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## IMPACT OF FII FLOWS ON INDIAN MARKET VOLATILITY

**CH R S CH MURTHY**  
**ASST. PROFESSOR**  
**SCHOOL OF MANAGEMENT STUDIES**  
**SREENIDHI INSTITUTE OF SCIENCE & TECHNOLOGY**  
**HYDERABAD**

### ABSTRACT

*Indian equity markets are today well integrated into the Global financial markets and are playing vital role for the benefit of investors' fraternity. They are well organized and are considered to be efficient because they react well both to international and internal factors. FIIs consider Indian equity markets as one of the best destinations. There is a steady increase in FII flows in to the Indian equity markets during the last few years. In this context the present study aims at an analysis of the impact of FII flows on the volatility of NIFTY. The time-series data on FII flows, NIFTY and DEFTY indices for the period of 2001-20015, were tested for stationary using ADF test. Granger's Causality Test was employed to investigate the possible causal relationship between the co integrated variables. However, investigation of volatility using models like ARCH, GARCH, EGARCH, etc reveals that there is no causality between FII flows and Nifty Volatility during the study period. Results of this study are useful to the FIIs, Retailers, QIBs, Pension Fund and Mutual Funds managers.*

### KEYWORDS

Defty, FII, Rupee Vs Dollar, VIX India Index, mutual fund.

### JEL CODES

H5, G2, G22.

### ABBREVIATIONS

FII	:	Foreign Institutional Investments
DII	:	Domestic Institutional Investments
DEFTY	:	Nifty in terms of Dollar
NIFTY	:	NSE index

### 1. INTRODUCTION

The term Foreign Institutional Investment (FII) is used most commonly in India refers to those outside investors who are investing in the financial markets of India. International institutional investors must register with the Securities and Exchange Board of India to participate in the market. One of the major market regulations pertaining to FIIs involves placing limits on FII ownership in Indian companies. An investor or investment fund that is from or registered in a country outside of the one in which it is currently investing. Institutional investors include hedge funds, insurance companies, pension funds and mutual funds. The FII flows are considering the Indian markets has safest place for their investments for this analysis where Nifty volatility is caused by the FII flows or not. The global financial crisis has re-emphasized the impact of volatility on portfolios. Post the financial crisis investors started exploring various options to hedge their portfolios against changing volatilities. Focus to index exposure, diversifying across asset-classes and volatility as one of the asset classes have emerged. Exchange traded products on volatility have picked up. India VIX indicates the investor's perception of the market's volatility in the near term. From the best bid-ask prices of NIFTY Options a contract, a volatility figure (%) is calculated which indicates the expected market volatility over the next 30 calendar days. India VIX uses the computation methodology of CBOE, with suitable amendments to adapt to the NIFTY options order book. A high India VIX value would suggest that the market expects significant changes in the Nifty, while a low India VIX value would suggest that the market expects minimal change. It has also been observed that historically, a negative correlation exists between the two. Volatility indices like India VIX are often perceived to display mean reverting characteristics by oscillating around a long-term variance.

### 2. OBJECTIVES OF THE STUDY

1. To Measure the relationship between FII, DII, Nifty, Defty and Rupee Vs Dollar.
2. To Measure the impact of FII flows on Defty, FII flows on Nifty Volatility, FII on VIX India index and Currency fluctuation influence on FII flows.

### 3. LITERATURE REVIEW

**1. Beaker and Harvey:** As the Indian equity market is growing, the trend and future prospects in foreign institutional investments has become a topic of great concern. A recent research survey by Japan Bank for international operation (JBIC), shows that in the next 3 years, India will be the third most favored investment destination for Japanese investors. A Smith Barney (a CITI group Division) study says estimated market value of foreign institutional investment in the top 200 companies in India (including ADRs and GRDs) at current market prices is US \$43 billion. This is 18% of the market capitalization of BSE 200. It is established in literature that block shareholders influence the firm performance (Cho & Padmanabhan, 2001).

**2. Douma, Kabir and Rejie 2006:** They investigated the impact of foreign institutional investment on the performance of emerging market firms and found that there is positive effect of foreign ownership on firm performance. They also found impact of foreign investment on the business group affiliation of firms. (Aggarwal, Klapper and Wysocki, 2005) observed that foreign investors preferred the companies with better corporate governance.

**3. Chakrabarti (2001):** He conducted the pair-wise Granger Causality tests between FII inflows and returns on the BSE National Index. He found that portfolio investment from FIIs was more an effect than a cause of market returns in India. **Mukherjee, Bose and Coondoo (2002)** studied the cause-and-effect relationship between FII flows and returns on the Indian equity market.

