An Empirical Study Of Volatility Of Nifty Returns And Net Fiis Flows

Dr.Monica Sharma

Abstract: The study under consideration is an endeavor to empirically investigate the causal relationships existing between Nifty returns and FII flows and also to examine volatility imparted by FIIs to the NSE Index after September 2008 for next ten years. Various financial econometric techniques including ADF Unit Root Test, Granger's Causality test, VAR-Impulse response function, and GARCH have been used to investigate the dynamic association between volatility series and net FII flows. Results indicate that stock market returns granger cause Net FIIs but Net FIIs inflows do not granger cause stock returns. Further, the results of GARCH model show that there is persistence of volatility in NSE index. Evidences have been gathered to support the truth that the volatility of NSE returns are impacted more by negative shocks ie FII sales as compared to positive shocks ie FII purchases.

Keywords: FIIs (Foreign Institutional Investments), Granger-causality, stock market returns, GARCH JEL Classification: G12, G23

1 INTRODUCTION:

Ever since India has opened its stock market for foreign investors in 1992, foreign institutionalinvestments have always remained talk of the town. Besides enhancing competition and imparting liquidity to the market, foreign institutional investment (FIIs) with their varied risk-return preferences also help in dampening volatility in stock markets. Additionally, they have become an established source of India's forex reserves thus corroborating the process of economic development. Indian government, though initially restrictive, has also relaxed the provisions for FII entry but the rise in the FII trading volume in recent years has resulted in further concerns regarding FII volatility, capital flight threat, its influence over the stock markets and impact of changes in regulatory regimes [Arya and Purohit(2012)]. Indian financial markets have been successful in retaining the interests of FIIs thus making the topic ever lucrative for the researchers.

2 OBJECTIVE OF THE STUDY

The financial crisis of September 2008 which is said to be the most difficult financial crisis faced by the world since 1930s brought about huge turmoil to the Indian stock market. The markets experienced huge volatility on account of FII withdrawal Foreign Institutional Investment (FIIs) as they needed to retrench assets to recover losses in their domestic countries and thus had become major sellers in Indian stock markets.(Bhatt, R.K.2011). The current study is a humble attempt to empirically investigate the relationship between Nifty index return and the volatility imparted by FIIs in the stock index returns in India after September 2008 for next ten years.

3 REVIEW OF LITERATURE

There are a number of causality studies to find the direction of causality between the FII flows and the Indian stock market returns, yielding mixed results. Some studies point out uni-directional causality where as some highlight bi-directional causality between the above said variables. Ahmad & Ashraf (2005) examined the relationship between Nifty stock returns and FII investment during two years 2002-04 using Granger-causality. They found a unidirectional relationship where equity returns granger cause FII flows and also used GARCH to analyze the static as well as dynamic relationship between Nifty stock returns and FII flows. Similarly Saxena and Bhadauriya(2011) explored the causal relationships between FIIs inflows and NSE index volatility by using Granger Causality test in a bivariate VAR framework and found unidirectional causality where stock market volatility is a cause to FII inflows. Chandra, (2012) also collected enough evidences of one sided causalities from stock market returns towards FII flows during various sample periods. On the other hand, Bose Suchismita et al. (2004) who found bi-directional causality between foreign capital inflows and stock returns. Babu (2008) investigated the dynamic interaction between stock market returns and FII flows in Indian stock market to bring out the presence of bi-directional causality between stock returns and FII flows. Further analysis using impulse response function highlighted that FII flows were driven by stock return. Christy & Murale, (2009) also revealed that there was bi-directional causality between net FII inflows andthe BSE Sensex— which mutually reinforced into each other. Similarly Kumar D. R., (2012) studied dynamics of stock returns in India and FII investments and found that there existed twin way causation between the variables though such relationship was more intense in case of returns causing net FII inflows as compared to net FII inflows causing the appreciation in stock market. Finance decisions like asset allocation, pricing of derivative or risk management involve volatility estimation (Poon, S. and Granger, C. 2003). Some literature has also been reviewed with regard to the association between FII trades and volatility of Indian stock market. Gordon and Gupta (2003) empirically suggested that not only FII capital flows in India are small in quantum but they are relatively less volatile also in contrast to some other emerging markets. Coondoo, D.and Mukherjee, P. (2004) examined three different aspects of volatility ie strength of volatility, duration of volatility and persistence of volatility and found that reasonable amount of volatility was present in the daily stock market returns and FII flows. Batra (2004) examined the time variation in Indian stock market volatility by employing asymmetric GARCH model for the long period ranging from 1979-2003. The findings revealed that India encountered the most volatile period in the stock market volatility during the initial period of the economic reforms and changes in the FII stock purchase and sale activity do not correspond to changes in stock return

