Impact of Foreign Institutional Investments on Stock Market Volatility in India

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Abstract

India is being viewed as a potential opportunity by investors, with the economy having the capacity to grow tremendously. Buoyed by exceptional support from the country's government, the FII sector in India looks set to prosper, and the outlook looks extremely promising. In this paper, an attempt was made to study the volatility patterns in Indian markets through properties such as volatility clustering, leverage effect. This paper tried to examine FII flows in Indian securities market and assessed the impact of foreign institutional investment on Indian stock market volatility. Effect of news in the first moment was modeled with the help of ARCH- GARCH process and the change over 24 hours (from a closing rate to a closing rate) was measured for a period from 2004-2014. Our analysis revealed the persistence of volatility and confirmed the leverage effect in Indian securities market. We observed that FIIs contributed significantly to the Indian stock market volatility. The coefficient of gross purchase was significant, suggesting that a greater volatility in gross purchase by FIIs could have greater implications for the volatility of stock indices during 2004-2014 in comparison to gross sales by FIIs.

Keywords: **stock market volatility, gross purchase, gross sale, leverage effect, volatility clustering, FII**

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We all are aware of the fact that one of the key measures to assess the market risk of a single instrument or an entire portfolio of instruments is volatility. It is the standard deviation of financial variables like interest rates, stock market returns, and so forth (Poon & Granger, 2003). The standard deviation of everyday stock returns around the mean value is known as stock return volatility and the return volatility of the aggregate market portfolio is known as stock market volatility. Volatility clustering (amplitude of the returns varying with time) is manifested by financial time series such as stock returns, which signify that small changes in the series are followed by small changes and the large changes in the series are followed by large changes (Mandelbrot, 1963). This has led to the usage of GARCH models in derivative pricing and financial forecasting. Accurate modeling and financial forecasting has garnered a lot of attention in recent years since variance is frequently used as a measure of risk in many risk-management systems.

The deviation of the current price of an asset from its average past prices is also determined by volatility. Since volatility increases with an increase in deviation, it is sometimes seen as an unpleasant feature that has unfavourable consequences regarding the investment decisions in financial instruments. Investors tend to become risk-averse due to persisting volatility. High risk due to this persisting volatility compels investors to demand for a

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higher compensation that leads to an increase in cost of capital and thus lowers the investment. Sometimes, due to increased consumer spending, stock return volatility may hamper economic performance and may affect business investment decisions. The extreme volatility in some cases may interrupt the smooth functioning of the financial system, making way for regulatory and structural changes. The problem of volatility is further amplified by the prevailing inefficiencies in emerging security markets like India. Thus, one cannot deny the fact that investors, brokers, and regulators perceive volatility in equity markets as a subject of great concern.

Massive flow of external capital in the form of direct and portfolio investment has been witnessed in the last 20 years due to increasing globalization. Increasing collaboration between developed and developing economies has led to an increase in international capital mobility. The level of international diversification of portfolios has increased significantly because of the liberalization of the capital markets.

Portfolio investment flows from industrial countries are gradually becoming important for developing countries like India. In the year 2000-01, portfolio investments in India accounted for over 37% of the total foreign investments in the country. A substantial part of these portfolio flows to India came in the form of FII investments, mostly in equities (Chakraborty, 2001). FII investments in our country have increased progressively ever since the opening of the Indian equity markets to foreigners. Policymakers around the world have been apprehensive about portfolio flow investments in spite of the fact that such investments benefit the economies of receiving countries. Portfolio flows - often denoted as "hot money" - are extremely volatile as compared to other modes of capital flows. Foreign investors are responsible for creating dreadful outcomes in the host country when they pull out their investments at the first sign of economic trouble. They have been blamed for aggravating small economic problems in a country by making large and collaborative withdrawals at the slightest hint of economic weakness.

Until the 1980s, India's growth strategy was concentrated on self-dependence; hence, policymakers were hesitant towards foreign investments or private commercial flows. However, post 1991, a major development in the form of liberalization of the Indian financial sector, especially that of capital markets, took place. After introducing the reforms, foreign institutional investors (FIIs) from September 14, 1992, with suitable restrictions, were allowed to invest in all securities traded on the primary and secondary markets, including shares, debentures, and warrants issued by companies which were listed or were to be listed on the stock exchanges in India and in schemes floated by domestic mutual funds (Loomba, 2012). FIIs have played a crucial role towards improving the stock market infrastructure, and SEBI has pledged its contribution towards its development. Undoubtedly, these days, national events as well as international events - both affect the Indian stock markets. In comparison to other emerging securities markets, Indian markets are more blessed by FIIs as they invest significant amount in Indian markets. Stock prices in India are frequently fluctuating from their fundamental values, and these fluctuations are mainly because of the presence of FIIs in Indian stock markets.

