MF&FII Dynamics - Pre & Post Crisis

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Abstract

Institutional investors are smart traders who may play significant role in the process of price discovery banking on their informational advantage about firm values. The trust of the market on institutional trade may also induce herding, leading to faster price correction or even deviation due to overreaction. Foreign Institutional Investors may often score over domestic mutual funds in efficient trading decisions due to perceived superiority in analytical skills and investment experience. Researchers contradicting such view site familiarity of the local environment and absence of linguistic or cultural barriers for domestic mutual funds as the reason of their superiority in security valuation, market timing and trade decision. This paper is an attempt to find answer to a controversial question about who is better informed about firm values, FIIs or the domestic mutual funds , before the crisis and afterwards.

Keywords: FII, mutual fund, information asymmetry, herding, vector autoregression.

JEL Classification: G140, G230

Introduction

India has been considered trans-border investors' green pasture for almost two decades due to robust economic growth and liberal policies. Especially after single window policy for foreign institutional investors adopted by Indian Govt. in 2003 net FPI flows sharply increased and reached Rs.625.83 billion (cumulative holdings became Rs.2803.09 billion) by the year 2007-08. During the global financial crisis stemmed by sub-prime crisis in the US and the following contagion FPI in India plummeted to a net outflow of Rs.433.36 billion (cumulative FII investments fell by 15% yoy) during 2008-09. Rise in risk and large fall in valuations in the USA triggered the outflow from emerging economies including India. A fear of contagion and the resultant search for safety of funds indeed added momentum to the contagion. In the aftermath of the crisis FPI flows again bounced back to Rs.1149.02 billion during 2009-10.

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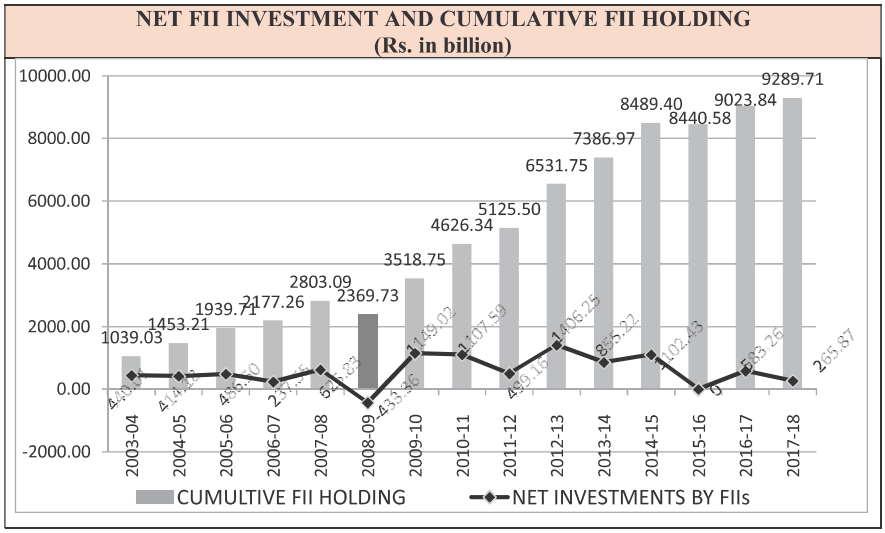
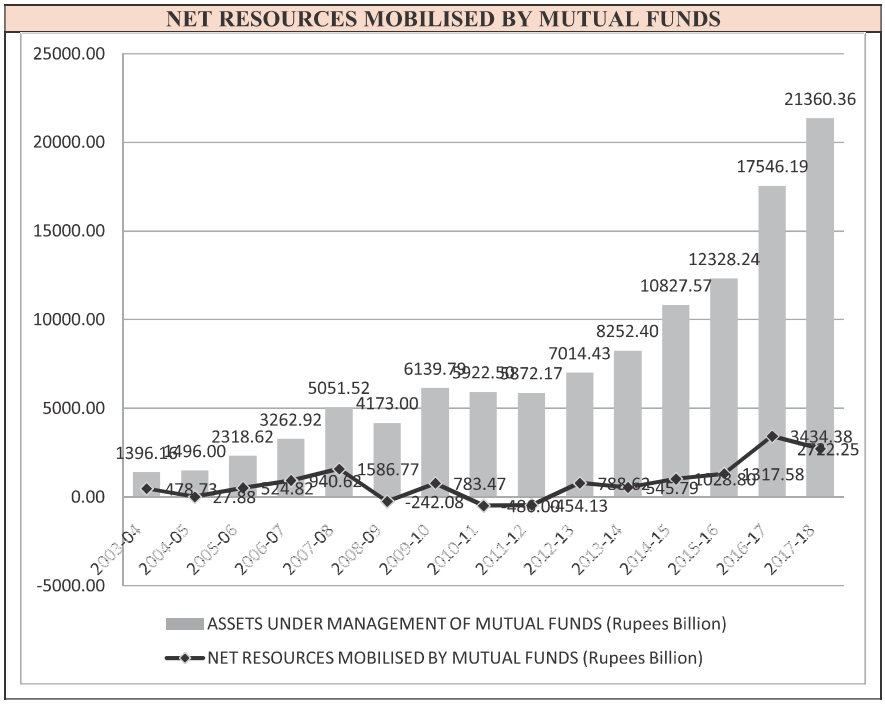
The paper has been presented in the Tenth Conference on Excellence in Research and Education (CERE 2019) of Indian Institute of Management Indore.

