Price Discovery and Arbitrage Efficiency of Indian Equity Futures and Cash Markets

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Abstract:

Present study investigates the price discovery efficiency and validity of Law of One Price in the Indian equity market by using tick-by-tick data available at National Stock Exchange of India. The study finds that strong and stable long-run relationship exists between Indian equity futures and cash markets, however, during short-run significant deviations from equilibrium relationship have been observed. Empirical findings in the study suggest that price discovery takes place in both markets, whereas, the Indian equity futures market dominates the information transmission process and the duration of lead-lag between two markets has been found to be varying in the range of five to fifty five minutes.

The study has further found that days to expiry do not play significant role in the price discovery mechanism of Nifty futures contracts. However, mispricings for individual stock futures contracts have been found to be significantly negatively associated with days to expiry, which implies that near to the expiration date more arbitrage opportunities are available and these findings support the early liquidation option as proposed by Brennan and Schwartz (1990). Regulatory restriction on the participation of institutional traders may be a significant factor leading to negative association between mispricings of futures contracts and days to expiry, therefore, they might be preferring either to unwind or to rollover their positions before maturity date, which not only makes money available to them but also enables them to take new positions.

Key Words: Price Discovery, Law of One Price, Arbitrage Activities, Cost-of-Carry, Information Spillover, Basis Risk, Early Liquidation Option and Market Microstructure.

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Section I: Introduction

Perfect market models presume that all traders are equally endowed with knowledge and ability to analyze the available information set(s). However, in reality, traders (due to circumstances and taste differentials) are observed to concentrate on acquiring particular set(s) of information and they leave to others to discount rest of it. Nonetheless, asset valuation theories suggest that if useful information is neglected, better-informed traders would soon recognize the opportunity to book risk-free profits from its collection and use. Traders making profits on expectation differentials arising from information differences suggest the information exchange role for futures market besides its traditional insurance or risk allocation function. Therefore, if inclusion of futures price in the decision making process eliminates noise in the pricing system, it suggests that information known to the informed traders has become public, which implies that expectations with respect to the future spot price for both groups will be same and the information exchange role of the futures market would cease. However, as long as the noise remains in the pricing system, a difference in return expectations will persist, which would provide incentives for collection and use of private information, thus, supports the information exchange role for the futures market (Brannen and Ulveling (1984)).

Considering the information exchange and price discovery roles of the futures market, many theoretical as well as empirical attempts (see table I) have been made and the regulatory bodies, market makers, academicians and practitioners unanimously have agreed upon the common notion that organized futures markets contain significant information for the prospective cash market price changes in short-run, irrespective of the fact that in the long-run, both markets observe strong and stable co-movement. However, Wahab and Lashgari (1993), Chan and Lien (2001), Chen et al., (2002), Lin et al., (2002), Lien et al., (2003), Lin et al., (2003), Mukherjee and Mishra (2006) and Thomas (2006) have found contrary evidence suggesting that cash market serves as dominant market and futures market behaves like satellite market[1].

The cost-of-carry relationship between two markets further implies that since price movements in both markets are subject to common information set(s), therefore,

[1] Lead-lag relationship between futures and cash markets has been a subject of interest for practitioners, traders, regulatory bodies and academicians alike because leading market may help the change agents to trigger regulatory changes and correct the market inefficiencies (Raju and Karande (2003)). It may also help portfolio managers to hedge their portfolio risk and boost the hedger's trading participation in the futures market, which may lead to the cash market stabilization (Ederington (1979), Figlewski (1984), Alexander (1999), Neuberger (1999) and Chang et al., (2000)). Lead-lag relationship between two markets is followed by information transmission from one market towards other but it should not be interpreted that information transmission takes place from dominant market towards the satellite market only because it is bi-directional phenomenon. However, the speed and amount of information transmission from one market to other would certainly be different (Kawaller et al., (1987), Stoll and Whaley (1990), Chan (1992) and Wahab and Lashgari (1993)).

law of one price must hold (Hasbrouck (1995)) and any deviation between two price series must be subject to transaction cost (Protopapadakis and Stoll (1983) and Goodwin (1992)). However, in real world, significant violations of law of one price have been observed (see table II), which implies that though stable long-run relationship persists between two markets, but during short-run, both price series significantly deviate from each other and offer exploitable arbitrage opportunities (Cox et al., (1981) and Stoll and Whaley (1990)).

Nevertheless, Cornell and French (1983a), Mackinlay and Ramaswamy (1988), Yadav and Pope (1990), Twite (1992), Neal (1996), Brailsford and Hodgson (1997), Akin (2003), Lee (2005) and Vipul (2005a and 2005b) found that the assumptions of cost-of-carry model do not hold in reality but Brailsford and Cusack (1997) by using three different futures pricing models (namely; cost-of-carry model, Ramaswamy-Saundaresan model and Hemler-Longstaff model) found that each model shows pricing errors and though small but exploitable arbitrage opportunities were persistent. Therefore, Brailsford and Cusack (1997) concluded that pricing errors besides the model misspecification (as evidenced in Cox et al., (1981)) may be a positive function of time-to-maturity and illiquidity in the market.

In addition, empirical works (see table II) have often found evidences of substantial and sustained 'wave-like' mispricings between cash and futures markets. One explanation to mispricings between two price series may be the immaturity of arbitrage sector to connect two markets. Other possible explanation put forward as potential determinants of mispricings includes infrequent trading in underlying asset and non-synchronous trading between two markets (Neal (1996) and Brailsford and Hodgson (1997)).

Presence of market frictions have also been documented as one of the potential factors, which leads to deviations between futures and the forward prices (Stoll and Whaley (1990)) because market frictions disturb market equilibrium and the asset market with relative cost advantage starts leading the corresponding market. This suggests that strategic trading rules may be formulated to book risk free profits available in the market (Brannen and Ulveling (1984), Lai and Lai (1991), Jong and Donders (1998), Min and Najand (1999) and Chan et al., (2004)).

Some more possible reasons for persistence of large spreads over the period may be the presence of imperfect market microstructure settings and the purpose for which futures contracts are used. For instance; Beaulieu et al., (2003) observed that reduction in tick size of TSE 35 Index Participation Units from 0.60% to 0.25% of the prevailing price helped to improve its price discovery efficiency in Canada, which implies that improvements in contract specifications help to improve the price discovery efficiency of the asset. Furthermore, Jiang et al., (2001) found that contemporaneous relationship between futures and cash markets got strengthened with removal of short selling restrictions in the Hong Kong cash market particularly when the market was undergoing bear phase and the underlying asset was relatively overpriced. Therefore, imperfect trading specifications of the futures contracts may be responsible for violation of the common notion that an asset, which involves zero investment, will always be an efficient price discovery vehicle (also see, Diamond and Verrecchia (1987), Puttonen (1993), Kempf (1998) and Beaulieu et al., (2003)).

Cornell and Reinganum (1981) found that absence of tax implications and the ability of traders to short sell were important features of the foreign exchange market (which are absent in other markets), which enables currency futures to represent their fundamental values. Antoniou et al., (1998) further found that due to restrictions on the participation of foreign institutional investors in futures market (which lead to lesser competitiveness in the market), information asymmetry in Spain significantly increased after the introduction of futures trading[2]. Therefore, presence of artificial trading restrictions may make arbitrageurs handicapped to correct price deviations between two markets, hence, as on the maturity date, traders would prefer to rollover to next contract instead of booking losses (because in most of futures markets, payoffs are settled in cash not by physical delivery).

The purpose of usage of futures market may be another important determinant of persistence of large spreads between futures and forward prices because empirical literature has found significantly dispersed market reactions to the dynamic interactions of speculators and hedgers. Bessembinder and Seguin (1992 and 1993), Gulen and Mayhew (2000) and Thomas (2006) have found that prominent usage of futures contracts for hedging, results into decline in the unwanted fluctuations in the cash market, whereas, every increased participation of noise traders amplify information asymmetry as well as the cash market volatility[3].

Furthermore, Kumar and Seppi (1994) found that illiquidity might have long lasting impact on basis; therefore, arbitrageurs struggle to close the gap between two prices. Roll et al., (2007) found that liquidity and basis in addition to being contemporaneously correlated forecast each other. They found bidirectional granger causality between short-term absolute basis and effective spreads. They have also found that quoted and effective spreads granger cause longer-term absolute basis, which suggests that liquidity enhances the efficiency of futures/cash pricing system and helps to mitigate pricing errors. Spread in prices of both markets is negatively associated with information assimilation efficiency of both markets, which improves with every addition in the market wide liquidity (Campbell et al., (1993)). Hence, spreads in prices of both markets would reduce as early as futures and the underlying asset markets mature.

Besides, researchers like Cornell and French (1983a and 1983b), Mackinlay and Ramaswamy (1988), Yadav and Pope (1994), Antoniou and Holmes (1995), Neal (1996), Stoll and Whaley (1997), Chow et al., (2003), Lien and Yang (2003), Vipul (2005a and 2005b) and others have found significant relationship between mispricings and time-to-expiry of the contract. They have found that arbitrage opportunities were positively

[2] Chen et al., (2002), Lin et al., (2002 and 2003), Mukherjee and Mishra (2006), Sah and Kumar (2006) and Thomas (2006) also found that regulatory bottlenecks on (foreign as well as domestic) institutional trader's participation in derivatives market were major reasons for futures markets in Taiwan and India to behave like satellite markets, whereas in these countries, cash markets have been found to be an efficient price discovery vehicle.

[3] In a theoretical model, Kyle (1985) defines market depth as the order flow required to move prices by one unit. His model suggests that market depth changes with trading activity (volume) and is also related to non-informational trading activity. According to the Kyle model, high market depth would be more closely associated with lower price volatility than would low depth, given the same level of trading volume. Thus, market depth may provide additional information about the interaction between price volatility and trading volume.

associated with time-to-expiry and as soon as contracts approach near to the expiration date, mispricings disappear or if were available, these were not economically exploitable. Cornell and French (1983a and 1983b) argued that in the presence of tax timing option, mispricings should be negative and converge to zero as time to expiration decreases because the value of tax timing option declines with reduction in time-to-expiry. However, Yadav and Pope (1990) found contrary results that time-to-maturity does not affect the intensity of mispricings.

In addition, Vipul (2005a and 2005b) found that individual days of one week to expiry do not show different mispricing patterns in India. He explains that since NIFTY futures were generally underpriced[4], therefore, as soon as the date of expiry approaches, mispricings go down partially because squaring up of short positions by hedgers creates sufficient demand of long positions in the futures market, which is reflected through shedding of open interest positions about one week prior to the expiry of futures contracts in India. Since, as on the date of expiry, uncertainty about expected dividend yield goes away, therefore, prices of futures contracts closely reflect the prices of underlying asset.

In addition to the time-to-maturity effect on mispricings, researchers like Brailsford and Hodgson (1997) and Vipul (2005a and 2005b) have examined whether the pattern of mispricings changes over different trading days-of-the-week. Brailsford and Hodgson (1997) found that index futures have significantly lower mispricings on Fridays in the Australian Market. However, Vipul (2005a and 2005b) did not find any significant evidence of days-of-the-week effect on mispricings in the Indian equity futures market.

Yadav and Pope (1990) further noted that mean arbitrage profits were positive when initially the futures contracts were underpriced, however, the mean arbitrage profits were negative when futures contracts were initially overpriced. They also noted that first order autocorrelation coefficient of mispricings were negative, which is obvious in the presence of an effective link between the cash and futures markets. Yadav and Pope (1990) and Neal (1996) also found that since the sign of mispricings revert to every new information shock, therefore, early unwinding option may prove to be a better option for arbitrageurs to book extra normal profits[5]. Yadav and Pope (1990) observed that additional profits arising out of rollover or early unwinding were a significant proportion of the total arbitrage profits and often exceeded the arbitrage profits arising from simple hold till expiration strategy. They further mentioned that additional profits imply a heavy transaction cost discount and should generate substantial arbitrage activity even when futures prices are within the transaction cost bounds. Neal (1996) consistent with

[4] Underpriced futures contracts indicates that the volume of shorters was higher than those who were long in the market, where; shorters may be investors and fund managers who hedge their investments or funds and speculators being the counter party were long in the market because they could buy underlying asset at a lower price.

[5] Neal (1996) mentions that contrary to the basic arbitrage model, the ability to liquidate an arbitrage position before expiration is a valuable option and affects the decision to establish an arbitrage option. The early liquidation model of Brennan and Schwartz (1990) predicts that an arbitrage position will be established when absolute deviation from fair value plus the value of the option to liquidate the position early exceeds the transaction costs of arbitrage.

Brennan and Schwartz (1990) found that arbitrage trade was a positive function of absolute deviation from fair value and of the directional volatility[6].

Another important issue, which may potentially be another strong determinant of mispricings between two markets, that is, the return generation process in both markets is inefficient, which is reflected in the form of statistically significant autoregressive returns (for instance; see Stevenson and Bear (1970), Rendleman and Carabini (1979), Koppenhaver (1983), Klemkosky and Lasser (1985), Glassman (1987), Gross (1988), Lo and MacKinlay (1988), Choudhry (1991), Johnson et al., (1991) and Gupta and Singh (2006b)). Delayed information assimilation in both markets cause bid/ask bounce, which generates intra market arbitrage opportunities and will result into widening of spread between two markets. Therefore, if return generation process in both markets is inefficient, basis would likely be to wander away from the cost-of-carry and possibilities of price convergence as on maturity date may be doubtful (for detailed discussion, see Fortenbery and Zapata (1997), Theobald and Yallup (2001), Zeng (2001), Monoyios and Sarno (2002) and Pattarin and Ferretti (2004)), which would enforce traders to rollover their current positions to the next contract cycle, hence, the cash market volatility will increase.

The above discussion suggests that though futures and cash markets observe strong and stable long run comovement but during short run significant lead lag relationship exists between two markets, which might offer risk free profit making opportunities to arbitrageurs. As early as arbitrageurs exploit the arbitrage opportunity, price discovery efficiency in both markets will improve and hedgers would be benefited because early exploitation of arbitrage opportunities tends to reduce variation in basis risk (Merrick Jr. (1988)). Review of empirical literature further suggests that irrational/unreal assumption of the estimation model and imperfect market microstructural settings are prominent factors, which cause exploitable deviations between prices of two markets. However, since, most of the studies have been conducted in developed markets and emerging markets are neglected to an extent, hence, the academic theories emerged out of empirical observations may not be universalized.

The current study is an attempt to examine the price discovery and arbitrage efficiency of an emerging capital market i.e. India, which is one of the most liquid markets of the world. Though, many empirical attempts have been made to examine the price discovery (Table I) and arbitrage efficiency (Table II) in the Indian equity futures

[6] Neal (1996) cites two limitations in the early liquidation option, which emerge because Brennan and Schwartz (1990) assumed that deviations between actual and theoretical futures contract price should follow Brownian Bridge Process, which would force mispricings to be zero at maturity and induce mean reversion in mispricings. First limitation Neal (1996) cited was that, early liquidation option (unlike basic arbitrage model) does not incorporate any bounds, which arbitrage will place on level and volatility of deviation from fair value because a bounded process is likely to affect the value of the early liquidation option. More generally, if the deviations are bounded by arbitrage, the volatility relevant to valuing the early liquidation option will not be the variance of mispricings but a measure of how quickly such mispricings reverses sign. The second limitation he cites is that the degree of reversion implied by the Brownian Bridge Process is simply proportional to 1/(T-t), where (T-t) is the time to maturity. As Brennan and Schwartz (1990) acknowledged that the process does not include other state variables, such as index arbitrage, which are likely to induce reversion, therefore, the empirical tests have used proxies for the value of the early liquidation option.

market but yet no conclusive evidence is available whether Indian equity futures market serves as an efficient price discovery vehicle. To the best of researchers' knowledge, one of the most prominent reasons for inconclusive evidence on price discovery and arbitrage efficiency of the Indian equity futures market may be that these empirical studies (except Bhatia (2007)) have employed daily closing prices, whereas, robust examination of price discovery and arbitrage efficiency of closely linked markets is possible by using high frequency (i.e. intraday) data (see, Diagler (1990)).

Nonetheless, Bhatia (2007) has used intraday data and has evidenced that Indian equity futures market is an efficient price discovery vehicle but the scope of the study is limited to Nifty futures and data has been considered only for one year. Present study reexamines the price discovery and arbitrage efficiency in the Indian equity futures market by using five minutes data of relatively lengthy time frame (i.e. April 2003 to March 2007) for Nifty as well as fifty most liquid individual stocks.

Current study attempts to address four empirical issues: **(i)** whether futures and cash markets observe strong and stable long run relationship; **(ii)** whether both markets observe strong comovement during short run; **(iii)** which market serves as a source for information/volatility spillover during short run; and **(iv)** how mispricings behave during the contract cycle. The study has been organized into four sections; section **one** introduces the problem, section **two** details about the data base and research design, section **three** discusses results and analysis and section **four** concludes the study.

Section II: Data Base and Research Design

Present study employs high frequency data from April 2003 to March 2007 for examining the price discovery and arbitrage efficiency in the Indian equity futures market. In order to avoid non synchronous trading between two markets (similar to Stoll and Whaley (1990)), all observations at five minutes interval (in both futures and cash segments) for Nifty and fifty most liquid individual stocks (Appendix A) have been considered. In addition to the trading activity in the futures segment, fifty most liquid individual stocks have been selected on the basis of following sample selection criteria:

1. In order to avoid the potential bias of corporate actions (namely, issue of bonus shares and stock splits) on the information dissemination efficiency of both equity stocks as well as stock futures contracts, the present study includes only those individual stocks in the sample size of the study, whose price series during the sample period were not adjusted due to any corporate action (for example see Lamoureux and Lastrapes (1990)). The dates of bonus issues and stock splits have been checked with Capitaline Database.
2. All those individual stock futures contracts, whose trading during the sample period was banned by stock exchange authorities due to any reason[7], doesn'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 the sample period, which otherwise could be a potential factor

[7] See Eligibility Selection Criteria for permitting and discontinuing the trading of Indices and Individual Stocks in F&O segment at NSE (www.nseindia.com).

responsible for inefficient price discovery (for example see Campbell et al., (1993)).

The price series of mid and far month futures contracts were also available but due to their low trading activity and turnover volume[8], both series have suffered with significant irregular trading. Therefore, the present study restricts the scope of the study to examine the price discovery and arbitrage efficiency of near month futures contracts because Efficient Market Hypothesis presumes voluminous and continuous trading activity (for details; see Campbell et al., (1993)).

Prior to using time series data in econometrical analysis, it is necessary that its statistical features (including unit root and cointegration) should be tested because existence of unit roots leads to spurious estimations. In order to test for the existence of unit roots and to determine the order of differencing necessary to convert non stationery series into stationary series, Augmented Dicky-fuller (ADF) and Phillip Perron test (PP) tests have been applied. Therefore, prior to applying econometrical procedures, if the price series of cash (S_t) as well as futures markets (F_t) are found to be non stationary, these will be differenced to convert these into stationary series. Table III reports the unit root test results of the price series of futures, cash and basis, which suggests that price series of futures and cash markets are non stationary at levels, whereas, their log first difference is stationary[9]. This implies that both series may be I(1); hence, should observe long run relationship, which is also evident from stationarity results of basis.

In addition, the long run relationship between two series has been examined by applying Johansen and Juselius (1990) cointegration procedure, which states that coefficient matrix (Π) contains essential information about the relationship between S_t and F_t. Specifically, if rank (Π) = 0, then Π is the 2x2 zero matrix, which implies that there is no cointegration relationship between S_t and F_{t-n}. However, if Π contains full rank, i.e. rank (Π) = 2 in case of futures and cash markets, then all variables in X_t are I(0), whereas, if Π has reduced rank, i.e. rank (Π) = 1, then there is a one cointegrating relationship between S_t and F_t, which is given by any row of matrix Π and the expression ΠX_{t-1} will be the error-correction term in equation (1)[10]. Where X_t is the 2x1 vector

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[8] Trading volume in mid and far months has been a result of rollovers in the last week of month i.e. near expiration date (for detail, see Thomas (2006)).

[9] In order to save space, the unit root test results of futures and cash market price series at levels are not reported but are available on demand.

