Volatility of Indian Stock Market and FIIs: A Time Series ARIMA Modeling Approach

Anandadeep Mandal, Sailabala Debi, and Smruti R. Tripathy

Abstract

This paper examines the stock market volatility and FIIs for the period (2004 – 2010). The volatility of NIFTY index influenced by the investment inflows of FIIs is modeled using a time series ARIMA approach. The empirical results calibrated through these models are analytic in several fronts. The paper further models and forecasts the index using the data set, where Foreign Institutional Investment (FII), Nominal Effective Exchange Rate (NEER) and Call money rate are considered as the exogenous variables. Finally, the empirical findings show that if the net FII flow is auto regressed with FII flow of various lag periods then it does not have significant influence on the monthly-volatility of the index. The paper also proposes the possible reasons supporting the empirical observations.

Keywords: Foreign Institutional Investor, stock market volatility, ARIMA, Nominal Effective Exchange Rate, Call money rate.

JEL Classification: C32, C53, E44

1. Introduction

Foreign Institutional Investment (FII), which is also known as International portfolio investments, are capital flows done by individuals or institutions in countries they are not resident of and plans to have a well-diversified international portfolio. In comparison to Foreign Direct Investment (FDI) which is also a form of foreign investment in which the investor has a long-term interest in the company by exercising control, FIIs don't look for exercise of control. According to *Bekaert and Harvey (2000)*, FII contribution to emerging economy's GDP has increased substantially over last two decades as the Emerging Economies (EMEs) have liberalized their financial markets to make it easier to access for foreign players. As advocated by Capital Asset Pricing Model (CAPM), it is always better to diversify internationally i.e. having a well-diversified portfolio of securities from different economies around the globe in proportion to their market cap to maximize risk adjusted returns.

There used to be a home bias for investors in developed economies but that seems to be getting neutralized with Emerging economies (EMEs) simplifying their tax structure, loosening the foreign exchange policies and making it easier to purchase or sell securities in these economies. These days EMEs have become favorite destinations for FIIs due to their lower correlation with developed market returns. Though the decoupling with the developed markets is not major, still foreign investors are choosing these economies to maximize their portfolio

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returns. Research studies have shown that the amount of asset allocation that fund managers make towards EMEs is higher than what would be suggested under portfolio risk divestment models. This describes how these fund houses play a significant role in the economic growth of these countries.

The composition of capital flows into the EMEs is generally dominated by FDI which is a more stable source of fund than the portfolio investments. Both, banking flows and FIIs make the market more volatile due to the increased linkage between foreign and domestic financial markets (Kohli, 2003). Capital inflows expose the country to the risk of sudden withdrawal of money by foreign portfolio investors which may make the markets even more volatile. The only logic that makes sense to the increased capital inflows is the fact that absorption by the external sector in form of capital outflows have increased too. While it is generally perceived that the portfolio flows are good for the economic growth of the recipient economy, it does make the policy makers of these economies susceptible to risk.

Indian financial markets have grown by leaps and bounds over the last one decade. The large chunk of the credit should go to the institutional investor over the retail investors. Due to this the Indian capital market has evolved in terms of providing innovative products. Both primary and secondary markets have witnessed the growth in participation of the FIIs. Countries with sound macroeconomic policies and efficient regulatory bodies have reaped the benefit of these increased institutional flows. India is no exception. India has allowed free capital flows by partially deregulating its exchange rate regime and having an independent monetary policy.

Research papers have shown that factors like market size, liquidity, and cost of trading, corporate governance, information dissemination, listing and accounting rules have direct impact on FIIs choosing investment destinations. Indian capital market regulators—Reserve Bank of India (RBI) and Securities and Exchange Board of India (SEBI)—have ensured that India always remain ahead of other EMEs in terms of financial sector reforms. Out of all the reforms that SEBI has undertaken few that stand out are, reducing the cap on FII investment and making their registration process easier.

India growth story has been really impressive over last decade. Sustaining this growth has become really imperative. With a growing economy the first challenge that India faces is huge capital requirement. But it is not always feasible to fund it through internal sources and also considering India as a capital scarce economy, overseas funding becomes a necessity. This is also a key to fuel the growth in the evolving consumption pattern in the economy. Sectors like infrastructure, pharmaceutical, retail have reaped maximum benefit out of it. India government has over the years encouraged FDI and FII flows into the economy as these are non debt creating and help mitigating funding related issues.

The financial crisis has caused a large number of foreign fund houses to focus on India and rest of the emerging economies as the growth story has shifted from the west to the east. Though, this large inflow of money is a welcome sign, it also exposes the economy to global corrections which may suddenly force the fund flows to reverse. The Indian policy makers have always tried to increase the participation of the retail investors in the Indian market. But due to the volatile nature of the FII flows, small retail investors most of the times end up making loss. India government is taking all possible measures to try and make the FII flows less volatile by keeping a minimum lock in period for their investments.

However, the research efforts in the above discussed concerned matter have failed to develop a model explaining the volatility of the Indian stock market and FIIs. In this paper, we develop a parametric model to explain and forecast the volatility of the stock market, influenced by institutional flows and other concerned macroeconomic factors. The rest of the paper proceeds as follows: Section 2 highlights the literature review; Section 3 explains the methodology used to derive the parametric model. The data concerning the empirical research is explained in Section 4; Section 5 provides the results and analysis, and Section 6 concludes the study.