Figure : 1



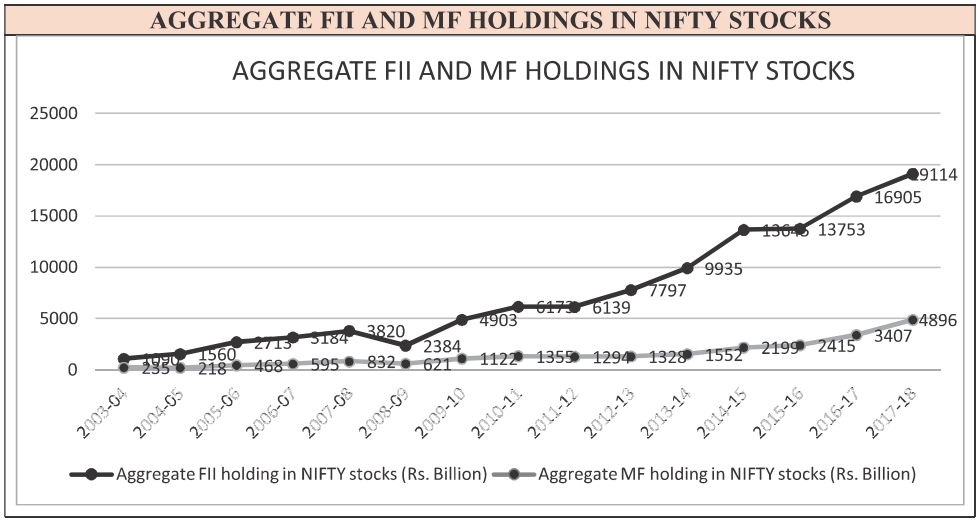
Indian mutual funds also witnessed a negative net resource mobilisation (a fall of 15.25% yoy and around 5% of total assets under management) during 2008-09 as investor confidence was shaken on account of significant fall in industrial production, reducing corporate profit margins, falling valuations, increasing return volatility and unprecedented FPI outflows. Net resource mobilisation bounced back the following year to the extent of 18.7% of total assets under management of the previous year-end.

Figure : 2



A close look at the equity markets reveals much larger equity holdings by FIIs than the holdings of mutual funds and a consistently widening gap, except a brief reversal during 2008-09 attributable to the flight off of FIIs triggerd by economic crisis. Total holdings of mutual funds and FIIs in NIFTY constituent companies was Rs.235 bn and Rs.1090 bn respectively at the end of 2003-04. The rapidly widening gap, only with temporary narrowing down during 2008-09, reached an astounding Rs.14219 bn at the end of 2017-18, while taking FII holdings to Rs.19114 bn and mutual fund holdings to Rs.4896 bn.

Figure : 3



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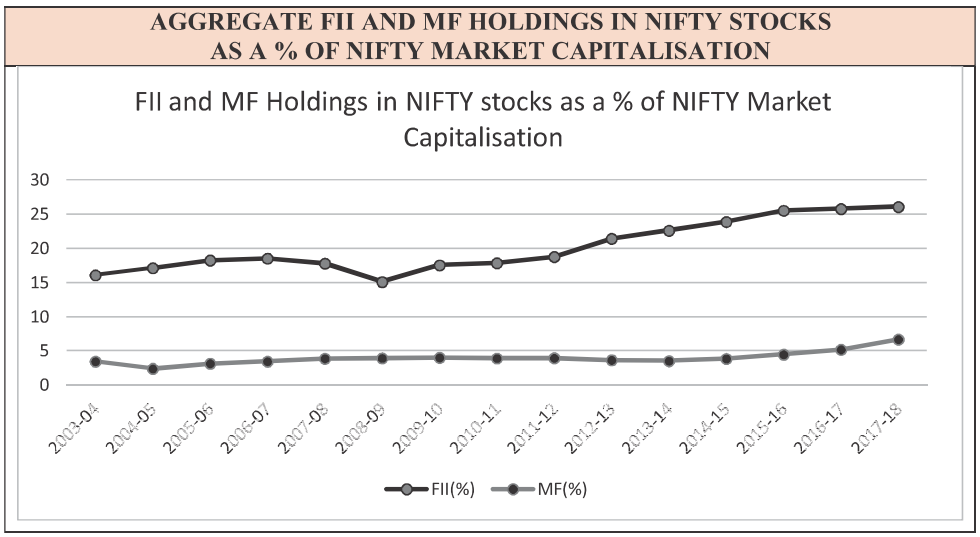

Empirical studies on both developed and emerging markets have found both mutual funds and foreign portfolio investors as smart traders possessing distinct informational advantages as against the individual traders. Large trade volume guided by superior analytical expertise and larger resource base of institutional investors synchronize to render economies of scale and thus reduce the marginal costs of information acquisition and processing. Superior information driven trade decisions of institutional investors impart momentum to the process of price discovery. In an inefficient market, stock returns reflect mispricing, slow price correction and exploitable irregularities. The institutional investors, banking on their informational advantages may exploit the opportunities to reap abnormal profits. With a rise in the number of competing institutional investors, the market may exhibit faster price correction to reflect new information and reduced mispricing, with gradual evaporation of exploitable irregularities.

In financial literature there is a growing discussion about information asymmetry between domestic and foreign investors. Among institutional investors, foreign ownership is found to have strong association with R & D expenditures of the firm and firm performance. Stocks with high foreign ownership tend to outperform stocks with low foreign ownership as they enjoy a long term information advantage (Huang and Shiu, 2009). A study on fund managers of developed economies observe domestic and foreign fund managers' differential investment behavior (by Lau and Ng, 2006) which may be attributed to difference in quality and quantity of information acquired and expertise in information processing. Higher credibility and reputation of foreign institutional investors may induce domestic investors including mutual funds to follow actions of FIIs which may be more profound in emerging economies like India. As behavioural changes in FPI flows and mutual fund investments have been witnessed after the crisis of 2007-08, such as, FPIs' becoming more sensitive to interest rate differentials between source country and the host country and risk aversion being placed by mutual funds ahead of risk management, the change in dynamic relationship between FPI and domestic mutual fund behaviour after the global financial crisis has become a subject of serious study.

