

Impact of Foreign Portfolio Investments (FPIs) on Indian Stock Market

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ABSTRACT

Foreign Portfolio Investments (FPIs) has been playing a significant role in developing the financial market of the country. Indian stock markets were opened to foreign investors in September 1992 and were allowed to invest in the primary and secondary market. The major portion of FPIs has been into equities. India is now the most favourite destination for FPI investors due to the increasing growth of economy. Foreign Portfolio Investment inflows were in large volume during the year 2015. In this paper, we identify the determinants, trends and pattern of Foreign Portfolio Investments in India and examine the relationship between the determinants and FPI flows in India. Further we explore the causal relationship between Foreign Portfolio Investment inflows and Stock market returns. For this purpose, the data is collected from 1st January 2001 to 31st December 2016. The study also examines the effect of Foreign Portfolio Investment on Stock market Volatility using GARCH Model of conditional volatility.

Keywords: Foreign Portfolio Investment, Indian Capital Market, Stock Market Volatility, GARCH

INTRODUCTION TO FOREIGN PORTFOLIO INVESTMENT IN INDIA: AN OVERVIEW

Foreign Portfolio Investment has been playing a significant role in developing the financial market of the country. Since there was a problem of scarcity of capital in India and domestic sources to raise finance were also limited, certain measures were taken by Indian Government in order to attract the foreign investors to make investment in India. Indian stock markets were opened to foreign investors in September 1992 and they were allowed to invest in primary and secondary markets. The major portion of FPIs has gone through equities. Since then, capital flow through Foreign Direct Investment and Foreign Portfolio Investment (FPIs) has played a significant role in the growth of Capital market and the Indian economy. Foreign Investment means the flow of capital from one country to another country especially the scarce economy. Foreign Portfolio Investment basically means that, the companies which are established outside India are investing in the Indian stock market. To make investments in India, the investors should get registered with Securities and Exchange Board of India (SEBI), the regulator for Indian Capital Markets. Foreign Portfolio Investors have the foreign based categories that can be registered for FPI such as Pension Funds, Mutual Funds, Investment Trust, Insurance and Reinsurance Companies, Banks, Endowments, University Funds, Foundations, Charitable Trusts or Charitable Societies, Asset Management Companies and Trustees.

Foreign Institutional Investment (FII) was recently re-nomenclated as Foreign Portfolio Investment (FPI) by making the registration process with SEBI more easier and simpler and existing three investor's classes were combined viz., FIIs, Sub accounts and Qualified Foreign Investors (QFIs). The Portfolio investor registered in accordance with SEBI guidelines shall be called Registered Foreign Portfolio Investor (RFPI). RFPI may purchase and sell shares and convertible debentures of Indian companies through registered broker or recognized Stock Exchange in India as well as which are offered to public in terms of relevant SEBI guidelines. Foreign Portfolio Investment (FPI) values are usually taken from the Net Investment made by FPIs that is, the difference between Gross Purchases and Gross Sales (Net Investment = Gross Purchases – Gross Sales). The FPI values include both the equity as well as debt segment of the Indian Capital Markets. FPI investments are volatile in nature; these investors prefer to invest in emerging markets, those which have potential to grow in near future. The emerging markets benefit from FPIs inflows in terms of mobilization of domestic resources, reduction in the cost of capital due to inflow of foreign funds thereby development of Indian Capital Markets and overall Indian Economy.

According to conducted poll by *Bank of America Merrill Lynch (BofA-ML)*, in the year 2015 India was the most preferred equity market for foreign investors. FPIs net investment stood at \$ 2.68 Billion in March 2016. Cumulative value of investment by FPIs during April 2000- December 2015 stood at US \$ 179.32 Billion. Till 2013, Mauritius was the largest source of FPI into country, followed by United States in the year 2014. The FPI inflows in the year 2014 touched to \$10 Billion. In November 2016, foreign investors pulled out nearly \$ 5 Billion from Indian market due to Demonetization of Indian Currency (Rupee) by the Indian Government. United states of America contribute 31% of FPI investment followed by Mauritius which is about 21%. After Mauritius, number of FPIs is from Singapore i.e. 11%, Europe is about 15% (Luxembourg 8%, UK 4%, Norway 3%) and United Arab Emirates contributing 3% which causes volatility in Indian stock market. Number of FPI inflows from Ireland, Japan and Canada is about 2%, 2% & 2%, which also causes volatility in Indian stock market.

LITERATURE REVIEW

(Joo and Mir, 2014) examines the impact of FIIs on volatility of Indian stock market on a monthly data set for the period from January 1999 to December 2013. ADF unit root test correlation GARCH model have been used. The study reveals there is moderate low positive correlation between Net FII & Indian stock markets. So results suggest that there is impact of FIIs on Indian stock market. **(Amita, 2014)** identified the determinants of FII and showed the relationship between the variables namely FII, Foreign exchange rate, BSE Sensex, exchange rate and inflation. The study was conducted for 12 years between 2001-02 to 2012-13 on monthly basis by using Correlation coefficient, ADF unit root test and Granger causality. The study concluded that there is bi-directional causality between FII and Sensex; and FII & Exchange rate has no causality between FII and Foreign exchange reserve. **(Saxena and Bhaduria, 2011)** investigates causal relationship between FII inflows and stock market returns. The study concluded that, there is no bidirectional causal relationship between FII inflows and stock market returns. The study finds that stock market volatility is cause to FII inflows and the trend of FII inflows does not have much impact on stock market volatility. **(Jain et al, 2013)** shows the effect of FII flow on capital market and examines the causal relationship between FII flows & capital market growth using Granger causality test and co-integration test for a period of 2000-2013. The study indicates that FII and Nifty did not have any causal relationship with each other. (Chakrabarti R. , 2001) observed the causal linkage between FII flows and stock returns. The paper divides sample period into pre-Asian crisis from May 1993 – June 1997 and the Asian crisis from July 1997 to December 1999. The result demonstrates that in post- Asian crisis period there is no impact of FII on Indian stock market returns. (Shrivastav, 2013) attempted to find out relationship between FII and Indian stock market for the year 2001-2010. The study uses correlation and regression technique to check whether relation exist between them. The study observed that there is

