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A STUDY ON EXAMINING THE INFLUENCE OF DIFFERENT DOMESTIC AND FOREIGN FINANCIAL MARKETS ON VOLATILITY OF INDIAN STOCK MARKET

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ABSTRACT

In this paper an attempt has been made to examine influence of innovation in different segments of domestic financial system and foreign stock market on stock market volatility in India and test for asymmetry in Indian stock market volatility using data on daily closing prices of S&P CNX Nifty, NASDAQ composite index, spot bullion in Mumbai, INR-USD daily spot exchange rate and daily net FII turnover data in EGARCH(1,1) specification. The study shows that stock market returns in India is significantly influenced by its own past innovation rather than past innovation in foreign exchange market and current innovation in gold bullion market. Further influence of the past innovation in foreign stock market on domestic stock market return is significantly larger than its own past innovation. Therefore, domestic stock market is influenced more by innovations in the foreign stock market than different segments of domestic financial market during the period under study. The study also reveals that there is asymmetry or leverage effect in stock return volatility in India which might be the result of innovation in domestic capital market and foreign stock market with varying degree of importance.

I. Introduction:

Stock market assists business and Government in raising funds, and investors to maximize their returns subject to their tolerance for risk. Actually primary market performs the economic function of transfer of funds between the public and the industry. On the other, an organized secondary market, where already issued securities are traded, facilitates and boosts investors' participation as the market provides liquidity for the investors. A vibrant secondary market with high return and low risk also boosts up primary market in generating new funds. But volatile in secondary market lowers the investors' confidence and disturbs the primary market resulting into reduced collection of new funds by the issuers, all implying market inefficiency. Since mid-1990s, economic liberalization and globalization of Indian economy have increased the degree of integration of the Indian capital market with the world market and that necessitate to undertake major transformations and reforms in the stock markets of the country in terms of establishment of SEBI, introduction of disclosure norms, dematerialization of securities, online trading, increasing participation of foreign institutional investors, value at risk based margin, reduction in rolling settlement period from T+5 to T+2 and so on. With these, volume of trading has increased significantly making Indian capital market comparable with that of the other developed markets and also the largest among emerging markets. But these events have also led to manifold increase in the price-volume volatility of the market causing a more risky situation to the market participants. Economic liberalization has not only increased the external integration of the Indian capital market with its foreign counterpart but also has impact on the relation between the stock market and other components of domestic financial system. Globalization has opened up the avenues for investors to greater portfolio diversification across countries so that risks can be reduced. Improved technology has also speeded up this process of portfolio diversification. Common news impact has also an important role on financial market linkages not only across countries but also across asset types.

Economic activities in a country are very much influenced by the behavior of real exchange rate. A fall in real exchange rate (devaluation) increases the competitiveness of domestic goods against foreign goods and thus has a positive effect on country's balance of trade. This in turn increases domestic aggregate demand leading to higher level of output. Again there is influence of economic activities on stock prices. The expected future cash flows from stock

depends on future domestic and foreign aggregate demand. Therefore while determining prices of stocks, present and future expected economic activities should be taken into account. In India and also in the international markets bullion (both gold and silver) is becoming an attractive area of investment. Higher volatility in stock market lowers common investors' confidence in it. Further almost steady increase in bullion prices may influence the common investors to reshuffle their portfolio in favour of bullion leading to inter market transfer of fund.

The knowledge regarding domestic and foreign stock market interactions and linkages of domestic stock market with other components of domestic financial system can help investors to carry out more efficient hedging and trading strategies. This knowledge regarding the linkages between markets (not only in their levels but also corresponding to their volatilities) is not only important for portfolio managers for risk reduction, but it is also important for derivative dealers for valuation of derivative securities whose payoffs are dependent on prices of multiple assets. Further as volatility linkages influence investment and risk management decisions, they should also be taken into account while setting regulatory policy.

Though there are different literatures showing that globally financial markets co-vary at a greater degree and there are asymmetries in volatility transmission as a result of some common news impact like 1987 stock market crash, Asian currency crisis etc., there are also literatures showing that such linkages exist even in normal situation. In this study we try to explore the impact of innovation in the different segments of domestic financial market in India, namely foreign exchange market, bullion market and capital market (represented by change in the growth rate of net FII turnover), and also foreign stock market on the volatility of domestic stock market.

