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Evidence from India

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Foreign Fund Flows and Stock Returns: Evidence from India*

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Foreign Fund Flows and Stock Returns:

Evidence from India

Abstract

We study the impact of foreign institutional investor (FII) flows on stock returns in India. We exploit stock-level daily trading data for FII purchases and FII sales to separate stocks into those experiencing abnormally high and low FII flow innovations. We find that stocks with high innovations are associated with a coincident price increase that is permanent, whereas stocks with low innovations are associated with a coincident price decline that is in part transient, reversing itself within one week. The differential abnormal return between high and low innovation stocks is nevertheless significant, both statistically and economically (relative to stock return volatility), largely unrelated to firm characteristics and increasing during periods of market stress. Our findings are robust in out-of-sample tests. The results are consistent with price "pressure" on stock returns induced by FII sales, as well as information being revealed through FII purchases and FII sales.

Keywords: Foreign Institutional Investors, Foreign Ownership, Portfolio Flows, Price Impact, Volatility.

"*Over time, we have to figure out how much we want to sort of expose ourselves to those relatively short-term flows ...*"

- Raghuram Rajan, Governor, Reserve Bank of India (RBI), February 3, 2014.[1]

"*The principal risk facing India remains the inward spillover from global financial market volatility, involving a reversal of capital flows*."

- IMF Country Report, February 2014.[2]

As suggested in the above two quotes, policy makers are concerned about the *real* effects of cross-border capital flows. Recent evidence seems to validate this concern. For instance, during the early 1990s, several East Asian countries experienced significant amounts of capital flows into their markets, but subsequently faced a sudden reversal of capital flows in 1997. The currency and stock markets of Indonesia, Thailand, Malaysia, Philippines, and South Korea suffered a major decline due to the flight of capital to safety. Capital-flows reverted back to original levels by 1999. However, during the interim period (1997-1999), the crisis spread from East Asia to Latin America and left many developing countries in a state of recession.

The debate about calibrating the level of capital flows thus rests on gaining a better understanding of the *precise* impact of foreign fund flows on the domestic economy and markets. Not much empirical research has been done to gauge the magnitude as well as the longevity of the impact of capital flows on equity markets. In this study, we examine the case of an emerging market (India) to see how foreign fund flows affect the domestic equity market performance both in terms of magnitude of the immediate impact as well as the permanence of the impact. Our study helps shed light on the tradeoff between information effects and transient volatility effects that arise in the context of global capital flows.

[1] See "Volatility may force a rethink on short-term inflows into government bonds, Shaji Vikraman, ET Bureau Feb 3, 2014, 07.02AM IST.

[2] IMF Country Report No. 14/57, February 2014 (Item No. 46, page 20), http://www.imf.org/external/pubs/ft/scr/2014/cr1457.pdf

Foreign fund flows in and out of Indian stock markets are now a sizeable portion of the market activity. Cumulative net investment flows from foreign institutional investors (FIIs) have exceeded USD 100 billion in the last decade, and FII gross flows account for a significant portion of the daily traded value on Indian exchanges. During the same period FII ownership has averaged around 10 percent (see Table 1). The number of FIIs registered with the Securities and Exchange Board of India (SEBI) increased from 882 in March 2006 to 1757 in March 2013, and FIIs, on average, accounted for 20 to 30 percent of the total turnover traded by FII and non FII traders at the National Stock Exchange of India (see Table 1).

While FII participation in Indian equity markets has been steadily increasing over the last decade, there is a widespread perception that foreign fund flows may be creating substantial volatility in markets, especially during times of market stress. This concern extends more generally to emerging markets given the illiquidity of their equity markets (relative to those of developed markets) for absorbing sudden inflows and outflows of foreign funds. Figure 1 shows the relationship between annual FII net inflows for India and the annualized standard deviation of the daily returns on the benchmark index for Indian equity markets, the CNX NIFTY index, for each fiscal year over the period, 2001-2012. FII net inflows were positive in all years except 2008-09. Figure 1 shows that during the global financial crisis (2008-09), FII inflows turned negative (net outflows of approx. USD 10 billion) consistent with the overall flight to quality of global capital flows. The volatility of the NIFTY is also much higher during this period in comparison to other years, lending casual support for the hypothesis that FII flows may have induced volatility in emerging markets.