volatility. As compared to other emerging markets, Mohan TT (2005) investigated the presence of modest volatility in FII inflows to India and it was found that stock market volatility was not the actual difficulty caused by fluctuations in FII inflows but the problems posed due to money supply and exchange rates management. Banerjee et. al. (2006) observed that asymmetric GARCH model as the best fit and found that NSE characterizes the existence of volatility clustering, leverage effect and increased volatility due to increased volumes. They also suggested that the participation of the FIIs in Indian scenario did not bring significant increase in stock market volatility. Tripathy, N. and Badhani K.N. (2009) used ARIMA model to forecast the relationship between FII activity and the Indian stock market and found there is nil significant impact of FIIs Investment on both BSE Sensex and NSE Indices during 2003-2007. Krishna R C (2008) SENSEX volatility confirms to be persistent and also positively related to volatility in macro-economic variables such as inflation, industrial production, and debt levels in the corporate sector. Mantri,J.K. et al. (2010) researched with the aim of using different GARCH, EGARCH, GJR- GARCH, IGARCH methods and ANN models to calculate the volatilities emcompassing Indian stock markets by using a fourteen year data of BSE Sensex and NSE Nifty. The results exhibited that there is no distinction in the volatilities of Sensex and Nifty when estimated under the family of GARCH & ANN models. Behera (2012) examined in Indian context, the effects of FIIs investment on stock market liquidity and volatility of equity returns using GARCH model and suggested that FIIs investments increase stock market volatility. Karthikeyan (2012) also targeted the FII inflows in India and their impact on Indian equity markets viz. BSE, NSE and S&P CNX 500. He demonstrated that positive relationship was present between the FII flows and Indian equity market performance but its impact was not at all significant. Loomba (2012) aimed at developing a thoughtful understanding of the dynamics related to the FIIs trading behavior and its influence on Indian equity market by using Daily BSE Sensex data and FII flows over a long period of 10 years ie from 01st Jan 2001to 31st Dec 2011. The results pointed towards the evidence of a significant positive correlation between Indian Capital Market and FII flows and that the movements in the former were fairly explained by the later. Lakshmi,P.(2012) established the dynamic relationships between FII trading activity and NIFTY spot index returns volatility by emloying GARCH/EGARCH framework. She found leverage effect was reduced to a negligible level if the trading volume of FIIs was included as an explanatory variable. Lakshmi,P. and Algappan(2012) also put forward FIIs as an explanatory variable in the GARCH model and suggested that FIIs impact on persistent volatility was very low as there could be other factors responsible for it. Econometric Techniques applied for the Empirical Analysis Daily closing price indices of NIFTY and daily data on the institutional equity investment flow (purchase, sales and net) of FIIs are obtained from Moneycontrol.com. The sample period of the study spans from 15th Sep 2008 to 31st Dec 2018 accounting for 2533 observations. No trading days have been omitted from the study and the price changes have been calculated from the last day when the market was open. Findings of stationary, causality and volatility have been computed using Eviews8 and MsExcel. The analysis involves two steps-Firstly, it examines the dynamic relationships between stock market returns and FII flows and; Secondly, it obtains the return volatility series by using a conditional volatility, GARCH model and examines the dynamic relationships between volatility series and FII flows.