[10] Since rank (Π) equals the number of characteristic roots (or eigen values) which are different from zero, the number of distinct cointegrating vectors can be obtained by estimating the number of these eigen values, which are significantly different from zero. The characteristic root of the n×n matrix Π, are the values of λ which satisfy the following equation $\left|\Pi - \lambda I_n\right| = 0$, where I_n is a n×n identity matrix. Johansen (1988), proposed the following two statistics to test for the rank of Π:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n}\ln(1-\hat{\lambda}_i)$$

$$\lambda_{\max}(r, r+1) = -T\ln(1-\hat{\lambda}_{r+1})$$

Where, $\hat{\lambda}_i$ are the eigen values obtained from the estimate of the Π matrix and T is the number of usable observations. The λ_{trace} tests the null that there are at most r cointegrating vectors, against the alternative

$(S_t, F_t)'$ of log-spot and log-futures prices, respectively, Δ denotes the first difference operator and ε_t is a 2x1 vector of error terms $(\varepsilon_{S,t}, \varepsilon_{F,t})'$. The VECM specification contains information on both short and long-run adjustment to changes in X_t, via the estimated parameters Γ_i and Π, respectively. In such case, Π can be factored into two separate matrices α and β, both of dimensions 2x1, where 1 represents the rank of Π such as $\Pi = \alpha\beta'$, where β' represents vector of cointegrating parameters and α is the vector of error correction coefficients measuring the speed of convergence to the long-run steady state (cited in Thomas (2006)).

$$\Delta X_t = \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_t, \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Once the long run relationship between two markets has been identified (table IV), it is important to examine the short run relationship between two series and to study the direction of information transmission. Voluminous literature on short-run dynamics between futures and cash markets (see table I), has applied Granger Causality methodology to examine the direction of information transmission. The null hypothesis of Granger Causality methodology is that there is no causal relationship between two variables, however, rejection of the null hypothesis suggests that there is significant information transmission from one market to other and it may be unidirectional or may be bidirectional subject to the market conditions in which these two series interact. Equation (2) lays down the estimation procedure of Granger Causality methodology, where, RSS_R = Restricted Residual Sum of Squares, RSS_{UR} = Unrestricted Residual Sum of Squares, m = Number of Lagged Terms of Endogenous Variable in Unrestricted Regression Equation, k = Number of Parameters Estimated in the Unrestricted Regression and n-k = Degrees of Freedom in F Distribution.

$$F = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The number of 'm' lagged terms to be introduced in the causality test may be chosen on the basis of Akaike (AIC) or Schwartz Information Criterion (SIC) (see Gujarati (2003) p. 698), however, in the current study, number of lags have been decided on the basis of SIC, which uses a function of residual sum of squares together with a penalty for large number of parameters. Specifically, SIC minimizes the expression: T*log(RSS)+K*(log T), where T is the number of observations, RSS is the sum of the squared residuals and K is the number of regressor. Furthermore, it has been presumed that error terms entering into the causality tests are uncorrelated, which has been tested through White Heteroscedasticity test procedure, whose null hypothesis (variance of residuals is time invariant) has been accepted for Nifty as well as all individual stock futures contracts but in order to save the space, only F statistics and p values have been

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that the number of cointegrating vectors is greater than r and the λ_{max} tests the null that the number of cointegrating vectors is r , against the alternative of r+1. Critical values for λ_{trace} and λ_{max} statistics are provided by Osterwald-Lenum (1992).

reported in table V, however, the results of White Heteroscedasticity test procedure are available on demand.

Unidirectional causality from futures (cash) to cash (futures) market indicates that estimated coefficients of the lagged futures (cash) are statistically different from zero as a group and the set of estimated coefficients of the lagged cash (futures) is not statistically different from zero. Unidirectional causal relationship suggests that traders prefer to trade through futures (cash) market, which later on transmits information to cash (futures) market, consequently significant lead-lag relationship may persist between these two. However, bidirectional causality or feedback relationship suggests that estimated sets of coefficients are statistically different from zero in both regression equations. Feedback relationship between futures and cash markets implies that both markets contain important information, which can be used to price the value content of new information in other market. Nonetheless, bidirectional causality implies feedback relationship but it does not refute the chances that two markets will observe lead-lag relationship during short-run. Finally, no causal relationship between two markets will suggest that information transmission between two markets do not result into any disturbance in equilibrium price of the other market. In efficient cost-of-carry regime, bidirectional causality between futures and cash markets is expected because current futures price at any time will be sum of current spot price and expected risk premium to hold such asset if trader is long in the cash market or opportunity cost if trader has taken short position in the cash market.

In order to investigate the lead-lag strength of a market, Vector Autoregression (VAR) and Vector Error Correction Methodologies (VECM) have been applied. VAR model as name suggests, models the vectors of variables as autoregressive processes, where each variable linearly depends upon its lagged values and those of other variables in the vector, which implies that future values of the process are a weighted sum of past and present values plus some noise and possible exogenous variables. Therefore, solutions to VAR model are the sum of both deterministic as well as stochastic components. The deterministic components depend upon initial conditions and deterministic terms and the stochastic components depend upon random shocks, which will be a weighted sum of past shocks. If the process is stable, then shocks in the distant past will have only a negligible impact, hence, the stochastic component will be the weighted sum of most recent information shocks. However, if the process is integrated (which implies that effects of past shock never decay), the stochastic component will be sum of all past shocks. Whereas, if the process is explosive, then shocks will be amplified as time passes (Rachev et al., (2006) pp. 321-372).

VAR model for futures and cash market returns can be functionally presented in equations (3.1) and (3.2). In equations (3.1) and (3.2) VAR process assumes that $\varepsilon_{f,t}$ and $\varepsilon_{s,t}$ are white noise and independently and identically distributed with zero mean and finite variance. The order of lagged terms (i.e. i to p and j to p) have been decided on the basis of SIC criteria. In equations (3.1) and (3.2), $R_{f,t}$ = daily returns of futures contract, $R_{f,t-i}$ = lagged daily returns of futures market, $R_{s,t}$ = daily returns of cash market, $R_{s,t-j}$ = lagged daily returns of cash market, $\alpha_{0,f}$ = intercept term of futures returns, $\alpha_{0,s}$ = intercept term of cash market returns, β_i = parameter of autoregressive terms and β_j =

parameter of lagged returns of other variable in the vector. Table VI reports the estimated results of VAR model.

$$R_{f,t} = \alpha_{0,f} + \sum_{i=1}^{p} \beta_i (R_{f,t-i}) + \sum_{j=1}^{p} \beta_j (R_{s,t-j}) + \varepsilon_{f,t} \quad \text{.....(3.1)}$$

$$Rs_{,t} = \alpha_{0,s} + \sum_{i=1}^{p} \beta_i (R_{s,t-i}) + \sum_{j=1}^{p} \beta_j (R_{f,t-j}) + \varepsilon_{s,t} \quad \text{.....(3.2)}$$

However, since, it has been observed in table IV that futures and cash market price series are cointegrated, therefore, VECM has been applied to further examine the lead-lag relationship between two series. VECM will be estimated as per the functional relationship expressed in equations (4.1) and (4.2), where, $R_{f,t}$ = daily returns of futures contract, $R_{f,t-j}$ = lagged daily returns of futures market, $R_{s,t}$ = daily returns of cash market, $R_{s,t-k}$ = lagged daily returns of cash market, $\alpha_{0,f}$ = intercept term of futures returns, $\alpha_{0,s}$ = intercept term of cash market returns, α_i = parameter of error correction term, β_j = parameter of autoregressive terms and β_k = parameter of lagged returns of other variable in the vector. Significant error correction terms will help researchers to identify the market, which will correct the information shocks so that price convergence on the maturity date may take place. Table VII reports the estimated results of VECM.

$$R_{f,t} = \alpha_{0f} + \sum_{i=1}^{p} \alpha_{if} (F_{t-i} - S_{t-i}) + \sum_{j=1}^{p} \beta_j R_{f,t-j} + \sum_{k=1}^{p} \beta_k R_{s,t-k} + \varepsilon_{ft} \quad \text{.....(4.1)}$$

$$R_{s,t} = \alpha_{0s} + \sum_{i=1}^{p} \alpha_{is} (F_{t-i} - S_{t-i}) + \sum_{j=1}^{p} \beta_j R_{s,t-j} + \sum_{k=1}^{p} \beta_k R_{f,t-k} + \varepsilon_{st} \quad \text{.....(4.2)}$$

Once the present study has identified that significant lead-lag relationship exists between Indian equity futures and cash markets, regulatory bodies and practitioners are interested to know whether such lead-lag relationship can be used to exploit potential arbitrage opportunities. Since, Vipul (2005b), Gupta and Singh (2007) and Gupta (2008) have found that significant arbitrage opportunities exists in the Indian capital market, therefore, the present study estimates equation (5) to examine the pattern and behavior of such opportunities by applying high frequency data. In equation (5), M_t = Difference between theoretical and actual futures price, α_0 = intercept term, β_j = coefficient of autoregressive terms decided on the basis of Schwartz Information Criterion, DTE = days to expiry of the contract, DAY*MOR = dummy for morning trading sessions as on different trading days, DAY*AFT = dummy for afternoon trading sessions as on different trading days and DAY*OTH = dummy for trading sessions other than morning and afternoon trading sessions. Morning trading session means any trading activity during 9.55 am to 11.00 am and afternoon trading session includes trading activity during 2.31 pm to 3.30 pm. In order to avoid the problem of multicollinearity, the present study instead of individual dummies for trading days of the week and trading sessions uses interactive dummies for trading session as on different trading days of the week.

$$M_t = \alpha_0 + \sum_{j=1}^{k} \beta_j M_{t-j} + \beta_k DTE + \sum_{m=1}^{4} \beta_m DAY*MOR + \sum_{n=1}^{5} \beta_n DAY*OTH + \sum_{o=1}^{5} \beta_o DAY*AFT + \varepsilon_t \quad \text{... (5)}$$

Mispricing in the present study means deviation between theoretical (equation (6)) and actual futures price series. In the present study, theoretical futures price is determined through cost-of-carry model, where $S_{t,T}$ = Theoretical (cost-of-carry) futures price of the underlying asset at time t with maturity date T, S_t = Current market price of the underlying asset, e = Exponential term with value 2.7183, r = Risk free borrowing and lending rate, i.e. 90 days T Bill rate in present case, d = Expected dividend yield, t = Current time period and T = Date of maturity.

$$S_{t,\,T} = S_t e^{(r-d)(T-t)} \quad \text{.....(6)}$$

Following Vipul (2005b), 90 days T Bill rate has been taken as discount rate for the period between the date of transaction and maturity date of contract and it has been collected from the official website of Reserve Bank of India (i.e. www.rbi.org.in). In addition, holding of equity stocks involve cash flows in terms of dividend, which is an important determinant of the price of a futures contract. Dividend payments are typically discrete events, which even in case of an index futures contract cannot be approximated with a continuous stream in the Indian equity market. The dividend payments tend to lump together during the second half of the calendar year as most of the companies have their book closing on 31st March. Moreover, since only the near month futures contracts have been studied, it is a fair assumption that the market would know the amount of dividend and its ex-dates with a priori certainty.

Dividend per share on fifty individual stocks under study and their ex dates have been checked with CAPITALINE DATABASE. The present value of dividend per share is included in equation (6) for the corresponding futures contracts, if the ex dividend day fell between the date of the transaction and the expiration day of the futures contract. Daily dividend yield for fifty individual stocks has been computed by using daily market capitalization through CAPITALINE DATABASE and in case of Nifty futures contracts, it has been collected from the official website of the National Stock Exchange of India (NSE).

Section III: Results and Analysis

Since the examination of price discovery and arbitrage efficiency is related to the information assimilation efficiency of the Indian equity futures and cash markets, therefore, prior to examining the relationship between two markets, it is imperative to investigate whether the price series under consideration are stationery. In table III, returns of both Indian equity futures and cash markets have been found stationary, whereas, price series of both markets were non-stationary at levels. Moreover, the joint dynamics of futures and cash markets i.e. "Basis" (difference between natural log of futures and cash prices) has been found stationary at levels. These empirical findings suggest that both markets are integrated of same order i.e. stable long-run relationship and strong comovement between both markets may exist; consequently, price convergence on maturity date will take place. These findings are consistent with (Fortenbery and Zapata (1997), Alexander (1999), Neuberger (1999), Sahadevan (2002), Lin et al., (2003), Kumar (2004), Pattarin and Ferretti (2004) and Crowder and Phengpis (2005)).

Absence of stationary and predictable basis may be a result of either immaturity of the market(s) and/or inappropriate regulatory framework (Fortenbery and Zapata (1997) and Kumar (2004)). Fama and French (1987) further argued that if mispricings are

governed by market factors only, then actual basis (i.e. $F_t - S_t$) should predict the theoretical basis (i.e. $S_{t,T} - S_t$) and if β is positive and significant in equation (7), it implies that variance of actual basis will help to correct the spot price deviation from its equilibrium price. In equation (7), $S_{t,T}$ = Theoretical futures price of the underlying asset at time t with maturity date T, S_t = Current market price of the underlying asset, α = Constant term, F_t = Current futures price, $\mu_{t,T}$ =Random error term.

$$S_{t,T} - S_t = \alpha + \beta (F_t - S_t) + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Therefore, finding stationary basis and both futures and cash price series stationary at first log difference (non stationary at levels) conforms to the presumptions of cointegration test procedure. Stationary basis also suggests that both markets are fairly competitive and during long-run, these efficiently discount the risk component of available information set(s).

In addition, table IV reports the Johansen Cointegration test (λ_{trace} and $\lambda_{\max}$) results and suggests that both markets are integrated of order one (except for BANKBARODA, GAIL, IPCL, MTNL, NTPC, ORIENTBANK), hence, price convergence on contract expiry date does take place, which implies that Indian equity futures and cash markets observe strong and stable long-run relationship and these findings are consistent with Thenmozhi (2002), Raju and Karande (2003), Gupta and Singh (2006a and 2006b), Sah and Kumar (2006), Thomas (2006) and Bose (2007). Absence of cointegration between futures and cash markets for six individual stocks may be a result of significantly low trading activity in either of the markets (Fortenbery and Zapata (1997) and Kumar (2004)).

Therefore, it can be concluded that Indian equity futures and cash markets are in long-run equilibrium, which implies that during long run, arbitrage mechanism in the Indian capital market may be efficient. In addition, stable long-run relationship between Indian equity futures and cash markets may be due to mean reverting nature of basis. Theoretically, it has been argued that in the presence of efficient cost-of-carry regime, Basis risk will be positively associated with time-to-expiry and it reverts to every information shock. Therefore, stationary basis is presumed to observe mean reverting behavior because when spread between two price series is different from cost-of-carry, arbitrageur's activity will correct such deviation and basis will restart matching with cost-of-carry of the respective futures contract (Zeng (2001), Theobald and Yallup (2001), Monoyios and Sarno (2002) and Pattarin and Ferretti (2004)).

Long-run relationship between Indian equity futures and cash markets provide important input for hedgers because widely followed hedging philosophy as suggested by Ederington (1979) presumes that for efficient hedging, there should be strong co-movement between two markets and hedgers should take Beta (β) weighted positions in futures market but inverse in sign. β in Minimum Variance Hedging philosophy will be a slope coefficient, computed as ratio of covariance of futures and cash price series to the variance of futures prices. Pennings and Meulenberg (1997) further stated that Ederington's efficient hedge ratio is expected to reduce the portfolio variance to minimum level but it may not help to achieve the portfolio objective if futures market observes thin trading, because thinly traded futures contract may not provide efficient hedging benefit in long-run, however, short-run hedge ratios may work efficiently

because nonetheless it will be Naïve hedge ratio (also see Theobald and Yallup (2001) and Lien (2003)).

Hasbrouck (1995) mentioned that existence of cointegration relationship between Indian equity futures and cash markets further suggest that both markets share same information set, thus, law of one price may hold in the long-run, which implies that there is no lead-lag relationship between two markets during long-run. However, Stoll and Whaley (1990) observed that presence of market frictions such as, infrequent trading of the underlying asset, significant difference in transaction cost of asset traded in futures and cash markets, short sale restrictions, etc. may be potential factors, which causes short-run deviations between two prices. Kim et al., (1999) further mentioned that due to significantly lower transaction cost in futures market, traders prefer to take early positions in the futures market and hedge their risk exposure in the cash market.

In the presence of efficient cost-of-carry regime, bidirectional causality between futures and cash markets is expected because current futures price at any time will be sum of current spot price and expected risk premium to hold such asset if trader is long in the cash market or opportunity cost if trader has taken short position in the cash market. Table V reports Granger Causality results, which suggests that significant bidirectional relationship (except for Nifty) exists between Indian equity futures and cash markets, however, there is unidirectional Granger Causality between Nifty and Nifty futures, where Nifty futures significantly granger cause Nifty at 10% significance level. However, the magnitude of F coefficients indicate that the Indian equity futures market strongly cause cash market. These findings are consistent with the findings of Kawaller et al., (1987), Ng (1987), Stoll and Whaley (1990), Chan (1992), Martikainen et al., (1995), Arshanapalli and Doukas (1997), Jong and Donders (1998), Pizzi et al., (1998), Booth et al., (1999), Min and Najand (1999), Tse (1999), Frino et al., (2000), Thenmozhi (2002), Covrig et al., (2004), Kenourgios (2004), Pattarin and Ferretti (2004), So and Tse (2004) and Zong et al., (2004) but are inconsistent with the findings of Wahab and Lashgari (1993), Chan and lien (2001), Chen et al., (2002), Lin et al., (2002), Lien et al., (2003), Lin et al., (2003), Mukherjee and Mishra (2006), Thomas (2006) and Gupta (2008).

In addition, the results of VAR methodology in table VI provide some important inputs for regulatory bodies as well as practitioners. Consistent with the granger causality results, significant information spillover has been identified between Indian equity futures and cash markets. Moreover, VAR results suggest that the Indian equity futures market significantly lead the Indian cash market where, Nifty futures lead Nifty by five minutes. However, the length of lead-lag relationship between individual stock futures and cash market varies in the range of five to fifty minutes. Out of fifty individual stocks considered in the study, twenty seven individual stock futures lead cash market by five to forty minutes. Whereas, fifteen individual stocks lead individual stock futures by five to fifty five minutes and no lead-lag relationship exists between eight individual stocks and their respective futures contracts. These findings are consistent with the findings of international literature, however, inconsistent with Indian literature (see table I).

In addition, the findings of VECM are consistent with the results of Granger Causality and VAR[11], which suggests that the Indian equity futures market dominates the price discovery process and the Indian cash market, operates as a satellite market for dissemination of an available information set. Moreover, VECM results suggest that both markets play equally important role in restoring market equilibrium as on the maturity date. Error correction terms in equations (4.1) and (4.2) suggest that in order to restore price equilibrium, there is upward movement in futures market and downward movement in cash market.

Once the present study has identified significant lead-lag relationship between Indian equity futures and cash markets, regulatory bodies and practitioners would be more interested to know whether, exploitable arbitrage opportunities are available? Since, Vipul (2005b) and Gupta (2008) have found that significant and exploitable arbitrage opportunities exist in the Indian capital market, therefore, the present study makes an attempt to examine the pattern and behavior of persistent risk free profit making opportunities.

The cost-of-carry model presumes that the magnitude of mispricings should be positively associated with the time to maturity of the contract because as soon as the contract approaches maturity date, the uncertainty regarding future cash flows reduces. Table VII reports the estimated results of equation (5), where the mispricings of Nifty are insignificantly associated with days to expiry (DTE), which implies that the amount of mispricings does not depend upon the period to maturity. These findings are contrary to Cornell and French (1983a and 1983b) but are consistent with Yadav and Pope (1990).

However, DTE significantly predicts mispricings of individual stock futures contracts. DTE is significantly negative for individual stock futures contracts (except for ABB, HCLTECH, ICICIBANK, JETAIRWAYS and MTNL), which implies that near to maturity date more arbitrage opportunities in the Indian equity futures market are available. These findings are inconsistent with the findings of Cornell and French (1983a and 1983b), Mackinlay and Ramaswamy (1988), Antoniou and Holmes (1995), Neal (1996), Stoll and Whaley (1997), Chow et al., (2003), Lien and Yang (2003), Vipul (2005a and 2005b) and Roll et al., (2007).

Negative association between days to expiry and the amount of mispricings may be because of the trading restrictions imposed by exchange authorities and SEBI on various market participants[12]. Therefore, these traders might be preferring either to

[11] Since the results of VECM are similar to the results of VAR, therefore, the current study in order to save space does not report the results of VECM, however, these are available on demand.

[12] For instance; in India, the trading member's position limits in equity index futures contracts shall be higher of Rs. 500 crores or 15% of the total open interest level in equity index futures contracts. In addition, for individual stocks having applicable market-wise position limit (MWPL) of Rs. 500 crores or more, the combined futures and options position limit for trading members shall be 20% of applicable MWPL or Rs. 300 crores, whichever is lower and out of which the stock futures position(s) cannot exceed 10% of the applicable MWPL or Rs. 150 crores, whichever is lower. In case of the individual stocks having applicable MWPL less than Rs. 500 crores, the combined futures and options position limit would be 20% of applicable MWPL and futures position cannot exceed 20% of applicable MWPL or Rs. 50 crore whichever is lower. Furthermore, the client wise gross open position limits across all the derivative contracts on an underlying, should not exceed 1% of the free float market capitalization (in terms of

unwind or roll over their positions before the maturity date. These findings are consistent with the findings of Brennan and Schwartz (1990), Yadav and Pope (1990) and Neal (1996). Brennan and Schwartz (1990) suggested that an early unwinding of arbitrage positions has trading value because early liquidation of arbitrage positions not only make the money available to arbitrageurs but it also enables them to take new positions, which otherwise may not be possible if arbitrageurs are unwinding their positions on the maturity date.