If FII flows induce volatility in emerging markets, a natural follow-up question is with regard to the key drivers of these FII flows. Figure 2 shows a ground-level perspective of the relationship between FII flows and macro events in developed countries. We plot the average FII net flows and the Chicago Board Options Exchange Market Volatility Index (henceforth, VIX) indicator on a weekly basis. A broad trend of a negative relationship between FII net flows and VIX levels emerges during the 2008-2010 period. Several events also illustrate the role of global uncertainty on FII flows on short horizon intervals. For instance, the Indian capital market suffered its biggest collapse on 22nd May 2006, exactly at a time when the VIX was exhibiting a

sharp increase, as can be seen in the bottom left corner of the figure. This behavior is again consistent with flight-to-safety. Further, the immediate recovery in FII flows around the same date mirrors a sharp reduction in VIX, suggesting not only that global risks are an important factor in Indian capital markets but also that the FII flows are a critical channel of contagion across international markets. In similar vein, the flash crash in Indian capital markets on 6th May 2010 happened soon after a critical credit rating downgrade of Greece on April 27th 2010. Interestingly, the variation in FII flows is also driven by local India related events, as seen in the spikes in FII flows on 26th November 2008, when the Mumbai terrorist attacks occurred.

Recent research has shed some light on the concerns of policy makers regarding this possible impact of net flows of foreign investors on domestic markets. In particular, studies have examined the extent of transmission of economic shocks from one region to another region of the world. Researchers have also examined whether the associated price pressure effects are permanent or temporary. Coval and Stafford (2007) show that sudden increases (decreases) in fund flows cause mutual funds to significantly adjust their holdings, resulting in price pressure effects, which are transient but can take several weeks to be reversed fully. Jotikasthira, Lundblad and Ramdorai (2012) find that asset fire sales in the developed world affect fund flows to emerging markets.[3] They argue that equity markets in emerging markets are influenced by this "push" factor and that fund flows provide an additional channel of contagion.[4,5]

Given the lack of data at the level of individual stock-level flows by foreign investors, current studies have focused on aggregate flows in and out of the emerging stock markets. While the studies to date have got around this problem by identifying foreign flows that vary over time and can be considered reasonably "exogenous" to the stock-market fundamentals of

[3] Several other studies have examined the impact of aggregate institutional trades on asset returns, e.g., Warther (1995), Edelen and Warner (2001), Goetzmann and Massa (2003), and Teo and Woo (2004). The main conclusion from these studies is that aggregate mutual fund flows affect contemporaneous stock returns.

[4] Jotikasthira, Lundblad and Ramdorai (2013) extend this line of argument by examining the relationship between global fund flows and domestic real economic activity. They find that shocks in fund flows affect investment policy of Chinese and Indian firms.

[5] Anshuman, Chakrabarti, and Kumar (2012) find that during the financial crisis period, the influence of (aggregate) foreign institutional investor (FII) flows on Indian equity markets increases during periods when the U.S. markets experience abnormal returns.

the emerging market, an alternative approach would be to examine the *cross-sectional* return performance of firms within an emerging stock market, affected differentially by foreign fund flows. This article adopts the latter approach by examining how stock returns differ between stocks experiencing foreign fund inflows versus foreign fund outflows. We are able to do this by accessing an exclusive dataset that provides information about FII flows at the individual stock level for the most actively traded stocks in the Indian market during the period 2006-2013.

Exploiting this stock-level daily trading data for FII purchases and FII sales, we separate stocks into those experiencing abnormally high and low FII flow innovations. We employ a "panel regression" approach in which we run a first-pass estimation procedure for predicting FII flows at the stock level based on lagged firm characteristics, FII flows, and market-wide factors. The residuals from this estimation exercise are then used to rank stocks each week to form high and low FII *flow innovation portfolios*.[6] We then study the returns of these portfolios in the pre-formation window (five days), on the portfolio-formation day, and in the post-formation window (five days).

We find that stocks with high innovations in FII flows are associated with a coincident (portfolio-formation day) price increase that is permanent, whereas stocks with low innovations in FII flows are associated with a coincident price decline that is in part transient, reversing itself within one week (see Figure 3). The differential cumulative abnormal return between high and low innovation stocks over a five-day period starting with the formation-day is nevertheless significant, both statistically and economically (relative to stock return volatility).

Our findings are similar to the findings of Coval and Stafford (2007), Frazzini and Lamont (2008) and Lou (2012), who study the impact of mutual fund flows on asset pricing over longer horizons. They conclude that price pressure due to fund flows can cause temporary deviations of stock prices from fundamental values followed by reversals over time. The asymmetric response for the high and low innovation portfolios is similar to the findings in the empirical

[6] Hasbrouck (1988) and Bessembinder and Seguin (1993) point out that the information content of trades can only be weeded out by examining the unexpected component of trading rather than the total amount of trading.

studies of block transactions, e.g., Holthausen et al (1987), Chan and Lakonishok (1993), Keim and Madhavan (1996) and Saar (2001). The prevalent explanation is that block buys are motivated by information whereas block sales are motivated by portfolio rebalancing concerns. Our findings are consistent with this explanation.

