	0.002108***	0.000660	-0.251264*	0.186306*	-0.031712*	0.9844205*	N.A.	0.42(0.94)
HDFCBANK	-0.022984	-0.071410*	N.A.	N.A.	0.000364	0.000774	0.001834**	0.000255	0.000900	-1.18357*	0.399426*	-0.038309*	0.889729*	N.A.	1.08(0.37)
HEROHONDA	0.019409	-0.081013*	-0.054823**	N.A.	0.001387	3.74E-05	0.000235	0.000529	0.002134***	-1.928026*	0.365160*	-0.032546	0.780029*	N.A.	0.23(0.99)
HINDLEVER	0.052557**	-0.058995**	N.A.	N.A.	-0.001551	0.000438	4.97E-05	-2.00E-05	0.000905	-0.677986*	0.139620*	-0.052034*	0.926967*	N.A.	0.37(0.96)
HINDPETRO	0.097455*	-0.044961***	N.A.	N.A.	2.31E-05	7.78E-05	-0.000986	-0.001930	0.001172	-0.438364*	0.202806*	-0.022429**	0.959359*	N.A.	0.18(0.99)
ICICIBANK	0.095894*	N.A.	N.A.	N.A.	0.000531	7.26E-06	0.002935*	-0.000300	0.000675	-0.707772*	0.307036*	-0.033838*	0.603400*	0.329100*	1.57(0.11)
IDBI	0.087461*	N.A.	N.A.	N.A.	-8.52E-05	0.001347	0.003550*	-0.000695	0.000887	-1.457025*	0.357244*	-0.027742	0.826969*	N.A.	1.18(0.30)
IFCI	0.031040	N.A.	N.A.	N.A.	-0.002492**	-0.006703*	0.010936*	-0.002115	-0.005018*	-0.678979*	0.259040*	0.042580**	0.923651*	N.A.	0.56(0.85)
INDUSINDBK	0.050921***	-0.069023**	N.A.	N.A.	0.000685	0.000220	0.000918	0.002420	0.001779	-0.898802*	0.287570*	0.032059**	0.901100*	N.A.	0.62(0.79)

Contd...

Symbol	AR(1)	AR(2)	AR(3)	AR(4)	MON	TUE	WED	THURS	FRI	C	ABS(1)	RESD/ SQRT	GARCH (1)	GARCH (2)	LM (10)
IOB	0.040651	-0.033324	N.A.	N.A.	0.002014***	-0.001018	0.002486***	0.000778	0.002827**	-0.478330*	0.233194*	0.018864***	0.957618*	N.A.	0.61(0.81)
IPCL	0.068208*	N.A.	N.A.	N.A.	0.001044	-0.000500	0.002621*	-0.000644	0.000244	-0.824581*	0.340507*	-0.065706*	0.919054*	N.A.	1.00(0.42)
JSTAINLESS	-0.023611	N.A.	N.A.	N.A.	7.82E-05	0.001089	8.21E-05	-0.001743	0.000550	-1.691608*	0.347974*	-0.108683*	0.792047*	N.A.	0.65(0.77)
KTKBANK	0.098818*	0.039492	0.078490*	N.A.	0.000333	-0.005065*	0.003341**	0.001524	-0.000658	-2.081920*	0.568382*	-0.165370*	0.753550*	N.A.	0.29(0.98)
LICHSGFIN	0.095732*	N.A.	N.A.	N.A.	0.001599*	-0.000481	0.003935*	-0.001107	6.02E-05	-0.754348*	0.242002*	0.016024	0.920483*	N.A.	0.78(0.65)
MRPL	0.136059*	-0.087619*	N.A.	N.A.	0.003965*	-0.004387*	0.000345	-0.002062	0.002800***	-1.073491*	0.338216*	-0.044112*	0.876556*	N.A.	0.55(0.86)
MTNL	0.072699*	-0.078107*	N.A.	N.A.	-0.001555	-0.001729	0.002486**	-0.000386	7.54E-05	-0.511552*	0.200810*	-0.019688**	0.949445*	N.A.	1.27(0.24)
NAGARFERT	0.060282*	N.A.	N.A.	N.A.	-0.002191*	-0.001409	0.004897*	-0.002014**	-0.002865*	-1.041585*	0.411166*	0.067401*	0.895178*	N.A.	0.77(0.66)
NATIONALUM	0.099209*	-0.065928*	N.A.	N.A.	-0.000834	-4.40E-05	0.002855**	0.001729	5.79E-05	-0.867262*	0.336286*	-0.009644	0.912318*	N.A.	0.87(0.56)
NEYVELLIG	0.079877*	N.A.	N.A.	N.A.	0.003920*	0.002186	0.003164**	0.001312	0.000889	-0.562587*	0.249915*	-0.003795	0.943450*	N.A.	0.72(0.70)
ORIENTBANK	0.069131*	-0.053518*	N.A.	N.A.	-0.000211	-0.001730**	0.003723*	0.000461	-0.001306	-0.797911*	0.392086*	0.013855	0.344528*	0.586467*	1.21(0.28)
PATNI	-0.014305	N.A.	N.A.	N.A.	0.000559	0.001823	-0.000107	5.45E-05	0.002062	-0.673551*	0.233248*	-0.068155*	0.933255*	N.A.	0.54(0.86)
PNB	0.066448	N.A.	N.A.	N.A.	0.001177	0.000855	0.001912	0.002412***	0.004350*	-0.575309*	0.297305*	0.018326	0.951584*	N.A.	0.92(0.51)
POLARIS	0.070467**	-0.063012**	N.A.	N.A.	0.003382***	-0.001706	0.001795	-0.002031	0.001548	-0.938561*	0.303950*	-0.084924*	0.891461*	N.A.	0.40(0.95)
RELCAPITAL	0.123120*	-0.041557**	N.A.	N.A.	-0.000270	-0.002121	0.003989*	0.001424	0.001020	-0.968037*	0.302238*	-0.034245*	0.892703*	N.A.	0.56(0.85)
RELIANCE	0.023041	N.A.	N.A.	N.A.	0.002192*	-0.000903	0.001916*	0.001176	0.001306	-1.838318*	0.498580*	-0.009184	0.806494*	N.A.	0.90(0.53)
SBIN	0.033738***	N.A.	N.A.	N.A.	-0.000410	0.000712	0.003574*	0.000167	0.000975	-0.478046*	0.208314*	-0.029923*	0.957393*	N.A.	1.56(0.11)
SCI	0.072412*	N.A.	N.A.	N.A.	0.002342***	-0.002202***	0.001603	-0.000940	0.002848**	-0.375658*	0.229395*	-0.003756	0.969269*	N.A.	1.06(0.39)
STF	-0.021440	N.A.	N.A.	N.A.	-0.000500	-0.003322*	0.004177*	0.001575	0.003580*	-0.830657*	0.286476*	0.047804*	0.906090*	N.A.	0.82(0.61)
STAR	0.078096**	N.A.	N.A.	N.A.	-0.000188	-0.004647***	-3.93E-05	0.002255	0.007741*	-0.799850*	0.251319*	-0.078331*	0.910411*	N.A.	0.55(0.86)
SYNDIBANK	0.087884*	N.A.	N.A.	N.A.	-0.000253	-0.002871*	0.002961*	0.002034***	0.001839***	-0.560501*	0.259742*	0.040204*	0.948755*	N.A.	0.46(0.92)
TAIACHEM	0.088674*	N.A.	N.A.	N.A.	0.002772*	-0.002919*	0.004121*	-0.001473	-0.001138	-0.640155*	0.246541*	0.002841	0.937509*	N.A.	0.42(0.94)
TAIAMOTORS	0.059163*	N.A.	N.A.	N.A.	-0.000240	-0.000518	0.002169***	0.000678	0.001406	-0.294250*	0.155173*	-0.030690*	0.975671*	N.A.	1.55(0.12)
TAIAPOWER	0.089592*	-0.067261*	N.A.	N.A.	0.002398*	-0.002967*	0.003842*	0.000256	0.000834	-0.410851*	0.207731*	-0.014968***	0.965552*	N.A.	1.38(0.15)
TAIATEA	0.089611*	-0.039422**	N.A.	N.A.	0.001955**	-0.001639***	0.002473*	-0.001579***	0.001166	-0.446230*	0.213449*	-0.053785*	0.961732*	N.A.	0.54(0.86)
TITAN	0.073649*	-0.051179*	N.A.	N.A.	0.001943	-0.001998	0.005888*	-0.002552	-0.000236	-1.034850*	0.248089*	-0.007849	0.873209*	N.A.	1.26(0.25)
TVSMOTORS	0.069820***	-0.095680*	N.A.	N.A.	0.000380	-8.47E-05	-0.003318	0.000139	0.001445	-2.551759*	0.419393*	-0.065842***	0.688727*	N.A.	0.53(0.87)
UTIBANK	0.043862***	N.A.	N.A.	N.A.	0.002052***	-0.001094	0.007515*	0.001197	0.001901	-1.831127*	0.416271*	-0.015860	0.780878*	N.A.	0.41(0.94)
VIJAYABANK	0.043954	N.A.	N.A.	N.A.	0.000646	-0.000541	0.003892**	0.002002	0.002739**	-0.823787*	0.271176*	-0.024175*	0.911756*	N.A.	0.45(0.92)

\* Significant at 1% Significance Level, \*\* Significant at 5% Significance Level, \*\*\* Significant at 10% Significance Level, AR= Order of Autoregression, C= Constant of Variance Equation, N.A. = Not Applicable and LM= Lagrange Multiplier Test Statistics.

Table 4: Information Dissemination Efficiency of the Indian Equity Market (Pre Futures Period) (Using EGARCH (p,q))

