WORKING PAPER NO. 109

THE DYNAMICS OF FOREIGN PORTFOLIO INFLOWS AND EQUITY RETURNS IN INDIA

AMITA BATRA

September 2003

INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS
Core-6A, 4th Floor, India Habitat Centre, Lodi Road, New Delhi-110 003

Table of Contents

Foreword

After a series of financial crises in the late 1990s, doubts have been expressed about the wisdom of promoting free cross –border portfolio flows. Foreign Institutional Investors (FIIs) constituting a major proportion of these cross –border capital flows are considered to be driven by "animal spirits" rather than rational investment decisions. The FIIs have often been blamed for large and concerted withdrawals of capital from countries in times of crisis, despite evidence showing that domestic/resident investors are often the first to exit at times of crisis, perhaps because of better information.

Foreign portfolio inflows through FIIs, in India, are important from the policy perspective, especially when the country has emerged as one of the most attractive investment destinations in Asia. In this paper an effort has been made to develop an understanding of the investment decisions, trading strategies and behavior of the FIIs in the Indian equity market.

This paper reveals aggregate evidence of FIIs chasing trends and adopting positive feedback trading on a daily basis even though no such behavior is evident over horizons of a month or so. This evidence seems to support the hypothesis that resident investors have better information on a daily basis, thus making it essential for FIIs to use price signals to discern underlying information that may have triggered them. Once the information is in public domain basic analysis of the implications for stock returns becomes more important. Thus, while FIIs do tend to herd together in the stock market, their trading behavior does not appear to be destabilizing for the Indian equity market.

I do hope that this paper will serve as a useful source and provide valuable reference material for researchers and policymakers associated with and interested in foreign portfolio inflows in India.

Arvind Virmani
Director & Chief Executive
ICRIER

September 2003

Abstract

The Foreign Institutional Investors (FIIs) have emerged as important players in the Indian equity market in the recent past. This paper makes an attempt to develop an understanding of the dynamics of the trading behavior of FIIs and returns in the Indian equity market by analyzing daily and monthly data. From our analysis we find that there is strong evidence of FIIs chasing trends and adopting positive feedback trading strategies at the aggregate level on a daily basis. However there is no evidence of positive feedback trading on a monthly basis. The results of our analysis also indicate that foreign investors have a tendency to herd together in their trading activity in India. The trading behavior and biases of the FIIs do not appear to have a destabilizing impact on the equity market.

The Dynamics of Foreign Portfolio Inflows and Equity Returns in India

Amita Batra[*]

I. Introduction

With the emerging market crises of the late 1990s, the role of Foreign Portfolio Investment (FPI) and the major players therein i.e. the foreign institutional investors (FIIs) has come under intense scrutiny by academics as well as policymakers. A general perception about the FIIs is that they are speculators and their investment is motivated by short- term gains. The FIIs in pursuit of short- term gains adopt short- term trading strategies such as positive feedback trading and herding (i.e. buy or sell stocks together as a group). Such behavioral biases of FIIs, it is believed, may lead to price overreaction and contribute to the creation or exacerbation of a financial crisis.

In case of India, investment by FIIs has seen a steady growth since the opening of the equity markets in September 1992. The share of FIIs in total FPI has increased from 47% in 1993-94 to around 74% in 2001-2002. FIIs have also acquired a significant presence in the Indian stock market. The share of their trading in total turnover attained a high of almost 30% in October 2001. In total market capitalization[1] FIIs account for about 13% and they make about 50-60% of average daily deliveries on the stock market.

Notwithstanding the FIIs being important players in the Indian stock market and that there are strongly held views on their trading behavior biases, little empirical analysis on the subject in the Indian context has been undertaken. In this paper an effort has been

[*] Sincere thanks are offered to Prof. Arvind Virmani for giving invaluable suggestions that helped me finalize the paper. Thanks are due to an anonymous referee for making useful comments on the first draft. Constructive suggestions by Dr. Wilima Wadhwa at the ICRIER seminar are thankfully acknowledged. Research assistance provided by Mr. Puneet Sudan is appreciated.

[1] Note that of total market capitalization only half is floating stock.

made to develop an understanding of the dynamics of the FII inflows and equity returns in the Indian equity market.

The paper is organized as follows. In addition to Introduction in section one a brief survey of the literature is presented in section two. In the following section the theoretical foundations of positive feedback trading and herding are discussed. The data, data sources and summary statistics of net equity purchases and equity returns are presented in section four. Empirical estimation comprising three parts on positive feedback trading, herding and impact of FII trading on stock market stability is given in section five. Section six concludes.

II. Survey of Literature

Dornbusch and Park (1995) argue that foreign investors pursue positive feedback trading strategies that make stocks overreact to changes in fundamentals. Bohn and Tesar (1996) and Clark and Berko (1996) show a positive contemporaneous relation between equity flows and stock returns using monthly data for Mexico. Choe, Kho and Stulz (1998) have examined the impact of foreign investors on stock returns in Korea before and after the 1997 Asian crisis using daily trade data. They find evidence of positive feedback trading before the crisis. During the crisis period their study reveals a weakening of the herding effect and disappearance of positive feedback trading by foreign investors. In addition they find no evidence of a destabilizing effect of the trades by foreign investors on Korea's stock market. Using the measure for herding as developed by Lakonishok, Shleifer and Vishny [LSV (1992)], Kim and Wei (2002) also show strong tendencies for herding by foreign investors and offshore investment funds in Korea in a similar time period. Bonser-Neal et al (2002) analyze the foreign trading behavior on the Jakarta stock exchange (Indonesia) between 1995 and 2000.They detect herding and positive feedback trading by foreign investors, but find no evidence to indicate that such trading behavior by foreign investors destabilized the market prices during the Asian crisis. Griffin et al (2002) use a theoretical model and empirical analysis to show that global stock return performance is an important factor in understanding

equity flows. Richards (2002) using data for daily net purchases by foreigners in six Asian emerging equity markets over 1999-2001 gives strong evidence of positive – feedback trading with respect to domestic, US and regional equity returns.

