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FIIs and Indian Stock Market: A Causality Investigation

Abstract

While the volatility associated with portfolio capital flows is well known, there is also a concern that foreign institutional investors might introduce distortions in the host country markets due to the pressure on them to secure capital gains. In this context, present chapter attempts to find out the direction of causality between foreign institutional investors (FIIs) and performance of Indian stock market. To facilitate a better understanding of the causal linkage between FII flows and contemporaneous stock market returns (BSE National Index), a period of nineteen consecutive financial years ranging from January 1992 to December 2010 is selected. Granger Causality Test has been applied to test the direction of causality.

1. Introduction

FII flows were almost non-existent until 1980s. Global capital flows were primarily characterized by syndicated bank loans in 1970s followed by FDI flows in 1980s. But a strong trend towards globalization leading to widespread liberalization and implementation of financial market reforms in many countries of the world had actually set the pace for FIIs flows during 1990s. One of the important features of globalization in the financial service industry is the

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increased access provided to non local investors in several major stock markets of the world. Increasingly, stock markets from emerging markets permit institutional investors to trade in their domestic markets. The post 1990s period witnessed sharp argument in flows of private foreign capital and official development finance lost its predominance in net capital flows. Most of the developing countries opened their capital markets to foreign investors either because of their inflationary pressures, widening current account deficits, and exchange depreciation; increase in foreign debt or as a result of economic policy. Positive fundamentals combined with fast growing markets have made India an attractive destination for foreign institutional investors. Portfolio investments brought in by FIIs have been the most dynamic source of capital to emerging markets in 1990s (Bekaert and Harvey, 2000). India opened up its economy and allowed Foreign Institutional Investment in September 1992[1] in its domestic stock markets[2]. This event represent landmark event since it resulted in effectively globalizing its financial services industry. Initially, pension funds, mutual funds, investment trusts, Asset Management companies, nominee companies and incorporated/institutional portfolio managers were permitted to invest directly in the Indian stock markets. Beginning 1996-97, the group was expanded to include registered university funds, endowment, foundations, charitable trusts and charitable. Till December 1998, investments were related to equity only as the Indian gilts market was opened up for FII investment in April 1998. Investments in debt were made from January 1999. Foreign Institutional Investors continued to invest large funds in the Indian securities market. For two consecutive years in 2004-05 and 2005-06, net investment in equity showed year-on-year increase of 10%. Since then, FII flows, which are basically a part of foreign portfolio investment, have been steadily growing in importance in India.

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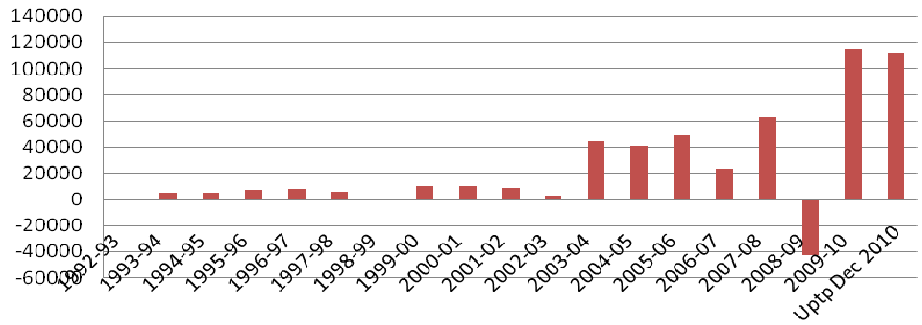
[1] The policy framework for permitting FII investment was provided under the Government of India guidelines vide Press Note dated September 14, 1992, which enjoined upon FIIs to obtain an initial registration with SEBI and also RBI's general permission under FERA. Both SEBI's registration and RBI's general permissions under FERA were to hold good for five years and were to be renewed after that period. RBI's general permission under FERA could enable the registered FII to buy, sell and realise capital gains on investments made through initial corpus remitted to India, to invest on all recognised stock exchanges through a designated bank branch, and to appoint domestic custodians for custody of investments held.

[2] The Government guidelines of 1992 also provided for eligibility conditions for registration, such as track record, professional competence, financial soundness and other relevant criteria, including registration with a regulatory organisation in the home country. The guidelines were suitably incorporated under the SEBI (FIIs) Regulations, 1995. These regulations continue to maintain the link with the government guidelines by inserting a clause to indicate that the investment by FIIs should also be subject to Government guidelines. This linkage has allowed the Government to indicate various investment limits including in specific c sectors.

Figure 1. Net FIIs Inflows in India between 1992-2010 (Rs. In Crore)



Source: Handbook of Statistics on the Indian Securities Market, SEBI.