Importantly, we find that there is no pre-formation differential abnormal return between the high and low innovation portfolios. Furthermore, the abnormal return differential between the portfolios does not arise due to a difference in their pre-formation firm characteristics (such as volatility, beta or systematic risk, idiosyncratic risk, size, price impact and trading volume).

We then examine if these return differentials can be explained in the time-series by market-wide factors. To this end, we relate the differential abnormal return between high and low FII flow innovation portfolios to time-series changes in portfolio characteristics as well as in market-wide shocks. We find that the differential abnormal return is increasing in global market volatility (VIX) as well as local stock market volatility.

In the overall sample, the high innovation portfolios are associated with a permanent price impact whereas about 40% of the price impact is reversed in the case of the low innovation portfolios. We ask whether these effects are secular across stocks that vary in market capitalization. One can expect that larger stocks, being more liquid, would be more suitable for portfolio rebalancing whereas smaller stocks, being less liquid, would be more suitable for buy and hold strategies. To answer this question, we partition the sample into three sub-samples: large-cap, mid-cap, and small-cap stocks. We find that the magnitude of abnormal return on the high and low innovation portfolios is related to firm size, i.e., it is greater in the case of large cap stocks, lower for mid cap stocks and least for small cap stocks.

Next, we examine the post formation window for both the high innovation portfolio and low innovation portfolio for each size category to see whether the abnormal returns are permanent or transient (i.e., reversed). In large-cap and mid-cap stocks, there is no price reversal for the high innovation portfolio, but there is partial price reversal for the low innovation portfolio. This finding suggest that, in large-cap and mid-cap stocks, abnormal FII

purchases are information based trades whereas abnormal FII sales are partly driven by information and partly driven by portfolio rebalancing motives. For small-cap stocks, however, there is no price reversals for both the high and low innovation portfolios. The absence of price reversal in small-cap stock suggests that FII traders may be wary of portfolio rebalancing in small-cap stocks because of illiqudity concerns (as discussed in Amihud and Mendelson (1986), illiquidity is inversely related to firm size). In other words, both FII purchases and sales in small-cap stock are likely to be information based trades. These findings are consistent with the view that FII trading (purchases as well as sales) in smaller stocks, which are less liquid, is driven by buy-and-hold motives of FII traders. Further, FII purchases in larger stocks are driven by buy-and hold motives, but FII sales in larger stocks, which are more liquid, are partly driven by portfolio rebalancing motives.

We also examine the impact of FII flows during periods of market stress. First, we compare the price impact of FII flows during the crisis period in India (January to December 2008) and during the non-crisis period. During the crisis period, excess FII sales have a greater adverse impact and during the non-crisis period, excess FII purchases have a greater impact. This finding is consistent with portfolio rebalancing being the more dominant channel during the crisis period and information-based trading being the driver of FII flows during the non-crisis period. Second, we segregate the sample into days associated with high VIX and days associated with low VIX relative to the median VIX level in the sample. The impact of FII flows is, in general, higher on days with high VIX as compared to days associated with low VIX. This finding also suggests that there is volatility spillover from the developed markets into emerging markets.

The key results discussed above are robust to alternative test methods. Because FII flows exhibit strong persistence we redefine our measure of FII flow innovations in terms of weekly cumulative innovations rather than daily innovations in FII flows. We find that our basic findings remain unaltered even under this new definition of FII flow innovations. The findings also survive in out-of-sample data (2012-13) in that we find similar price behavior for portfolios with high and low innovations in FII flows as found in in-sample data (2006-11). Finally, we confirm our basic result using a parametric version of our test to exploit the full information in

the sample and find that impact of FII flows is nonlinear and asymmetric for excess FII purchases and excess FII sales.

Overall, our results are consistent with price "pressure" on stock returns induced by FII sales, given the partial reversal of formation-day negative returns for stocks experiencing abnormally high FII outflows. The results are, however, also consistent with information being revealed through FII purchases and FII sales, given the permanent nature of formation-day returns for stocks experiencing abnormal FII flows. In summary, we conclude that while FII outflows contribute to transient volatility for stocks experiencing the outflows, trading by FIIs also generates new information. As suggested in Gromb and Vayanos (2010) and Shleifer and Vishny (1997), the first result suggests "limits to arbitrage" at work when the aggregate risk appetite of global financial firms is low (i.e., in periods associated with high VIX), with liquidity providers (in our setting, the domestic investors in Indian stock markets who purchase stocks being sold by the FIIs) generating excess returns in such states. The second result suggests that as in developed markets (see for instance the seminal work of French and Roll (1986)), in emerging markets too, trading, and in particular, FII trading contributes to the generation of information. These relative effects of foreign fund flows must be balanced against each other while evaluating their desirability for emerging markets.