Literature Review

Working on US equity markets, Dennis and Weston (2001), have documented strong evidence that institutions are better informed, which is consistent with the hypothesis that there exists economies of scale in acquisition and aggregation of information which may put FIIs in advantageous position than domestic mutual funds. They have also found that the firms with higher percentage of institutional ownership portray higher incidence of informed trading. By analysing the joint behaviour of returns, cash-flow news, and trading between individuals and institutions, Cohen, Gompers, and Vuolteenaho (2002) have found that institutions respond to good cash flow news by buying shares from individuals. Thus institutions as a group exploit the under-reaction in price response to firm level cash-flow news and move prices to their fundamental values.

Institutions are momentum investors, tend to follow past price changes and engage in herding (Grinblatt, Titman, and Wermers, 1995). Herding by institutional investors accelerates incorporation of new information into stock prices and thus moves stock prices toward their fundamental values (Nofsinger and Sias, 1999 and Wermers, 1999). Showing evidence that institutional demand is weakly, but positively, related to returns over the following year, Sias (2004) has suggested that institutional herding reflects the manner in which information is incorporated into securities prices.

When there is uncertainty about the quality of traders' information, herd behaviour may cause significant short run mispricing [Avery and Zemsky (1998)]. Puckett and Yan (2008) have shown that short term institutional herding significantly affect efficiency of security prices. They found strong evidence of return reversals following short-term sell herds and weak evidence of return continuations following short-term buy herds. The short term sell herds are motivated by behavioural considerations and drive prices away from fundamental values. From the evidence of absence of return reversals following short-term buy-herds, the authors suggested that these herds are information based and help incorporation of new information into security prices.

Relative superiority of information content of trade decisions by foreign and domestic institutional investors is

a controversial question. Although familiarity of the local environment and absence of linguistic or cultural barriers are likely to give local investors a superior understanding about local firm fundamentals [Hau (2001), Dvořák (2005) and Brennan and Cao (1997)] evidences are found by researchers that foreign investors are generally sophisticated institutional investors possessing superior analytical skills and investment experience which enable them in analysing market conditions and firms' fundamentals better, leading to optimal investment and trading decisions and a superior performance than the local investors (Froot and Ramadorai,2008, Grinblatt and Keloharju, 2000 and Karolyi, 2002). In emerging markets, where the local investors are likely to be less sophisticated, the effect may be more intense.

Froot, O'Connell, and Seasholes (2001), analysing daily net portfolio flows into 44 countries between 1994 and 1998, have provided evidence that portfolio flows in and out of an economy have positive and statistically significant forecasting power for future equity returns in emerging markets. Therefore institutional cross-border flows are linked to fundamentals (Froot and Ramadorai, 2008). Working on Taiwanese stock market, Huang and Shiu (2009) have shown that foreign investors enjoy an informational advantage over local investors in the long run. Ding, Guedhami, Ni and Pittman (2012) have found evidence that in state owned enterprises, local institutional ownership has strong forecasting power for future stock returns but foreign institutional ownership has no such predictive ability, whereas, in non-state owned enterprises foreign institutional ownership is positively and significantly related with future stock returns, the relationship being weak for local institutional ownership. Suggesting that trade decisions of FIIs in non-state owned firms are driven by superior information but they do not enjoy this advantage in case of state owned firms.

Objective of the study

The study attempts to put some light on the inconclusiveness about causal relationship between FII and Mutual Fund holdings in equity shares and their relative ability in leading stock returns in Indian context.

1. Sample Selection

The fifty (50) companies included in Standard & Poor (S&P) CNX Nifty constitute the universe of the study. The Nifty companies are the focus of this study for two reasons. First, they have widely dispersed shareholding in comparison to small cap companies and hence are expected to disclose more information. Second, these companies' market capitalisation constitutes around 62.9% of market capitalisation of all NSE listed companies (as on 31st March 2017).

2. Period of Study

The period 2004-05 to 2017-18 is selected for the purpose of the entire study. Subjecting the retrieved time series data of each firm to Chow Breakpoint Test finds a structural break during 2003-04, which indicates the prudence of studying the period since then. This is further strengthened by the fact that in 2003, with the objective of streamlining the registration process of FIIs and reducing the time taken for registration, the dual approval process of Securities and Exchange Board of India (SEBI) and Reserve Bank of India (RBI) was changed into a single approval process of SEBI leading to a sudden surge in annual net addition to the number of FIIs and the net investment by them.

3. Data Type and Source

The analysis is based on secondary data at firm level. The CMIE Prowess database is the source of information about the mutual fund activities, foreign institutional investors' activities and firm level quarterly financial data.

4. Statistical Tools : Vector Auto Regression (VAR) method is used to explain the interrelationship of the variables. VAR Granger Causality or Wald tests are employed to find existence of causality and the direction thereof.

Statistical calculations are done making extensive use of Microsoft Excel and panel data analysis is done using EVIEWS software package on the computer.

6. Hypotheses

To determine relationship between FII holdings and mutual fund holdings in a firm's stock the following null hypotheses are framed and tested.