Figure 1 shows the movement of Net FII flows in India. The above figure shows the FII flows are negative in 1998-99 because of East Asian crisis and after that FII flows started to increase and increased upto 2007-08 and again in 2008-09, there is sudden decline in FII flows due to global financial crisis. Foreign institutional investors pulled out close to Rs 50,000 crore (Rs 500 billion) at the domestic stock market in 2008-09, almost equalling the inflow in the 2007-08, FIIs' net outflows have been Rs 47,706.2 crore (Rs 477.06 billion) till March 30 in the financial year 2008-09 as against huge inflows of Rs 53,000 crore (Rs 530 billion) in the previous fiscal, according to information on the SEBI. FII flows into India remained strong since April 2009. According to data released by the SEBI, net FII inflows (debt and equity combined) in 2009-10 stood at US$30.25 billion (over Rs. 1.43 trillion)-the highest at any point in time during the last three financial years, driven by both the equity and debt segment. During the quarter ended March 2010, the FII (debt and equity combined) flows into India stood at US$ 9.26 billion driven by strong debt flows as against US$ 6.63 billion for the quarter ended December 2009 and US$7.93 billion for the quarter ended September 2009. In the previous quarters, the FII inflows were predominantly in the equity segment while in the last three months there have been significant investments in the debt segment as well. Anecdotal evidence suggests that the debt investments made by FIIs have largely been in better rated short term debt papers driven by attractive yields.

2. FIIs and Stock Market Behaviour: Empirical Evidence

FII investment as a proportion of a developing country's GDP increases substantially with liberalization as such integration of domestic financial markets with the global markets permits free flow of capital from 'capital-rich' to 'capital-scarce' countries in pursuit of higher rate of return and increased productivity and efficiency of capital at global level. Clark and Berko (1997) emphasize the beneficial effects of allowing foreigners to trade in stock markets and outline the "base-broadening" hypothesis. The perceived advantages of base- broadening arise from an increase in the investor base and the consequent reduction in risk premium due to risk sharing. Other researchers and policy makers are more concerned about the attendant risks associated with the trading activities of foreign investors. They are particularly concerned about the herding behaviour of foreign institutions and potential destabilization of emerging stock markets.

In 1990s, several research studies have explored the cause and effect relationship between FII flows and domestic stock market returns but the results have been mixed in nature, Tesar and Werner (1994, 1995), Bhon and Tesar (1996), and Brennan and Cao (1997) have examined the estimates of aggregate international portfolio flows on a quarterly basis and found evidence of positive, contemporaneous correlation between FII inflows and stock market returns. Jo (2002) has shown empirically tested instances where FII flows induce greater volatility in markets compared to domestic investors while Bae *et. al.* (2002) has proved that stocks traded by foreign investors experience higher volatility than those in which such investors do not have much interest.

There have been attempt to explain the impact of FIIs on Indian stock market. Most of the studies generally point the positive relationship between FII investment and movement of the National Stock Exchange share private index, some also agree on bidirectional causality stating that foreign investors have the ability of playing like market makers given their volume of investment (Babu and Prabheesh in 2008; Agarwal, 1997; Chakrabarti, 2001; and Trivedi and Nair, 2003, 2006[3]). Whereas, Takeshi (2008) reported unidirectional causality from stock returns to FII flows irrelevant of the sample period in India whereas the reverse causality works only post 2003. However, impulse function shows that the FII investments in India are more stock returns driven. Perhaps the high rates of growth in recent times coupled with an increasing trend in corporate profitability have imparted buoyancy to stock markets, triggering off return chasing behaviour by the FIIs. Kumar (2001) inferred that FII flows do not respond to short-term changes or technical position of the market and they are more driven by fundamentals. The study finds that there is causality from FII to Sensex. This is in contradiction to Rai and Bhanumurthy (2003) results using

[3] Trivedi and Nair (2006) investigate the determinants of FII flows to India and the causal relationship between FII movement and indian stock market. Their study finds return and volatility in the Indian stock market emerge as principal determinants of FIIs inflows.

similar data but for a larger period. A study by Panda (2005) also shows FII investments do not affect BSE Sensex. No clear causality is found between FII and NSE Nifty. Mazumdar (2004) studied the impact of FII flow in Indian stock market focusing on liquidity and volatility aspects. Her study reveals that FII has enhanced liquidity in the Indian stock market while there is no evidence of increased volatility of equity returns. Sundaram (2009) found FII data to be I (0) i.e. it does not have a unit root at conventional level. It also gives positive unidirectional granger causality results i.e. stock returns Granger cause FII. No reverse causality is seen even after inserting a structural break in 2003, as some of the researchers suggest.