As against the existing empirical literature that concentrates largely on stock / firm level analysis, our study has broader coverage. It attempts to analyze aggregate trading by FIIs in India rather than stock level trades of individual investors. Further, keeping in view the greater possibility of homogeneity of trading behavior in one group, our analysis includes all the FIIs rather than one subset of FIIs as has been the case in earlier studies relating to feedback trading and herding.

III. Theoretical Foundations

Positive feedback trading pattern can result from extrapolative expectations about prices, from stop – loss orders i.e. automatic selling when the price falls below a certain point, from forced liquidations when an investor is unable to meet her margin calls or from portfolio insurance investment strategy which calls for selling stocks when the price falls and buying it when the price rises.

Our analysis on positive feedback trading tests the hypothesis that net equity demand by FIIs is driven by recent returns in the equity market of the host country. This can be viewed as a general exploration of the Brennan and Cao (1997) model that suggests that net inflows should be a linear function of returns across equity markets. This model explains why flows would depend on returns in contrast with the more often discussed and tested, mean –variance model that produces no flows because of changes in asset prices. A brief outline of the Brennan and Cao (1997) model on international portfolio investment followed by the model specification for the present analysis is given below.

The Brennan and Cao Model

The optimal trading strategy of the individual investor *i* is given by

$$\nabla \widetilde{D}_t^i \equiv \widetilde{D}_t^i - \widetilde{D}_{t-1}^i = r\left[S_t^i(\widetilde{Z}_t^i - \widetilde{P}_t) - S_t(\widetilde{U} - \widetilde{P}_t) + \frac{\widetilde{X}_t}{r} - \sum_{j=0}^{t-1}(S_j^i - S_j)\nabla \widetilde{P}_t \right], \ldots\ldots. (1)$$

$$where \nabla \widetilde{P}_t \equiv \widetilde{P}_t - \widetilde{P}t - 1$$

Equation (1) shows that the trading strategy of investor i in period t depends on:

- the difference between his vector of private signals in period t **(Zt)** and the vector of prices, $\widetilde{P}_t$, weighted by his private signal precision matrix, S_t^i,
- the difference between the vector of the average private signal, $\widetilde{U}$, and the vector of prices, $\widetilde{P}_t$**,** weighted by the average private signal precision matrix, S_t,
- the vector of supply shocks due to new liquidity traders in session $\widetilde{X}_t$,
- the vector of price changes, $\nabla \widetilde{P}_t$, weighted by the difference between the investor's private signal precision matrix and the market average precision matrix, $S_j^i - S_j$, accumulated for all sessions up to session $t-1$.

Since the econometrician observes neither the supply shock nor the private signals, it is convenient to consider the expected trade of investor i conditional on the vector of price changes at time t, $\nabla \widetilde{P}_t$**.**

The conditional expected trade vector might be written as:

$$E[\nabla \widetilde{D}_t^i \mid \nabla \widetilde{P}_t] = r[\omega_t^i \Gamma_t \nabla \widetilde{P}_t + E[\widetilde{X}t / r \mid \nabla \widetilde{P}_t] - \Omega_t^i \nabla \widetilde{P}_t]$$

where

$\omega_t^i = S_t^i - S_t$, the marginal informational (dis)advantage of investor i arising from private signals received at time t

$\Omega_t^i = \sum_{j=o}^{t} \omega_j^i = K_t^i - K_t$, the cumulative informational (dis)advantage of the investor arising from all the private signals received up to time t.

$$\Gamma_t = Cov[\widetilde{U} - \widetilde{P}_{t-1}, \nabla \widetilde{P}_t] Var^{-1}[\nabla \widetilde{P}_t]$$

The following simple results can be obtained in a single security setting:

$\Gamma_t > 0$ so that the trades of an investor with no cumulative information advantage (Ω_t^i = 0), but with positive marginal information advantage (ω_t^i > 0), will be positively correlated with the current price change; the trades of an investor with a positive cumulative information advantage $(\Omega_t^i > 0)$, but with no marginal information advantage $(\omega_t^i = 0)$, will be negatively correlated with the price change in the current period.

Thus the relation between the trades of well and poorly informed investors and price changes is critically related to the extent to which the information (dis)advantage arises from a marginal private information advantage in the current period, or from an accumulation of superior private information signals in the past. To derive testable implications from the model it will be necessary to make an assumption about the relative magnitudes of the cumulative and marginal information advantages of domestic investors.

To develop the implications of the model for international portfolio investment, consider a setting in which there are M countries indexed m. The market portfolio of each country is treated as a single risky asset, currency risk is ignored and assume that investors in all countries have access to the same riskless asset whose return is zero.