II. Brief literature survey:

Following the pioneering work of Mandelbrot (1963) and Fama (1965) various studies have documented the different features of stock market volatility. It has been empirically found that the volatilities in financial markets are not constant, i.e., they are 'time varying' and also exhibit positive serial correlation or 'volatility clustering' (i.e., changes in volatilities are nonrandom). It has also been observed that volatility of returns is persistent in nature (Bollerslev, Chou and Kroner, 1992) as it is characterized by long memory process. For capturing volatility clusters in financial time series, the autoregressive conditional heteroskedastic (ARCH) models (Engle, 1982) and generalized ARCH (GARCH) models (Bollerslev, 1986) have been widely used. Black (1976) first documented that, changes in volatility were found to be negatively correlated with changes in the stock prices, i.e., volatility was higher in a falling market than in a rising market. Later Christie (1982) also supported this asymmetry or leverage effect. There are varieties of techniques which have been used to study the asymmetric volatility linkages such as cross market correlation coefficients, co-integration, GMM, VAR, ARCH, and GARCH family of models. Three famous GARCH formulations describing this asymmetry were Exponential GARCH model (Nelson, 1991), Threshold GARCH model (Golsten et al., 1993) and Power GARCH model (Ding et al., 1993). Engle.R.F and Ng.V.K.(1993) have recommend the news impact curve to measure how volatility estimates incorporate new information. Using some new diagnostic tests, authors have shown that the model proposed by Golsten, Jagannathan and Runkle is the best parametric model to capture asymmetry.

There are few studies conducted on modeling stock return volatilities in India. Pandey (2002) has shown that extreme value estimators can be safely used in general for estimating volatility of liquid assets except certain estimators in some estimation period. Comparing the estimation and forecasting ability of various estimators and models on the basis of four different criteria related to bias and efficiency, Pandey (2005) has later shown that extreme value estimators performed better than conditional volatility models. Karmakar (2005) has used conditional volatility models to estimate volatility in Indian stock market both at macro and micro level and observed that GARCH (1,1) model provided reasonably good forecast. In their attempt to model daily volatility in the stock index return of NSE in India, Banerjee and Sarkar (2006) have shown that asymmetric GARCH model is superior to Historical Average or EWMA model in predicting volatility.

There are mainly two types of literature addressing the issue of volatility transmission. Few investigate the transmission mechanism of price and volatility spillovers across the major stock markets in the world with varying results due to specific techniques and data used. King and Wadhwani (1990) have used high-frequency data in their contagion model for the New York, London and Tokyo

stock markets and found evidence in support of their model. Karolyi (1995) has used bivariate GARCH framework and finds short-lived price spillovers between the New York and Toronto stock markets. Koutmos.G. and Booth.G.G. (1995) have found the evidence of asymmetric volatility transmission across New York, Tokyo and London stock markets using an extended multivariate EGARCH model on the basis of daily open to close return. They have also analyzed the interaction and linkages among the markets before and after 1987 crash and found the evidence of more interdependence between the markets in the post crash period. Koutmos (1999) has tested and confirmed the hypothesis that stock index returns adjust asymmetrically to past information in emerging stock market, i.e., conditional variance is asymmetric due to faster adjustment of prices to past negative returns which is an alternative explanation for the leverage effect. Ng.A. (2000) has developed a volatility spillover model to compare the magnitude and changing nature of volatility spillovers from Japan (regional market) and US (world market) to the Pacific-Basin markets and found that though both regional and world factors were important source of volatility spillovers to the Pacific-Basin region, world factors were more influential. Author have also found that important liberalization events, currency return fluctuations, number of DR listings, trade size and closed-end country fund premium affect the relative importance of the regional and world market factors. Few other literatures investigate the volatility spillovers between different components of the financial system or different asset types of a country to address the issue of domestic financial integration. Flemming et al. (1998) have used GMM to estimate stochastic volatility representation of their speculative trading model for predicting volatility linkages between stock, bond and money markets. Authors have found support of their observations regarding strong volatility linkages between the markets which become stronger after 1987 stock market crash. Ebrahim(2000) has used trivariate GARCH model while investigating information transmission between foreign exchange (U.S. dollar /Canadian dollar, Deutsche mark, and Japanese yen) and associated money markets and has found strong evidence of volatility spillovers in all the three models, and in some cases volatility spillovers have been found to be asymmetric. The volatility spillovers from Eurocurrency to foreign exchange markets have been found to be small and compared to Euro Mark and Euro Yen markets, Euro Canada market has found to be more susceptible to exchange rate shocks. However, author has found low pair-wise contemporaneous correlations between innovations for all the three models, which indicate, common factors explain a small fraction of the total variation in the innovations. According to author this is either because investors process information from other markets gradually or spillovers are caused by market contagion effects. Badrinath H.R. and Apte P.G.(2005) using a multivariate EGARCH framework have found asymmetric volatility spillover across stock, foreign exchange and call money markets in India though with varying degree. Authors have found stock market having greatest asymmetric impact on the other two markets.

