

RESEARCH ARTICLE

EMPIRIAL EVIDENCE OF VOLATILITY SPILLOVER OF NET FII INFLOWS ON INDIAN STOCK MARKET**Sakshi Saxena*, Nidhi Malhotra**¹Doctoral Researcher, Banasthali Vidyapith, Rajasthan, India.²Department of Management, Lal Bahadur Shastri Institute of Management, Dwarka, Delhi, India.***Corresponding Author: Sakshi Saxena**

Abstract: Foreign institutional investors have become increasingly important and contribute significantly to emerging stock markets. The present study attempts to analyze the causal relationship between the investments by FII's & returns of Stock Market in the Indian stock market and also to analyze incidences of volatility spillover from one variable to another, also to check for bi-directional relation. For this purpose, thirteen years of daily data ranging from 2009 to 2022 which will include the Stock market data along with Indian Net FII flows. In order to assess volatility, *GARCH (1,1)* model has been used and the results states that *GARCH (1,1)* model is significant enough to explain volatility spillover effect of FIIs on SENSEX. Granger Casualty test has been used to measure causal relationship between Indian FII data and SENSEX data. The results states unidirectional casualty between Indian SENSEX data and Indian FII data.

Keywords: Stock market, Volatility spillovers, FIIs Capital Flows, Stock markets, SENSEX, *GARCH Model*, Finance.

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INTRODUCTION

Every economy needs to find various avenues for the investment to grow. It helps an economy to come up with new business ideas which accelerate innovation and create job opportunities and growth prospects. Economies which are not able to create business opportunities, are not able to witness increase in their growth rate. Thus, positive economic growth attracts capital inflows in the economy. Foreign capital is the investment made by one country in another country.

Foreign capital plays a huge role in bridging the gap between the existing domestic capital and required capital. Along with accelerating growth rate, it also benefit the domestic country with efficient technology, understanding latest processes and human skill development. Developing countries needs inflow of foreign investment, since it acts as an aid in their development. In 1991, doors of foreign investment were opened in India as Foreign Institutional Investment (FIIs) and Foreign Direct Investment (FDIs).

FDI helps in overall development of an economy, since it leads to capital formation, better infrastructure, increase in overall productivity and job prospects. FIIs helps in enhancing equity market performance of the domestic country.

FIIs helps in improving market efficiency and reduction in the cost of capital, especially for emerging economies that are going through liberalization. Additionally, it is said that FIIs cause the domestic stock market to be volatile.

Merton's [1] 'base broadening hypothesis' suggested that foreign investment has a major long-term impact on stock values, primarily because international diversity reduces the risk premium. Warther's [2] in his study 'price pressure hypothesis', explains that foreign investment affects stock market as liquidity increases temporarily, though the effect is short term.

FII's investment is not only based on country's economic conditions, but also on 'market sentiments'. Such sentiments leads to speculation and high fluctuations in FII's movements and contributes to volatility in the domestic country. Stock price fluctuations over a specific time period are referred to as volatility. Some amount of volatility is good, since it shows changes in economic position, but volatility created by FII's flows is unfavourable for individual investors and stock market. Existence of volatility affects the investor's decision in deciding their investment strategy.

Since there is more uncertainty when there is volatility, an investor would also anticipate a larger risk premium to cover the risk that has grown as a result of volatility. Batra [3] scrutinizes trading behavior and effect of trading biases on stock market stability and finds that their trading behavior and biases does not affect stock market stability and FII's normally forms herd while performing trading activity.

Large amount of investment in Indian stock market comes through FII mode. Mazumdar [4] explains positive evidence about FII investment affecting stock market liquidity. Due to FII inflows market liquidity increases, but it also increases volatility in the stock prices. Since there is more uncertainty when there is volatility, an investor would also anticipate a larger risk premium to cover the risk that has grown as a result of volatility. This leads to volatility.

Thus, FII investment impacts Indian stock market a lot. Quantum of FII investment plays a vital role in forming policies and taking investment decisions for the growth and development of the economy. There is a ton of literature discussing the casual connection between stock returns and FII flows as well as analysing volatility. But, there has always been a debate on whether FII investments destabilizes financial market or not. Therefore, the objective of the current work is to investigate this dynamic connection between stock market results and FII investment. The present study also uses daily data for the same.

LITERATURE REVIEW

Many academics and researchers have contributed to the explanation of the dynamics underlying the connection between stock market gains and FII flows.

