An Emperical Investigation of Impact of Net FII Investment on Performance of Indian Stock Market of BSE

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Introduction

This paper examines the impact of the foreign institutional investors' (FIIs) on the Indian stock markets. FIIs have been allowed to invest in the domestic financial market since 1992; An important feature of the development of stock market in India in the last 15 years has been the growing participation of Institutional Investors, both foreign institutional investors and the Indian mutual funds combined together, the total assets under their management amounts to almost 18%of the entire market capitalization. The decision to open up the Indian financial market to FII portfolio flows was influenced by several factors such as the disarray in India's external finances in 1991 and a disorder in the country's capital market. Aimed primarily at ensuring non-debt creating capital inflows at a time of an extreme balance of payment crisis and at developing and disciplining the nascent capital market, foreign investment funds were welcomed to the country. FII inflow to India grew manifold from US $0.18 million (net, monthly) in January 1993 to about US $400 million within a year's time. Given the volatile nature of capital flows to emerging markets seen in the early 1990s and the nature and growth of such flows to India, FII investment in India, obviously called for special regulatory attention. Investment by FIIs in India is jointly regulated by Securities and Exchange Board of India (SEBI) through the SEBI (Foreign Institutional Investors) Regulations, 1995 and by the Reserve Bank of India through Regulation 5(2) of the Foreign Exchange Management Act (FEMA), 1999.

The net impact of these changes has reflected in the stock market of India. ,and in the last fifteen years the participation of foreign institutional investors which can be depicted in the following chart

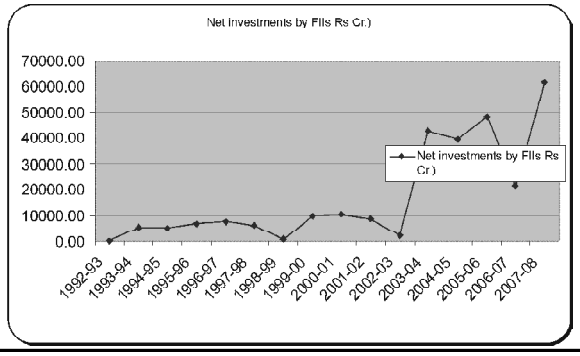

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Chart 1. Showing the net investments by Foreign institutional investors

The number of FIIs registered with the Securities and Exchange Board of India (SEBI) has doubled to 1,050 between March 2001 and June 2007. In the beginning of calendar year 2008, the figure has crossed 1124. FIIs account for a little over a third of the total turnover on the BSE and NSE today. Since May 2006, FIIs have, on an average, accounted for 34 per cent of the total turnover on the two exchanges every month. In fact, during this period, FIIs were net sellers only in four months. FIIs made a net investment of US$ 9.88 billion in the Indian market this year (till September 20), much higher than the US$ 8 billion they had invested in India in the whole of 2006. In fact, net FII flows between April and June 2007 at US$ 7.4 billion were twice the total of US$ 3.2 billion in the preceding twelve months put together. This is a clear index of how bullish this category of investors is on the prospects for the Indian stock market.

The recent waves of financial globalization since mid-1980s have been marked by a surge in international capital flows among the industrial and developing countries. Such capital growth rate has been associated with high growth rates in some developing countries. However, some countries have experienced periodic collapse in growth rates and significant financial crisis over the same period. Many developing countries with a high degree of financial integration have also experienced higher growth rate (Prasad et al., 2003).

India has emerged as an important destination for global investment. This is reflected in the number of FIIs registered with SEBI. The liberalization process of the Indian economy has been a contributing factor for the increase in financial flows. It is generally believed that FII investment broadens the base of portfolio diversification and causes a long- term increase in the stock prices by reducing the equilibrium rate of return. For a domestic economy, it is equally important to analyze the relationship between stock market and foreign investment. It is found that there is a unidirectional casual relationship between market capitalization and stock market and between net FII investment and stock market (N P Tripathy, 2007).

The international capital flow such as direct and portfolio flows has huge contribution to influence the economic behavior of the countries positively. Umashankar Patnaik and Narayan (2005) used monthly time series data, and found that Foreign Direct Investment (FDI) is positively affecting the economic growth direct contribution, while Foreign Institutional Investment (FII) is negatively affecting the growth alb its, in a small way and make a preliminary attempt to test whether the international capital flows has positive impact on financial markets and economic growth. The empirical analysis using the time series data between April 1995 to December 2004 shows that FDI plays an unambiguous role in contributing to economic growth.