Calculating Nifty Stock Returns

Logarithmic process is used to convert the closing price indices into compounded log return by using following formula:

$Rt = \ln (Pt / Pt-1)*100$

Where Rt = compounded return /logarithmic daily return percentage at time t

Pt, Pt-1 = closing value of the index at the two successive days t, t-1 respectively.

The unique additive property of log-returns, which is not applicable in relative returns accounts for the reason to consider log-returns instead of relative returns. (Fryzlewicz, P. 2007)

Descriptive Statistics for Returns and FIIs

The Jarque-Bera (JB) Normality test checks if the series is normally distributed by testing whether skewness and excess kurtosis jointly equal zero. The H0 that the Nifty index returns series are normally distributed is strongly rejected by JB test results. It confirms the fact that stock Nifty index returns in India do not tag on a normal distribution. At the same time the basic descriptive statistics have also been calculated and results reveal that the stock return data under investigation has leptokurtosis and fat tails. Hence the results support the use of the GARCH model to examine the dynamics of stock market return volatility.

Table1: *Descriptive Statistics Results*

	NIFTY Index Return
Mean	*0.0356*
Median	*0.047*
Maximum	*16.334*
Minimum	*-13.014*
Std. Dev.	*1.295*
Skewness	*0.237*
Kurtosis	*19.809*
Jarque-Bera	*29832.47(p value=0.00)*

Test for Stationarity

Engle and Granger (1987) put forth that “a time series is said to be stationary if displacement over time does not alter the characteristics of a series in a sense that probability distribution remains constant over time”. It denotes that the mean variance as well as covariance of the series must remain constant over time. As the data of the present study deals with time series data, widely accepted unit root test, namely Augmented- Dicky Fuller (ADF) has been employed to test the stationarity of the series. This test adds the lagged values of the dependent variable in the model.

The ADF test involves estimating the following regression:

$\Delta Yt = \beta 1+\beta 2t+\delta Yt-1+\alpha i\ \Sigma \Delta Yt-i +\varepsilon t$

where εt is a pure white noise error term and where

$\Delta Y t-1 = (Y t-1 – Y t-2)$, $\Delta Yt-2 = (Y t-2 – Y t-3)$ and so on.

Table2: *Unit Root Test*

Null Hypothesis	*ADF Test Statistic*	*Result*
NIFTY Stock Return has a unit root	*-46.7879 (p value=0.01)*	*Null Hypothesis is rejected*
FIIs has a unit root	*-16.1239 (p value=0.00)*	*Null Hypothesis is rejected*
Test critical values:	*1 percent level- -3.432742 5 percent level- -2.862483 10 percent level--2.567317*	

Granger Causality

Granger(1969) observed that Granger causality is an accepted method to study casual links between random variables. Granger causality test is the test of a joint hypothesis that lagged values of variables are not statistically significant. Hence, the null hypothesis is:-

$$H_o: \beta_1 = \beta_2 = \cdots = \beta_j = 0$$

Hence Granger-causality test has been conducted in order to test whether FIIs granger cause stock market returns and vice versa. SC has been sued for selecting the optimum lag length and for applying Granger causality and the Vector lags order selection criteria of Schwarz information criterion (SC) was found to be 4. VAR Granger causality test statistics are shown in the table 3.