The rest of the paper is organized as follows. Section I describes the data and methodology used in our analysis. Section II discusses the key empirical results. Section III provides robustness checks. Section IV concludes.

I. Data and Methodology

Our sample period of study is from Jan 1st, 2006 to June 30th, 2013. We use data from Jan 1st, 2006 to Dec 31st, 2011 for an in-sample analysis and the data from Jan 1st, 2012 to June 30th, 2013 for out-of-sample tests. The dataset contains daily purchases and sales of foreign institutional investors (FIIs), daily adjusted closing prices on the most actively traded stocks preferred by FIIs in the Indian economy. The data for our analysis comes from three sources. The first source is a proprietary data of daily stock-wise FII trading obtained from the National

Stock Exchange (NSE); the second source is the Prowess database created by the Center for Monitoring Indian Economy (CMIE) for daily adjusted closing prices of NSE listed stocks; and the third source is www.finance.yahoo.com for data on the S&P500 index and the VIX index of the US market.

To select the sample firms, we first consider all stocks that are part of four broad based indices: the CNX NIFTY index, the CNX JUNIOR index, the CNX MIDCAP index and the CNX SMALLCAP index as on June 28, 2013, in order to exclude stocks that are infrequently traded during the period Jan 2006 to Dec 2011. This filter results in 272 stocks and these stocks represent approximately 88% of the free float market capitalization of all stocks listed on the NSE. We drop 8 stocks for which data on FII flows is missing. We impose an additional filter that requires selected stocks to have at least 250 FII trading days across the entire in-sample period of 2006-2011. This filtration causes 13 stocks to be left out of the sample. Next, we truncate the sample further by imposing some restrictions on outliers. 23 stocks are dropped because they are associated with extreme outliers in beta estimates. 5 stocks are dropped because of missing data on institutional and retail ownership. Further, FII share of trading volume on any trading day is censored at +/- 95% and daily stock returns are censored at +/- 20%. Our final sample data consists of an unbalanced panel of 223 unique stocks with 279,864 stock-day observations.

The data on the benchmark market index, the CNX NIFTY index, as well as the S&P 500 index and the CBOE VIX index are used as follows. The CNX NIFTY index is used to measure the broad market performance in the Indian economy. It is a well-diversified index consisting of 50 stocks across 22 different sectors in the economy. The S&P 500 index and the CBOE VIX index movements help capture the broad global market performance and the "risk-appetite" of the global financial sector, respectively.

I.1 Variable Definitions

Stock returns are defined by continuously compounding the return on daily adjusted closing prices for the i^{th} stock on day t, as follows:

$$RET_{it} = 100 * \ln\left(\frac{P_{it}}{P_{it-1}}\right),$$

where P_{it} is the closing stock price adjusted for splits and dividends, etc., on day t. Similarly, the returns on the NIFTY index are calculated as

$$NIFTY\_RET_t = 100 * \ln\left(\frac{NIFTY_t}{NIFTY_{t-1}}\right).$$

Abnormal returns for the i^{th} stock on day t are defined as excess returns over the expected returns obtained from a CAPM model using 52 prior weekly observations.

$$AB\_RET_{it} = RET_{it} - E(RET_{it}) = RET_{it} - \alpha_i - \beta_i NIFTY\_RET_t$$

We define net FII inflows as the difference between the daily rupee value of purchases (*FII_BUYS*) and daily rupee value of sales (*FII_SELLS*) scaled by the aggregate rupee value of daily FII as well as non-FII trading volume (*RUPEE_VOLUME*).

$$FII\_Net_{it} = \frac{FII\_BUYS_{it} - FII\_SELLS_{it}}{RUPEE\_VOLUME_{it}},$$

where $RUPEE\_VOLUME_{it}$ is the aggregate rupee trading volume on Day t for stock i, i.e., the denominator above includes non-FII trades. The variable *FII_NET* gives an economic measure of the daily net FII flows relative to the total daily rupee trading value.[7]

Table 2 presents a list of variables and the corresponding definitions. The discussion on these variable definitions has been presented at various places in the text, and this table provides a summary. Table 3 presents the descriptive statistics of variables related to firm characteristics, market characteristics and FII trading statistics. The average firm size is 170 billion rupees (nearly $3 billion) and the average (daily) stock return is 0.0202%. During the same period, the average daily returns on the NIFTY index is 0.0333%, and on the S&P 500 index, 0.0014%. The mean βeta of the stocks is 1.00 and the annualized idiosyncratic volatility is 36.16%. The CBOE volatility index (*VIX*) had a mean level of nearly 24 during the sample period. FII daily average purchases (*FII_BUYS*) were approximately equal to FII daily average sales (*FII_SELLS*), resulting in a daily average net FII flow (*FII_NET*) close to zero.