Foreign institutional investors (FIIs) have played a very important role in shaping Indian markets' fortunes with their money flows. A large part of the 25% plus rally in Sensex in the year 2012 can be attributed to the $20-billion-plus of inflows from FIIs. Between June and August 2013, India saw its sharpest bout of FII outflow since the global financial crisis, leading to fears of a possible capitulation by FIIs (Anand, 2013).

The Indian stock market is growing rapidly and is attracting investors from all across the globe. The Indian market has attracted domestic investors as well as foreign investors in the past. Institutional investors play a crucial role by investing a large proportion of their investment in Indian markets, and out of that, a major chunk of investment comes from foreign institutional investors. An important question regarding this is whether these foreign investors (FII) direct the Indian stock market. This paper tries to examine the influence of the foreign institutional investors on Indian stock markets. FIIs, because of their short-term nature, can have bidirectional causation with the returns of other domestic financial markets such as money markets, stock markets, and foreign exchange markets. Hence, understanding the determinants of FIIs is very important for any emerging economy as FIIs exert a larger impact on the domestic financial markets in the short run and a real impact in the long run.

This paper tries to empirically examine the volatility patterns in the Indian stock market for a period of 10 years, that is, from 2004-2014 with respect to its volatile nature and properties such as the leverage effect. This paper

makes an effort to develop an understanding of the investment patterns of FIIs and their impact on the Indian stock market. In this paper, an effort is made to study the contribution of FIIs' investment to the stock market volatility using high-frequency data. The study was undertaken to analyze the following objectives:

(1) To observe the stock market volatility without any exogenous variables.

(2) To examine the contribution of foreign institutional investors' investments to stock market volatility through: (a) the impact of gross purchases and gross sales by FIIs, and (b) the combined impact of investment by FIIs in the form of gross turnover by FIIs.

Review of Literature

Volatility is an important economic variable. Which markets are volatile? Do the stock prices follow the same volatility patterns? Does the volatility of one market helps in forecasting the volatility of another market? These are some of the fundamental questions whose answers demand proper empirical investigation. Many researchers have used ARCH and GARCH models as their standard tools to represent the real - world financial volatility. A large number of literatures have investigated the patterns of volatility in emerging stock markets and the impact of foreign investments on them. Many of them observed that FIIs have a substantial impact on emerging stock markets like India.

The inflow of foreign investments did not result in fluctuations in equity markets of India. Some researchers tried to assess the impact of foreign investments on the stock market of an economy. Others observed that foreign institutional investors favoured corporations with better control and direction. An affirmative impact of foreign control on a firm's operations was witnessed. Some examined the impact of FII investment on the business group association of corporations. Thus, there seems to be conflicting observations by various researchers regarding the causal relationship between foreign institutional investor's investments and stock market volatility and returns of various stock market indices. Hence, one can say that it is necessary to inspect whether FIIs are the cause or effect of stock market variations in India.

Mehta (2009), in the research paper on FII flows in Indian securities markets, observed that foreign investors were investing heavily in Indian markets. This made small investors think that the markets were manipulated. In favour of Indian investors, it was observed that out of all the factors, it was basically the performance of the Indian stock markets as compared to other emerging and developed markets that perhaps may cause returns and not the other way around. Sethi (2007) suggested that steady and stable capital inflows by FIIs are of importance. The foreign portfolio flow has a significant impact on the economic activities of emerging countries.

Few research studies focused on foreign investor investments in India and fluctuations in Sensex and concluded that they were strongly related and had a noteworthy impact on Sensex movement. Some studies observed that in the Indian stock markets, FIIs had extremely high level of impact on market sentiments and price trends. Some concluded that since the beginning of liberalization, FII flows to India have steadily grown in importance.