3. Methodology and Data Source

There have been quite a few episodes of volatility in the Indian stock market over past decade induced by several adverse exogenous developments like East Asian Crisis in mid-1997, imposition of economic sanctions subsequent to Pokhran Nuclear explosion in May 1998, Kargil War in June 1999, stock Market Scam of early 2001 and the Black Monday of May 17, 2004 when the market was halted for the first time in the wake of a sharp fall in the index. In the first quarter of 2008-09, market was again halted in the wake of sharp fall in the index. A sharp decline in FII flows coincided with the above events and this has prompted the Indian policy makers to announce a number of changes in FII regulations like enhancing the aggregate FII investment limit (in February 2001), permitting foreign investors to trade in exchange traded derivatives (in December 2003) etc. in order to regenerate the foreign investors' interests in the Indian capital market. So, to facilitate a better understanding of the causal linkage between FII flows and stock market movements, a period of nineteen consecutive financial years ranging from *January, 1992 to December, 2010* is selected for the empirical study.

The present chapter is based on secondary market data of monthly net FII flows (i.e., gross purchase-gross sales by foreign investors) into the Indian equity market and monthly averages of BSE National Index is a market capitalization- weighted index of equity shares of 100 companies from the 'Specified' and 'Non-specified' list of the five stock exchanges – Mumbai, Calcutta, Delhi, Ahmadabad and Madras – and its monthly values are averages of daily closing indices. Since the market for equity shares is subject to much larger fluctuations than the bond market, the emphasis is on equity market in the present study. Both the secondary data for the relevant sample period are obtained from RBI website. The following variables are used in the model.

B_t represents natural log of BSE National Index's averages of daily closing indices at month t and F_t represents FII's investment in equity at month t.

$$B_t = \text{In}\ (B)$$

where, B is the monthly averages of BSE national index.

It is important to note that, as mentioned earlier, BSE National Index is representative market capitalization weighted index of five major stock exchanges of the country and hence use of BSE National Index monthly returns as the measure of Indian stock market returns in the case analysis appears justified.)

4. Analytical Tools

Empirical work based on the time series data assumes that the underlying time series is stationary. According to Engle and Granger (1987) *"a time series is said to be stationary if displacement over time does not alter the characteristics of a series in a sense that probability distribution remains constant over time"*. In other words, the mean and variance of the series are constant over time and the value of covariance between tow time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is compute.

Before going to use the Granger causality test one should test the normality and stationary properties of the variable in case of time series data. As our data is time series in nature, first one has to test normality by using Jerque Bera test and then stationarity of variables using different unit root tests.

Normality Test

The Jarque-Bera (JB) and Anderson Darling (AD) tests are used to tests whether the closing values of stock market and FII follow the normality distribution. The JB test of normality is an asymptotic or large sample test. It is also based on the OLS residuals. This test first computes the skewness and Kurtosis measures of the OLS residuals and uses the following test statistic:

$$JB = n\left[s^2/6 + {(K-3)^2}/{24}\right]$$

where n = sample size, S = skewness coefficient, and K = kurtosis coefficient. For a normally distributed variable, S=0 and K=3. Therefore, the JB test of normality is the test of Joint hypothesis that S and K are 0 and 3 respectively. Under null hypothesis that the residuals are normally distributed, Jerque and Bera showed that asymptotically (i.e., in large samples) the JB statistic follows the chi-square distribution with 2 df. If the p value of the computed chi-square statistic in an application is sufficiently low, one can reject the hypothesis that the residuals are normally distributed. But if p value is reasonably high, one does not reject the normality assumption. The Anderson-Darling normality test, known as the A^2 is used to further verify the findings of JB test.

Unit root test (Stationarity Test)

Unit root test is used to test whether the averages of BSE and FII flows are stationary or not. The researcher can test the stationarity of variable by using Augmented Dicky-Fuller (ADF) test and Phillips-Perron (PP) test. ADF is an augmented version of the Dickey–Fuller test for a larger and more complicated set of time series models. The augmented Dickey–Fuller (ADF) statistic, used in the test, is a negative number. The more negative it is, the stronger the rejections of the hypothesis that there is a unit root at some level of confidence.

The testing procedure for the ADF test is the same as for the Dickey–Fuller test but it is applied to the model

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta \Delta y_{t-1} + \cdots + \delta_{p-1} \Delta y_{t-p+1} + \epsilon_t$$

where α is a constant, β the coefficient on a time trend and p the lag order of the autoregressive process. Imposing the constraints $\alpha = 0$ and $\beta = 0$ corresponds to modelling a random walk and using the constraint $\beta = 0$ corresponds to modelling a random walk with a drift.