correlation between FII and movement of Sensex and FIIs significantly influences movement of Sensex. (Loomba, 2012) examined the effect of FIIs on Indian stock market volatility using daily data. The study was conducted for period of 10 years that is from January 2001-December 2011. Pearsons correlation were used as technique and found that there is significant relation between BSE Sensex & FII in Indian stock market. (Arora and Kumar, 2015) In their study they analyzed the relationship between FII flows and Indian capital market. Using the methods of ADF unit root test, GARCH model, they found that there is no significant changes in Indian capital market return and after opening market to foreign investors the volatility were reduced. (Kulshrestra, 2014) The research explores determinants of FIIs in India and also finds impact of FII on Indian capital market by using regression and correlation techniques. The period of study was 2000-2011 with 2931 observation of FII. The study states that FII investment and movement of BSE Sensex & CNX nifty are closely correlated and FIIs have impact on Indian capital market. (Sundari and Shareef, 2015) This study shows the impact of FII on stock market in India for the period from 2000 to 2013, ADF unit root test, Johansen co integration and Granger causality test is used to investigate relation between FII and NIFTY in India. The result of cointegration test states a long run relation between variable and Granger causality reveals no relation between the variables. (Kumar, 2014) This paper show the effect of FII investment in Indian capital market by considering FII activity in Nifty index futures trading on NSE and Singapore exchange VAR framework and Granger causality test were used, so result was FII investment are statistically related with Nifty returns. (Walia et al, 2012) The paper analyses behavioral pattern of FII and examines the changes in Sensex due to FII flows. The period of study was 2001 to 2010 by using Karl Pearson's coefficient of correlation test. The conclusion was, there is volatility in Sensex due to FII inflows to a great extent. Based on the review of literature we formulate the following objectives of the study.

OBJECTIVES OF THE STUDY

1. To study determinants, trends and pattern of Foreign Portfolio Investments in India and to examine the relationship between the determinants and FPI flows in India.
2. To explore the causal relationship between Foreign Portfolio Investment inflows and Stock market returns.
3. To examine the effect of Foreign Portfolio Investment on Stock market Volatility.

RESEARCH METHODOLOGY

Period of the Study: The study is undertaken for a period of 16 years from 1st January 2001 to 31st December 2016.

Data sources: The study is based on Secondary data for analysis. The monthly data on Foreign Portfolio Investment is collected from SEBI website (www.sebi.gov.in) up to April 2014 & from June 2014 onwards the data is available on NSDL website (www.nsdl.co.in). The monthly data on Nifty 50, Nifty Bank, Nifty Pharma, Nifty IT and Nifty FMCG is collected from NSE website (www.nseindia.com).

Sample size: The study considers selected Sectoral indices and the variables are as follows

TABLE 1: SAMPLE SIZE

	Period of The Study	Observations
Dependent variables		
Nifty 50	1 Jan'01- Dec'16	192
Nifty Bank	1 Jan'01- Dec'16	192
Nifty Pharma	1 Jan'01- Dec'16	192
Nifty IT	1 Jan'01- Dec'16	192
Nifty FMCG	1 Jan'01- Dec'16	192
Independent variable		
Foreign Portfolio Investment	1 Jan'01- Dec'16	192

Statistical Tools and Techniques used:

Descriptive Statistics and Multiple Regression: Descriptive Statistics helps us to present the data in more meaningful manner. Mean, Standard Deviation, Skewness, Kurtosis, Jarque Bera tests has been used to analyze determinants and variables taken for the study. **Regression analysis** has been used to measure the determinants of FPI that attracts the FPI inflows in India. FPI inflows were considered as Dependent Variable and Determinants were considered as Independent Variable. **Correlation:** This test is used to show whether there is Correlation existing between FPI inflows and Determinants of FPI. **Unit root analysis (Augmented Dickey Fuller):** The study uses Unit root test to check whether data series of variables that is, FPI inflows and Stock market indices are stationary or not. **Co-integration and Granger Causality:** Co-integration test is used to check whether two variables that is, FPI inflows and Nifty 50 & Sectoral indices have long term relationship between them. Johansen Co-integration test is used in the study. Granger Causality test examines to determine whether one variable is useful to predict the other variable. In other words, it checks the causal relationship between above mentioned variables. **Vector Error Correction Model:** is used when Co-integrated equation is detected between the variables which mean there is long term relationship between them. Therefore we use VECM to analyze the short term properties of co-integrated series. If the coefficient of VECM is negative and significant than there will be long run relationship between independent and dependent variable if there are any short run fluctuations in variables. **GARCH Model:** Generalized Autoregressive Conditional Heteroskedasticity model is used to determine the nature of Conditional Volatility.

$$GARCH_t = \alpha + \beta_1 (RES_{t-1})^2 + \beta_2 GARCH_{t-1}$$

The conditional variance equation can be written as a function of three terms:

- A constant term (α).
- ARCH term (RES_{t-1}): news about volatility from the past period which is measured as lag of squared residuals.
- The GARCH term: last period forecast variance.

DETERMINANTS OF FOREIGN PORTFOLIO INVESTMENT IN INDIA

When India opened its door for foreign portfolio investors, portfolio flows in Indian market was the major source of capital for India. This led to economic growth of the country and growth of Indian capital market in particular. This study examines the determinants which influence the FPI inflows in India. As evidenced by previous studies that there

is a relationship between the FPI inflows and determinants like Foreign exchange rates, Inflation, etc. These determinants are as follows-

1. **Inflation:** Inflation refers to country's internal stability. Increased instability of Inflation rate makes the economy unattractive to make investment. The high return also declines the real return of fixed income securities like bonds.
2. **Exchange rate:** Large fluctuations in exchange rate decrease the inflows of FPI and increase the uncertainty in the economy of the host country. In emerging countries the exchange rate fluctuations brings restrictions on the inflows of FPI.
3. **Gross Domestic Product:** it is the indicators of economy activities. By using GDP growth rate, economic growth can be measured. If there is increase in host country of GDP it decreases the volatility of GDP.
4. **Interest rate:** when interest rate rises, cost of borrowing increases so it has negative impact on their profits. So the investors may delay the investment activity to later period, when the interest rate are decreased so to reduce their cost of investment.