III. Research gap:

From the review of existing literature it seems to us that, in India there is a scope for conducting fresh research in the post liberalization period regarding the influence of different segments of domestic financial system and foreign stock market on the volatility of Indian stock market. Further, to the best of our knowledge, there is hardly any study examining the influence of bullion market on domestic stock market volatility using daily data. Moreover, our study uses daily data covering quite a long period of time and therefore, can examine both short-term and long-term changes, if any, in the Indian stock market volatility.

IV. Objectives and Significance of the Study:

Our main objective is to examine the following issues related to stock market volatility in India during the study period spanning from 06.05.1998 to 18.05.2010 using daily frequency data.

1. Is there any influence of innovation in different segments of domestic financial market namely, foreign exchange market, bullion market and net FII turnover, on stock market return volatility in India?
2. Is the domestic stock market is more influenced by different segments of domestic financial market than the foreign stock market?
3. Is there any evidence of asymmetry or leverage effect in stock market volatility in India during the study period?
4. If there is any evidence of asymmetry, then is the domestic financial integration or external financial integration or both, responsible for this observed asymmetry?

This study examines the influence of different components

of domestic financial market and foreign stock market on the domestic stock market volatility, which is very important for investment and risk management decisions while hedging against shocks generated across markets. The results of the study also may help market regulators in setting regulatory policy considering the influence of volatility linkages across different markets on investment and risk management decisions.

V. Plan of the paper:

The remaining portion of the study is organized as follows. Section VI outlines the data used in the study along with the study period. Section VII details the hypotheses to be tested, and econometric and statistical techniques to be applied in testing the hypotheses. Section VIII enumerates the analysis of the data and findings of the study and finally Section IX concludes the study and presents directions for future research.

VI. Study period and Data Base:

The study covers relatively a long period from May 6, 1998 to May 18, 2010 when major changes were brought about in the structure and functioning of the Indian stock market. S&P CNX Nifty index is used as the representative of Indian stock market and NASDAQ composite index is used as that of the foreign stock market, the data of both of which are obtained from Capitaline. INR-USD daily spot exchange rate is used as the representative of the foreign exchange market and daily closing spot price of gold bullion at Mumbai is used as that of the bullion market in India. Daily return series of all the above variables contain total 2994 data points during the study period. Further, daily net turnover of FII is used as the representative of the capital market scenario, the data for which is available only for the period 17.04.2006 to 18.05.2010. Daily FII turnover data is obtained from NSE Website. Here we get only 973 data points. Data for INR-USD daily spot exchange rate and daily closing price of gold bullion at Mumbai are obtained from daily issues of Economic Times, Mumbai. Daily data are processed using Microsoft Excel.

VII. Methodology:

One interesting feature of the asset prices is that 'bad' news or negative shocks seemed to affect volatility more than 'good' news or positive shocks. Strong negative correlation between current stock return and future volatility is very common. The tendency for volatility to decline in a rising market and increase in a falling market is called asymmetry or often leverage effect. In the Indian context, we try to capture the asymmetric impact of innovation in different segments of domestic financial Market, namely foreign exchange market, bullion (gold) market, capital market (change in growth rate of net FII turnover) and innovation in foreign stock market on the volatility of domestic stock market return following the EGARCH specification of Nelson (1991).

We have set the following hypotheses for accomplishing the objectives of the study.

(i) Innovation in different segments of domestic financial market namely, foreign exchange market, gold bullion market and net FII turnover have significant influence on stock market return volatility in India.

(ii) Domestic stock market is influenced more by innovations in different segments of domestic financial market compared to the foreign stock market.