By including lags of the order p (greek for 'rho') the ADF formulation allows for higher-order autoregressive processes. This means that the lag length p has to be determined when applying the test. One possible approach is to test down from high orders and examine the t-values on coefficients. An alternative approach is to examine information criteria such as the Akaike information criterion (AIC), Bayesian information criterion (BIC) or the Hannan-Quinn information criterion (HQIC). We use this alternative approach of determining the lag length based on AIC.

The unit root test is then carried out under the null hypothesis $\gamma = 0$ against the alternative hypothesis of $\gamma < 0$. Once a value for the test statistic is computed it can be compared to the relevant critical value for the Dickey–Fuller Test.

$$DF_{\tau} = \frac{\hat{\gamma}}{SE(\hat{\gamma})}$$

If the test statistic is less (this test is non symmetrical so we do not consider an absolute value) than (a larger negative) the critical value, then the null hypothesis of $\gamma = 0$ is rejected and no unit root is present.

One advantages of ADF is that it corrects for higher order serial correlation by adding lagged difference term on the right hand side. One of the important assumptions of DF test is that error terms are uncorrelated, homoscedastic as well as identically and independently distributed (iid). Phillips-Perron (1998) has modified the DF test, which can be applied to situations where the above assumptions may not be valid. Another advantage of PP test is that it can also be applied in frequency domain approach, to time series analysis. The derivations of the PP test statistic is quite involved and hence not given here. The PP test has been shown to follow the same critical values as that of DF test, but has greater power to reject the null hypothesis of unit root test.

Granger causality Test

Granger causality test was developed in 1969 and popularized by Simsin 1972. According to this concept, a time series X_t granger causes another time series Y_t if series Y_t can be predicted with better accuracy by using past values of X_t rather than by not doing so, other information is being identical. If it can be shown, usually through a series of F-tests and considering AIC of lagged values of X_t (and with lagged values of Y_t also known), that those X_t values provide statistically significant information about future values of Y_t times series then X_t is said to Granger cause Y_t i.e. X_t can be used to forecast Y_t. The pre condition for applying Granger Causality test is to ascertain the stationarity of the variables in the pair. Engle and Granger (1987) show that if two non-stationary variables are co-integrated, a vector auto-regression in the first difference is unspecified. If the variables are not co-integrated; therefore, Bivariate Granger causality test is applied at the first difference of the variables. The second requirement for the Granger Causality test is to find out the appropriate lag length for each pair of variables. For this purpose, the researcher used the vector auto regression (VAR) lag order selection method available in Eviews. This technique uses six criteria namely log likelihood value (Log L) , sequential modified likelihood ratio (LR) test statistic, final prediction error(F&E), AKaike information criterion (AIC), Schwarz information criterion(SC) and Kannan-Quin information criterion (HQ) for choosing the optimal lag length. Among these six criteria, all except the LR statistics are monotonically minimizing functions of lag length and the choice of optimum lag length is at the minimum of the respective function and is denoted as a * associated with it.

Since the time series of FII is stationary or I (0) from the unit root tests, the Granger causality test is performed as follows:

$$\Delta B_t = \alpha_1 + \beta_{11}\Delta B_{t-1} + \beta_{12}\Delta B_{t-2} + \cdots + \beta_{1n}\Delta B_{t-n} + \gamma_{11}F_{t-1} + \gamma_{12}F_{t-2} + \cdots + \gamma_{1n}F_{t-n}\varepsilon_{1,t}$$

$$F_t = \alpha_2 + \beta_{21}F_{t-1} + \beta_{22}F_{t-2} + \cdots + \beta_{2n}F_{t-n} + \gamma_{21}\Delta B_{t-1} + \gamma_{22}\Delta B_{t-2} + \cdots + \beta_{1n}\Delta B_{t-n}\varepsilon_{1,t}$$

where n is a suitably chosen positive integer; β_j and γ_i, j = 0, 1.....k are parameters and α's are constant; and ε_t's are disturbance terms with zero means and finite variances. (ΔB_t is the first difference at time t of BSE averages where the series in non-stationary. F_t is the FII flows at time t where the series is stationary).

Variance Decomposition

The vector auto-regression (VAR) by Sims (1980) has been estimated to capture short run causality between BSE averages and FII investment. VAR is commonly used for forecasting systems of interrelated time series and for analysing the dynamic impact of random disturbances on the system of variables. In VAR modelling the value of a variable is expressed as a linear function of the past, or lagged, values of that variable and all other variables included in the model. Thus all variables are regarded as endogenous. Variance decomposition offers a method for examining VAR system dynamics. It gives the proportion of the movements in the dependent variables that are due to their 'own' shocks, versus shocks to the other variables. A shock to the ith variable will of course directly affect that variable, but it will also be transmitted to all of the other variables in the system through the dynamic structure of VAR (Chirs Brooks, 2002). Variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR and provides information about the relative importance of each random innovation in affecting the variables in the VAR. In the present study, BVAR model has been specified in the first differences as given in following equations:

$$\Delta X_t = \alpha_1 + \sum_{j=1}^{k} \left(\alpha_{11}(t)\Delta X_{t-j}\right) + \sum_{f=1}^{k} \alpha_{12}(f)\Delta Y_{t-f} + \epsilon_{xt}$$

$$\Delta Y_t = \alpha_2 + \sum_{j=1}^{k} \left(\alpha_{21}(t)\Delta X_{t-j}\right) + \sum_{f=1}^{k} \alpha_{22}(f)\Delta Y_{t-f} + \epsilon_{yt}$$

where ε's are the stochastic error terms, called impulse response or innovations or shock in the language of VAR.

Impulse Response function

Since the individual coefficients in the estimated VAR models are often difficult to interpret, the practitioners of this technique often estimate the so-called impulse response function (IRF). The IRF traces out the response of the dependent variable in the VAR system to shocks in the error terms. So, for each variable form each equation separately, a unit shock is applied to the error, and the effects upon the VAR system over time are noted. Thus, if there are m variables in a system, total of m_2 impulse responses could be generated. In our study there are four impulse responses possible for each phase, however we have considered only two which are of our interest. In econometric literature, but impulse response functions and variance decomposition together are known as innovation accounting (Enders, 1995).

5. Empirical Analysis

As outlined in the methodology the empirical analysis of impact of FII flows on Indian stock market is conducted in the six parts:

First: The normality test is has been conducted for F_t and B_t. The Jerque Bera statistics and Anderson darling test are used for this purpose. The results are shown in Table (3 (B).1) along with descriptive statistics. The skewness coefficient, in excess of unity is taken to be fairly extreme (Chou 1969). High or low Kurtosis value indicates extreme leptokurtic or extreme platykurtic (Parkinson1987). Skewness value 0 and Kurtosis value 3 indicates that the variables are normally distributed. As per the statistics of Table 1 frequency distributions of variables are not normal.

Table 1. Descriptive Statistics of FIIs

Estimates	Time period(January 1992 to December 2010)
Mean	2031.739
Median	546.2450
Maximum	29506.91
Minimum	-13461.39
Standard deviation	5254.431
Skewness	1.926040
Kurtosis	10.18559
Jarque-Bera	631.4772
Probability	0.000000
Andersion Darling (Adj. Value)	21.36305
Probability	0.000000
Result	**Not Normal**

Source: Authors calculation using BSE National Index Data (Data has been accessed from RBI Database).

These results are further supported by Jerque-Bera (probability = 0) and Andersion Darling (probability = 0). Zero value of probability distribution indicates that the null hypothesis is rejected. Or FII flows are not normally distributed.

Table 2. Descriptive Statistics of BSE National Index

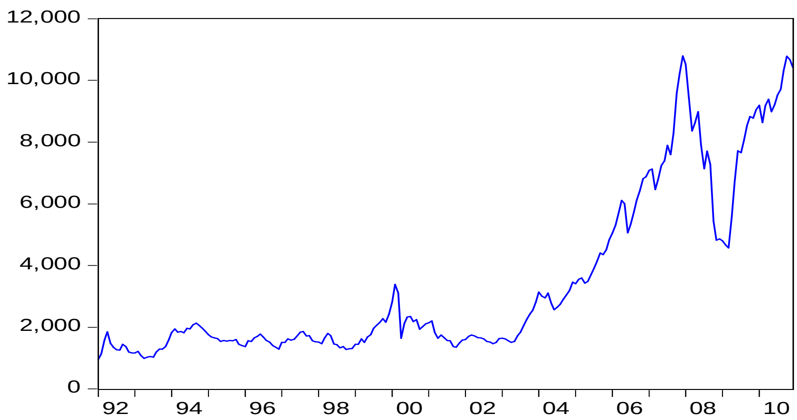
Estimates	Time period(January 1992 to December 2010)
Mean	3440.320
Median	1938.505
Maximum	10795.30
Minimum	960.1400
Standard deviation	2763.419
Skewness	1.262780
Kurtosis	3.206250
Jarque-Bera	60.99942
Probability	0.000000
Anderson Darling (Adj. Value)	23.06024
Probability	0.000000
Result	**Not Normal**

Source: Authors calculation using BSE National Index Data (Data has been accessed from RBI Database).

The results presents in table 2 shows that these results supported the by Jerque-Bera (probability = 0) and Andersion Darling (probability = 0). Zero value of probability distribution indicates that the null hypothesis is rejected. Or BSE national index averages are not normally distributed. However, BSE national index averages shows less variable than FII flows as indicated by their Standard Deviation.