Furthermore, results in table VII suggests that three trading sessions as on Friday observes maximum amount of mispricings as compared to that during other trading sessions over different trading days of the week. These findings are obvious because in India, futures contracts expire on the last Thursday of the month and last Friday of the month becomes the first trading day for any futures contract. Friday being first trading day of the month has to discount maximum risk component emerging out of the uncertainties regarding future cash flows, therefore, presence of information asymmetry is bound to offer maximum arbitrage opportunities. In addition, dummies for other and afternoon trading sessions of Wednesday have been found to be significantly negative, which further support the argument that days to maturity plays key role in efficient price discovery in the Indian equity futures market. Moreover, mispricings are found to be significantly autoregressive for higher order and the significant autoregressive coefficients are observed to be declining, which implies that Basis conforms to the asymptotic property of financial time series[13].

In addition to reporting the seasonal behavior of mispricings in the Indian equity futures contracts, table VII provides another important information that except for NIFTY, mispricings for individual stock futures contracts persist over the contract cycle because when, equation (5) was estimated through Ordinary Least Square (OLS) procedure, the variance of error term was found to be time varying (except for Nifty), therefore, equation (5) has been estimated through GARCH (1,1) assuming 't' distribution. Moreover, table VII reports presence of volatility clustering in the mispriced series because the sum of ARCH and GARCH terms is approximately equal to 1.

Section IV: Conclusion

Present study examines the price discovery and arbitrage efficiency of Indian equity futures and cash markets. Study finds strong and stable long-run comovement between two markets, which suggests that both markets observe long-run price equilibrium, hence, on maturity date price convergence does take place. However, during short-run, significant violations of equilibrium relationship have been observed, which implies that significant volatility spillover from one market to other takes place. Granger Causality results further suggest that Indian equity futures market dominates the information assimilation process in the Indian capital market. Therefore, in the present study, though feedback relationship has been identified, which implies that price

number of shares) or 5% of the open interest in all derivative contracts in the same underlying stock (in terms of number of shares), whichever is higher (For details, see F&O segment in www.nseindia.com).

[13] In order to save space, in table VII, since the sign of autoregressive terms do not change, therefore, only the significant order of autoregression has been reported. However, detailed results are available on demand.

discovery takes place in both markets but Indian equity futures market has been found to be strongly causing the Indian cash market.

In addition, it has been found that both markets observe significant lead-lag relationship whose duration varies in the range of five to fifty five minutes. VECM results further suggest that both markets play equally important role in restoring market equilibrium on the maturity date. Moreover, mispricings have been found to be significantly sensitive to the days to maturity. However, contrary to the existing literature, present study finds that mispricings are negatively associated with days to expiry, which supports the argument that traders instead of unwinding their positions on the maturity date, either exercise early liquidation option or rollover their position to the next contract cycle.

Moreover, present study finds that Friday offers maximum number of arbitrage opportunities, which may draw its explanation from the fact that in India, futures contracts expire on the last Thursday of the month and Friday being the first day of the contract month has to discount maximum amount of uncertainties with regard to the future cash flows. However, Wednesday being the last trading day before settlement on last Thursday of the month observes minimum number of arbitrage opportunities.

In India, exploitable arbitrage opportunities may be persistent because of the lack of competitiveness in the Indian capital market. For instance; nonetheless, Securities and Exchange Board of India (SEBI) has permitted Futures and Options trading on two stock exchanges in India i.e. Bombay Stock Exchange of India (BSE) and National Stock Exchange of India (NSE) but virtually, NSE account for 99% trading activity in the Futures and Options segment in India. In addition, SEBI has restricted the total exposure of institutional traders in the market, which has allowed retail traders to dominate the market who base their decision on firm-specific or insider information, which is often little stale or late. Therefore, present study suggests that increase in market competitiveness may help to improve price discovery efficiency.

In addition, futures and options trading has been permitted for more than 250 individual equity stocks, however, less than 10% of these are sufficiently liquid. Therefore, stock exchange authorities are suggested to make the eligibility norms more stringent so that only quality (fundamentally strong) stocks qualify for trading in futures and options segment. This is expected to help to improve the hedging efficiency of the Indian equity futures market.

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Table I Empirical Evidences on Cointegration, Causal and Lead-Lag Relationship Between Cash and Futures Markets						
Author (Year of Study)	**Market Understudy**	**Symbol of Stock(s)/Index(ices) Understudy**	**Sample Period**	**Long-Run Relationship**	**Information Transmission**	**Leading Market**
Kofi (1973)	U.S.A.	Wheat and Maine Potato Futures and Spot Markets	Jan. 1953-Dec. 1969	Yes	N.E.	Futures Market Leads Cash Market
Cox (1976)	U.S.A.	Onion, Maine Potatoes, Pork Bellies, Hogs, Cattle and Frozen Concentrated Orange Juice Futures and Spot Markets	Sept. 1942 to Oct. 1959, Dec. 1941 to July 1971, Sept. 1961 to Sept. 1971, Feb. 1966 to May 1970, Nov. 1964 to July 1971 and Oct. 1966 to Aug. 1971	Yes	N.E.	Futures Market Leads Cash Market
Protopapadakis and Stoll (1983)	U.S.A.	Silver, Copper, Tin, Lead, Zinc, Coffee, Sugar, Soybean Meal, wheat, Rubber and Futures and Cash Markets	1972 to 1980	Yes	Bidirectional	N.E.
French (1986)	U.S.A.	21 Commodity Futures and Spot Markets	Jan. 1965 to Dec. 1984	N.E.	N.E.	Futures Market Leads Spot Market
Kawaller et al., (1987)	U.S.A.	S&P500 Futures and S&P500 Index	Jan. 1984- Dec. 1985	Yes	N.E.	Futures Market Leads Cash Market
Ng (1987)	U.S.A.	Value Line Futures and Value Line Index, S&P500 Futures and S&P500 Index, BP, DM, SF, CD and JY	Jan. 1981 to Dec. 1985, Apr. 1982 to Dec. 1986 and Jan. 1983 to Dec. 1986	N.E.	Futures Market Causes Cash Market Not Vice Versa	Futures Market Leads Cash Market
Stoll and Whaley (1990)	U.S.A.	S&P500 Futures and S&P500 Index MMI Futures and MMI Index	April 1982 to March 1987 and July 1984 to March 1987	Yes	Bidirectional	Futures Market Leads Cash Market
Lai and Lai (1991)	U.S.A, U.K., Germany, France, Canada and Japan	USD, BP, DM, SF, CD and JY	July 1973 to Dec. 1989	Yes	N.E.	N.E.
Chan (1992)	U.S.A.	S&P500 Futures and S&P500 Index MMI Futures and MMI Index and 20 Stock Futures	Aug. 1984 to June 1985 and Jan. 1987 to Sept. 1987	N.E.	Bidirectional	Futures Market Leads Cash Market
Wahab and Lashgari (1993)	U.K. and U.S.A.	FTSE100- FTSE100 Futures and S&P500-S&P500 Futures	Jan. 1988 to May 1992	Yes	Bidirectional	Cash Market Leads Futures Market
Martikainen et al., (1995)	Finland	RCAS, RFUT and 22 Individual Stock and Futures Contracts on Same Stocks	Jan. 1989 to Dec. 1990	Yes	Bidirectional	Futures Market Leads Cash Market
Tse (1995)	Japanese	NSA Futures and NSA Index	Dec. 1988 to Apr. 1993	Yes	N.E.	Futures Market Leads Cash Market
Arshanapalli and Doukas (1997)	U.S.A.	S&P500 Futures and S&P500 Index	Oct. 1987 only	Yes	Bidirectional	Futures Market Leads Cash Market
Fortenbery and Zapata (1997)	U.S.A	NCE	June 1993 to July 1995	No	N.E.	None

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Author (Year of Study)	Market Understudy	Symbol of Stock(s)/Index(ices) Understudy	Sample Period	Long-Run Relationship	Information Transmission	Leading Market
Abhyankar (1998)	U.K.	FTSE100- FTSE100 Futures	Jan. 1992 to Dec. 1992	Yes	Bidirectional	Futures Market Leads Cash Market but after incorporating the nonlinear components in the model no lead lag was observed
Chatrath and Song (1998)	U.S.A.	JY Futures and JY	Jan. 1992 to Dec. 1995	N.E.	Bidirectional	Futures Market Leads Cash Market
Chow (1998)	U.S.A.	Gold, Silver, Palladium and Platinum Futures and Spot Markets	Jan. 1975 to Sept. 1997, Jan. 1970 to Sept. 1997, Mar. 1977 to Sept. 1997 and Jan. 1970 to July 1997	Traditional Methodology may not find cointegration but the model applied in paper observes cointegration	N.E.	N.E.
Jong and Donders (1998)	Europe	AEX Index Futures, AEX Index Options and AEX Index	Jan. to July 1992 and Jan. to June 1993	N.E.	Futures to Options and Cash. Bidirectional for Options and Cash	Futures Leads Options and Cash. No lead lag between options and cash
Lien and Tse(1998)	Singapore	Nikkei Futures	Jan. 1989 to Aug. 1996	Yes	Futures causes cash market	Futures Market Leads Cash Market
Pizzi et al., (1998)	U.S.A.	S&P500 and S&P500 Futures	Jan. 1987 to Mar. 1987	Yes	Bidirectional	Futures Market Leads Cash Market
Booth et al., (1999)	Germany	FDAX, ODAX and DAX	Jan. 1992 to Dec. 1994	Yes	Futures to Options and Cash. Bidirectional for Options and Cash	Futures Leads Options and Cash. No lead lag between options and cash
Kavussanos and Nomikos (1999)	U.K.	BIFFEX and BPI	July 1988 to April 1997	Yes	Bidirectional but Stronger from Futures to Cash Market than vice versa	Futures Market Leads Cash Market
Min and Najand (1999)	Korea	KOSPI200 Futures and KOSPI200 Index	May 1996 to Oct. 1996	Yes	Bidirectional	Futures Market Leads Cash Market
Tse (1999)	U.S.A.	DJIA Futures and DJIA Index	Nov. 1997 to April 1998	Yes	Bidirectional	Futures Market Leads Cash Market
Frino et al., (2000)	Australia	AOI and SPI	Aug. 1995 to Dec. 1996	Yes	Bidirectional	Futures Market Leads Cash Market
Chan and Lien (2001)	U.S.A.	Feeder Cattle and Live/Lean Hog Futures and Spot Markets	Sept. 1977 to Dec. 1998	Yes	Bidirectional	Cash Market Leads Futures Market
Theobald and Yallup (2001)	U.K.	FTSE100 Futures and FTSE100 Index	Jan. 1999 to Dec. 1999	Yes	Bidirectional	Futures Market Leads Cash Market
Chen et al., (2002)	Taiwan	TAIFEXTAIEX- TAIEX and SGXMSCI[b]-MSCI[b]	July 1998 to July 2000	Yes	Bidirectional	SGXMSCI[b] leads both TAIFEXTAIEX-TAIEX
Monoyios and Sarno (2002)	U.S.A. and U.K.	S&P 500 and FTSE 100 Futures	Jan. 1988 to Dec. 1998	Yes	Bidirectional	Futures Market Leads Cash Market
Sahadevan (2002)	India	Pepper, Cotton, Castro seed, Castor Oil, Mustard Seed and Gur Futures and Spot Markets	Jan 1999 to Aug. 2001	No	No	None
Tan (2002)	Malaysia	MSCI[a] and KLFI	Jan. 1996 to Sept. 2000	Yes	Bidirectional	Futures Market Leads Cash Market

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Author (Year of Study)	Market Understudy	Symbol of Stock(s)/Index(ices) Understudy	Sample Period	Long-Run Relationship	Information Transmission	Leading Market
Thenmozhi (2002)	India	Nifty Futures and Nifty Index	June 2000 to July 2002	N.E.	Futures to Cash Market	Futures Market Leads Cash Market
Babu and Bhole (2003)	India	Nifty Futures and Nifty Index	June 2000 to Sept 2003	Yes	Bidirectional	Futures Market Leads Cash Market
Beaulieu et al., (2003)	Canada	TSE35 Index Futures and TSE35 Index	Aug. 1991 to Oct. 1991	Yes	N.E.	Futures Market Leads Cash Market
Kavussanos and Nomikos (2003)	U.K.	BIFFEX and BPI	Aug. 1988 to April 1998	Yes	Bidirectional but Stronger from Futures to Cash Market than vice versa	Futures Market Leads Cash Market
Lien et al., (2003)	Singapore	Nikkei 225 Futures and Cash Markets	Sept. 1995 to Dec. 1999	Yes	Bidirectional	Cash Market Leads Futures Market
Lin et al., (2003)	Taiwan	TAIFEXTAIEX and TAIEX	Jan. 1999 to Mar. 2000	No	Bidirectional	Cash Market Leads Futures Market
Raju and Karande (2003)	India	Nifty Futures and Nifty Index	June 2000 to Oct. 2002	Yes	N.E.	No Significant Lead-Lag Relationship
Soydemir and Petrie (2003)	U.S.A.	DJIA Futures and DJIA Index	March 1999 to Aug. 1999	Yes	Bidirectional	Futures Market Leads Cash Market
Chan et al., (2004)	Taiwan	TAIFEX, Mini-TAIEX, TE and TBI	Oct. 2001 to Mar. 2002	Yes	Bidirectional	Futures Market Leads Cash Market
Covrig et al., (2004)	Japan and Singapore	Nikkei 225 Futures and Nikkei 225 Index	Mar. 2000 to June 2000	Yes	Bidirectional	Futures Market Leads Cash Market
Kavussanos et al., (2004)	U.K.	BIFFEX and BPI	Jan. 1996 to Dec. 2000	Yes	Bidirectional but Stronger from Futures to Cash Market than vice versa	Futures Market Leads Cash Market
Kenourgios (2004)	Athens	FTSE/ASE-20 Futures and FTSE/ASE-20 Index	Aug. 1999 to June 2002	Yes	Bidirectional	Futures Market Leads Cash Market
Pattarin and Ferretti (2004)	Italy	Mib30 and Fib30	Nov. 1994 to Sept. 2002	Yes	Bidirectional	Futures Market Leads Cash Market
Ryoo and Smith (2004)	Korea	KOSPI200	Sept. 1993 to Dec. 1998	Yes	Bidirectional	Futures Market Leads Cash Market
So and Tse (2004)	Hong Kong	HIS, HSIF and TF	Nov. 1999 to June 2002	Yes	N.E.	Futures Market Leads Cash Market
Zong et al., (2004)	Mexico	IPC Index Futures and IPC Index	April 1999 to July 2002	Yes	Bidirectional	Futures Market Leads Cash Market
Hasan (2005)	U.K. and U.S.A.	FTSE100- FTSE100 Futures and S&P500-S&P500 Futures	Jan. 1985-Dec. 1993 and Jan. 1983- Dec. 1993	Yes	Bidirectional	None
Gupta and Singh (2006a)	India	Nifty Futures and Nifty Cash	June 2000 to Feb. 2005	Yes	Bidirectional	No Lead Lag Relationship
Gupta and Singh (2006c)	India	Nifty Futures and Nifty Index	June 2000 to Dec. 2005	Yes	Bidirectional	No Lead Lag during full Sample period but futures market significantly leads cash market during High Volatility Period.

Contd….

Author (Year of Study)	Market Understudy	Symbol of Stock(s)/Index(ices) Understudy	Sample Period	Long-Run Relationship	Information Transmission	Leading Market
Gupta and Singh (2006d)	India	Nifty and 24 Stock Futures	June 2000 to July 2005	Yes	Bidirectional	No Lead Lag for Nifty futures but significant lead lag relationship exists in case of stock futures.
In and Kim (2006)	U.S.A.	S&P500 Futures and S&P500 Index	April 1982 to Dec. 2001	Yes	Bidirectional	None
Mukherjee and Mishra (2006)	India	NIFTY and 5 Stock Futures	April to Sept. 2004	Yes	Bidirectional	Cash Market Leads Futures Market
Sah and Kumar (2006)	India	Nifty Futures and Nifty Index	June 2000 to March 2005	Yes	Bidirectional	Cash Market Leads Futures Market
Thomas (2006)	India	Nifty Futures and Nifty Index	June 2000 to April 2005	Yes	Bidirectional	Cash Market Leads Futures Market
Bhatia (2007)	India	Nifty Futures and Nifty Index	April 2005 to March 2006	Yes	Bidirectional	Futures Market Leads Cash Market
Bose (2007)	India	Nifty Futures and Nifty Index	March 2002 to Sept. 2006	Yes	Nifty Futures Causes Nifty	Futures Market Leads Cash Market
Floros and Vougas (2007)	Greece	FTSE/ASE20 and FTSE/ASE Mid40 at ADEX	Aug. 1999-Aug. 2001 and Jan 2000 to Aug. 2001	Yes	N.E.	Futures Market Leads Cash Market
Gupta (2008)	India	Nifty Futures and 84 Individual Stocks	Jan. 2003 to Dec. 2006	Yes	Bidirectional	Cash Market Leads Futures Market

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, **DAX**= Deutscher Aktienindex Index, **DJIA**= Dow Jones Industrial Average Index, **DM**=Deutsche Mark, **FDAX**= Deutscher Aktienindex Index Futures, **HIS**= Hang Seng Index, **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**[a]= Malaysian Stock Composite Index, **MSCI**[b]= 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, **TE**= TSE Electronic Sector Index Futures, **TF**= Tracker Fund, Wisconsin, **U.K.**= United Kingdom, **U.S.A.**= Unites States of America, **USD**= U.S. Dollar.

Source: Compiled from various studies

Table II Empirical Evidences on Pricing Efficiency of Futures Markets				
Author (Year of Study)	**Country Understudy**	**Market Understudy**	**Period Understudy**	**Mispricings**
Cornell and Reinganum (1981)	U.S.A	IMM	1974-1979	No
Cornell and French (1983a)	U.S.A	NYSE and S&P500	June 1982-Sept. 1982	Yes
Figlewski (1984)	U.S.A	S&P500	1982-1983	No
Cornell (1985)	U.S.A	S&P500	1982-1983	No
Klemkosky amd Lasser (1985)	U.S.A	T-Bond Futures	1978-1981	Yes
Arditti et al., (1986)	U.S.A	S&P500	1982-1984	Yes
Merrick Jr. (1987)	U.S.A	NYSE and S&P500	1982-1986	Yes
Mackinlay and Ramaswamy (1988)	U.S.A	S&P500	1982-1987	Yes
Bhatt and Cakici (1990)	U.S.A	S&P500	1982-1987	Yes
Diagler (1990)	U.S.A	S&P500 and MMI	1987-1988	No
Stulz et al., (1990)	Switzerland	OTC Market	Jan. 1989- Oct. 1989	No
Yadav and Pope (1990)	U.K.	FTSE-100	1984-1988	Yes
Yau et al., (1990)	Hong Kong	HSI	1986-1988	Yes
Chung (1991)	U.S.A	MMI	1984-1986	Yes
Klemkosky and Lee (1991)	U.S.A	S&P500	1983-1987	Yes
Puttonen and Martikainen (1991)	Finnish	FOX	1988-1990	Yes
Twite (1991)	Australia	AOI	1983-1988	Yes
Lim (1992)	Japan	Nikkei and Simex	1988-1989	No
Twite (1992)	Australia	SPI	1983-1988	Yes
Yadav and Pope (1992)	U.K.	FTSE100	1986-1990	Yes
Neal (1996)	America	S&P500	1989	Yes
Brailsford and Hodgson (1997)	Australia	AOI and SPI	1989-1993	Yes
Brailsford and Cusack (1997)	Australia	SPI	1994-1995	Yes
Bae et al., (1998)	Hong Kong	HIS	1993-1994	No
Akin (2003)	America	11 commodity contracts traded on CME	1982-2000	Yes
Lee (2005b)	Korea	KOSPI	1996-2001	Yes
Vipul (2005b)	India	NIFTY, ACC, INFOSYS, RIL, SATYAM, TELCO, TISCO	2002-2004	Yes
Gupta and Singh (2007)	India	Nifty	July 2000 to Dec. 2005	Yes
Roll et al., (2007)	America	S&P500	1988-2002	Yes
Gupta (2008)	India	Nifty and 84 Individual Stocks	Jan. 2003 to Dec. 2006	Yes
Source: Compiled from various studies.				