Given the huge volume of these flows and their impact on the other domestic financial markets, understanding the behavior of the flows becomes

very important, especially at a time of liberalizing the capital account. By using monthly data, Kulwant & Bhanumurthy (2004) found that FII inflow depends on stock market returns, inflation rates (both domestic and foreign), and ex-ante risk. In terms of magnitude, the impact of stock market returns and the ex-ante risk turned out to be the major determinants of FII inflow.

Parthapratim (2006) examined the impact of foreign portfolio investment on India's economy and industry. As FPI essentially interacts with the real economy via the stock market, the effect of foreign portfolio on the country's economic development will also be examined. The result of this study suggests that the entry of foreign portfolio investors will boost a country's stock market and consequently the economy, does not seem to be working in India.

Chakrabarti, using monthly data, examines the nature and causes of FIIs net flow to the Indian equity market during 1993-1999. Mukherjee et.al. analyzed the relationship between FII inflows and equity returns during 1999 to 2002. The results show that FIIs flows tend to be caused by returns in the stock market and not the other way around. Batra used daily data on FII equity purchases and sale and equity returns during 2000 t0 2002 on the BSE Sensex, as well as monthly data during 1994 to 2002. The analysis shows evidence of FIIs adopting positive feedback trading at the aggregate level on the daily returns with no such evidence on the monthly returns.

Saji (2006) have shown that the foreign institutional investor's share in the Indian capital markets has shown a steady increase from $200 mn in 1991-1992 to $8.8 bn in 2004. This led to the creation of marked growth in FIIs due to the financial liberalization policies that were followed by India. The study has shown an empirical evidence for the significant linkages between the FII inflows and the performance of sensex. The performance of Sensex in terms of market capitalization, movement of Sensex, Returns on Sensex, Trading Turnover and Sensex P/E ratio are significantly related to the surge in FIIs inflows. The behavior of Returns on Sensex and Volatility has been more stabilizing due to external inflows and the fluctuations are largely due to withdrawals by the domestic equity holders during the period considered.

Kumar (2006) examines the role of institutional investors in Indian stock markets and finds that the market movement can be explained using the direction of the funds flow from these investors. An important feature of the development of stock market in India in the last 15 years has been the growing participation of Institutional Investors, both foreign institutional investors and the Indian mutual funds combined together, the total assets under their management amounts to almost 18% of the entire market capitalization. The regression results of this study show that the combined might of the FIIs and mutual funds are a potent force, and they infact direction can forecast market direction using the direction of the flow of funds from FIIs and mutual funds, the Granger causality test has showed that the mutual funds in fact lead the market rise or fall and FIIs follow suit.

The FII share plays a significant and positive role in determining the performance of public sector but not necessarily private sector banks. This is explained by the critical role that FII plays in public sector banks in improving managerial efficiency by avoiding issues relating to moral hazard. Therefore, this work suggests that further research is required to bring out the direction of casuality between FII share and performance to check if FII is attracted to better performing firms whether banks with higher FII perform better or both (Umakrishnan et al., 2008).

Golaka et al.,(2003) examined the dynamic linkages between the foreign exchange and stock market for India. These results have opened up some interesting issues regarding the exchange rate and stock price casual relationship. In India, though stock market investment does not constitute a very significant portion of total household savings compared to other form of financial assets, it may have a significant impact on exchange rate movements as FII investment has played a dominant role.

Since the portfolio flows of the FIIs is on the increase over time and as the major chunck of this investment goes into equity markets it certainly would have an impact on the shareholding pattern of Indian companies listed on the stock exchanges. A study on the shareholding pattern brings out the following observations. The FIIs hold an investment in each of the companies included in the index at both the points in time. In 45 of the 49 companies studied FIIs have increased their stake in the calendar year 2003. In as many as 30 companies the shares held by the FIIs are more than 10% of the total shares outstanding of these companies. Of these 30 companies, the shares held by the FIIs are more than 20% in the case of 14 companies. Hence, the policy makers of our country have to craft appropriate strategies to attract more foreign portfolio flows, which can strengthen our domestic capital markets (Lakshmi 2003)

The Methodology

The participants in the equity market are basically classified, into domestic institutional investors (DIIs), foreign institutional investors (FIIs) & non-institutional participants (retail investors). FII form a subset of total institutional turnover. From the empirical evidence, it is clearly noted that the most imp interaction between Indian firms and the global financial system takes place through foreign portfolio flows. Hence, there is a need for a closer examination of these transactions and it is also necessary to examine the extent to which portfolio flows affect the domestic stock market.

The period of study is chosen from the year of 2000 to 2007. The period is chosen from 2000 as the Asian crisis of 1997-98 bought a strong pitch in the capital flows and the FII flows became emerging outflows from the year of 1999. The dynamic relation between FII and the movement of sensex is explored in this study using daily data of last one year 2006-2007 to analyze the short run relationship.