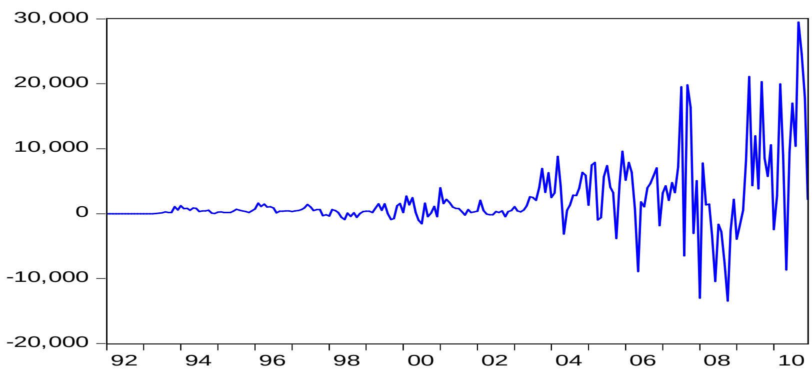
Second: Stationary test has been conducted by BSE national index averages and Net FII flows. Simplest way to check the stationarity of variables is to Plot time series graph and observed the trend in mean, variance and co-variances. A time series is said to be stationary if their mean and variance of the series are constant. BSE national Index averages seems to be trend in its mean since it has a clear cut upward movement which is the sign of non constant mean. Further, Vertical fluctuation is not the same at different portions of the series, indicating that variance is not constant. Thus, it is said that the series BSE national index averages are not stationery (Figure 2).

Figure 2. BSE National Index Averages Time Series



Source: Authors computation using BSE National Index Data (Data has been accessed from RBI Database).

Figure 3. Net FII Flows Time Series (in Rs. Crore)



Source: Authors computation using BSE National Index Data (Data has been accessed from RBI Database).

In case of Net FII flows time series (Figure 3), means and variance seems to be constant, which indicates presence of stationery in the time series. In addition to visual inspection, econometric tests are needed to decide the actual nature of time series. Or In simply, the researchers conforms the above decisions by applying Unit root tests. The results of various unit root tests namely DF, ADF and PP test are shown in table 3 and 4.

Table 3. Unit Root Test of BSE National Index Averages

Variable: BSE	At Level		At First Difference	
	t- statistics	p-value	t-statistics	p-value
Without Trend Values				
DF	0.53428	0.5937	-6.19464	0.0000
ADF	-0.09609	0.9473	-6.98863	0.0000
PP	0.053630	0.9615	-10.65834	0.0000
With Trend Values				
DF	-1.83147	0.0684	-6.42789	0.0000
ADF	-2.11103	0.5364	-7.13124	0.0000
PP	-1.66719	0.7627	-10.69348	0.0000

Source: Authors calculation using BSE National Index Data (Data has been accessed from RBI Database).

The results present in table 3 shows that the values of the different unit root test *i.e.*DF and ADF and PP values and their p- values support the results of the time series graph. It was found that BSE is non- stationery in both the cases with trend values and without trend values. BSE is stationery when the trend is allowed only according to the Dikky Fuller test at 10% significance level but ADF and PP test does not support the view of DF test. So it is concluded that the BSE is non- stationery series at level. Therefore, we can also check the stationerity at first difference. At First difference, all the unit root tests show that the BSE is stationery in all the cases at 1% significance level. So, it was found that the BSE is stationery at their first difference.

Table 4. Unit Root Test of Net FII Flows Averages

Variable: FII	**At Level**		**At First Difference**	
	t- statistics	**p-value**	**t-statistics**	**p-value**
Without Trend Values				
DF	-4.14925	0.0000	-17.28878	0.0000
ADF	-4.60525	0.0020	-12.03556	0.0000
PP	-10.4613	0.0000	-69.92335	0.0001
With Trend Values				
DF	-10.61406	0.0000	-2.143656	0.0000
ADF	-10.7099	0.0000	-12.03258	0.0000
PP	-11.2578	0.0000	-71.13907	0.0001

Source: Authors calculation using FII Data (Data has been accessed from SEBI Database).

The results presents in table.5 shows that the values of different unit root test results of Net FII flows. It was found that the FII is stationery in all the cases at 1% significance level.

Third: Correlation test has been conducted between FII and BSE. Correlation test can be seen as first indication for the existence of interdependency among time series. Table 5 shows the correlation coefficients between BSE averages and FIIs investment.

Table 5. Correlation Matrix between FII and BSE

Symbol	BSE	FII
BSE	1.00000	0.43482
FII	0.43482	1.00000

Source: Authors calculation using FII and BSE Data (Data has been accessed from SEBI Database and RBI Database).