Trading activities of FIIs and the domestic stock market turnover indicate that FIIs are becoming more important at the margin as an increasingly higher share of stock market turnover is accounted for by FII trading in India. One of the research studies on the relation between foreign institutional investments and equity returns in India indicated that equity returns in India caused FII flows and there was a significant volatility clustering in FII investments and NIFTY series. Gupta (2011) suggested that the increasing contribution of FIIs in the Indian stock market had an effect on each other, but their timing of the impact was different. Bansal and Pasricha (2009) analyzed the effect of market opening on Indian securities markets. They concluded that fluctuations in Indian markets had reduced considerably after liberalization, but no change was found on average returns of Indian securities markets. Upadhyay (2006) observed that FII flows enhanced and strengthened the domestic savings and domestic investment without the external burden of our country being affected. Capital inflows to the equity

market raise the stock prices, reduce the borrowing cost, and boost the investment by domestic companies. With heavy selling and buying of stocks by foreign investors, Indian markets have become volatile. Karmakar (2006) measured the volatility of daily market returns in the Indian stock market over the period from 1961 to 2005 by using the GARCH models. In a research paper by Banerjee and Sarkar (2006), modeling and estimation of stock return volatility of the NSE index was done by using a GARCH model. Intra-day data was taken for a period of 4 years (June 2000 to January 2004). They observed the phenomenon of volatility clustering as well as leverage effect on volatility in the stock markets of India. They also found that the changing trading volumes were positively affecting the market volatility.

Prasanna (2008) examined the relationship between FII and firm specific characteristics in terms of ownership structure, financial performance, and stock performance. The paper observed that the promoters' holdings and the foreign investments were inversely related and share returns and earnings per share contributed significantly in influencing their investment decisions. Saravanan and Deo (2011) examined the role of FIIs in the Indian stock market during the recent financial crisis. They suggested that FIIs optimally used their portfolio and got huge returns both in crisis and non-crisis periods by adopting positive feedback-trader strategy and negative feedback-trader strategy, respectively.

Dhamija (2008) discussed that an increase in the volume of FII inflows in the recent years has led to high volatility of these flows and impact on the stock market price indices. Garg and Bodla (2009) concluded that the rate of FII flows into the country is governed by the performance of the domestic stock market and the foreign investor expectations about this performance. Shukla (2011) suggested that FIIs had a significant impact on the share prices of the mid-cap and small-cap companies, but a small and periodic shift in their behaviour lead to market volatility.

Saha (2009) investigated the participation of foreign institutional investors, other financial institutions in India, and the performance of the Indian stock markets and concluded that the Indian stock market is regarded at par with the developed markets. Chittedi (2008) analyzed the performance of Sensex and FIIs in the Indian stock market and revealed that liquidity as well as volatility were highly influenced by FII inflows in BSE Sensex.

Foreign Institutional Investors

The term foreign institutional investor is defined by SEBI as an institution established or incorporated outside India, which proposes to make investments in India in securities provided that a domestic asset management company or domestic portfolio manager who manages funds raised or collected or brought from outside India for investment in India on behalf of a sub-account shall be deemed to be a Foreign Institutional Investor. Foreign investments refer to investments made by residents of a country in financial assets and production processes of another country.

(1) Need For FIIs: FIIs add to the foreign reserves inflow as the funds through FDI (foreign direct investment) are insufficient. Some of the advantages of FIIs are :

- They enhance competition and efficiency of the financial markets.
- They diminish the cost of capital for entrepreneurs.
- They increase domestic savings and investments.
- They help to improve corporate governance.
- They are a major source of liquidity for the Indian market.

(2) FIIs' Influence on the Indian Stock Market: Since the past few years, India has become an attractive destination for foreign investors mainly because of its stable economic growth and development policies. Since liberalization,

these investors have been the most vivid path for capital funding in our securities markets. However, there are some concerns regarding the fluctuations caused by these foreign investors owing to their herd mentality thus, significantly influencing the Indian securities markets. According to Rahul Goswami, Chief Investment Officer for fixed income at ICICI Prudential Mutual Fund, "FIIs are flocking towards Indian bonds as the confidence level of the Central Bank and the government is at one of the highest levels, and benign commodity prices have added confidence" (Szabo, 2014). A large part of the 25% plus rally in Sensex in the year 2012 can be attributed to the $20-billion-plus of inflows from FIIs. Portfolio flows, because of their short-term nature, can cause uneven expansion and contraction in domestic liquidity and thus have a greater impact upon the stock market (Kohli, 2001).