SYMBOL	AR(1)	AR(2)	AR(3)	MON	TUE	WED	THURS	FRI	C	ABS (1)	RES/SQR (1)	GARCH (1)	GARCH (2)	LM (10)
NIFTY	0.082225**	N.A.	N.A.	0.000324	-0.003677**	0.008575*	-0.001222	-0.001186	-1.017846*	0.135888*	-0.098072*	0.885703*	N.A.	0.20(0.99)
ABB	0.115863*	N.A.	N.A.	0.001733**	-0.000456	0.003165*	-8.88E-05	-0.000708	-1.652403*	0.451556*	0.005768	0.824358*	N.A.	0.67(0.75)
ACC	0.037626	N.A.	N.A.	0.000829	-0.004313	0.005712**	-0.001762	-0.000747	-0.560173*	0.240807*	-0.076067*	0.944111*	N.A.	0.35(0.97)
ALBK	0.103402*	N.A.	N.A.	0.003176	-0.001019	0.006061*	0.011177*	0.000589	-0.608868*	0.268696*	0.079969*	0.942261*	N.A.	0.78(0.54)
ALOKTEXT	0.100035*	N.A.	N.A.	0.002367	0.001546	0.002967	-0.000961	-0.003281***	-0.467951*	0.228433*	0.047750*	0.955197*	N.A.	0.61(0.81)
ANDHRABANK	-0.051868	N.A.	N.A.	0.005254*	0.000772	0.002885**	0.003109***	0.001686	-0.140773*	-0.061443*	0.216007*	0.974965*	N.A.	0.86(0.57)
ARVINDMILL	0.113315*	-0.056144**	N.A.	0.003276**	-0.005119*	0.010594*	-0.005000*	-0.005907*	-1.140804*	0.256095*	0.066604*	0.858501*	N.A.	1.14(0.31)
AUOPHARMA	0.060800	N.A.	N.A.	-0.005231**	-0.000548	-0.002633	-0.000317	0.000316	-1.967756*	0.380838*	-0.063729	0.767870*	N.A.	0.35(0.97)
BAJAJAUTO	-0.010041	N.A.	N.A.	0.003381*	-0.004185*	0.001591	-0.000125	-0.004858*	-0.881959*	0.312280*	-0.040283**	0.912320*	N.A.	0.40(0.95)
BANKBARODA	0.110554*	N.A.	N.A.	0.001956	-0.004806*	0.007003*	0.000204	-0.002592*	-0.966960*	0.318592*	0.017335	0.894575*	N.A.	0.62(0.80)
BANKINDIA	0.056302**	N.A.	N.A.	2.63E-05	-0.004275*	0.007528*	-0.002199	-0.004179*	-0.972547*	0.302962*	0.059139*	0.895068*	N.A.	0.64(0.78)
BEL	0.090798*	N.A.	N.A.	0.000622	-0.004642***	0.011493*	0.000654	-0.003774	-1.067186*	0.233903*	0.004346	0.858692*	N.A.	0.74(0.69)
BHEL	0.048375	-0.061539**	N.A.	0.000922	0.000620	0.005022**	-0.001692	-0.004642**	-1.593202*	0.247349*	-0.075748*	0.791976*	N.A.	0.43(0.93)
BILT	0.100381*	N.A.	N.A.	0.001769	-0.002522**	0.003402*	0.000606	-0.001304	-0.449357*	0.225713*	0.015514	0.959339*	N.A.	0.72(0.71)
BONGAIREFN	0.072241*	N.A.	N.A.	-0.001579	-0.006411*	0.015034*	-0.001845	-0.002841***	-1.500907*	0.338016*	0.090003*	0.801978*	N.A.	0.78(0.64)
CENTURYTEXT	0.097941*	-0.088320*	N.A.	0.007821*	-0.000311	0.001978	-0.001856	-0.002405	-0.707745*	0.224422*	0.001647	0.918828*	N.A.	0.95(0.49)
CESC	0.075155*	N.A.	N.A.	-0.004887*	-0.006510*	0.007935*	-0.002261	0.006261*	-2.580309*	0.287164*	0.060775*	0.644741*	N.A.	0.59(0.82)
CHAMBLFERT	0.040546	N.A.	N.A.	0.005378*	0.002223	-0.000143	0.001546	0.000730	-0.143139*	0.029872*	0.117412*	0.983201*	N.A.	0.40(0.95)
COLGATE	0.043554**	-0.058227*	N.A.	-0.000536	-0.000934	0.001472	-0.000234	0.000110	-0.378537*	0.223321*	0.064415*	0.384007*	0.588460*	1.43(0.13)
CORPBANK	0.033108	N.A.	N.A.	0.001904	0.000219	0.002183***	0.001015	-0.003032**	-0.764411*	0.297789*	0.019061	0.921255*	N.A.	1.07(0.38)
DIVISLAB	0.058135	N.A.	N.A.	-0.001148	-0.001067	-0.000192	0.000678	0.001785	-0.047905*	-0.026981*	0.024788*	0.990988*	N.A.	0.50(0.89)
ESCORTS	0.119095*	N.A.	N.A.	0.001279	-0.003228**	0.006816*	0.000268	-0.003662*	-0.466268*	0.188048*	0.028181**	0.952528*	N.A.	1.18(0.30)
ESSAROIL	0.007778	N.A.	N.A.	0.005985	-0.002317	0.005090	0.004962	-0.000262	-4.143446*	0.343266*	-0.059218	0.400568	N.A.	0.53(0.87)
GAIL	0.021705	N.A.	N.A.	0.002373	0.000117	0.003066*	0.001407	-0.000761	-0.659259*	0.243219*	0.010473	0.937676*	N.A.	0.19(0.99)

Contd...

SYMBOL	AR(1)	AR(2)	AR(3)	MON	TUE	WED	THURS	FRI	C	ABS	RES/SQR	GARCH	GARCH	LM
	(1)	(2)	(3)							(1)	(1)	(1)	(2)	(10)
GLAXO	0.042280***	N.A.	N.A.	0.001274	0.000931	0.000835	0.001027	-0.001441	-0.633964*	0.232583*	-0.023564***	0.938312*	N.A.	0.75(0.68)
GNFC	0.060981*	N.A.	N.A.	0.003200*	0.000865	0.003201*	-0.000720	0.000424	-0.483779*	0.182758*	0.012602	0.949904*	N.A.	0.15(0.99)
GRASIM	0.110383	N.A.	N.A.	-0.002640***	-0.001994	0.004599*	-0.002862	-0.002648***	-0.313881*	0.231461*	-0.011680	0.091601*	0.888758*	1.51(0.13)
HCLTECH	0.098752**	-0.101772**	N.A.	-0.001449	-0.005590	-0.000988	0.002397	-0.009626*	-0.788140*	0.351189*	-0.041361	0.917147*	N.A.	0.58(0.83)
HDFCBANK	-0.062848**	N.A.	N.A.	0.000271	-0.000800	0.002901*	-0.001103	0.001980**	-0.904163*	0.363116*	-0.009211	0.912823*	N.A.	1.30(0.22)
HEROHONDA	0.072184	-0.133351*	N.A.	0.002760	-0.000307	0.002276	-0.000941	0.002487	-1.939078*	0.385747*	-0.021006	0.774698*	N.A.	0.22(0.99)
HINDLEVER	0.009345	-0.133441**	-0.042313	-0.006978*	0.002131	0.005265**	-0.000743	-0.004248	-0.826112	0.122195*	-0.096757*	0.903518*	N.A.	0.77(0.66)
HINDPETRO	0.095630	N.A.	N.A.	-0.003461	-0.000363	0.001944	-0.000457	-0.004355	-0.518347*	0.233650*	0.006388	0.949908*	N.A.	1.31(0.22)
ICICBANK	0.086804*	N.A.	N.A.	0.000146	-0.004321*	0.006806	-0.001022	-0.001952	-1.403961*	0.411637*	-0.009310	0.838570*	N.A.	1.30(0.23)
IDBI	0.074011*	N.A.	N.A.	0.000762	-0.000825	0.003398***	4.40E-05	0.000131	-1.220344*	0.329418*	0.014005	0.855679*	N.A.	0.80(0.63)
IFCI	0.022357	N.A.	N.A.	-0.002871*	-0.006868*	0.012694*	-0.001886	-0.007409*	-0.595243*	0.260772*	0.060918*	0.936833*	N.A.	0.44(0.93)
INDUSINDBK	0.048809	N.A.	N.A.	0.003039**	-0.000772	0.002130	0.002600	0.000520	-0.954348*	0.288938*	0.053557*	0.894739*	N.A.	0.81(0.62)
IOB	0.004908	N.A.	N.A.	0.003189*	-0.001530	0.001810	0.001414	0.002145	-0.393251*	0.237567*	0.052300*	0.969703*	N.A.	0.54(0.86)
IPCL	0.083606*	N.A.	N.A.	0.001836	-0.000891	0.005193*	-0.001448	-0.002631***	-0.950480*	0.330618*	-0.041021*	0.897425*	N.A.	1.30(0.23)
JSTAINLESS	0.036382	N.A.	N.A.	-0.004109	0.000740	0.001123	-0.001750	-0.000389	-1.667549*	0.397445*	0.055040	0.803307*	N.A.	0.86(0.57)
KTKBANK	0.106757**	N.A.	N.A.	0.000189	-0.006414*	0.003997**	0.004244**	-0.003394	-2.966485*	0.639179*	-0.234244*	0.624394*	N.A.	0.17(0.99)
LICHSGFIN	0.083761*	N.A.	N.A.	0.001660**	-0.000238	0.005626*	-0.000592	-0.000764	-0.783782*	0.253101*	0.028128*	0.916588*	N.A.	0.69(0.74)
MRPL	0.154543*	-0.102625*	N.A.	0.005305**	-0.007644*	0.000109	-0.000598	0.003131	-1.348049*	0.368602*	-0.062521*	0.834497*	N.A.	0.43(0.93)
MTNL	0.076289	N.A.	N.A.	-0.002013	-0.003936*	0.004898*	-8.71E-05	-0.002487	-0.415747*	0.152214*	-0.023037	0.956414*	N.A.	1.15(0.32)
NAGARFERT	0.056121*	N.A.	N.A.	-0.003883*	-0.002255*	0.005178*	-0.002011**	-0.003008*	-0.903701*	0.410785*	0.088409*	0.914948*	N.A.	0.93(0.51)
NATIONALUM	0.098397*	N.A.	N.A.	-0.001373	-0.001868	0.06495*	0.001083	-0.000530	-1.073988*	0.355440*	0.027911	0.879329*	N.A.	0.81(0.62)
NEVELLJIG	0.039603	N.A.	N.A.	0.004884*	0.003750**	0.0004750*	0.001771	-0.000855	-0.899240*	0.275464*	-0.008653	0.893773*	N.A.	0.78(0.65)
ORIENTBANK	0.047451**	N.A.	N.A.	0.001066	-0.002813*	0.006391*	-0.000221	-0.001295	-0.582487*	0.261876*	-0.029498	0.939642*	N.A.	1.41(0.17)
PATNI	-0.025128	N.A.	N.A.	-0.001328	0.003624	-0.000505	0.002367	-0.000840	-0.628671*	0.246479*	0.024639*	0.965077*	N.A.	0.41(0.94)
PNB	0.068611	N.A.	N.A.	0.005598**	-0.001070	0.002070	0.002443	0.005389**	-0.412992*	0.214639*	0.096172**	0.965077*	N.A.	0.84(0.59)
POLARIS	0.003604	N.A.	N.A.	0.005377	-0.002486	0.005989	-0.003758	0.002007	-2.974589*	0.472648*	-0.188716*	0.564851*	N.A.	0.42(0.94)
RELCAPITAL	0.143544*	-0.048459**	N.A.	-0.001194	-0.002428**	0.004976*	0.001228	-0.001609	-0.746607*	0.263300*	-0.017164	0.921057*	N.A.	1.34(0.17)
RELIANCE	0.059479**	N.A.	N.A.	0.000212	-0.001840	0.004778*	0.001423	-0.003011	-0.986170*	0.298230*	-0.058344*	0.895064*	N.A.	1.11(0.35)
SBIN	0.054234**	N.A.	N.A.	-0.001926	-0.000760	0.004110*	-0.002054	0.000294	-0.790942*	0.238942*	-0.022426	0.915533*	N.A.	1.25(0.26)
SCI	0.066976**	N.A.	N.A.	0.003674	-0.002525	0.007420*	-0.0005135*	0.001632	-1.873969*	0.257288*	0.163125*	0.738148*	N.A.	0.98(0.46)
SRF	-0.037004***	N.A.	N.A.	-0.000860	-0.003151**	0.005062*	0.001324	0.001732	-0.254321*	0.142722*	0.060180*	0.977432*	N.A.	0.94(0.49)
STAR	0.094804**	N.A.	N.A.	-0.000110	-0.005274	0.000355	0.005579	0.005697	-0.468265*	0.202212*	-0.119327*	0.953365*	N.A.	0.44(0.92)
SYNDIBANK	0.024424	N.A.	N.A.	-0.001507	-0.002638***	0.006065*	0.001387	0.002693**	-0.236747*	0.093596*	0.127897*	0.977847*	N.A.	0.60(0.81)
TATACHEM	0.109398*	-0.038451***	N.A.	0.002627*	-0.003596*	0.006280*	-0.002104***	-0.002461*	-0.574748*	0.224781*	0.018763***	0.943376*	N.A.	0.53(0.87)
TATAMOTORS	0.088394*	N.A.	N.A.	-0.002904***	-0.001661	0.007196*	-0.002740	-0.005148*	-0.339462*	0.136250*	-0.022969	0.965493*	N.A.	1.20(0.28)
TATAPOWER	0.063055**	N.A.	N.A.	0.000257	-0.003432**	0.010257*	-0.001888	-0.004714*	-0.518486*	0.193270*	0.028515**	0.947402*	N.A.	0.45(0.92)
TATATEA	0.098271*	N.A.	N.A.	-0.000609	-0.002786	0.007002*	-0.003129***	-0.002399	-0.929925*	0.214086*	-0.072962*	0.891434*	N.A.	0.29(0.98)
TITAN	0.077715*	-0.043508***	N.A.	0.001369	-0.002381	0.007630*	-0.003643**	-0.002198	-1.104420*	0.254799*	0.016907	0.863565*	N.A.	1.54(0.12)
TVSMOTORS	0.037763	N.A.	N.A.	-0.002581	-0.002302	-0.005067	0.001959	-0.000493	-2.680869*	0.448756*	-0.070948	0.677125*	N.A.	0.55(0.85)
UTTIBANK	0.037843	N.A.	N.A.	0.001521	-0.002410	0.007874*	0.002415	0.001387	-1.902154*	0.425919*	-0.010252	0.768238*	N.A.	0.38(0.96)
VIJAYABANK	0.019927	N.A.	N.A.	0.001059	-0.001741	0.005216*	0.003334*	0.002616	-0.846165*	0.262916*	0.000489	0.906093*	N.A.	0.43(0.93)