Khandelwal [5] finds existence of unidirectional causality from FII flows to equity market returns. Ananda [6] shows evidence of unidirectional causality from FII's flow to the rupee-dollar exchange rate. Paliwal and Vashishtha [7] find existence of bi-directional causality between stock return and FII investments. Bhattacharya and Mukherjee [8] in their study did finds bi-directional casualty association between stock returns and FII's, while as such no relationship between exchange rate and FII investments.

Dua and Garg [9] investigated that the vital determinants of FII flows are exchange rate, performance of stock market and domestic output growth. Ghosh and Herwadkar [10] shows that stock price, yield on government securities and exchange rate impacts. During both short and long run, FII inflows positively. Brailsford [11] addresses spillovers of volatility between the Australian and New Zealand stock markets. The findings states that conditional volatility of New Zealand markets is influenced by Australian market volatility. Reverse also holds true. Chiang, Yang, and Wang [12] find that Asian countries' national currencies' values and stock returns are correlated favourably.

Alam and Alam [13] attempt to analyze the FII's movement in the Indian stock market. Mainly, the focus was on impact of FII trading on the Indian capital market and also on the relationship between market return and FII flows. The findings reveal an association between FII net inflows and the Sensex. Amit [14] focuses on identifying FII trading behavior and the effects of their trading biases on the stability of the stock market using both daily and monthly data. The results states that FII's have been "positive feedback investors and trend chasers" based on daily data analysis and not on monthly data analysis.

Bohra and Dutt [15] tries to find out the correlation between turnover of FII and Sensex listed shares turnover in different groups. The results states that There is a link between investment by FII's and market returns, though the exception for the same relationship has been seen in the year 2005 and 2008. Additionally, it asserts that changes in FII movement patterns have a significant impact on how retail investors feel about the market. Chakrabarti [16] makes an effort to analyze FII investment and the relationship between it and the Sensex, as well as the country's GDP share and foreign investment in the equity market of India. According to the findings, FII has a favorable effect on the nation's development.

Upadhyay [17] supported that FIIs helps in domestic investments and shifting the country's foreign debt burden. Increased equity market capital inflows lower capital costs and promote investment. The study also supported that foreign capital inflows can contribute market volatility as FII can play with the positive sentiments present in the market, when it is booming and can exit when the index has risen to certain heights. Both Dandapani *et. al.* [18] and Srikanth *et. al.* [19] reported results that were similar.

In an attempt to determine whether there is a relationship between FII flows and stock prices and exchange rates, Badhani [20] finds that there is a long-term relationship between FII flows and stock prices and a long-term relationship between FII flows and exchange rates, but not between stock prices and exchange rates. Bi-directional long-term causality is present between FII flow and stock prices which supports both 'base-broadening hypothesis' and 'positive feedback trading hypothesis'.

According to Chakrbarti [21], there is a one-way causal relationship between FII flows and stock returns during pre-Asian crisis period (1993-1997) which is not the same in the post-crisis period (1997-1999) indicating that FIIs does not determine market returns in post-Asian crisis period. Bhattacharya and Mukherjee [22] examines the connection among stock returns, FII and exchange rate in

Indian context and finds that the relationship between market returns and exchange rate is not only evident due to the presence of FII only, but also due to other factors prevailing.

On the other hand, Srinivasan and Kalaivani [23] proved exchange rate impacts FII inflows negatively in both short as well as long run, while equity price has a long-term good impact but a short-term negative impact. Sabri [24] attempts in finding out the factors impacting increase in volatility in stock return and instability in emerging markets. The evaluation of growing stock market characteristics was the key objective.

According to the findings, the largest positive association was reported by trade volume and exchange rate. Stanley [25] examined the importance of FIIs towards India's Forex reserves. The results shows that FIIs strongly influences short term market movements during bear market, while such correlation is low during bear market due to the presence of other market participants.

However, not much significant relationship has also been reported in many studies. Bodart and Reding [26] proves that exchange rates have a large influence on market returns and volatility, but the impact is very minimal. Kim & Singal [27] attempts to research the impact of liberalization on stock price behavior and finds that not much volatility in the stock market is reported due to large foreign inflows.

This result has been supported by the studies of Ananthanarayan *et al.* [28], Batra [29], Mazumdar [30], who also finds the volatility of emerging markets has little to do with its measure of market integration. Ahmed *el al.* [31] and Panda [32] in their study did not find much effect of FII inflows on stock returns.

Academics and market participants have been interested in the association between FII flows and stock market returns in Indian stock markets. Existing research yields inconsistent results in understanding stock market volatility driven by FII flows. Among all the literature discussed above, it is very difficult to arrive to any conclusion about the relationship between financial market performance and FII flows.