Let μ^m denote the measure of domestic investors in country m. Then, from equation (2), the vector of conditional expected trades by investors in country m is given by:

$$E[\nabla \widetilde{D}_t^i \mid \nabla \widetilde{P}_t] = r[\omega_t^i \Gamma_t \nabla \widetilde{P}_t + E[\widetilde{X}t / r \mid \nabla \widetilde{P}_t] - \Omega_t^i \nabla \widetilde{P}_t] \text{.....(3)}$$

Assuming that the contribution of noise traders in country m to the aggregate supply shock, $\widetilde{X}_t$, is $\mu^m \widetilde{X}_t$. Then, adding the trades on noise traders to those of the (rational) investors, and dropping the time subscript, the expectation of the vector of aggregate security purchases by all individuals in country m (including noise traders), $\widetilde{\Pi}^m$, conditional on the vector of prices changes, $\nabla \widetilde{P}$, is

$$\mathrm{E}\left[\widetilde{\Pi}^m \mid \nabla \widetilde{P}\right] = \Theta^m \nabla \widetilde{P} \qquad (4)$$

where

$$\Theta^m \equiv r\left[\omega^m \Gamma - \Omega^m\right], \qquad \omega^m \equiv \int_{i \varepsilon m} \omega^i di, \qquad \Omega^m \equiv \int_{i \varepsilon m} \Omega^i di$$

Equation (4) implies that portfolio flows can be written as a linear function of price changes in the M market portfolios plus an orthogonal error term. If there are no differences in information precisions across countries, then $\omega^m = \Omega^m = 0$ and portfolio flows will be independent of market returns. If there are differences in information endowments, the conditional expectations of portfolio flows will be linearly dependent on the vector of price changes[2].

[2] Allowing for lagged decision making by foreign investors, the flows may be expressed as a linear function of recent returns.

It may be noted that Brennan and Cao predict a positive relationship between flows and recent returns on the assumption that the information of the locals is the result of a gradual process of superior information acquisition rather than of periodic large information leakages to locals. A negative relation is possible if neither investor has a cumulative information advantage, but locals have a marginal informational advantage (i.e. better access to news).

Based on equation (4) above we specify the model for the present analysis. The portfolio inflows i.e. net purchases of stocks by FIIs (NFIIP) is modeled as a function of recent returns on the market portfolio of only one country i.e. the host country. Our model specification is thus as follows:

Model Specification

$$NFIIP_t = \gamma R_{t-1}$$

Where

$NFIIP_t$ denotes net equity purchases by FIIs at time t.

R_{t-1} denotes returns in the previous period. As our analysis is restricted to one country, i.e. India, the FII equity demand is modeled as a function of the returns on the market portfolio (index) of India as represented by R_{t-1}.

$\gamma>0$ refers to the case of positive feedback traders. $\gamma<0$ indicates a case of negative feedback trading. The negative feedback trader exhibits a "buy low, sell high strategy" Negative feedback trading can result from profit taking as markets rise or from investment strategies that target a constant share of wealth in different assets.

If indeed the trading by foreign investors is related with returns, there are several views as to whether this reflects the informational advantage or disadvantage of foreign investors. Further there are differing views on the possible creation of price pressure,

herding bias and destabilizing effects of trading by FIIs. Some theoretical rationales that have been developed to explain the herding bias in investor trading are as follows:

Reputational Herding[3], investors may disregard their private information and trade with the crowd due to the reputational risk of acting differently from other managers (Scharfstein and Stein (1990)).

Investigative Herding, managers may trade together simply because they receive correlated private information, perhaps from analyzing the same indicators (Froot, Scharfstein and Stein (1992)) and (Hershleifer, Subrahmanyam and Titman (1994)).

Informational cascades- managers may infer private information from prior trades of better-informed managers and trade in the same direction (Bikchandani, Hershleifer and Welch (1992)),

Institutional investors may share an aversion to stocks with certain characteristics, such as stocks with lower liquidity or stocks that are less risky (Falkenstein 1996).

While there exist several alternative rationales to explain herding, there is not, to our knowledge, any theoretical model that takes into account these alternative rationales to derive explicit predictions regarding herding by different groups of investors. Pioneering empirical work to quantify herding has been undertaken by Lakonishok, Shleifer and Vishny (LSV 1992) and Wermers (1999). We follow both LSV and Wermers to measure the extent of herding by FIIs in India.

[3] In *The General Theory*, John Maynard Keynes (1936 pp. 157-58) expresses skepticism about the ability and inclination of "long term investors" to buck market trends and ensure efficient investment. In his view, investors may be reluctant to act according to their own information and beliefs, fearing that their contrarion behavior will damage their reputation as sensible decision makers

IV. Data

Basic Data

The analysis is undertaken using daily data. Daily data give more precise results and are better able to capture the lead – lag dynamics between net equity purchases by FIIs and equity returns. However as a longer series on both the equity returns and the FII equity purchase and sales with a monthly frequency is available some results based on monthly data are also presented to gain further insight into the trading behavior of FIIs based on long horizon returns[4]. The average of the daily closing values of the price index is used to arrive at the monthly data.

The returns are calculated for the sensex. Sensex was a natural choice for inclusion in the study, as it is the most popular market index and widely used by market participants for benchmarking.

Returns are proxied by the log difference change in the price index.

$$R_t = log\ P_t - log\ P_{t-1}$$

R_t = return at time t

P_t, P_{t-1} = closing value of the stock price index at time t, t-1.

Days when there is no trading are omitted and the price change is calculated from the last day the market was open. Local currency returns are used[5].

Data on FII equity purchases and sales on daily and monthly basis for our reference period are used. This is as available from the Securities and Exchange Board of India (SEBI).

[4] Weekly data was also analyzed. The results are not reported as they were not significantly different from those for monthly data.

[5] Typically, local market securities settle in local currency.