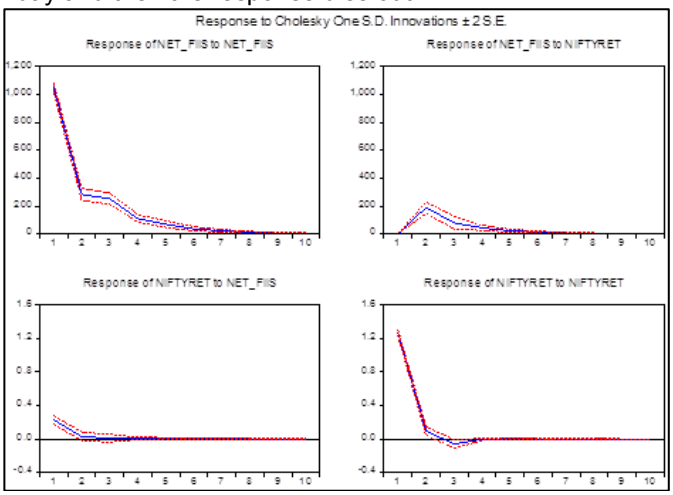
Table 3*. VAR Granger Causality Tests*

H0	*Chi-square Stastistic*	*Probability*	*Decision*
NIFTY Stock Return does not Granger Cause Net FIIs	*84.0334*	*0.0000*	*H0 Rejected*
Net FIIs does not Granger Cause NIFTY Stock Return	*0.9183*	*0.6318*	*H0 not Rejected*

There is unidirectional causality between these two variables. Results indicate that stock market returns granger cause Net FIIs but Net FIIs inflows do not granger cause stock returns. The findings of this study are consistent with Saxena and Bhadauriya(2011) but inconsistent with Bose Suchismita et al. (2004) who found bi-directional causality between FII inflows and stock market returns. The discrepancy in findings of the study may be the result of different time and stock market selection.

Impulse Response

The results of Granger-causality may not completely depict the interactions between the time series in question. Therefore, impulse response function has also been applied to examine the dynamic relationships between innovations/shocks in stock market returns and innovations/shocks in net FII flows. Impulse response function studies the responsiveness of endogenous variable in VAR system for current and future periods when a unit shock is put to the error term. The estimated dynamic response of FII net flows and Nifty Stock Returns for ten future periods to a one standard deviation shocks are described in Figure 1. This figure clearly depicts that the FII net flows is positively responding to Nifty stock market return about up to 5 days where as the latter Nifty stock return is responding to FII net flows for about just 1day and then the response dies out.



Effect of Net FII Flows on Nifty Index Return

To examine the relationship of Net FII flows with Nifty stock returns the following model has been estimated:

NIFTYt= α+ βFII+ εt

Where:

NIFTYt is the Continuously compounded return Stock Market Return

FII is the Net FII Flows [equity purchases – sales](in rupees crores)

The coefficient of FII investments is +ve and statistically significant implying a +ve impact on Nifty stock returns as depicted in table 4.

Table 4*: OLS Estimates of Impact of Net FII Flows on Nifty Stock Return*

Dependent Variable	*Constant*	*Co-efficient of Net FIIs*	*R2*	*DW*
Ret	*-0.012942***	*0.000203**	*0.31*	*1.91*
,: significant at 5% and 10% respectively*				

Effect of Net FII flows on Nifty Index Return Volatility

To study the hypothesis of effect of Net FII flows on stock market volatility, GARCH techniques have been employed. The basic argument of ARCH model is that volatility is a latent variable and hence cannot be observed but it can be estimated. Commonly, the ARCH models are used in modeling financial time series which demonstrate time-varying volatility clustering which means that prolonged periods of swings immediately followed by prolonged periods of relative calm. ARCH models can be used after conditional heteroskedasticity i.e. ARCH effect is confirmed in the time series under consideration. Statistically, volatility clustering implies that there exists sturdy autocorrelation in squared returns which can be detected by calculating the first order autocorrelation coefficient in squared returns.

Conditional Volatility (Heteroskedasticity) of Returns

The author has conducted all the pre-estimation diagnostic checks to check the existence of ARCH effect and property of data used in the exercise. For this purpose, firstly ARMA (1,1) Model has been successfully tested the results for which are displayed in table 5:

	Table 5: ARMA(1,1) Model on Nifty Stock Return			
	Co-efficient	*Standard Error*	*T-statistic*	*p-value*
Constant	*0.036*	*0.027*	*1.343*	*0.1794*
AR(1)	*-0.405*	*0.168*	*-2.409*	*0.0161*
MA(1)	*0.484*	*0.161*	*3.005*	*0.0027*

Testing for presence of Serial Correlation

GARCH Model can be applied only when the fitted model is free from serial correlation. For testing H0 of no serial correlation, Breusch Godfrey Serial Correlation LM Test has been used and results depicted in table 6:

Table6: Breusch Godfrey Serial Correlation LM Test	
F-statistic : 0.527	Prob. F: 0.7158
Obs*R-squared : 2.112	Prob. Chi-Square: 0.7151

The p-value of 71.51% which is more than 5 percent shows that no evidence of serial correlation is present.