Hypothesis 1 (H_{01}): An increase (decrease) in FII holding in a firm does not result

in an increase (decrease) in Mutual Fund holding.

Hypothesis 2 (H_{02}): An increase (decrease) in Mutual Fund holding in a firm does not result in an increase (decrease) in FII holding.

Hypothesis 3 (H_{03}): An increase (decrease) in FII holding in a firm does not precede an increase (decrease) in return on the firm's stock.

Hypothesis 4 (H_{04}): An increase (decrease) in Mutual Fund holding in a firm does not precede an increase (decrease) in return on the firm's stock.

7. Variables Used

Foreign Institutional Holding ($FII_{i,t}$): Contemporaneous and lagged values of FII holdings are used for the purpose of vector autoregression. FII holdings for any firm include all shares held by non-residents irrespective of their location. Firm level FII holding is measured by the percentage of outstanding common shares held by the FIIs in each company at the end of the quarter t.

Mutual Fund Holding ($MF_{i,t}$): Firm level Mutual Fund holding is measured by the percentage of outstanding common shares held by the MFs in each company at the end of the quarter t.

Return ($RET_{i,t}$): Researchers have observed significant relation between institutional investments and stock returns [Dornbusch and Park (1995), Bohn and Tesar (1996) and Clark and Berko (1997)]. It is measured by quarterly percentage stock return as available in the CMIE Prowess database.

Liquidity (TO_{it}): Natural logarithm of quarterly turnover of the firms' equity shares are taken as the proxy for liquidity.

Volatility ($VOLAT_{i,t}$) : High levels of return volatility induce portfolio rebalancing requirements and trading activity leading to increase in stock liquidity which is necessary for faster incorporation of new information into security prices. Also, FIIs and mutual funds may prefer more stable returns and hence tend to avoid stocks with high return volatility. Volatility ($VOLAT_{i,t}$) is measured by variance of daily total returns for each stock 'i' in each quarter 't' .

Size ($MCAP_{i,t}$): Small firms usually have undiversified portfolio of assets and projects and are riskier than larger firms [Kothari (2009)]. Espinosa et al. (2005) argue that level of information flow is typically higher for larger firms making them less risky in terms of information asymmetry. Here, the variable $SIZE_{i,t}$ is measured as natural logarithm of each firm's total market capitalisation at the end of the quarter t.

Price to Book Value ratio ($PB_{i,t}$): The price to book value ratio is measured by the market value of equity divided by the book value of equity as at the end of each quarter 't' of the study period. It is generally considered as one of the factors for investment decision making by institutional investors.

Promoter's Holdings ($PROM_{i,t}$): Higher promoter's holdings in firms cause lower dispersion in ownership and inadequate information flow to the stock market investors thereby impeding efficient price discovery. Hence, promoter's holding is included in the VAR analysis as another explanatory variable. Promoter's holding ($PROM_{i,t}$) is measured by percentage of outstanding common shares held by the promoters of each company 'i' at the end of the quarter t.

The Model

$$MF = \alpha + \sum_{j=1}^{k} \beta_j FII_{it-j} + \sum_{j=1}^{k} \gamma_j MCAP_{it-j} + \sum_{j=1}^{k} \delta_j MF_{it-j} + \sum_{j=1}^{k} \theta_j D(PB)_{it-j} + \sum_{j=1}^{k} \mu_j PROM_{it-j} + \sum_{j=1}^{k} \pi_j RET_{it-j} + \sum_{j=1}^{k} \rho_j TO_{it-j} + \sum_{j=1}^{k} s_j VOLAT + \varepsilon_{it}$$

$$FII_{it} = \alpha' + \sum_{j=1}^{k} \beta'_j FII_{it-j} + \sum_{j=1}^{k} \gamma'_j MCAP_{it-j} + \sum_{j=1}^{k} \delta'_j MF_{it-j} + \sum_{j=1}^{k} \theta'_j D(PB)_{it-j} + \sum_{j=1}^{k} \mu'_j PROM_{it-j} + \sum_{j=1}^{k} \pi'_j RET_{it-j} + \sum_{j=1}^{k} \rho'_j TO + \sum_{j=1}^{k} s'_j VOLAT + \varepsilon'_{it}$$

Findings

On the basis of minimum Schwarz Information Criterion, lag 2 is chosen as the optimum lag (ref. Table:1 below) for VAR analysis.

Table 3 reveals that in pre-crisis period, i.e., till 2007 no

significant effect of FII flows on mutual fund flows (χ^2=3.450345, p=0.1781) and vice versa (χ^2=2.185852, p=0.3352) were visible. FIIs were found to follow returns (χ^2=9.801855, p=0.0074) and their strong preference for larger (high market capitalisation) companies (χ^2=19.48885, p=0.0001) with high share turnover (χ^2=21.3593, p=0) were observed which together signify inadequate access to new value-relevant information and /or inefficient data processing. Larger firms obviously have relatively better quality disclosure, greater number of analysts following, faster dissemination of new information and thus less negative return surprises. FII flows were not found to have significant causal influence on stock returns (χ^2=2.289163, p=0.3184) and return volatility (χ^2=6.604616, p=0.0368).

In post crisis period (2009-18) FIIs ceased to be return chasers (χ^2=6.890956, p=0.0319), neither share turnover was found to have significant effect on FII flows anymore (χ^2=4.938568, p=0.0846), although the preference for larger companies persisted (χ^2=14.15148, p=0.0008). This may indicate increased understanding of Indian economy and firm fundamentals and improved access to quality information. This explanation is further supported by a feeble (χ^2=6.026794, p=0.0491) causal influence of FII flows on returns which were absolutely not seen during pre-crisis period.