Sample Period

In the daily analysis we are constrained by the availability of data. Daily data on FII equity purchase and sales are available from January 2000 to December 2002. January 2000 to December 2002 is therefore our reference period for the daily analysis. On a monthly basis, however data for both the sensex and the FII equity purchase and sales is available from January 1994 to December 2002 and so the analysis on the monthly basis is undertaken for this reference period. A further sub sample analysis is undertaken for the monthly data. The sub samples are drawn as per an endogenous break date analysis for the total turnover series to examine if the FIIs alter their trading strategies when the total turnover series reveals a structural break. For herding, the sub samples are identified to examine if the FIIs reveal excess herding in times of pressure (a financial crisis in the region i.e. the East Asian crisis) in the stock market.

Descriptive statistics

A brief summary of the descriptive statistics for net equity purchases by FIIs and the equity returns in the Indian stock market over 2000 – 2002 are presented in the Appendix. Data on the autocorrelation structure of daily net equity purchases by FIIs and trading imbalance (normalized excess purchases) and daily returns upto five lag periods are also presented. The extent of predictability in daily net equity purchases by FIIs is positive but small. The positive autocorrelation could be on account of investors responding to new information in the same direction but with different speeds or simply because some investors establish positions slowly. The first order autocorrelation is .16 for the trading imbalance and .26 for excess equity purchases and this falls over subsequent periods. The median autocorrelation in net daily equity purchases by FIIs is .05. The first order autocorrelation in returns is even lower and turns negative at lag two. Median autocorrelation in daily net returns is very small (-.0190) and negative.

V. Empirical Analysis

Our empirical analysis comprises three parts. In part one we examine if trading by FIIs reveals any trends of positive feedback trading. In part two we examine if there is evidence of herding by the FIIs. In the last part we analyze the destabilizing impact, if any, of the FII trading strategies on stock prices in India.

V.1 Positive Feedback Trading

Positive feedback trading describes the strategy of rushing in when the markets are booming and rushing out when the markets are on the decline. Hence it predicts a relation between the past performance of the market (as indicated by the value of the market index) and the current FII investment. Based on the model specified in section III we estimate the following regression[6] :

$$TRIM_t = \gamma R_{t-1} + \varepsilon_t \quad \text{.....(V.1)}$$

where

TRIM, the dependent variable is defined as normalized trading imbalance of FIIs i.e. excess purchases normalized by total trade undertaken by FIIs at time t
TRIM is conditioned on the sign of the market return of the previous day (R_{t-1}), the same day (R_t) and the day after (R_{t+1}).

$\gamma > 0$ indicates positive feedback trading

$\gamma < 0$ indicates a case of negative feedback trading

The model as in equation (V.1) is estimated and then analyzed in three stages as follows:

[6] Our regressions provide no test for informational advantage or otherwise that the FIIs may have.

i) Static Analysis

As a first step to estimating the bivariate model in equation (V.1) we do a Granger –causality test. Granger causality test is used to eliminate the possibility of a simultaneity bias in the model. Our results for the test show that market returns Granger-cause future foreign investment flows in India. Thus ensuring one way causality in the model we proceed with checking for the presence of a unit root in the two variables. Both the Augmented Dickey Fuller (ADF) and Philips - Perron (PP) tests confirm that variables, TRIM and Ret., are stationary. The model is then estimated under OLS assumptions.

ii) A Dynamic analysis using a VAR model

$$\begin{bmatrix} R_t \\ TRIM_t \end{bmatrix} = \alpha + \beta(L) \begin{bmatrix} R_{t-1} \\ TRIM_{t-1} \end{bmatrix} + \in_t$$

Where L indicates the lag structure[7].

The above specified VAR[8] system is used to analyze the impact of innovations in returns on trading imbalance. For this we specify the channels of causality using the standard "identification by ordering" methodology. The channel of causality is as established from the results of the Granger – causality test. The Impulse Response Functions (IRFs) so generated allow us to trace the time path of the impact of shocks on the variables contained in the VAR.

iii) As the flows are somewhat predictable, it might only be the unexpected or surprise component of flows that is related to lagged returns. To test for this a series of unexpected trading imbalance (UTRIM) on day t is constructed. Unexpected TRIM was derived as actual imbalance less expected flows. Both the

[7] We estimate the model with two lags as determined by the AIC and SBC criteria.
[8] As both the variables are stationary the VAR model is estimated in levels.

static and dynamic specifications are re-estimated with the unpredictable component of trading imbalance as the dependent variable. Specifically we ask the question: do returns predict flows over and above the predictions of lagged flows?

Results:

Static Model

The results of the Static estimation of equation (V.1) using both TRIM and UTRIM as dependent variable are shown below in Table V.1:

Table V.1

Dependent Variable Normalized Trade Imbalance	**Independent variables**		
	R	**R (-1)**	**R(+1)**
TRIM	.5309 (1.0052)	3.49 (6.8159)*	.936 (1.7735)
UTRIM	.6568 (1.2779)	3.62 (7.2785)*	1.06 (2.0686)

Figures in parentheses are t ratios

* Significant at .5%

A significant and positive relation between lagged daily returns and trade imbalance is observed. There is strong evidence that FIIs have been positive feedback traders at the aggregate level tending to buy following good news in the equity market in India. With UTRIM as dependent variable the results remain unchanged. A highly significant indication of the unexpected component of the variable TRIM following lagged returns is observed.

The similarity of results for both the regressions using TRIM and UTRIM as dependent variables could be on account of a very small predictable component in both the series. As indicated in section IV the extent of autocorrelation at lag one is only 16 per cent for TRIM and 26 per cent for net purchases.