Testing ARCH Effects

To examine the presence of the ARCH effects that indicate serial correlation and volatility clustering of the returns ARCH effect devised originally by Engle (1982) has been used. The ARCH-LM test is employed to check the occurrence of serial correlation in the squared errors from equation (2) to test the ARCH effect. All the tests confirmed the occurrence of ARCH effect in Nifty index return series as displayed in table 7.

Null hypothesis, Ho - No ARCH effect is present in the series.

Alternative hypothesis, H1 - ARCH effect is present in the series.

Table7: ARCH Effect	
F-statistic : 34.15325	*Prob. F: 0.000*
*Obs*R-squared : 129.8501*	*Prob. Chi-Square: 0.000*

The significance of parameters ie 129.8501 indicate the presence of conditional volatility ie ARCH effect.

GARCH (1, 1) Model Description

After confirmation of ARCH effects, GARCH (1, 1) model has been estimated using net FII flows as independent variable in conditional variance equation. So, the conditional volatility in returns is measured through the GARCH (1, 1) model as the objective is to capture the volatility clustering in the financial data.

The testable GARCH (1, 1) equations to study the impact of net FII flows on Nifty stock market return volatility are given as below:

Mean Equation:

$Rt=a0+a1Rt-1+ \varepsilon t$ equation (1)

where:

Rt is the Nifty index return series.

Rt-1 is the Nifty index return series with one period lag

εt is the residual term and is a sequence of iid random variables with mean 0 and variance 1, which is frequently assumed to follow a standard normal or standardized student-t distribution.

The mean equation in the GARCH model, i.e. equation (1) is estimated as specified because the data fits well for ARMA (1,1) in present study.

Variance Equation:

$Ht=bo+b1FII+\alpha \varepsilon 2t-1 + \beta Ht-1$ equation (2)

where:

Ht is Variance of the residual terms derived from equation (1)

Ht-1 is the previous days residual variance of Stock return series ie GARCH term.

ε2t-1 is the previous period's squared residual derived from equation (1) ie ARCH term. It is the previous period information about volatility.

FII is the net FII flows used as variance regressor. Conditional variance equation is represented as a trilogy of 3 terms:-the mean, news about previous period volatility viz. calculated as the lagged squared residual from the mean equation (known as the ARCH term) and previous period's forecast variance or volatility (GARCH term).

Table 8: Parameter Estimates of GARCH Models				
	Coefficient	*Std. Error*	*z-statistic*	*p-value*
constant	*0.7761*	*0.0740*	*10.4844*	*0.0000*
RESID(-1)^2	*0.2559*	*0.0230*	*11.0871*	*0.0000*
GARCH(-1)	*0.3841*	*0.0436*	*8.7920*	*0.0000*
NET_FIIs	*-0.0001*	*0.0000*	*-17.5931*	*0.0000*

ARCH co-efficient of 0.2559 indicate presence of heteroskedasity in the series and also depict that previous day return information can influence present day volatility in return series. It shows that to what extent conditional variance is dependent on previous period squared residuals derived from mean equation (equation 1). GARCH coefficients indicate if the volatility is persistent or not, as a persistent volatility shock raises the intensity of volatility in stock return series. The coefficients α and β measure the dependence of present volatility (Ht) of Nifty stock return series on innovation term (εt-1) and past volatility (Ht-1) of stock return series respectively. The coefficients of GARCH model i.e. the ARCH and the GARCH coefficients (0.2559 and 0.3841) are all positive and also statistically significant as required. The sum of the ARCH-GARCH coefficients (α + β) measures the degree of persistence of volatility over time. Innovative shocks to the current volatility remain significant for long periods into the future if the parameters α+β is close to one. The sum of both these coefficients is 0.64 which depicts that volatility shocks do have an above average persistent impact on conditional variance. These shocks will cast an true permanent effect if the addition of both ARCH and GARCH coefficients become equal to unity.