For the purpose of data analysis, Foreign portfolio investment is used as a Dependent variable and Bank rate, Exchange rate, Gross domestic product and Wholesale price index is used as an independent variable.

$$IFPI = \beta_0 + \beta_1 BR + \beta_2 ER + \beta_3 GDP + \beta_4 WPI$$

Where, BR= Bank Rate, ER= Exchange Rate, GDP= Gross Domestic Product, WPI= Whole Price Index

TABLE 2: CORRELATION CO-EFFICIENT MATRIX BETWEEN NET FPI FLOWS AND DETERMINANTS OF FPI

	BANK RATE	EXCHANGE RATE	GDP	FPI	WPI
BANK RATE	1.000000				
EXCHANGE RATE	0.749401	1.000000			
GDP	0.224762	0.184683	1.000000		
FPI	0.353050	0.100983	0.189153	1.000000	
WPI	-0.351360	-0.284856	-0.042489	-0.064187	1.000000

Table 2 displays correlation coefficient between Foreign Portfolio Investment inflows and Determinants of FPI viz., Bank rate, Exchange rate, GDP and WPI. There exists a positive correlation between Bank rate and Exchange rate. In case of GDP and Bank rate, there is low degree of positive correlation. There is correlation between Bank rate and FPI inflows (0.35%). It implies that if Bank rate increases, it is likely to attract more FPI inflows in India. The degree of correlation between Bank rate and WPI has been found to be negative which means that increase in Bank rate will bring decline in WPI by 0.35%. There is no correlation between exchange rate and GDP. Further it displays that, there exist a negative relationship between Exchange rate and WPI (0.28%). It implies that increase in Exchange rate will

bring adverse effect on WPI. The table also indicates that there is no relationship between GDP and FPI. Similarly there is no correlation between GDP & WPI and FPI & WPI.

TABLE 3: UNIT ROOT TEST RESULTS

Unit Root	Augmented Dickey–Fuller Test	
	t-statistics	p-value
Null Hypothesis		
FPI has a unit root	-9.669902	0.0000
Bank rate has a unit root	-7.685942	0.0000
Exchange rate has a unit root	-6.229226	0.0000
GDP has a unit root	-7.933521	0.0000
WPI has a unit root	-11.86900	0.0000

Table 3 displays the result of Unit Root Test. We use Augmented Dickey-Fuller test to check the Stationarity. The data series is stationary at levels and the data is significant at 10%, 5% and 1% level. After confirmation of stationary nature of data series we employ Granger causality test to check relationship between the variables.

TABLE 4: GRANGER CAUSALITY TEST

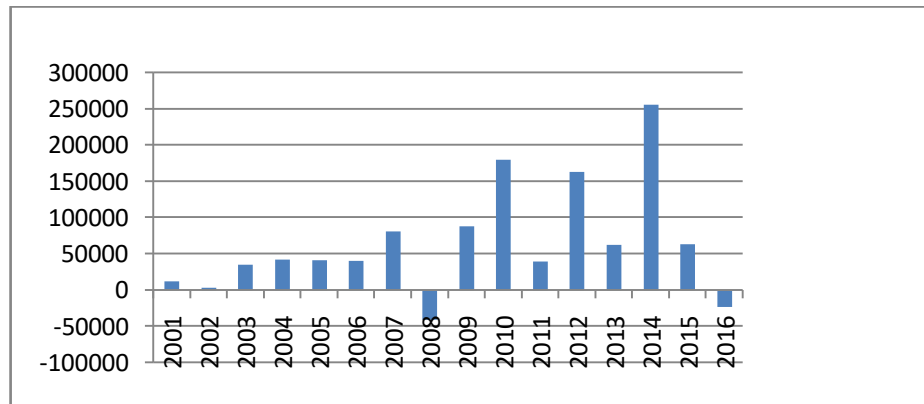
Null Hypothesis (H ₀)	F-statistics	p-value	Accept/Reject hypothesis	Direction/Nature of Causality
FPI does not granger cause Bank rate	0.07659	0.9264	Accept	Unidirectional
Bank rate does not granger cause FPI	3.82732	0.0277	Reject	
FPI does not granger cause Exchange rate	1.99696	0.1453	Accept	No Causality
Exchange rate does not granger cause FPI	0.78592	0.4607	Accept	
FPI does not granger cause GDP	1.12918	0.3305	Accept	No Causality
GDP does not granger cause FPI	0.38890	0.6796	Accept	
FPI does not granger cause WPI	0.26018	0.7718	Accept	No Causality
WPI does not granger cause FPI	0.07769	0.9254	Accept	

Table 4 displays the results of Granger Causality test. Once we are confirmed that the data series is stationary we can test the further analysis to check the causal relationship between the variables. The above table shows the causality between FPI, Bank rate, Exchange rate, GDP, WPI. We use Granger Causality to know the direction of causal relationship between the variables. Table 4 displays, pair wise analysis of granger causality. The Null hypothesis is one variable does not cause other variable. It is clear from the table that p-value for the Null hypothesis i.e. FPI does not Granger cause Bank rate, where p-value is more than critical value hence we fail to reject the hypothesis accepting that there is no causal relationship between two variables. On the other hand, the result of Bank rate does not granger cause FPI is significant and we can say that Bank rate do affects FPI. Hence we conclude that there is unidirectional cause between FPI and Bank rate. In case of causal relationship between FPI and Exchange rate, where the p-value for null hypothesis of FPI does not granger cause Exchange rate and Exchange rate does not granger cause FPI is more than critical value, hence there is no causality between the two variables. Similarly in case of causality between

FPI and GDP, The Null hypothesis for both the direction of variables p-value is more than critical value so we conclude that there is no causality between the variables. In case of FPI and WPI, the p-value for null hypothesis for FPI does not granger cause WPI and WPI does not granger cause FPI is more than critical values so we accept the null hypothesis concluding that neither FPI granger cause WPI nor WPI granger cause FPI so there is no causality between variables.