One of the two very significant change observed is that FIIs started showing causal influence of promoters holdings (χ^2=23.83123, p=0) which effect was absolutely non-existent during pre crisis period (χ^2=0.527328, p=0.7682). This may indicate a learning from fallout of the Satyam Computers scam where steady decline of promoters' holdings were clearly observable but the underlying current were outside analysts and corporate radar in an unexplained and uncanny way.

The second one is that FII flows in post-crisis period started to have very significant causal influence on mutual fund flows (χ^2=13.92081, p=0.0009) which was not observed before the crisis (χ^2=3.450345, p=0.1781). Mutual funds have also stopped chasing returns after the crisis (χ^2=0.408588, p=0.8152). Historical returns have been found to be sole significant determinant of mutual fund movements during pre-crisis period which poses serious question about fund management. After the crisis, other than FII flows, promoters' holdings also are found to have causal influence on mutual fund flows (χ^2=19.75564, p=0.0001). Return volatility (χ^2=9.694972, p=0.0078) and share turnover (χ^2=19.28004, p=0.0001) have emerged as very significant determining factors of mutual fund flows. Whereas they are not found to have very significant impact on returns (χ^2=0.63367, p=0.7285), mutual funds seem to enhance return volatility (χ^2=14.23426, p=0.0008).

Conclusion

The paper deals with the probable association between FII and Mutual Fund flows in and out of Indian equity stocks in pre and post subprime crisis period. Data on FII and Mutual Fund equity holdings in firms are extracted from quarterly financial statements. Also the structural break during 2003 has reduced the pre crisis regressable time span. Availability of higher frequency data could provide a larger and more effective dataset to reveal even more dependable findings about the nature of the relationships studied. Notwithstanding this minor limitation in this study the results of VAR analysis and the successive VAR Granger Causality Test show a positive and significant association between FII and Mutual Fund flows.

A very important finding is that, both FIIs and MFs were return chasers in pre crisis period which ceases post crisis, and is a welcome change from MF investors' points of view, as the fund managements now put more emphasis on fundamentals and less on historical returns. Turnover had a significant positive impact on FII flows, the disappearance of this causal influence shows assigning less importance by FIIs on trade of domestic investors. The findings suggest superiority of FIIs over domestic Mutual Funds in gathering and processing value relevant information in post crisis period and recognition of the same in flow behaviour of mutual funds. Mutual Funds are found to herd behind FIIs in post crisis period whereas no causal relationship is found in the other direction, signifying the acceptance by MFs of FIIs superiority in information acquisition and processing. This trust on informativeness of FII trades is reinforced by promoters' behaviour, whose richness in insider information is obvious and beyond doubt, as FII flows have been found to precede changes in promoters' holdings.

Table-1: Identification of Optimum Lag

Schwarz Information Criterion									
Lag	0	1	2	3	4	5	6	7	8
SC	40.806	26.035	25.873*	25.953	26.080	26.229	26.346	26.470	26.592

* indicates lag order selected by the criterion

Table-1 identifies a lag of 2 quarters as the optimum lag for Vector Autoregression Analysis.

Table-2: Vector Auto regression Estimates during Pre & Post Crisis Period

	Pre Crisis (2004-2007) Standard errors in ( ) & t-statistics in [ ]					Post Crisis (2009-2018) Standard errors in ( ) & t-statistics in [ ]				
	FII	**MF**	**PROM**	**RET**	**VOLAT**	**FII**	**MF**	**PROM**	**RET**	**VOLAT**
FII(-1)	1.009	-0.012	-0.008	0.069	0.236	0.953	-0.044	-0.081	0.056	-0.004
	-0.041	-0.020	-0.042	-0.048	-0.095	-0.027	-0.012	-0.024	-0.025	-0.037
	[24.495]	[-0.599]	[-0.187]	[1.427]	[2.482]*	[35.936]	[-3.722]*	[-3.393]*	[2.224]*	[-0.105]
FII(-2)	-0.056	0.021	-0.010	-0.060	-0.244	0.030	0.043	0.069	-0.060	0.008
	-0.041	-0.020	-0.042	-0.048	-0.095	-0.027	-0.012	-0.024	-0.025	-0.037
	[-1.347]	[1.050]	[-0.249]	[-1.239]	[-2.569]*	[1.115]	[3.689]*	[2.879]*	[-2.395]*	[0.214]
MF(-1)	-0.059	1.026	-0.006	0.057	0.026	-0.131	1.015	-0.049	0.020	-0.151
	-0.081	-0.040	-0.083	-0.096	-0.188	-0.056	-0.025	-0.050	-0.053	-0.079
	[-0.724]	[25.826]	[-0.076]	[0.597]	[0.136]	[-2.330]*	[40.784]*	[-0.974]	[0.372]	[-1.907]*
MF(-2)	0.086	-0.092	0.024	-0.103	-0.155	0.140	-0.058	0.075	-0.030	0.067
	-0.080	-0.039	-0.082	-0.094	-0.185	-0.056	-0.025	-0.050	-0.053	-0.079
	[1.077]	[-2.345]	[0.297]	[-1.093]	[-0.835]	[2.485]*	[-2.335]*	[1.485]	[-0.565]	[0.849]
PROM(-1)	-0.005	0.009	0.967	0.010	-0.145	-0.140	-0.020	0.913	0.009	0.033
	-0.046	-0.022	-0.046	-0.054	-0.105	-0.029	-0.013	-0.026	-0.027	-0.041
	[-0.114]	[0.383]	[20.85]	[0.195]	[-1.378]	[-4.859]*	[-1.530]	[35.325]	[0.343]	[0.809]
PROM(-2)	0.001	-0.007	0.013	-0.023	0.170	0.135	0.011	0.071	-0.011	-0.029