**4. Bohra, N. Singh and Dutt, Akash. (2011):** Studied the behavioral pattern of FII in India and figure out the reasons for indifferent responses of BSE Sensex due to FII inflows. They found the correlation between FII investment and turnover of different individual groups at BSE Sensex. They concluded that there is a positive correlation between FII investment and stock market but in year 2005 and 2008, it was also observed that positive or negative movement of FII's investment leads to a major shift in the sentiments of domestic or related investors in market.

**5. Shukla, K. Rajeev et al (2011):** Investigated the impact of foreign institutional investors on Indian stock indices. He revealed that India, after United States hosts the largest number of listed companies and Global investors now enthusiastically seek India as their preferred destination for investment. Many Indians working in foreign countries now divert their savings to stocks. They concluded that FIIs have significant impact on the share prices of the Midcap & Small-cap companies but small and a periodic shift in their behavior leads to market volatility.



**4. RESEARCH METHODOLOGY**

This analysis is based on secondary data by using the descriptive statistical tools. The following formulas were considered for the analysis.

**Bi variant correlation**

Bi variant analysis is one of the simplest forms of quantitative (statistical) analysis. It involves the analysis of two variables (often denoted as X, Y), for the purpose of determining the empirical relationship between them. In order to see if the variables are related to one another, it is common to measure how those two variables simultaneously change together.

$$S[i, j] = \frac{\sum_{k=M_t}^{M_t+L-1} T[k, i]T [k, j]}{\sqrt{\sum_{k=M_t}^{M_t+L-1} T[k, i]^2} \sqrt{\sum_{k=M_t}^{M_t+L-1} T[k, j]^2}}$$

**HETEROSKEDASTICITY TEST**

In statistics, when the standard deviations of a variable, monitored over a specific amount of time, are non-constant. Heteroskedasticity often arises in two forms, conditional and unconditional. Conditional Heteroskedasticity identifies non-constant volatility when future periods of high and low volatility cannot be identified. Unconditional Heteroskedasticity is used when futures periods of high and low volatility can be identified.

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i \quad 1 \dots n$$

**4.1 REGRESSION ESTIMATION MODELS**

**Arch:** An econometric term used for observed time series. ARCH models are used to model financial time series with time-varying volatility, such as stock prices. The ARCH concept was developed by economist Robert F. Engle, for which he won the 2003 Nobel Memorial Prize in Economic Sciences.

$$\sigma_t^2 = \omega + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 + \sum_{i=1}^q \alpha_i^- \varepsilon_{t-i}^2 I(\varepsilon_{t-i} < 0),$$

**GARCH:** A statistical model used by financial institutions to estimate the volatility of stock returns. This information is used by banks to help determine what stocks will potentially provide Higher returns, as well as to forecast the returns of current investments to help in the Budgeting process.

$$\log \sigma_t^2 = \omega_t + \sum_{k=1}^{\infty} \beta_k g(Z_{t-k}),$$

**TARCH:** Finance theory suggests that an asset with a higher perceived risk would pay an higher return on average. Then, the theory suggests that the mean return would be related to the conditional variance or standard deviation

**E-GARCH:** The exponential GARCH (EGARCH) model is a GARCH variant that models the logarithm of the conditional variance process. In addition to modeling the logarithm, the EGARCH model has additional leverage terms to capture asymmetry in volatility clustering.

$$g(Z_t) = \theta Z_t + \gamma(|Z_t| - E|Z_t|).$$

**PARCH:** An econometric term used for observed time series. ARCH models are used to model financial time series with time-varying volatility, such as stock prices. The POWER ARCH is also called PARCH concept was developed by economist Robert F. Engle, for which he won the 2003 Nobel Memorial Prize in Economic Sciences.

**Johnson Co-integration test:** Johansen tests assess the null hypothesis  $H(r)$  of co integration rank less than or equal to  $r$  among the num Dims-dimensional time series in  $Y$  against alternatives  $H(\text{num Dims})$  (trace test) or  $H(r+1)$  (maxeig test). The tests also produce maximum likelihood estimates of the parameters in a vector error-correction (VEC) model of the co integrated series.

$$X_t = \mu + \Phi D_t + \Pi_p X_{t-p} + \dots + \Pi_1 X_{t-1} + e_t, \quad t = 1, \dots, T$$