[7] We also considered an alternative definition where the net FII trading is normalized by the sum of FII purchases and FII sales, as has been employed in studies of stock order flow. However, in the context FII trading in emerging markets, there is considerable variation in FII trading due to differences in firm size. Our measure, as defined above, captures the economic significance of FII trading relative to overall trading volume in the stock. Thus we are able to control for spurious correlations driven by the size effect.

I.2 Empirical Design

In this paper, we rely on a simple procedure to infer the information content of FII flows. We construct portfolios on the basis of innovation in net FII flows (as described in I.3) and then examine the short-run performance of these portfolios and how it is related to net FII flows. This approach allows us to isolate the impact of FII flows on asset returns.

To elaborate, first, we sort stocks on the basis of innovation in *FII_NET* at the beginning of every week and segregate stocks into five quintiles. We then examine the abnormal return on the portfolio of stocks over a 10 day trading window around the day of portfolio formation (Day 0). The ten day window covers a pre-formation period over the (-5, -1) window and a post-formation period over the (0, 5) window. We examine the immediate impact of FII flows (returns on Day 0) and also the subsequent reaction of the portfolio returns over (0, 5). This allows us to determine the permanent and the transient components of the impact of FII flows on stocks returns.

The next step of our analysis is to perform time series analysis of the returns on Day 0 and the cumulative returns over the (0, 5) window to see whether these returns can be explained by differences in firm characteristics and time-varying market-wide shocks.

I.3 Innovations in FII Flows

We consider a panel regression model of *FII_NET* on lagged *FII_NET*, lagged stock returns and other control variables; residuals from this model (*FII_NET_INNOV*) are used as a proxy for the "true" (unobserved) innovations in FII flows. The panel regression model allows for firm fixed effects. The control variables are related to firm characteristics and market factors. Firm characteristics include firm size (*SIZE*), turnover (*TOVER*), percentage of retail (*RETAIL_OSHP*) and institutional ownership (*INSTITUTIONAL_OSHP*) in non-promoter holdings. Market factors include lagged returns on NIFTY, S&P500, volatility index (*VIX*) and aggregate FII flows (*AGGR_FFLOW*), which is defined as (total *FII_BUYS* – total *FII_SELLS*) / total traded rupee value on day *t* for all stocks. The exact specification we estimate is as follows:

$$FII\_NET_{i,t} = FirmFEff + \sum_{j=1}^{5} FII\_NET_{t-j} + \sum_{k=1}^{5} \mathrm{Re}t_{t-k} + \delta_1 SIZE + \delta_2 TOVER + \delta_3 RETAIL\_OSHP_{t-1} + \delta_4 INSTITUTIONAL\_OSHP_{t-1}$$
$$+ \alpha_1 AGGR\_FFLOW_{t-1} + \alpha_2 VIX_{t-1} + \alpha_3 \Delta VIX_{t-1} + \alpha_4 NIFTY\_RET_{t-1} + \alpha_5 S\&P500\_RET_{t-1} + \alpha_6 NIFTY\_VOLATILITY_{t-1} + e_{i,t}$$

The above regression serves the purpose of a first-pass panel regression.[8] The regression residuals define innovation (*FII_NET_INNOV*). Note that the *FirmFEff* refers to firm fixed effects. Table 4 shows the results of estimating this panel regression of *FII_NET* on lagged *FII_NET*, lagged returns, firm characteristics and market factors. The *R*-squared value is around 19 percent. *FII_NET* is significantly related to the first-lagged return and up to five lagged values of *FII_NET*. The positive coefficients on lagged return is consistent with trend-chasing or positive feedback trading by FIIs. The positive coefficient on lagged *FII_NET* shows persistence in order flow. Both these findings are similar to what has been reported in Anshuman, Chakrabarty and Kumar (2012) regarding aggregate FII flows in Indian equity markets. The firm characteristics that have significant coefficients in the panel regression model are firm size, retail ownership, and institutional ownership. The positive relationship of FII flows with firm size is not surprising. The negative relationship with institutional ownership is perhaps reflecting mean reversion arising either due to ownership constraints (there are regulatory limits on FII ownership in each stock) or due to portfolio rebalancing motives (rather than buy-and-hold motives) of FII traders. The other variables with significant coefficients are market stress (*VIX*), first difference in market stress (Δ*VIX*), and aggregate FII flows (*AGGR_FFLOW*). The coefficient on lagged S&P 500 returns is insignificant but the coefficient on lagged NIFTY returns is negative. The residuals obtained from this panel regression (*FII_NET_INNOV*) are used as a proxy for surprises or innovations in FII flows.

