Dynamic Interaction between Institutional Investment and Stock Returns in India: A Case of FIIs and MFs

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Abstract

This paper investigates the interaction between institutional investment and market return in Indian stock market. We have used daily net investment data of Foreign Institutional Investors (FIIs) and Mutual Funds (MFs) from January 2000 to December 2009. Empirical result has shown that FIIs investment is positively related to lagged market return whereas MFs investment is negatively related to lagged market return. Bi- directional causality is found between FIIs investment and market return whereas in case of MFs only market return causes the investment. Impulse response analysis confirms that impact of shock to market return is more lasting on institutional investment than otherway round. Sub- period analysis confirms that relationship between FIIs flows and market return did not change significantly during the study period in comparison with MFs.

1. Introduction

THE FLOW OF institutional investment and its relationship with security returns has been of perennial interest to investors and policy makers alike. Generally the flow of institutional investment has been highly correlated with the market returns. Various explanations have been advanced in the extant literature. There are three prominent hypotheses viz. first, price pressure hypothesis, trading by institutional investors affect stock prices contemporaneously [Harris and Gurel (1986); Shleifer (1986)]; second, feedback trading hypothesis, institutional investors have a tendency to be momentum traders [Davidson and Dutia (1989); Delong *et al.* (1990)]; third, information revelation hypothesis, institutions have superior information which helps them to time their trades better [Lee *et al.*, (1991)].

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Institutional investors' herding and feedback trading can have the potential to explain various financial phenomenons viz. volatility, momentum and reversals in stock prices. In India, institutional investments from both foreign and domestic institutions have increased considerably since mid 1990's. Further, the issue has gained prominence due to the emergence of financial crisis and large scale withdrawal of funds from the emerging markets.

This paper examines the dynamic interaction between institutional investment and stock returns in Indian securities market. The core of institutional investment comprises foreign and domestic institutions. Foreign institutional investors include portfolio investors, GDRs, ADRs, offshore investors and others whereas; domestic institutions comprise banks, domestic financial institutions, insurance and pension schemes and mutual funds. In this study we confine to foreign institutional investors (FIIs) and mutual funds (MFs) as they constitute major chunk of investment in the category of foreign and domestic institutions respectively.

The major objective of the paper is to assess the relationship between FIIs and MFs flows with market return. The remainder of the paper is organized as follows: Section I deals with review of studies on the relationship between institutional investment and returns with reference to India; section II and III elaborates methodology adopted and data used in the study. Section IV presents the empirical results of the study; section V outlines the major findings and finally in section VI concluding remarks is presented.

II. Literature Review

In this section an attempt is made to review the relevant literature on institutional investment behavior in Indian context. Prasanna (2008) examined FIIs investment preferences in India. The study has observed that apart from economic development of the country, firm specific factors to a large extent determine FIIs investment in a firm. FIIs invested more in companies with higher volume of shares owned by general public. The promoters' holdings and foreign investment were inversely related and also foreign investors tend to choose companies where family holding of promoters is not substantial. Returns and earnings per share were significant factors influencing the investment decisions by FIIs.

Gordon and Gupta (2003) analyzed the factors affecting portfolio equity flows into India. The analysis has shown that, the magnitude of flows was smaller in India compared to other emerging markets and also less volatile than other emerging markets. Portfolio flows were determined by both domestic and external factors. Among external factors Libor was prominent and in domestic factors credit ratings and lagged returns were important determinants of portfolio flows. In quantitative terms both domestic and external factors were found to be equally important in determining portfolio flows.

Batra (2003) examined FII trading behavior and returns in Indian equity market based on daily and monthly data. The study has found trend chasing and positive feedback trading by FIIs on daily basis at an aggregate level. But

no such evidence was found in monthly basis. Based on the impact of trading imbalance, study concluded that bias of FIIs do not have destabilizing impact on the equity market.

Chakrabarti (2002) examined the nature and causes of FII flows to India. The study has found FII inflows were highly correlated with equity returns in India and argued that FII flows are effects of returns rather than the cause of it. The study also argued that, FIIs do not seem to have informational disadvantage compared to local investors. It was found that Asian crisis resulted in a regime shift and since then domestic equity returns became the single most important determinant of FII flows to India.

Mukherjee *et al.* (2002) examined the daily flows of FIIs investment in Indian stock market. The study has found that domestic equity returns was the most important factor in influencing the FIIs investment flows into the country and FIIs investment flows do not have significant impact on returns. FIIs sale and net flows were significantly affected by the performance of the equity market whereas FIIs purchase was not responsible for such a performance. The study has also found that, FIIs investment flows were highly autocorrelated.

Suresh Babu and Prabheesh (2008) examined the causal relationship between foreign institutional investment and stock returns. The study has found bi directional causality between FIIs investment and stock returns. FIIs investment flows were more stock return driven.

Thenmozhi and Kumar (2009) examined the dynamic interaction between mutual fund flows and security returns and between mutual fund flows and volatility. They found a positive contemporaneous relationship between stock market returns and mutual fund flows measured as stock purchases and sales. The study has found that mutual funds flows are significantly influenced by returns but returns were not influenced by mutual fund flows. The study has also identified a strong positive relationship between stock market volatility and mutual fund flows.

Some of the studies reviewed in this section belong to early part of 2000. They are the initial periods in the development of institutional investment. It gives enough justification to have revisit the pattern of institutional investment. The studies of Suresh Babu and Prabheesh (2008), and Thenmozhi and Kumar (2009) do belong to the latest period and have addressed the primary objective of the present study individually i.e. examining the relationship between returns and institutional investment as represented by FIIs and MFs. But, both studies have considered only one estimation window. In the present study an attempt is made to analyze the relationship between institutional investments and market return over a period of time by dividing the study to cover different phases in the market.