The sample covers two types of data series namely, the monthly data from 2000-2007 and daily data from 2006-2007 of index price of Sensex and net

FII investment in the market. The top 30 constituents of Sensex are taken as the sample population for this study because it acts as a benchmark index to measure the performance of the Indian stock market. The sample size of the study for monthly data from Jan 2000-Dec 2007 is 96 and for the daily data from Jan 2006- Dec 2007 are 250.

The main objective of this study is to analyze the role of FIIs in the Indian stock market and their contribution towards the performance of sensex, the benchmark index of the Indian stock market. The study encompasses the monthly net FII investment, collected from the "Database on Indian economy" of RBI, and the monthly index price of The main objective of this study is to analyze the role of FIIs in the Indian stock market and their contribution towards the performance of sensex, the benchmark index of the Indian stock market. The study encompasses the monthly net FII investment, collected from the "Database on Indian economy" of RBI, and the monthly index price of sensex, collected from BSE website. The period of study includes the duration of 7 years starting from 2000 to 2007. The data is collected also on daily basis for the period of 2006-2007 for analyzing the influence of FII on the movement of sensex in the short run.

This study includes only the net monthly investment of FII and it does not include the cumulative investment. The study was carried out in a threefold manure First of all the FII flows into the Indian capital market, were analyzed after 1993,during which India has opened up its economy thereby facilitating the flow of funds across the borders. As the foreign investors has emerged as the one of the routine reasons offered by market pundits for the movement of Sensex and Nifty in the Indian stock market, the present work is framed in order to analyze the influence of FII flows in the performance of stock market.

The study includes the following tools, namely,

- Correlation analysis
- Regression models
- Augmented Dickey-fuller Test.
- Granger Casuality Test.
- Impulse response of VAR model

Finally, the data was collected and analysed through statistical test using SPSS 11.0 version, i.e., statistical package for social science and gretl 1.7.1 version.

The first objective of the study is to establish the association between the net FII and the performance of sensex using indicators such as market capitalization, movement of sensex, trading turnover, and return on sensex. The correlation is one of the most common and most useful statistics that describes the degree of relationship between two variables. The Pearson's correlation is used to find a correlation between at least two continuous variables.

The return on sensex is calculated using the given formula:

$$\text{Return on market index (Rm)} = \frac{\text{Market index (t)} - \text{Market index (t-1)}}{\text{Market index (t-1)}}$$

In this analysis, the influence of institutional activity on the market can be examined by running a linear regression by taking the movement of sensex as the dependent variable as it captures the market's direction and the institutional investment as the independent variable.

Another linear regression is conducted with FII and DII as the independent variables separately and the movement of sensex as the dependent variable and the hypothesis are set as follows:

H1: Net FII as well as DII have an influence on the movement of market

Vector Auto regression model (VAR)

The dynamic relationship between the two variables can be established through Vector autoregression model (VAR). The VAR estimation procedure requires selection of variables to be included in the model. The variables should be selected according to the relevant economic model and should fairly account for and explain the link between real and financial sides of the economy. The important steps in VAR estimation are as follows,

- Checking the stationarity of the variables
- Selection of appropriate lag length
- Ordering of variables.
- Impulse response of the VAR system.

For any time series analysis, all the data series must be stationary. Stationary condition has been tested using **Augmented Dickey Fuller (ADF).** It is a test for a unit root in a time series sample. The ADF, used in the test is a negative number. The more negative it is, the stronger the rejection of null hypothesis that there is a unit roots at some level of confidence. Consider a simple model, as follows,

$$Y_t = \alpha_1 Y_{t-1} + U_t$$

Where,

α_1 = is a parameter (estimated value)

Yt is said to be stationary series if a1 lies between – 1 to 1. If Yt is a non-stationary series, then the variance of Yt increases steadily with time and goes to infinity. If the absolute value $\alpha 1 > 1$, then the series is explosive. Therefore, the hypothesis of a stationary series can be evaluated by testing whether the a1 value is strictly less than one.

Hypothesis

H2: $\alpha_1 < 1$

In time series literature, unit root tests like ADF tests are used to check whether a variable or series included in the model is stationary or not. For the VAR estimation all the variables included in the model should be stationary.

Selection of appropriate lag length

The last but not the least step of VAR estimation is the selection of appropriate lag length of each variable in the system. The selection of lag length is the biggest challenge in VAR modeling. Various lag selection criteria are used to select the optimum

lag lenth of variables in the system. These are noted as Likelihood ratio (LR), Final prediction error (FPR), Akaike information criteria (AIC), Schwarzn information criteria (SIC) and Hannan - Quinn information criteria.