The static regression analysis has also been undertaken for the monthly data[9] and the results are as shown in Table V.2 below:

TABLE V.2

Dependent variable: Normalized Trade Imbalance TRIM	**Independent variables**		
	R	**R (-1)**	**R(+1)**
1994:02 2002:07	.514 (1.0284)	.177 (.3513)	.633 (1.2354)
1994:02 1998:02[10]	1.146 (1.1356)	.67 (.6429)	1.0327 (1.0027)
1998:03 2002:06	-.047 (-.1794)	-.237 (-.903)	.276 (1.0486)

Figures in parentheses are t ratios

There is no indication of positive feedback trading in monthly data. For monthly data on the unpredictable component of trading imbalance (UTRIM) there is no indication of positive feedback trading at all[11]. On a monthly basis the series of TRIM are

[9] Exogeneity of variables for monthly data is established using Granger causality and Hausman test. The results of the latter are presented in the Appendix.

[10] For monthly data the analysis is carried out for the full sample and two sub periods. The sub periods are classified by an endogenous break date analysis. We carry out this structural break test for total turnover series. The test yields 1998:02 as indicative of a break in the total turnover series. We then proceed to examine if the structural break in the FII turnover is accompanied by a change in their trading strategies also.

[11] Results not presented here but available with the author.

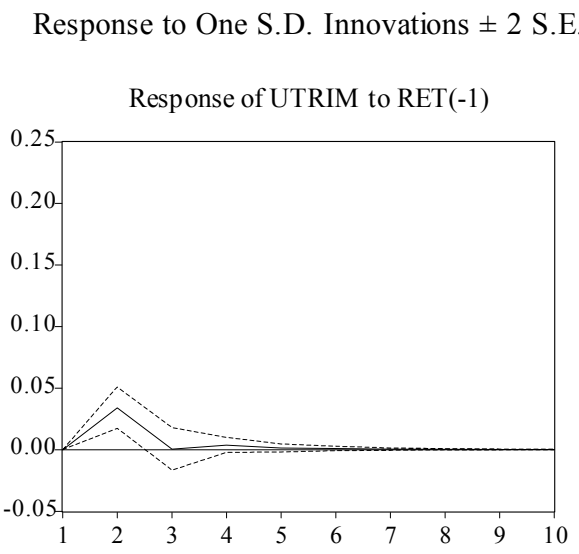
highly autocorrelated. It is possible that the FII investment is not led by returns, that is the FIIs are not indulging in return chasing but is led by their own trade on a monthly basis.

From the static regression estimation results we can conclude that FIIs buy following high previous day stock returns but respond very little with respect to previous month stock returns

Dynamic Analysis (VAR)

The graphs for the Impulse Response Functions (IRFs) as generated by the bivariate VAR model are shown in Figures 1 and 2 for lagged daily returns and lagged monthly returns respectively. The response of TRIM to one S.E error shock to returns on the previous day is sharp, significant but short lived. For the unexpected flows the lagged returns are highly significant and the impact as seen through the Impulse Response graphs trace a very sharp response of the UTRIM to lagged returns. The impact however dies very soon. For monthly returns no significant feedback trading is observed

Figure 1: Response to a Shock to Lagged Daily Returns



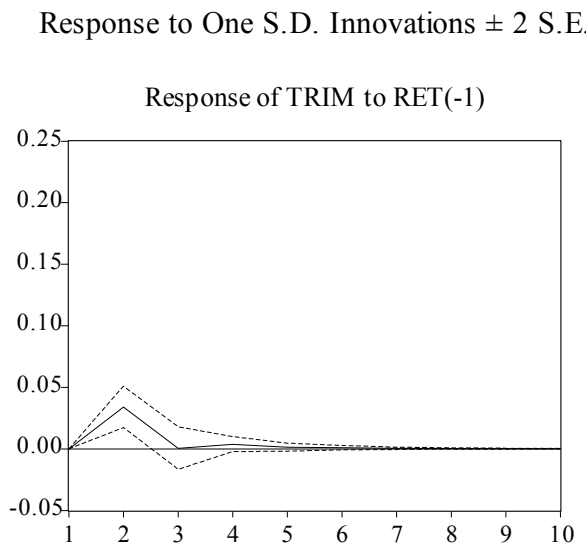
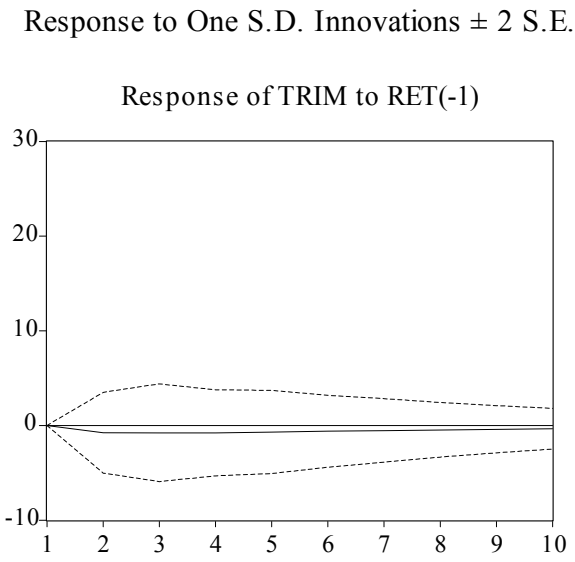
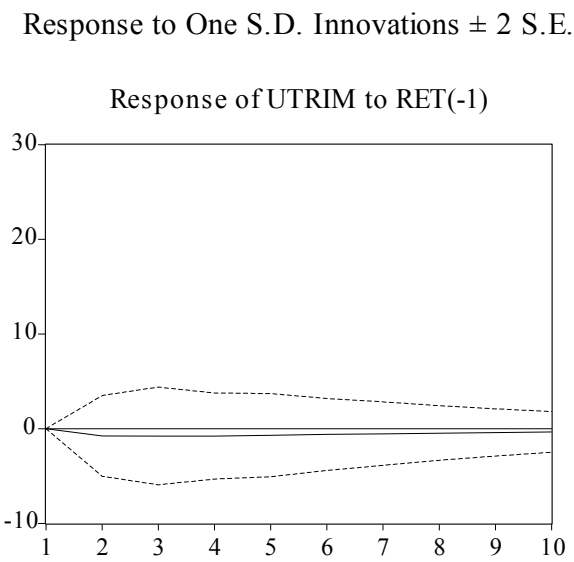