III. Methodology
To analyze the relationship between institutional investment (i.e. FIIs and MFs investment) and stock returns the study proposes to use VAR approach and Granger Causality test.

The foundation of time series analysis is stationarity. A stationary process is a stochastic process whose joint probability distribution does not change when shifted in time or space. As a result, parameters such as the mean and variance, if they exist, also do not change over time or position. We have applied Augmented Dickey and Fuller (ADF) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. In ADF test null hypothesis is time series is non-stationary and alternative hypothesis is time series is stationary whereas KPSS test is an alternative test where stationarity is the null hypothesis and the existence of a unit root is the alternative hypothesis.

Vector Auto Regression (VAR) model is used to analyze the relationship between FIIs and MFs net investment and index returns. Model is applied separately for FIIs and MFs. An unrestricted VAR model of returns and net institutional investment (i.e. FIIs and MFs) can be expressed as

$$R_t = \beta_{10} + \beta_{11} R_{t-1} + \ldots\ldots + \beta_{1k} R_{t-k} + \alpha_{11} II_{t-1} + \ldots\ldots + \alpha_{1k} II_{t-k} + \varepsilon_{Rt} \tag{1}$$

$$II_t = \beta_{20} + \beta_{21} II_{t-1} + \ldots\ldots + \beta_{2k} II_{t-k} + \alpha_{21} R_{t-1} + \ldots\ldots + \alpha_{2k} R_{t-k} + \varepsilon_{IIt}$$

where R_t and II_t are index return and institutional investment respectively. The appropriate lag lengths are selected using the Akiake Information Criterion (AIC) and Schwartz Information Criterion (SIC). The study has also used impulse response functions to examine the response of stock returns to innovations in institutional investment and vice versa.

Granger causality test is used to test the direction of causality between institutional investment and stock returns. Test is applied for FIIs and MFs separately. It is expressed as follows:

$$R_t = \alpha + \sum_{i=1}^{m} \beta_i R_{t-1} + \sum_{i=1}^{m} \lambda_{11} II_{t-1} + \varepsilon_{Rt} \tag{2}$$

$$II_t = \mu + \sum_{i=1}^{m} \delta_i R_{t-1} + \sum_{i=1}^{m} \phi_i II_{t-1} + \varepsilon_{IIt}$$

The null hypothesis of institutional investment does not Granger cause stock returns can be tested by $H_0: \lambda_i = 0$. In the same way the null hypothesis of stock returns does not Granger cause institutional investment can be tested by $H_0: \delta_i = 0$.

IV. Data

The study has used daily net investment data of FIIs and MFs and daily return of BSE Sensex index which is calculated as the first difference of natural logarithm. Net daily investment of MFs and FIIs are in Rupees crores is taken from SEBI website and Sensex index closing values is collected from CMIE Prowess database. The study period is from January 2000 to December 2009. Full period has been divided in to three sub periods to account for

changes in trends in institutional investment flows i.e. 2000- 2003, 2004-2007 and 2008- 2009. It is also coincided with large changes in the market capitalization.

In the study period, there is an increasing trend in institutional investment and market capitalization during second sub period whereas declining trend in the third sub period. In order to control for the long-term effects, we normalized the flows to account for market growth and growth in the institutional investment. Market growth is important since the total capitalization grew over the interval of study. For e.g. Rs 500 crore demand shocks in the early part of the sample period cannot be equated with same amount demand shocks in the later part of the period. As in Goetzmann and Massa (2003), flows are normalized by taking the 90 day trailing moving average of BSE Sensex market capitalization. Specifically following procedure has been adopted: SFlows= RFlows/RMAMKT, where SFlows are standardized flows, RFlows are raw flows i.e. net flows before standardization and RMAMKT is the rolling moving average of market capitalization in the preceding 90 trading days.

V. Empirical results

Empirical results of the study are organized as follows. Table 1 presents the summary statistics of standardized daily net FIIs, MFs investment and Sensex return. Table 2 shows the unit root test statistics of ADF and KPSS tests. Tables 3 to 6 show the results of VAR Model of net FIIs investment and Sensex return for period 2000- 2009, 2000- 2003, 2004- 2007, and 2008- 2009 respectively. Figures from 1 to 4 show the impulse response functions of the VAR Model of net FIIs investment and Sensex return for the corresponding period. In the similar way, tables 7 to 10 presents the results of VAR Model of net MF investment and Sensex return for period 2000- 2009, 2000- 2003, 2004- 2007, and 2008- 2009 respectively. Graphs from 5 to 8 show the impulse response functions of the VAR Model of net MF investment and Sensex return for the corresponding period.

Unit root test result is shown in table 2. The study has reported both ADF and KPSS test statistics. In case of ADF test, the null hypothesis of non stationarity is rejected at one percent level of significance for standardized daily net FIIs, MFs flows and Sensex returns in full period as well in sub periods. Whereas in case of KPSS test, the null hypothesis of stationarity is not rejected. So, all three series used in the study viz. standardized daily net FIIs, MFs flows and Sensex returns are stationary and fulfills the requirements of the VAR model.

Table 3 shows the result of the VAR model of Net FIIs investment and Sensex return for full period i.e. 2000- 2009. Lag length of five has been chosen based on two information criterions viz. Akaike information criterion and Schwarz criterion. In case of FIIs net investment equation, all lagged net FIIs investment coefficients are positive and statistically significant at one percent level of significance. Current level of investment is positively related only to one day lagged return as remaining lagged Sensex return coefficients are statistically insignificant.