[8] We explored alternative specifications with and without firm fixed effects and time fixed effects. These variations turned out to be quite similar and the panel regression model with firm fixed effects is fairly robust.

II. Analysis

II.1 Hypothesis related to Fund Flows

If cross-border fund-flow is a phenomenon unrelated to domestic markets valuations, then under market efficiency, foreign fund flows should not influence domestic asset returns. Our null hypothesis, stated below, reflects this line of reasoning.

H1. *Foreign fund flows have no systematic impact on market prices of domestic assets*.

The alternative hypothesis is that asset returns are influenced by fund flows. Recent studies by Coval and Stafford (2007), Frazzini and Lamont (2008) and Lou (2012) find that mutual fund flow induced price impacts exhibit a degree of reversal. It has also been well established in prior literature that information is asymmetrically incorporated on ask and bid sides of the market. Block purchases are associated with permanent price impact whereas block sales have been associated with transient price impact (See Holthausen et al (1987), Chan and Lakonishok (1993), Keim and Madhavan (1996) and Saar (2001) for studies that document this phenomenon). One explanation for this asymmetric impact is that block sales are motivated by information whereas block sales are motivated by portfolio rebalancing concerns. Given these possibilities, we propose the alternative hypothesis as follows.

H1a. *Foreign flows reflect information-based trading; therefore they cause a permanent impact on market prices of domestic assets*.

H1b. *Foreign flows reflect portfolio rebalancing requirements; therefore domestic assets experience price pressure - a transient effect that is reversed in the following periods*.

An interesting way to identify price-pressure effects (i.e., flow-induced price changes) is to examine the relationship between the magnitude of the price effect and the magnitude of fund flows. A positive relationship confirms price pressure effects, as has been demonstrated in the classic study by Scholes (1972), who studied price pressure associated with secondary distributions by firms on the New York Stock Exchange. Hypothesis H2 and H3 examine this aspect of the price-pressure hypothesis.

H2. *The price pressure associated with foreign flows should be positively related to the size of the shock in foreign flows*.

As shown in Table 1, FII flows are related to firm size. We can, therefore, expect price pressure effects to be positively related to firm size.

H3. *The price pressure associated with foreign flows should be positively related to firm size because foreign flows, as a proportion of total trading volume, increase with firm size*.

Finally, if fund flows affect asset return, we should expect that uncertainty associated with fund flows should also affect asset returns. In particular, we would expect to see a greater price pressure during days associated with high global market uncertainty. We employ two proxies for global market uncertainty, namely, high VIX days and the financial crisis period, as discussed in the hypotheses below.

H4. *The price pressure associated with foreign fund flows should be positively related to the uncertainty in markets (VIX)*.

H5. *The price pressure associated with foreign fund flows should be greater during the periods of the financial crisis (January to December 2008) as compared to the non-crisis periods*.

II.2 Abnormal Returns associated with FII Flows

Hypothesis H1, H1a and H1b are examined in this section. Table 5 presents a result relating the innovations in FII flows to contemporaneous and subsequent stock returns. First, we rank all stocks according to daily innovations in *FII_NET* flows once every week (on Mondays) and group them into five quintiles. Over the 6-year sample period, there are 315 portfolio formation days. The first major column presents the findings for the portfolios with the lowest innovations (Q1) in innovations in *FII_NET* and the second major column presents the findings for the portfolio with the highest innovations (Q5) in *FII_NET*. The table also shows the difference in the abnormal returns of these two portfolios (Q5-Q1). The returns examined are the cumulative abnormal returns over the (-5, -1) window, the abnormal returns on the portfolio-formation day (DAY 0) and the abnormal returns over the (0, 5) window.