TRENDS AND PATTERNS OF FPI AND SECTORAL INDICES OF NSE

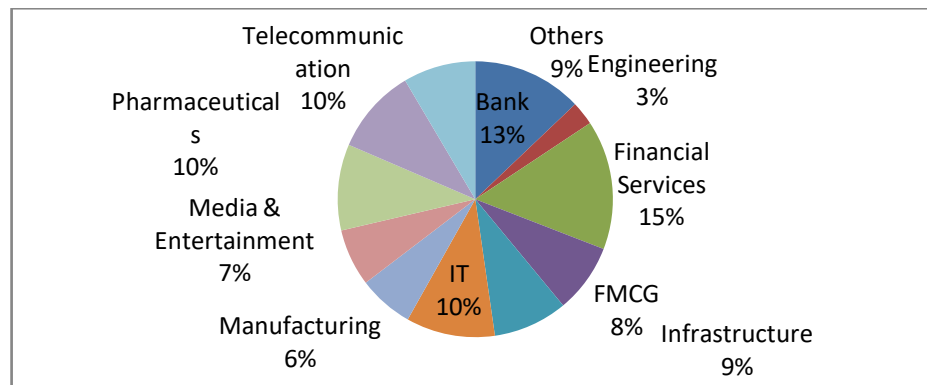
FIGURE 1: YEARLY TREND OF FPI FLOW



Source: SEBI

As shown in **Figure 1**, there is variation in the FII inflows for the period of 16 years, i.e. 2001-2016. The net investment has risen from Rs. 12,494.8 crores in the year 2001 to Rs. 2, 56,213 crores in 2014 with ups and downs in the inflows during the period. For the period of 16 years there has been increase in most of the years, i.e. 12 years, while decrease in rest of the years. Therefore, it can be concluded that there were variations in the inflows of FPI into Indian Stock Market.

FIGURE 2: SECTORAL INVESTMENT BY FPI



Source: NSE fact book 2016

Figure 2 exhibits the FPI inflows into Indian stock market (National Stock Exchange). It can be seen from above; the major portion of Foreign Portfolio Investment is into Financial Services followed by Bank and IT. It can be concluded that India is favorite destination of FPI in Indian Stock Market.

Descriptive Statistics

TABLE 5: DESCRIPTIVE STATISTICS

Variables	Obs	Mean	Std.Dev	Skewness	Kurtosis	Jarque-Bera	Prob.
Foreign Portfolio Investment	191	5475.329	12230.30	-0.126654	4.875349	28.49958	0.000001
Nifty 50	191	4345.382	2397.725	0.138054	1.901360	10.21249	0.006059
Nifty Bank	191	7995.816	5536.768	0.478074	2.173224	12.71566	0.001733
Nifty IT	191	8816.693	5719.682	1.271527	4.741478	75.60312	0.000000
Nifty Pharma	191	4477.807	3522.760	1.086568	2.962937	37.59432	0.000000
Nifty FMCG	191	8850.829	6575.729	0.722281	2.021185	24.23185	0.000005

Table 5 exhibits the descriptive statistic for FPI inflows affecting NSE Sectoral indices, namely Nifty50, Nifty Bank, Nifty IT, Nifty Pharma and Nifty FMCG. It can be seen that Nifty FMCG has highest mean and the standard deviation is highest in case of FPI followed by Nifty FMCG and Nifty IT. This means there is wide range of fluctuations in FPI inflows in India. Whereas, Nifty-50 shows lowest standard deviation among the variables which indicates less fluctuations of Nifty50 returns. The data is said to be normal if skewness is ‘zero’, therefore in above table, the data of FPI, Nifty50 and Nifty Bank are fairly symmetrical. In case of Nifty FMCG the data is moderately skewed and Nifty IT and Nifty Pharma are highly skewed where the data is not normal. The data is said to be normal if Kurtosis has value 3, so Nifty Pharma is said to be normally distributed. The data distribution of FPI and Nifty IT is called Leptokurtic since value is greater than 3 and Nifty50, Nifty bank and Nifty FMCG is called Platykurtic since value is less than 3. The Hypothesis of Jarque Bera test is normally distributed, since the data is significant for all variables we reject the hypothesis concluding data is not normally distributed.

Regression analysis

TABLE 6: REGRESSION ANALYSIS

	Nifty50		Nifty Bank		Nifty IT		Nifty Pharma		Nifty FMCG	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
α	0.0015	0.73	0.0001	0.99	0.0158	0.27	0.0042	0.28	0.0036	0.32
β	0.0000	0.00	0.0000	0.00	0.0000	0.0929	0.0000	0.00	0.0000	0.00
R^2	0.1808		0.1930		0.0149		0.1290		0.1035	
SCLM Obs. R^2	26.31	0.00	26.02	0.00	1.69	0.43	19.26	0.0001	6.96	0.03
Heteroskedasticity	3.37	0.07	0.81	0.37	0.33	0.56	2.97	0.08	1.39	0.24
Normality	45.90	0.00	10.69	0.005	111810.0	0.00	42.69	0.00	12.13	0.002

Table 6 displays, regression analysis results. Regression analysis is used to estimate the relationship between the dependent variables namely Nifty50, Nifty bank, Nifty IT, Nifty Pharma, Nifty FMCG and the independent variable Foreign Portfolio Investment. It also shows the strength of impact of independent variable on dependent variable. Therefore probability is less than critical value in all the cases except Nifty IT, we conclude that there is significant relation between dependent and independent variable. Beta explains if there is a change in independent variable than how much per cent it will bring changes in dependent variable. The R^2 measures the fraction of the variance of dependent variable explained by independent variable. So we can conclude that FPI individually cannot explain the variance of independent variable even if it has significant relationship. It means there are some other factor which combined affects the dependent variable.