**Granger Causality Test:** The Granger causality test is a statistical hypothesis test for determining Whether one time series is useful in forecasting another. Regressions reflects "mere" correlations, but Granger argued that causality in economics could be reflected by measuring the ability of predicting the future values of a time series using past values of another time series. Since the question of "true causality" is deeply philosophical, econometricians assert that the Granger test finds only "predictive causality."

$$\mathbb{P}[Y(t + 1) \in A | \mathcal{I}(t)] \neq \mathbb{P}[Y(t + 1) \in A | \mathcal{I}_{-X}(t)]$$

**5. PERIOD OF STUDY**

1. The analysis has been emphasized between 2001 to 2015 period i.e. 15 Years data.
2. This paper has focused on FII flows which were rolled in to the Indian equity market
3. All the variables are used for the analysis were yearly averaged with the stationary data.

**6. LIMITATIONS**

- VIX India index, DII Flows and Defty data considered from 2009-2015.

7. ANALYSIS

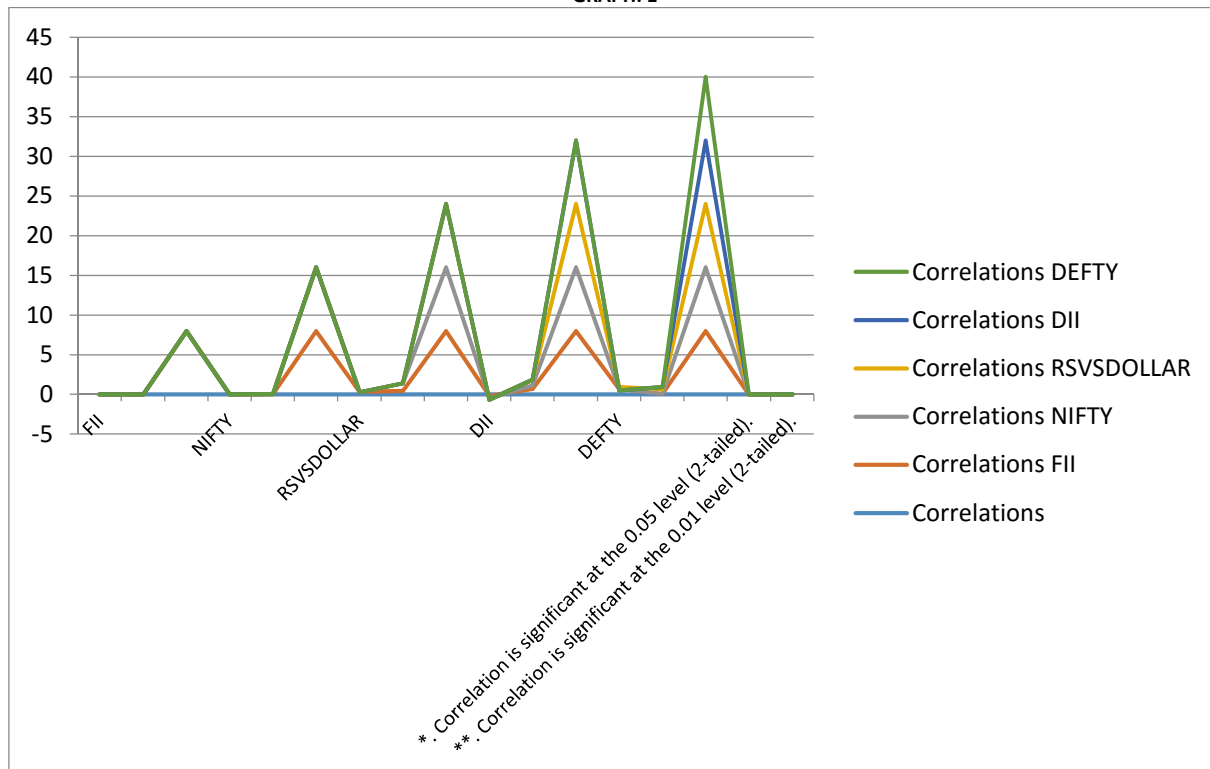
1. TO MEASURE THE RELATIONSHIP BETWEEN FII, DII, NIFTY, DEFTY AND RUPEE Vs. DOLLAR

TABLE 1: CORRELATIONS

		FII	NIFTY	RSVSDOLLAR	DII	DEFTY
FII	Pearson Correlation					
	Sig. (2-tailed)					
	N	8				
NIFTY	Pearson Correlation	.789*				
	Sig. (2-tailed)	0.02				
	N	8	8			
RSVSDOLLAR	Pearson Correlation	0.309	-0.019			
	Sig. (2-tailed)	0.457	0.964			
	N	8	8	8		
DII	Pearson Correlation	-0.178	-0.32	-0.151		
	Sig. (2-tailed)	0.673	0.44	0.722		
	N	8	8	8	8	
DEFTY	Pearson Correlation	0.667	.921**	0.246	-0.413	
	Sig. (2-tailed)	0.071	0.001	0.556	0.31	
	N	8	8	8	8	8

\*. Correlation is significant at the 0.05 level (2-tailed).  
 \*\*. Correlation is significant at the 0.01 level (2-tailed).