Figure 2: Response to a Shock to Lagged Monthly Returns





The analysis using the VAR model reinforces our conclusion from the static estimation i.e. FIIs undertake significant positive feedback trading in relation to lagged daily returns.

As the data reveals a strong tendency for the FIIs to indulge in positive feedback trading over short horizons, we examine further if the FIIs show a herding bias in their trading behavior. Before doing so, we briefly recapitulate our conclusions of the analysis on positive feedback trading by FIIs in the Indian equity market.

Positive Feedback Trading: Conclusions

- There is strong evidence that FIIs have been positive feedback investors at the aggregate level on daily basis.
  - FIIs in India are "return chasers" and/or "momentum traders"
- A shock to current returns increases flows significantly but the impact is short-lived
- The trend chasing - momentum trading characteristic of the FIIs meets the more stringent test as well

- Lagged daily returns help in predicting daily flows over and above the predictability of past flows

- FIIs do not follow their own daily trade. This is evident from the low predictable component FII net equity purchases by FIIs.
- Popular financial press hypothesis of flows impacting returns does not hold true for India
- The trading Horizon of FIIs is possibly a day and not a month

V.2 Herding

In this section we evaluate the extent to which the FIIs herd. Herding or correlated trading refers to a tendency for a particular investor group's trade to accumulate on one side of the market or the other without regard to direction.

Measurement of Herding

We assume that the market comprises of two groups of traders, foreign investors and domestic investors. We calculate herding from the foreign investor's perspective. We follow the measure proposed by Lakonishok, Shleifer and Vishny [LSV (1992)] and Wermers (1998) to investigate the extent of herding by FIIs in India. The LSV measure is as follows:

$$HM = | p(t) - E[p(t)]| - E| p(t) - E[p(t)]| \quad \text{..... (V.2)}$$

where

p (t) is the proportion of "buy" trade by FIIs on day t.

E| p (t)-E[p (t)] | is the adjustment factor to allow for random variation around the expected proportion of "buys" under the null hypothesis of independent trading decisions by FIIs. The adjustment factor assumes that p(t) follows a binomial distribution with the probability E[p(t)] of success. For E[p (t)] a proxy that is the average "buy" trade during the entire period of reference is used.

Implicitly equation (V.2) defines and measures herding as the tendency of a subgroup of investors to trade a given stock (in our case stock index) together and in the same direction, more often than would be expected by investors trading randomly and independently[12]. The average of HM over the entire sample period gives the extent to which FIIs herd in India. A positive and significant HM[13] is evidence of herding by FIIs.

Modified Herding Measure

We also use a modified herding measure (Wermers-1999) to examine if in a particular period the FIIs were buying (or selling) in a proportion greater than the average trade during that period. For monthly data this conditional measure is further examined for a time period of excessive pressure (financial crisis in the region – East Asian crisis) to see if the trading pattern by the FIIs in this period is any different from the other "more normal" time period. The relation between the conditional and unconditional measure is as follows:

Buy Herding Measure: $BHM(t) = HM(t)|p(t) > E[p(t)]$

Sell Herding Measure: $SHM(t) = HM(t)|p(t) < E[p(t)]$

Average of BHM and SHM will reveal if the FIIs herd into or out of the Indian stock market at any time point. In computing these measures we are assuming that each trade is originating from different institutional investors. It is possible otherwise that herding may be on account of the same investor executing multiple trades. We however do not have data to this level of detail and hence the assumption.

[12] The LSV measure uses only the number of investors on the two sides of the market, without regard to the extent of trade that they indulge in, to assess the extent of herding. In situations where, if the buyers and sellers on either side are same in number but one side exceeds the other in terms of its trade (i.e. buy or sell imbalance) the LSV measure may not be able to capture herding even though it may exist in the market. We hope to correct for this deficiency in the LSV measure as we use the trade (buy) imbalance rather than the number of FIIs on either side of the market.

[13] The herding measure may be thought of as a measure of dispersion.

We compute the herding measure using daily and monthly horizon. The results for the herding measures are presented in Table V.3 below.

Results:

Table V.3: Herding Measures (%)

	LSV Herding Measure (%)	Conditional HM (%)	
		BHM	**SHM**
Daily (full sample)	9.41	9.04	9.82
Monthly (full sample)	14.72	14.31	15.16
Sub period (EA crisis)	13.31	6.79	20.97
Pre sub period	24.02	22.6	26.5

Daily data extends from January 4, 2000 to December 30, 2002.
Monthly data extends from January 1994 to December 2002
EA crisis sub period is defined as July 1997 to December 1998.

Both daily and monthly data indicate herding. Herding by foreign investors on a daily basis averages 9.41 per cent[14]. This implies that the extent to which trade by FIIs accumulates on one side of the market is 9.41 per cent higher than the expected had the FIIs trade been independent and random. For monthly data the HM measure is higher at 14.72. The higher HM for the monthly time period may imply that not all FIIs that move together do so on the same day.