	-0.045	-0.022	-0.046	-0.053	-0.104	-0.029	-0.013	-0.026	-0.027	-0.040
	[0.016]	[-0.331]	[0.292]	[-0.430]	[1.628]	[4.734]*	[0.891]	[2.757]	[-0.427]	[-0.712]
RET(-1)	0.048	0.021	-0.006	-0.007	0.046	0.041	-0.003	0.033	-0.038	0.180
	-0.033	-0.016	-0.034	-0.039	-0.076	-0.027	-0.012	-0.024	-0.026	-0.038
	[1.458]	[1.292]	[-0.169]	[-0.171]	[0.598]	[1.523]	[-0.219]	[1.359]	[-1.466]	[4.708]*
RET(-2)	-0.089	0.043	-0.048	0.014	-0.004	0.057	-0.007	-0.011	-0.050	0.082
	-0.031	-0.015	-0.032	-0.037	-0.073	-0.026	-0.012	-0.024	-0.025	-0.037
	[-2.841]*	[2.768]*	[-1.489]	[0.368]	[-0.060]	[2.141]	[-0.600]	[-0.451]	[-2.019]	[2.195]*
VOLAT(-1)	-0.008	0.008	-0.007	-0.002	0.207	0.011	0.021	0.017	0.024	0.250
	-0.017	-0.008	-0.017	-0.020	-0.038	-0.017	-0.007	-0.015	-0.016	-0.024
	[-0.462]	[0.965]	[-0.426]	[-0.121]	[5.401]	[0.646]	[2.793]*	[1.111]	[1.544]	[10.61]*
VOLAT(-2)	-0.003	-0.007	0.018	0.001	0.065	0.012	-0.001	-0.007	-0.072	0.282
	-0.013	-0.006	-0.013	-0.015	-0.030	-0.012	-0.005	-0.011	-0.011	-0.017
	[-0.199]	[-1.021]	[1.346]	[0.096]	[2.170]	[1.010]	[-0.196]	[-0.617]	[-6.489]*	[16.899]*
TO(-1)	-0.011	-0.004	-0.050	0.089	0.449	0.094	-0.025	-0.092	0.008	0.183
	-0.081	-0.039	-0.082	-0.095	-0.186	-0.066	-0.029	-0.059	-0.062	-0.092
	[-0.136]	[-0.114]	[-0.608]	[0.935]	[2.412]*	[1.439]	[-0.849]	[-1.558]	[0.129]	[1.988]*
TO(-2)	0.271	-0.015	-0.047	-0.082	-0.222	0.051	-0.094	0.021	-0.077	0.031
	-0.076	-0.037	-0.078	-0.090	-0.176	-0.062	-0.027	-0.056	-0.058	-0.087
	[3.557]*	[-0.396]	[-0.600]	[-0.909]	[-1.261]	[0.827]	[-3.416]*	[0.385]	[-1.309]	[0.355]
MCAP(-1)	1.060	0.224	-0.547	1.053	1.215	0.717	-0.101	-0.529	0.575	-3.577
	-0.495	-0.242	-0.504	-0.582	-1.142	-0.308	-0.136	-0.277	-0.290	-0.434
	[2.143]	[0.926]	[-1.084]	[1.809]	[1.064]	[2.325]*	[-0.741]	[-1.912]	[1.982]	[-8.239]*
MCAP(-2)	-1.415	-0.284	0.810	-1.030	-2.327	-0.940	0.204	0.667	-0.591	2.868
	-0.492	-0.240	-0.501	-0.579	-1.136	-0.309	-0.137	-0.277	-0.291	-0.435
	[-2.874]*	[-1.180]	[1.616]*	[-1.778]	[-2.049]*	[-3.047]*	[1.492]	[2.408]*	[-2.033]	[6.597]*

D(PB(-1))	-0.031	-0.035	-0.044	0.118	0.112	-0.070	-0.021	0.148	0.000	0.011
	-0.074	-0.036	-0.076	-0.087	-0.171	-0.028	-0.012	-0.025	-0.026	-0.039
	[-0.420]	[-0.968]	[-0.575]	[1.351]	[0.655]	[-2.516]*	[-1.671]	[5.890]*	[-0.018]	[0.279]
D(PB(-2))	0.022	-0.033	-0.050	0.107	0.560	0.007	-0.005	0.040	0.013	-0.103
	-0.060	-0.029	-0.061	-0.070	-0.138	-0.026	-0.012	-0.024	-0.025	-0.037
	[0.366]	[-1.123]	[-0.829]	[1.525]	[4.061]*	[0.261]	[-0.465]	[1.705]	[0.541]	[-2.775]*
C	3.979	0.734	-1.510	0.863	15.209	2.630	0.052	-0.602	1.685	9.661
	-0.926	-0.452	-0.944	-1.089	-2.137	-0.886	-0.392	-0.796	-0.835	-1.248
	[4.296]	[1.621]	[-1.600]	[0.791]	[7.115]	[2.967]	[0.131]	[-0.756]	[2.019]	[7.738]
R-squared	0.956	0.921	0.988	0.046	0.279	0.979	0.941	0.992	0.042	0.486
Adj. R-squared	0.955	0.919	0.988	0.023	0.262	0.979	0.940	0.992	0.032	0.481

Table:2 (Continued)