Wald test is used test the degree of persistence in which:

The H0 is α+ β =1(alternatively known as, 'the variance is integrated' or non-stationarity of the variance)
H1 is α+ β<1 where the estimated α and β are the coefficients from the variance equation.
Highly significant Wald statistics confirms the stability of the model. All these results confirm the adequacy of our GARCH (1,1) model. Further, net FII is used as the variance regressor in the above mentioned GARCH model. If net FII flows augment stock market volatility, the coefficient of FII in the conditional variance equation, i.e. equation (2) needs to be positive and significant. The results in the above table show that the coefficient of FII investment is negative but highly significant. However, the coefficient is very low in magnitude, i.e. 0.0001. Therefore, it may be concluded that FII sales increase NSE volatility more than FII purchases. Decision of the model: Volatility present in the Nifty stock return series is largely dependent on its own shocks such as ARCH and GARCH terms and is influenced by the negative net FII flows ie when FII sales are more than FII purchases.

Diagnostics for GARCH (1, 1) Model
The following post-estimation residual diagnostic checks are carried out which satisfy all the conditions.

1. **Correlogram squared residuals:** The autocorrelation function and the partial autocorrelation function of the squared returns are examined to check the appropriateness of the GARCH model. The results (see table 9) are examined in line with the H0 being no serial correlation and p-values are found to be more than 5% giving us the reason to accept the model.

Table9: *Correlogram squared residuals*

Autocorrelation	*Partial Correlation*
| |	| |
| |	| |
| |	| |
| |	| |

2. **ARCH LM test:** It check the existence of variance clustering in line with the H0 of no ARCH effects. The value of R-squared statistic should be insignificant if the variance had been modeled properly. The results displayed in table 10 depict that No ARCH effects are present the model. ARCH-LM χ2 statistics are highly insignificant proves absence of further ARCH effects.

Table 10: No ARCH Effects	
F-statistic : 0.1775	*Prob. F: 0.6735*
*Obs*R-squared : 0.177675*	*Prob. Chi-Square: 0.6734*

Dynamic Forecasts of GARCH Model:
The figure1 depicts that stock market volatility remains stable as blue line lies within + 2S.E bounds. This gives clear indication to the FIIs that they can hold their assets and may earn stable returns.

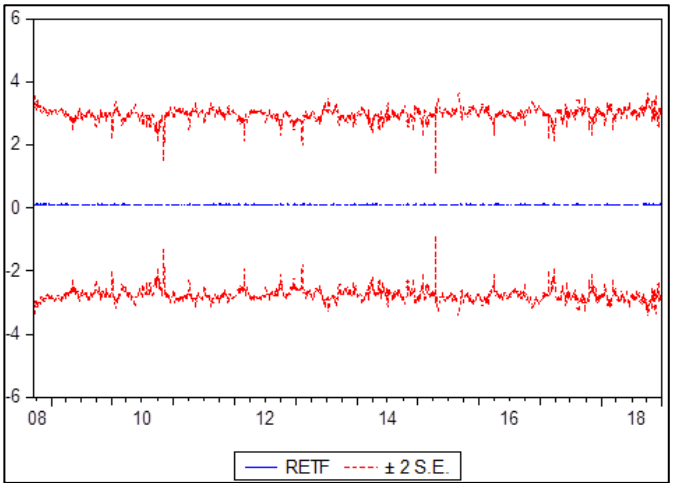


Figure 1: *Dynamic Forecasts of GARCH model*

Main Findings and Concluding Remarks
The present study attempted towards modeling the volatility in the Nifty index returns and its relationship with the net FII flows, using daily data covering period over 10 years. The results of the GARCH model show that persistence of volatility is present in Nifty index returns. The coefficients of all the parameters except net FII flows of the present model are positive and significant. After introducing net FII flows in the GARCH model enough evidence has been gathered to uphold the argument that the volatility of Indian markets are perturbed more by negative shocks i.e. FII sales as compared to positive shocks i.e. FII purchases. Therefore, it has been concluded that during the long run period the FII sales activity has a persistent impact on the persistence effect in the volatility of NSE index returns though small but statistically significant.