(iii) There is asymmetry or leverage effect in stock market volatility in India.

(iv) Both internal and external financial integration are responsible for the asymmetry or leverage effect in stock market volatility in India.

We use econometric analysis package EViews for testing various statistical properties of the return and volatility data and to test above hypotheses regarding stock market volatility in India, in EGARCH(1,1) specification.

Volatility has been estimated on return $(R_{S,t})$ which is represented as: $R_{S,t} = \log_e(P_{S,t} / P_{S,t-1})$ (1)

Where $R_{S,t}$ is continuous daily return in Nifty at time t, and $P_{S,t-1}$ and $R_{S,t}$ are two successive daily closing prices of Nifty. Returns in all other markets are similarly calculated. Change in FII growth rate is measured as:

$RF_t = GF_t - GF_{t-1}$ (2)

Where RF_t is the change in FII growth rate at time t, GF_{t-1} and GF_t are two successive daily growth rate of FII and $GF_t = (FII_t - FII_{t-1})/FII_{t-1}$, FII_{t-1} and FII_t are two successive daily net FII turnovers.

In the standard GARCH model one problem is that it requires the assurance of all of the estimated coefficients to be positive. The advantage of the EGARCH specification of Nelson (1991) is that without complex parameter restrictions it ensures nonnegetivity of conditional variance at all times but having asymmetrical responses of asset returns to both, positive and negative innovations in return

generating process.

$R_{S,t}$ being the daily return at time t, let Ψ_{t-1} be the information set containing the realized values of all relevant variables up to time t-1. As investors know the information in Ψ^{t-1} while making their investment decision at the period t-1, the relevant mean return is the conditional expected value of $R_{S,t}$ given Ψ_{t-1} and relevant volatility is the conditional variance of $R_{S,t}$ given Ψ_{t-1} which two are denoted respectively by

$m_{S,t} = E(R_{S,t} / \Psi_{t-1})$ and $h_{S,t} = Var(R_{S,t} / \Psi_{t-1})$. Therefore return series $R_{S,t}$ can be defined as:

$$R_{S,t} = E(R_{S,t}/\Psi_{t-1}) + \varepsilon_{S,t} = m_{St} + \varepsilon_{S,t} \quad (3)$$

Where $\varepsilon_{S,t} = R_{S,t} - m_{S,t}$ is the unexpected return at time t. A positive $\varepsilon_{S,t}$ means an unexpected increase in price suggesting the arrival of good news while a negative $\varepsilon_{S,t}$ means an unexpected decrease in price suggesting the arrival of bad news. A large value of $|\varepsilon_{S,t}|$ implies the 'significant' or big news producing a large unexpected change in price. Actually $\varepsilon_{S,t}$ may be termed as white noise.

Following Nelson (1991) EGARCH (1,1) model is represented as:

$$R_{S,t} = a_{S,0} + a_{S,1}R_{S,t-1} + a_{E,1}R_{E,t-1} + \varepsilon \quad S,t \quad (4)$$

$\varepsilon_{S,t} / \psi_{t-1}$ follows $N(0, h_{S,t})$

$$\log(h_{S,t}) = \alpha_{S,0} + \beta_{S,1}[|\varepsilon_{S,t-1}/\sqrt{h_{S,t-1}}| - E|\varepsilon_{S,t-1}/\sqrt{h_{S,t-1}}|] + \gamma_{S,1}(\varepsilon_{S,t-1}/\sqrt{h_{S,t-1}}) + \delta_{S,1}\log(h_{S,t-1}) \quad (5)$$

Equation (4) is the conditional mean equation for Nifty return series where Nifty return $R_{s,t}$ is influenced by its own past innovations $R_{s,t-1}$ and also by past innovations coming from the market for exchange rate $R_{E,t-1}$. Conditional on Ψ_{t-1}, is assumed to be normally distributed with zero mean and variance of $h_{S,t}$.