While daily and monthly HM do not reveal any significant difference in the buy and sell side herding, even though there is a sell side bias in herding it is not very significant. This however becomes very significant in times of pressure in the region as revealed by our monthly data results for the sub - period coinciding with the East Asian crisis. The sub - period shows a distinct pattern of heavy sell side herdingin comparison

[14] Note that this HM value is more than that reported by Kim and Wei (2002) and Bonser – Neal et al(2002) for pre crisis Korea and Indonesia respectively.

with the buy side herding during a crisis in comparison with HM prior to the pressure period. There is a spectacular fall in the HM from pre crisis to crisis period on the buy side and the fall though not as spectacular as for the buy side is also observed on the sell side. This could be due to a differential reaction of the investors or because of lack of liquidity of markets as crisis evolved. It is easier for investors to trade on the same side if the liquidity is high than when the markets dry up.

The results indicate that foreign investors have a tendency to herd in the Indian equity market even though they all may not do it on the same day. In times of pressure in the stock market, on account of a financial crisis in the region there is excessive sell side herding even though the extent of herding on the average and on either side of the market during a crisis may be lower than that in the immediately preceding period

V.3 Destabilizing?

In the previous sections, we find evidence that foreign investors engage in herding and positive feedback trading strategies in the Indian stock market. There has been considerable debate on whether such trading strategies have adverse impacts on the financial markets of emerging market economies. Neither positive feedback trading nor herding may necessarily be destabilizing. The concern about positive feedback trading however is that it makes stock prices overshoot to new information. Consequently, if trades by FIIs destabilize markets, we would expect large sales (buys) by FIIs that decrease (increases) prices to be followed by further price declines (increases).

On examining the data we observe that the days of "buy" imbalance follow positive index returns, so that FIIs buy following price increases. The price increase usually does not continue after the purchase by FIIs. In fact same sign (to the trade imbalance) contemporaneous returns are also not observed. The reverse holds true for "sell" imbalances. In case of events where price increase persists the returns are insignificantly different from zero. This implies that even though trading by FIIs reveals

trend -chasing behavior there is no consequent persistent impact on prices or returns in the market.

To investigate further if FIIs have a destabilizing effect on the equity market in India, we use the event study methodology. We select days of largest buy order and sell order imbalance. For each of the selected events we examine abnormal returns (based on constant mean return model) from the preceding five (-5) to the following five (+5) days. In Table VI.1 below we present the returns and abnormal returns for one such event.

Table Vl.1

	Days Relative to the FII Trade Imbalance (Day 0)										
	-5	-4	-3	-2	-1	0	1	2	3	4	5
"Sell"											
Raw Returns	-0.03	0.004	-0.007	-0.003	0.011	0.009	0.019	0.001	-0.012	0.019	0.024
AR	-0.015	0.029	0.018	0.022	0.014	0.034	0.026	0.013	0.006	0.006	0.044
"Buy"											
Raw Returns	-0.005	-0.001	0.034	0.002	0.016	0.006	-0.005	0.006	-0.001	0.007	0.001
AR	-0.014	-0.01	0.025	0.007	-0.007	-0.003	-0.04	-0.003	-0.01	-0.002	-0.002

In general, on a day of positive net buy order imbalance the abnormal returns show a negative sign while the reverse is true of the days of net sell order imbalance. The FIIs therefore do not appear to have a destabilizing influence on stock prices.

VI. Conclusions

In this paper daily and monthly data has been analyzed to explore the trading behavior of FIIs and the impact of their trading biases upon stock market stability. It is found that there is strong evidence that FIIs have been positive feedback investors and trend chasers at the aggregate level on a daily basis. However, there is no evidence of positive feedback trading on a monthly basis. There are almost no joint dynamics between long horizon returns and net equity purchases. The results of our analysis also indicate that foreign investors have a tendency to herd on the Indian equity market even though they all may not do it on the same day. In times of pressure in the stock market on

account of a financial crisis in the region there is excessive sell side herding even though the extent of herding on the average and on either side of the market during a crisis may be lower than that in the immediately preceding period. On investigating the impact of trading imbalance across days we do not find any significant evidence that would make it possible to attribute equity market instability to FIIs.

Appendix

I. Summary Statistics: 2000-2002

Variable	**Mean**	**Median**	**S.D.**	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
TRIM	0.056838	0.070316	0.24226	0.169	0.149	0.132	0.105	0.07
RET	-0.000652	0.000473	0.017237	0.071	-0.015	-0.034	0.035	-0.011
NFIIP	30.85261	21.10	132.508	0.261	0.203	0.181	0.133	0.035

II. Stationarity

Unit Root Tests

TRIM

Test	t statistic	Critical value	Inference(1%)
ADF	-9.821	3.4417	No unit root
PP	-21.8323	3.4417	No unit root

Ret

Test	t statistic	Critical value	Inference(1%)
ADF	-12.1304	3.4417	No unit root
PP	-25.3946	3.4417	No unit root

III.A. Exogeneity

Granger Causality tests

Null Hypothesis	F statistic	Critical Value	Inference
TRIM does not Granger cause Ret	4.27	6.68	Not reject
TRIM does not Granger cause Ret	31.24	6.68	Reject

The inference is drawn at 1 per cent level of significance but is valid at 5% also.

III.B. Hausman Test

Variable	Coefficient	t-statistic
C	3.80	.6799
Ret	421.85	.2954
Resid. Ret	-362.17	-.2543

References

Bekaert, Geert and Campbell R. Harvey, 2003. 'Emerging Markets Finance', *Journal of Empirical Finance* 10, 3-55.