The procedure for testing statistical causality between net FII investment and movement of sensex is the direct "Granger-causality" test proposed by C. J. Granger in 1969. Granger causality may have more to do with precedence, or prediction, than with causation in the usual sense. It suggests that while the past can cause/predict the future, the future cannot cause/predict the past.

According to Granger, X causes Y if the past values of X can be used to predict Y more accurately than simply using the past values of Y. In other words, if past values of X statistically improve the prediction of Y, then we can conclude that X "Granger-causes" Y.

To determine whether a relationship exists between net FII investment and movement of sensex, the regression is used for movement of sensex on past values of net FII investment, lagged back one-day period

Movement of sensex = a + b (FII-1) + u

The results of this regression indicate that movements of sensex are positively related to net FII when lagged for one-day period (see Table). Moreover, stock prices lagged one-day is both positive and statistically significant at the .05 levels. As a result, it is concluded that there is a relationship between past values of FII and the movement of sensex. Thus, the results from this regression suggest that past values of FII do lead market movement, but this does not imply that net FII "Granger-cause" the market movement.

Formal tests of causality should be conducted as follows,

To test causality between and its direction the following equation is specified:

$$(MS)_t = \alpha_0 + \sum_{j=1}^{k} \chi_j (MS)_{t-j} + \sum_{j=1}^{k} \beta_j (FII)_{t-j} + Uxt$$

$$(FII)_t = \alpha_0 + \sum_{j=1}^{k} \chi_j (MS)_{t-j} + \sum_{j=1}^{k} \beta_j (FII)_{t-j} + Uxt$$

Hypothesis

For this above-mentioned equation, two types of hypothesis are framed as follows,

1. **H3**: $b_i > 0$ for all values of i or FII does not "Granger cause" the movement of sensex.
2. **H4**: $b_i > 0$ for all values of I or Movement of sensex "Granger cause" the net FII.

The steps in testing whether FII "Granger cause" the movements of sensex are as follows.

First, the regression is used for movement of sensex on past values of movement of sensex, but do not include the lagged FII terms. This is the restricted regression. From the regression model, the restricted sum of squares, RSSR is noted.

Second, another regression is used including the lagged FII terms. This is the unrestricted regression. From this regression, the unrestricted residual sum of squares, RSSUR is noted.

F= ((RSSR - RSSUR)/m)/ (RSSUR / (n-k))

Impulse Response function

The most important thing is that the individual coefficients in the estimated VAR models are often difficult to interpret directly. To overcome this problem, Innovation Accounting Technique is used which includes impulse response function.

The impulse response function (IRF) shows the dynamic response of the dependent variable to a one period standard deviation shock to the innovation of the system. A shock to the i-th variable not only directly affects the i-th variable, but is also transmitted to all other endogenous variables through the dynamic (lag) structure of the VAR. it may be noted that the responses can change dramatically if the ordering of the variables are changed. So, proper care should be taken while ordering the variables, which are included in a model.

The monthly FII inflows for the past seven years are correlated with the movement of sensex over the same period of Janaury 2000 to December 2007.

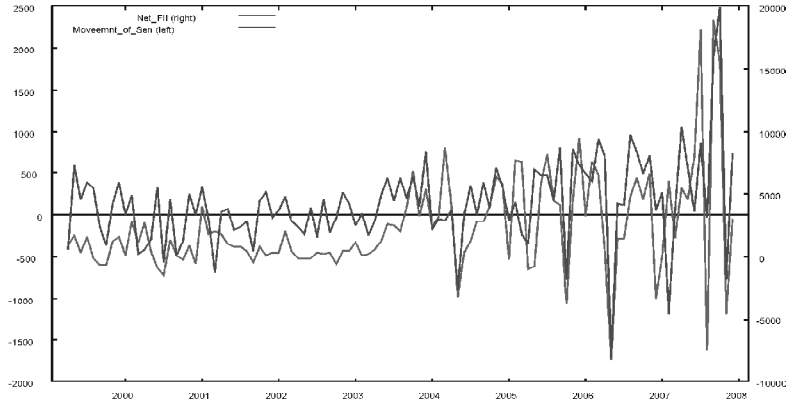
3.1.1.1. Table showing the association between FII inflows and movement of sensex

Correlations

		Investment	of sensex
Net FII investment	Pearson Correlation	1	.684
	Sig. (2-tailed)	.	.000
	N	96	96
Movement of sensex	Pearson Correlation	.684**	1
	Sig. (2-tailed)	.000	.
	N	96	96

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

3.1.2.1. Chart showing the co-movement between the FII inflows and movement of sensex



From the correlation table 3.1.1.1, it is observed that the association between the net FII inflows and the movement of sensex is significant and positive indicated by the correlation coefficient of 0.684 at 1% level of significance. The above graph indicates the co-movement and converging behavior between the two variables. The movement of sensex is not closely following the net FII in the initial period but after the year of 2006 it closely converges with movement in the net FII. The FII inflows attained its peak in the mid of 2007 and the sensex also responded quickly to it and attained its all time hike.