Equation (5) is the conditional variance equation of Nifty returns reflecting the EGARCH (1,1) representation of the variance of $\varepsilon_{S,t}$ Since the conditional variance equation is in log-linear form, regardless of the magnitude of $\log(h_{s,t})$, the implied value of $h_{s,t}$ can never be negative. So it permits the coefficients to be negative. The variance is conditional both on its own past values and past values of the standardised residual $\varepsilon_{S,t-1} / \sqrt{h_{S,t-1}}$. As the standardised value of $\varepsilon_{S,t-1}$ is a unit free measure, according to Nelson, this allows for a more natural interpretation of the size and persistence of shocks. The persistence of volatility in stock return is measured by $\delta_{S,1}$. If $\delta_{S,1}$ is significantly large the volatility is persistent in nature. The EGARCH model allows for leverage effects. Given the value of $h_{s,t-1}$, a unit increase in $\varepsilon_{S,t-1}$ will induce a change in the log of the conditional variance by $\beta_{S,1} + \gamma_{S,1}$ while a unit decrease in $\varepsilon_{S,t-1}$ will induce a change in the log of the conditional variance by $\beta_{S,1} - \gamma_{S,1}$. T he EGARCH model can be estimated by maximum likelihood by specifying a density for standardised residual.

The same model is used to estimate asymmetric impact of innovation in bullion market, foreign stock market (NASDAQ Return), and change in rate of growth of net FII turnover separately on the domestic stock market, but with a difference in the case of bullion market and net FII, as here we estimate the asymmetric impact of innovation in current period bullion market and change in net FII growth rate in current period, on the domestic stock market. Since daily FII turnover data is available only from 17.04.2006, we are able to estimate the impact of change in FII growth rate on stock market volatility from that period only.

To estimate the asymmetric impact of innovation in bullion market, foreign exchange market and foreign stock market together, on the domestic stock market we make only the necessary change in the mean equation (the form of the conditional variance equation remaining same) of the model as shown below:

$$R_{S,t} = a_{S,0} + a_{S,1}R_{S,t-1} + a_G R_{G,t} + a_{E,1}R_{E,t-1} + a_{Q,1}R_{Q,t-1} + \varepsilon \quad (6)$$

$\varepsilon_{S,t} / \psi_{t-1}$ follows $N(0, h_{S,t})$ where $R_{G,t}$ and $R_{Q,t-1}$ are current return in gold bullion market and lag return in NASDAQ respectively.

VIII. Data analysis and Findings:

First we examine the stationarity of each time series of returns with the help of unit root test using Augmented Dickey Fuller (ADF) (1979) test statistic. The results reject the hypotheses of presence of unit root in each series and therefore the return series under examination are all found to be stationary. From the descriptive statistics of all the return series presented in Table-A and Table-B, it is observed that in each series skewness statistic is different from zero which indicates that return distributions are not symmetric. Kurtosis for each series is found to be fairly high suggesting that the underlying data is leptokurtic or heavily tailed, which corroborates the findings of the earlier studies in this field. The results of the test for asymmetric impact of

innovation in foreign exchange market, bullion market, foreign stock market and change in FII growth rate separately on Nifty return are shown in Table-1 to Table-4 and those of all the markets together except change in growth of net FII turnover, on Nifty return are shown in Table-5. From the estimates of the coefficients of the mean equation in Table-1 & Table-2, we find that nifty return is significantly influenced by its own past innovation rather than past innovation in foreign exchange market and current innovation in gold bullion market. But the estimates of the coefficients of the mean equation in Table-3 reveal that influence of the past innovation in foreign stock market on Nifty return is significantly larger than its own past innovation. From Table-4 we find significant positive influence of change in net FII growth rate on Nifty return. Results are almost same when we incorporate all the variables together except change in net FII growth rate, in the conditional mean equation of Nifty return. Therefore, the hypothesis number (i) is rejected in case of foreign exchange market and gold bullion market but it can be accepted in case of net FII turnover. Observed results reject the hypothesis number (ii) also. From the estimates of the coefficients in the equation of log ($h_{s,t}$) we find that all coefficients are highly significant. In all the case is $\delta_{S,1}$ significantly large implying that Nifty returns volatility is persistent in nature. For all the estimates we find negative value of $\gamma_{S,1}$ and positive value of $\beta_{S,1}$ .When we examine any existence of leverage effect in Nifty returns volatility, we find that in every case ($\beta_{S,1}+\gamma_{S,1}$) and ($\beta_{S,1}-\gamma_{S,1}$) both are positive and also ($\beta_{S,1}-\gamma_{S,1}$) is greater than ($\beta_{S,1}+\gamma_{S,1}$). i.e., given the value of $h_{s,t-1}$, an unit decrease in $\varepsilon_{S,t-1}$ is inducing a change in the log of conditional variance greater than the change in case of unit increase in $\varepsilon_{S,t-1}$.This implies that in all cases 'bad news' or negative shocks induce greater volatility in nifty returns than 'good news' or positive shocks proving the existence of asymmetry or leverage effect in Nifty return volatility. Therefore the hypothesis number (iii) can be accepted. Observing insignificant influence of foreign exchange market and gold bullion market on mean Nifty return from Table-1, Table-2 and also from Table-5 but highly significant influence of capital market (change in net FII growth rate) and foreign stock market on mean Nifty return from Table-3, Table-4 and also from Table-5, we may conclude that the observed asymmetry or leverage effect in Nifty return volatility might be the result of own innovation and innovation in domestic capital market and foreign stock market with varying degree of importance. Therefore the hypothesis number (iv) cannot be fully rejected.