Vector Autoregression Estimates						
	Pre Crisis (2004-2007) Standard errors in ( ) & t-statistics in [ ]			Post Crisis (2009-2018) Standard errors in ( ) & t-statistics in [ ]		
	TO	MCAP	D(PB)	TO	MCAP	D(PB)
FII(-1)	-0.001	-0.002	0.004	0.027818	0.0031	0.0166
	-0.021	-0.004	-0.026	-0.01058	-0.00222	-0.02664
	[-0.054]	[-0.563]	[0.168]	[2.629]*	[1.406]	[0.626]
FII(-2)	-0.005	0.001	-0.001	-0.02285	-0.00255	-0.01825
	-0.021	-0.004	-0.026	-0.01058	-0.00222	-0.02665
	[-0.229]	[0.211]	[-0.051]	[-2.158]*	[-1.145]	[-0.684]
MF(-1)	-0.025	0.010	0.035	0.042962	0.0050	-0.00721
	-0.041	-0.009	-0.050	-0.02243	-0.00471	-0.05648

	[-0.617]	[1.156]	[0.686]	[1.915]	[1.069]	[-0.128]
MF(-2)	0.027	-0.013	-0.052	-0.03095	-0.00388	0.020841
	-0.040	-0.009	-0.050	-0.0224	-0.00471	-0.05642
	[0.673]	[-1.484]	[-1.049]	[-1.381]	[-0.823]	[0.369]
PROM(-1)	-0.036	0.003	0.028	-0.01956	-0.00097	-0.0041
	-0.023	-0.005	-0.028	-0.01149	-0.00241	-0.02893
	[-1.582]	[0.709]	[0.984]	[-1.702]	[-0.399]	[-0.142]
PROM(-2)	0.028	-0.004	-0.028	0.012796	0.00046	0.0027
	-0.023	-0.005	-0.028	-0.01138	-0.00239	-0.02865
	[1.234]	[-0.826]	[-1.006]	[1.125]	[0.196]	[0.097]
RET(-1)	-0.027	-0.001	0.014	0.022737	0.00321	-0.01756
	-0.017	-0.004	-0.020	-0.01085	-0.00228	-0.02733
	[-1.628]	[-0.365]	[0.675]	[2.095]	[1.410]	[-0.642]
RET(-2)	-0.009	-0.003	-0.023	-0.03157	0.00063	-0.02496
	-0.016	-0.003	-0.019	-0.01053	-0.00221	-0.02652
	[-0.583]	[-0.996]	[-1.189]	[-2.998]*	[0.285]	[-0.941]
VOLAT(-1)	0.009	0.001	0.012	0.028439	0.01118	0.02660
	-0.008	-0.002	-0.010	-0.00668	-0.0014	-0.01682
	[1.055]	[0.356]	[1.183]	[4.258]*	[7.965]*	[1.582]
VOLAT(-2)	-0.012	-0.001	-0.009	0.012653	0.00744	0.01019
	-0.007	-0.001	-0.008	-0.00472	-0.00099	-0.01189
	[-1.894]	[-0.368]	[-1.130]	[2.679]*	[7.499]*	[0.858]
TO(-1)	0.404	0.002	0.029	0.304575	-0.00243	-0.06342
	-0.041	-0.009	-0.050	-0.02614	-0.00549	-0.06583
	[9.935]*	[0.196]	[0.591]	[11.652]*	[-0.443]	[-0.963]

TO(-2)	0.296	-0.008	-0.020	0.237689	-0.03277	-0.17022
	-0.038	-0.008	-0.047	-0.02477	-0.00521	-0.06237
	[7.703]*	[-0.961]	[-0.420]	[9.597]*	[-6.296]*	[-2.729]*
MCAP(-1)	0.342	0.976	0.457	0.172	0.883	0.666
	-0.249	-0.053	-0.306	-0.12299	-0.02585	-0.30971
	[1.373]	[18.366]*	[1.493]	[1.396]	[34.170]	[2.151]*
MCAP(-2)	-0.122	0.002	-0.550	0.244088	0.12963	-0.52262
	-0.248	-0.053	-0.305	-0.12314	-0.02588	-0.3101
	[-0.490]	[0.043]	[-1.805]	[1.982]	[5.009]	[-1.685]
D(PB(-1))	0.028	-0.014	-0.300	-0.00129	0.002242	-0.357
	-0.037	-0.008	-0.046	-0.01117	-0.00235	-0.028
	[0.749]	[-1.704]	[-6.528]*	[-0.116]	[0.955]	[-12.70]
D(PB(-2))	0.002	-0.014	-0.187	0.001	0.000	-0.297
	-0.030	-0.006	-0.037	-0.01051	-0.00221	-0.02647
	[0.055]	[-2.163]*	[-5.064]*	[0.155]	[0.201]	[-11.25]
C	-0.342	0.440	1.151	-2.35499	0.0452	-0.347
	-0.467	-0.099	-0.573	-0.35364	-0.07433	-0.890
	[-0.732]	[4.428]	[2.008]	[-6.659]	[0.608]	[-0.389]
R-squared	0.754	0.980	0.105	0.691221	0.9796	0.14298
Adj. R-squared	0.748	0.979	0.084	0.688126	0.97939	0.13439

* significant at 1% level of significance

Table-2 shows the values of coefficients representing effects of the explanatory variables up to lag 2 (the optimum lag). Most important findings are (i) historical return dependent investment decisions of FII and MFs cease after the crisis, (ii) MFs following FIIs in their investment decisions in post crisis period and (iii) promoters are found to take cue from FII trades during post crisis.