Table 1
Summary Statistics

		Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
2000- 2009	FII	6.19E-05	4.72E-05	0.002906	-0.00117	0.000211	2.088532	26.59595
	MF	2.90E-07	-9.43E-07	0.000403	-0.00039	7.04E-05	0.309839	5.92273
	SENSEX	0.000473	0.001373	0.1599	-0.11809	0.018009	-0.16653	8.724546
2000- 2003	FII	6.87E-05	5.26E-05	0.002203	-0.00067	0.000191	1.687186	20.19811
	MF	-1.37E-05	-1.30E-05	0.000275	-0.00033	6.58E-05	-0.12308	5.192925
	SENSEX	0.000135	0.001107	0.071178	-0.07423	0.016148	-0.38724	5.387119
2004- 2007	FII	8.15E-05	6.12E-05	0.002906	-0.00117	0.000233	2.509841	31.64161
	MF	1.20E-05	9.60E-06	0.000403	-0.00019	6.85E-05	0.744565	5.815442
	SENSEX	0.001248	0.001994	0.079311	-0.11809	0.014803	-0.75065	9.517504
2008- 2009	FII	2.53E-06	-5.54E-06	0.00114	-0.00068	0.000187	1.039374	9.066305
	MF	5.43E-06	2.29E-06	0.000368	-0.00039	7.87E-05	0.164794	6.286025
	SENSEX	-0.00051	0.000168	0.1599	-0.11604	0.026512	0.284985	6.543319

Table 2
Unit Root Test Statistics

		FII	MF	Sensex
2000- 2009	ADF Test	-16.663*	-24.557*	-46.331*
	KPSS Test	0.201	0.211	0.129
2000- 2003	ADF Test	-13.370*	-15.226*	-29.642*
	KPSS Test	0.199	0.205	0.071
2004- 2007	ADF Test	-12.421*	-11.777*	-24.315*
	KPSS Test	0.043	0.133	0.057
2008- 2009	ADF Test	-6.756*	-18.018*	-19.982*
	KPSS Test	0.208	0.070	0.076

Note : * Statistically significant at one percent level of significance.

In case of Sensex return equation, index return is positively related to first and third day lagged investment at five percent level of significance. Current index return is positively related to previous day return and negatively related to second and third day lagged return at one and five percent level of significance respectively. The study has also performed Granger Causality test to identify the direction of causality between FIIs investment and index return. The null hypothesis of SENSEX does not Granger Cause FII and FII does not Granger Cause SENSEX are rejected at one percent level of significance. This clearly shows the feedback effect or bidirectional causality between the two variables.

Table 3
VAR Model of Net FII and Sensex return for period 2000-2009.

	FII	SENSEX
FII(-1)	0.17218	4.424444
	[8.16466]*	[2.24854]**
FII(-2)	0.097099	1.955669
	[4.55525]*	[0.98328]
FII(-3)	0.132846	4.681327
	[6.26064]*	[2.36443]**
FII(-4)	0.06868	-0.97452
	[3.22802]*	[-0.49089]
FII(-5)	0.060108	-0.37501
	[2.93586]*	[-0.19630]
SENSEX(-1)	0.002221	0.05261
	[9.81942]*	[2.49229]**
SENSEX(-2)	6.11E-05	-0.05724
	[0.26514]	[-2.66367]*
SENSEX(-3)	-0.00018	-0.04519
	[-0.79891]	[-2.10112]**
SENSEX(-4)	-4.21E-05	0.006615
	[-0.18306]	[0.30836]
SENSEX(-5)	-0.00022	-0.03963
	[-0.97749]	[-1.85643]***
C	2.84E-05	-0.00012
	[6.56742]*	[-0.30180]
SENSEX does not Granger Cause FII		19.8624*
FII does not Granger Cause SENSEX		3.24249*

Notes : Values in the square bracket shows the 't' statistics
*   significant at 1%,
**   at 5% level of significance
***   at 10% level of significance.

Figure 1 shows the impulse response functions i.e. impact of one standard deviation shock to the innovation in each variable on rest of the variables in the VAR model. Thick line in the middle represents the estimates of impulse responses whereas dotted lines around impulse response represent two standard deviation bands. If the bands excludes zero, the effect is significant. The impact of one standard deviation shock to innovations in index return has positive and significant impact on the net FIIs investment. The impact lasts till third day. Whereas the impact of one standard deviation shock to innovations in FIIs investment to returns is also positive and lasts till second day.
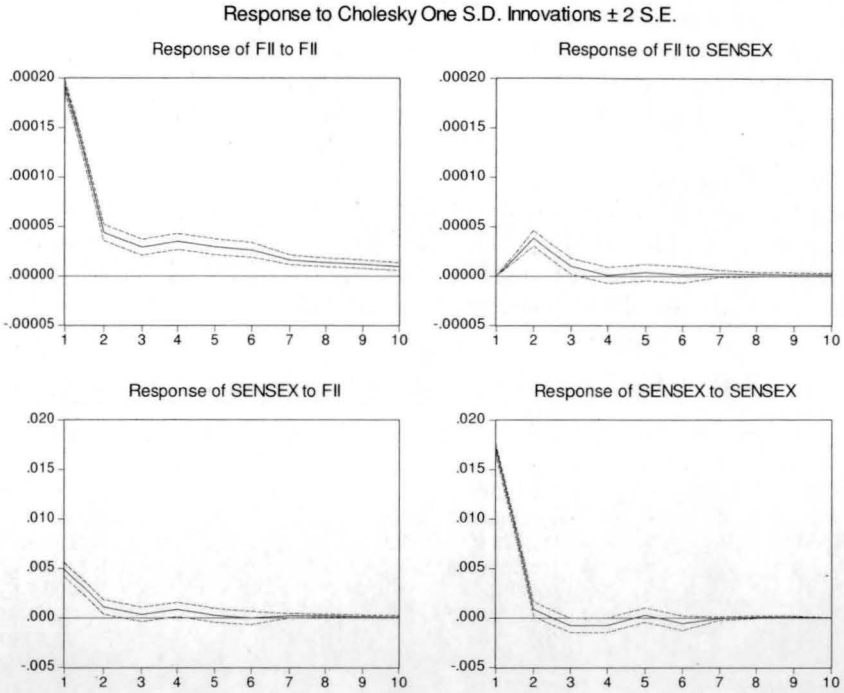
Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 1
Impulse responses of VAR Model of Net FII and Sensex return for
period 2000-2009.