IX. Conclusion:

In this paper we have made an attempt to examine influence of innovation in different segments of domestic financial system and foreign stock market on stock market volatility in India and test for asymmetry in Indian stock market volatility using data on daily closing prices of S&P CNX Nifty, NASDAQ composite index, spot gold bullion in Mumbai, INR-USD daily spot exchange rate and daily net FII turnover data in EGARCH(1,1) specification. Our estimation period spans from May 6, 1998 to May 18, 2010 when major changes were brought about in the structure and functioning of the Indian stock market due to liberalization of the economy. The results of the study suggest that stock market returns in India is significantly influenced by its own past innovation rather than past innovation in foreign exchange market and current innovation in gold bullion market and influence of the past innovation in foreign stock market on domestic stock market return is significantly larger than its own past innovation. Therefore domestic stock market is influenced more by innovations in the foreign stock market than different segments of domestic financial market during the period under study. We also find evidence for existence of asymmetry or leverage effect in stock return volatility in India which might be the result of own past innovation and innovation in domestic capital market and foreign stock market with varying degree of importance. The results may be different for other Indian stock market indices and other components of domestic financial market. Therefore, the scope of further research is to examine volatility spillovers across these markets in a setting of multivariate EGARCH model.

Table-A

Descriptive Statistics	Nifty Return	Return in Foreign Exchange	Return in Gold Bullion	NASDAQ Return
Mean	0.000489	4.53E-05	0.000491	7.40E-05
Median	0.000960	0.000000	0.000000	0.000405
Maximum	0.163340	2.336070	2.275230	0.132550
Minimum	-0.130540	-2.337700	-2.276050	-0.101680
Std. Dev.	0.017785	0.084317	0.059991	0.019068
Skewness	-0.166980	-0.020454	-0.039460	0.083783
Kurtosis	9.318943	746.0217	1384.099	7.268611
Jarque-Bera	4995.061	68872134	2.38E+08	2276.578
Probability	0.000000	0.000000	0.000000	0.000000
Sum	1.463320	0.135530	1.471030	0.221520
Sum Sq. Dev.	0.946712	21.27807	10.77162	1.088265
Observations	2994	2994	2994	2994

Table-B

Descriptive Statistics	Nifty Return	Change in FII Growth Rate
Mean	0.000368	-0.000330
Median	0.001090	-0.295040
Maximum	0.163340	483.4944
Minimum	-0.130140	-482.9481
Std. Dev.	0.021479	35.54984
Skewness	0.033724	0.023725
Kurtosis	8.677509	105.3327
Jarque-Bera	1307.009	424552.1
Probability	0.000000	0.000000
Sum	0.358510	-0.321250
Sum Sq. Dev.	0.448436	1228405.
Observations	973	973

Table- 1

Estimated Results of EGARCH (1,1) based on Return in Nifty and Lag Exchange Rate Return

Coefficient Symbol	Estimates	Std. Error	Z-Statistic	Probability
$a_{S,1}$	0.106301	0.019204	5.535333	0.0000
$a_{E,1}$	0.002865	0.006845	0.418592	0.6755
$\alpha_{S,0}$	-0.604691	0.045746	-13.21857	0.0000
$\beta_{S,1}$	0.240950	0.014909	16.16140	0.0000
$\gamma_{S,1}$	-0.131723	0.009903	-13.30127	0.0000
$\delta_{S,1}$	0.948877	0.004751	199.7358	0.0000