FIIs impact on movement in market capitalization

The association between the monthly FII inflows and the movement in market capitalization are represented by correlation table as follows,

3.1.1.2. Table showing the association between FII inflows and the market capitalization

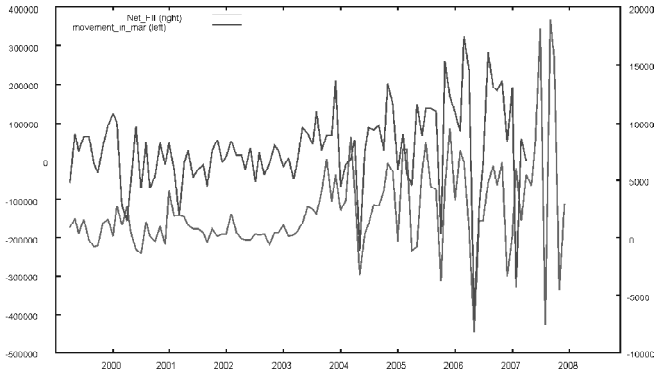
Correlations

		Net FII investment	market Capitalization
Net FII investment	Pearson Correlation	1	.517**
	Sig. (2-tailed)	.	.000
	N	96	87
Movement of market Capitalization	Pearson Correlation	.517**	1
	Sig. (2-tailed)	.000	.
	N	87	87

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

The correlation test for the monthly time series data between net FII investment and the movement of market capitalization shows that the association is significant and positive, indicated by correlation coefficient of 0.517 at 1% level of significance.. The absolute value of the correlation coefficient indicates the strength, with larger absolute values indicating stronger relationship

3.1.2.2. Chart showing the co-movement between the FII inflows and movement of market capitalization



In the initial periods the market capitalization is not converging with net FIIs investment, but over the time passes after 2004 it converges closely at two points. In general the market capitalization is not closely following the selling and buying of FII.

FIIs impact on movement of trading turnover

The association between the monthly FII inflows and the movement of trading turnover is represented by correlation table as follows,

3.1.1.3. Table showing the association between FII inflows and the trading turnover

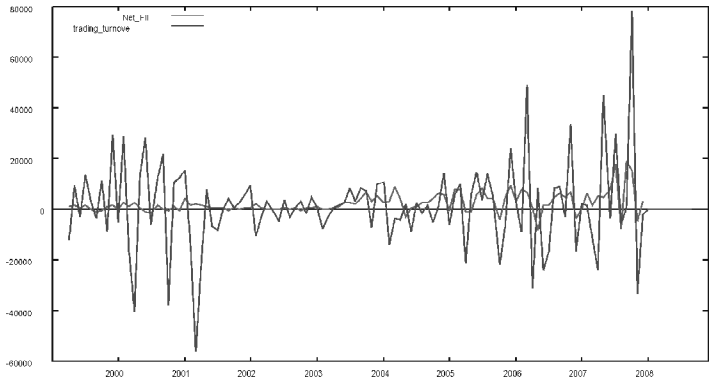
Correlations

		Net FII investment	Movement of trading Turnover
Net FII investment	Pearson Correlation	1	.396**
	Sig. (2-tailed)	.	.000
	N	96	96
Movement of trading turnover	Pearson Correlation	.396**	1
	Sig. (2-tailed)	.000	.
	N	96	96

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

The correlation test for the monthly time series data between net FII investment and the movement of trading turnover shows that the association is significant and positive, indicated by correlation coefficient of 0.396 at 1% level of significance. The absolute value of the correlation coefficient indicates the strength, with least absolute values indicating moderate relationshi

3.1.2.3. Chart showing the co-movement between the FII inflows and movement of trading turnover



The trading turnover is fluctuating at a high frequency but the FII investment is not fluctuating at the same frequency. It is found from the above graph, 3.1.2.3, the trading turnover is not highly influenced by the net FIIs investment.

FIIs impact on return on sensex

The association between the monthly FII inflows and the return on sensex is represented by correlation table as follows,

3.1.1.4. Table showing the association between FII inflowsand the return on sensex

Correlations

		Net FII investment	Return on Sensex
Net FII investment	Pearson Correlation	1	.492**
	Sig. (2-tailed)	.	.000
	N	96	96
Return on Sensex	Pearson Correlation	.492**	1
	Sig. (2-tailed)	.000	.
	N	96	96

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

The correlation test for the monthly time series data between net FII investment and the return on sensex shows that the association is significant and positive, indicated by correlation coefficient of 0.492 at 1% level of significance.