To account for the possible changes in the relationship between FIIs investment and index return, study period has been divided in to three sub periods viz. 2000- 2003, 2004- 2007, and 2008- 2009 representing different phases in the growth of stock market activity. Lag length of three for first two sub periods and four for last period has been chosen based on information criterions. As in the case of full period, even in the first two periods, FIIs investment is positively related to its own lags as well as one day lagged index return. Whereas in the first sub period, Sensex return is not significantly related to lagged FIIs investment. But in the second period, one day lagged FIIs investment is positively related to index return. In the last period, one day lagged FIIs investment is not significant in FIIs investment equation whereas remaining lagged FIIs investment coefficients are positively significant and first day lagged return coefficient is also positively significant.

The results of Sensex return equation shows different pattern in sub periods in comparison with the result of the full period. In first period lagged FIIs investment is not a significant predictor of index return whereas in the second period one day lagged FIIs investment is positively related to index return. Finally, in the last sub period third day lagged return is positively related with index return. The null hypothesis of SENSEX does not Granger Cause FII is rejected at one percent level of significance in all three sub periods

and FII does not Granger Cause SENSEX is also rejected at five percent level of significance in first and third period whereas at 10 percent level of significance in second period.

The analysis impulse response functions of the sub period shows similar pattern as in the case of full period. The response of FIIs investment to one standard deviation shock to Sensex return is positive and lasts up to three days whereas the response of Sensex return to one standard deviation shock to innovations in FIIs investment is also positive and significant up to second day.

Comparison of the results of the full period and sub periods, it becomes quite evident that the relationship between FIIs investment and Sensex return did not change considerably in the study period as shown by the VAR model and impulse response analysis. In full period as well as in sub periods, bidirectional causality is found between FIIs investment and return.

Similar exercise is also been carried on net MFs investment and index return for full period as well as for three sub periods. In case of full period, a lag length of five has been chosen. The MFs investment equation shows that MFs investment is positively related to its own lags as the coefficients of all five lags are statistically significant. MFs investment is negatively related to lagged index return as all five coefficients are statistically significant at one percent level of significance. In case of Sensex return equation, index return is positively related to one day lagged MFs investment at 10 percent level of significance. At the same time, index return is positively related one day lag and negatively related to second day lag. The Granger causality test result shows that, the null hypothesis of SENSEX does not Granger Cause MF is rejected at one percent level of significance whereas MF does not Granger cause SENSEX is not rejected even at 10 percent level of significance.

Impulse response function shows that, one standard deviation shock to innovations in Sensex return negatively affects MFs investment and it is significant even up to 10 days. Whereas the response of Sensex returns for same amount of shock to innovations of MFs investment is positive and significant till second day.

Sub period analysis has shown some interesting findings. In case of first two sub periods lag length of three is chosen. In MFs investment equation, current level of investment is positively related with lagged investment and negatively related with Sensex return. This is similar to the result of the full period. But in case of Sensex return equation, in the first sub period return is positively related to one day lagged MFs investment and Sensex return. In second period i.e. 2004- 2007, Sensex return is negatively related to one day lagged MFs investment, positively related to two day lag and negatively related to three day lagged MFs investment.

Granger Causality test shows that the null hypothesis of SENSEX does not Granger Cause MF investment and MF does not Granger Cause SENSEX

return are rejected at five percent level of significance for first two sub periods. This shows the feedback effect between MFs flows and security returns.

For last sub period lag length of three is chosen. MFs investment equation shows that it is positively related to its own lag and negatively related to Sensex return. The Sensex return equation shows neither lagged MFs investment nor lagged return influences the index return. Granger Causality test shows only a unidirectional causality from Sensex return to MFs investment.

The impulse response analysis of sub periods shows different pattern in comparison with full period result. The response of MFs investment to one standard deviation shock to innovations in index returns is negative and lasts up to sixth day in the first sub period whereas largely insignificant in second sub period. The response of index return to one standard deviation shock to innovations in MFs investment is positive and lasts till mid second day in first sub period and remains largely insignificant in second sub period. In final period, response of MFs investment to one standard deviation shock to innovations in index returns is negative and lasts up to third day whereas response of index return to one standard deviation shock to innovations in MFs investment is positive and lasts only one day.

VI. Major Findings:

From the analysis of the relationship between FIIs investment and index return we found following aspects: First, the study has found a preliminary evidence of herding behavior on the part of FIIs. It is shown by the significant positive relationship between lagged FIIs investment with current level of investment.

Second, there is also some evidence of momentum trading strategy pursued by FIIs. FIIs investment is positively related with lagged index return.