It was found that there is a moderate degree of correlation between FII flows and BSE averages (table 5). Further, it was found that the movement in the BSE averages or FII flows does not strongly influence market movement as the coefficient of determination of the bse and FII is not high (r^2= o.1890). The correlation needed to be further verified for the direction of influence by the Granger causality test for long term movement among the returns of stock markets, by the co-integration. To perform co-integration test, time series must be non-stationary and in our findings FIIs comes out be stationary at level which rejects the applicability of co-integration test. So, we can't predict anything about long term relationship between BSE and FIIs on the basis of co-integration test. As the researcher applied Granger Causality test to find out the relationship between FII flows and BSE National Index.

Fourth*:* To capture the degree and direction of the long term correlation between BSE and FII flows, granger causality tests are conducted. For the granger causality test, the researcher needed to find out the optimum lag length by applying VAR are shown in the table 6:

Table 6. VAR Lag Order Selection Criteria

Lag	SC	HQ
0	38.53852	38.52013
1	33.97035*	33.91518
2	34.00448	33.91252
3	33.99523	33.86648
4	34.03152	33.86598*
5	34.09417	33.89185
6	34.17025	33.93114
7	34.23005	33.95416
8	34.26151	33.94884

Note: *indicates lag order selected by the criterion;

SC: Schwarz information criterion

HC: Hannan-Quinn information criterion

Source: Authors calculation.

It was found that the Vector lags order selection criteria of Schwarz information criterion (SC) i.e. (SC=1) and Hannan-Quinn information criterion (HQ) i.e. (HQ=4). It was found that the HQ is more than the SC. Therefore, the researcher used HQ for selecting the optimum lag length and for applying Granger causality test. Granger causality test statistics are shown in the table 7.

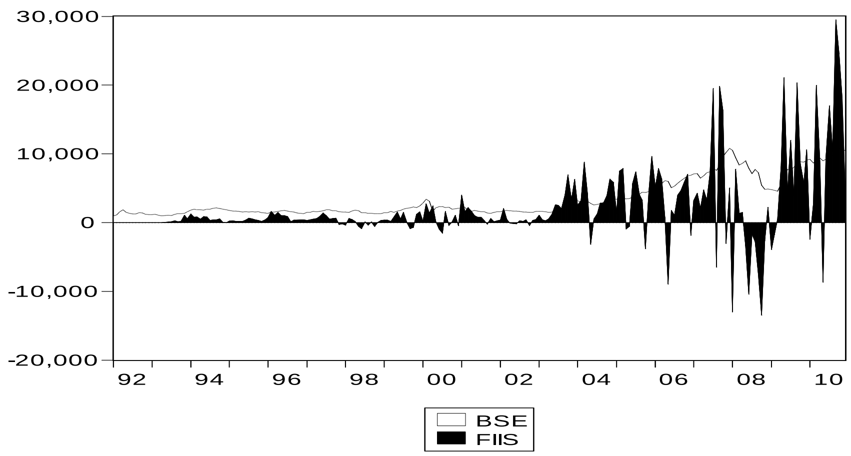
Table 7. Results of Granger Causality Tests

Null Hypothesis	F-Statistic	p-Value
FII does not granger cause BSE	6.12012	0.0001
BSE does not granger cause FIIS	2.28553	0.0613
No. of lags specified by HQ	4	4

Source: Authors calculation using FII and BSE Data (Data has been accessed from SEBI Database and RBI Database).

The results of granger causality test (present in table 7) shows that the F-statistics of FII and BSE was significant. Therefore, the null hypotheses were rejected and alternative (i.e. FII granger cause BSE and BSE granger cause FII were accepted. In other words, there is statistical evidence that any forecast about the movement of market depends on the movement of FII flows and vice-versa. It can also be shown from the following graph:

Figure 4. Movement of BSE Averages and FII Flows



Source: SEBI Database and RBI Database.

The above graph shows that if there is movement in the BSE averages then FII flows are also affected. FII flows are more volatile than BSE averages because the graph show that if the BSE is increased or decreased by one points the FII flows are moved by more than one point. BSE Averages shows frequent downward trend which causes FIIs to disinvest and this influence of BSE and FII flows are supported with the outcome that BSE granger cause FIIs and FIIs granger cause BSE.

Fifth: In the context of varying causal links of BSE with FIIs net investment, Sim's VAR were applied and short run causal links were explored by using Variance decomposition and Impulse response functions. Variance Decomposition determines how much of the n step ahead forecast error variance of a given variable is explained by innovations to each explanatory variable. Generally it is observed that own shocks explain most of the forecast error variance of the series in a VAR. Table 8 shows the results of Variance decomposition of FII and BSE at 2, 5 and 10 periods. In the case of Bivariate modelling of BSE and FII, BSE explains 91% of its own forecast error variance while FII explains only 9% of BSE variance; but FII explains 81% of its own forecast while BSE explains only 19% of FII variance. This indicated that BSE defines FII more than FII defines BSE which conclude to the result that BSE causes FII in short run. It indicates that FII do not hesitate to pull out their money from Indian market whenever market faces downward trend.