2. Literature Review

Over the last decade, a lot of study has been done regarding FII investments in India and its impact on stock market volatility. Chakraborty (2007) underscores the fact that FII activities in Indian stock market have increased over the years. It is a result of better stock market returns rather than the cause of it. It also emphasizes how the importance of FII can't be underplayed as they are the vital catalysts when it comes to making emerging capital markets more efficient. Another paper discussing the

impact of FII regulations in India by Bose and Coondoo (2004) appreciates the liberalizing policies undertaken by the government. which has helped in achieving the expansion of FII activities in the economy. The restrictive measures taken to stabilize the flow have not really made any adverse impact on the portfolio flows.

A study by Bekaert and Harvey (2000) highlights that there was a significant correlation between emerging market and developed market returns. There seems to be a major decoupling to a great extent in the period after the slowdown as the emerging markets have outperformed the developed ones. It also talks about the fact that FII participation after liberalization did not cause any stock market volatility.

Han and Wang (2004) highlighted that the FIIs are more informed and better geared than the individual investors and; hence are it is not surprising that presently these sophisticated investors hold a significant portion of the corporate sector's securities in India. As the share of the FIIs has gone up, it has significantly influenced the asset prices of the recipient economy. Consequently, the factors impacting the flow of FIIs, and the influence of these investors on the volatility of the Indian stock market has become a primary focus for the policy maker. Tesar and Werner (1995) and Li (2002) stated the impact of FIIs on the domestic market. Calvo and Mendoza (2000) in their work mentions that the stock market surge due to the flow of FIIs does not last for the entire period of the capital inflows and ends before the investments subsides. Henry (2000) distinguished the two major impacts of market linearization with relevance to international asset pricing models: (i) it leads to the increase in domestic equity prices and (ii) it triggers more physical investments as the cost of capital decreases, leading to economic boom. Gompers *et al*. (2001) analyzed the investment pattern of the institutional investors. They concluded that if the demand and the supply of a particular asset are not perfectly elastic then the institutional demand in share market will affect stock market prices. Han *et al*. (2004) studied the effect of investment constraints of the institutional investors on stock prices. They state a direct relationship between the investment constraints and price momentum of the asset prices. In a similar study Lin *et al*. (2006) stated that the investment performance of FIIs on high holding stocks significantly outperformed the low holding stocks. However, Li (2002) claimed that there was no significant movement in the asset price behavior due to FIIs on Taiwan stock market. Richards (2004) in his paper on Asian equity markets found that the global markets influenced the trading behavior of the FIIs and the price impact due to these foreign investors was significant.

In this paper we look at the impact of FIIs on the Indian stock market behavior and for this purpose, we model and empirically examine changes in market return and volatility.

3. Methodology

3.1. Forecasting Future Values from an ARIMA Model

We define the ARMA model for as:

$$Y_t = \phi_0 + \varphi_1 Y_{t-1} + \ldots + \varphi_p Y_{t-p} - \phi_1 \alpha_{t-1} - \ldots - \phi_q \alpha_{t-q} + \alpha_t \quad (3.1)$$

Or it can be written as:

$$\varphi_p(B) = \phi_0 + \phi_q(B)\alpha_t \quad (3.2)$$

Since we have the values of $Y_1, Y_2, \ldots, Y_n$ and we propose to forecast for Y_{n+l} [1], we define the value of as:

$$Y_{n+l} = \phi_0 + \varphi_1 Y_{n+l-1} + \ldots + \varphi_p Y_{n+l-p} - \phi_1 \alpha_{n+l-1} - \ldots - \phi_q \alpha_{n+l-q} + \alpha_{n+l} \quad (3.3)$$

For the above equation (3.3) the minimum mean square error forecast for Y_{n+l} is:

$$\hat{Y}_n(l) = \phi_0 + \varphi_1 \left[Y_{n+l-1} \right] + \ldots + \varphi_p \left[Y_{n+l-p} \right] - \phi_1 \left[\alpha_{n+l-1} \right] - \ldots - \phi_q \left[\alpha_{n+l-q} \right] \quad (3.4)$$

3.2. ARMA Model Forecasting in Infinite MA Form

We define the ARIMA model for Y_t as:

$$Y_t = \phi_0' + \psi_\infty(B)\alpha_t \quad (3.5)$$

Where, $\phi_0' = E(Y_t) = \phi_0 / (1 - \varphi_1 - \ldots \varphi_p)$ and expanding $\psi_\infty(B)$ gives:

$$Y_t = \phi_0' + \psi_1 \alpha_{t-1} + \psi_2 \alpha_{t-2} + \psi_3 \alpha_{t-3} + \ldots + \alpha_t \quad (3.6)$$

[1] 'l' step ahead of the forecast region 'n'

Now, since we have the values of $Y_1, Y_2, ..., Y_n$ and we propose to forecast for Y_{n+l}, we define the value of Y_t in an ARIMA model as:

$$Y_{n+l} = \phi_0' + \psi_1\alpha_{n+l-1} + \psi_2\alpha_{n+l-2} + \psi_3\alpha_{n+l-3} + ... + \alpha_{n+l} \quad (3.7)$$

Similar to equation (3.4) the minimum mean square error forecast for Y_{n+l} in an ARIMA model is:

$$\hat{Y}_n(1) = \phi_0' + \psi_1\alpha_n + \psi_2\alpha_{n-1} + \psi_3\alpha_{n-2} + ... \quad (3.8)$$