GRAPH: 1



**Interpretation:** The above table and diagram depicts the relationship between the select variables. The bi-variant co-relations of Pearson indicate that Rupee Vs Dollar with Nifty & DII observed negative relationship and at the same point of time FII & DII is also negative co-relation. Defty is having the positive co-relation with Rupee Vs Dollar fluctuation.

2. TO MEASURE THE IMPACT OF FII FLOWS ON DEFTY, FII FLOWS ON NIFTY VOLATILITY, FII ON VIX INDIA INDEX AND CURRENCY FLUCTUATION INFLUENCE ON FII FLOWS

A. To Measure the impact of FII flows on Defty

TABLE: 2

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
	<b>Log Likelihood by Rank</b>				
0	-270.0059	-270.006	-269.776	-269.776	-268.915
1	-258.8682	-258.843	-258.843	-258.474	-258.229
2	-257.1806	-256.75	-256.75	-254.653	-254.653
	<b>AIC by Rank)</b>				
0	54.80118	54.80118	55.15510	55.15510	55.38302
1	53.37364*	53.56863	53.76863	53.89484	54.04571
2	53.83612	54.14996	54.14996	54.13058	54.13058
	<b>SIC by Rank</b>				
0	54.92221	54.92221	55.33665	55.33665	55.62509
1	53.61571*	53.84096	54.07121	54.22768	54.40881
2	54.19922	54.57358	54.57358	54.61472	54.61472

**Interpretation:** The analysis of Johnson Co-integration test has been applied between FII & Defty the result indicates that the log likelihood rank values were found to be decreasing in all time models along with the alpha levels. There the data is co-integrated between the analyzed variables.

**Granger causality test (GCT):** The above test indicates that FII is not causing the Defty because the probability value is found to be above significance level but Defty is causing the FII lows which is reflected by the probability values which has fallen under significance level.

**B. FII flows on Nifty Volatility**

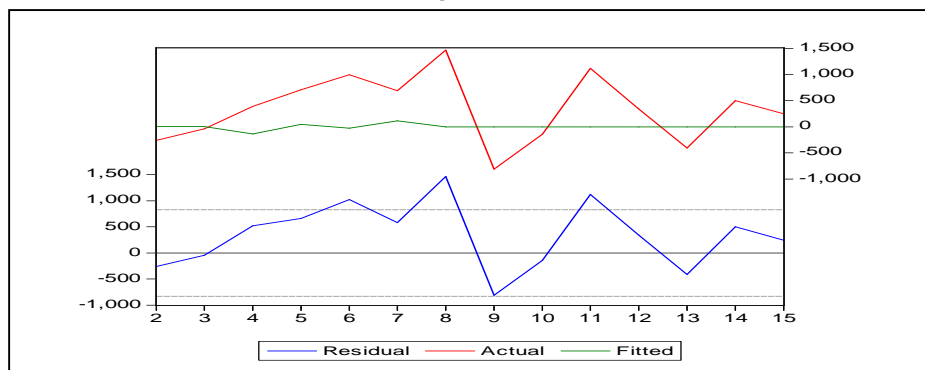
TABLE: 3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.033025	0.46017	2.244877	0.0463
WGT_RESID^2(-1)	-0.032089	0.301952	-0.106272	0.9173
R-squared	0.001026	Mean dependent var		1.000813
Adjusted R-squared	-0.08979	S.D. dependent var		1.195868
S.E. of regression	1.248403	Akaike info criterion		3.422246
Sum squared resid	17.14361	Schwarz criterion		3.509161
Log likelihood	-20.2446	Hannan-Quinn criter.		3.404381
F-statistic	0.011294	Durbin-Watson stat		1.987222
Prob(F-statistic)	0.91728			

**Interpretation:** The Nifty volatility with FII flows has been measured by the Hetero Skedsticity test the probability value is found to be significant which 0.0463 it is less than 0.5 is. Hence the residual test can be applied.