$\beta_{S,1} + \gamma_{S,1} = (0.240950) + (-0.131723) = 0.109227$ /in case of good news

$\beta_{S,1} - \gamma_{S,1} = (0.240950) - (-0.131723) = 0.372673$ /in case of bad news

Table- 2

Estimated Results of EGARCH (1,1) based on Return in Nifty and Return in Gold Bullion

Coefficient Symbol	Estimates	Std. Error	Z-Statistic	Probability
$a_{S,1}$	0.105639	0.019285	5.477671	0.0000
a_{G}	0.015792	0.013452	1.173999	0.2404
$\alpha_{S,0}$	-0.592914	0.044795	-13.23521	0.0000
$\beta_{S,1}$	0.239248	0.014769	16.19954	0.0000
$\gamma_{S,1}$	-0.130314	0.009787	-13.31511	0.0000
$\delta_{S,1}$	0.950145	0.004644	204.5771	0.0000

$\beta_{S,1} + \gamma_{S,1} = (0.239248) + (-0.130314) = 0.108934$ /in case of good news

$\beta_{S,1} - \gamma_{S,1} = (0.239248) - (-0.130314) = 0.369562$ /in case of bad news

Table- 3

Estimated Results of EGARCH (1,1) based on Return in Nifty and Lag Return in NASDAQ

Coefficient Symbol	Estimates	Std. Error	Z-Statistic	Probability
$a_{S,1}$	0.086958	0.018699	4.650375	0.0000
a_{Q1}	0.154453	0.012900	11.97325	0.0000
$\alpha_{S,0}$	-0.628939	0.044059	-14.27482	0.0000
$\beta_{S,1}$	0.246679	0.015534	15.88038	0.0000
$\gamma_{S,1}$	-0.136900	0.010075	-13.58803	0.0000
$\delta_{S,1}$	0.946732	0.004556	207.7776	0.0000

$\beta_{S,1} + \gamma_{S,1} = (0.246679) + (-0.136900) = 0.109779$ / in case of good news

$\beta_{S,1} - \gamma_{S,1} = (0.246679) - (-0.136900) = 0.383579$ /in case of bad news

Table- 4

Estimated Results of EGARCH (1,1) based on Nifty Return and Change in net FII Growth Rate.

Coefficient Symbol	Estimates	Std. Error	Z-Statistic	Probability
$a_{S,1}$	0.100614	0.034528	2.913948	0.0036
$a_{F,1}$	0.0000297	7.24E-06	4.098717	0.0000
$\alpha_{S,0}$	-0.544337	0.062084	-8.767743	0.0000
$\beta_{S,1}$	0.265829	0.026257	10.12392	0.0000
$\gamma_{S,1}$	-0.147079	0.020507	-7.171990	0.0000
$\delta_{S,1}$	0.956582	0.006425	148.8896	0.0000

$\beta_{S,1} + \gamma_{S,1} = (0.265829) + (-0.147079) = 0.118750$ / in case of good news

$\beta_{S,1} - \gamma_{S,1} = (0.265829) - (-0.147079) = 0.412908$ / in case of bad

Table- 5

Estimated Results of EGARCH (1,1) based on Return in Nifty and all the Markets taken together except Growth in net FII Trade.

Coefficient Symbol	Estimates	Std. Error	Z-Statistic	Probability
$a_{S,1}$	0.082525	0.018801	4.389291	0.0000
a_{G}	0.017526	0.013515	1.296773	0.1947
$a_{E,1}$	0.001949	0.006599	0.295297	0.7678
a_{Q1}	0.154669	0.013039	11.86184	0.0000
$\alpha_{S,0}$	-0.629704	0.043986	-14.31608	0.0000
$\beta_{S,1}$	0.245370	0.015443	15.88878	0.0000
$\gamma_{S,1}$	-0.136772	0.010004	-13.67227	0.0000
$\delta_{S,1}$	0.946535	0.004553	207.9018	0.0000

$\beta_{S,1} + \gamma_{S,1} = (0.245370) + (-0.136772) = 0.108598$ /in case of good news

$\beta_{S,1} - \gamma_{S,1} = (0.245370) - (-0.136772) = 0.382142$ /in case of bad news

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