From the correlation analysis among four indicators which measures the performance of Indian stock market, it is found that the movements of sensex and market capitalization have a strong association with the Net FII investment. Among the two factors, movement of sensex is strongly associated with the Net FII investment and therefore movement of sensex is chosen as the indicator to study the market fluctuations in the further analysis.

3.2. Impact of Institutional investment on Movement of sensex

Objective 2

To analyze the extent to which net institutional investment influence the market movements.

In this analysis, the influence of institutional activity on the market can be examined by running a linear regression by taking the movement of sensex as the dependent variable as it captures the market's direction and the institutional investment as the independent variable.

Hypothesis :

H_0: The institutional investment has no influence on the movement of sensex.

H_a: The institutional investment has an influence on the movement of sensex.

The impact of combined net investment which includes both DII and FII on the movement of sensex is analyzed as follows:

3.2.1.1. Table showing R^2 value for regression model

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.647 [a]	.419	.413	419.40257

a. Predictors: (Constant), Net institutional investment

The R^2 of 0.419 implies that the predictor variable, namely Net institutional investment, explain about 41.9 % of the variance in the movement of sensex. The ANOVA table reveals that the F-Statistics (67.745) is very large and the corresponding p-value is highly significant (0.000) or lower than the significance value of 0.05. This indicates that the slope of the estimated linear regression model line is not equal to zero confirming that there is linear relationship between net institutional investment and the movement of sensex.

3.2.1.2. Table showing Standardized coefficient of regression model

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-107.214	52.128		-2.057	.042
	Net institutional investment	8.786E-02	.011	.647	8.231	.000

a. Dependent Variable: Movement of sensex

As depicted in the above table, the beta coefficient of 0.647 indicates that the institutional investment makes the satisfactory level of contribution in explaining the dependent variable, the movement of sensex. Therefore the null hypothesis (H_0) is rejected and it is found that

This result further leads to the analysis of determining the highly influencing variable, among the two institutional investments namely, FII and DII.

Another linear regression is conducted with FII and DII as the independent variables separately and the movement of sensex as the dependent variable to find the influence of individual variables.

The results of the linear regression are presented as follows:

3.2.1.3. Table showing R^2 value for regression model of individual institutional investment

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.684[a]	.468	.456	403.54083

a. Predictors: (Constant), Net DII Investment, Net FII investment

The R^2 of 0.468 implies that the predictor variables, namely Net FII and DII, explain about 46.8 % of the variance in the movement of sensex. The ANOVA table reveals that the F-Statistics (40.855) is large and the corresponding p-value is highly significant (0.000) or lower than the significance value of 0.05. This indicates that the slope of the estimated linear regression model line is not equal to zero confirming that there is linear relationship between net FII, DII and the movement of sensex.

3.2.1.4. Table showing standardized coefficient of regression model of individual institutional investment

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-86.775	50.643		-1.713	.090
	Net FII investment	8.915E-02	.010	.688	8.672	.000
	Net DII investment	5.453E-03	.030	.014	.182	.856

a.Dependent Variable: Movement of sensex

As depicted in the table, the largest beta coefficient is 0.688 which is for Net FII inflows. This means that this variable makes the strongest unique contribution in explaining the dependent variable, when the variance explained by other predictor variable is controlled for. This indicates that the domestic institutional investment has no role in the market fluctuations but it is mainly due to the FII inflows and outflows I the market and DII follows it. Therefore it is clear that the institutional activity has an influence on the market movements and FII has more influence compared to DII. But this influence does not explain the direction

of market movement to rise or fall following the inflow or outflow of FII from the market. This leads to the further analysis of finding the direction of movement of market following FII's activity.

3.3. Impulse response of VAR model

Objective 3:

To examine the dynamic relationship between FII activity and the movement of sensex.

The dynamic relationship between the two variables can be established through Vector autoregression model (VAR) using the daily data from the year 2006 - 2007.