Some major impacts of FIIs on the stock market are :

- They increase the depth and breadth of the market.
- They play a major role in expanding the securities business.
- Their policy of focusing on fundamentals of shares causes efficient pricing of shares.

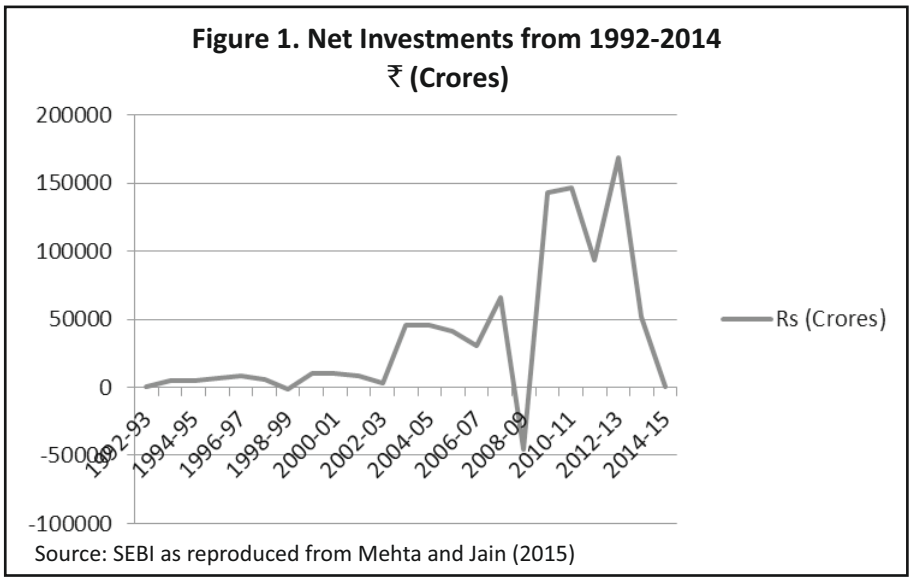
These impacts have made the Indian stock market more attractive to FIIs and also to domestic investors. The impact of FIIs is so high that whenever FIIs tend to withdraw the money from the market, the domestic investors become fearful and they also withdraw from the market. An increase in portfolio investments by FIIs may also have an impact on equity price movements via effects on interest rates and asset prices, reserve and money supply, inflation and saving instruments, and domestic activity (Samal, 1997).

Table 1(a). FII Investments from 1992-2014 (in INR Crores)

INR crores			
Financial Year	Equity	Debt	Total
1992-93	13	0	13
1993-94	5,127	0	5,127
1994-95	4,796	0	4,796
1995-96	6,942	0	6,942
1996-97	8,546	29	8,575
1997-98	5,267	691	5,958
1998-99	-717	-867	-1,584
1999-00	9,670	453	10,122
2000-01	10,207	-273	9,933
2001-02	8,072	690	8,763
2002-03	2,527	162	2,689
2003-04	39,960	5,805	45,765
2004-05	44,123	1,759	45,881
2005-06	48,801	-7,334	41,467
2006-07	25,236	5,605	30,840
2007-08	53,404	12,775	66,179
2008-09	-47,706	1,895	-45,811
2009-10	110,221	32,438	142,658
2010-11	110,121	36,317	146,438
2011-12	43,738	49,988	93,726
2012-13	140,033	28,334	168,367
2013-14	79,709	-28,060	51,649
2014-15 **	9,602	-9,185	418
Total	**717,688**	**131,222**	**848,911**

** upto April 30, 2014

Source: SEBI as reproduced from Mehta and Jain (2015)



The FII investment numbers depicted in Table 1(a) clearly give us an indication that FII investments fell drastically during the time of the 2008 financial crisis but recovered quickly to good numbers during the 2009-2011 time period ; 2011-12 saw a dip which was again followed by a good jump in the 2012-13 period. The net investment graph in the Figure 1 clearly suggests that net investments fell sharply in the 2008-2010 period and increased in the 2010-2012 period. The fall during 2008-2010 was mainly attributed to the global financial crisis.