\* Significant at 1% Significance Level, \*\* Significant at 5% Significance Level, \*\*\* Significant at 10% Significance Level, AR= Order of Autoregression, C= Constant of Variance Equation, N.A. = Not Applicable and LM= Lagrange Multiplier Test Statistics.

**Table 5: Information Dissemination Efficiency of the Indian Equity Market (Post Futures Period) (Using EGARCH (p,q))**

Symbol	AR(1)	AR(2)	AR(3)	MON	TUE	WED	THURS	FRI	C	ABS(I)	RESID/ SOR(L)	GARCH (I)	LM (I0)
NIFTY	0.154374*	-0.076437*	0.083483*	0.000824	0.000122	0.000882	0.001012***	0.000207	-1.410000*	0.294941*	-0.197307*	0.865679*	1.18(0.30)
ABB	0.157387*	N.A.	N.A.	0.003955**	0.004056**	0.003141	0.000417	0.004019**	-1.586295*	0.472316*	-0.028777	0.844386*	0.49(0.90)
ACC	7.36E-05	-0.068292*	N.A.	-4.46E-05	0.000269	0.002598*	0.002128**	0.003380*	-0.565648*	0.243239*	0.009065	0.951229*	1.37(0.19)
ALBK	0.125709**	N.A.	N.A.	-0.000822	-0.000606	0.001237	-0.001306	0.001615	-2.377180*	0.373424*	-0.085456***	0.730867*	0.71(0.72)
ALOKTEXT	0.102140***	-0.148856*	N.A.	0.005279**	-0.001449	-0.001991	-0.000563	0.000372	-0.751908*	0.201725*	-0.038418	0.918605*	0.74(0.68)
ANDHRABANK	0.117354*	-0.107996*	N.A.	-0.002294	0.000361	-0.000119	0.000662	0.001834	-1.161644*	0.379395*	-0.080493*	0.878446*	0.60(0.81)
ARVINDMILL	0.125072*	-0.072176***	N.A.	0.002555	-0.002805	-0.001559	-0.002009	0.003913**	-1.048308*	0.257281*	-0.053014*	0.880980*	0.52(0.88)
AUROPHARMA	0.005683	N.A.	N.A.	0.001970	0.000451	0.000525	0.001959	0.006295*	-2.282043*	0.406260*	0.032627	0.736860*	0.33(0.97)
BAJAJAUTO	0.020854	N.A.	N.A.	0.001952**	0.000530	0.001778***	0.001302	0.002395**	-1.122133*	0.200673*	-0.055117*	0.877525*	0.48(0.91)
BANKBARODA	0.133906*	N.A.	N.A.	-0.000774	-5.11E-05	0.002811	0.000905	0.001763	-0.983581*	0.214622*	-0.104231*	0.884273*	0.39(0.88)
BANKINDIA	0.118210*	N.A.	N.A.	-0.001096	0.000179	-0.000122	0.002595	0.003528*	-2.297166*	0.314625*	-0.152818*	0.701400*	1.02(0.43)
BEL	0.075404*	N.A.	N.A.	0.001655	0.000903	0.000321	0.001963	0.002892**	-0.225045*	0.108413*	-0.058519*	0.980594*	0.47(0.91)
BHEL	0.048718***	N.A.	N.A.	0.002711*	0.000485	0.000905	0.001194	0.002958*	-1.056542*	0.348309*	-0.083445*	0.896420*	0.73(0.70)
BILT	-0.065660	N.A.	N.A.	0.000470	-0.001364	-0.004388***	-0.001564	0.005052*	-1.846537*	0.261830*	-0.201745*	0.783783*	0.24(0.99)
BONGAIREFN	0.186720*	N.A.	N.A.	-0.001030	-0.000171	-0.004297	-0.002842	0.000677	-1.862775*	0.380818*	-0.045079	0.789833*	0.35(0.97)
CENTURYTEXT	-0.011459	N.A.	N.A.	0.002385	0.003288	0.002062	0.004892***	0.004349***	-1.080493*	0.413398*	-0.076115***	0.891562*	0.93(0.51)
CESC	0.097800***	N.A.	N.A.	0.001964	-0.000903	0.003995	-0.001539	0.001796	-0.643636*	0.165878*	-0.114111*	0.930137*	0.79(0.64)
CHAMBLFERT	0.028319	N.A.	N.A.	0.001831	-0.001492	0.001873	-0.003416	0.004371	-1.729674*	0.134170*	-0.084812*	0.783449*	0.81(0.62)
COLGATE	-0.028172	-0.074304	N.A.	0.004918*	0.000988	0.002826	-0.002727	0.001216	-0.606642	0.079016	-0.078884*	0.927083*	0.30(0.98)
CORPBANK	0.183352*	N.A.	N.A.	-0.004510*	0.001045	-0.001520	0.001239	0.003124	-2.815172*	0.534834*	-0.140159*	0.674048*	1.01(0.43)
DIVISLAB	0.100441***	N.A.	N.A.	0.003465	0.002853	0.000887	0.003639	0.006152*	-2.080769*	0.460902*	-0.057642	0.767050*	0.41(0.94)
ESCORTS	-0.031443	N.A.	N.A.	0.001868	0.000116	6.28E-05	-0.002192	0.004389	-1.411637*	0.363298*	-0.136895*	0.829209*	0.44(0.93)
ESSAROIL	0.082270	N.A.	N.A.	6.13E-05	-0.001596	0.001901	-0.007047**	0.003609	-0.990542*	0.430828*	-0.096882**	0.899753*	0.67(0.75)
GAIL	0.085037**	N.A.	N.A.	-0.001060	0.001347	-0.001066	0.000980	-0.000264	-0.699987*	0.268785*	-0.113182*	0.932967*	0.58(0.83)
GLAXO	-0.028218	N.A.	N.A.	0.001616	-0.000332	0.002097	0.001567	0.002633	-1.300880*	0.372032*	-0.056952	0.870019*	0.78(0.65)
GNFC	-0.016870	N.A.	N.A.	0.007261*	-0.001067	-0.002468	-0.001448	0.005857*	-2.039826*	0.527274*	-0.009060	0.772909*	0.77(0.66)
GRASIM	0.070706*	N.A.	N.A.	0.001433	0.000750	0.001935***	0.002739*	0.001555	-0.864025*	0.308068*	-0.007527	0.920072*	1.53(0.13)
HCLTECH	-0.026263	N.A.	N.A.	0.001514	0.003117**	-0.000105	0.002506**	0.003321**	-0.317268*	0.196205*	-0.008591	0.977118*	0.47(0.91)
HDFCBANK	0.067818	-0.104389*	N.A.	0.000509	0.001269	0.000302	0.002569**	-0.000642	-4.753104*	0.610843*	-0.104409*	0.456968*	0.49(0.90)
HEROHONDA	-0.008420	-0.052957***	-0.074620**	0.000995	0.000475	-0.000443	0.001162	0.001797	-2.528222*	0.384631*	-0.029169	0.706532*	0.66(0.76)
HINDLEVER	0.061650**	N.A.	N.A.	-0.000490	0.000103	-0.000850	-4.55E-05	0.001285	-0.462808*	0.103572*	-0.038708*	0.951234*	0.67(0.75)
HINDPETRO	0.079585**	N.A.	N.A.	-0.000818	-0.001414	0.000559	0.001015	0.005806*	-7.571875*	0.416362*	-0.091462*	0.001515	0.23(0.99)
ICICIBANK	0.086196*	N.A.	N.A.	0.000989	0.003916**	0.001542	0.001341	0.001939	-0.440795*	0.121310*	-0.043265*	0.953975*	1.07(0.38)
IDBI	0.118822**	N.A.	N.A.	-0.004738***	-0.000686	0.002917	-0.003109	0.000863	-2.046250*	0.375038*	-0.180887*	0.755292*	1.23(0.27)
IFCI	0.004971	N.A.	N.A.	-0.001335	-0.008287**	0.001719	-0.003159	0.009875*	-3.989910*	0.494657*	-0.080763	0.450148*	0.81(0.62)
INDUSINDBK	0.029119	N.A.	N.A.	-0.006857***	0.001553	-0.002375	0.002454	0.006607***	-1.364314*	0.300716*	-0.043519	0.831464*	0.32(0.98)
IOB	0.092250***	N.A.	N.A.	-0.004644***	0.000994	0.001224	-0.001907	0.005517**	-2.653659*	0.368132*	-0.102116**	0.672764*	0.25(0.99)
IPCL	0.037809	N.A.	N.A.	0.000583	2.89E-05	0.000361	-2.97E-05	0.003259**	-1.150380*	0.350830*	-0.119275*	0.880391*	0.67(0.74)
JSTAINLESS	-0.029313	N.A.	N.A.	0.001415	-0.001916	-0.001175	-0.001485	0.001865	-2.341985*	0.358480*	-0.235653*	0.698642*	0.90(0.53)

Contd...