As can be seen in Table 5 (Panel A), the abnormal return for the low (high) innovation portfolio, Q1 (Q5), on the portfolio formation day (Day 0) is economically and statistically significant. The abnormal return over the (0, 1) window, *AB_RET* (0, 1), is -0.93% for the low innovation portfolio (Q1) but is +0.88% for the high innovation portfolio (Q5). Further, the low innovation portfolio (Q1) is associated with negative returns and the high innovation portfolio (Q5) is associated with positive returns. The (abnormal) return difference between the high innovation portfolio and the low innovation portfolio (Q5 - Q1) is also statistically significant. The differential abnormal returns between stocks with high innovation and low innovation are equal to 1.82%. These findings indicate that FII inflows are associated with price appreciation and FII outflows are associated with price declines.

In contrast to the positive differential abnormal returns (between high and low innovation stocks) on the portfolio-formation day (Day 0), the differential abnormal returns in the post-formation window (0, 5) is negative.[9] The cumulative abnormal return in the post-formation window (0, 5) is significantly positive (0.36%) for the low innovation portfolio (Q1), but *in*significantly positive (0.04%) for the high innovation portfolio (Q5). This pattern indicates reversal of prices in the post-formation window. However, we can see that there is significant reversal *only* for the low innovation portfolio. Thus the statistically significant differential cumulative abnormal returns (Q5 - Q1) of -0.31% in the post-formation window is largely driven by the reversal of the prices for the low innovation portfolio (Q1). In contrast to the post-formation window, the cumulative abnormal returns differential (Q5 - Q1) over the pre-formation window, (-5, -1), is statistically *insignificant* (-0.08%).

These results can be more easily seen in Figure 3, which shows the cumulative abnormal returns over the (-5, 5) window. High innovation stocks experience a significant coincident price appreciation whereas low innovation stocks experience a significant coincident price decline.[10] The cumulative abnormal returns in the post-formation period remain flat for the high

[9] This result also holds for longer windows, e.g., over (0, 10) and (0, 20). However, given that FII trading innovations occur continuously, it would be difficult to make meaningful inferences for longer post-formation windows.

[10] This result holds for raw returns as well abnormal returns; all returns reported in the paper refer to abnormal returns.

innovation portfolio. However, for the low innovation portfolio, the cumulative abnormal returns line starts rising in the post-formation period.

These findings imply that stocks with high innovations (positive residuals) in FII flows experience a coincident abnormal return that reflects a *permanent* information effect. However, stocks with low innovations (negative residuals) in FII flows experience both *permanent* information effects and *transient* effects, which are reversed over the post-formation window. In other words, order imbalances on the buy side and the sell side are associated with asymmetric effects, thereby confirming the claims in Hypothesis H1a and H1b, while rejecting the null hypothesis, H1, of no price effects. Hypothesis H2 is also confirmed in that the abnormal return on Day 0 is positively related to the size of the innovations.

When we examine abnormal returns for the low innovation portfolio in Figure 3, we can see that a significant proportion (approximately, 40%) of the abnormal returns on Day 0 are reversed in the post-formation period. Given the volatility of a typical stock is around 36.16%, a return reversal of approximately 0.36% suggests that the transient effect accounts for $0.36*\sqrt{(252)}/36.16$, or nearly 16% percent of the annualized volatility of a typical stock.[11]

In summary, low innovation stocks experience both a permanent information effect as well as a transient effect on the portfolio formation day; the latter effect gets reversed during the post-formation period. On the other hand, high innovation stocks experience only a permanent information effect and there is no reversal of returns during the post-formation period. As a consequence, (negative) differential abnormal returns between high and low innovation stocks during the post-formation window are largely driven by the return reversal experienced by low innovation stocks.

To examine whether the differential abnormal return between high and low innovation stocks is arising because of differences in firm characteristics, we perform additional tests, as shown in Table 5 (Panel B). We can see that there are no significant differences in liquidity (as

[11] To obtain an idea about the magnitude of the impact of FII flow innovations on prices, we can consider the study of Hendershott and Menkveld (2013) who estimate price pressure on the NYSE. They report that a $100,000 inventory shock causes an average price pressure of 0.28% with a half-life of 0.92 days. They also report that (i) price pressure causes average transitory volatility in daily stock returns of 0.49% and (ii) price pressure effects are substantially larger with longer durations in smaller stocks.

measured by the Amihud Illiquidity ratio), firm size, local as well as global systematic risk exposure, volatility, and ownership structure between the high innovation portfolio and the low innovation portfolio. This finding gives us some assurance that the differences in performance of high innovation and low innovation portfolios are unlikely to be driven by differences in firm characteristics.

The results are consistent with "price pressure" on stock returns induced by FII sales, given the partial reversal of formation-day negative returns for stocks experiencing abnormally high FII outflows, i.e., the low innovation portfolio. The results are, however, also consistent with information being revealed through FII purchases and FII sales, given the permanent nature of formation-day returns for stocks experiencing abnormal FII flows. While FII outflows contribute to transient volatility for stocks experiencing outflows, it appears that trading by FIIs also generates new information.