Empirical Methodology

Nifty is the selected index and daily data on NSE Nifty is used for a period from January 2004 to December 2014. Similarly, daily data on gross purchases, gross sales, and gross turnover by FIIs for the same period were considered. The total number of observations for that period constitutes 2674. The days on which there was no trading by FIIs are excluded while taking the data on Nifty. To model the dynamic process of intra-daily volatility, a series of ARCH and GARCH models have been formulated following Engle (1982) and Bollerslev (1982). We start by modeling the effect of news in the first moment (conditional mean equation) and measure the change over 24 hours (from a closing rate to a closing rate).

The intra-daily model for Nifty is defined as:

$$\varepsilon_t = \frac{\text{Nifty Close}_{(t)} - \text{Nifty Close}_{(t-1)}}{\sqrt{24}}$$

The changes in the index price are normalized by dividing them by the square root of daily hours, where NiftyClose *(t)* is the closing price on date *t*,
NiftyClose (*t*-1) is the closing price on the previous day, *t* -1,
ε_t is the error term.

This shows the basic conditional equation for the index price divided by the number of hours for which it has been observed. The data on NSE Nifty was taken from the website of National Stock Exchange and data on FIIs' gross purchase, gross sales, and gross turnover were taken from the website of Securities and Exchange Board of India (SEBI).

Table 1. Summary Statistics of Daily NiftyClose$_t$, GP, GS, and GT

Variable	Skewness	Kurtosis	Jarque -Bera Statistic	Chi-square Critical Value(*)
NiftyClose $_t$	0.062116	9.471828	4666.611	9.210
GP	1.749823	11.51034	9434.021	9.210
GS	1.448298	8.288654	4051.125	9.210
GT	1.476381	9.529464	5721.547	9.210

(*) denotes significant at the 1% level of significance. DOF = 2

Table 2. Unit Root Test Statistics

	Augmented Dickey Fuller Value	Significance at 1%	Significance at 5%
Nifty Series	-48.24173	-3.432605	-2.862422
Gross Purchase	-5.720690	-3.432611	-2.862425
Gross Sales	-5.268834	-3.432612	-2.862425

(1) Summary Statistics: The Jarque-Bera (JB) test is asymptotically chi-squared distributed with two degrees of freedom because JB is just the sum of squares of two asymptotically independent standardized normal (Bowman & Shenton, 1975).

The Jarque-Bera test for normality is:

- **Null Hypothesis:** Series is normally distributed (skewness is zero and excess kurtosis is zero).
- **Alternate hypothesis:** Series is non-normally distributed.

(2) Decision Rule: This test statistic can be compared with a χ^2 (chi-square) distribution with 2 degrees of freedom (DOF). The null hypothesis of normality is rejected if the calculated test statistic exceeds critical value from the $\chi^2_{(2)}$ distribution.

Statistical values for closing value of Nifty (NiftyClose $_{(t)}$), gross purchases, gross sales, and gross turnover by FIIs are presented in the Table 1. It is clear from the Table that each of the series, that is, NiftyClose $_t$, gross purchase, gross sales, and gross turnover by FIIs suggest positive skewness and excess kurtosis, which means leptokurtic distribution of the series.

Jarque-Bera (J-B) test statistic is also significant for all the series. Hence, all the four series, that is, closing value of Nifty (NSE_Close$_t$), gross purchases (GP), gross sales (GS), and gross turnover (GT) by FIIs are non-normal. Thus, we reject the null hypothesis.

(3) Unit Root Test : Each of the series, that is, nifty series, gross purchase by FIIs, gross sales by FIIs, and gross turnover by FIIs are checked for stationarity by applying the Augmented Dickey Fuller (ADF) unit root test. If the critical value is less than calculated ADF value, then the series is non-stationary and one can say that unit root exists. Alternatively, if the calculated ADF value is less than the critical value from Fuller's table, then the series is stationary and one can conclude that unit root does not exist. To measure volatility symmetric and asymmetric, generalized autoregressive conditional heteroskedasticity (GARCH) type models are applied. The symmetric GARCH model focuses on the time varying variance of the conditional distributions of returns. These models capture the existence of volatility clustering through the symmetric model and leverage effect through the asymmetric model.