Table-3: VAR Granger Causality Test Results

Dependent variable: FII						
	Pre Crisis			Post Crisis		
Excluded	Chi-sq	df	Prob.	Chi-sq	df	Prob.
MF	2.185852	2	0.3352	6.196009	2	0.0451
PROM	0.527328	2	0.7682	23.83123	2	0*
RET	9.801855	2	0.0074*	6.890956	2	0.0319
VOLAT	0.320323	2	0.852	2.774323	2	0.2498
TO	21.3593	2	0*	4.938568	2	0.0846
MCAP	19.48885	2	0.0001*	14.15148	2	0.0008*
D(PB)	0.377777	2	0.8279	7.314212	2	0.0258
All	54.9546	14	0*	82.71148	14	0*

Dependent variable: MF						
	Pre Crisis			Post Crisis		
Excluded	Chi-sq	df	Prob.	Chi-sq	df	Prob.
FII	3.450345	2	0.1781	13.92081	2	0.0009*
PROM	0.277533	2	0.8704	19.75564	2	0.0001*
RET	9.728961	2	0.0077*	0.408588	2	0.8152
VOLAT	1.579946	2	0.4539	9.694972	2	0.0078*
TO	0.408466	2	0.8153	19.28004	2	0.0001*
MCAP	2.701799	2	0.259	8.630302	2	0.0134
D(PB)	1.870844	2	0.3924	2.793513	2	0.2474
All	26.18969	14	0.0245	73.20393	14	0*

Dependent variable: PROM						
Excluded	Chi-sq	df	Prob.	Chi-sq	Df	Prob.
FII	2.584845	2	0.2746	15.66033	2	0.0004*
MF	0.568239	2	0.7527	4.418435	2	0.1098
RET	2.280794	2	0.3197	2.053932	2	0.3581
VOLAT	1.820379	2	0.4024	1.240555	2	0.5378
TO	2.152493	2	0.3409	2.575784	2	0.2759
MCAP	8.774314	2	0.0124	7.969685	2	0.0186
D(PB)	0.876427	2	0.6452	34.71144	2	0*
All	19.65012	14	0.1416	64.74255	14	0*

Dependent variable: RET						
Excluded	Chi-sq	df	Prob.	Chi-sq	df	Prob.
FII	2.289163	2	0.3184	6.026794	2	0.0491
MF	3.408153	2	0.1819	0.63367	2	0.7285
PROM	3.141507	2	0.2079	0.464136	2	0.7929
VOLAT	0.019509	2	0.9903	45.88506	2	0*
TO	1.025551	2	0.5988	2.009601	2	0.3661
MCAP	3.274781	2	0.1945	4.145328	2	0.1259
D(PB)	3.527883	2	0.1714	0.323594	2	0.8506
All	31.22201	14	0.0052*	65.08069	14	0*

Dependent variable: VOLAT						
Excluded	Chi-sq	df	Prob.	Chi-sq	df	Prob.
FII	6.604616	2	0.0368	0.280227	2	0.8693
MF	5.561571	2	0.062	14.23426	2	0.0008*
PROM	5.703689	2	0.0577	1.002401	2	0.6058
RET	0.358766	2	0.8358	26.93999	2	0*
TO	6.017294	2	0.0494	6.049874	2	0.0486
MCAP	26.23293	2	0*	91.26429	2	0*
D(PB)	16.49941	2	0.0003*	8.876344	2	0.0118
All	111.7387	14	0*	162.1571	14	0*

Dependent variable: TO						
Excluded	Chi-sq	df	Prob.	Chi-sq	df	Prob.
FII	1.094721	2	0.5785	10.57988	2	0.005*
MF	0.459983	2	0.7945	5.917705	2	0.0519
PROM	8.653278	2	0.0132	16.92358	2	0.0002*
RET	3.097002	2	0.2126	13.40714	2	0.0012*
VOLAT	3.944482	2	0.1391	48.70954	2	0*
MCAP	20.01063	2	0*	149.0008	2	0*
D(PB)	0.56727	2	0.753	0.051024	2	0.9748
All	42.46659	14	0.0001*	189.4626	14	0*

Dependent variable: MCAP						
Excluded	Chi-sq	df	Prob.	Chi-sq	df	Prob.
FII	1.822039	2	0.4021	3.119247	2	0.2102
MF	2.956429	2	0.228	1.579759	2	0.4539
PROM	1.344805	2	0.5105	1.935739	2	0.3799
RET	1.165596	2	0.5583	2.067454	2	0.3557
VOLAT	0.209711	2	0.9005	237.9637	2	0*
TO	1.265854	2	0.531	54.19256	2	0*
D(PB)	6.472395	2	0.0393	0.915199	2	0.6328
All	18.30567	14	0.1932	274.7192	14	0*

Dependent variable: D(PB)						
Excluded	Chi-sq	df	Prob.	Chi-sq	df	Prob.
FII	0.196458	2	0.9064	0.508769	2	0.7754
MF	2.203651	2	0.3323	0.705148	2	0.7029
PROM	1.003935	2	0.6053	0.104198	2	0.9492
RET	1.790664	2	0.4085	1.295248	2	0.5233
VOLAT	2.139197	2	0.3431	6.095739	2	0.0475
TO	0.350862	2	0.8391	13.82667	2	0.001*
MCAP	5.131327	2	0.0769	6.579045	2	0.0373
All	22.94874	14	0.0611	42.78907	14	0.0001*

* significant at 1% level of significance.

Table-3 indicates direction and significance of causal relationships between the variables in the Vector Autoregressive Model.

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The paper has been presented in the Tenth Conference on Excellence in Research and Education (CERE 2019) of Indian Institute of Management Indore.