Symbol	AR(1)	AR(2)	AR(3)	MON	TUE	WED	THURS	FRI	C	ABS(I)	RESID/ SQR(I)	GARCH (I)	LM (10)
KTKBANK	0.081003	N.A.	N.A.	9.90E-05	0.002978	0.001975	-0.000111	0.002229	-1.147946*	0.383650*	-0.072276***	0.877958*	0.14(0.99)
LICHSGFIN	0.112475***	N.A.	N.A.	-0.001121	0.002592	-0.002943	-0.005224*	0.002991***	-5.449346*	0.633056*	-0.088764	0.363116*	0.97(0.47)
MRPL	0.090688	N.A.	N.A.	0.002099	-5.98E-05	-0.001160	-0.004360**	0.002095	-1.662852*	0.361739*	-0.039232	0.809652*	0.69(0.74)
MTNL	0.052255***	-0.103329*	N.A.	-0.001246	-0.000637	0.001784	-0.000944	0.001721	-0.942053*	0.276943*	-0.003506	0.900244*	1.26(0.25)
NAGARFERT	0.059632	N.A.	N.A.	0.004203	0.000700	0.000326	-0.001305	-0.001027	-3.739694*	0.601235*	-0.069213	0.539566*	0.14(0.99)
NATIONALUM	0.093620*	-0.073655**	N.A.	-0.000702	0.001353	0.001086	0.002047	0.000675	-0.770237*	0.266578*	-0.031582	0.923120*	0.44(0.93)
NEVELLILIG	0.134404*	N.A.	N.A.	0.001943	-0.000494	-0.000741	-0.000685	0.000423	-0.501465*	0.261099*	-0.060105***	0.958755*	0.82(0.61)
ORIENTBANK	0.132769*	-0.113083*	N.A.	-0.002421	-0.000180	-0.001739	0.003282**	0.001314	-1.041413*	0.385195*	-0.034113	0.897969*	1.23(0.27)
PATNI	0.006419	N.A.	N.A.	0.001306	0.000948	-7.27E-06	-0.001132	0.002544	-0.357856*	0.103820*	-0.096497*	0.962797*	0.27(0.99)
PNB	0.058558	N.A.	N.A.	-0.000642	0.001248	0.001530	0.002750	0.003059***	-0.891856*	0.334943*	-0.024921	0.9112624*	0.83(0.60)
POLARIS	0.072531**	N.A.	N.A.	0.002602	-0.002866	0.000655	-0.001424	0.002062	-1.916608*	0.364480*	-0.132448*	0.761272*	0.22(0.99)
RELCAPITAL	0.013165	N.A.	N.A.	0.001197	-0.000321	0.000379	0.001777	0.007384*	-2.419099*	0.605442*	-0.288975*	0.714600*	0.76(0.67)
RELIANCE	-0.002341	N.A.	N.A.	0.002102**	-0.000387	0.000631	0.000621	0.003488*	-3.816066*	0.631986*	0.072604*	0.578599*	0.68(0.75)
SBIN	0.016190	N.A.	N.A.	0.000214	0.001352	0.002834*	0.000705	0.001122	-0.580789*	0.201192*	-0.032041*	0.944958*	1.33(0.21)
SCI	0.080170*	N.A.	N.A.	0.001263	-0.001992	3.43E-05	0.001628	0.002624***	-0.528808*	0.255861*	-0.030943**	0.953380*	0.70(0.73)
SRF	0.017077	N.A.	N.A.	0.005126**	-0.005082***	-0.005802***	0.000531	0.006443*	-3.159898*	0.843596*	0.040811	0.618325*	1.32(0.22)
STAR	-0.004801	N.A.	N.A.	-0.001176	-0.004422	-0.003386	-0.000919	0.009614*	-1.859846*	0.456036*	-0.063333	0.784496*	0.89(0.54)
SYNDIBANK	0.110658*	N.A.	N.A.	0.000726	-0.001941	0.001336	0.004313**	0.000828	-1.649637*	0.294705*	-0.147397*	0.798259*	0.29(0.98)
TATACHEM	-0.025162	N.A.	N.A.	0.002982***	-0.001417	-0.000819	0.000436	0.002307	-2.086345*	0.327413*	-0.188943*	0.768631*	0.48(0.91)
TATAMOTORS	0.024968	N.A.	N.A.	0.001013	0.000211	-0.000485	0.003080**	0.004804*	-0.695983*	0.213686*	-0.026839	0.929827*	0.99(0.45)
TATAPOWER	0.105695*	-0.081679*	N.A.	0.002949*	-0.002760	0.000678	0.000575	0.003559*	-0.590860*	0.234804*	-0.058763*	0.946817*	1.19(0.29)
TATAEA	0.073310*	N.A.	N.A.	0.003426*	-0.001088	0.000152	-0.001159	0.003162*	-0.785633*	0.281220*	-0.035446**	0.927419*	0.50(0.89)
TITAN	0.082333	N.A.	N.A.	0.004170	0.000871	-0.001084	5.70E-05	0.005868***	-0.825899**	0.230242*	-0.082244**	0.903667*	0.40(0.95)
TVSMOTORS	0.103955***	N.A.	N.A.	0.002935	0.000631	-0.001679	-0.002497	0.002929	-2.192131*	0.360531*	-0.084411***	0.729911*	0.75(0.68)
UTIBANK	0.056479	N.A.	N.A.	0.003765	0.002610	0.005367**	-0.004742*	0.005197**	-1.776629*	0.328669*	-0.023074	0.793828*	0.68(0.75)
VIJAYABANK	0.056632	N.A.	N.A.	-0.003004	2.19E-05	-0.000683	-0.000370	0.003315	-5.377137*	0.626353*	-0.298049*	0.344263*	0.74(0.69)

\* Significant at 1% Significance Level, \*\* Significant at 5% Significance Level, \*\*\* Significant at 10% Significance Level, N.A. = Not Applicable, AR= Order of Autoregression, C= Constant of Variance Equation and LM= Lagrange Multiplier Test Statistics.

Table 6: Impact of Introduction of Futures Trading on the Indian Cash Market Volatility (Using EGARCH (p,q))