Third, FIIs trading activity predicts the future movement of stock market. This is shown by the significant relationship between index return and lagged FIIs investment.

Fourth, there is bi-directional causality between Sensex Return and FIIs investment in Indian stock market.

Fifth, the relationship between FIIs investment and index return did not change considerably in the study period. The major findings of the full period are reflected in the sub periods as well.

From the analysis of the relationship between MFs investment and index returns following observations are made: First, MFs, like FIIs tend to follow their own trading activity. This is shown by the positive relationship between MFs investment with its own lags.

Second, in quite contrast to FIIs, MFs investment has a negative relationship with lagged index return. This shows the tendency of MFs to book profits.

Third, the relationship between MFs investment and index return has undergone considerable changes in the study period. In first two sub periods there is bi- directional causality between returns and MFs investment but there is unidirectional causality from returns to MFs investment in the last sub period as well as in the full period. This shows the decline in the weight of MFs activity on index return.

Fourth, based on the impulse response analysis of full period as well as sub period shows that the impact of shock to index return on institutional investment is more lasting than the impact of shock to institutional investment on index return.

Finally, over the years FIIs have retained their significance of influencing the market whereas MFs seems to have been found losing their strength in influencing the market at least in the later part of the study period.

VII. Conclusion

This study has examined the dynamic interaction between institutional investment activity and stock market return. Based on a VAR framework the study has found that, institutional investors devise their trading strategy based on their previous investment as well as market return. Empirical results have confirmed that impact of returns on institutional investment is lasting than institutional investment on returns. Over a period of time MFs progressively lost their capacity to influence the market whereas FIIs have grown during the same period. Given the relationship between FIIs investment activity and stock market return and volatile nature of inflow and outflow of funds gives justification for specific policy to monitor the activity of this class of investors. It also calls for the need to strengthen the domestic institutions and encourage retail investment to counterbalance impact of FIIs on Indian stock market.

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Table 4
VAR Model of Net FII and Sensex return for period 2000-2003

	FII	SENSEX
FII(-1)	0.170153	3.064697
	[5.25221]*	[1.06043]
FII(-2)	0.14077	4.363968
	[4.31340]*	[1.49894]
FII(-3)	0.128824	4.515413
	[4.05451]*	[1.59306]
SENSEX(-1)	0.001976	0.059823
	[5.38701]*	[1.82804]***
SENSEX(-2)	-0.00021	-0.00561
	[-0.55010]	[-0.16927]
SENSEX(-3)	-0.00118	-0.0519
	[-3.21360]*	[-1.58080]
C	3.91E-05	-0.00074
	[6.05977]*	[-1.29372]
SENSEX does not Granger Cause FII		13.3032*
FII does not Granger Cause SENSEX		2.92795**

Notes : Values in the square bracket shows the 't' statistics
*   significant at 1%,
**   at 5% level of significance
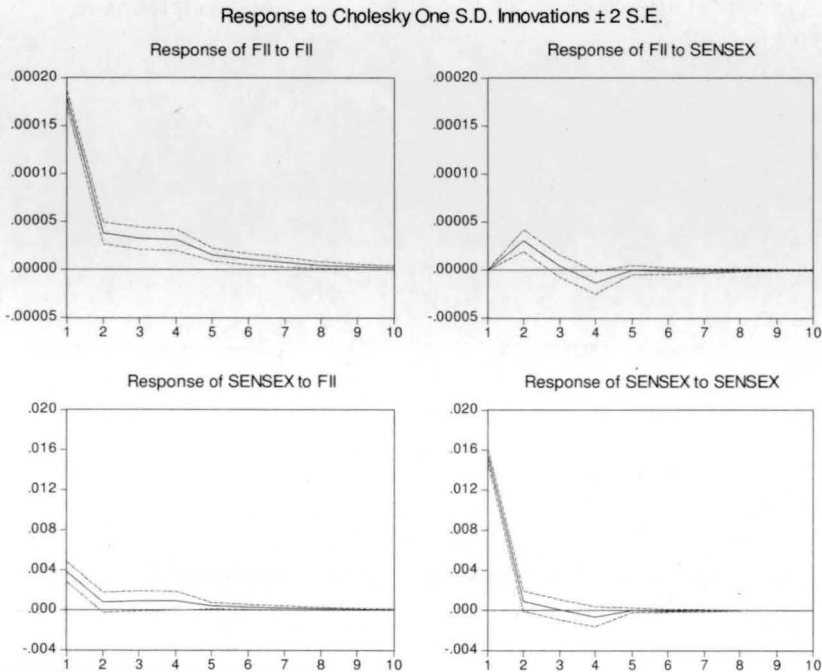***   at 10% level of significance.

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

Figure 2
Impulse responses of VAR Model of Net FII and Sensex return for period 2000-2003

Table 5
V AR Model of Net FII and Sensex return for period 2004-2007

	FII	SENSEX
FII(-1)	0.211829	5.316685
	[6.53421]*	[2.40651]**
FII(-2)	0.067816	0.323482
	[2.05825]**	[0.14406]
FII(-3)	0.159111	-0.4341
	[5.00734]*	[-0.20046]
SENSEX(-1)	0.002326	0.051265
	[4.81024]*	[1.55533]
SENSEX(-2)	7.04E-05	-0.13415
	[0.14585]	[-4.07721]*
SENSEX(-3)	0.000871	0.017747
	[1.78976]***	[0.53496]
C	4.15E-05	0.000877
	[5.45945]*	[1.69252]***
SENSEX does not Granger Cause FII	8.17815*	
FII does not Granger Cause SENSEX	2.10896***	