Bikhchandani, Sushil, David Hirshleifer, and Ivo Welch, 1992, 'A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades', *Journal of Political Economy* 100, 992-1026.

Bohn, H., and L. Tesar, 1996, 'U. S. Equity Investment in Foreign Markets: Portfolio Rebalancing or Return Chasing?', *American Economic Review* 86 (2), 77-81.

Bonser-Neal, C, Steven L. Jones, David Linman and Robert Neal, 2002, Herding, Feedback Trading and Foreign Investors. Indiana University.

Brennan, M., and H. Cao, 1997, 'International Portfolio Investment Flows', *Journal Of Finance* 52, 1851-1880.

Chakrabarti, Rajesh, FII Flows to India: Nature and Causes, Georgia Institute of Technology.

Choe, Y., B. C. Kho, and R. M. Stulz, 1998, 'Do Foreign Investors Destabilize Stock Markets? The Korean Experience in 1997', *NBER Working Paper* 6661, NBER Cambridge M A.

Choe, Y., B. C. Kho, and R. M. Stulz, 1998, 'Do Domestic Investors Have More Valuable Information about Individual Stocks than Foreign Investors?', *NBER Working Paper* 8073

Claessens, Stijn, Susmita Dasgupta and Jack Glen. 1995, 'Return Behavior in Emerging Stock Markets', *World Bank Eonomic Review* (January) 131-151.

Clark, J., and E. Berko,1997, 'Foreign Investment Fluctuations and Emerging Market Stock Returns: The Case of Mexico', *Federal Reserve Bank of New York, Staff Reports* 24.

Dornbusch, R. and Y.C.Park, 1995, 'Financial Integration in a Second Best World: Are We Sure About Our Classical Prejudices', in R. Dornbusch and Y.C. Park, eds., *Financial Opening: Policy Lessons for Korea*, Korea Institute of Finance, Seoul, Korea.

Froot, K., O' Connell, P., and M. Seasholes, 2001, 'The Portfolio Flows of International Investors', *Journal of Financial Economics* 59, 151-193

Froot, Kenneth A., David S. Scharfstein, and Jeremy C. Stein, 1992, 'Herd on The Street: Informational Inefficiencies in a Market with Short-Term Speculation', *Journal of Finance* 47, 1461-1484.

Gooptu, Sudarshan. 1993, 'Portfolio Flows to Emerging Markets, in Portfolio Investment in Developing Countries', *World Bank Discussion Paper* ed. by Stijn Claessens and Sudarshan Gooptu (Washington: World Bank).

Grinblatt, M., S. Titman and R. Wermers, 1995, 'Momentum Investment Strategies, Portfolio Performance, and Herding', *American Economic Review* 85, 1088-1105.

Griffin John M., F. Nardari and Rene M. Stulz, 2002, 'Daily Cross Border Equity Flows: Pushed of Pulled?' *NBER Working Paper* 9000.

Hamao, Y., and J. Mei. 2001, 'Living with the "Enemy": An Analysis of Investment in the Japanese Equity Market', *Journal of International Money and Finance* 20: 715-730

Hirshleifer, David, Avanidhar Subrahmanayam, and Sheridan Titman, 1994, 'Security Analysis and Trading Patterns when Some Investors Receive Information Before Others', *Journal of Finance* 49, 1665-1698.

Hirshleifer, David and Siew Hong Teoh, 2001, 'Herd Behavior and Cascading in Capital Markets: A Review and Synthesis', *Working Paper, Ohio State University.*

Howell, Michael J. 1993, 'Institutional Investors and Emerging Stock Markets, in Portfolio Investment in Developing Countries', *World Bank Discussion Paper* ed. By Stijn Claessens and Sudarshan Gooptu (Washington: World Bank).

Kim, W., and S.Wei, 2002, 'Foreign Portfolio Investors Before and During A Crisis', *Journal of International Economics* 51, 77-96.

Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny, 1992, 'The Impact of Institutional Trading on Stock Prices', *Journal of Financial Economics* 32, 23-44.

Nofsinger, John R. and Richard W. Sias, 1999, 'Herding and Feedback Trading by Institutional and Individual Investors', *Journal of Finance*, 54, 6, December 2263-2295.

Richards, Anthony, 2002, 'Big Fish in Small Ponds: The Momentum Investing and Price Impact of Foreign Investors in Asian Emerging Equity Markets', Reserve Bank of Australia and IMF.

Samal, Kishore C., 1997. Emerging Equity Market in India: Role of Foreign Institutional Investors, *Economic and Political Weekly*, October 18, 2729-2732.

Scharfstein, David S. and Jeremy C. Stein, 1990, 'Herd Behavior and Investment', *American Economic Review* 80, 465-479.

Seasholes, M., 2001, 'Smart Foreign Traders in Emerging Markets', *Unpublished working paper, University of California, Berkeley.*

Sias, Richard W., and John R. Nofsiger, 1998, 'Herding and Feedback Trading by Institutional and Individual Investors', *Unpublished working paper, Washington State University.*

Sias, Richard W., and Laura T. Starks, 1997, 'Return Auto-correlation and Institutional Investors', *Journal of Financial Economics* 46, 103-131.

Sias, Richard W., 2001, 'The Behavior of Institutional Investors: Tests for Herding, Stealth Trading, and Momentum Trading'.

Warther, V., 1995, 'Aggregate Mutual Fund Flows and Security Returns', *Journal of Financial Economics.*

Wermers, Russ, 1999, 'Mutual Fund Herding and The Impact on Stock Prices', *Journal of Finance* 2, 581-622.