Symbol	AR(1)	AR(2)	AR(3)	AR(4)	MON	TUE	WED	THURS	FRI	C	ABS(I)	RESID/ SORT(I)	GARCH(I)	GARCH (2)	DF	LM(10)
NIFTY	0.119918 <sup>*</sup>	-0.40526 <sup>**</sup>	0.063673 <sup>*</sup>	0.033485 <sup>***</sup>	0.000698	-0.000503	0.001877 <sup>*</sup>	0.000584	-0.000116	-1.150227 <sup>*</sup>	0.227247 <sup>*</sup>	-0.173850 <sup>*</sup>	0.876238 <sup>*</sup>	N.A.	-0.115006 <sup>*</sup>	0.58(0.83)
ABB	0.115742 <sup>*</sup>	N.A.	N.A.	N.A.	0.002222 <sup>*</sup>	0.000507	0.003126 <sup>*</sup>	-5.81E-05	0.000201	-1.636340 <sup>*</sup>	0.454046 <sup>*</sup>	0.001652	0.826762 <sup>*</sup>	N.A.	-0.070362 <sup>*</sup>	0.38(0.96)
ACC	0.012536	-0.050110 <sup>**</sup>	N.A.	N.A.	1.73E-05	-0.000303	0.003144 <sup>*</sup>	0.001638	0.002757 <sup>*</sup>	-0.608575 <sup>*</sup>	0.264301 <sup>*</sup>	0.0024460 <sup>***</sup>	0.939599 <sup>*</sup>	N.A.	-0.063637 <sup>*</sup>	0.98(0.46)
ALBK	0.110391 <sup>*</sup>	N.A.	N.A.	N.A.	0.001189	-0.000882	0.003488 <sup>**</sup>	0.003488 <sup>**</sup>	0.001173	-0.957657 <sup>*</sup>	0.311459 <sup>*</sup>	0.018827 <sup>*</sup>	0.897278 <sup>*</sup>	N.A.	-0.073695 <sup>*</sup>	0.79(0.56)
ALOKTEXT	0.102207 <sup>*</sup>	N.A.	N.A.	N.A.	0.003526 <sup>*</sup>	0.000144	0.001174	9.17E-05	-0.001465	-0.550616 <sup>*</sup>	0.242821 <sup>*</sup>	0.031924 <sup>*</sup>	0.944365 <sup>*</sup>	N.A.	-0.035059 <sup>*</sup>	0.82(0.61)
ANDHRABANK	0.077424 <sup>*</sup>	N.A.	N.A.	N.A.	0.000316	0.001968	0.001527	0.000980	0.002801 <sup>*</sup>	-0.710716 <sup>*</sup>	0.032852 <sup>*</sup>	0.033458	0.935008 <sup>*</sup>	N.A.	-0.001059	0.69(0.73)
ANDHARMILL	0.096999 <sup>*</sup>	-0.065876 <sup>*</sup>	N.A.	N.A.	0.003164 <sup>*</sup>	-0.003926 <sup>**</sup>	0.004929 <sup>*</sup>	-0.003445 <sup>*</sup>	-0.001912	-1.114928 <sup>*</sup>	0.335421 <sup>*</sup>	0.029524 <sup>*</sup>	0.414660 <sup>*</sup>	0.456054 <sup>*</sup>	-0.060312 <sup>*</sup>	0.32(0.98)
AUROPHARMA	0.035339	-0.087890 <sup>**</sup>	N.A.	N.A.	-0.001894	-0.000279	-0.000418	0.001360	0.004432	-2.097675 <sup>*</sup>	0.387942 <sup>*</sup>	-0.012612	0.750799 <sup>*</sup>	N.A.	-0.059399 <sup>**</sup>	0.87(0.56)
BAJAJAUTO	0.021906	N.A.	N.A.	N.A.	0.002535 <sup>*</sup>	-0.001022	0.001492 <sup>**</sup>	0.000853	0.000241	-0.905724 <sup>*</sup>	0.245120 <sup>*</sup>	-0.044124 <sup>*</sup>	0.903212 <sup>*</sup>	N.A.	-0.041506 <sup>*</sup>	0.29(0.98)
BANKBARODA	0.119697 <sup>*</sup>	-0.039510 <sup>***</sup>	N.A.	N.A.	0.001281	-0.003336 <sup>*</sup>	0.005372 <sup>*</sup>	-0.000782	-0.000782	-1.478504 <sup>*</sup>	0.293820 <sup>*</sup>	-0.016159	0.893765 <sup>*</sup>	N.A.	-0.003904	1.33(0.21)
BANKINDIA	0.086931 <sup>*</sup>	N.A.	N.A.	N.A.	-0.002042	-0.003012 <sup>*</sup>	0.005396 <sup>*</sup>	-0.000837	-0.001923	-1.475504 <sup>*</sup>	0.349153 <sup>*</sup>	-0.003553	0.829072 <sup>*</sup>	N.A.	0.047333 <sup>*</sup>	0.40(0.95)
BEL	0.081168 <sup>*</sup>	N.A.	N.A.	N.A.	0.001168	0.000574	0.003947 <sup>*</sup>	0.001849	0.001537	-0.400513 <sup>*</sup>	0.136663 <sup>*</sup>	-0.023244 <sup>*</sup>	0.953038 <sup>*</sup>	N.A.	-0.053845 <sup>*</sup>	0.63(0.79)
BHEL	0.051125 <sup>*</sup>	-0.049294 <sup>*</sup>	N.A.	N.A.	0.002661 <sup>*</sup>	0.000502	0.002235 <sup>**</sup>	0.000788	0.001190	-1.279175 <sup>*</sup>	0.331744 <sup>*</sup>	-0.079604 <sup>*</sup>	0.734041 <sup>*</sup>	0.113355	-0.144979 <sup>*</sup>	0.91(0.53)
BLIT	0.075886 <sup>*</sup>	N.A.	N.A.	N.A.	0.001673	-0.002190	0.001579	0.000120	0.000560	-0.488739 <sup>*</sup>	0.233512 <sup>*</sup>	-0.005510	0.954450 <sup>*</sup>	N.A.	-0.023579 <sup>*</sup>	1.11(0.35)
BONGAIREFN	0.074630 <sup>*</sup>	N.A.	N.A.	N.A.	-0.001330	-0.003826 <sup>*</sup>	0.007448 <sup>*</sup>	-0.002082	-0.000682	-1.345611 <sup>*</sup>	0.339040 <sup>*</sup>	0.049708 <sup>*</sup>	0.862215 <sup>*</sup>	N.A.	-0.195011 <sup>*</sup>	1.04(0.41)
CENTURYTEXT	0.076427 <sup>*</sup>	-0.057263 <sup>*</sup>	N.A.	N.A.	0.006288 <sup>*</sup>	0.000200	0.001045	0.001576	-0.000242	-0.799019 <sup>*</sup>	0.274594 <sup>*</sup>	-0.017680	0.910672 <sup>*</sup>	N.A.	-0.036279 <sup>*</sup>	0.81(0.62)
CESC	0.079887 <sup>*</sup>	N.A.	N.A.	N.A.	-0.002602 <sup>*</sup>	-0.004656 <sup>*</sup>	0.006676 <sup>*</sup>	-0.002154	0.005921 <sup>*</sup>	-2.049757 <sup>*</sup>	0.304555 <sup>*</sup>	0.007019	0.725577 <sup>*</sup>	N.A.	-0.209846 <sup>*</sup>	0.36(0.96)
CHAMBLFERT	0.025627 <sup>*</sup>	-0.058133 <sup>**</sup>	N.A.	N.A.	0.003337 <sup>*</sup>	0.001703	-8.82E-05	-0.001147	0.001012	-0.237785 <sup>*</sup>	0.105712 <sup>*</sup>	0.038506 <sup>*</sup>	0.977665 <sup>*</sup>	N.A.	-0.003642 <sup>*</sup>	0.25(0.99)
COLGATE	0.034647 <sup>*</sup>	-0.055597 <sup>*</sup>	N.A.	N.A.	-1.33E-05	-0.000634	0.002442 <sup>*</sup>	-0.000135	5.21E-05	-0.233133 <sup>*</sup>	0.123180 <sup>*</sup>	0.034075 <sup>*</sup>	0.981676 <sup>*</sup>	N.A.	-0.008954	1.41(0.13)
CORPBANK	0.050212 <sup>**</sup>	N.A.	N.A.	N.A.	0.000830	0.000585	0.000896	0.000989	-0.000919	-1.056873 <sup>*</sup>	0.348173 <sup>*</sup>	-0.012177	0.884553 <sup>*</sup>	N.A.	-0.041284 <sup>*</sup>	0.89(0.54)
DIVISLAB	0.106108 <sup>*</sup>	N.A.	N.A.	N.A.	0.002732 <sup>**</sup>	0.002904	0.000950	0.0005614	0.003522 <sup>*</sup>	-1.363327 <sup>*</sup>	0.305437 <sup>*</sup>	-0.015183	0.935695 <sup>*</sup>	N.A.	-0.090720 <sup>*</sup>	1.02(0.86)
ESCORTS	0.104815 <sup>*</sup>	N.A.	N.A.	N.A.	0.001507	-0.002705 <sup>**</sup>	0.005102 <sup>*</sup>	-8.10E-05	-0.002906 <sup>*</sup>	-0.669440 <sup>*</sup>	0.234594 <sup>*</sup>	0.009354	0.928075 <sup>*</sup>	N.A.	0.018281 <sup>**</sup>	1.02(0.42)
ESSAROIL	0.029794	-0.067343 <sup>***</sup>	N.A.	N.A.	0.001374	-0.002012	0.003872	-0.002414	0.004082	-1.700695 <sup>*</sup>	0.410384 <sup>*</sup>	-0.058116 <sup>*</sup>	0.777815 <sup>*</sup>	N.A.	-0.099662 <sup>*</sup>	0.39(0.95)
GAIL	0.051824 <sup>**</sup>	N.A.	N.A.	N.A.	0.000378	0.000923	0.002244 <sup>**</sup>	0.001423	-0.000536	-0.649515 <sup>*</sup>	0.266845 <sup>*</sup>	-0.053111 <sup>*</sup>	0.940410 <sup>*</sup>	N.A.	0.004803	0.68(0.74)
GLAXO	0.027961 <sup>*</sup>	N.A.	N.A.	N.A.	0.001484 <sup>*</sup>	0.000793	0.001033	-0.000162	-0.000135	-0.792270 <sup>*</sup>	0.265778 <sup>*</sup>	-0.028258 <sup>**</sup>	0.920633 <sup>*</sup>	N.A.	-0.029173 <sup>*</sup>	0.52(0.88)
GNFC	0.051264 <sup>*</sup>	N.A.	N.A.	N.A.	0.004825 <sup>*</sup>	0.000714	0.002573 <sup>**</sup>	-0.001175	0.001007	-0.537388 <sup>*</sup>	0.195435 <sup>*</sup>	0.013775	0.943540 <sup>*</sup>	N.A.	-0.011950 <sup>***</sup>	0.23(0.99)
GRASIM	0.091166 <sup>*</sup>	-0.033893 <sup>***</sup>	N.A.	N.A.	0.000294	3.27E-05	0.002937 <sup>*</sup>	0.000876	0.000409	-0.503535 <sup>*</sup>	0.281567 <sup>*</sup>	-0.002451	0.299865 <sup>*</sup>	0.658667 <sup>*</sup>	-0.033761 <sup>*</sup>	1.32(0.16)
HCLTECH	0.015596	N.A.	N.A.	N.A.	0.001032	0.000157	-0.000383	0.002268 <sup>***</sup>	0.000849	-0.367305 <sup>*</sup>	0.214574 <sup>*</sup>	-0.024266	0.967644 <sup>*</sup>	N.A.	-0.032568 <sup>*</sup>	0.39(0.95)
HDFCBANK	-0.013774	-0.074835 <sup>*</sup>	N.A.	N.A.	0.000138	0.000735	0.001893 <sup>*</sup>	0.000386	0.000864	-1.267243 <sup>*</sup>	0.414072 <sup>*</sup>	-0.036843 <sup>*</sup>	0.868564 <sup>*</sup>	N.A.	-0.069430 <sup>*</sup>	1.04(0.41)
HEROHONDA	0.017761	-0.080998 <sup>*</sup>	N.A.	N.A.	0.001291	0.000126	0.000199	0.000662	0.002111 <sup>***</sup>	-2.210272 <sup>*</sup>	0.378042 <sup>*</sup>	-0.031442	0.736314 <sup>*</sup>	N.A.	-0.083798 <sup>*</sup>	0.27(0.99)
HINDLEVER	0.054955 <sup>**</sup>	-0.056833 <sup>**</sup>	N.A.	N.A.	-0.001419	0.000434	-1.01E-05	-3.71E-05	0.000944	-0.771953 <sup>*</sup>	0.140475 <sup>*</sup>	-0.051456 <sup>*</sup>	0.912680 <sup>*</sup>	N.A.	-0.023930 <sup>**</sup>	0.33(0.97)
HINDPETRO	0.097581 <sup>*</sup>	-0.043806	N.A.	N.A.	0.000103	6.92E-05	-0.000921	-0.001873	0.001266	-0.470803 <sup>*</sup>	0.205426 <sup>*</sup>	-0.021066 <sup>***</sup>	0.953840 <sup>*</sup>	N.A.	-0.012624 <sup>***</sup>	0.18(0.99)
ICICIBANK	0.099935 <sup>*</sup>	N.A.	N.A.	N.A.	0.000498	0.000188	0.003049 <sup>*</sup>	0.001033	0.000613	-1.203204 <sup>*</sup>	0.317381 <sup>*</sup>	-0.025699 <sup>**</sup>	0.858185 <sup>*</sup>	N.A.	-0.103873 <sup>*</sup>	0.95(0.48)
IDBI	0.098373 <sup>*</sup>	N.A.	N.A.	N.A.	-0.000832	-0.000419	0.003115 <sup>**</sup>	-0.001228	0.000877	-1.513989 <sup>*</sup>	0.370524 <sup>*</sup>	-0.043051 <sup>*</sup>	0.816836 <sup>*</sup>	N.A.	-0.084930 <sup>*</sup>	1.16(0.31)
IFCI	0.029471	N.A.	N.A.	N.A.	-0.002508 <sup>**</sup>	-0.006634 <sup>*</sup>	0.010956 <sup>*</sup>	-0.002088	-0.005264 <sup>*</sup>	-0.679967 <sup>*</sup>	0.257616 <sup>*</sup>	0.044246 <sup>*</sup>	0.923778 <sup>*</sup>	N.A.	0.016574 <sup>**</sup>	0.55(0.85)
INDUAINDBANK	0.052941	-0.064220 <sup>**</sup>	N.A.	N.A.	0.000828	-1.18E-05	0.000915	0.002428	0.001721	-0.953056 <sup>*</sup>	0.287875 <sup>*</sup>	0.033484 <sup>**</sup>	0.894921 <sup>*</sup>	N.A.	0.034202 <sup>*</sup>	0.72(0.70)
IOB	0.040555	-0.033342 <sup>**</sup>	N.A.	N.A.	0.002017	-0.001014	0.002479 <sup>**</sup>	0.000778	0.002825 <sup>*</sup>	-0.479041 <sup>*</sup>	0.23292 <sup>*</sup>	0.019106 <sup>**</sup>	0.957578 <sup>*</sup>	N.A.	0.001247 <sup>*</sup>	0.61(0.81)
IPCL	0.065988 <sup>*</sup>	N.A.	N.A.	N.A.	0.001053	-0.000454	0.002286 <sup>**</sup>	-0.000760	0.000261	-0.908255 <sup>*</sup>	0.340784 <sup>*</sup>	-0.069050 <sup>*</sup>	0.904401 <sup>*</sup>	N.A.	-0.056078 <sup>*</sup>	1.16(0.32)
JSTAINLESS	-0.023883	N.A.	N.A.	N.A.	8.53E-05	0.001073	0.000123	-0.001705	0.000550	-1.693068 <sup>*</sup>	0.347098 <sup>*</sup>	-0.105939 <sup>*</sup>	0.792702 <sup>*</sup>	N.A.	0.011175	0.64(0.78)
KTKBANK	0.092919 <sup>*</sup>	0.038415	0.075576 <sup>*</sup>	N.A.	0.000245	-0.00056 <sup>*</sup>	0.003223 <sup>**</sup>	0.001395	-0.000640	-2.005395 <sup>*</sup>	0.567421 <sup>*</sup>	-0.163391 <sup>*</sup>	0.760169 <sup>*</sup>	N.A.	-0.081557 <sup>*</sup>	0.25(0.99)
LICHSGFIN	0.095222 <sup>*</sup>	N.A.	N.A.	N.A.	0.001533 <sup>**</sup>	-0.000618	0.003689 <sup>*</sup>	-0.001310	6.90E-05	-0.854706 <sup>*</sup>	0.250518 <sup>*</sup>	0.010743	0.906679 <sup>*</sup>	N.A.	-0.045000 <sup>*</sup>	0.70(0.72)
MRPL	0.132902 <sup>*</sup>	-0.083695 <sup>*</sup>	N.A.	N.A.	0.003573 <sup>*</sup>	-0.003738 <sup>**</sup>	0.000274	-0.002604	0.002551	-1.410883 <sup>*</sup>	0.351498 <sup>*</sup>	-0.043652 <sup>*</sup>	0.823244 <sup>*</sup>	N.A.	-0.140413 <sup>*</sup>	0.54(0.86)
MTNL	0.062083 <sup>*</sup>	-0.078453 <sup>*</sup>	N.A.	N.A.	-0.001444	-0.001861	0.002510 <sup>**</sup>	-0.000374	0.002001	-0.644199 <sup>*</sup>	0.215701 <sup>*</sup>	-0.017525	0.930167 <sup>*</sup>	N.A.	-0.032232 <sup>*</sup>	1.20(0.28)
NAGARFERT	0.060638 <sup>*</sup>	N.A.	N.A.	N.A.	-0.002321	-0.001608 <sup>**</sup>	0.004856 <sup>*</sup>	-0.000255 <sup>*</sup>	-0.002839 <sup>*</sup>	-1.040763 <sup>*</sup>	0.411405 <sup>*</sup>	0.068230 <sup>*</sup>	0.895983 <sup>*</sup>	N.A.	0.028777 <sup>*</sup>	0.70(0.65)
NATIONALUM	0.093387 <sup>*</sup>	-0.063774 <sup>*</sup>	N.A.	N.A.	-0.001016	-1.12E-05	0.002708 <sup>**</sup>	0.001826	0.000112	-0.970190 <sup>*</sup>	0.334739 <sup>*</sup>	-0.007824 <sup>*</sup>	0.892463 <sup>*</sup>	N.A.	-0.078371 <sup>*</sup>	0.80(0.73)
NEVELLIG	0.080445 <sup>*</sup>	N.A.	N.A.	N.A.	0.003288 <sup>*</sup>	0.001966	0.002502	0.000547	0.000172	-0.747483 <sup>*</sup>	0.273156 <sup>*</sup>	-0.021791 <sup>**</sup>	0.915877 <sup>*</sup>	N.A.	-0.088120 <sup>*</sup>	0.66(0.76)