3.3. Forecast Error and Forecast Error Variance

For one step-ahead (i.e. $l = 1$) we have:

$$Y_{n+1} = \phi_0' + \psi_1\alpha_n + \psi_2\alpha_{n-1} + \psi_3\alpha_{n-2} + ... + \alpha_{n+1} \quad (3.9)$$

$$\hat{Y}_n(1) = \phi_0' + \psi_1\alpha_n + \psi_2\alpha_{n-1} + \psi_3\alpha_{n-2} + ... \quad (3.10)$$

$$e_n(1) = Y_{n+1} - \hat{Y}_n(1) = \alpha_{n+1} \quad (3.11)$$

$$Var\left[e_n(1)\right] = Var\left(\alpha_{n+1}\right) = \sigma_\alpha^2 \quad (3.12)$$

Now, for $l = 2$, we obtain:

$$Y_{n+2} = \phi_0' + \psi_1\alpha_{n+1} + \psi_2\alpha_n + \psi_3\alpha_{n-1} + ... + \alpha_{n+2} \quad (3.13)$$

$$\hat{Y}_n(2) = \phi_0' + \psi_1\left[\alpha_{n+1}\right] + \psi_2\alpha_n + \psi_3\alpha_{n-1} + ...$$

$$\Rightarrow \hat{Y}_n(2) = \phi_0' + 0 + \psi_2\alpha_n + \psi_3\alpha_{n-1} + ... \quad (3.14)$$

$$e_n(2) = Y_{n+2} - \hat{Y}_n(2) = \alpha_{n+2} + \psi_1\alpha_{n+1} \quad (3.15)$$

$$Var\left[e_n(2)\right] = Var\left(\alpha_{n+2} + \psi_1\alpha_{n+1}\right) = Var\left(\alpha_{n+2}\right)$$

$$+\psi_1^2 Var\left(\alpha_{n+1}\right) = \sigma_\alpha^2\left(1 + \psi_1^2\right) \quad (3.16)$$

Similarly, for $l = 3$, we obtain:

$$Y_{n+3} = \phi_0' + \psi_1\alpha_{n+2} + \psi_2\alpha_{n+1} + \psi_3\alpha_n + ... + \alpha_{n+3} \quad (3.17)$$

$$\hat{Y}_n(3) = \phi_0' + \psi_1\left[\alpha_{n+2}\right] + \psi_2\left[\alpha_{n+1}\right] + \psi_3\alpha_n + ...$$

$$\Rightarrow \hat{Y}_n(3) = \phi_0' + 0 + 0 + \psi_3\alpha_n + ... \quad (3.18)$$

$$e_n(3) = Y_{n+3} - \hat{Y}_n(3) = \alpha_{n+3} + \psi_1\alpha_{n+2} + \psi_2\alpha_{n+1} \quad (3.19)$$

$$Var\left[e_n(3)\right] = Var\left(\alpha_{n+3} + \psi_1\alpha_{n+2} + \psi_2\alpha_{n+1}\right)$$

$$= \sigma_\alpha^2\left(1 + \psi_1^2 + \psi_2^2\right) \quad (3.20)$$

Deriving from equation (3.20) for 'l' steps-ahead forecast we get:

$$\hat{Y}_n(l) = \phi_0' + 0 + 0 + ... + \psi_l\alpha_n + \psi_{l+1}\alpha_{n-1} + ... \quad (3.21)$$

$$e_n(l) = Y_{n+l} - \hat{Y}_n(l) = \alpha_{n+l} + \psi_1\alpha_{n+l-1} + ... + \psi_{l-1}\alpha_{n+1} \quad (3.22)$$

$$Var\left[e_n(l)\right] = \sigma_\alpha^2\left(1 + \psi_1^2 + ... + \psi_{l-1}^2\right) = \sigma_\alpha^2\sum_{i=0}^{l-1}\psi_i^2 \quad (3.23)$$

In the above equation, $\psi_0 \equiv 1$

3.4. Eventual (Long-run) Forecasts

For the stationary time series, from equation (3.21), i.e. $\hat{Y}_n(l) = \phi_0' + 0 + 0 + ... + \psi_l\alpha_n + \psi_{l+1}\alpha_{n-1} + ...$, the weights of ψ die down, and hence we obtain the long-run forecast as:

$$\lim_{l\to\infty}\hat{Y}_n(l) = \phi_0' = E\left(Y_t\right) \quad (3.24)$$

Similarly from equation (3.22) we derive:

$$\lim_{l\to\infty} Var\left[e_n(l)\right] = \sigma_\alpha^2\left(1 + \psi_1^2 + \psi_2^2 + ...\right) = Var\left(Y_t\right) \quad (3.25)$$

4. Data Used

The model designed in this paper for estimating the volatility in the Indian equity markets (S&P CNX Nifty index) uses: (i) Foreign Institutional Investment (FII), (ii) Nominal Effective Exchange Rate (NEER), and (iii) Call money rate as the exogenous variables for empirical findings. The endogenous or dependent variable in this model is the Nifty index (NSE).

The primary reason of choosing S&P CNX Nifty index as a proxy for the Indian equity markets is because: (i) Nifty represent the sectorial diversity of the Indian equity market. The index includes 50 companies and takes into account 23 sectors of the Indian economy. (ii) the bulk volume of trade in equity markets is traded in NSE. The monthly opening and closing data are accounted for the study. The Period under study is 2004-2010. The main reason behind choosing the period for study 2004-2010 is to see the pre- and post-financial turmoil scenarios of 2008. As the economic slowdown is a major event which increased FII's asset allocation percentage towards the emerging economies.