Serial Correlation Lagrange Multiplier test is used to test serial correlation. The Null hypothesis is there is no serial correlation up to specified, here we reject Null hypothesis except Nifty IT concluding residuals are serially correlated. The Null hypothesis for Heteroskedasticity is there is no heteroskedasticity; in all the cases above we conclude that there is heteroskedasticity.

TABLE 7: UNIT ROOT TEST RESULTS

Unit Root	Augmented Dickey–Fuller Test	
Null Hypothesis	t-statistics	p-value
FPI has a unit root	-8.399972	0.0000
Nifty-50 has a unit root	-9.932850	0.0000
Nifty Bank has a unit root	-10.07360	0.0000
Nifty IT has a unit root	-12.50519	0.0000
Nifty FMCG has a unit root	-11.64985	0.0000
Nifty Pharma has a unit root	-10.25852	0.0000

Unit root test is used to check whether the data series is stationary or not. Table 7 shows the critical values at 10%, 5% and 1% level and the results of Unit root test. In this test we use Augmented Dickey Fuller test in order to check the stationarity. We used natural logarithm before testing unit root. In our test, the Null hypothesis is Variables has unit root. In order to check the results we have compared and checked whether t-statistic is less than Critical values for each variable. The results we found are the data series is stationary at level only since we observed t-statistics less than critical values. And the data is significant at 10%, 5% and 1% level. Therefore we reject Null hypothesis and we can say that the variables do not have unit root problem and the data series is stationary. After confirmation of stationary nature of data series we can carry our Cointegration test and Granger causality test to check relationship between the variables.

TABLE 8: GRANGER CAUSALITY RESULTS

Null Hypothesis (H₀)	F-statistics	Probability value	Accept/Reject hypothesis	Direction/ Nature of Causality
FPI does not granger cause Nifty50	1.26832	0.2838	Accept	No Causality
Nifty50 does not granger cause FPI	2.78489	0.0644	Accept	
FPI does not granger cause Nifty Bank	4.49912	0.0124	Reject	Bidirectional
Nifty Bank does not granger cause FPI	3.01819	0.0513	Reject	
FPI does not granger cause Nifty IT	0.31424	0.7307	Accept	No Causality
Nifty IT does not granger cause FPI	0.01169	0.9884	Accept	
FPI does not granger Cause Nifty Pharma	2.33460	0.0997	Accept	No Causality
Nifty Pharma does not granger cause FPI	1.99259	0.1393	Accept	
FPI does not granger cause Nifty FMCG	1.45553	0.2360	Accept	Unidirectional
Nifty FMCG does not granger cause FPI	4.27157	0.0154	Reject	

Table 8 displays the results that are obtained by applying Granger causality test. Once we are confirmed that the data series is stationary we can test the further analysis to check the causal relationship between the variables. The above table shows the causality between FPI, Nifty50, Nifty Bank, Nifty IT, Nifty FMCG and Nifty Pharma. Although the

Cointegration test used further examines the long term relationship between the variables but it does not specify the direction of Causal relation. Therefore to know the direction of causal relationship between the variables, Granger Causality test is used.

In the above table, pair wise analysis of granger causality is shown. The Null hypothesis is one variable does not cause other variable. It is clear from the table that p-value for the Null hypothesis i.e. FPI does not Granger cause Nifty 50, where p-value is more than critical value hence we fails to reject the hypothesis concluding there is no causal relationship between two variables. Whereas, the result of Nifty50 does not granger cause FPI is insignificant and we can say that nifty50 does not granger cause FPI. Hence we conclude that neither FPI granger cause Nifty50 nor Nifty50 granger cause FPI so there is no causality between variables.

Further, p-value for Null hypothesis of FPI does not granger cause Nifty Bank is less than critical value, similarly p-value for Null hypothesis of Nifty bank does not granger cause FPI is less than critical value, therefore both the Null hypothesis is rejected concluding FPI as well as Nifty Bank affects each other. Hence there is Bidirectional causality between variables. In case of causal relationship between FPI and Nifty IT, where the p-value for null hypothesis of FPI does not granger cause Nifty IT and Nifty IT does not granger cause FPI is more than critical value, hence there is no causality between the two variables. Similarly in case of causality between FPI and Nifty Pharma, p-value is more than critical value so we conclude that there is no causality between the variables.

The p-value for Null hypothesis that FPI does not granger cause Nifty FMCG is more than critical value therefore we fail to reject the Null hypothesis and concludes FPI does not granger cause Nifty FMCG. For next Null hypothesis that is Nifty FMCG does not granger cause FPI is less than critical value, hence we reject the Null hypothesis concluding Nifty FMCG affects FPI and there is Unidirectional causality between two variables.

TABLE 9: JOHANSEN COINTEGRATION TEST RESULTS

Hypothesized No. of CE(s)	Trace		Max-Eigen	
	Trace statistics	p-value	Max-Eigen statistics	p-value
None *	99.76745	0.0257*	44.03600	0.0170*
At most 1	55.73145	0.3888	25.46223	0.3544
At most 2	30.26922	0.7052	13.72819	0.8409
At most 3	16.54103	0.6737	10.96052	0.6513
At most 4	5.580504	0.7444	5.281850	0.7059
At most 5	0.298654	0.5847	0.298654	0.5847

Trace test & Max-Eigen indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Cointegration test is used to examine the long term relationship between the variables. Cointegration means that even if the time series data individually being non stationary but linear combination of more time series can be stationary.

Therefore we use Johansen Cointegration test to check long term relationship. Table 9 reveals the results for testing number of cointegrating relations. Two types of test statistics are reported namely Trace statistics and Maximum Eigen value statistics, which reveal long run relation, exist between FPI and NSE sectoral indices.