Contd...

Symbol	AR(1)	AR(2)	AR(3)	AR(4)	MON	TUE	WED	THURS	FRI	C	ABS(I)	RESID/ SQRT(I)	GARCH(I)	GARCH (2)	DF	LM(10)
ORIENTBANK	0.069437 <sup>*</sup>	-0.054594 <sup>*</sup>	N.A.	N.A.	-0.000252	-0.001719 <sup>**</sup>	0.003672 <sup>*</sup>	0.000474	-0.001317	-0.775905 <sup>*</sup>	0.393424 <sup>*</sup>	0.013281	0.337965 <sup>*</sup>	0.595488 <sup>*</sup>	-0.014742	1.24(0.26)
PATNI	-0.013614	N.A.	N.A.	N.A.	0.000644	0.001849	-0.000207	-3.66E-05	0.002062	-0.689378 <sup>*</sup>	0.233979 <sup>*</sup>	-0.072255 <sup>*</sup>	0.930248 <sup>**</sup>	N.A.	-0.012180	0.51(0.88)
PNB	0.065986 <sup>**</sup>	N.A.	N.A.	N.A.	0.001109	0.000797	0.001912	0.002398 <sup>***</sup>	0.004374 <sup>*</sup>	-0.584056	0.299454 <sup>*</sup>	0.016495	0.949622 <sup>*</sup>	N.A.	-0.009853	0.91(0.53)
POLARIS	0.053669 <sup>***</sup>	-0.069445 <sup>*</sup>	N.A.	N.A.	0.002954 <sup>***</sup>	-0.002309	0.002146	-0.001784	0.002678	-1.917509 <sup>*</sup>	0.378647 <sup>*</sup>	-0.138182 <sup>*</sup>	0.727227 <sup>*</sup>	N.A.	-0.249224 <sup>*</sup>	0.20(0.99)
RELCAPITAL	0.123660 <sup>**</sup>	-0.042613 <sup>***</sup>	N.A.	N.A.	-0.000257 <sup>*</sup>	-0.002086	0.004222 <sup>*</sup>	0.001381	0.000918	-0.927833	0.293842 <sup>*</sup>	-0.031861 <sup>*</sup>	0.898236 <sup>*</sup>	N.A.	0.023740 <sup>*</sup>	0.66(0.77)
RELIANCE	0.023930	N.A.	N.A.	N.A.	0.001893 <sup>**</sup>	-0.001077	0.001881 <sup>**</sup>	0.000883	0.001695 <sup>**</sup>	-2.569063 <sup>*</sup>	0.534995 <sup>*</sup>	0.016272	0.697838 <sup>*</sup>	N.A.	-0.230954 <sup>*</sup>	0.90(0.53)
SBIN	0.035634	N.A.	N.A.	N.A.	-0.000475	0.000633	0.003697 <sup>*</sup>	0.000181	0.001013	-0.596816 <sup>*</sup>	0.210973 <sup>*</sup>	-0.029275 <sup>*</sup>	0.939727 <sup>*</sup>	N.A.	-0.032887 <sup>*</sup>	1.39(0.18)
SCI	0.073513 <sup>*</sup>	N.A.	N.A.	N.A.	0.001954	-0.002010	0.001433	-0.000713	0.002611 <sup>**</sup>	-0.616075 <sup>*</sup>	0.257109 <sup>*</sup>	0.005719	0.932459 <sup>*</sup>	N.A.	-0.068270 <sup>*</sup>	0.73(0.70)
SRF	-0.019010	N.A.	N.A.	N.A.	-0.000486	-0.003138 <sup>*</sup>	0.004276 <sup>*</sup>	0.001581	0.003403 <sup>*</sup>	-0.417568 <sup>*</sup>	0.192404 <sup>*</sup>	0.040020 <sup>*</sup>	0.958290 <sup>*</sup>	N.A.	0.015315 <sup>**</sup>	1.40(0.17)
STAR	0.077851 <sup>**</sup>	N.A.	N.A.	N.A.	-0.000325	-0.004659 <sup>**</sup>	-0.000284	0.002058	0.007763 <sup>*</sup>	-0.897465 <sup>*</sup>	0.262554 <sup>*</sup>	-0.077485 <sup>*</sup>	0.895029 <sup>*</sup>	N.A.	-0.034678 <sup>**</sup>	0.63(0.78)
SYNDIBANK	0.087823 <sup>*</sup>	N.A.	N.A.	N.A.	-0.000131	-0.002949 <sup>*</sup>	0.003002 <sup>*</sup>	0.001859 <sup>***</sup>	0.001912 <sup>**</sup>	-0.623118 <sup>*</sup>	0.258677 <sup>*</sup>	0.045104 <sup>*</sup>	0.942010 <sup>*</sup>	N.A.	0.029095 <sup>**</sup>	0.42(0.94)
TATACHEM	0.085043 <sup>*</sup>	N.A.	N.A.	N.A.	0.002853 <sup>*</sup>	0.002746 <sup>*</sup>	0.003900	-0.001156	-0.000994	-0.787756 <sup>*</sup>	0.264922 <sup>*</sup>	-0.003130	0.918273 <sup>*</sup>	N.A.	-0.051541 <sup>*</sup>	0.29(0.98)
TATAMOTORS	0.059354 <sup>*</sup>	N.A.	N.A.	N.A.	-0.000102	-0.000504	0.001975 <sup>**</sup>	0.000914	0.001705	-0.473384 <sup>*</sup>	0.170115 <sup>*</sup>	-0.026102 <sup>**</sup>	0.949602 <sup>*</sup>	N.A.	-0.038445 <sup>*</sup>	1.45(0.15)
TATAPOWER	0.090187 <sup>*</sup>	-0.064648 <sup>*</sup>	N.A.	N.A.	0.002305 <sup>*</sup>	-0.003044	0.003694	4.50E-05	0.001039	-0.548611 <sup>*</sup>	0.219532 <sup>*</sup>	-0.021708 <sup>**</sup>	0.945547 <sup>*</sup>	N.A.	-0.040305 <sup>*</sup>	1.41(0.13)
TATASTEEL	0.090731 <sup>*</sup>	-0.044748 <sup>**</sup>	N.A.	N.A.	0.002215 <sup>*</sup>	-0.001624 <sup>***</sup>	0.002362 <sup>**</sup>	-0.001626 <sup>***</sup>	0.001501	-0.799024 <sup>*</sup>	0.245940 <sup>*</sup>	-0.056115 <sup>*</sup>	0.913116 <sup>*</sup>	N.A.	-0.072339 <sup>**</sup>	0.41(0.94)
TITAN	0.073042 <sup>*</sup>	-0.051338 <sup>*</sup>	N.A.	N.A.	0.001964	-0.002000	0.005857 <sup>*</sup>	-0.002525	-0.000188	-1.043673 <sup>*</sup>	0.247949 <sup>*</sup>	-0.008112	0.871651 <sup>*</sup>	N.A.	-0.009644	1.23(0.26)
TVSMOTORS	0.069291 <sup>*</sup>	-0.098054 <sup>*</sup>	N.A.	N.A.	0.000292	-0.000205	-0.003420	0.000268	0.001513	-2.579001 <sup>*</sup>	0.420882 <sup>*</sup>	-0.070396 <sup>***</sup>	0.690463 <sup>*</sup>	N.A.	0.067362 <sup>***</sup>	0.49(0.90)
UTIBANK	0.047079 <sup>**</sup>	N.A.	N.A.	N.A.	0.002113 <sup>**</sup>	-0.000980	0.007470 <sup>*</sup>	0.000714	0.001878	-1.853729 <sup>*</sup>	0.418760 <sup>*</sup>	-0.016483	0.774653 <sup>*</sup>	N.A.	-0.125022 <sup>*</sup>	0.37(0.96)
VHAYABANK	0.042553	N.A.	N.A.	N.A.	-1.09E-05	-0.000678	0.004024 <sup>*</sup>	0.001918	0.002527 <sup>**</sup>	-0.991313 <sup>*</sup>	0.275951 <sup>*</sup>	-0.046946 <sup>*</sup>	0.886516 <sup>*</sup>	N.A.	-0.062475 <sup>*</sup>	0.44(0.93)

\* Significant at 1% Significance Level, \*\* Significant at 5% Significance Level, \*\*\* Significant at 10% Significance Level, N.A. = Not Applicable and LM= Lagrange Multiplier Test Statistics, AR= Order of Autoregression, C= Constant of Variance Equation and DF= Dummy for Futures Trading.