Table III Unit Root Test Results

Symbols	Variables	Augmented Dickey Fuller Test		Philips Perron Test	
		Without Drift	With Drift and Trend	Without Drift	With Drift and Trend
NIFTY	DFUTURES	-102.80*	-102.85*	-273.99*	-274.01*
	DCASH	-269.36*	-269.36*	-269.31*	-269.31*
	BASIS	-23.04*	-23.04*	-26.01*	-26.01*
ABB	DFUTURES	-80.30*	-80.33*	-202.57*	-202.65*
	DCASH	-139.85*	-139.88*	-209.75*	-209.80*
	BASIS	-8.15*	-8.35*	-50.62*	-52.89*
ACC	DFUTURES	-127.46*	-127.49*	-286.27*	-286.32*
	DCASH	-137.39*	-137.42*	-340.82*	-341.00*
	BASIS	-9.88*	-10.27*	-164.18*	-174.46*
ANDHRABANK	DFUTURES	-81.93*	-81.93*	-275.17*	-275.17*
	DCASH	-107.09*	-107.10*	-284.90*	-284.90*
	BASIS	-13.41*	-13.93*	-108.68*	-115.93*
ARVINDMILL	DFUTURES	-66.83*	-66.87*	-272.99*	-273.03*
	DCASH	-109.42*	-109.44*	-291.37*	-291.54*
	BASIS	-10.24*	-14.08*	-192.66*	-272.96*
ASHOKLEY	DFUTURES	-43.57*	-43.59*	-207.60*	-207.60*
	DCASH	-51.13*	-51.15*	-213.28*	213.30*
	BASIS	-8.28*	-8.93*	-54.66*	-58.59*
BAJAJAUTO	DFUTURES	-203.98*	-204.01*	-304.61*	-304.72*
	DCASH	-159.82*	-159.85*	-311.81*	-312.00*
	BASIS	-9.91*	-10.02*	-82.58*	-84.33*
BANKBARODA	DFUTURES	-122.37*	-122.37*	-277.44*	-277.44*
	DCASH	-122.72*	-122.72*	-278.51*	-278.51*
	BASIS	-9.96*	-10.35*	-92.11*	-95.68*
BANKINDIA	DFUTURES	-123.23*	-123.24*	-272.49*	-272.49*
	DCASH	-111.12*	-111.12*	-293.26*	-293.28*
	BASIS	-11.52*	-12.14*	-177.90*	-192.19*
BEL	DFUTURES	-203.01*	-203.03*	-281.35*	-281.43*
	DCASH	-165.48*	-165.51*	-308.09*	-308.29*
	BASIS	-11.31*	-13.09*	-197.00*	-227.32*
BHEL	DFUTURES	-78.16*	-78.22*	-285.32*	-285.41*
	DCASH	-305.42*	-305.45*	-306.22*	-306.51*
	BASIS	-13.79*	-13.98*	-160.71*	-163.63*
BPCL	DFUTURES	-202.81*	-202.82*	-290.65*	-290.67*
	DCASH	-135.47*	-135.48*	-315.33*	-315.37*
	BASIS	-10.91*	-11.25*	-98.47*	-103.86*
CANBK	DFUTURES	-96.02*	-96.02*	-269.84*	-269.84*
	DCASH	-119.64*	-119.64*	-279.30*	-279.30*
	BASIS	-10.92*	-11.05*	-103.86*	-106.46*
CENTURYTEX	DFUTURES	-69.02*	-69.02*	-195.37*	-195.37*
	DCASH	-69.92*	-69.92*	-202.88*	-202.88*
	BASIS	-6.60*	-10.77*	-124.12*	-199.70*
COLGATE	DFUTURES	-72.83*	-72.85*	-206.59*	-206.62*
	DCASH	-85.62*	-85.64*	-224.72*	-224.85*
	BASIS	-8.67*	-9.59*	-127.74*	-142.28*
CUMMINSIND	DFUTURES	-195.92*	-195.92*	-195.22*	-195.25*
	DCASH	-69.02*	-69.03*	-208.89*	-208.90*
	BASIS	-6.84*	-9.34*	-142.50*	-186.48*
DIVISLAB	DFUTURES	-136.93*	-136.95*	-193.48*	-193.49*
	DCASH	-133.98*	-134.00*	-197.76*	-197.80*
	BASIS	-7.54*	-10.82*	-106.41*	-147.98*
ESCORTS	DFUTURES	-58.30*	-58.30*	-195.52*	-195.51*
	DCASH	-75.94*	-75.94*	-198.13*	-198.12*
	BASIS	-7.63*	-18.65*	-90.06*	-148.19*

Contd….

Symbols	Variables	Augmented Dickey Fuller Test		Philips Perron Test	
		Without Drift	With Drift and Trend	Without Drift	With Drift and Trend
ESSAROIL	DFUTURES	-199.30*	-199.30*	-198.59*	-198.59*
	DCASH	-79.10*	-79.10*	-201.51*	-201.51*
	BASIS	-7.61*	-12.95*	-172.57*	-253.40*
GAIL	DFUTURES	-40.38*	-40.39*	-260.41*	-260.41*
	DCASH	-39.97*	-39.98*	-277.18*	-277.18*
	BASIS	-9.14*	-10.62*	-42.83*	-55.33*
GNFC	DFUTURES	-104.43*	-104.44*	-201.03*	-201.04*
	DCASH	-89.87*	-89.88*	-208.75*	-208.76*
	BASIS	-8.05*	-8.74*	-52.47*	-60.92*
GRASIM	DFUTURES	-129.06*	-129.10*	-282.12*	-282.19*
	DCASH	-202.49*	-202.53*	-306.74*	-306.88*
	BASIS	-12.31*	-12.66*	-153.67*	-160.35*
HCLTECH	DFUTURES	-92.98*	-92.99*	-286.46*	-286.52*
	DCASH	-280.40*	-280.41*	-280.62*	-280.65*
	BASIS	-13.93*	-15.27*	-142.15*	-157.07*
HEROHONDA	DFUTURES	-134.61*	-204.46*	-301.67*	-301.64*
	DCASH	-216.93*	-216.95*	-325.15*	-325.12*
	BASIS	-9.26*	-9.63*	-54.29*	-58.23*
HINDUNILVR	DFUTURES	-204.32*	-204.32*	-295.08*	-295.08*
	DCASH	-216.59*	-216.59*	-320.14*	-320.14*
	BASIS	-8.82*	-8.83*	-56.42*	-57.15*
HINDPETRO	DFUTURES	-155.98*	-155.90*	-291.08*	-291.08*
	DCASH	-206.89*	-206.89*	-307.12*	-307.22*
	BASIS	-9.42*	-9.46*	-93.84*	-94.62*
ICICIBANK	DFUTURES	-200.91*	-200.93*	-294.56*	-294.62*
	DCASH	-210.61*	-210.63*	-321.76*	-321.93*
	BASIS	-11.37*	-12.33*	-65.69*	-75.82*
IDBI	DFUTURES	-70.85*	-70.85*	-204.59*	-204.59*
	DCASH	-105.84*	-105.84*	-208.12*	-208.11*
	BASIS	-8.01*	-9.76*	-104.70*	-138.72*
IDFC	DFUTURES	-179.86*	-179.85*	-179.43*	-179.42*
	DCASH	-128.08*	-128.07*	-190.44*	-190.43*
	BASIS	-6.93*	-7.17*	-61.69*	-65.29*
IPCL	DFUTURES	-94.33*	-94.35*	-284.65*	-284.65*
	DCASH	-85.97*	-85.99*	-297.36*	-297.36*
	BASIS	-8.02*	-8.39*	-74.92*	-81.33*
JETAIRWAYS	DFUTURES	-211.63*	-211.63*	-210.52*	-210.52*
	DCASH	-95.65*	-95.66*	-229.02*	-229.04*
	BASIS	-13.01*	-13.21*	-74.78*	-76.20*
KTKBANK	DFUTURES	-109.69*	-109.70*	-198.34*	-198.34*
	DCASH	-198.51*	-198.52*	-198.53*	-198.63*
	BASIS	-5.18*	-5.35*	-54.14*	-57.77*
MARUTI	FUTURES	-110.82*	-110.85*	-286.72*	-286.77*
	CASH	-114.30*	-114.33*	-319.90*	-319.89*
	BASIS	-14.48*	-15.07*	-209.06*	-219.31*
MATRIXLABS	FUTURES	-70.77*	-70.78*	-199.58*	-199.59*
	CASH	-107.28*	-107.29*	-206.55*	-206.56*
	BASIS	-5.40*	-5.57*	-11.02*	-11.99*
MTNL	FUTURES	-131.22*	-131.22*	-285.53*	-285.53*
	CASH	-204.45*	-204.45*	-308.24*	-308.24*
	BASIS	-10.86*	-11.42*	-124.10*	-134.18*

Contd….

Symbols	Variables	Augmented Dickey Fuller Test		Philips Perron Test	
		Without Drift	With Drift and Trend	Without Drift	With Drift and Trend
NATIONALUM	DFUTURES	-205.53*	-205.54*	-306.69*	-306.72*
	DCASH	-206.62*	-206.63*	-307.17*	-307.22*
	BASIS	-8.61*	-10.53*	-49.59*	-70.31*
NDTV	DFUTURES	-203.60*	-203.60*	-202.81*	-202.81*
	DCASH	-193.00*	-193.00*	-192.44*	-192.43*
	BASIS	-6.82*	-12.08*	-137.48*	-227.59*
NTPC	DFUTURES	-44.16*	-44.19*	-244.39*	-244.52*
	DCASH	-68.93*	-68.94*	-257.40*	-257.42*
	BASIS	-11.40*	-15.15*	-148.66*	-170.99*
ORIENTBANK	DFUTURES	-121.59*	-121.59*	-272.67*	-272.67*
	DCASH	-106.37*	-106.37*	-278.07*	-278.08*
	BASIS	-10.54*	-10.74*	-100.50*	-103.73*
PNB	DFUTURES	-82.03*	-82.04*	-274.18*	-274.20*
	DCASH	-123.21*	-123.22*	-282.55*	-282.56*
	BASIS	-7.80*	-8.02*	-44.83*	-46.79*
POLARIS	DFUTURES	-103.67*	-103.67*	-296.75*	-296.75*
	DCASH	-128.41*	-128.41*	-299.03*	-299.03*
	BASIS	-8.45*	-11.71*	-168.80*	-262.88*
RELCAPITAL	DFUTURES	-102.26*	-102.28*	-195.20*	-195.21*
	DCASH	-90.20*	-90.23*	-213.62*	-213.70*
	BASIS	-6.99*	-11.84*	-132.90*	-227.49*
RELIANCE	DFUTURES	-126.47*	-126.49*	-278.50*	-278.55*
	DCASH	-124.29*	-124.32*	-362.86*	-363.05*
	BASIS	-9.47*	-11.24*	-205.79*	-251.34*
SBIN	DFUTURES	-128.83*	-128.85*	-295.09*	-295.14*
	DCASH	-108.01*	-108.03*	-342.49*	-342.65*
	BASIS	-10.38*	-12.09*	-172.74*	-216.62*
SRF	DFUTURES	-65.18*	-65.23*	-195.72*	-195.73*
	DCASH	-68.57*	-68.62*	-195.23*	-195.24*
	BASIS	-6.83*	-8.07*	-89.41*	-116.14*
SYNDIBANK	DFUTURES	-120.78*	-120.79*	-280.66*	-280.68*
	DCASH	-89.60*	-89.62*	-288.46*	-288.47*
	BASIS	-10.20*	-10.49*	-114.61*	-117.27*
TATACHEM	DFUTURES	-206.16*	-206.16*	-207.02*	-207.10*
	DCASH	-140.92*	-140.93*	-212.14*	-212.24*
	BASIS	-5.84*	-5.89*	-11.62*	-11.93*
TATAMOTORS	DFUTURES	-111.64*	-111.64*	-253.47*	-253.46*
	DCASH	-118.00*	-118.00*	-285.31*	-285.31*
	BASIS	-9.36*	-9.36*	-108.96*	-109.06*
TATAPOWER	DFUTURES	-129.91*	-129.93*	-295.20*	-295.25*
	DCASH	-104.80*	-104.83*	-309.41*	-309.48*
	BASIS	-13.39*	-14.63*	-72.16*	-81.73*
TITAN	DFUTURES	-127.76*	-127.79*	-190.30*	-190.32*
	DCASH	-70.28*	-70.32*	-207.56*	-207.61*
	BASIS	-8.45*	-11.60*	-103.39*	-144.15*
UNIONBANK	DFUTURES	-123.18*	-123.19*	-273.23*	-273.24*
	DCASH	-125.57*	-125.58*	-294.36*	-294.39*
	BASIS	-11.78*	-13.10*	-148.13*	-156.90*

* Significant at 1% level of significance, ** Significant at 5% level of significance and *** Significant at 10% level of significance.

Table IV Cointegration Test Results of Indian Equity Futures and Cash Markets

Symbol	Hypothesized No. of CE(s)	Eigen Value	Trace Test		Maximum Eigenvalue Test	
			Test Statistics	P Value	Test Statistics	P Value
NIFTY	**None**	0.0075	**529.2203**	**0.0000**	**523.8858**	**0.0001**
	At Most 1	7.70E-05	5.3344	0.5491	5.3344	0.5491
ABB	**None**	0.0036	**124.4350**	**0.0000**	**118.6033**	**0.0001**
	At Most 1	0.0002	5.8317	0.4820	5.8317	0.4820
ACC	**None**	0.0019	**133.4790**	**0.0001**	**132.6467**	**0.0001**
	At Most 1	1.21E-05	0.8323	0.3616	0.8323	0.3616
ANDHRABANK	**None**	0.0030	**189.4902**	**0.0001**	**186.2266**	**0.0001**
	At Most 1	5.31E-65	3.2636	0.8438	3.2636	0.3438
ARVINDMILL	**None**	0.0044	**269.1699**	**0.0000**	**264.3801**	**0.0001**
	At Most 1	7.96E-05	4.7898	0.6268	4.7898	0.6268
ASHOKLEY	**None**	0.0022	**80.0827**	**0.0000**	**72.5274**	**0.0000**
	At Most 1	0.0002	7.5552	0.2902	7.5552	0.2902
BAJAJAUTO	**None**	0.0017	**117.7408**	**0.0000**	**114.5975**	**0.0001**
	At Most 1	4.59E-05	3.1433	0.8590	3.1433	0.8590
BANKBARODA	**None**	0.0027	**176.8494**	**0.0000**	**165.5671**	**0.0001**
	At Most 1	0.0002	11.2822	0.0797	11.2822	0.0797
BANKINDIA	**None**	0.0041	**262.8391**	**0.0000**	**255.1969**	**0.0000**
	At Most 1	0.0001	7.6422	0.2823	7.6422	0.2823
BEL	**None**	0.0034	**241.3121**	**0.0000**	**232.5590**	**0.0000**
	At Most 1	0.0001	8.7531	0.1961	8.7531	0.1961
BHEL	**None**	0.0030	**209.8312**	**0.0000**	**205.2461**	**0.0001**
	At Most 1	6.68E-03	4.5852	0.6566	4.5852	0.6566
BPCL	**None**	0.0023	**168.7715**	**0.0000**	**159.2990**	**0.0001**
	At Most 1	0.0001	9.4725	0.1532	9.4725	0.1532
CANBK	**None**	0.0028	**178.5392**	**0.0000**	**172.3145**	**0.0001**
	At Most 1	0.0001	6.2247	0.4323	6.2247	0.4323
CENTURYTEX	**None**	0.0048	**164.2567**	**0.0000**	**158.5459**	**0.0001**
	At Most 1	0.0002	5.7108	0.4979	5.7108	0.4979
COLGATE	**None**	0.0073	**244.5776**	**0.0000**	**240.5875**	**0.0001**
	At Most 1	0.0001	3.9902	0.7435	3.9902	0.7435
CUMMINSIND	**None**	0.0047	**148.9476**	**0.0000**	**142.4187**	**0.0001**
	At Most 1	0.0002	6.5289	0.3962	6.5289	0.3962
DIVISLAB	**None**	0.0081	**253.5490**	**0.0000**	**250.6740**	**0.0001**
	At Most 1	9.35E-05	2.8750	0.8910	2.8750	0.8910
ESCORTS	**None**	0.0113	**359.5442**	**0.0000**	**354.8428**	**0.0001**
	At Most 1	0.0002	4.7015	0.6396	4.7015	0.6396
ESSAROIL	**None**	0.0076	**256.1755**	**0.0000**	**245.7109**	**0.0001**
	At Most 1	0.0003	10.4647	0.1076	10.4647	0.1076
GAIL	**None**	0.0019	**131.6807**	**0.0000**	**116.2672**	**0.0001**
	At Most 1	0.0003	15.4135	0.0159	15.4135	0.0159
GNFC	**None**	0.0033	**115.2339**	**0.0000**	**106.6122**	**0.0000**
	At Most 1	0.0003	8.6217	0.2050	8.6217	0.2050
GRASIM	**None**	0.0026	**183.9451**	**0.0000**	**179.9256**	**0.0001**
	At Most 1	5.88E-05	4.0196	0.7393	4.0196	0.7393
HCLTECH	**None**	0.0035	**247.7210**	**0.0000**	**243.6995**	**0.0001**
	At Most 1	5.86E-05	4.0215	0.7390	4.0215	0.7390
HEROHONDA	**None**	0.0020	**139.7802**	**0.0000**	**134.9230**	**0.0001**
	At Most 1	7.08E-05	4.8572	0.6170	4.8572	0.6170
HINDUNILVR	**None**	0.0017	119.33	**0.0000**	**116.3086**	**0.0001**
	At Most 1	4.40E-05	3.02	0.8739	3.02	0.8739
HINDPETRO	**None**	0.0019	139.9960	**0.0000**	**130.4349**	**0.0001**
	At Most 1	0.0001	9.5611	0.1485	9.5611	0.1485
ICICIBANK	**None**	0.0030	208.8081	**0.0000**	**203.3243**	**0.0001**
	At Most 1	7.99E-05	5.4837	0.5285	5.4837	0.5285
IDBI	**None**	0.0052	177.0000	**0.0000**	**172.0030**	**0.0001**
	At Most 1	0.0002	4.9940	0.5972	4.9940	0.5972
IDFC	**None**	0.0033	**96.3153**	**0.0000**	**92.4693**	**0.0000**
	At Most 1	0.0001	3.8459	0.7643	3.8459	0.7643

Contd….