The FII data used are the net inflow figure includes both flows to equity as well as debt market. The debt market

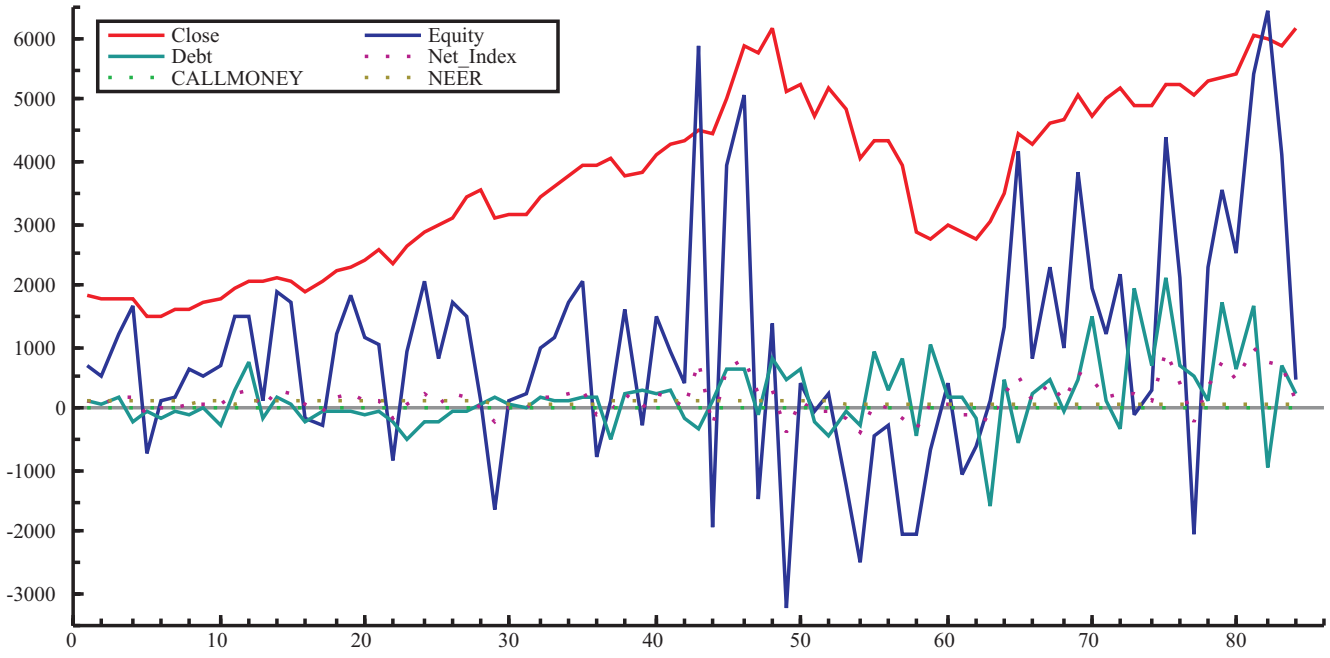
flows are included, as it reflects the future growth prospects of the FIIs. Nominal Effective Exchange Rate (NEER) is taken on a monthly basis. The daily NEER data for a month is collected and then it is averaged out. NEER is chosen as a variable for the model over a USD/INR exchange rate due to the fact that NEER gives a better comparative value of the home country currency in comparison to the major traded currencies in the basket. Call money rate is taken for the study as a proxy for the interest rate. The repo[2] rate is not taken as it doesn't change frequently and hence fails to deliver market sentiments in terms of interest rate at any given point in time. The daily call money data is taken and it is then averaged out for monthly data.

5. Empirical Findings

5.1. Time Series Data

The graph below reveals that the endogenous series is non-stationary whereas the exogenous variables are mean reverting. The endogenous variable also shows an upward trend.

Figure 1



A Dickey-Fuller test is conducted to test for the presence of unit root – the time series is non-stationary. The series is defined as: $DY_t = dY_{t-1} + \mu_t$, where DY_t is the first difference operator of the series and μ_t is the white noise $\mu_t \sim N(0,1)$. The null hypothesis (H_0) is $d = 0$, that there exists a unit root. The table 5.1 summarizes the results of regression done by taking the first difference as the dependent variable and the lags as the regressors.

Table 5.1

Close: ADF tests (T=77, Constant+Trend; 5%=-3.47 1% = – 4.08)