Table 3. Parameter Estimates of the GARCH Model

Model	Coefficient	Value of Coefficient	*Z*-value	*P*-value	Akaike Information Criterion	Schwarz's Criterion
GARCH (1,1)	Intercept	10.70604	3.1458	0.0017	10.90858	10.91740
	ARCH	0.092181	14.0651	0.0000		
	GARCH	0.914336	155.919	0.0000		
GARCH (1,1)	Intercept	4455.240	7.0629	0.0000	11.36666	11.37988
with Gross	ARCH	0.112768	5.4685	0.0000		
Purchase &	GARCH	0.501840	6.8135	0.0000		
Gross Sales	Gross Purchase	-1.188842	-2.5353	0.0112		
	Gross Sales	-1.024880	-1.8282	0.0675	10.88389	10.89491
GARCH (1,1)	Intercept	-27.03002	-5.4457	0.0000		
with Gross	ARCH	0.081248	11.5502	0.0000		
Turnover	GARCH	0.891214	97.1937	0.0000		
	Gross Turnover	0.157982	7.4429	0.0000		

(4) Unit Root Test Results : The results of the standard Augmented Dickey Fuller unit root test, applied on the variables daily nifty series, gross purchases, gross sales, and gross turnover by FIIs are presented in the Table 2. We can say that since the ADF value for each variable is less than the test statistics, unit root does not exist in any series.

We adopted GARCH (1,1) and E-GARCH (1,1) as generally, small number of parameters seem to work well for modeling the variance dynamics over long sample periods (Bollerslev, Chou, & Kroner, 1992). GARCH (1, 1) and E-GARCH (1, 1) were first modeled with no exogenous variables and with Nifty series as the dependent variable. In the next process, the mean and variance equations under each model were extended to include gross purchases and gross sales by FIIs as two independent variables. Finally, the mean and variance equations under each model were used to include gross turnover by FIIs as the only independent variable.

Empirical Results and Discussion

(1) Volatility Clustering in Nifty Series : Poterba and Summers (1986) argued that for multi period assets like stocks, shocks have to persist for a long time for time- varying risk premium to be able to explain the large fluctuations observed in the stock market. The degree of volatility clustering was also investigated by Engle and Mustafa (1992) by combining the Black - Scholes option pricing formula with a stochastic variance process modeled by an ARCH process.

The parameter estimates of symmetric GARCH (1, 1) models are presented in the Table 3. The Table 3 shows that the sum of ARCH and GARCH parameters for symmetric GARCH (1, 1) model in both the cases is close to one. The estimated GARCH (1, 1) results, as shown in the Table 3, indicate the presence of the GARCH form of heteroskedasticity in intraday changes. The GARCH parameters are significant at the 5% level for each series, suggesting a strong GARCH effect. As with the daily series, the sum of the coefficients ($\alpha_i + \beta_i$) is just less than one, indicating a high degree of volatility persistence.

(2) Leverage Effect in Nifty Series : As noted by Black (1976), the leverage effect (volatility asymmetry) implies that the amplitude of relative price fluctuations of stock indices tend to increase when its price drops. Thus, the leverage effect is a negative volatility-return relationship which implies that a fall in stock prices leads to a significant increase in trading activity, thereby increasing the volatility in securities market. A plausible economic

Table 4. Parameter Estimates of the E-GARCH Model

Model	Coefficient	Value of Coefficient	*Z*- value	*P*-value	Akaike Information Criterion	Schwarz's Criterion
E-GARCH (1,1)	Intercept	-0.007622	-0.4075	0.6836	10.89519	10.90621
	ARCH	0.215989	18.593	0.0000		
	GARCH	-0.083839	-10.033	0.0000		
	Leverage	0.981328	385.992	0.0000		
E-GARCH (1,1)	Intercept	0.123222	5.499	0.0000	10.86641	10.88184
with Gross	ARCH	0.181789	15.1524	0.0000		
Purchase &	GARCH	-0.111136	-9.3753	0.0000		
Gross Sales	Leverage	0.958936	256.325	0.0000		
	Gross Purchase	1.06E-04	3.4821	0.0005		
	Gross Sales	4.49E-05	1.4192	0.1558		
E-GARCH (1,1)	Intercept	0.130946	5.745	0.0000	10.86583	10.87905
with Gross	ARCH	0.180949	15.575	0.0000		
Turnover	GARCH	-0.106294	-9.8123	0.0000		
	Leverage	0.95787	251.237	0.0000		
	Gross Turnover	7.75E-05	9.9709	0.0000		