Symbol	Hypothesized No. of CE(s)	Eigen Value	Trace Test		Maximum Eigenvalue Test	
			Test Statistics	P Value	Test Statistics	P Value
IPCL	**None**	0.0016	**119.6607**	**0.0000**	**108.7306**	**0.0001**
	At Most 1	0.0002	10.9301	0.0908	10.9301	0.0908
JETAIRWAYS	**None**	0.0041	**148.2486**	**0.0000**	**143.2198**	**0.0001**
	At Most 1	0.0001	5.0288	0.5923	5.0288	0.5923
KTKBANK	**None**	0.0025	79.1621	0.0000	77.0498	0.0000
	At Most 1	6.77E-05	2.1123	0.9614	2.1123	0.9614
MARUTI	**None**	0.0039	**252.5168**	**0.0001**	**250.3932**	**0.0001**
	At Most 1	3.31E-05	2.1237	0.1450	2.1237	0.1450
MATRIXLABS	**None**	0.0010	**39.3019**	**0.0006**	**34.4472**	**0.0002**
	At Most 1	0.0001	4.8546	0.6173	4.8546	0.6173
MTNL	**None**	0.0019	**140.3428**	**0.0001**	**130.6212**	**0.0001**
	At Most 1	0.0001	9.7217	0.0018	9.7217	0.0018
NATIONALUM	**None**	0.0017	**123.3865**	**0.0000**	**115.8687**	**0.0001**
	At Most 1	0.0001	7.5178	0.2936	7.5178	0.2936
NDTV	**None**	0.0065	**211.3639**	**0.0000**	**206.9242**	**0.0001**
	At Most 1	0.0001	4.4397	0.6779	4.4397	0.6779
NTPC	**None**	0.0044	**193.2884**	**0.0000**	**182.0630**	**0.0001**
	At Most 1	0.0003	11.2254	0.0814	11.2254	0.0814
ORIENTBANK	**None**	0.0019	**127.9800**	**0.0000**	**117.1130**	**0.0001**
	At Most 1	0.0002	8.8670	0.0929	8.8670	0.0929
PNB	**None**	0.0010	**70.1868**	**0.0000**	**62.5897**	**0.0000**
	At Most 1	0.0001	7.5970	0.2864	7.5970	0.2864
POLARIS	**None**	0.0028	**196.2489**	**0.0000**	**192.2291**	**0.0001**
	At Most 1	5.86E-05	4.0198	0.7392	4.0198	0.7392
RELCAPITAL	**None**	0.0053	**184.6091**	**0.0000**	**176.3229**	**0.0001**
	At Most 1	0.0003	8.2862	0.2292	8.2862	0.2292
RELIANCE	**None**	0.0037	**257.9841**	**0.0000**	**254.1347**	**0.0001**
	At Most 1	5.59E-05	3.8494	0.7638	3.8494	0.7638
SBIN	**None**	0.0027	**193.7208**	**0.0000**	**187.4038**	**0.0001**
	At Most 1	9.19E-05	6.3170	0.4211	6.3170	0.4211
SRF	**None**	0.0049	**155.0368**	**0.0001**	**152.4819**	**0.0001**
	At Most 1	8.16E-05	2.5549	0.1100	2.5549	0.1100
SYNDIBANK	**None**	0.0023	**140.6967**	**0.0000**	**136.6305**	**0.0001**
	At Most 1	6.77E-05	4.0661	0.7325	4.0661	0.7325
TATACHEM	**None**	0.0013	48.7758	0.0000	41.8771	0.0000
	At Most 1	0.0002	6.8988	0.3552	6.8988	0.3552
TATAMOTORS	**None**	0.0028	**163.4635**	**0.0000**	**159.0174**	**0.0001**
	At Most 1	7.95E-05	4.4461	0.6770	4.4461	0.6770
TATAPOWER	**None**	0.0028	**201.8957**	**0.0000**	**193.3267**	**0.0001**
	At Most 1	0.0001	8.5691	0.2086	8.5691	0.2086
TITAN	**None**	0.0104	**341.2376**	**0.0000**	**333.9578**	**0.0001**
	At Most 1	0.0002	7.2798	0.3162	7.2798	0.3162
UNIONBANK	**None**	0.0028	**179.5441**	**0.0000**	**175.2320**	**0.0001**
	At Most 1	7.01E-05	4.3121	0.6966	4.3121	0.6966

Table V Granger Causality Test Results of Indian Equity Futures and Cash Markets

Symbol	Null Hypothesis	F Value	P Value
NIFTY	Cash Market Does Not Granger Cause Futures Market	1.07	0.37
	Futures Market Does Not Granger Cause Cash Market	2.24	0.06
ABB	Cash Market Does Not Granger Cause Futures Market	18.65	3.6E-44
	Futures Market Does Not Granger Cause Cash Market	274.53	0.0000
ACC	Cash Market Does Not Granger Cause Futures Market	8.353	3.5E-25
	Futures Market Does Not Granger Cause Cash Market	605.669	0.0000
ANDHRABANK	Cash Market Does Not Granger Cause Futures Market	86.62	6.0E-161
	Futures Market Does Not Granger Cause Cash Market	765.02	0.0000
ARVINDMILL	Cash Market Does Not Granger Cause Futures Market	31.40	1.8E-90
	Futures Market Does Not Granger Cause Cash Market	532.47	0.0000
ASHOKLEY	Cash Market Does Not Granger Cause Futures Market	9.70	1.4E-27
	Futures Market Does Not Granger Cause Cash Market	219.75	0.0000
BAJAJAUTO	Cash Market Does Not Granger Cause Futures Market	119.48	2.0E-272
	Futures Market Does Not Granger Cause Cash Market	567.99	0.0000
BANKBARODA	Cash Market Does Not Granger Cause Futures Market	49.87	9.0E-120
	Futures Market Does Not Granger Cause Cash Market	425.53	0.0000
BANKINDIA	Cash Market Does Not Granger Cause Futures Market	37.29	6.0E-95
	Futures Market Does Not Granger Cause Cash Market	657.39	0.0000
BEL	Cash Market Does Not Granger Cause Futures Market	33.18	2.0E-182
	Futures Market Does Not Granger Cause Cash Market	235.92	0.0000
BHEL	Cash Market Does Not Granger Cause Futures Market	38.23	9.0E-134
	Futures Market Does Not Granger Cause Cash Market	418.82	0.0000
BPCL	Cash Market Does Not Granger Cause Futures Market	99.21	3.0E-245
	Futures Market Does Not Granger Cause Cash Market	628.14	0.0000
CANBK	Cash Market Does Not Granger Cause Futures Market	35.61	3.4E-70
	Futures Market Does Not Granger Cause Cash Market	668.14	0.0000
CENTURYTEX	Cash Market Does Not Granger Cause Futures Market	6.77	1.0E-15
	Futures Market Does Not Granger Cause Cash Market	322.64	0.0000
COLGATE	Cash Market Does Not Granger Cause Futures Market	13.21	1.5E-25
	Futures Market Does Not Granger Cause Cash Market	477.36	0.0000
CUMMINSIND	Cash Market Does Not Granger Cause Futures Market	11.63	7.8E-47
	Futures Market Does Not Granger Cause Cash Market	192.63	0.0000
DIVISLAB	Cash Market Does Not Granger Cause Futures Market	43.81	1.0E-120
	Futures Market Does Not Granger Cause Cash Market	175.69	0.0000
ESCORTS	Cash Market Does Not Granger Cause Futures Market	29.44	8.2E-41
	Futures Market Does Not Granger Cause Cash Market	408.78	0.0000
ESSAROIL	Cash Market Does Not Granger Cause Futures Market	24.12	4.9E-76
	Futures Market Does Not Granger Cause Cash Market	243.52	0.0000
GAIL	Cash Market Does Not Granger Cause Futures Market	25.28	1.5E-74
	Futures Market Does Not Granger Cause Cash Market	645.12	0.0000
GNFC	Cash Market Does Not Granger Cause Futures Market	17.30	7.0E-29
	Futures Market Does Not Granger Cause Cash Market	409.29	0.0000
GRASIM	Cash Market Does Not Granger Cause Futures Market	27.90	2.1E-74
	Futures Market Does Not Granger Cause Cash Market	645.12	0.0000
HCLTECH	Cash Market Does Not Granger Cause Futures Market	71.80	4E-204
	Futures Market Does Not Granger Cause Cash Market	256.07	0.0000
HEROHONDA	Cash Market Does Not Granger Cause Futures Market	104.46	3E-195
	Futures Market Does Not Granger Cause Cash Market	743.49	0.0000
HINDUNILVR	Cash Market Does Not Granger Cause Futures Market	69.38	5.0E-128
	Futures Market Does Not Granger Cause Cash Market	680.44	0.0000
HINDPETRO	Cash Market Does Not Granger Cause Futures Market	37.28	7.0E-116
	Futures Market Does Not Granger Cause Cash Market	415.66	0.0000
ICICIBANK	Cash Market Does Not Granger Cause Futures Market	29.98	8.3E-53
	Futures Market Does Not Granger Cause Cash Market	768.66	0.0000
IDBI	Cash Market Does Not Granger Cause Futures Market	22.07	1.4E-45
	Futures Market Does Not Granger Cause Cash Market	381.22	0.0000
IDFC	Cash Market Does Not Granger Cause Futures Market	16.81	1.9E-50
	Futures Market Does Not Granger Cause Cash Market	210.42	0.0000
IPCL	Cash Market Does Not Granger Cause Futures Market	26.05	7.9E-55
	Futures Market Does Not Granger Cause Cash Market	729.61	0.0000
JETAIRWAYS	Cash Market Does Not Granger Cause Futures Market	29.92	1.4E-52
	Futures Market Does Not Granger Cause Cash Market	377.89	0.0000

Contd….

Symbol	Null Hypothesis	F Value	P Value
KTKBANK	Cash Market Does Not Granger Cause Futures Market	45.35	4.0E-125
	Futures Market Does Not Granger Cause Cash Market	185.45	0.0000
MARUTI	Cash Market Does Not Granger Cause Futures Market	37.89	9.0E-104
	Futures Market Does Not Granger Cause Cash Market	599.77	0.0000
MATRIXLABS	Cash Market Does Not Granger Cause Futures Market	15.02	3.0E-17
	Futures Market Does Not Granger Cause Cash Market	506.61	0.0000
MTNL	Cash Market Does Not Granger Cause Futures Market	12.33	2.7E-31
	Futures Market Does Not Granger Cause Cash Market	604.92	0.0000
NATIONALUM	Cash Market Does Not Granger Cause Futures Market	70.61	2.0E-144
	Futures Market Does Not Granger Cause Cash Market	553.44	0.0000
NDTV	Cash Market Does Not Granger Cause Futures Market	42.81	5.0E-142
	Futures Market Does Not Granger Cause Cash Market	175.04	0.0000
NTPC	Cash Market Does Not Granger Cause Futures Market	52.09	3.0E-155
	Futures Market Does Not Granger Cause Cash Market	324.65	0.0000
ORIENTBANK	Cash Market Does Not Granger Cause Futures Market	37.12	2.0E-150
	Futures Market Does Not Granger Cause Cash Market	260.87	0.0000
PNB	Cash Market Does Not Granger Cause Futures Market	20.19	6.5E-52
	Futures Market Does Not Granger Cause Cash Market	435.39	0.0000
POLARIS	Cash Market Does Not Granger Cause Futures Market	15.48	1.9E-43
	Futures Market Does Not Granger Cause Cash Market	452.54	0.0000
RELCAPITAL	Cash Market Does Not Granger Cause Futures Market	8.70	3.0E-19
	Futures Market Does Not Granger Cause Cash Market	390.18	0.0000
RELIANCE	Cash Market Does Not Granger Cause Futures Market	3.71	7.9E-08
	Futures Market Does Not Granger Cause Cash Market	658.69	0.0000
SBIN	Cash Market Does Not Granger Cause Futures Market	25.08	1.2E-61
	Futures Market Does Not Granger Cause Cash Market	885.09	0.0000
SRF	Cash Market Does Not Granger Cause Futures Market	18.64	2.5E-47
	Futures Market Does Not Granger Cause Cash Market	213.47	0.0000
SYNDIBANK	Cash Market Does Not Granger Cause Futures Market	48.54	2.0E-116
	Futures Market Does Not Granger Cause Cash Market	658.35	0.0000
TATACHEM	Cash Market Does Not Granger Cause Futures Market	27.97	1.9E-79
	Futures Market Does Not Granger Cause Cash Market	115.02	0.0000
TATAMOTORS	Cash Market Does Not Granger Cause Futures Market	23.72	1.9E-49
	Futures Market Does Not Granger Cause Cash Market	634.53	0.0000
TATAPOWER	Cash Market Does Not Granger Cause Futures Market	24.98	2.2E-70
	Futures Market Does Not Granger Cause Cash Market	394.31	0.0000
TITAN	Cash Market Does Not Granger Cause Futures Market	16.28	1.5E-21
	Futures Market Does Not Granger Cause Cash Market	551.82	0.0000
UNIONBANK	Cash Market Does Not Granger Cause Futures Market	43.99	2.2E-96
	Futures Market Does Not Granger Cause Cash Market	789.86	0.0000

Table VI Vector Auto regression Methodology

Symbol	NIFTY (4)		ABB (13)		ACC(20)		ANDHRABANK(09)		ARVINDMILL(15)		ASHOKLEY (18)		BAJAJAUTO(11)		BANKBARODA(12)		BANKINDIA(13)	
	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S
F-1	-10.78*	2.82*	-25.43*	50.95*	-21.84*	105.36*	-35.09*	82.40*	-30.80*	87.49*	-22.77*	59.69*	-52.99*	76.53*	-34.86*	69.67*	-30.04*	90.95*
F-2	5.14*	0.40	-16.21*	30.65*	-8.83*	73.07*	-24.47*	44.88*	-18.46*	55.99*	-8.07*	40.32*	-26.77*	50.88*	-10.79*	45.06*	-17.71*	57.93*
F-3	8.51*	-0.11	-13.06*	19.97*	-3.75*	53.86*	-15.45*	31.70*	-12.60*	37.19*	-3.89*	28.78*	-18.16*	37.05*	-12.20*	25.53*	-11.96*	41.06*
F-4	5.16*	0.87	-6.84*	16.14*	-5.01*	39.62*	-12.20*	24.68*	-10.02*	26.60*	-1.92*	19.83*	-13.58*	25.44*	-0.82	20.81*	-11.78*	29.06*
F-5	N.A.	N.A.	-4.50*	13.27*	-6.71*	29.34*	-8.16*	20.12*	-11.30*	18.13*	1.12	17.55*	-10.86*	19.46*	-0.90	11.96*	-10.82*	20.06*
F-6	N.A.	N.A.	-4.58*	11.06*	-4.21*	25.64*	-2.69*	16.63*	-9.89*	13.41*	-0.01	11.55*	-10.03*	14.26*	1.60	11.70*	-10.40*	15.81*
F-7	N.A.	N.A.	-5.28*	7.09*	-6.44*	18.69*	-0.75	10.71*	-10.48*	8.85*	-2.00	6.82*	-9.13*	10.28*	-0.88	8.38*	-8.16*	12.28*
F-8	N.A.	N.A.	-5.07*	6.14*	-5.51*	15.27*	0.19	8.49*	-8.30*	7.92*	-2.51**	4.21*	-6.22*	9.16*	-4.95*	6.67*	-7.13*	9.78*
F-9	N.A.	N.A.	-4.70*	4.77*	-5.42*	13.08*	-1.33	3.80*	-10.36*	4.58*	-1.98**	3.71*	-6.82*	4.80*	-2.03**	8.37*	-8.41*	5.88*
F-10	N.A.	N.A.	-3.84*	4.21*	-3.40*	13.55*	N.A.	N.A.	-8.08*	3.88*	-2.84*	1.76***	-3.69*	5.52*	-3.18*	5.31*	-4.97*	6.56*
F-11	N.A.	N.A.	-4.80*	3.33*	-3.00*	12.47*	N.A.	N.A.	-7.38*	3.03*	-2.78*	1.42	-3.34*	4.34*	-0.36	5.27*	-3.86*	5.06*
F-12	N.A.	N.A.	-4.30*	0.87	-1.30	12.47*	N.A.	N.A.	-5.30*	2.45**	-3.96*	-0.88	N.A.	N.A.	-1.66***	2.76*	-4.04*	2.77*
F-13	N.A.	N.A.	-5.14*	-3.17*	-2.36**	9.37*	N.A.	N.A.	-9.05*	-2.57**	-7.75*	-4.81*	N.A.	N.A.	N.A.	N.A.	-3.16*	2.54**
F-14	N.A.	N.A.	N.A.	N.A.	0.48	10.08*	N.A.	N.A.	-5.88*	-2.39**	-3.91*	-1.97**	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-15	N.A.	N.A.	N.A.	N.A.	-1.73***	9.02*	N.A.	N.A.	-1.83***	0.62	-4.28*	-1.53	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-16	N.A.	N.A.	N.A.	N.A.	-0.91	7.64*	N.A.	N.A.	N.A.	N.A.	-0.15	0.83	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-17	N.A.	N.A.	N.A.	N.A.	-2.39**	5.69*	N.A.	N.A.	N.A.	N.A.	-4.59*	5.12*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-18	N.A.	N.A.	N.A.	N.A.	-3.24*	2.83*	N.A.	N.A.	N.A.	N.A.	-4.54*	-4.39*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-19	N.A.	N.A.	N.A.	N.A.	1.14	5.51*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-20	N.A.	N.A.	N.A.	N.A.	-0.64	1.71***	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-21	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-1	0.27	-6.24*	13.46*	-56.94*	6.91*	-131.67*	19.90*	-87.27*	15.33*	-98.34*	8.44*	-67.60*	34.34*	-89.14*	21.17*	-75.25*	17.44*	-101.39*
S-2	-0.63	-0.04	15.91*	-27.75*	10.15*	-77.53*	23.81*	-39.95*	17.10*	-53.76*	8.99*	-36.94*	23.60*	-50.47*	12.56*	-40.43*	18.89*	-56.04*
S-3	0.98	1.49	14.76*	-17.02*	10.31*	-52.08*	22.61*	-24.18*	15.96*	-32.93*	4.87*	-25.98*	20.68*	-30.97*	14.10*	-20.55*	15.33*	-37.66*
S-4	1.69***	4.53	8.89*	-14.10*	8.90*	-38.80*	14.38*	-20.05*	13.73*	-22.76*	3.12*	-18.39*	12.58*	-25.53*	3.44*	-16.77*	14.40*	-27.01*
S-5	N.A.	N.A.	7.25*	-10.77*	7.61*	-30.63*	10.09*	-16.99*	13.82*	-16.34*	2.15**	-13.34*	12.32*	-18.43*	0.58	-10.59*	12.69*	-19.64*
S-6	N.A.	N.A.	5.70*	-10.48*	6.05*	-24.72*	5.08*	-13.78*	12.19*	-12.37*	3.61*	-8.35*	9.98*	-13.21*	0.04	-9.51*	10.60*	-15.55*
S-7	N.A.	N.A.	4.03*	-7.76*	6.17*	-19.39*	3.35*	-9.37*	11.90*	-8.40*	2.03**	-7.88*	7.19*	-11.05*	3.20*	-6.73*	9.56*	-11.35*
S-8	N.A.	N.A.	5.81*	-4.90*	5.69*	-16.81*	1.41	-6.50*	10.03*	-7.37*	4.02*	-3.48*	6.31*	-9.85*	5.03*	-6.88*	8.25*	-8.52*
S-9	N.A.	N.A.	4.67*	-4.02*	3.18*	-16.36*	-0.82	-5.41*	8.97*	-5.28*	2.29**	-3.07*	4.72*	-6.93*	1.81***	-8.53*	7.38*	-7.06*
S-10	N.A.	N.A.	5.08*	-4.13*	3.50*	-14.37*	N.A.	N.A.	7.95*	-3.73*	2.03**	-2.14**	4.85*	-3.94*	2.82*	-4.88*	5.18*	-5.84*
S-11	N.A.	N.A.	5.06*	-3.35*	2.74*	-13.57*	N.A.	N.A.	7.65*	-2.20**	3.84*	-0.78	2.80*	-3.38*	0.33	-5.83*	4.05*	-4.42*
S-12	N.A.	N.A.	3.60*	-1.44*	1.76	-12.98*	N.A.	N.A.	6.37*	-1.73***	4.85*	0.94	N.A.	N.A.	0.54	-3.88*	4.64*	-2.24**
S-13	N.A.	N.A.	3.90*	-1.48*	0.58	-12.52*	N.A.	N.A.	5.87*	-0.74	2.97*	-0.11	N.A.	N.A.	N.A.	N.A.	2.77*	-1.62
S-14	N.A.	N.A.	N.A.	N.A.	0.08	-11.32*	N.A.	N.A.	3.55*	-0.82	5.40*	2.95*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-15	N.A.	N.A.	N.A.	N.A.	0.66	-10.16*	N.A.	N.A.	3.64*	-1.08	2.92*	-0.05	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-16	N.A.	N.A.	N.A.	N.A.	2.37**	-7.14*	N.A.	N.A.	N.A.	N.A.	-0.17	-1.76***	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-17	N.A.	N.A.	N.A.	N.A.	1.25	-6.40*	N.A.	N.A.	N.A.	N.A.	-1.68***	-2.34**	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-18	N.A.	N.A.	N.A.	N.A.	1.40	-5.11*	N.A.	N.A.	N.A.	N.A.	0.61	-0.90	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-19	N.A.	N.A.	N.A.	N.A.	-1.33	-5.87*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-20	N.A.	N.A.	N.A.	N.A.	-0.05	-2.50**	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-21	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
C	2.86*	0.22	1.81***	1.95**	2.26**	2.12**	0.54	0.67	-0.08	-0.06	0.90	0.94	2.54**	2.29**	0.40	0.43	1.11	1.15

Contd….