OBJECTIVES OF THE STUDY

- To investigate the association (causal relationship) between net FII Flows and Indian stock market returns.
- To examine volatility spillover of net FII movements on Stock markets movement of Indian stock market.

Hypotheses

For the purpose of this research, it is pertinent to make some postulations & hypothesis which would give directions to our study & help us to arrive at reliable, stable & valid conclusions. Therefore, the applicable hypothesis are:

For Causalty Relationship

H₀: There exists no association (causal relationship) between Net FII movements & Stock Returns.

H₁: There exists association (causal relationship) between Net FII movements & Stock Returns.

For spillover relationship:

H₀: There exists no volatility spillover of Net FII movements on Stock Markets.

H₁: There exists volatility spillover of Net FII movements on Stock Markets.

DATA COLLECTION AND METHODOLOGY

The study's sample consists of daily closing prices from the Indian stock market, with an emphasis on SENSEX data. CMIE Prowess database has been used to collect the data. The Foreign Institutional Investors (FII) data has been collected from Bloomberg Terminal using relevant tickers. Thus, the data source is secondary in nature.

The data was gathered for the time period January 2009 to December 2022. The study used daily data and not weekly and monthly data because it captures more accurate information about changes in stock prices [33-34], and it also aids in depicting the fluctuation of variables more clearly [35].

Granger Causality Test was used to understand the causal relationship between Net FII movements and stock performance. A range of indicators were investigated for unit root features in this investigation. Using the model described in equation 1, the null hypothesis of a single root is tested against the option of stationary.

$$\Delta Y_t = \alpha_0 + Y_{t-1} + \sum \beta_i \Delta Y_{t-1} + e_t \quad (1)$$

GARCH MODEL

Generalized Autoregressive Conditionally Heteroscedastic model (GARCH) model has been used to explore the volatility spillover effect between Indian stock market returns and FII flows. In contrast to past innovation, the GARCH model allows the conditional variance to depend on prior own lags. By using the GARCH model, it is possible to interpret the present fitted variance as a weighted function of both the fitted variance from the model during the preceding period and the long-term average value information about volatility during the preceding period. The fundamental GARCH (1, 1) model looks like this:

$$\text{Mean Equation: } R_t = \mu + e_t$$

$$\text{Variance Equation: } \sigma_t^2 = \omega + \alpha e_{t-1}^2 + \beta \sigma_{t-1}^2$$

Where e_{t-1}^2 is the volatility-related news from the previous period and σ_{t-1}^2 is the forecast variance from the most recent period. Being near to one ($\alpha + \beta$) indicates substantial existence of volatility clustering and suggests market inefficiencies.

GRANGER CAUSALITY TEST

Clive W. Granger suggested using statistics to determine whether there is any possible predictive value between two indicators. If the past values of one time series help the forecast of the other, the relationship is said to be Granger causal. In the two equations below, A Granger causality test is used to examine whether two stationary series, X_t and Y_t have a causal relationship:

$$Y_t = \alpha_0 + \sum_{k=1}^m \beta_k Y_{t-k} + \sum_{k=1}^m \varphi_k X_{t-k} + u_t$$

$$X_t = \delta_0 + \sum_{k=1}^m \gamma_k X_{t-k} + \sum_{k=1}^m \phi_k Y_{t-k} + v_t$$

Where α β δ φ ϕ 's are constants and m is the optimal lag length and u_t and v_t are assumed to be white noise i.e., disturbance terms with zero mean and finite variance.

The Granger causality test determines if changes in Y_t lead to changes in X_t . If Y_t causes X_t , then the former's lags should have an impact on the latter's equation, i.e., $\phi_k \neq 0$. It would be argued that Y_t Granger causes X_t or that there is unidirectional causality from Y_t to X_t . On the other hand, lags of X_t should be important in the equation for Y_t if X_t causes Y_t . It would be referred to as "bi-directional causality" or "bi-directional feedback" if both sets of lags were substantial. Additionally, Y_t is considered to be substantially exogenous in the equation of X_t if there is uni-directional Granger causality from Y_t to X_t .

EMPIRICAL ANALYSIS

Table 1 displays descriptive statistics of SENSEX 30 and Indian FIIs returns.

Table 1: Descriptive analysis

	India	
	IND FIIs	SENSEX
Mean	1.574828	119.7842
Median	1.290000	118.7372
Maximum	277.9900	174.7798
Minimum	-149.8700	49.61724
Std. Dev.	17.14409	23.36192
Skewness	2.681697	-0.103240
Kurtosis	42.59806	3.088205
Jarque-Bera	164001.8	5.177925
Prob.	0.00000	0.075098
Unit root testing	-46.62971 (0.0001)	-2.845814 (0.0001)

Further, the data has been tested to detect the existence of heteroscedasticity. ARCH-LM (Lagrange multiplier) test has been used to detect the presence of ARCH effect in the mean equation of SENSEX and FII data series. Indian FII and SENSEX data has been tested for ARCH effect.