In the above study, we reject the null hypothesis at 5% level and we accept that there is cointegrating equation. The result indicates that there is 1 cointegrating equation between variables. But if we fail to reject Null hypothesis it means that there is no Cointegrating variables in equation. Since we found at least one cointegrating equation between the variables we use Vector Error Correction Model.

Vector Error Correction Model

Vector Error Correction Model is used after it is confirmed the existence of long term relationship among the variables and have at least one cointegrating equation. VECM explains the short run adjustments of cointegrated variables towards their equilibrium values.

Equation 1-

Dependent variable- Nifty50, Independent variable- FPI

$$\begin{aligned} \Delta \ln \text{Nifty50} = & 0.0003C - 0.0034EC - 0.0058\Delta \text{FPI}_{t-1} + 0.0228*\Delta \text{LFPI}_{t-2} - 0.3620*\Delta \text{LnNIFTY50}_{t-1} \\ & (0.0041) \quad (0.0198) \quad (0.0165) \quad (0.01221) \quad (0.0667) \\ & -0.4935*\Delta \text{LnNIFTY50}_{t-2} \\ & (0.0656) \end{aligned}$$

The above equation shows the vector error correction model for Nifty50 as dependent variable and FPI as independent variable. The term {-0.0034EC} helps to determine the speed of correction within the variables. The coefficient of Error correction term of Nifty50 is negative but insignificant which suggests that even if long run relation exists, the relation cannot be explained by VECM. That means it shows the independent relation between the variables. The other variables which are significant are to be tested by using Wald test to examine the joint short run impact of variables on dependent variable.

Wald test

The table shows the test of joint significance of variables using Wald test.

H₀: There is no significant impact of variables jointly on the NSE Sectoral Indices

H₁: There is significant impact of variables jointly on the NSE Sectoral Indices

TABLE 10: WALD TEST

Test statistics	Value	Df	Probability
F-statistic	33.29862	(2, 182)	0.0000

Three variables are significant based on the VECM equation namely $\Delta LFPI_{t-2}$, $\Delta LnNIFTY50_{t-1}$ and $\Delta LnNIFTY50_{t-2}$. The probability value of F-statistic is less than 0.05; so we reject the Null hypothesis and we accept the impact of the variables jointly on the dependent in short run.

Equation 2-

Dependent variable- Nifty Bank, Independent variable- FPI

$$\begin{aligned} \Delta LnNiftyBank = & -0.0001C + 0.0767EC - 0.0482\Delta LFPI_{t-1} + 0.0149\Delta LFPI_{t-2} \\ & (0.0055) (0.0250) (0.0215) (0.0161) \\ & -0.2019\Delta LnNiftyBank_{t-1} - 0.4125\Delta LnNiftyBank_{t-2} \\ & (0.0741) (0.0686) \end{aligned}$$

The above equation shows the vector error correction model for Nifty Bank as dependent variable and FPI as independent variable. The term $\{+0.0767EC\}$ helps to determine the speed of correction within the variables. The coefficient of Error correction term of Nifty Bank is positive but significant which suggests that even long run relation exist, the error correction is not happening by testing VECM. The other variables which are significant are to be tested by using Wald test to examine the joint short run impact of variables on dependent variable.

Wald test

The table shows the test of joint significance of variables using Wald test.

TABLE 11: WALD TEST

Test statistics	Value	Df	Probability
F-statistic	11.31476	(2, 182)	0.0000

Three variables are significant based on the VECM equation namely $LFPI_{t-1}$, $\Delta LnNiftyBank_{t-1}$ and $\Delta LnNiftyBank_{t-2}$. The probability value of F-statistic is less than 0.05; so we reject the Null hypothesis and we accept the impact of the variables jointly on the dependent in short run.

Equation 3-

Dependent variable- Nifty Pharma, Independent variable- FPI

$$\Delta LnNiftyPharma = 0.0001C + 0.0574EC - 0.0463\Delta LFPI_{t-1} - 0.0051*\Delta LFPI_{t-2} -$$

$$\begin{array}{cccc}
 (0.0038) & (0.0143) & (0.0133) & (0.0106) \\
 0.1936\Delta\text{LnNiftyPharma}_{t-1} & -0.2791\Delta\text{LnNiftyPharma}_{t-2} & & \\
 (0.0782) & & & (0.0712)
 \end{array}$$

The above equation shows the vector error correction model for Nifty Pharma as dependent variable and FPI as independent variable. The term $\{+0.0574\text{EC}\}$ helps to determine the speed of correction within the variables. The coefficient of Error correction term of Nifty Pharma is positive but significant which suggests that even long run relation exist, error correction is not happening by using VECM. The other variables which are significant are to be tested by using Wald test to examine the joint short run impact of variables on dependent variable.

Wald test

The table shows the test of joint significance of variables using Wald test.

TABLE 12: WALD TEST

Test statistics	Value	Df	Probability
F-statistic	4.657418	(2, 182)	0.0107

Three variables are significant based on the VECM equation namely LFPI_{t-1} , $\Delta\text{LnNiftyPharma}_{t-1}$ and $\Delta\text{LnNiftyPharma}_{t-2}$. The probability value of F-statistic is less than 0.05; so we reject the Null hypothesis and we accept the impact of the variables jointly on the dependent in short run.

Equation 4-

Dependent variable- Nifty FMCG, Independent variable- FPI

$$\begin{array}{cccc}
 \Delta\text{LnNiftyFMCG} = -0.0003\text{C} + 0.0378\text{EC} - 0.0357\Delta\text{IFPI}_{t-1} - 0.0085*\Delta\text{LFPI}_{t-2} - \\
 (0.0037) & (0.0164) & (0.0141) & (0.0107) \\
 0.4655\Delta\text{LnNiftyFMCG}_{t-1} - 0.3849\Delta\text{LnNiftyFMCG}_{t-2} \\
 (0.0705) & & & (0.0685)
 \end{array}$$

The above equation shows the vector error correction model for Nifty FMCG as dependent variable and FPI as independent variable. The term $\{+0.0378\text{EC}\}$ helps to determine the speed of correction within the variables. The coefficient of Error correction term of Nifty FMCG is positive but significant which suggests that even long run relation exist, error correction is not happening by using VECM. The other variables which are significant are to be tested by using Wald test to examine the joint short run impact of variables on dependent variable.