Symbol	BEL(24)		BHEL(18)		BPCL(12)		CANBK(10)		CENTURYTEX(16)		COLGATE(11)		CUMMINSIND(25)		DIVISLAB(14)		ESCORTS(7)	
	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S
F-1	-32.04*	79.65*	-32.88*	85.57*	-43.10*	85.06*	-26.42*	80.91*	-12.37*	70.21*	-25.50*	68.94*	-22.59*	65.96*	-28.90*	43.91*	-18.67*	53.08*
F-2	-27.81*	43.99*	-15.99*	50.87*	-25.73*	52.75*	-13.26*	45.74*	-2.14*	49.14*	-10.04*	45.39*	-10.22*	46.58*	-18.97*	34.33*	-12.35*	29.19*
F-3	-13.00*	39.66*	-14.84*	32.05*	-16.21*	36.73*	-9.34*	29.57*	-2.16*	34.62*	-5.05*	31.99*	-9.68*	30.70*	-7.41*	29.40*	-8.23*	19.42*
F-4	-12.00*	27.79*	-9.88*	24.18*	-12.22*	27.41*	-3.74*	23.30*	-0.12	27.88*	-3.09*	23.75*	-8.74*	25.11*	-8.21*	20.90*	-3.91*	16.00*
F-5	-11.20*	22.97*	-10.17*	14.88*	-10.46*	19.55*	-4.69*	13.81*	-1.55	21.07*	-2.00**	17.15*	-10.22*	17.62*	-5.00*	18.92*	-2.84*	10.61*
F-6	-9.14*	17.84*	-4.60*	14.61*	-6.77*	15.08*	-3.07*	11.49*	-1.29	17.82*	2.45**	19.28*	-9.53*	13.22*	-7.95*	14.70*	-0.60	10.56*
F-7	-9.87*	14.56*	-6.58*	9.44*	-6.59*	8.51*	-4.33*	6.67*	-4.65*	11.03*	-0.52	12.66*	-5.79*	14.28*	-6.13*	13.16*	0.99	6.89*
F-8	-6.97*	13.64*	-5.23*	7.37*	-6.04*	6.97*	-2.28**	5.12*	-4.06*	9.46*	-2.59*	7.47*	-6.68*	12.20*	-6.27*	11.03*	N.A.	N.A.
F-9	-6.88*	10.02*	-8.08*	4.19*	-3.45*	6.26*	-3.16*	1.90***	-4.51*	7.44*	-1.08	7.37*	-8.60*	10.13*	-8.86*	7.97*	N.A.	N.A.
F-10	-5.69*	9.55*	-7.60*	4.31*	-1.70***	5.50*	-0.21	4.72*	-3.87*	5.62*	-1.18	6.06*	-7.99*	8.19*	-7.67*	4.20*	N.A.	N.A.
F-11	-6.11*	7.34*	-8.22*	2.43**	-2.31**	3.89*	N.A.	N.A.	-4.82*	3.55*	-0.57	5.25*	-7.27*	8.52*	-3.63*	6.74*	N.A.	N.A.
F-12	-6.99*	5.82*	-6.93*	0.40	-0.29	4.23*	N.A.	N.A.	-5.50*	1.77***	N.A.	N.A.	-6.14*	7.31*	-4.87*	5.09*	N.A.	N.A.
F-13	-8.11*	4.06*	-3.89*	0.86	N.A.	N.A.	N.A.	N.A.	-6.89*	0.09	N.A.	N.A.	-4.58*	6.87*	-3.68*	3.20*	N.A.	N.A.
F-14	-8.34*	4.50*	-4.66*	0.30	N.A.	N.A.	N.A.	N.A.	-5.89*	-0.66	N.A.	N.A.	-2.44**	9.58*	-3.09*	2.00*	N.A.	N.A.
F-15	-8.96*	4.87*	-4.45*	0.98	N.A.	N.A.	N.A.	N.A.	-5.63*	-1.37	N.A.	N.A.	-2.92*	7.58*	N.A.	N.A.	N.A.	N.A.
F-16	-5.59*	7.57*	-6.39*	0.45	N.A.	N.A.	N.A.	N.A.	-5.12*	-1.03	N.A.	N.A.	-2.13**	7.73*	N.A.	N.A.	N.A.	N.A.
F-17	-6.67*	6.18*	-4.10*	1.23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-2.50**	6.72*	N.A.	N.A.	N.A.	N.A.
F-18	-6.03*	6.41*	-6.23*	-2.00**	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-2.32**	6.29*	N.A.	N.A.	N.A.	N.A.
F-19	-5.22*	6.41*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-1.17	8.02*	N.A.	N.A.	N.A.	N.A.
F-20	-1.95***	6.23*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-1.90***	6.30*	N.A.	N.A.	N.A.	N.A.
F-21	-4.47*	4.15*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-1.35	6.44*	N.A.	N.A.	N.A.	N.A.
F-22	-2.31**	6.09*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1.28	7.49*	N.A.	N.A.	N.A.	N.A.
F-23	-2.16**	3.62*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-0.45	6.21*	N.A.	N.A.	N.A.	N.A.
F-24	-2.48**	0.84*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-0.75	7.23*	N.A.	N.A.	N.A.	N.A.
F-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-1.21	7.51*	N.A.	N.A.	N.A.	N.A.
S-1	24.80*	-88.36*	23.15*	-93.47*	32.83*	-97.96*	15.48*	-84.39*	6.00*	-72.70*	10.68*	-79.30*	10.11*	-75.05*	23.18*	-49.09*	9.30*	-55.60*
S-2	19.65*	-51.92*	18.16*	-48.81*	19.98*	-55.45*	15.02*	42.38*	3.48*	-45.33*	5.20*	-48.02*	10.03*	-44.58*	14.54*	-32.79*	13.51*	-24.28*
S-3	16.34*	-37.98*	16.13*	-32.64*	18.97*	-33.77*	13.75*	-23.61*	3.93*	-31.95*	6.34*	-32.66*	11.60*	-28.46*	8.03*	-25.33*	9.55*	-14.96*
S-4	13.53*	-28.13*	12.59*	-22.99*	14.16*	-23.29*	7.20*	-17.24*	2.22**	-25.71*	3.94*	-23.70*	11.36*	-21.58*	7.72*	-20.35*	4.61*	-14.04*
S-5	12.64*	-21.41*	10.70*	-16.47*	8.08*	-19.80*	6.59*	-12.50*	3.01*	-19.15*	4.52*	-15.94*	12.55*	-14.12*	7.78*	-15.94*	4.51*	-8.09*
S-6	9.26*	-18.76*	7.97*	-13.48*	8.23*	-12.98*	5.08*	-9.55*	3.10*	-15.12*	1.03	-16.40*	9.88*	-12.64*	8.19*	-13.40*	1.47	-9.23*
S-7	9.26*	-15.12*	8.01*	-8.81*	7.20*	-9.89*	5.25*	-5.15*	4.61*	-10.49*	1.35	-13.12*	6.29*	-14.39*	5.89*	-12.14*	-0.70	-6.93*
S-8	8.09*	-13.59*	6.04*	-7.69*	6.42*	-7.36*	3.14*	-4.24*	4.77*	-8.51*	1.65*	-7.96*	7.52*	-11.50*	5.57*	-9.31*	N.A.	N.A.
S-9	6.47*	-11.09*	5.99*	-5.94*	2.10**	-7.66*	1.12	-4.47*	3.37*	-7.55*	2.57**	-6.26*	8.22*	-9.73*	7.65*	-7.25*	N.A.	N.A.
S-10	7.20*	-8.58*	7.10*	-4.64*	0.43	-6.71*	1.17	-2.82*	4.53*	-4.78*	0.65	-6.42*	7.11*	-8.23*	6.67*	-5.52*	N.A.	N.A.
S-11	6.28*	-7.39*	6.24*	-4.22*	-0.19	-5.33*	N.A.	N.A.	5.32*	-2.68*	0.46	-4.56*	7.11*	-7.86*	6.01*	-5.64*	N.A.	N.A.
S-12	5.74*	-7.60*	4.61*	-3.18*	1.60	-3.76*	N.A.	N.A.	5.40*	-1.23	N.A.	N.A.	6.49*	-6.62*	6.11*	-3.93*	N.A.	N.A.
S-13	8.21*	-5.54*	4.69*	-3.14*	N.A.	N.A.	N.A.	N.A.	6.17*	-0.49	N.A.	N.A.	3.60*	-9.02*	3.39*	-3.60*	N.A.	N.A.
S-14	8.81*	-5.43*	6.03*	-2.02**	N.A.	N.A.	N.A.	N.A.	5.69*	0.10	N.A.	N.A.	3.54*	-9.42*	1.24	-3.16*	N.A.	N.A.
S-15	9.37*	-7.08*	5.72*	-1.58	N.A.	N.A.	N.A.	N.A.	5.88*	1.70	N.A.	N.A.	3.51*	-8.43*	N.A.	N.A.	N.A.	N.A.
S-16	6.57*	-8.37*	7.28*	-1.14	N.A.	N.A.	N.A.	N.A.	5.56*	1.77***	N.A.	N.A.	3.05*	-7.08*	N.A.	N.A.	N.A.	N.A.
S-17	6.97*	-7.60*	5.57*	-1.45	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1.58	-8.95*	N.A.	N.A.	N.A.	N.A.
S-18	5.87*	-7.59*	3.91*	-1.72***	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1.66***	-7.77*	N.A.	N.A.	N.A.	N.A.
S-19	3.74*	-7.70*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	2.25**	-7.44*	N.A.	N.A.	N.A.	N.A.
S-20	4.83*	-5.39*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.40	-8.46*	N.A.	N.A.	N.A.	N.A.
S-21	4.13*	-4.70*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1.54	-6.33*	N.A.	N.A.	N.A.	N.A.
S-22	2.52**	-4.95*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.94	-6.57*	N.A.	N.A.	N.A.	N.A.
S-23	3.33*	-2.75*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.77	-6.60*	N.A.	N.A.	N.A.	N.A.
S-24	4.02*	0.97	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.47	-7.67*	N.A.	N.A.	N.A.	N.A.
S-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	3.87*	-4.69*	N.A.	N.A.	N.A.	N.A.
C	2.12**	2.37**	2.83*	2.85*	0.38	0.31	0.45	0.46	0.98	0.98	0.86	0.90	0.96	1.03	1.64***	1.88***	0.36	0.43

Contd….

Symbol	ESSAROIL(17)		GAIL(21)		GNFC(9)		GRASIM(14)		HCLTECH(14)		HEROHONDA(9)		HINDPETRO(16)		HINDUNILVR(9)		ICICIBANK(9)	
	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S
F-1	-25.97*	62.86*	-24.25*	65.28*	-22.26*	57.48*	-27.24*	93.04*	-35.77*	59.18*	-47.19*	79.46*	-35.51*	79.82*	-38.00*	76.82*	-32.69*	80.95*
F-2	-11.71*	44.78*	-10.07*	37.31*	-9.58*	47.74*	-14.15*	59.73*	-24.26*	33.10*	-18.94*	51.98*	-17.40*	48.60*	-19.91*	48.02*	-14.60*	50.45*
F-3	-11.09*	30.96*	0.93	25.09*	-5.85*	27.13*	-9.24*	41.04*	-19.97*	23.45*	-11.36*	34.11*	-8.37*	33.53*	-13.94*	29.71*	-5.84*	33.03*
F-4	-10.34*	24.26*	3.32*	17.81*	-5.23*	19.12*	-6.19*	31.10*	-11.65*	17.15*	-6.87*	24.29*	-8.46*	23.90*	-11.64*	19.65*	-4.96*	19.56*
F-5	-8.64*	18.99*	0.24	9.40*	-3.20*	13.82*	-8.10*	19.67*	-10.39*	11.59*	-6.48*	15.35*	-8.65*	14.69*	-6.01*	13.73*	-4.52*	13.43*
F-6	-6.16*	16.94*	-0.04	6.47*	-1.65***	12.18*	-7.46*	15.71*	-3.55*	10.39*	-3.26*	11.82*	-6.84*	11.51*	-3.48*	10.57*	-3.91*	8.92*
F-7	-5.95*	13.42*	0.66	6.84*	-0.79	10.03*	-6.02*	12.98*	-6.73*	6.19*	-2.13**	8.92*	-5.87*	8.36*	-1.51	8.17*	-5.06*	4.02*
F-8	-6.27*	10.49*	-2.16**	1.46	0.75	9.20*	-4.89*	10.89*	-1.41	5.96*	-0.71	7.44*	-5.21*	6.38*	-0.84	5.60*	-3.38*	3.92*
F-9	-4.55*	9.09*	-2.57**	-1.08	-1.12	4.21*	-5.81*	7.81*	-3.91*	3.83*	-2.28**	4.09*	-7.25*	5.47*	-2.56**	2.52**	-3.48*	1.32
F-10	-4.24*	7.00*	-3.66*	-0.73	N.A.	N.A.	-2.76*	8.25*	-5.48*	5.21*	N.A.	N.A.	-4.61*	6.86*	N.A.	N.A.	N.A.	N.A.
F-11	-4.56*	5.77*	-4.73*	-3.60*	N.A.	N.A.	-4.00*	4.59*	-9.49*	4.86*	N.A.	N.A.	-6.23*	4.87*	N.A.	N.A.	N.A.	N.A.
F-12	-4.29*	4.86*	-6.45*	-4.21*	N.A.	N.A.	-3.05*	4.13*	-12.19*	2.71*	N.A.	N.A.	-4.18*	4.69*	N.A.	N.A.	N.A.	N.A.
F-13	-4.60*	3.29*	-7.81*	-7.74*	N.A.	N.A.	-3.02*	2.88*	-11.22*	0.90	N.A.	N.A.	-7.95*	4.57*	N.A.	N.A.	N.A.	N.A.
F-14	-5.10*	1.64***	-9.91*	-5.87*	N.A.	N.A.	-3.43*	1.02	-6.70*	0.64	N.A.	N.A.	-3.79*	5.92*	N.A.	N.A.	N.A.	N.A.
F-15	-3.73*	2.21**	-5.67*	-0.30	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-2.35**	3.58*	N.A.	N.A.	N.A.	N.A.
F-16	-4.73*	0.46	-3.08*	0.79	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	2.51**	3.03*	N.A.	N.A.	N.A.	N.A.
F-17	-4.13*	-0.23	-5.52*	4.58*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-18	N.A.	N.A.	-7.85*	3.90*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-19	N.A.	N.A.	-10.64*	2.03**	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-20	N.A.	N.A.	-6.58*	-0.20	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-21	N.A.	N.A.	-5.00*	-2.97*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-1	17.86*	-65.68*	17.94*	-72.57*	9.16*	-65.53*	18.27*	-101.58*	26.75*	-59.56*	29.42*	-99.54*	22.09*	-90.10*	22.27*	-95.31*	15.18*	-98.72*
S-2	11.42*	-41.49*	6.77*	-41.04*	10.73*	-37.23*	14.81*	-58.20*	22.46*	-31.12*	13.30*	-57.63*	13.20*	-50.17*	14.20*	-53.82*	11.89*	-51.78*
S-3	12.76*	-27.51*	5.72*	-18.65*	9.66*	-22.18*	11.37*	-38.92*	18.25*	-22.32*	13.78*	-33.02*	12.64*	-30.20*	17.16*	-27.27*	7.65*	-32.49*
S-4	10.09*	-23.26*	2.51**	-13.78*	6.33*	-16.93*	9.35*	-29.25*	10.27*	-17.68*	10.32*	-22.13*	9.21*	-20.81*	12.46*	-18.51*	5.77*	-20.35*
S-5	9.43*	-16.84*	1.94***	-10.08*	5.06*	-13.65*	8.38*	-20.67*	9.64*	-11.19*	7.15*	-15.28*	9.25*	-12.86*	6.72*	-13.89*	3.99*	-14.14*
S-6	6.29*	-15.72*	1.58	-6.23*	2.25**	-11.66*	7.92*	-15.77*	4.66*	-9.60*	2.83*	-11.73*	6.04*	-10.56*	5.15*	-10.06*	4.31*	-9.18*
S-7	5.93*	-13.01*	3.23*	-3.45*	1.08	-9.31*	7.21*	-12.43*	6.33*	-5.73*	1.17	-9.19*	5.51*	-8.48*	2.40**	-7.51*	4.87*	-5.46*
S-8	6.66*	-8.70*	3.03*	-0.31	0.70	-5.80*	5.18*	-10.24*	2.65*	-4.54*	-0.07	-7.37*	5.33*	-6.86*	0.34	-6.83*	3.23*	-4.43*
S-9	4.45*	-8.46*	1.88***	-0.88	-0.22	-4.13*	3.59*	-9.83*	3.81*	-3.42*	2.68*	-2.93*	5.25*	-7.52*	0.57	-3.02*	0.53	-3.79*
S-10	4.23*	-6.62*	2.70*	-0.39	N.A.	N.A.	3.32*	-7.72*	6.23*	-4.70*	N.A.	N.A.	3.29*	-7.96*	N.A.	N.A.	N.A.	N.A.
S-11	4.87*	-5.59*	5.44*	2.12**	N.A.	N.A.	3.29*	-5.80*	8.66*	-4.66*	N.A.	N.A.	4.64*	-5.61*	N.A.	N.A.	N.A.	N.A.
S-12	4.14*	-4.35*	7.73*	3.11*	N.A.	N.A.	2.65*	-4.25*	10.54*	-2.78*	N.A.	N.A.	5.58*	-4.31*	N.A.	N.A.	N.A.	N.A.
S-13	4.29*	-4.45*	10.65*	7.29*	N.A.	N.A.	2.59*	-4.17*	10.50*	-0.18	N.A.	N.A.	7.88*	-4.15*	N.A.	N.A.	N.A.	N.A.
S-14	5.58*	-1.28	7.02*	0.44	N.A.	N.A.	0.86	-3.17*	5.67*	0.99	N.A.	N.A.	4.07*	-5.58*	N.A.	N.A.	N.A.	N.A.
S-15	4.56*	-1.92***	4.92*	-1.36	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1.93***	-4.52*	N.A.	N.A.	N.A.	N.A.
S-16	4.94*	-1.20	5.27*	-0.67	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.38	-3.21*	N.A.	N.A.	N.A.	N.A.
S-17	5.72*	2.18**	6.73*	-4.19*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-18	N.A.	N.A.	7.26*	-3.15*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-19	N.A.	N.A.	8.79*	-1.39	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-20	N.A.	N.A.	5.68*	-0.92	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-21	N.A.	N.A.	7.06*	4.59*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
C	0.39	0.40	0.56	0.81	0.26	0.26	2.39**	2.35**	0.56	0.52	1.70***	1.58	-0.19	-0.20	0.48	0.47	2.58*	2.33**

Contd….