Indian FIIs have average return of 1.574828 with a maximum of 277.9900 and a minimum of -149.8700. SENSEX has average return of 119.7842 with a minimum return of 49.61724 and a maximum return of 174.7798. When compared to the SENSEX, Indian FIIs are extremely volatile. The daily returns reported standard deviation of 23.36192 in SENSEX 30 and 17.14409 in Indian FIIs. A larger standard deviation could indicate that the market experienced extraordinary cross-sectional changes as a result of unanticipated announcements or shocks.

The skewness and kurtosis measures reveal details about the basic statistical distribution of stock returns. The skewness rating for Indian FIIs indicates that the data is severely skewed, but the data for SENSEX is pretty symmetrical. The p-value for FII is less than 5%, so it can be concluded that the data from FIIs does not follow a normal distribution & does not resembles a bell-shaped curve. While, the P-Values for Sensex is more than 5%, so it means that Sensex data follow normal distribution & resembles a Bell shaped curve. Unit root testing result shows that the probability value for both data sets is less than 0.05, resulting in the null hypothesis rejection. As a result, the data for Indian FIIs and SENSEX is stationary at the level.

According to the findings, FII data is not devoid of serial correlation. Serial correlation has been eliminated from the residuals following ARCH modeling. SENSEX data is free from serial correlation in the model. Thus, this model can be used for hypothesis testing and forecasting.

Table 2: ARCH LM Test

		Before ARCH Modelling	After ARCH Modelling
		F-statistic (Prob.)	F-statistic (Prob.)
INDIA	FII	49.70749 (0.0000)	0.025632 (0.8728)
	SENSEX	0.788475 (0.3746)	

The next step is to assess the volatility between FII data and Indian SENSEX returns. The equation for the same can be represented as:

$$\text{GARCH} = \text{C}(3) + \text{C}(4) * \text{RESID}(-1)^2 + \text{C}(5) * \text{GARCH}(-1) + \text{C}(6) * \text{AGARCH}01$$

In the above equation, the constant term is C (3). Previous period's squared residual (error derived from the mean equation) is RESID (-1) ^2. It is regarded as dependent factor volatility

news from the previous day. Also known as the ARCH term. In the Table 3, the coefficients of the mean equation are coefficient of dependent variable, i.e, C (1) and C (2). The ARCH and GARCH coefficients' relevance is of particular interest. This suggests that the squared residuals from the previous period, as well as the conditional variance, are both intrinsic jolts to the volatility of the variable that is dependent. The result states that ARCH term, GARCH term and exogenous variable, i.e., GARCH (1,1) are significant enough to explain volatility spillover effect of FIIs on SENSEX.

Table 3: GARCH (1, 1) Results

Equation		India
Mean equation		
	C(1)	0.287855
	C(2)	0.998205 ^a
Variance equation	C(3)	0.054468 ^a
	C(4)	0.065225 ^a
	C(5)	0.907384 ^a
	C(6)	4.43E-05 ^a

(^a is significant values)

After assessing the volatility in the FII data and SENSEX, casualty has been tested between Indian FII data and SENSEX data. The Granger Causality Test determines if one time series can be used to forecast another. Table 4 displays the causality test findings.

It states that it is SENSEX which responds to movement in Indian FIIs. Indian FIIs does not cause movement in SENSEX returns. Thus, there is unidirectional casualty between Indian SENSEX data and Indian FII data [33-35].

Table 4: Granger casualty

Null hypothesis	Obs	F-Statistic	Prob.	Granger Causality
India				
SENSEX_USD does not granger cause IND_FII	2463	78.1260	1.E-33	Unidirectional causality SENSEX → FII
IND_FII does not granger cause SENSEX_USD		0.33824	0.7131	

CONCLUSION

The connection between trading of FII's and market volatility has not been well studied, therefore most of the perception regarding the

unfavourable consequences of FII trading and volatility is based on knowledge and plausible hypotheses. It was determined that the SENSEX's volatility has grown within the time frame under consideration. Over time, FIIs have become more volatile as well. The GARCH test study's conclusions indicate that the Indian stock market's volatility is influenced by the volatility of prior times, and that FII investment has a significant impact on the SENSEX volatility, one of the important indices used to reflect the stock market of India. Therefore, the data suggests that both FIIs and the Indian stock market have significantly increased volatility.

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