Research limitations – This research considered only NSE stock market returns and Net FII flows whereas more macroeconomic variables may be considered for the further research.

4 REFERENCES:

[1] Ahmad,Ashraf and Ahmed(2005): "Foreign Institutional Investment Flows and Equity Returns

in India". The ICFAI Journal of Applied Finance, 11, pp. 16-30.
[2] Banerjee, A. and Sarkar, S. (2006): "Modeling daily volatility of the Indian stock market using intra-day data". Indian Institute Of Management , Calcutta.
[3] Babu, M. S., & Prabheesh, K. (2008). "Causal relationships between Foreign Institutional Investments and stock returns in India". International Journal of Trade and Global Markets, 1 (3), pp 259-265.
[4] Batra, A. (2009): "Stock Return Volatility Patterns in India. Indian Council for Research on International Economic Relations (ICRIER)". https://core.ac.uk/download/pdf/6604692.pdf (accessed on 20th May 2019).
[5] Behera(2012): "An Assessment of FII Investment in Indian Capital Market". http://ssrn.com/abstract=2258352 (accessed on 22 March 2019)
[6] Bose Suchismita and Coondoo Dipankor (2004): "The Impact of FII Regulations in India: A Time-Series Intervention Analysis of Equity Flows". Money & Finance, ICRA Bulletin, 2(18), pp 54-83.
[7] Chandra, A. (2012). "Cause and effect between FII trading behaviour and stock market returns: The Indian experience". Journal of Indian Business Research, 4 (4), 286 - 300.
[8] Christy, M. P., & Murale, M. V. (2009): "An Emperical Investigation of Impact of Net FII Investment on Performance of Indian Stock Market of BSE". Journal of contemporary research in management, 4 (1), pp 125-143.
[9] Coondoo, D.and Mukherjee, P.(2004). "Volatility of FII in India". http://www.icra.in/Files/MoneyFinance/Oct2003March2004VolatilityofFII.pdf (accessed on 2.10.2019)
[10] R. K. (2011): Recent Global Recession and Indian Economy: An Analysis. International Journal of Trade, Economics and Finance, Vol. 2, No. 3,212-217.
[11] Karthikeyan, P., & Mohanasundaram, T. (2012): "FII Flows and Indian Equity Market Performance". Asian Journal of Managerial Science, 1 (1), 12-22.
[12] Loomba, J. (2012): "Do FIIs Impact Volatility of Indian Stock Market". International Journal of Marketing, Financial Services & Management Research, 1 (7), 80-93.
[13] Saxena and Bhadauriya (2011): "Fii Flows And Stock Market Volatility: Exploring Causal Link". http://ssrn.com/abstract=2063140 (accessed on 10thMay 2019)
[14] Krishna R C (2008): " Volatility of Indian Stock Market and FIIs". Center for Development Studies, Trivandrum, Kerala: http://ssrn.com (accessed on 10thMay 2019)
[15] Lakshmi,P. (2012): "FII Trading Volume and Symmetric Volatility: Analysis from Indian Spot Market". Vilakshan, XIMB Journal of Management.
[16] Lakshmi,P and Algappan (2012): "An Empirical Analysis on the Dynamic Relationship Between FII Trading Volume & NIFTY Returns". European Journal of Economics, Finance and Administrative Sciences, 52, pp86-98.
[17] Mantri,J.K. et al. (2010): "Artificial Neural Networks – An Application To Stock Market Volatility". International Journal of Engineering Science and Technology Vol. 2(5), 2010, pp1451-1460.
[18] Mohan TT (2005): "Taking stock of Foreign Institutional Investors". Economic and Political weekly, www.rbi.org.in , www.sebi.gov.in.
[19] Poon, S. and Granger, C. (2003). "Forecasting Volatility in Financial Markets: A Review". Journal of Economic Literature, 41, pp 478-539.