Symbol	IDBI(11)		IDFC(17)		IPCL(11)		JETAIRWAYS(9)		KTKBANK(14)		MARUTI(14)		MATRIXLABS(6)		MTNL(15)		NATIONALUM(10)	
	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S
F-1	-25.22*	62.54*	-17.56*	57.50*	-23.48*	87.44*	-25.37*	56.75*	-24.33*	48.88*	-36.25*	28.51*	-17.26*	53.10*	-20.64*	93.93*	-47.38*	72.17*
F-2	-7.70*	46.23*	-8.90*	36.36*	-7.62*	57.50*	-11.01*	34.15*	-15.90*	31.01*	-16.11*	61.19*	-5.20*	35.64*	-10.59*	58.12*	-21.51*	47.92*
F-3	-4.80*	32.40*	-4.97*	27.27*	-1.81***	43.51*	-10.11*	21.22*	-21.20*	19.72*	-14.84*	43.66*	-1.31*	21.53*	-6.74*	39.90*	-11.89*	32.12*
F-4	-5.43*	22.26*	-6.72*	12.36*	-0.69	32.06*	-6.29*	13.63*	-16.37*	17.05*	-12.96*	31.79*	-2.81*	12.37*	-6.28*	27.87*	-7.55*	22.56*
F-5	-1.76***	19.42*	-7.84*	6.94*	-1.38	22.54*	-3.85*	10.07*	-12.58*	15.41*	-8.13*	25.37*	0.04	9.85*	-8.86*	17.70*	-8.97*	14.23*
F-6	-2.74*	15.90*	-5.45*	8.30*	-1.57	18.07*	-3.63*	6.94*	-10.91*	12.36*	-6.68*	18.79*	5.70*	10.16*	-8.43*	14.21*	-4.64*	11.92*
F-7	-4.75*	10.58*	-7.63*	1.59	-0.10	13.66*	-4.82*	4.97*	-8.79*	12.27*	-5.19*	14.91*	N.A.	N.A.	-6.51*	12.10*	-5.17*	8.03*
F-8	-3.46*	8.94*	-6.86*	1.23	-4.12*	6.99*	-2.76*	2.33**	-9.07*	9.29*	-3.89*	11.96*	N.A.	N.A.	-6.81*	8.24*	-0.18	9.80*
F-9	-0.95	7.23*	-5.28*	2.02**	-3.03*	4.36*	-2.65*	3.79*	-7.25*	8.15*	-4.78*	6.88*	N.A.	N.A.	-6.55*	6.05*	-0.61	6.81*
F-10	-0.32	5.25*	-5.60*	2.29**	-0.45	5.07*	N.A.	N.A.	-6.48*	8.42*	-4.21*	6.28*	N.A.	N.A.	-5.75*	4.61*	-2.74*	2.87*
F-11	1.07	5.31*	-7.33*	1.70***	0.89	5.81*	N.A.	N.A.	-6.07*	6.01*	-3.75*	5.93*	N.A.	N.A.	-6.12*	3.37*	N.A.	N.A.
F-12	N.A.	N.A.	-6.97*	1.51	N.A.	N.A.	N.A.	N.A.	-5.76*	4.16*	-4.96*	4.17*	N.A.	N.A.	-4.09*	3.03*	N.A.	N.A.
F-13	N.A.	N.A.	-5.85*	1.82***	N.A.	N.A.	N.A.	N.A.	-6.92*	2.38**	-4.43*	3.57*	N.A.	N.A.	-4.65*	2.99*	N.A.	N.A.
F-14	N.A.	N.A.	-6.41*	1.07	N.A.	N.A.	N.A.	N.A.	-2.39**	1.41	-4.21*	2.67*	N.A.	N.A.	-3.99*	2.52**	N.A.	N.A.
F-15	N.A.	N.A.	-4.99*	2.19**	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-3.98*	0.83	N.A.	N.A.
F-16	N.A.	N.A.	-3.46*	4.46*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-17	N.A.	N.A.	-4.35*	0.01	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-18	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-19	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-20	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-21	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-1	14.48*	-68.27*	10.75*	-60.75*	13.12*	-94.45*	11.07*	-70.88*	10.37*	-50.66*	17.28*	-111.85*	8.07*	-58.70*	7.71*	-104.09*	24.90*	-84.39*
S-2	10.30*	-40.20*	8.29*	-34.47*	4.15*	-59.22*	14.17*	-32.95*	16.18*	-25.27*	17.96*	-62.67*	6.26*	-32.41*	8.84*	-57.10*	17.66*	-47.22*
S-3	6.43*	-28.64*	6.34*	-21.71*	7.88*	-37.88*	12.35*	-18.31*	22.37*	-14.85*	19.82*	-40.13*	4.61*	-17.89*	8.59*	-37.00*	13.27*	-29.51*
S-4	5.43*	-21.29*	7.21*	-12.22*	3.79*	-29.61*	9.33*	-11.25*	17.85*	-14.19*	16.62*	-30.07*	3.72*	-11.66*	9.24*	-25.44*	8.43*	-21.59*
S-5	3.91*	-17.20*	10.77*	-6.63*	0.93	-22.08*	7.48*	-9.18*	12.79*	-13.75*	11.39*	-23.38*	-0.09	-9.54*	9.81*	-16.60*	9.02*	-13.66*
S-6	4.59*	-13.16*	8.64*	-5.46*	0.45	-17.10*	5.46*	-7.32*	8.95*	-12.33*	7.86*	-18.58*	-2.26**	-6.80*	8.59*	-13.23*	6.30*	-10.92*
S-7	4.91*	-9.44*	8.83*	-0.62	2.28*	-11.15*	4.03*	-5.66*	9.68*	-10.87*	7.58*	-13.85*	N.A.	N.A.	7.31*	-10.76*	3.33*	-10.04*
S-8	3.35*	-7.92*	8.11*	-0.43	4.19*	-5.58*	3.38*	-2.42**	7.80*	-8.88*	5.18*	-11.83*	N.A.	N.A.	7.05*	-8.15*	0.59	-8.69*
S-9	0.44	-6.52*	5.64*	-2.49**	0.58	-6.75*	4.12*	-1.21	5.55*	-7.25*	3.90*	-9.11*	N.A.	N.A.	6.38*	-6.28*	-0.62	-6.67*
S-10	-0.36	-5.77*	4.44*	-4.55*	0.21	-4.62*	N.A.	N.A.	4.25*	-9.68*	3.17*	-7.62*	N.A.	N.A.	5.82*	-5.18*	2.46**	-3.39*
S-11	-2.58*	-5.83*	7.06*	-1.94***	-3.06*	-6.56*	N.A.	N.A.	6.03*	-5.36*	2.71*	-6.78*	N.A.	N.A.	5.67*	-3.49*	N.A.	N.A.
S-12	N.A.	N.A.	7.76*	-2.27**	N.A.	N.A.	N.A.	N.A.	6.81*	-2.17**	2.88*	-5.30*	N.A.	N.A.	5.33*	-2.52**	N.A.	N.A.
S-13	N.A.	N.A.	6.27*	-2.96*	N.A.	N.A.	N.A.	N.A.	6.64*	-4.77*	2.53**	-4.27*	N.A.	N.A.	2.61*	-4.21*	N.A.	N.A.
S-14	N.A.	N.A.	7.47*	-3.56*	N.A.	N.A.	N.A.	N.A.	4.26*	-1.03	2.88*	-2.22**	N.A.	N.A.	4.31*	-3.09*	N.A.	N.A.
S-15	N.A.	N.A.	5.60*	-4.32*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	4.43*	-1.40	N.A.	N.A.
S-16	N.A.	N.A.	4.39*	-4.04*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-17	N.A.	N.A.	3.36*	-2.42**	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-18	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-19	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-20	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-21	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
C	-0.11	-0.14	0.38	0.39	1.25	1.23	-0.94	-1.09	0.95	1.27	1.95***	1.95***	0.04	0.04	0.50	0.43	1.13	1.37

Contd….

Symbol	NDTV(17)		NTPC(15)		ORIENTBANK(21)		PNB(14)		POLARIS(16)		RELCAPITAL(14)		RELIANCE(19)		SBIN(13)		SRF(14)	
	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S
F-1	-33.74*	53.14*	-47.48*	64.06*	-33.32*	72.43*	-26.93*	76.52*	-28.65*	83.42*	-14.18*	72.15*	-12.73*	105.29*	-35.85*	101.27*	-22.43*	52.32*
F-2	-20.53*	36.34*	-19.67*	51.57*	-20.46*	38.75*	-12.08*	43.08*	-9.38*	57.85*	-6.03*	50.57*	-3.31*	72.56*	-14.10*	76.10*	-8.60*	38.93*
F-3	-16.03*	28.08*	-14.97*	34.49*	-12.64*	24.15*	-6.01*	29.51*	-7.96*	40.58*	-3.98*	36.72*	1.71***	54.75*	-6.54*	59.84*	-2.84*	31.02*
F-4	-14.45*	20.44*	-9.17*	25.36*	-10.64*	15.55*	-3.39*	23.21*	-8.53*	28.31*	-3.86*	28.00*	0.31	39.73*	-4.60*	46.28*	-1.36	23.90*
F-5	-14.06*	14.64*	-7.84*	16.85*	-11.78*	8.14*	-2.44**	17.52*	-7.68*	20.62*	-2.99*	21.45*	-2.17**	28.09*	-5.84*	34.33*	-0.80	17.84*
F-6	-10.05*	14.76*	-3.77*	14.85*	-9.37*	8.92*	-0.17	15.02*	-5.29*	18.39*	-3.61*	17.15*	-1.92***	21.82*	-2.92*	28.59*	-0.71	13.30*
F-7	-9.52*	11.52*	-3.11*	11.67*	-6.88*	7.42*	0.50	14.89*	-7.53*	11.94*	-4.47*	12.95*	-1.39	17.83*	-3.35**	21.76*	-4.01*	6.84*
F-8	-8.92*	8.78*	-3.34*	9.16*	-7.00*	6.44*	2.47**	15.97*	-5.94*	10.59*	-2.91*	10.85*	-1.40	13.96*	-2.06**	18.88*	-2.54**	6.51*
F-9	-8.30*	6.70*	-4.82*	4.86*	-6.17*	6.95*	-0.81	11.55*	-5.67*	9.13*	-4.57*	7.52*	-4.96*	9.59*	-4.24*	13.65*	-2.52**	6.03*
F-10	-6.32*	5.78*	-7.51*	1.44	-1.37	8.01*	0.64	10.47*	-4.70*	8.39*	-3.53*	6.58*	-5.54*	7.59*	-2.13**	12.31*	-4.60*	2.97*
F-11	-6.55*	3.74*	-7.19*	-0.48	-2.78*	8.09*	0.15	7.79*	-1.97***	9.41*	-5.16*	3.56*	-5.67*	6.83*	-1.91****	9.32*	-3.81*	2.90*
F-12	-7.21*	4.12*	-11.72*	-5.64*	-0.94	9.40*	-0.59	5.64*	-2.50**	6.92*	-3.96*	3.03*	-6.84*	7.04*	-1.61	6.72*	-3.99*	2.93*
F-13	-6.89*	3.04*	-15.45*	-9.44*	-1.07	9.87*	-3.82*	3.17*	-3.33*	4.99*	-3.13*	2.68*	-8.92*	8.82*	-1.07	4.04*	-2.44**	3.05*
F-14	-6.42*	2.44**	-13.24*	-6.77*	-0.05	10.32*	-5.40*	-0.23	-2.61*	4.60*	-1.66***	2.43**	-6.40*	9.61*	N.A.	N.A.	-2.50**	4.78*
F-15	-7.95*	0.19	-8.28*	-5.85*	-0.95	8.84*	N.A.	N.A.	-1.52	4.47*	N.A.	N.A.	-3.48*	10.61*	N.A.	N.A.	N.A.	N.A.
F-16	-5.52*	2.91*	N.A.	N.A.	1.68***	10.50*	N.A.	N.A.	-3.73*	1.21	N.A.	N.A.	-2.93*	9.43*	N.A.	N.A.	N.A.	N.A.
F-17	-3.14*	2.39**	N.A.	N.A.	4.20*	11.40*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-3.11*	8.25*	N.A.	N.A.	N.A.	N.A.
F-18	N.A.	N.A.	N.A.	N.A.	1.21	7.92*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-3.01*	6.25*	N.A.	N.A.	N.A.	N.A.
F-19	N.A.	N.A.	N.A.	N.A.	5.64*	10.13*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-1.27	5.54*	N.A.	N.A.	N.A.	N.A.
F-20	N.A.	N.A.	N.A.	N.A.	5.82*	9.73*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-21	N.A.	N.A.	N.A.	N.A.	3.39*	8.87*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-1	23.29*	-51.58*	23.62*	-86.09*	21.53*	-75.99*	13.22*	-82.58*	12.19*	-92.15*	7.84*	-79.70*	1.16	-143.63*	17.04*	-132.85*	14.42*	-55.64*
S-2	20.81*	-31.68*	16.43*	-50.66*	19.65*	-35.42*	12.60*	-40.20*	10.91*	-53.16*	9.34*	-47.04*	3.08*	-85.85*	14.34*	-80.92*	9.12*	-35.25*
S-3	16.74*	-23.63*	15.26*	-32.65*	17.11*	-18.48*	10.21*	-23.72*	12.22*	-34.25*	6.69*	-34.43*	3.99*	-58.38*	11.55*	-57.69*	4.44*	-27.55*
S-4	14.60*	-18.10*	13.81*	-23.60*	14.28*	-11.09*	4.36*	-20.57*	10.25*	-24.90*	4.86*	-26.51*	4.66*	-41.41*	9.52*	-43.36*	2.37**	-21.71*
S-5	13.18*	-14.12*	11.47*	-16.95*	12.58*	-5.71*	2.93*	-16.84*	7.33*	-20.52*	4.07*	-20.57*	3.02*	-31.47*	7.06*	-34.49*	1.58	-16.36*
S-6	10.43*	-12.16*	9.79*	-12.42*	9.31*	-7.40*	1.66***	-13.38*	7.33*	-15.71*	4.08*	-15.93*	2.43**	-24.74*	4.92*	-27.46*	3.03*	-9.90*
S-7	9.00*	-10.17*	6.95*	-10.08*	8.01*	-7.71*	0.76	-12.47*	7.99*	-10.74*	4.07*	-12.55*	2.40**	-19.08*	4.42*	-21.81*	2.47**	-7.61*
S-8	9.40*	-7.06*	5.96*	-6.80*	7.25*	-7.06*	-2.30**	-15.11*	5.88*	-10.42*	3.55*	-10.03*	2.97*	-14.92*	3.75*	-18.00*	3.50*	-4.95*
S-9	7.26*	-6.20*	5.85*	-4.75*	4.34*	-9.01*	-2.51**	-13.46*	5.03*	-9.80*	4.50*	-7.21*	3.95*	-11.54*	2.60*	-14.63*	2.16**	-5.73*
S-10	6.75*	-4.67*	6.39*	-1.85**	3.06*	-8.21*	-0.42	-10.01*	3.48*	-8.52*	4.58*	-5.21*	5.25*	-9.65*	2.10**	-11.81*	4.33*	-2.86*
S-11	6.59*	-3.24*	9.17*	1.04	1.80***	-9.17*	-0.06	-8.11*	2.01**	-9.05*	5.03*	-3.49*	5.42*	-9.01*	1.03	-9.34*	5.10*	-2.05**
S-12	7.71*	-2.43**	11.17*	3.51*	1.94***	-8.34*	0.50	-6.39*	2.67*	-7.06*	2.94*	-3.40*	6.56*	-8.74*	1.40	-6.28*	3.24*	-2.31**
S-13	5.22*	-3.97*	12.23*	5.38*	0.91	-9.08*	2.45**	-3.67*	2.83*	-4.57*	2.42**	-2.41**	6.24*	-9.78*	1.85***	-3.53*	2.32**	-3.94*
S-14	6.41*	-2.73*	10.85*	4.89*	-0.19	-10.42*	3.96*	-0.33	1.62	-5.41*	3.47*	-0.83	4.65*	-10.67*	N.A.	N.A.	-0.83	-3.87*
S-15	8.20*	-0.77	7.23*	3.09*	1.35	-8.05*	N.A.	N.A.	0.76	-4.36*	N.A.	N.A.	3.13*	-10.78*	N.A.	N.A.	N.A.	N.A.
S-16	4.80*	-3.18*	N.A.	N.A.	-2.54**	-11.07*	N.A.	N.A.	2.55**	0.13	N.A.	N.A.	2.56**	-9.37*	N.A.	N.A.	N.A.	N.A.
S-17	2.42**	-2.25**	N.A.	N.A.	-2.84*	-10.18*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	2.80*	-7.89*	N.A.	N.A.	N.A.	N.A.
S-18	N.A.	N.A.	N.A.	N.A.	-2.15**	-8.15*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	2.56**	-5.99*	N.A.	N.A.	N.A.	N.A.
S-19	N.A.	N.A.	N.A.	N.A.	-6.85*	-10.87*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1.16	-4.21*	N.A.	N.A.	N.A.	N.A.
S-20	N.A.	N.A.	N.A.	N.A.	-4.87*	-8.98*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-21	N.A.	N.A.	N.A.	N.A.	-1.76***	-6.11*	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
C	0.53	0.58	1.11	1.50	0.05	0.09	1.17	1.16	0.32	0.34	1.72***	1.66***	2.36**	2.07**	1.75***	1.70***	-0.15	-0.14

Contd….

Symbol	SYNDIBANK(12)		TATACHEM(15)		TATAMOTORS(11)		TATAPOWER(15)		TITAN(7)		UNIONBANK(11)	
	F	S	F	S	F	S	F	S	F	S	F	S
F-1	-40.43*	86.15*	-28.22*	39.37*	-22.17*	81.27*	-34.80*	75.21*	-12.67*	60.91*	-29.54*	91.97*
F-2	-16.34*	59.88*	-13.38*	20.79*	-9.23*	52.68*	-14.76*	42.87*	-6.26*	38.70*	-20.76*	51.09*
F-3	-12.96*	42.84*	-9.65*	16.97*	-4.70*	35.12*	-4.47*	30.57*	-6.19*	23.08*	-9.93*	41.02*
F-4	-8.04*	30.42*	-6.79*	10.69*	-4.98*	21.85*	-6.49*	18.28*	-2.45**	17.43*	-7.03*	31.91*
F-5	-8.84*	21.58*	-6.73*	7.47*	-6.59*	13.52*	-5.85*	11.31*	0.21	12.76*	-6.15*	24.27*
F-6	-8.19*	16.52*	-3.07*	6.92*	-5.04*	10.39*	-3.49*	11.05*	2.63*	9.95*	-4.32*	18.24*
F-7	-5.97*	13.84*	-5.19*	4.48*	-3.55*	7.35*	-2.93*	7.88*	3.25*	7.15*	-4.87*	14.49*
F-8	-6.76*	9.25*	-2.04**	5.47*	-2.14**	6.32*	-1.73***	6.25*	N.A.	N.A.	-5.33*	12.10*
F-9	-4.02*	7.83*	-2.46**	5.76*	-3.81*	2.02**	-1.95***	3.68*	N.A.	N.A.	-6.58*	6.42*
F-10	-5.20*	5.45*	-0.42	4.96*	-0.47	3.62*	-0.90	2.96*	N.A.	N.A.	-5.15*	3.09*
F-11	-3.12*	4.53*	-4.84*	3.21*	-2.60*	-0.21	0.75	2.11**	N.A.	N.A.	-2.03**	3.29*
F-12	-2.71*	2.47**	-6.35*	0.14	N.A.	N.A.	3.46*	2.50**	N.A.	N.A.	N.A.	N.A.
F-13	N.A.	N.A.	-7.30*	-1.90***	N.A.	N.A.	1.90***	2.24**	N.A.	N.A.	N.A.	N.A.
F-14	N.A.	N.A.	-5.41*	-3.47*	N.A.	N.A.	-1.63	-2.06**	N.A.	N.A.	N.A.	N.A.
F-15	N.A.	N.A.	-4.42*	-0.63	N.A.	N.A.	4.96*	0.04	N.A.	N.A.	N.A.	N.A.
F-16	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-17	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-18	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-19	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-20	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-21	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
F-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-1	21 .55*	-96.01*	15.19*	-47.66*	13.77*	-95.54*	15.88*	-88.42*	7.16*	-67.94*	15.71*	-11.21*
S-2	17.62*	-55.15*	12.96*	-21.04*	11.64*	-51.79*	11.87*	-44.67*	9.32*	-36.14*	20.99*	-48.98*
S-3	16.83*	-35.72*	8.72*	-14.52*	11.28*	-30.71*	10.71*	-25.65*	7.59*	-20.89*	14.13*	-36.55*
S-4	11.87*	-27.02*	8.54*	-9.23*	10.54*	-19.33*	12.05*	-12.87*	3.40*	-15.86*	9.35*	-29.09*
S-5	10.17*	-20.00*	8.00*	-4.49*	7.80*	-14.35*	7.75*	-9.45*	0.89	-11.48*	7.74*	-22.85*
S-6	9.68*	-14.59*	4.29*	-6.75*	5.54*	-11.27*	5.50*	-8.35*	-1.44	-7.65*	5.76*	-18.45*
S-7	8.44*	-11.03*	6.86*	-5.79*	4.57*	-7.97*	3.36*	-6.55*	-2.10**	-6.51*	4.70*	-13.21*
S-8	5.34*	-9.15*	2.80*	-4.93*	3.80*	-6.44*	1.65***	-5.20*	N.A.	N.A.	6.05*	-9.56*
S-9	4.40*	-6.28*	1.08	-6.63*	1.41	-5.55*	0.28	-5.00*	N.A.	N.A.	4.30*	-7.87*
S-10	3.69*	-6.80*	0.20	-4.91*	-0.13	-4.72*	-1.10	-3.40*	N.A.	N.A.	4.43*	-3.63*
S-11	2.25*	-5.53*	5.73*	-2.56**	-0.18	-4.06*	-1.77***	-3.16*	N.A.	N.A.	1.55	-1.75***
S-12	2.61*	-2.43**	4.32*	-1.68***	N.A.	N.A.	-3.57*	-2.49**	N.A.	N.A.	N.A.	N.A.
S-13	N.A.	N.A.	6.97*	-1.36	N.A.	N.A.	-2.34**	-2.39**	N.A.	N.A.	N.A.	N.A.
S-14	N.A.	N.A.	5.50*	-0.51	N.A.	N.A.	1.03	-0.43	N.A.	N.A.	N.A.	N.A.
S-15	N.A.	N.A.	4.67*	-0.66	N.A.	N.A.	0.50	-1.33	N.A.	N.A.	N.A.	N.A.
S-16	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-17	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-18	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-19	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-20	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-21	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-22	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-23	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-24	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
S-25	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
C	0.86	0.88	0.59	0.79	0.62	0.62	1.67***	1.81***	1.45	1.62	0.82	0.84

N.A. Not Applicable, * Significant at 1% level of significance, ** Significant at 5% level of significance and *** Significant at 10% level of significance.