**Table 7: Impact of Introduction of Futures Trading on the Indian Cash Market Volatility by Controlling Other Market-Wide Reforms (Using EGARCH (p,q))**

Symbol	AR(1)	AR(2)	AR(3)	SI	MON	TUE	WED	THURS	FRI	C	ABS (1)	RES/ SOR(1)	GARCH (1)	GARCH (2)	DF	LM
NIFTY	0.059782*	N.A.	N.A.	0.712870*	0.000177	0.000198	-0.000131	8.75E-05	0.000421	-0.405542*	0.118593	0.016309*	0.964500*	N.A.	-0.030510*	1.31(0.26)
ABB	0.067466*	N.A.	N.A.	0.499984*	0.001481*	0.000744	0.001143	5.89E-05	0.000596	-1.677281*	0.400991	0.036141**	0.919538	N.A.	-0.102896*	0.43(0.93)
ACC	-0.038871	N.A.	N.A.	0.943536*	-0.000443	3.19E-05	0.001022	0.000464	0.001131	0.557011*	0.207764*	0.015206	0.942743*	N.A.	-0.075581*	0.82(0.61)
ALBK	0.067147*	N.A.	N.A.	1.046908*	-0.000410	-0.001116	0.001719	0.003348*	-0.003181**	-0.737072*	0.164390*	0.107979*	0.919416*	N.A.	-0.043551*	1.35(0.20)
ALOKTEXT	0.000611	N.A.	N.A.	0.972171*	0.004624*	-0.000540	0.000104	-0.001662	-0.001495	-0.297702*	0.137707*	0.044114*	0.971794*	N.A.	-0.018596*	1.02(0.42)
ANDHRA-BANK	0.010437	-0.070905*	N.A.	1.107978*	-0.001038	9.37E-05	9.06E-05	0.000853	-0.002244**	-1.194853*	0.265276*	0.055126*	0.963265*	N.A.	-0.090703*	0.61(0.81)
ARVINDMILL	0.097778*	-0.031598	N.A.	1.002847*	0.003810*	-0.002877	0.000173	-0.003582	-0.002885*	-0.430703*	0.169211*	0.016425***	0.956020*	N.A.	-0.030859*	0.83(0.60)
AUROPHAR-MA	-0.031462	N.A.	N.A.	0.808126*	-0.000478	4.31E-05	-0.000130	-6.61E-05	0.001505	-3.197439*	0.382779*	0.068790**	0.609639*	N.A.	-0.148157*	0.24(0.99)
BAJAJAUTO	0.008846	N.A.	N.A.	0.467168*	0.002256*	-0.000855	4.06E-05	8.37E-05	-7.64E-05	-0.890047*	0.210953*	-0.019672	0.903271*	N.A.	-0.050747*	0.83(0.60)
BANKBARO-DA	0.084209*	N.A.	N.A.	1.017233*	0.000709	-0.002370**	0.001098	0.000700	-0.000955	-0.677722*	0.183400*	0.019050**	0.924415*	N.A.	-0.038440*	1.49(0.14)
BANKINDIA	0.064054*	N.A.	N.A.	1.023337*	-0.000750	-0.001272	0.002009**	0.000108	-0.001681	-1.197261*	0.200561*	0.056416*	0.857173*	N.A.	-0.017778**	0.46(0.92)
BEL	0.049869*	N.A.	N.A.	0.971976*	0.000328	0.000132	0.000959	3.90E-05	0.000986	-1.117187*	0.277793*	0.021027	0.960657*	N.A.	-0.218298*	0.79(0.64)
BHEL	0.023780	N.A.	N.A.	0.795271*	0.001818**	0.001082	-0.000790	0.000781	0.001546	-1.163647*	0.253079*	-0.002691	0.861271*	N.A.	-0.133557*	0.67(0.76)
BILT	0.040550*	N.A.	N.A.	0.872859*	0.001697**	-0.002167**	-0.000208	-0.0001036	0.000490	-0.176043	0.115304	0.016036**	0.987349	N.A.	-0.013996*	1.51(0.13)
BONGAIRE-FN	0.008963	N.A.	N.A.	1.021824*	-0.001111	-0.003569*	0.003373*	-0.001466	-0.000848	-1.225349*	0.354666*	0.081410*	0.852493*	N.A.	-0.190322*	0.79(0.64)
CENTURY-TEXT	0.041170**	N.A.	N.A.	1.179265*	0.005514*	0.001103	-0.001881	-0.000785	-0.001231	-0.499288*	0.186220*	0.023146**	0.948068*	N.A.	-0.036852*	1.04(0.41)
CESC	0.051072**	N.A.	N.A.	0.829549*	-0.002128**	-0.003501*	0.002237**	-0.002513**	0.004829*	-2.154682*	0.268278*	0.067282*	0.712445*	N.A.	-0.311289*	0.58(0.83)
CHAM-BLFERT	0.019945	N.A.	N.A.	0.803803*	0.003635*	-0.000449	-0.000180	-0.0001030	-0.000497	-0.539239*	0.057445*	0.088690*	0.935189*	N.A.	-0.014321*	0.13(0.99)
COLGATE	0.042962*	N.A.	N.A.	0.438386*	0.000620	-0.000558	0.001639**	0.000152	0.000206	-0.459051*	0.182329*	0.068209*	0.959492*	N.A.	0.022966*	1.08(0.37)
CORPBANK	0.054820*	N.A.	N.A.	0.925276*	-3.49E-05	0.000763	0.000514	0.001265	-0.001980**	-1.340849*	0.260010*	0.064773*	0.843355*	N.A.	-0.067801*	0.49(0.90)
DIVISLAB	0.024284	N.A.	N.A.	0.772861*	0.003671*	0.002171	0.000302	-0.000318	0.001488	-6.534422*	0.333186*	0.040537*	0.103572*	N.A.	-0.733162*	0.58(0.83)
ESCORTS	0.053103*	N.A.	N.A.	1.050747*	0.001448	-0.001321	0.000391	-0.000550	-0.001212	-0.418968*	0.207009*	0.033695*	0.437495*	N.A.	0.004427*	1.54(0.12)
ESSAROIL	-0.032021	N.A.	N.A.	1.668896*	0.000798	-0.004163**	0.000672	-0.007203	0.0003974	-1.656396*	0.248263*	0.074500*	0.786858*	N.A.	-0.044424**	0.77(0.66)
GAIL	-0.043542**	N.A.	N.A.	0.997061*	-0.000658	0.000720	0.000829	-0.000197	-0.001097	-0.888319*	0.249144*	-0.031067*	0.937415*	N.A.	0.001231	1.50(0.13)
GLAXO	0.027845	N.A.	N.A.	0.522269*	0.001011	0.000349	0.000581	0.000948	-0.000438	-1.389962*	0.360164*	-0.013196	0.855513*	N.A.	-0.058462*	0.74(0.69)
GNFC	0.022333	N.A.	N.A.	0.868654*	0.004164*	0.000119	-0.001306	-0.001691	-0.000313	-0.311528	0.126773*	0.044302*	0.969424*	N.A.	-0.015279*	0.28(0.98)
GRASIM	0.058549*	N.A.	N.A.	0.636861*	-0.000192	0.001166	0.001241	0.000223	9.05E-05	-0.272719*	0.176987*	0.009384*	0.191961*	N.A.	0.788477*	1.26(0.22)
HCLTECH	-0.010109	N.A.	N.A.	1.154169*	-0.000884	0.000175	-0.001200	-0.001002	-0.526618*	0.262038*	0.262038*	0.012570*	0.949635*	N.A.	-0.059113*	0.86(0.57)
HDFCBANK	-0.036034	N.A.	N.A.	0.576099*	-0.000104	0.001202	0.001269	0.000275	-4.64E-05	-1.353769*	0.324165*	0.044302*	0.852121*	N.A.	-0.084138*	1.56(0.11)
HEROHONDA	0.011570	-0.097535*	-0.068739*	0.753551*	0.000469	-0.000529	-0.000284	-0.000402	0.001147	-0.503491*	0.158435*	0.042000*	0.370190**	N.A.	0.578759*	1.14(0.33)
HINDLEVER	0.039751	-0.067581*	N.A.	0.706190*	-0.001774*	3.09E-05	-0.000551	-0.001101	-0.000494	-1.413789*	0.193653*	0.038238*	0.836441*	N.A.	-0.086947*	1.12(0.34)
HINDPETRO	0.050946**	N.A.	N.A.	0.856400*	-0.000896	0.000396	-0.002169*	-0.002332*	-0.001728	-0.420604*	0.195482*	-0.005042	0.960578*	N.A.	-0.014069**	0.13(0.99)
ICICIBANK	0.063408*	N.A.	N.A.	0.786902*	-0.000170	0.000706	0.001872*	-0.000388	-0.000995	-0.994588*	0.300511*	0.001375*	0.891353*	N.A.	-0.082004*	0.45(0.92)
IDBI	-0.015764	N.A.	N.A.	1.05875*	-0.002191**	0.000515	0.000943	-0.001302	0.000264	-2.0551063*	0.416291*	-0.055194*	0.752147*	N.A.	-0.213702*	0.95(0.47)
IFCI	0.036787**	N.A.	N.A.	0.959968*	-0.001846**	-0.002445**	0.002498**	-0.002596**	-0.003337*	-0.906310*	0.33320*	0.014614*	0.900476*	N.A.	-0.007963*	0.67(0.75)
INDUSINDBK	-0.014914	N.A.	N.A.	1.135974*	0.000576	-0.000967	0.000321	-5.74E-05	-0.000232	-0.611990	0.111587*	0.095192*	0.929007*	N.A.	0.026768*	0.57(0.84)
IOB	0.012199	N.A.	N.A.	0.898843*	0.000732	-8.53E-05	0.002390*	0.001770	0.001228	-0.719859*	0.206924*	0.016063*	0.924488*	N.A.	-0.011695*	0.60(0.81)

Contd...