Wald test

The table shows the test of joint significance of variables using Wald test.

TABLE 13: WALD TEST

Test statistics	Value	Df	Probability
F-statistic	18.77350	(2, 182)	0.0000

Three variables are significant based on the VECM equation namely $LFPI_{t-1}$, $\Delta LnNiftyFMCG_{t-1}$ and $\Delta LnNiftyFMCG_{t-2}$. The probability value of F-statistic is less than 0.05; so we reject the Null hypothesis and we accept the impact of the variables jointly on the dependent in short run.

Equation 5-

Dependent variable- Nifty IT, Independent variable- FPI

$$\begin{aligned} \Delta LnNiftyIT = & 0.0015C + 0.0068EC - 0.0030\Delta IFPI_{t-1} - 0.0085*\Delta LFPI_{t-2} \\ & (0.0131) \quad (0.0008) \quad (0.0305) \quad (0.0307) \\ & -0.0077\Delta LnNiftyIT_{t-1} - 0.0368\Delta LnNiftyIT_{t-2} \\ & (0.0979) \quad (0.0727) \end{aligned}$$

The above equation shows the vector error correction model for Nifty IT as dependent variable and FPI as independent variable. The term $\{+0.0068EC\}$ helps to determine the speed of correction within the variables. The coefficient of Error correction term of Nifty IT is positive but significant which suggests that even if long run relation exists, error correction is not happening by using VECM. Since other variables are insignificant, we cannot use Wald test to examine the joint short run impact of variables on dependent variable.

INTRODUCTION TO EFFECT OF FPI ON STOCK MARKET VOLATILITY

Volatility has a great impact on the decision of the investors to invest in Indian market. Averse investor makes the investment and holds various stocks due to volatility and uncertainty in market. Due to increased risk the investors demand high risk premium. Volatility in stock market is most important factor for investors and most of the investment is through the FPI. When there is FPI inflows rises the stock market indices and outflow bring down the stock market indices which brings the huge fluctuation in Indian stock market.

TABLE 14: PARAMETER ESTIMATES OF GARCH MODEL

Nifty 50				
variable	coefficient	Std. error	z-statistic	Prob.
<i>Variance equation</i>				
C	3511112.	873932.6	4.017600	0.0001
RESID(-1)^2	1.520853	0.423947	3.587370	0.0003
GARCH(-1)	-0.946336	0.019292	-49.05340	0.0000
FPI	0.016701	0.001206	13.85263	0.0000

Once we are confirmed with the stationarity of data, we can further analyze GARCH model. The dependent variable is Nifty50 and independent as FPI, where we presented the variance equation. **Table 4.1** shows the parameter estimates of GARCH model. The variance equation gives the one period ahead forecast variance based on past experience which is called as Conditional variance. The GARCH result show that the GARCH term and FPI is significant, it means that past volatility influences the current volatility and the inflows of FPI are influencing the volatility of Nifty50 returns. So we can conclude that the Nifty50 volatility is influenced by the past volatility and FPI inflows.

TABLE 15: PARAMETER ESTIMATES OF GARCH MODEL

Nifty bank				
variable	coefficient	Std. error	z-statistic	Prob.
<i>Variance equation</i>				
C	18818256	5568269.	3.379552	0.0007
RESID(-1)^2	1.358338	0.283189	4.796583	0.0000
GARCH(-1)	-1.000801	0.014370	-69.64607	0.0000
FPI	0.027273	0.012436	2.193100	0.0283

Table 15 shows the parameter estimates of GARCH model where we presented variance equation of dependent variable as Nifty bank and independent as FPI. The GARCH results of Nifty bank shows the similar results as shown in results of Nifty50. The table shows the GARCH term and FPI is significant, past volatility influences the current volatility and FPI inflows influences the volatility of Nifty bank.

TABLE 16: PARAMETER ESTIMATES OF GARCH MODEL

Nifty IT				
variable	coefficient	Std. error	z-statistic	Prob.
<i>Variance equation</i>				
C	21063831	6522957.	3.229184	0.0012
RESID(-1)^2	1.145961	0.248339	4.614501	0.0000
GARCH(-1)	-0.834232	0.131063	-6.365137	0.0000
FPI	-0.025542	0.020020	-1.275798	0.2020

Table 16 represents the parameter estimates of GARCH model. It shows the Variance equation of dependent variable as Nifty IT and independent variable as FPI. The result shows that GARCH term is significant indicates current volatility is influenced by the past volatility but FPI is insignificant which indicates that FPI inflows does not influence the volatility of Nifty IT.

TABLE 17: PARAMETER ESTIMATES OF GARCH MODEL

Nifty FMCG				
variable	coefficient	Std. error	z-statistic	Prob.
<i>Variance equation</i>				
C	26988253	8358641.	3.228785	0.0012
RESID(-1)^2	2.005930	0.482591	4.156580	0.0000
GARCH(-1)	-0.999178	0.001571	-636.1425	0.0000
FPI	0.015302	0.009860	1.551943	0.1207

Table 17 shows the result of GARCH model. The variance equation is represented of dependent variable as Nifty FMCG and independent as FPI. The results indicate that FPI is insignificant at 5% level, which means volatility of FPI is not influenced by Nifty FMCG. Whereas GARCH term is significant which indicates past volatility is influencing the current volatility.

TABLE 18: PARAMETER ESTIMATES OF GARCH MODEL

Nifty Pharma				
variable	coefficient	Std. error	z-statistic	Prob.
<i>Variance equation</i>				
C	7848711.	2440833.	3.215587	0.0013
RESID(-1)^2	2.002295	0.561853	3.563736	0.0004
GARCH(-1)	-0.996148	0.003289	-302.8635	0.0000
FPI	0.005747	0.007129	0.806223	0.4201

Table 18 shows the result of parameter estimate of GARCH model. It shows that variance equation of dependent variable Nifty Pharma and independent variable FPI. The result shows that FPI is insignificant it means that an FPI inflow does not influence the volatility of Nifty Pharma returns. The GARCH term shows significant at 5% level of significance which indicates the volatility of Nifty Pharma is influenced by previous volatility.