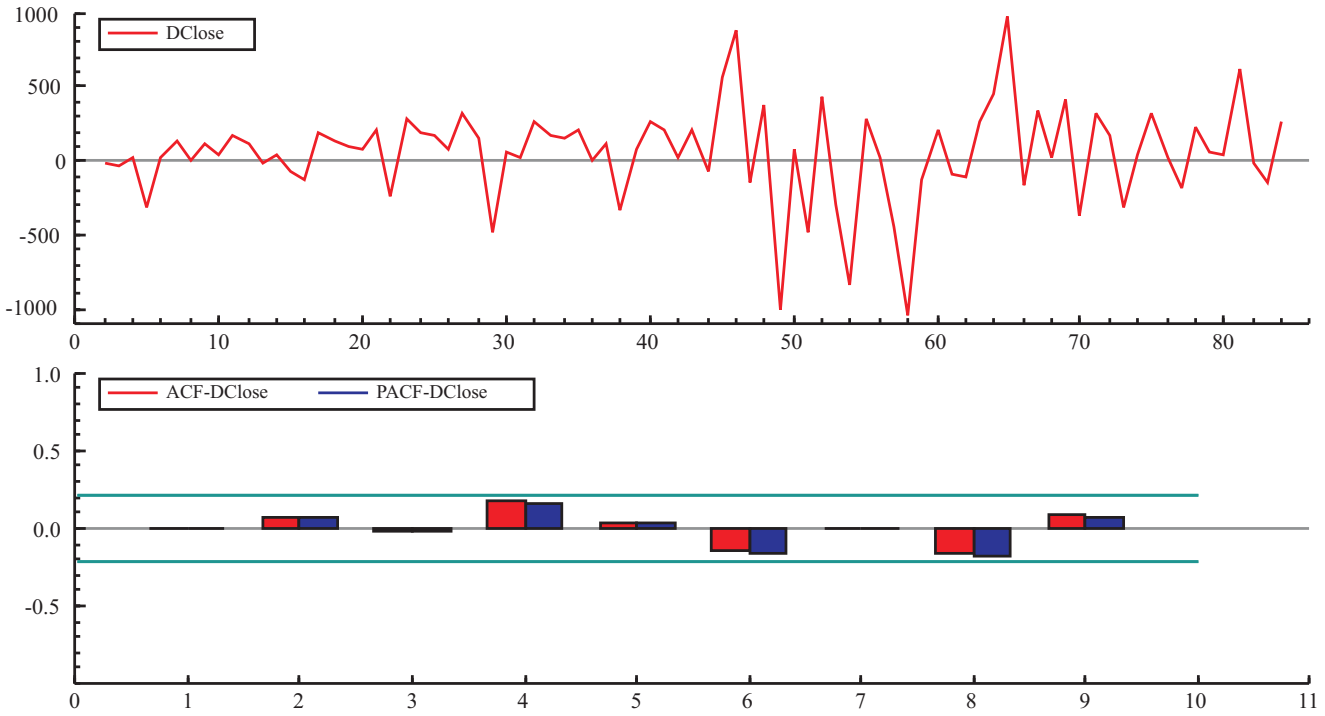
D-lag	*t-adf*	*beta Y_1*	*sig-ma*	*t-DY_lag*	*t-prob*	*AIC*	*F-prob*
6	-2.451	0.85141	326.6	-0.6793	0.4993	-11.69	
5	-2.837	0.83802	325.4	1.208	0.2311	-11.67	0.4993
4	-2.096	0.85845	326.4	2.099	0.0394	-11.70	0.3899
3	-2.587	0.88603	334.2	0.2850	0.7764	-11.66	0.1078
2	-2.105	0.88993	332.0	1.020	0.3113	-11.67	0.1846
1	-1.927	0.90169	332.1	0.3037	0.7622	-11.66	0.2032
0	-1.918	0.90498	330.1			-11.64	0.2870

[2] A repurchase agreement (or repo) is an agreement between two parties whereby one party sells the other a security at a specified price with a commitment to buy the security back at a later date for another specified price.

The AIC chooses model with 4 lags: -2.096 > -3.47 we accept the null that the NIFTY index close has a unit root and hence is non-stationary.

The graph below shows the plot of 1st difference of the NIFTY index time series. The ACF and PACF state that the series revert to mean and hence they are stationary.

Figure 5.2



5.2. Selection of Appropriate Model

The table below shows the estimates of the unrestricted VAR model.

Table 5.2

Correlation of URF residuals (standard deviations on diagonal)

	DClose	*Net-Index*	*NEER*	*C_Money*
DClose	0.015830	0.60344	0.27223	-0.092518
Net_Index	0.60344	0.13380	0.26738	-0.10169
NEER	0.27223	0.26738	.0062927	-0.28325
C_Money	-0.092518	-0.10169	-0.28325	0.015992

The standard deviations in the main diagonal above are very good measures of fit of the corresponding equations. For instance 0.015830 indicates that the residual standard deviation is around 1.583% for the equation where *y* is the dependent variable.

The following table shows the correlation between actual and fitted values of the unrestricted VAR model.

Table 5.3

DClose	*Net-Index*	*NEER*	*C_Money*
0.99715	0.94791	0.91726	0.99738

The graphs below state that the degree of fitness is very good. It shows that the density of residuals is very close to the normal distribution in each of the cses. The ACFs show absence of serial correlation and confirms that the residuals are stationary.

A univariate time series model is used to estimate the financial variables based on historical data. It also considers the historical and present values of the error terms. Box and Jenkins approach is used to identify the best fit model. The best fit model is selected based on: (i) Identification: Through ACF and PACF graphs, the order of the model is determined. The ACF declines because of the AR part where as the PACF declines because of the MA part. Even though the graphical presentation fails to provide accurate prediction of the models, it provides the initial information of the model estimation. The graphical interpretation is summarized in the table below:

Figure 5.3

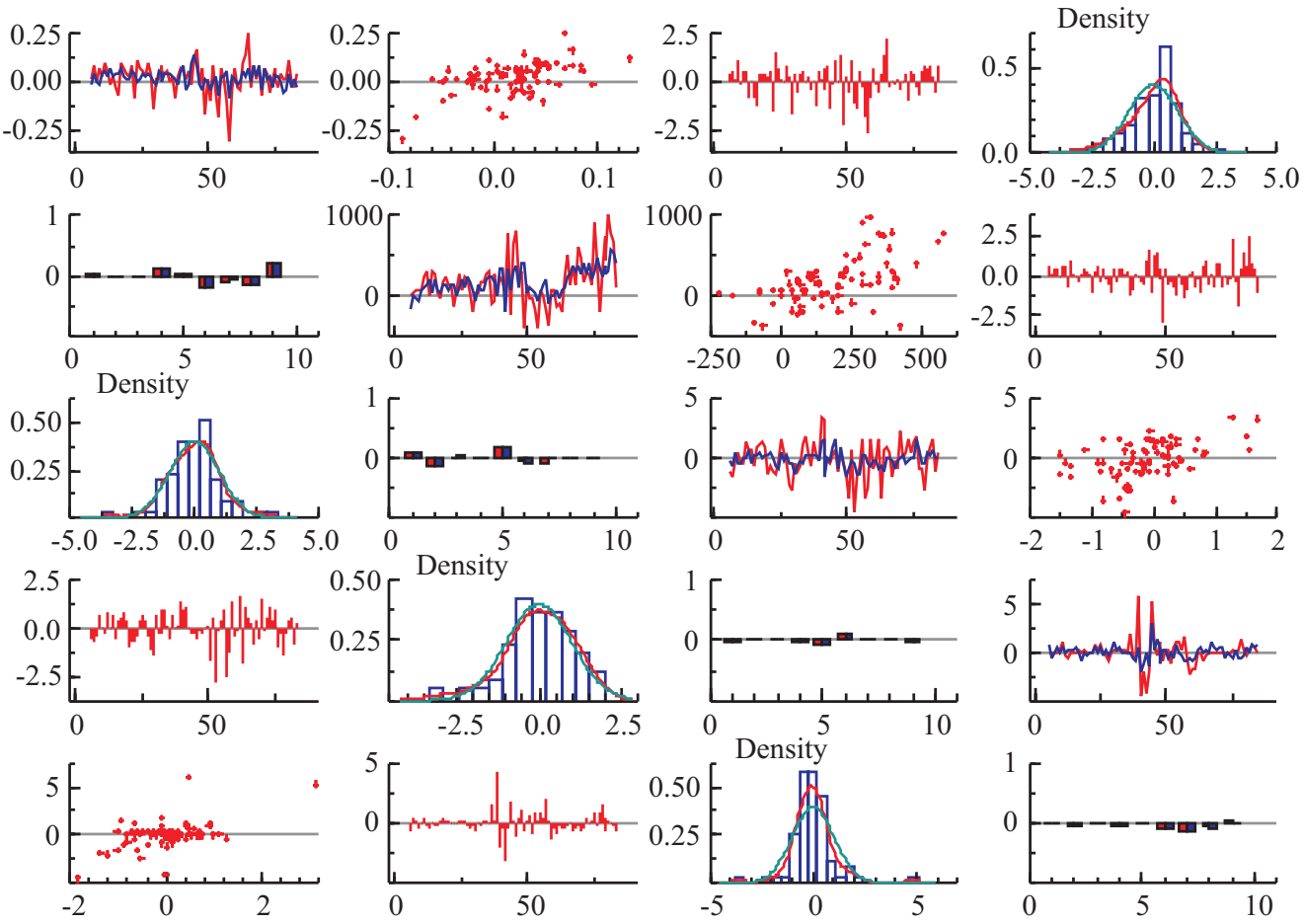


Table 5.4

Index	*Lags (signifi-cant)*	*Probable Models*
NIFTY Index	4	AR(4), MA(4), ARMA(4,4)
NEER	1, 4	AR(1), MA(1), ARMA(1,1), AR(4), MA(4), ARMA(4,4)
Call Money	4	AR(4), MA(4), ARMA(4,4)
NET FII	3,4	AR(3), MA(3), ARMA(3,3)
AR(4), MA(4), ARMA(4,4)		

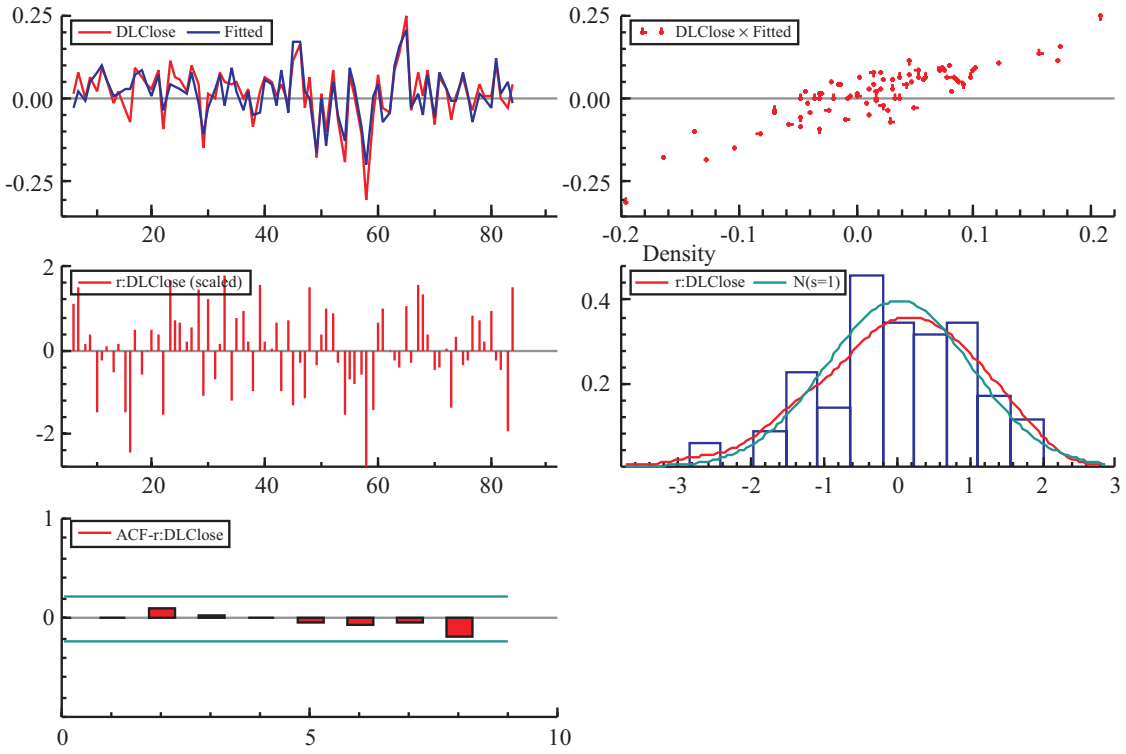
Next we estimate the model. On the basis of the parameters found for estimation in the above stem, a model is formulated using maximum likelihood function. Among all the significant models, the model which passed the portmanteau test with the lowest AIC (AIC is give by: ($AIC = (\hat{}\sigma 2)) + 2k / n$) value is taken as the most significant model. And finally we carry out model checking by over fitting the data in order to check whether the result derived from step (ii) is the best model. The results are described below:

Table 5.5

INDEX	*ARIMA Model (over fitting)*	*t-value (TC= -1.96)*	*AIC value*	*t-prob*	*Portmanteau: Chi^2 value*	*Most Significant Model*
	ARIMA(4,0,4)	3.83	-4.21165	0.000	176.78 [0.0743]	
	ARIMA(4,0,4)	3.76	-4.2108	0.000	177.12 [0.0719]	
NIFTY						ARIMA(4,0,4)
	ARIMA(6,0,0)	0.388	-	-		
	ARIMA(4,0,0)	-1.77 2.65				
NEER	ARIMA(1,0,0)	-4.19	-4.0132	.000	213.74 [0.0012**]	
	ARIMA(0,0,1)	-4.28	-5.01341	.000	213.65 213.65	
	ARIMA(4,0,4)	3.63, 3.01	-5.017	.000 .001	181.22 [0.0419]*	
	ARIMA(1,0,1)	-0.36 -0.49				
	ARIMA(1,0,0)	3.45	-5.0235	.001	163.25 [0.1426]	
	ARIMA(0,0,1)	1.19	-	-		
	ARIMA(1,0,1)	3.03 -2.9	-5.0217	.002 .004	139.39 [0.3573]	
C_Money	ARIMA(4,0,4)	-3.15	-4.0801	.002	151.31 [0.4318]	
	ARIMA(4,0,0)	8.86 -6.7	-4.0744	0.00 0.00	158.09 [0.3096]	AR(4)
NET FII	ARIMA(4,0,0)	2.6	-4.069	0.01	176.39 [0.0947]	
	ARIMA(0,0,3)	2.12	-4.067	0.05		
	ARIMA(0,0,4)	-3.43	-4.0798	.001	154.07 [0.3712]	MA(4)
	ARIMA(4,0,4)	1.53 1.57				
	ARIMA(3,0,0)	0.969	-		-	

The graph below shows the ARIMA (4,d,4) results of the NIFTY index.

Figure 5.4



The residual diagnostics implies that the residuals are stationary with no auto-correlation and the models are a good fit.

5.3. Forecasting Using ARIMA Model

The forecasting results using ARIMA (4, d, 4) is shown below.