Notes : Values in the square bracket shows the 't' statistics
  * significant at 1%,
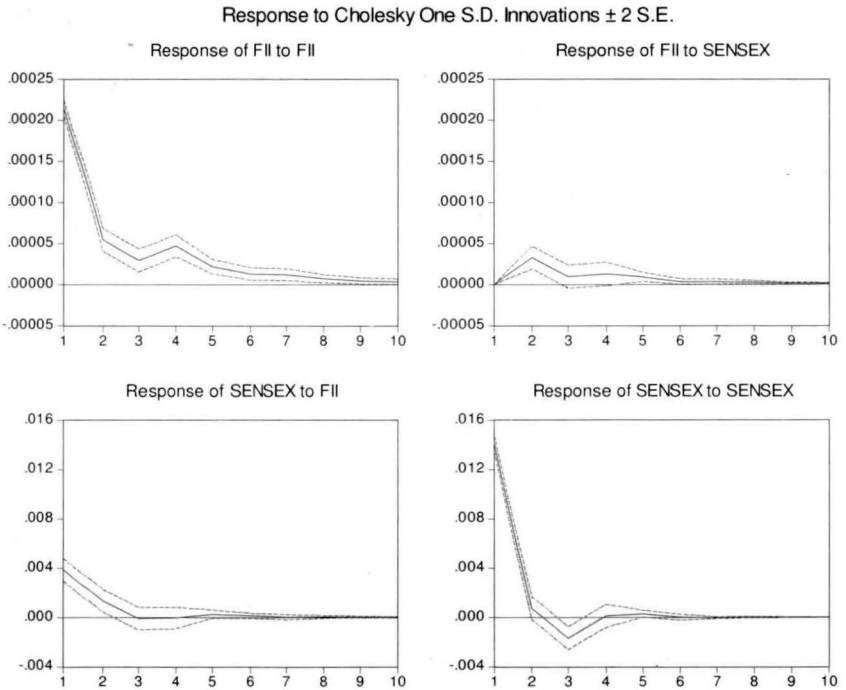 ** at 5% level of significance
  *** at 10% level of significance.

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

Figure 3
Impulse responses of V AR Model of Net FII and Sensex return for period 2004-2007

Table 6
VAR Model of Net FII and Sensex return for period 2008-2009

	FII	SENSEX
FII(-1)	0.045992	0.217328
	[0.90098]	[0.02526]
FII(-2)	0.127857	3.857265
	[2.50972]**	[0.44919]
FII(-3)	0.169702	29.032
	[3.37451]*	[3.42492]*
FII(-4)	0.235115	-8.61471
	[5.02906]*	[-1.09319]
SENSEX(-1)	0.002522	0.054421
	[8.14895]*	[1.04318]
SENSEX(-2)	0.000486	-0.04234
	[1.45441]	[-0.75224]
SENSEX(-3)	-0.00018	-0.12478
	[-0.53222]	[-2.24229]**
SENSEX(-4)	-0.00087	-0.11183
	[-2.67250]**	[-2.04988]**
C	1.76E-06	-0.00073
	[0.23576]	[-0.57573]
SENSEX does not Granger Cause FII		19.4299*
FII does not Granger Cause SENSEX		3.25842

Notes : Values in the square bracket shows the 't' statistics
* significant at 1%,
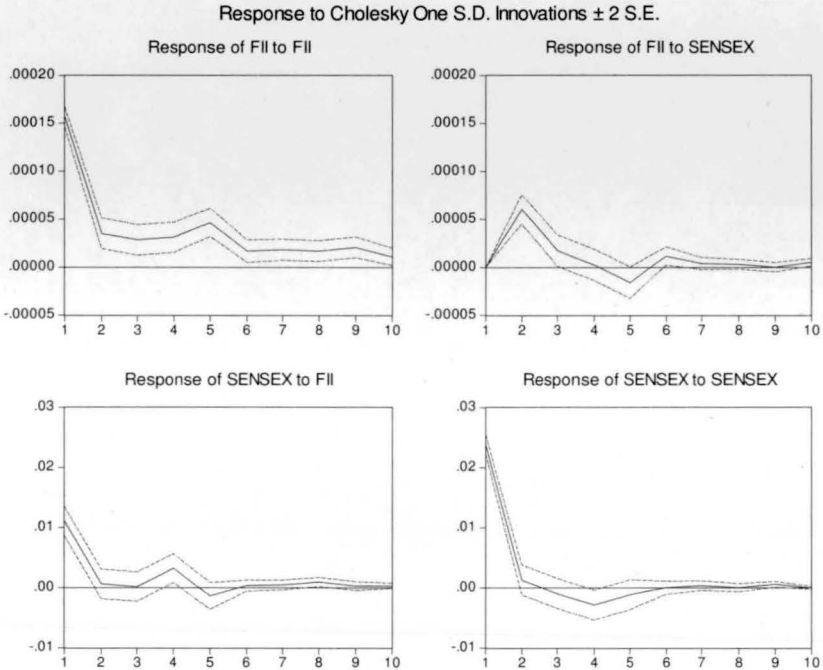** at 5% level of significance
*** at 10% level of significance.