FINDINGS AND CONCLUSION

The study has been carried out to analyze impact of foreign portfolio Investment on Indian stock market and to examine the causal relationship between the variables.

Relationship between the determinants of FPI and FPI inflows

In this objective we have examined the relationship between the determinants of FPI and FPI inflows. To check whether there is any impact of determinants of FPI on the FPI inflows in India, we used the quarterly time series data for 16 years from 1 January 2001- 31st December 2016. We employed Correlation and Granger causality test to check relationship between the variables. The results were:-

- In case of Bank rate and FPI inflows, the correlation result shows there is correlation exist between the variables. The granger causality result shows the Unidirectional causality i.e. Bank rate affects FPI.
- In case of Exchange rate and FPI inflows, there is no correlation exist between the variables. Similarly, the results of granger causality shows there is no causality between Exchange rate and FPI inflows.
- In case of GDP and FPI inflows, the results of Correlation shows there is no relationship between the variables. The granger causality result shows that there is no causality between the variables. That means change in GDP in short run will not affect the FPI inflows.
- In case of WPI and FPI inflows, the Correlation result shows that there is no correlation between the variables. The granger causality analysis shows that there is no causality exists between the variables. Which indicates change in WPI will in short run will not affect the FPI inflows.

Causal relationship between Foreign portfolio Investment and Stock market returns

In this objective, we analyzed the causal relationship between the FPI inflows and NSE sectoral indices namely Nifty50, Nifty Bank, Nifty IT, Nifty Pharma and Nifty FMCG. We used monthly time series data for 16 years from 1st January 2001 to 31st December 2016 and apply Granger causality, Cointegration and Vector Error Correction Model for analysis.

- In case of variables Nifty50 and FPI inflows are negative and insignificant where there is independent relation between the variables but the variables are cointegrated. The result of granger causality shows that there is no causality between the variables.
- In case of variables Nifty Bank and FPI inflows are cointegrated and coefficient of ECM is positive and significant therefore error correction is not happening. The result of granger causality shows that there is bidirectional relation between Nifty bank and FPI.
- In case of variables Nifty Pharma and FPI inflows are cointegrated and coefficient of ECM is positive and significant therefore error correction is not happening. The result of granger causality shows no causality between the variables.
- In case of variables Nifty IT and FPI inflows are cointegrated and coefficient of ECM is positive and significant therefore error correction is not happening. The result of granger causality shows no causality between the variables.
- In case of variables Nifty FMCG and FPI inflows result shows even if variables are cointegrated and coefficient of ECM is positive and significant therefore error correction is not happening. The result of granger causality shows that there is unidirectional causality between variables where Nifty FMCG granger causes FPI.

Effect of FPI on Stock market volatility

In this objective, we analyzed the effect of foreign portfolio Investment on Stock market Volatility. We analyzed Monthly data of FPI, nifty50, Nifty Bank, Nifty IT, Nifty Pharma, Nifty FMCG for the period of 16 years i.e. from 1st January 2001- 31st December 2016. GARCH model was used for analysis purpose.

- In case of variables Nifty50 and FPI, the GARCH term is significant indicating that the past volatility influences the current volatility of Nifty50.
- In case of variables Nifty Bank and FPI, the GARCH term and FPI inflows are significant which states that the current volatility is influenced by the past volatility of Nifty Bank and FPI inflows.
- In case of variables Nifty IT and FPI, the GARCH term is significant which indicates that the current volatility of Nifty IT is influenced by the past volatility but FPI inflows are insignificant indicating FPI inflows does not influence volatility of Nifty IT.
- In case of variables Nifty FMCG and FPI, the GARCH term is significant indicating past volatility influences the Current volatility whereas, FPI inflows is insignificant stating FPI inflows does not influences the volatility of Nifty FMCG.
- In case of variables Nifty Pharma and FPI, the GARCH term is significant stating past volatility influences the current volatility whereas, FPI inflows is insignificant indicating FPI inflows does not influences the volatility of Nifty Pharma.

CONCLUSION

The study presents the Impact of Determinants or factors of FPI on Foreign Portfolio Investment in India. It also represents the impact of FPI inflows on Indian Stock market. The study shows that determinants are influencing FPI in different ways. Quarterly data was collected for 16 years from 2001-2016 and the study uses Correlation and Granger causality analysis. The result of correlation shows that Bank rate has a relationship with FPI inflows whereas other variables do not have any relation with FPI inflows. In case of Granger causality, the result indicates that there is unidirectional causality between the Bank rate and FPI where Bank rate affects FPI inflows and there is no causality between the other variables with FPI.

To study the causal relationship between FPI and NSE sectoral indices namely Nifty50, Nifty bank, Nifty Pharma, Nifty IT and Nifty FMCG, monthly data is used for 16 years from 2001-2016. In this study we have used Descriptive statistic to check the normality of data where we found data was not normal. Than results of unit root test shows the stationary data. Since all the variables shows the existence of cointegration to check long term relationship between the variables which shows the positive and significant Coefficient of ECM by using Vector Error Correction model. The result of granger causality shows the bidirectional relationship between Nifty bank and FPI, and unidirectional relation between Nifty FMCG and FPI inflows where Nifty FMCG affects FPI inflows. Rest of the variables has no causality exist between them.

The study presents the Effect of FPI on stock market volatility for the period of 2001-2016 by using GARCH model. The independent variable is FPI and dependent variables are Nifty50, Nifty Bank, Nifty Pharma, Nifty IT and Nifty FMCG. The result of GARCH analysis for the stock market returns for selected indices depicts the past volatility of all the dependent variable influences the current volatility.

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