Table 5.6

Maximum likelihood estimation of ARIMA (4, d, 4) model

The estimation sample is: 6 – 84; the dependent variable is NIFTY Index

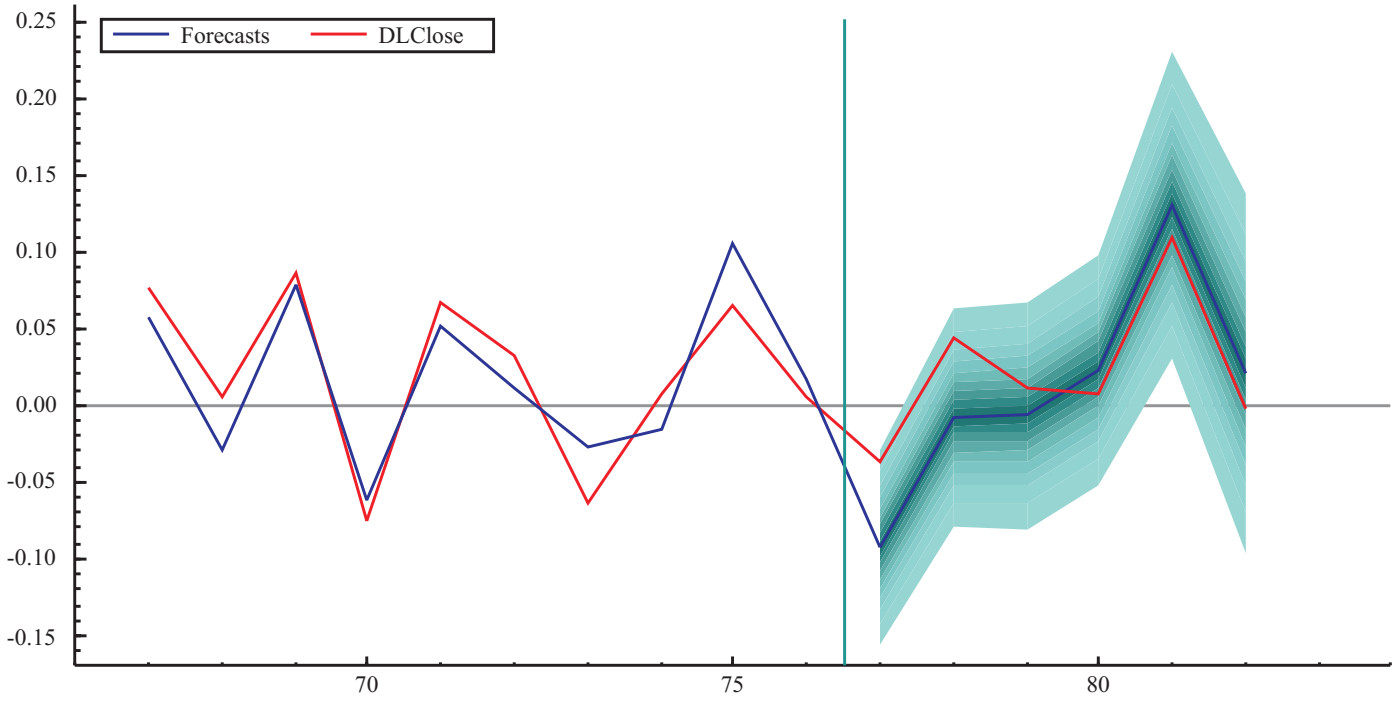
	Coefficient	*Std.Error*	*t-value*	*t-prob*
d parameter	-0.932055	0.3848	-2.42	0.020
AR-1	0.146180	0.2686	0.544	0.589
AR-2	-0.09552	0.1655	-0.577	0.567
AR-3	0.0479614	0.1581	0.303	0.763
AR-4	0.327257	0.1390	2.35	0.024
MA-1	0.282520	0.1755	1.61	0.115
MA-2	0.117952	0.1596	0.739	0.464
MA-3	0.282517	0.1750	1.61	0.114
MA-4	0.999996	0.08208	12.2	0.000
DLClose_1	0.220661	0.09560	2.31	0.026
DLClose_2	0.284677	0.09762	2.92	0.006
DLClose_3	0.0328026	0.1078	0.304	0.762
DLClose_4	-0.284972	0.09566	-2.98	0.005
Constant	0.0286629	0.005953	4.81	0.000
Net_Index	0.0001614	2.547e-005	6.34	0.000
Net_Index_1	-9.37e-005	2.798e-005	-3.35	0.002
Net_Index_2	1.595e-005	3.227e-005	0.495	0.624
Net_Index_3	-2.816e-005	3.347e-005	-0.841	0.405
Net_Index_4	4.907e-005	3.255e-005	1.51	0.140
DNEER	0.0057	0.004328	1.34	0.188
DNEER_1	0.0123125	0.004419	2.79	0.008
DNEER_2	-0.0151126	0.003439	-4.39	0.000
DNEER_3	-0.00483122	0.004035	-1.20	0.238
DNEER_4	0.00217067	0.003777	0.575	0.569
DCALLMONEY	-0.00693895	0.004154	-1.67	0.103

	Coefficient	*Std.Error*	*t-value*	*t-prob*
DCALLMONEY_1	-0.00313935	0.003190	-0.984	0.331
DCALLMONEY_2	-0.00343916	0.003129	-1.10	0.278
DCALLMONEY_3	-0.00855094	0.003821	-2.24	0.031
DCALLMONEY_4	-0.0168571	0.005221	-3.23	0.002
Trend	-0.000736877	0.0001308	-5.63	0.000

log-likelihood:124.941724; No. of observations:71; No. of parameters: 31
AIC.T -187.883449; AIC:-2.64624575
mean(DLClose):0.01788; var(DLClose): 0.00705657
sigma:0.0373398; sigma^2: 0.00139426

The graph below highlights the accuracy of the forecasting showing the error fans.

Figure 5.5



6. Conclusion

It is generally perceived that FII has a larger role in influencing the market volatility. But the empirical findings suggest that, FIIs are not the major cause of volatility in Indian equity markets. When the net FII flow is auto regressed with FII flow of various lag periods the result obtained is not significant enough to suggest that FIIs cause high volatility. Empirical results state that when the Net index series (which represents the FII flow) is auto regressed with the series with 2 month lag it is found that one unit change in FII flow causes 0.016 % change in the equity index. The primary reason for this finding is that the data series used for the study is a monthly data series. If closely observed, the market volatility caused by FIIs is generally on a daily basis. When monthly data series is taken, the volatility fizzles out. Another reason that can be attributed to this is the varied categories of foreign portfolio flows that come to Indian equity markets. Many FII flows are through the hedge fund route which is highly speculative and short term in nature where as the dedicated emerging market funds are for relatively longer term. When results for NEER's impact on index volatility

are studied it is found that exchange rate has significant impact on index volatility. Exchange rate differential is one of the key factors that FIIs look to cash in on in any economy. It is primarily the exchange rate which determines the growth in exports of any economy hence the performance of various firms.

According to the findings, it is imperative to know for any investor about the time horizon of its investment. If the investor is a long-term investor then as the findings suggest, they should not be worried about the FII action in the equity markets as it hardly have an impact. For long-term investment, the investors should be concerned about the fundamentals of the company where the investment has been done. Even if there is high volatility in that stock due to FII action, in long run it averages out.

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