Table VII Arbitrage Efficiency of the Indian Equity Futures Market

Symbol	Mean Equation																Variance Equation		
	C	DTE	MONAFT	MONOTH	TUEMOR	TUEAFT	TUEOTH	WEDMOR	WEDAFT	WEDOTH	THUMOR	THUAFT	THUOTH	FRIMOR	FRIAFT	FRIOTH	AR	C	ARCH(1)	GARCH(1)
Nifty	0.0075	0.0002	-0.0242*	-0.0121*	-0.0372*	-0.0309*	-0.03400*	-0.0103*	-0.0054**	-0.0079*	-0.0043***	0.00198	-0.0012	0.00538*	0.0126*	0.00903*	3	N.A.	N.A.	N.A.
ABB	0.0036***	4.88E-05*	-0.0002	-1.13E-04	0.0001	-0.0003	-0.0002	0.0002	-0.0004**	-0.0001	0.0005*	0.0002	0.0003***	0.0001	-0.0003*	-7.81E-05	12	4.85E-07*	0.4437*	0.4637*
ACC	-3.02E-04	-1.29E-04*	-1.89E-04*	-3.96E-05	1.65E-04**	-2.06E-05	3.66E-05	8.83E-05	-0.0002***	-8.57E-05	0.0002**	2.71E-05	5.82E-05	1.06E-04	-1.18E-04**	1.95E-05	15	3.07E-07*	0.3177*	0.5964*
ANDHRABANK	0.0013	-2.52E-04*	-0.0003*	-0.0002*	0.0002**	4.03E-05	0.0001	0.0005*	0.0004*	0.0005*	0.0009*	0.0007*	0.0008*	0.0006*	1.77E-04***	0.0004*	9	6.14E-07*	0.2896*	0.6112*
ARWINDMILL	-7.11E-04***	-1.84E-04*	-1.11E-04	-2.82E-05	0.0002**	6.73E-05	0.0002	0.0002	-1.37E-05	5.95E-05	0.0005*	4.34E-04*	4.60E-04*	4.25E-04*	1.86E-04*	3.97E-04*	12	4.24E-07*	2.80E-01*	0.6555*
ASHOKLEY	-0.0023	-0.0003*	-0.0002***	-4.39E-05	0.0002	-4.49E-05	1.30E-04	-3.13E-05	-4.50E-04**	-0.0003	0.0002	-0.0001	-3.87E-05	0.0004*	0.0002***	4.02E-04*	9	7.80E-07*	0.2404*	0.5821*
BAJAJAUTO	2.25E-03	-1.28E-05***	-6.46E-05	-1.18E-05	-4.38E-05	-2.27E-04**	-2.00E-04***	-2.11E-04***	-2.36E-04**	-2.23E-04***	-8.43E-05	-0.0002***	-1.43E-04	2.44E-04*	2.18E-04*	1.89E-04**	9	4.07E-07*	0.4233*	0.5656*
BANKBARODA	1.06E-03**	-2.18E-04*	-0.0004*	-1.52E-04**	4.31E-06	-2.65E-04**	-9.66E-05	5.70E-05	-2.70E-05	-1.61E-05	1.89E-04	-1.62E-04	6.69E-05	4.15E-04*	9.75E-05	2.26E-04**	5	5.59E-07*	0.2502*	0.6240*
BANKINDIA	0.0004	-0.0002*	-0.0004*	-0.0003*	4.44E-05	-0.0002***	-2.45E-05	-0.0002	-0.0003*	-0.0003***	0.0002	-4.31E-05	4.90E-06	-3.91E-05	-0.0004*	-0.0002***	16	6.66E-07*	0.2696*	0.6092*
BEL	0.0098	-1.57E-04*	-0.0002*	-1.67E-04*	0.0005*	0.0003**	0.0003*	4.17E-05	-0.0002	-0.0002	0.0005*	0.0002	0.0004*	0.0005*	0.0004*	0.0005*	7	4.36E-07*	0.3520*	0.6088*
BHEL	0.0012**	-3.14E-05*	-0.0003*	-6.10E-05	-1.37E-05	-0.0003*	-0.0001	-7.36E-05	-0.0003*	-0.0001	2.94E-05	-0.0002**	-6.49E-05	7.79E-05	-4.82E-05	7.20E-05	11	3.86E-07*	0.3310*	0.5824*
BPCL	0.0021	-3.16E-05*	-0.0002**	-0.0001**	1.97E-05	-0.0003**	-9.77E-05	-0.0001	-0.0004*	-0.0002	-4.81E-05	-0.0002***	-0.0002	-1.50E-05	-0.0002*	-0.0001	12	5.32E-07*	0.3528*	0.5678*
CANBANK	0.0003	-0.0002*	-0.0003*	-0.0001***	-0.0002	-0.0004*	-0.0004*	-0.0001	-0.0004*	-0.0003**	0.0003**	-0.0001	2.27E-05	-3.21E-05	-0.0004*	-2.26E-05	11	5.26E-07*	0.2937*	0.6141*
CENTURYTEX	-6.83E-05	-0.0002*	-0.0004*	-0.0001	0.0001	-0.0002	-0.0001	-0.0002	-0.0005*	-0.0003***	0.0002	-4.88E-05	-1.45E-05	0.0003**	5.11E-05	0.0002	15	3.48E-07*	0.2383*	0.6877*
COLGATE	0.0006	-0.0002*	6.24E-05	2.64E-05	0.0005*	0.0002	0.0003***	0.0003	-0.0002	-0.0001	8.13E-05	0.0002	4.25E-05	0.0003	-9.58E-05	7.85E05	11	5.70E-07*	0.3131*	0.6181*
CUMMINSIND	0.0009***	-0.0002*	-0.0004*	-0.0003*	0.0001	-0.0003	-0.0002	-0.0005**	-0.0009*	-0..0007*	-0.0004**	-0.0007*	-0.0005**	-0.0003***	-0.0003*	-0.0003	13	6.45E-07*	0.2472*	0.6531*
DIVISLAB	0.0006	-0.0003*	-0.0002	-0.0001	0.0002	0.0001	0.0002	0.0014*	0.0013*	0.0013*	0.0011*	0.0010*	0.0010*	0.0019*	0.0018*	0.0018*	9	1.06E-08*	0.3495*	0.7706*
ESCORTS	-0.0013*	-0.0001*	-0.0004*	-0.0003**	3.00E-05	-0.0004***	-0.0002	-1.21E-05	-0.0003	-0.0001	0.0003	0.0001	0.0002	-9.03E-05	-0.0003*	-0.0002	8	6.59E-07*	0.2072*	0.6889*
ESSAROIL	-0.0006**	-0.0001*	-0.0003***	-0.0001	0.0002	-0.0003	3.03E-05	0.0003***	-0.0001	-6.47E-05	0.0006*	0.0003	0.0003***	0.0001	-0.0003***	-9.79E-06	18	9.16E-07*	0.2605*	0.6276*
GAIL	0.0022	-8.90E-05*	-0.0005*	-0.0003*	0.0002	-0.0001	1.96E-05	-0.0002	-0.0004*	-0.0002***	3.36E-05	-0.0003**	-9.56E-05	0.0002**	-7.99E-05	0.0001	7	4.28E-07*	0.3213*	0.6199*
GNFC	0.0001	-0.0003*	-0.0002	-4.41E-05	0.0001	-8.65E-05	2.72E-05	-1.86E-06	-0.0001	4.62E-06	0.0007*	0.0003	0.0005*	0.0003***	-2.98E-05	0.0002	11	6.59E-07*	0.2909*	0.6352*
GRASIM	0.0014***	-7.04E-05*	-3.17E-05	3.49E-05	0.0002*	0.0001	0.0002***	0.0005*	0.0002***	0.0003*	0.0003*	0.0001	0.0002**	7.19E-05	3.20E-05	0.0001***	18	3.81E-07*	0.3298*	0.5967*
HCLTECH	0.0009	7.36E-05*	-0.0003*	-0.0002*	3.09E-05	-0.0002	-5.66E-05	-3.96E-05	-0.0004*	-0.0003***	-5.06E-05	-0.0002	-6.05E-05	-3.42E-05	-0.0003*	-0.0001	9	5.82E-07*	0.2992*	0.5941*
HEROHONDA	0.0028	-5.65E-05*	-0.0002*	-5.22E-05	6.21E-05	-0.0003**	-6.18E-05	-0.0001	-0.0006*	-0.0004*	-0.0002	-0.0006*	-0.0004*	0.0001	-0.0001***	2.78E-05	11	4.92E-07*	0.3356*	0.5624*
HINDPETRO	-0.0007	-0.0002*	-0.0003*	-0.0001**	0.0002**	-4.29E-05	9.37E-05	3.68E-05	-0.0002**	-0.0001	8.71E-05	-0.0001	3.91E-05	0.0002*	4.22E-05	0.0002***	16	3.64E-07*	0.3601*	0.5952*
HINDUNILVR	0.0016	-0.0002*	-4.15E-05	-7.78E-05	0.0002*	6.79E-05	9.37E-05	-4.60E-05	-9.71E-05	-5.34E-05	0.0001	-0.0001	-2.93E-05	7.18E-05	-5.37E-05	6.14E-05	13	3.48E-07*	0.3075*	0.5600*
ICICIBANK	0.0013	6.73E-05*	-0.0003*	-8.13E-05	0.0001	-8.71E-05	-1.22E-05	-4.03E-05	-6.19E-05	1.01E-05	-0.0001	-0.0004*	-0.0003*	-0.0002*	-0.0006*	-0.0003*	12	4.81E-07*	0.3731*	0.5373*
IDBI	-0.0009	-0.0001*	-0.0004*	-0.0003*	-0.0003*	-0.0005*	-0.0003**	1.76E-05	-0.0003	-0.0002	0.0002	0.0001	0.0001	0.0002	-7.16E-05	0.0001	17	5.54E-07*	0.2663*	0.6059*
IDFC	-0.0002	-0.0002*	-0.0001	-0.0001	-0.0001	6.07E-05	-3.45E-05	5.48E-05	-0.0002	1.31E-05	0.0002	0.0002	0.0003***	0.0006*	0.0006*	0.0006*	13	4.54E-07*	0.2822*	0.6399*
IPCL	-0.0062	-0.0002*	-0.0003*	-0.0002*	4.77E-05	-0.0002***	-6.14E-05	-2.09E-05	-0.0004*	-0.0002**	-6.94E-05	-0.0002*	-0.0001	0.0002**	1.58E-05	0.0002**	17	2.81E-07*	0.2873*	0.6541*
JETAIRWAYS	0.0011	6.55E-05*	-0.0003*	-0.0002*	-9.64E-05	-0.0002	-0.0002	-0.0002	-0.0005*	-0.0003***	-0.0002	-0.0006*	-0.0004**	-0.0006*	-0.0007*	-0.0006*	11	5.51E-07*	0.3624*	0.5734*
KTKBANK	0.0014	-0.0002*	-0.0005*	-0.0003*	0.0002	9.84E-05	0.0001	0.0006*	0.0002	0.0004**	0.0003	0.0002	7.47E-05	0.0001	-0.0003**	-2.28E-05	22	7.52E-07*	0.2807*	0.6088*
MARUTI	-0.0005	-4.88E-05*	-0.0002*	-0.0001*	-6.12E-05	-0.0003*	-0.0002**	-5.08E-05	-0.0002**	-8.71E-05	-4.42E-05	-0.0003*	-0.0001	5.56E-05	1.42E-05	6.28E-05	10	3.47E-07*	0.3583*	0.5601*
MATRIXLABS	0.0041	-0.0002*	-0.0005*	-0.0004*	-0.0001	-0.0003	-0.0002	-0.0001	-0.0005*	-0.0004***	-0.0003***	-0.0003**	-0.0002	-7.05E-05	-6.41E-05	2.66E-06	8	3.67E-07*	0.2668*	0.6847*
MTNL	1.6393	7.47E-05*	-1.23E-05	4.02E-05	-1.45E-05	-6.82E-05	-0.0001	-7.48E-05	-0.0001	-0.0001	-4.90E-05	1.91E-05	5.52E-05	3.46E-05	3.65E-05	3.88E-05	15	4.92E-07*	0.2719*	0.5859*
NATIONALUM	-0.0013	-0.0002*	-0.0004*	-0.0002*	-0.0002	-0.0002	-0.0001	0.0002	2.09E-06	9.13E-05	0.0003***	0.0003**	0.0003*	0.0005*	0.0003*	0.0004*	12	5.89E-07*	0.3320*	0.6095*
NDTV	-0.0007***	-0.0002*	-0.0004*	-0.0002**	6.87E-05	-0.0004**	1.30E-05	0.0002	-0.0001	0.0002	0.0004***	0.0003***	0.0003	0.0001	-0.0001	0.0002	20	6.97E-07*	0.2772*	0.6466*
NTPC	0.0018***	-0.0002*	-0.0002*	-0.0001**	5.40E-05	8.12E-05	9.29E-05	0.0002	1.82E-05	0.0001	9.21E-05	-7.49E-05	-1.53E-05	0.0003*	0.0001***	0.0003*	13	3.40E-07*	0.2811*	0.5623*
ORIENTBANK	0.0007	-0.0001*	-0.0004*	-0.0002*	0.0001	-0.0003**	-9.02E-05	-6.86E-05	-0.0002	-0.0002	2.35E-05	-0.0002***	-7.51E-05	7.06E-05	-0.0002*	-0.0001	12	3.94E-07*	0.2669*	0.6637*
PNB	0.0008	-0.0001*	-0.0002**	-1.59E-05	0.0002	-0.0002	2.03E-05	-5.15E-05	-0.0003**	-0.0002	0.0002	-2.07E-05	0.0001	0.0003*	-0.0001***	6.44E-05	12	4.29E-07*	0.3288*	0.5915*
POLARIS	-0.0022*	-0.0002*	-0.0003*	-0.0002*	5.56E-05	-0.0002**	-4.72E-05	0.0001	-0.0003*	-9.89E-05	0.0004*	-3.03E-05*	0.0001	0.0003*	-0.0002*	6.40E-05	18	4.44E-07*	0.2308*	0.6765*
RELCAPITAL	-0.0017*	-0.0001	-0.0004*	-0.0002*	-9.20E-05	-0.0002***	-0.0002	-0.0003**	-0.0003**	-0.0002	-7.74E-05	-0.0003**	-0.0002	0.0001	-2.43E-05	0.0002***	22	4.18E-07*	0.3047*	0.6034*
RELIANCE	0.4771	-0.0001*	-0.0002*	-9.28E-05*	3.31E-05	-0.0001**	-2.48E-05	-0.0002*	-0.0003*	-0.0003*	7.36E-05	-1.66E-05	5.08E-05	9.32E-05	-8.94E-05***	5.92E-05	14	2.47E-07*	0.3802*	0.4962*
SBIN	-0.0010	-0.0002*	-0.0002*	-8.33E-05**	0.0002*	-2.69E-05	9.04E-05	6.10E-05	-0.0002**	6.29E-08	2.40E-05	-6.62E-05	-2.28E-05	8.74E-05	-9.37E-05**	6.81E-05	17	2.38E-07*	0.3418*	0.5640*
SRF	-5.07E-05	-0.0002*	-0.0001	-1.63E-05	0.0001	-0.0002	9.11E-05	-0.0002	-0.0006*	-0.0003	3.94E-05	4.45E-05	1.16E-05	0.0002	-1.77E-05	0.0001	14	4.57E-07*	0.2623*	0.6736*
SYNDIBANK	0.0002	-0.0002*	-0.0004*	-0.0003*	-0.0003*	-0.0006*	-0.0005*	-0.0001	-0.0006*	-0.0004	8.13E-06	-0.0001	-9.85E-05	-4.34E-05	-0.0005*	-0.0003**	16	7.74E-07*	0.3005*	0.5966*
TATACHEM	0.0029***	-0.0002*	-0.0004*	-0.0003*	0.0006*	0.0002	0.0003***	0.0003***	-0.0001	0.0001	0.0004**	-8.91E-05	0.0002	0.0002	-4.67E-06	1.31E-05	11	4.27E-07*	0.2866*	0.6597*
TATAMOTORS	-0.0028	-7.47E-05*	-0.0001**	-0.0001*	5.38E-05	-0.0002***	-2.22E-05	-6.23E-05	-0.0004*	-0.0002***	6.33E-05	-3.60E-05	-5.09E-05	-4.04E-05	-0.0002*	-0.0001	12	3.37E-07	0.3608*	0.5425*
TATAPOWER	7.37E-05	-0.0001*	-0.0004*	-0.0002*	0.0003*	2.71E-05	0.0002	0.0003**	-3.48E-05	0.0001	0.0004*	0.000	0.0002**	0.0002*	-6.95E-05	2.16E-05	13	3.98E-07*	0.2991*	0.6212*
TITAN	-0.0013*	-0.0001*	-0.0003*	-0.0002*	0.0003*	-9.82E-06	0.0001	0.0002	-0.0003	6.07E-05	0.0001	-3.91E-05	-2.00E-05	0.0003***	3.01E-05	0.0003*	17	4.43E-07*	0.2797*	0.6341*
UNIONBANK	-0.0009	-0.0002*	-0.0004*	-0.0003*	3.14E-05	-6.28E-05	-4.76-05	0.0003**	0.0002	0.0002***	0.0003**	-0.0002	2.18E-05	0.0002***	-0.0002*	4.65E-05	16	6.31E-07*	0.2824*	0.6261*

C= Constant, DTE= Days to Expiry, MONAFT= Dummy for Monday Afternoon Trading Session, MONOTH= Dummy for Monday Trading Session other than Morning and Afternoon. TUEMOR= Dummy for Tuesday Morning Session, TUEAFT= Dummy for Tuesday Afternoon Trading Session, TUEOTH= Dummy for Tuesday Trading Session other than Morning and Afternoon, WEDMOR= Dummy for Wednesday Morning Session, WEDAFT= Dummy for Wednesday Afternoon Trading Session, WEDOTH= Dummy for Wednesday Trading Session other than Morning and Afternoon, THUMOR= Dummy for Thursday Morning Session, THUAFT= Dummy for Thursday Afternoon Trading Session, THUOTH= Dummy for Thursday Trading Session other than Morning and Afternoon, FRIMOR= Dummy for Friday Morning Trading Session, FRIAFT= Dummy for Friday Afternoon Trading Session, FRIOTH= Dummy for Friday Trading Session other than Morning and Afternoon, AR= Significant order of Auto Regression, * Significant at 1% level of significance, ** Significant at 5% level of significance and *** Significant at 10% level of significance.

Appendix A
List of Equity Index and Stocks in the Sample

Symbol	Name of the Underlying Index/Stock
NIFTY	S&P CNX NIFTY
ABB	ABB Ltd.
ACC	Associated Cement Co. Ltd.
ANDHRABANK	Andhra Bank
ARVINDMILL	Arvind Mills Ltd.
ASHOKLEY	Ashok Leyland Ltd.
BAJAJAUTO	Bajaj Holdings and Investment Ltd.
BANKBARODA	Bank of Baroda
BANKINDIA	Bank of India
BEL	Bharat Electronics Ltd.
BHEL	Bharat Heavy Electricals Ltd.
BPCL	Bharat Petroleum Corporation Ltd.
CANBK	Canara Bank
CENTURYTEX	Century Textiles Ltd.
COLGATE	Colgate Palmolive (India) Ltd.
CUMMINSIND	Cummins India Ltd.
DIVISLAB	Divi's Laboratories Ltd.
ESCORTS	Escorts India Ltd.
ESSAROIL	Essar Oil Ltd.
GAIL	GAIL (India) Ltd.
GNFC	Gujarat Narmada Fertilizer Co. Ltd.
GRASIM	Grasim Industries Ltd.
HCLTECH	HCL Technologies Ltd.
HEROHONDA	Hero Honda Motors Ltd.
HINDUNILVR	Hindustan Unilever Ltd.
HINDPETRO	Hindustan Petroleum Corporation Ltd.
ICICIBANK	ICICI Bank Ltd.
IDBI	Industrial Development Bank of India Ltd.
IDFC	Infrastructure Development Finance Company Ltd.
IPCL	Indian Petrochemical Corpn. Ltd.
JETAIRWAYS	Jet Airways (India) Ltd.
KTKBANK	The Karnataka Bank Ltd.
MARUTI	Maruti Suzuki India Ltd.
MATRIXLABS	Matrix Laboratories Ltd.
MTNL	Mahanagar Telephone Nigam Ltd.
NATIONALUM	National Aluminium Co. Ltd.
NDTV	New Delhi Television Ltd.
NTPC	NTPC Ltd.
ORIENTBANK	Oriental Bank of Commerce
PNB	Punjab National Bank
POLARIS	Polaris Software Lab Ltd.
RELCAPITAL	Reliance Capital Ltd.
RELIANCE	Reliance Industries Ltd.
SBIN	State Bank of India
SRF	SRF Ltd.
SYNDIBANK	Syndicate Bank
TATACHEM	Tata Chemicals Ltd.
TATAMOTORS	Tata Motors Ltd.
TATAPOWER	Tata Power Co. Ltd.
TITAN	Titan Industries Ltd.
UNIONBANK	Union Bank of India