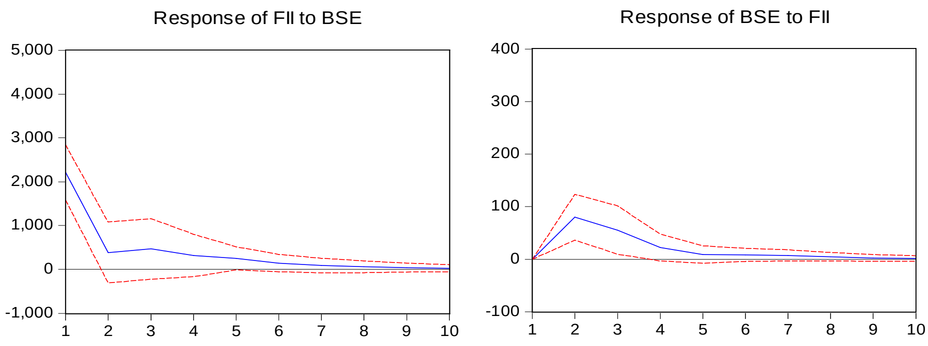
Table 8. Results of Variance Decomposition

Variance Decomposition of	Variance Periods	BSE	FII
BSE	2	94.27	5.73
	5	91.41	8.59
	10	91.30	8.70
FII	2	20.00	80.00
	5	19.18	80.82
	10	19.14	80.86

Source: Authors calculation using FII and BSE Data (Data has been accessed from SEBI Database and RBI Database).

***Sixth*:** To investigate dynamic responses further between the variables, Impulse Response of the VAR system has also been estimated. The impulse response functions can be used to produce the time path of the dependent variables in the BVAR, to shocks from all the explanatory variables. The shock should gradually die away if the system is stable. The Impulse Response functions (IFRs) as generated by the VAR model are shown in figure 5.

Figure 5. Response to Cholesky One S.D. Innovations ± 2S.E



Source: Authors calculation using FII and BSE Data (Data has been accessed from SEBI Database and RBI Database).

The response BSE to one standard deviation shock to FII is sharp and significant and dies after ten lags. Whereas response of FII to one standard deviation shock to BSE is also sharp and significant and dies after ten lags. It implies that FIIs and BSE are correlated with each other. As indicated by variance decomposition, similar pattern of causality is also observed graphically using impulse response functions. Impulse response function indicated that BVAR (Bayesian VAR) is stable.

6. Conclusion

This chapter empirically investigates the causal relationship between BSE averages and FII flows in Indian economy. The researcher also investigates the degree of interdependency between BSE averages and FII flows. First of all, normality of time series in checked. And found that the BSE averages and FII flows both are not normally distributed. After that stationarity is checked and found that FII Flows are stationery at level but BSE averages are non-stationery at level. BSE averages are stationery at their first difference. In this chapter correlation test is also applied and shows that the BSE averages and FII flows are positively correlated with each other. The correlation is further verified by the direction of influence by Granger Causality test. Granger Causality test shows that Both FII and BSE Granger cause each other. In order to find out the short term causality between two time series, variance decomposition and Impulse Response function is used. Variance decomposition and Impulse response function provide the same result as the Granger Causality test provides.

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Streszczenie

ZAGRANICZNI INWESTORZY INSTYTUCJONALNI I RYNEK AKCJI W INDIACH: BADANIA ZWIĄZKU PRZYCZYNOWEGO

Aczkolwiek brak stabilności związany z przepływami kapitału portfelowego jest dobrze znany, to istnieje również obawa, że zagraniczni inwestorzy instytucjonalni mogą wprowadzać zakłócenia na rynkach krajów przyjmujących z uwagi na wywieraną na nich presję, aby zapewniać zyski kapitałowe. W tym kontekście niniejszy rozdział próbuje poznać kierunek przyczynowości pomiędzy zagranicznymi inwestorami instytucjonalnymi (FIIs) i działaniem indyjskiej giełdy. Aby ułatwić lepsze zrozumienie związku przyczynowego między przepływami FII i mającymi miejsce w tym samym czasie wynikami giełdy papierów wartościowych (BSE National Index), wybrany został okres dziewiętnastu kolejnych lat począwszy od stycznia 1992 do grudnia 2010. Do zbadania kierunku przyczynowości zastosowano test przyczynowości Grangera.