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

Response of FII to FII

Response of FII to SENSEX

Response of SENSEX to FII

Response of SENSEX to SENSEX

Figure 4
Impulse responses of VAR Model of Net FII and Sensex return for period 2008-2009

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Table 7
VAR Model of Net MF and Sensex return for period 2000- 2009

	MF	SENSEX
MF(-1)	0.253638	9.494375
	[12.4549]*	[1.66805]***
MF(-2)	0.133079	7.352197
	[6.35227]*	[1.25560]
MF(-3)	0.040524	-7.239
	[1.92333]***	[-1.22923]
MF(-4)	0.061215	2.057098
	[2.92849]*	[0.35209]
MF(-5)	0.062883	-8.36981
	[3.10639]*	[-1.47927]
SENSEX(-1)	-0.00035	0.072775
	[-4.72371]*	[3.56099]*
SENSEX(-2)	-0.00035	-0.04529
	[-4.75223]*	[-2.19778]**
SENSEX(-3)	-0.00023	0.003629
	[-3.05486]*	[0.17539]
SENSEX(-4)	-0.00027	0.011231
	[-3.58234]*	[0.54256]
SENSEX(-5)	-0.00026	-0.01562
	[-3.57446]*	[-0.75681]
C	7.49E-07	0.000435
	[0.57892]	[1.20242]
SENSEX does not Granger Cause MF		17.5707*
MF does not Granger Cause SENSEX		1.58874

Notes : Values in the square bracket shows the 't' statistics
　　*　　significant at 1%,　　**　　at 5%　level of significance
　　***　　at 10% level of significance

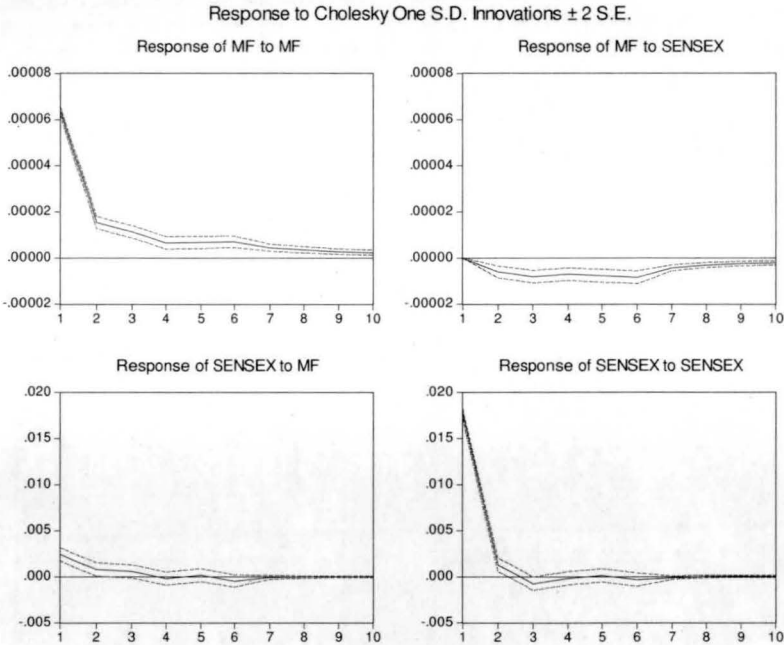Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 5
Impulse responses of VAR Model of Net MF and Sensex return for
period 2000- 2009

Table 8
VAR Model of Net MF and Sensex return for period 2000- 2003

	MF	SENSEX
MF(-1)	0.21034	32.44488
	[6.68367]*	[3.93307]*
MF(-2)	0.213884	-5.2686
	[6.80520]*	[-0.63951]
MF(-3)	0.055014	-12.9598
	[1.74864]***	[-1.57152]
SENSEX(-1)	-0.00021	0.070687
	[-1.76600]***	[2.23115]**
SENSEX(-2)	-0.00064	0.021075
	[-5.24072]*	[0.66333]
SENSEX(-3)	-0.00024	-0.00201
	[-1.97824]**	[-0.06362]
C	-7.15E-06	0.000272
	[-3.59529]*	[0.52165]
SENSEX does not Granger Cause MF	12.5727*	
MF does not Granger Cause SENSEX	5.32053*	

Notes : Values in the square bracket shows the 't' statistics
    *   significant at 1%,
    **   at 5% level of significance
    *** at 10% level of significance.

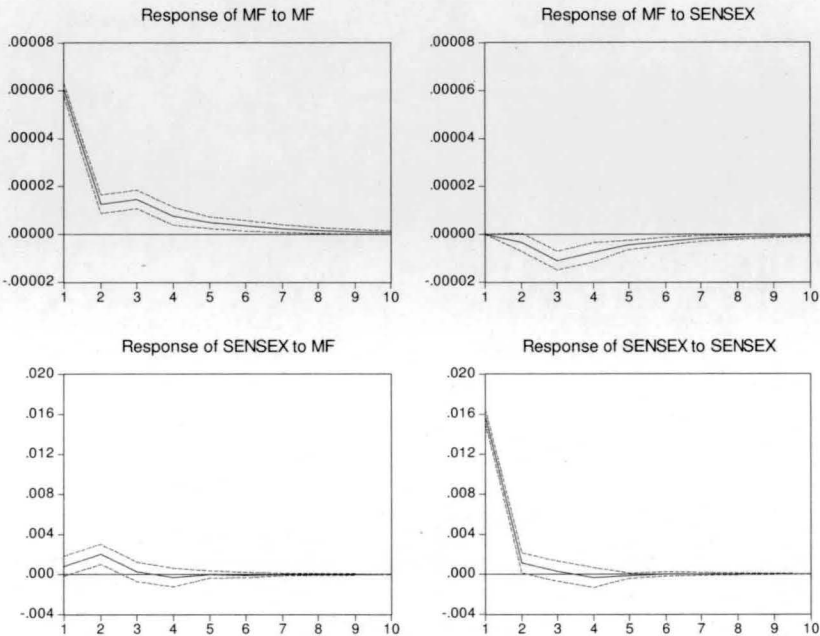Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 6
Impulse responses of VAR Model of Net MF and Sensex return for
period 2000- 2003