The Stationary condition has been tested using Augmented Dickey Fuller (ADF). The unit root test results on the individual data series is shown as below:

3.3.1.1. Table showing ADF unit root test for FIIs investment

Null Hypothesis: D(FII) has a unit root		
Variable	t-statistic	p-value
FII	-12.24390	0.0000
For the first difference		
Test critical values:	1%	-3.456950
	5%	-2.873142
	10%	-2.573028

3.3.1.2. Table showing ADF unit root tests for movement of sensex

Null Hypothesis: D(MS) has a unit root		
Variable	t-statistic	p-value
FII	-10.80610	0.0000
For the first difference		
Test critical values:	1%	-3.457400
	5%	-2.873339
	10%	-2.573133

From the above tables, the two variables considered are stationary. The estimated values of both FII and movement of sensex, reported by the ADF test statistic at the first difference are -12.24390 and -10.80610 respectively. The critical values at 1%, 5% and 10% significance level are also given and the test statistic

exceeds the critical value and hence the null hypothesis is rejected. Therefore the two variables, Net FII and movement of Sensex are said to be stationary and ready for testing the Granger Casuality.

Selection of Lag length

The selection of lag length is the biggest challenge in VAR modeling. Various lag selection criteria are used to select the optimum lag lenth of variables in the system. These are noted as Likelihood ratio (LR), Final prediction error (FPR), Akaike information criteria (AIC), Schwarzn information criteria (SIC) and Hannan - Quinn information criteria.

The results for VAR lag order selection are as follows:

3.3.1.3. Table showing the VAR Lag order selection criteria

Endogenous variables: MS FII						
Exogenous variables: C						
Included observations: 242						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-3613.558	NA	3.25E+10	29.88065	29.90948	29.89226
1	-3582.959	60.44022	2.61E+10	29.66082	29.74732*	29.69566
2	-3578.544	8.648457	2.60E+10	29.65738	29.80156	29.71546
3	-3565.708	24.92855*	2.42E+10	29.58436	29.78620	29.66567*
4	-3561.125	8.824405	2.41E+10*	29.57955*	29.83906	29.68409
5	-3558.718	4.596689	2.44E+10	29.59271	29.90988	29.72048
6	-3554.303	8.354153	2.43E+10	29.58928	29.96413	29.74029
7	-3550.819	6.536761	2.44E+10	29.59355	30.02606	29.76778
8	-3549.883	1.740873	2.50E+10	29.61887	30.10905	29.81633
*** indicates lag order selected by the criterion**						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

From the table, it is inferred that the lag length 3 is found to be significant under likelihood ratio and Hannan-Quinn information criteria. The lag length of 4 is found to be satisfied under Final prediction error and Akaike information criteria. The lag length of 2 is chosen for testing the pairwise casuality in terms of AIC for the full sample period.

Ordering the variable

Tool used: Granger Casuality Test

The ordering of the variable is another crucial aspect in VAR estimation. The casual link among the variables needs to be explored. The empirical analysis of the study begins with testing of casuality between the FII investment and movement of sensex for the daily data of the period 2006 – 2007. The ordering of the variables can be selected using pairwise granger casuality test as follows,

3.3.1.4. Table showing Pairwise Granger Casuality Tests for FII and movement of sensex

Pairwise Granger Causality Tests			
Lags: 4			
Null Hypothesis:	**Obs**	**F-Statistic**	**Probability**
FII does not Granger Cause MS	246	5.39493	0.00036
MS does not Granger Cause FII		4.24899	0.00244

If the F-value exceeds the critical F-value at the chosen level of significance, the null hypothesis is rejected. The reported F-value and P-value suggest that there is a bidirectional casuality using 4 period lag between the movement of sensex and the net FII and this would imply that movement of sensex "Granger cause" net FII and vice versa or improve the prediction. Since bidirectional casuality exists between FIIs and movement of sensex the ordering of variables are made keeping in mind that the movement of sensex is followed by the buying and selling in the FII activity. Thus, the following ordering is adopted, namely,