**RESIDUAL TEST**

GRAPH: 2



**Interpretation:** The above residual test shows that Nifty is getting fluctuated and crossed many times above the fitted lines, which indicated the Nifty has traded extremely volatility. So regression estimate models can be apply to figure of the FII impact on Nifty volatility.

**Models of Experiment**

**ARCH**  
The Arch estimated model has been applied between Nifty & FII flows. The probability value has been found to be non-significant because it is above 0.5 i.e. 0.705.

**GARCH**  
The Arch estimated model has been applied between Nifty & FII flows. The probability values have been found to be non-significant because it is above 0.5 i.e. 0.843.

**TARCH**  
The Arch estimated model has been applied between Nifty & FII flows. The probability values have been found to be non-significant because it is above 0.5 i.e. 0.6108.

**E-GARCH**  
The Arch estimated model has been applied between Nifty & FII flows. The probability values have been found to be non-significant because it is above 0.5 i.e. 0.7429.

**PARCH**  
The Arch estimated model has been applied between Nifty & FII flows. The probability values have been found to be non-significant because it is above 0.5 i.e. 0.8695.

**STATEMENT**

All the estimate regression models are indicating Nifty volatility is not affected by the FF flows for the selected period

C. Currency fluctuation influence on FII flows Vs Indian Market  
WEIGHTED LEAST SQUARES ANALYSIS

TABLE 4

Model Summary	
Multiple R	0.463
R Square	0.214
Adjusted R Square	0.071
Std. Error of the Estimate	0.731
Log-likelihood Function Value	-57.019

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.601	2	0.8	1.5	0.266
Residual	5.87	11	0.534		
Total	7.471	13			

Coefficients						
	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta	Std. Error		
(Constant)	4.326	1.592			2.718	0.02
NIFTY	0.005	0.003	0.404	0.28	1.441	0.177
FII	9.12E-10	0	0.135	0.28	.	.

**Interpretation:** The above analysis of regression weighted least square analysis has been applied with Rupee Vs Dollar to Nifty & FII. The R Square value is less than 0.6 but ANOVA is found to be significant i.e. 0.266 the co-efficient value of weighted least square for the Nifty & FII is having significant with Rupee Vs Dollar fluctuation.

D. FII impact on VIX India index

TABLE 5

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
	Log Likelihood by Rank				
0	-1556.852	-1556.852	-1556.837	-1556.84	-1556.83
1	-1544.762	-1544.655	-1544.64	-1544.64	-1544.635
2	-1540.497	-1537.826	-1537.826	-1537.74	-1537.738
	AIC by Rank				
0	53.82249	53.82249	53.89093	53.89093	53.95965
1	53.54353	53.57433	53.60828	53.64270	53.67706
2	53.53439	53.51126*	53.51126*	53.57717	53.57717
	SIC by Rank				
0	53.96459	53.96459	54.10408	54.10408	54.24385
1	53.82773*	53.89405	53.96353	54.03347	54.10336
2	53.96069	54.00861	54.00861	54.14556	54.14556

**Interpretation:** Johnson co-integrated test has been applied for FII & VIX India indeed the log likelihood rank values were found to be decreasing in all trend models and also alpha levels. The analysis indicated that the data between the two variables are co-integrated.

TABLE 6

Null Hypothesis:	Obs	F-Statistic	Prob.
DVIXINDEX does not Granger Cause FII	58	0.09203	0.9122
FII does not Granger Cause DVIXINDEX		0.42663	0.6549

**GCT:** It has proven that FII Flows are influencing the Indian volatility indeed also impacting the FII flow because the probability value is found to be significant for both the variables.

8. FINDINGS

- Rupee Vs Dollar is found to be slightly negative correlation with Nifty & DII flow but the FII flows were having stung correlation with Nifty.
- The external Indian indeed Defty is not caused by the FII Flows
- FII flows were not influencing the Nifty volatility during the analysis period
- Currency fluctuation is having significant impact on Nifty movement along with the FII flows into the equity market.
- It has been observed with the analysis that Indian volatility index is affected by FII flows in to India.

9. CONCLUSION

The analysis of FII flows impact on Indian market volatility for the duration of 15 years (2001-2015) on the various variables selected shows that the Rupee Vs Dollar fluctuation is influencing the Indian market along with the external flows in to Indian equity markets. The FII flows are playing the dominant role in Indian market but the analysis has proven that the external flows were not the only reason behind the Indian market volatility. Indian markets considered to be efficient markets among the Global capital investment arena. There are many internal and external factors which were causing the equity market to fluctuate. Hence there is further scope to do research in this area and find the real factors that are causing its higher market volatility.

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