Table 9
VAR Model of Net MF and Sensex return for period 2004- 2007

	MF	SENSEX
MF(-1)	0.361934	-14.8037
	[11.5241]*	[-1.94819]**
MF(-2)	0.089643	20.51488
	[2.68509]**	[2.53977]**
MF(-3)	0.116977	-15.3142
	[3.71614]*	[-2.01081]**
SENSEX(-1)	-0.0002	0.080987
	[-1.51451]	[2.55751]**
SENSEX(-2)	-3.84E-05	-0.12177
	[-0.29532]	[-3.86782]*
SENSEX(-3)	-0.00037	0.021575
	[-2.84970]*	[0.68312]
C	5.96E-06	0.001352
	[3.00764]*	[2.82017]*
SENSEX does not Granger Cause MF	3.29323 **	
MF does not Granger Cause SENSEX	3.40386**	

Notes : Values in the square bracket shows the 't' statistics
     *   significant at 1%,
     **   at 5% level of significance
     *** at 10% level of significance.

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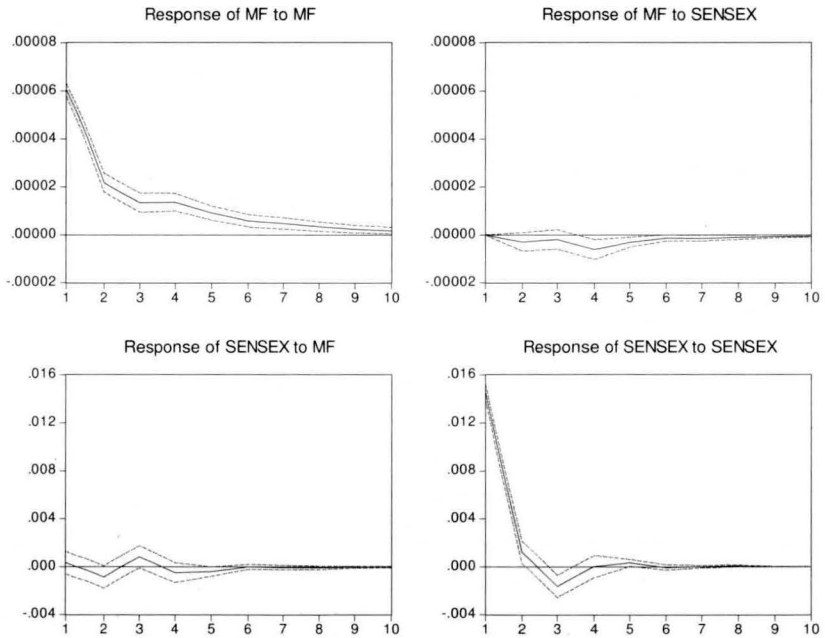

Figure 7
Impulse responses of VAR Model of Net MF and Sensex return for
period 2004- 2007

Table 10
VAR Model of Net MF and Sensex return for period 2008- 2009

	MF	SENSEX
MF(-1)	0.232685	14.48649
	[4.70616]*	[0.84737]
SENSEX(-1)	-0.0006	0.057982
	[-4.05298]*	[1.14046]
C	3.84E-06	-0.00057
	[1.05420]	[-0.45113]
SENSEX does not Granger Cause MF	16.4266*	
MF does not Granger Cause SENSEX	0.71803	

Notes : Values in the square bracket shows the 't' statistics
*   significant at 1%,
**   at 5% level of significance
***   at 10% level of significance.
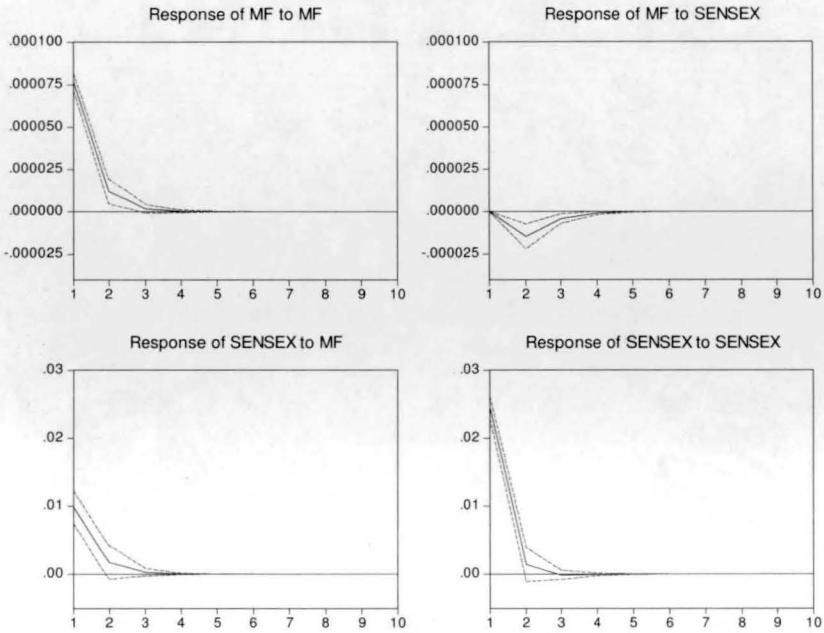
Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 8
Impulse responses of VAR Model of Net MF and Sensex return for period 2008- 2009

CAPITAL BUDGETING DECISION UNDER RISK & UNCERTAINTY

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