{FII, MS}

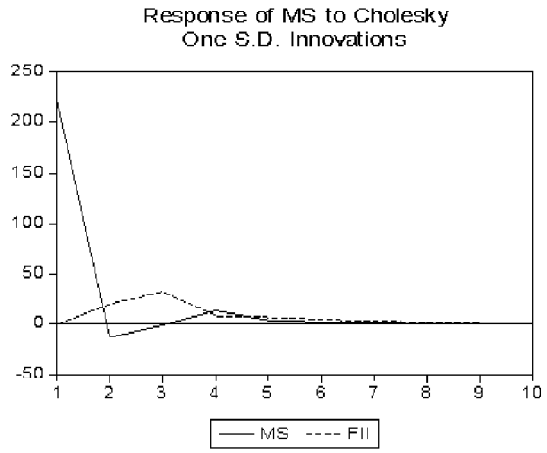
Impulse response of VAR system

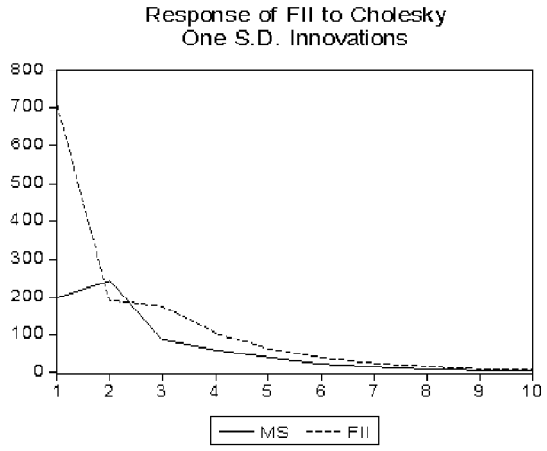
To further investigate the dynamic responses among the variables, the impulse response of the VAR has been calculated. The impulse response shows that the effects of an individual variable shock to build up over time both through the lagged value of the dependent variable in the equation and through current

and lagged effects from the impact of the shock and the changes in the dependent and independent variables on the dependent variable. The impulse responses mirror the coefficients of the moving average representation of the VEC model and track the effects of one time shock to one of the innovations on the current and future endogenous variables.

The following graph shows estimates of 2 impulse response functions,

3.3.2.1. Chart showing the impulse response to FII and MS by FII and MS.





From the graph 3.3.2.1, it is clearly understood that the movement of sensex due to some macroeconomic and microeconomic factors is acting towards negative direction up to second day of observation and as the FII investment began to rise in the positive direction the market also is influenced by the positive feedback from the FIIs net investment and continues to coincide with the reaction of FII activity. Within 3 to 4 days of market activity, the shock innovation in FII buying or selling provides an impulse response in the direction of movement of sensex and vice versa.

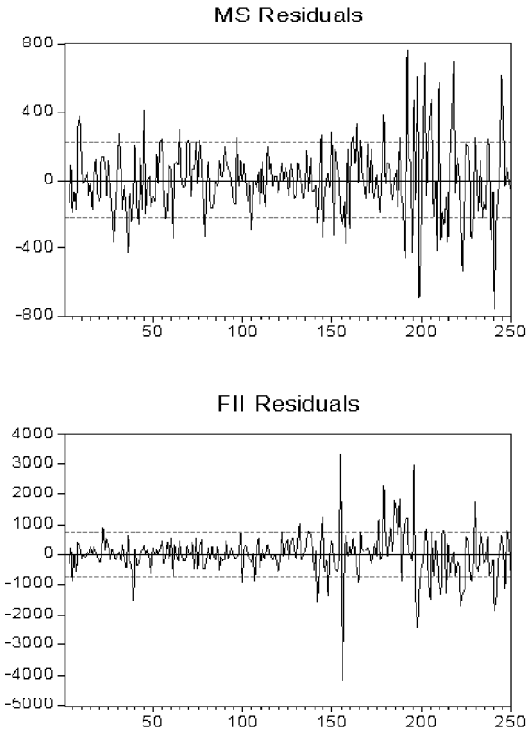
Residuals

Residuals are estimates of experimental error obtained by subtracting the observed responses from the predicted responses.

The predicted response is calculated from the chosen model, after all the unknown model parameters have been estimated from the experimental data. Examining residuals is a key part of all statistical modeling. Carefully looking at residuals can tell us whether our assumptions are reasonable and our choice of model is appropriate.

The following graph explains the residuals of the variables used in the study:

3.3.2.2. Chart showing the Residuals of the variables in the model



The residuals chart 3.3.2.2 clearly shows that the assumptions made for the model are reasonable and the choice of model is appropriate. The observed value and predicted value are fit among themselves and the experimental error is minimal and the residuals of FII and movement of Sensex are statistically fit for the model.

Conclusion

The Indian stock markets have really come of age there were so many developments in the last 15 years that make the markets on par with the developed markets. Indian stock market is booming, ridding

On high FII influx. This reflects upon the high returns in the market. Competition is increasing in the market because of the entry of both domestic and international players. The important feature of developed markets is the growing clout of institutional investors and this paper sets out to characterize the dynamic relationship between the FII net investment and the movement of Sensex using a VAR technique. The linkages between the FIIs inflows and the performance of Sensex are robust and significant. The performance of Sensex in terms of market capitalization, movement of Sensex, Returns on Sensex and Trading Turnover are significantly related to the surge in FIIs inflows. It is clearly understood that the net FII is a potent force, and in fact can forecast market direction using the direction of the flow of funds from FIIs. The Granger causality test has showed that net FII investment in fact lead the market rise or fall and movement of market follow suit and vice versa. It is also found that by using a VAR model based on time series and impulse response analysis that shocks

FII investment impacts the movement of market in the expected direction over a short horizon.

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