explanation was further investigated by Christie (1982) according to which, a reduction in the equity value raises the debt-equity ratio, thus raising the riskiness of a firm. Alternatively, if the market risk premium is an increasing function of volatility, large negative returns increase the future volatility by more than positive returns due to a volatility feedback effect (Campbell & Hentschel, 1992). It has been observed that volatility in emerging economies like India is generally not symmetric. Hence, a symmetric GARCH model is not capable of accounting the leverage effect present in asymmetric Nifty series of such emerging markets since the conditional variance is only linked to past conditional variances and squared innovations (Bollerslev et al., 1992). Nelson (1991) stated that the non-negativity constraints in the GARCH model are too restrictive. He introduced the exponential GARCH (EGARCH) model to overcome this problem. Engle and Ng (1993) described a News Impact Curve with an asymmetric response to good and bad news. Thus, the asymmetric GARCH model is also applied in this paper.

If a leverage term is negative, this implies that a negative shock has a greater impact on volatility rather than the positive shocks of the same magnitude. The significance of negative shocks persistence or the volatility asymmetry indicates that investors are more prone to negative news in comparison to positive news. This implies that the volatility spillover mechanism is asymmetric. Positive value of leverage coefficients, as shown in the Table 4, indicates that a positive shock of returns increases the volatility by more than negative shocks. Positive value implies that positive innovations are more destabilizing than negative innovations, that is, positive shock to market returns is likely to cause volatility to rise by more than a negative shock of the same magnitude. The leverage coefficient is significant in asymmetric GARCH model in each of the three cases. Thus, it confirms the positive leverage effect in Nifty series. Furthermore, Akaike information criterion (AIC) and Schwartz's criterion (SC) values are minimum for the E-GARCH model when compared with the GARCH model in all the cases, that is, (a) without any exogenous variable, (b) gross purchases and gross sales by FIIs as independent variables, and (c) gross turnover by FIIs as an independent variable. Hence, the E-GARCH model predicts volatility best.

(3) Impact of Gross Purchases, Gross Sales, and Gross Turnover by FIIs on Stock Market Volatility

➲ **Null Hypothesis:** Gross purchase and gross sales together do not impact market volatility.

➲ **Alternate Hypothesis:** Gross purchase and gross sales together impact market volatility.

The results of symmetric as well as asymmetric GARCH models, as shown in the Table 3 and Table 4, indicate that the coefficient of gross purchases by FIIs is significant, but that of gross sales by FIIs is not significant in both the models, that is, GARCH and E-GARCH. Hence, gross purchase significantly contributes to stock market volatility, but gross sales by FIIs do not significantly contribute to stock market volatility. The coefficient of gross purchase is significant, suggesting that a greater volatility in gross purchase by FIIs could have greater implications for the volatility of stock indices during that particular period. Hence, we accept the null hypothesis.

➲ **Null Hypothesis:** FIIs' investments do not impact the Indian stock markets.
➲ **Alternate Hypothesis:** FIIs' investments significantly impact the Indian stock markets.

While taking only gross turnover by FIIs as the exogenous variable instead of gross purchases and gross sales by FIIs, the results suggest that FIIs contribute significantly to stock market volatility, and coefficient of gross turnover is also significant in both the models for the period of our study. Hence, we reject the null hypothesis.

Our results are in conformity with the studies of Sethi (2007), Gupta (2011), Upadhyay (2006), Banerjee and Sarkar (2006), Shukla (2011), Chittedi (2008), Gordon and Gupta (2003), and Ganesamoorthy and Shankar (2012).

However, our findings are contrary to the results obtained by Hamao and Mei (2001), Tesar and Werner (1995), and Bohn and Tesar (1996), who found that there was little evidence that trading by foreign investors tended to increase market volatility any more than trading of domestic groups. Kim and Singal (2000) and De Santis and Imorohoroglu (1997) studied the behaviour of stock prices following the opening of a stock market to foreigners or large foreign inflows. They found that there was no systematic effect of liberalization on stock market volatility. Pal (1998) found the hypothesis that the entry of foreign portfolio investments boosted a country's stock markets and economy did not seem to be working in India. The influx of FIIs failed to invigorate the Indian stock market. Majumder and Nag (2013) found that flow of FIIs had no significant effect on inducing stock market volatility in India. Naik and Padhi (2015) suggested that FIIs did not have any significant impact on market returns, but DIIs investment flows did have a significant impact.