Symbol	AR(1)	AR(2)	AR(3)	SI	MON	TUE	WED	THURS	FRI	C	ABS (1)	RESD/ SOR(1)	GARCH (1)	GARCH (2)	DF	LM
IPCL	0.015470	N.A.	N.A.	0.960938*	0.001283	-0.000112	-0.000457	-0.002572*	-0.000443	-0.957975*	0.312816*	-0.018338**	0.898497*	N.A.	-0.070479*	1.28(0.24)
JSTAINLESS	-0.006204	N.A.	N.A.	1.229821	-0.000513	-0.000548	-0.001806	-0.004456*	-0.000700	-2.168621	0.301769	0.001899	0.740284	N.A.	0.042662	0.45(0.92)
KTKBANK	-0.023560	N.A.	N.A.	1.132114	0.001822	-0.002907*	0.001444	-0.000735	-0.000680	-0.129535*	0.128264*	0.121144*	0.992751*	N.A.	-0.018387*	0.13(0.99)
LICHSGFIN	0.069942*	N.A.	N.A.	0.680246*	0.000608	8.97E-05	0.000644	-0.001793**	0.000784	-0.852141*	0.230257*	0.047290*	0.908517*	N.A.	-0.059716*	0.56(0.84)
MIRPL	-0.002514	N.A.	N.A.	1.351219*	0.001820	-0.005041*	0.000639	-0.004680	-0.000917	-1.173227*	0.314998*	-0.017819	0.860966*	N.A.	-0.132771*	0.62(0.79)
MTNL	0.042555**	-0.080823*	N.A.	0.809773*	-0.002180*	-0.000711	-0.000806	-0.001394	0.000676	-0.495840*	0.167383*	0.015814*	0.948721*	N.A.	-0.020960*	0.51(0.89)
NAGARFERT	0.033848**	N.A.	N.A.	0.615873*	-0.000862	-0.000457	0.002305*	-0.002534*	-0.001140	-0.748854*	0.252533*	0.073847*	0.922260*	N.A.	0.012533***	0.40(0.95)
NATIION-ALUM	0.036457	N.A.	N.A.	0.957543*	-0.000612	-0.000473	0.000450	-0.000178	-0.000161	-0.907900*	0.257266*	0.015059	0.894652*	N.A.	-0.114257*	0.35(0.97)
NEYVELIJIG	0.011769	N.A.	N.A.	1.123248*	0.003090*	-0.000607	0.000287	-0.001016	-0.001481	-0.756685*	0.273095*	0.006518	0.919462*	N.A.	-0.084370*	1.10(0.36)
ORIENT-BANK	0.030756	N.A.	N.A.	0.728647*	-0.000681	-0.001738**	0.000866	0.000810	-0.000240	-0.985887*	0.313390*	0.031992*	0.901185*	N.A.	-0.016980**	1.26(0.25)
PATNI	-0.018085	N.A.	N.A.	0.611465*	-9.02E-05	0.001580	-0.000723	-0.001086	0.000438	-1.160022*	0.312987*	-0.059749**	0.877402*	N.A.	-0.028398	0.38(0.96)
PNB	-0.008509	N.A.	N.A.	1.088511*	0.000720	0.001036	0.001046	0.000505	-0.000133	-0.520979*	0.242495*	0.056812*	0.954147*	N.A.	-0.024675***	0.65(0.77)
POLARIS	0.014356	-0.061146**	0.068094*	1.544459*	0.000632	-0.003351*	-0.001784	-0.003929*	-0.000897	-3.501251*	0.383940*	-0.042632**	0.488822*	N.A.	-0.578166*	0.34(0.97)
RELCAPITAL	0.075603*	N.A.	N.A.	1.170902*	-0.000302	-0.000914	-0.000280	-0.000614	-0.000464	-0.279597*	0.150922*	0.001230	0.977403*	N.A.	0.007450**	1.05(0.40)
RELIANCE	0.009698	N.A.	N.A.	0.707692*	0.001122	-0.000543	2.46E-05	8.17E-05	0.001150	-2.641604*	0.441796*	0.091265*	0.693790*	N.A.	-0.230338*	1.09(0.37)
SBIN	0.020748	N.A.	N.A.	0.851740*	-0.000294	0.000984	0.000197	-0.000313	0.000839	-0.448583*	0.160606*	0.026708	0.957229*	N.A.	-0.032835*	0.83(0.60)
SCI	0.019043	N.A.	N.A.	0.821658*	0.000761	-0.001201	6.27E-05	-0.001134	0.000420	-0.723830*	0.282444*	0.038252*	0.919989*	N.A.	-0.098282*	0.55(0.85)
SRF	-0.054314*	N.A.	N.A.	0.749914*	-0.000187	-0.002938*	0.001256	0.000584	0.002630**	-0.302511*	0.192159*	0.026822*	0.549526*	N.A.	0.000244	1.18(0.30)
STAR	0.038783	N.A.	N.A.	1.016575	0.000149	-0.003002	-0.00087	-0.001515	0.003526***	-0.874559*	0.140860*	0.048715*	0.889146*	N.A.	-0.044796*	0.49(0.90)
SYNDIBANK	0.025126	-0.037314	N.A.	0.718781*	-7.74E-05	-0.001341	0.000746	0.003478*	0.003685*	-0.968500*	0.308675*	-0.013471	0.901902*	N.A.	0.006780	0.12(0.99)
TATACHEM	0.069262*	N.A.	N.A.	0.771136*	0.002960*	-0.002981*	0.002366*	-0.000639	-0.001662**	-0.362795*	0.149451*	0.037994*	0.966355*	N.A.	-0.025524*	0.52(0.87)
TATAMO-TORS	0.036889**	N.A.	N.A.	0.900333*	-0.000458	-0.000272	-0.001280	0.000582	0.001741**	-0.255002*	0.120215*	0.000390	0.976875*	N.A.	-0.023506*	1.33(0.18)
TATAPOWER	0.046570**	-0.073206*	N.A.	0.766690*	0.001797*	-0.001850**	0.000388	-0.000731	0.000421	-0.379638*	0.180956*	0.015598	0.966631*	N.A.	-0.031169*	1.49(0.14)
TATA TEA	0.083739*	N.A.	N.A.	0.722561*	0.001035	-0.001053	0.000317	-0.002271*	0.001601**	-0.578495*	0.210421*	-0.011895	0.942692*	N.A.	-0.052675*	0.89(0.55)
TITAN	0.012095	N.A.	N.A.	0.916601*	0.002408**	-0.000623	0.002157**	-0.001462	0.001540	-0.893668*	0.219586*	0.001060	0.894504*	N.A.	-0.015631**	0.99(0.45)
TVSMOTORS	0.031998	N.A.	N.A.	0.975927*	-0.001021	-7.83E-05	-0.004159	-0.000776	-0.001309	-3.272426*	0.461699*	0.018173	0.618338*	N.A.	0.010813	0.56(0.85)
UTIBANK	-0.014223	N.A.	N.A.	0.750493*	0.002098**	-0.001850***	0.003327*	0.000307	0.001115	-2.024974*	0.371523*	0.045507*	0.752828*	N.A.	-0.161156*	0.49(0.90)
VIJAYABANK	-0.029608	N.A.	N.A.	1.052616*	-0.000610	-0.002096*	0.002189**	-0.000210	-0.001408	-0.718977*	0.268655*	-0.073869*	0.928638*	N.A.	-0.033098*	0.18(0.99)

\* Significant at 1% Significance Level, \*\* Significant at 5% Significance Level, \*\*\* Significant at 10% Significance Level, N.A. = Not Applicable and LM= Lagrange Multiplier Test Statistics, AR= Order of Autoregression, SI = Surrogate Index, C= Constant of Variance Equation and DF= Dummy for Futures Trading

## Appendix A

List of Equity Index and Stocks in the Sample \*

Symbol	Date of Listing in Equity Segment	Date of Listing in F&O Segment	No. of Observations		
			Total	Pre Futures	Post Futures
NIFTY	03-Nov-95	12-Jun-00	2485	846	1639
ABB	01-Jan-96	20-Apr-05	2485	2062	423
ACC	01-Jan-96	09-Nov-01	1896	614	1283
ALBK	29-Nov-02	20-Apr-05	1020	597	423
ALOKTEXT	02-Jan-96	27-May-05	1747	1351	396
ANDHRABANK	04-Apr-01	29-Aug-03	1432	598	834
ARVINDMILL	01-Jan-96	26-Sept-03	2485	1671	814
AUROPHARMA	15-Jan-96	12-May-05	788	381	407
BAJAJAUTO	01-Jan-96	09-Nov-01	2243	960	1283
BANKBARODA	26-Feb-97	29-Aug-03	2446	1612	834
BANKINDIA	07-May-97	29-Aug-03	2404	1570	834
BEL	14-Oct-96	31-Jan-03	2361	1384	977
BHEL	01-Jan-96	09-Nov-01	2485	1202	1283
BILT	01-Jan-96	12-May-05	2485	2078	407
BONGAIREFN	01-Jan-96	12-May-05	2481	2074	407
CENTURYTEX	01-Jan-96	20-Apr-05	2245	1821	423
CESC	01-Jan-96	12-May-05	2485	2078	407
CHAMBLFERT	01-Jan-96	12-May-05	1249	842	407
COLGATE	01-Jan-96	20-Apr-05	2485	2062	423
CORPBANK	05-Dec-97	12-May-05	2261	1854	407
DIVISLAB	12-Mar-03	12-May-05	949	542	407
ESCORTS	01-Jan-96	27-May-05	2485	2089	396
ESSAROIL	01-Jan-96	12-May-05	685	278	407
GAIL	02-Apr-97	26-Sep-03	1372	558	814
GLAXO	01-Jan-96	20-Apr-05	2243	1820	423
GNFC	01-Jan-96	12-May-05	2485	2078	407
GRASIM	01-Jan-96	09-Nov-01	2485	1202	1283
HCLTECH	11-Jan-00	31-Jan-03	1517	540	977
HDFCBANK	01-Jan-96	29-Aug-03	2485	1651	834
HEROHONDA	01-Jan-96	31-Jan-03	1434	457	977
HINDUNILVR	01-Jan-96	09-Nov-01	1602	319	1283
HINDPETRO	02-Jan-96	09-Nov-01	1789	506	1283
ICICIBANK	24-Sept-97	31-Jan-03	2306	1329	977
IDBI	01-Jan-96	20-Apr-05	1455	1032	423
IFCI	01-Jan-96	27-May-05	2485	2089	396
INDUSINDBK	29-Jan-98	12-May-05	1372	965	407
IOB	13-Dec-00	20-Apr-05	1509	1086	424
IPCL	01-Jan-96	31-Jan-03	2485	1508	977
JSTAINLESS	17-Nov-03	12-May-05	707	300	407
KTKBANK	10-May-00	27-May-05	1038	642	396

Symbol	Date of Listing in Equity Segment	Date of Listing in F&O Segment	No. of Observations		
			Total	Pre Futures	Post Futures
LICHSGFIN	01-Jan-96	20-Apr-05	2485	2062	423
MRPL	01-Jan-96	20-Apr-05	1372	949	423
MTNL	01-Jan-96	09-Nov-01	2485	1202	1283
NAGARFERT	01-Jan-96	27-May-05	2485	2089	396
NATIONALUM	28-Apr-99	31-Jan-03	1920	943	977
NEYVELILIG	23-Aug-00	20-Apr-05	1587	1164	423
ORIENTBANK	01-Jan-96	29-Aug-03	2485	1651	834
PATNI	25-Feb-04	20-Apr-05	710	287	423
PNB	26-Apr-02	29-Aug-03	1168	334	834
POLARIS	24-Nov-99	31-Jan-03	1350	373	977
RELCAPITAL	01-Jan-96	20-Apr-05	2485	2062	423
RELIANCE	01-Jan-96	09-Nov-01	2265	982	1283
SBIN	01-Jan-96	09-Nov-01	2485	1202	1283
SCI	05-Jan-96	31-Jan-03	1996	1019	977
SRF	01-Jan-96	27-May-05	2474	2078	396
STAR	02-Feb-00	27-May-05	832	436	396
SYNDIBANK	27-Dec-99	26-Sept-03	1751	937	814
TATACHEM	01-Jan-96	20-Apr-05	2485	2062	423
TATAMOTORS	01-Jan-96	09-Nov-01	2485	1202	1283
TATAPOWER	01-Jan-96	09-Nov-01	2485	1202	1283
TATATEA	01-Jan-96	09-Nov-01	2485	1202	1283
TITAN	01-Jan-96	12-May-05	2485	2077	407
TVSMOTORS	03-Dec-01	12-May-05	735	328	407
UTIBANK	03-Dec-98	20-Apr-05	2016	1593	423
VIJAYABANK	10-Jan-01	20-Apr-05	1490	1067	423

## (Footnotes)

- 1 See p. 499 in Lee and Ohk (1992).
- 2 For details see Gulen and Mayhew (2000).
- 3 See, Rahman (2001).
- 4 Symbol of the Individual Stocks are Reliance, Bhel, Drreddy, Icicibank, Glaxo, Hdfc, Hindlever, L&T, Itc, Ranbaxy, Sail, Sbin, Wipro, Ashokley, Bob, Bel, Idbi, Corpbank, Vyasya, Asianpaint.