Implications

When equity price movement is greatly influenced by FIIs, the price of a company's scrips may fall, even when a company performs well. Thus, emerging stock markets must work out a comprehensive and balanced plan to bring the adverse impact of FIIs' investments to a tolerable limit (Roy, 2001). Instead of worrying about the sensitive nature of foreign investors and fearing that they might pull out their money abruptly at the slightest hint of trouble, India should encourage domestic investors who can pump liquidity in the Indian stock markets even in the face of global liquidity crunch so that the Indian financial sector continues to get a boost (Samal, 1997). In addition to that, policies in India should be implemented in such a way that foreign investors find the economic environment as a promising destination to invest. This will help in averting a panic situation created by FIIs. Foreign investments in India can be promoted for a longer period by creating an amicable investing environment for them. These long term investments will contribute towards the Indian stock markets' growth and development. Furthermore, markets will avert sudden panic situations created due to strong selling by foreign investors and will create a stable environment for inclusive economic growth and development. Derivative instruments which facilitate long term foreign investment with specified lock in periods can also be introduced.

Conclusion

In the past 20 years, India has witnessed remarkable developments in securities market as well its financial sector that keeps Indian markets on a level at par with the developed markets. Stock market reforms in context of transaction and trading systems are making emerging markets at par with the developed markets. A significant aspect of developed markets is huge investments by foreign investors; hence, this paper tries to figure out if Indian stock markets are also influenced by foreign institutional investors. A quick look at the net investment data by foreign investors indicates that Indian markets act as attractive hot spots for them and ,therefore, their influence is growing. Also, foreign investment, especially in the e-commerce sector, is going on unabated. There is no doubt that they are not only emerging as major players in the local markets of India, but their presence is also dominating the Indian securities market. The main reason that can be attributed to unpredictable nature of stock markets associated with FII investments is the hypersensitive nature of foreign investors. This makes it necessary to understand the investing behaviour of foreign investors as their herding nature is capable of sucking capital out of the markets unexpectedly and pumping enormous amounts, causing the share markets to go wild; thus making them unstable. Statistics on trading patterns of FIIs and gross turnover suggest that FIIs are becoming extremely influential as an increasing proportion of stock market turnover is credited to FIIs' trading.

In this paper, the data taken as gross purchases, gross sales, and gross turnover by foreign investors and closing value of Nifty points towards positive skewness and excess kurtosis that signify that distribution of each of the series is leptokurtic in nature. For the Indian stock market, the addition of ARCH and GARCH coefficients coming close to one in symmetric GARCH (1, 1) model signals that volatility shocks are persistent. Furthermore, GARCH coefficients are coming out to be larger than ARCH coefficients for both the models, which also approve the volatility persistence in the Indian securities market. A positive leverage effect can be seen in Indian securities markets as suggested by the significant and positive coefficient of leverage indicating that positive shock to market returns is likely to cause volatility to rise by more than a negative shock of the same magnitude for the period of our study. The coefficient of gross purchases is significant, but that of gross sales by FIIs is not significant in both the models. Hence, gross purchases significantly contribute and gross sales by FIIs do not significantly contribute to the stock market volatility in India. The coefficient of gross purchase is significant, implying that a greater volatility in gross purchase by FIIs could lead to more volatility of the Nifty index during the 2004-2014 period.

Limitations of Study and Scope for Further Research

The study is concerned with Indian equity markets only and not with global markets. It is relevant for Nifty50 index. The study focused only on FII investments in Indian markets as movement of stocks might be governed by multiple factors.

Other indices like Sensex, BSE100, BSE200, and Dollex-100 can also be included apart from Nifty. Domestic institutional investors (DIIs) and FDI can also impact the volatility of the markets, and hence, their impact can also be studied. Economic variables pertaining to both macro as well as micro environments such as foreign exchange rate, speculative trading, interest rate prevailing in the market, political factors, and government policies related to specific sectors, and so forth can be studied as they might affect the performance of the Indian capital markets. Correlation tests can also be carried out to find the degree of association between the FII gross purchase and gross sales with Nifty and other indices. Industry wise sectoral analysis to identify the sectors mainly influenced by the FII investments can also be done. This will help in formulating a framework using which an investor can assess the risks involved due to investments in these sectors.

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