II.3 Time Series Variation in Return Shocks

Having established that there are both permanent information effects and transient price-pressure effects associated with innovation in FII flows, we now examine if the time-series of these effects can be explained by the time series variation of market-wide factors. Figure 4 shows the time series relationship between the differential abnormal returns (between the high and low innovation portfolios) and lagged *VIX*. The correlation between these variables 0.3913 and statistically significant. High VIX may be causing FII flows to be driven more by portfolio rebalancing concerns rather than fundamental information, and therefore, leading to greater price-pressure effects.

We compute the cross-sectional average of the differential returns (Y_t) between high and low innovation stocks on each portfolio formation day. Y_t is then regressed on firm characteristics (X_t) and lagged market-wide factors (Z_{t-1}), e.g., market returns and volatility in the US and India, ownership structure in terms of retail and institutional ownership, and aggregate FII flows:

$$Y_t = \alpha_0 + \beta\, X_t + \gamma\, Z_{t-1} + \varepsilon_t$$

The results are reported in Table 6. From the regression results we can see that the time-series of the differential return on Day 0, (Q5 – Q1), is positively related to the time-series of the Amihud Illiquidity measure and lagged *VIX*. These findings indicate that the returns differential on the portfolio-formation day (Day 0) is greater during times of illiquidity and a rise in the global stock market volatility (*VIX*), consistent with the claim in Hypothesis H4. NIFTY lagged returns and NIFTY volatility are also positively related to differential returns.

More importantly, the intercept is statistically significant and positive, indicating that even after controlling for firm characteristics and market-wide factors, going long on a high innovation portfolio and short on a low innovation portfolio provides a positive "alpha". In summary, the time series variation in the abnornmal returns differential due to innovations in FII flows is driven by the time-series variation in firm specific illiquidity as well as in global risk perceptions and local market risk. Nevertheless, being exposed to these risks is rewarded by the market in the form of an "alpha".

II.4 Size Effect

Next, we examine the impact of firm size on how FII trading affects stock returns. One can expect that larger stocks, being more liquid, would be more suitable for portfolio rebalancing whereas smaller stocks, being less liquid, would be more suitable for buy and hold strategies. We partition the sample into three sub-samples: large cap, mid cap, and small cap stocks based on whether the stock appears on the CNX NIFTY, CNX MIDCAP and the CNX SMALLCAP indices, respectively, of the National Stock Exchange (NSE). Table 7 shows the differential abnormal returns between the high and low innovation portfiolios by market size. Abnormal returns on Day 0 are directly related to firm size. Large cap stocks (as in the NIFTY index) experience the highest Day 0 abnormal return differential of 2.14% between the abnormal returns on the high and low innovation portfolios. In contrast, the mid cap and small cap stocks experience abnormal return differentials of 1.71% and 1.62%, respectively. Figure 5 presents the same findings. We can see that the abnormal return on the high and low innovation portfolios is higher in the case of large cap stocks, lower for mid cap stocks and least for small cap stocks. This finding is consistent with the conjecture in Hypothesis H3.

Note that large-cap stocks, on average, experience daily FII purchases of Rs 268.78 million whereas mid-cap and small-cap stocks experience daily FII purchases of Rs 36.95 million and Rs 12.23 million, respectively. Likewise, large-cap, mid-cap, and small-cap stocks experience, on average, daily FII sales of Rs 282.12, 35.92, and 12.15, million respectively. These numbers suggest that total FII flows (FII Purchases plus FII sales) are directly related to firm size and that FIIs trade much less in small-cap stocks than in mid-cap stocks and large-cap stocks. We can see that Day 0 abnormal return differentials between high and low innovation portfolios exhibit the same monotonic relation with firm size as total FII order flows do.[12]

To compare with the earlier results, recall that in the overall sample, the high innovation portfolios are associated with a permanent price impact whereas nearly 40% of the price impact is reversed in the case of the low innovation portfolios. This pattern is followed in the case of large-cap and mid-cap stocks. The price reversal observed in the post-formation window is largely driven by the price reversal in the low innovation portfolio. It is slightly greater for large-cap stocks than for mid-cap stocks.

In the case of small cap stocks, there is no price reversal for both the low innovation (Q1) as well as the high innovation (Q5) portfolios. Given the low extent of FII trading in small cap stocks, it seems that when FIIs buy and sell, their order flow is perceived by the market as informed order flow and there is no significant price reversal on both sides of the market. This is consistent with the view that FII trading in smaller stocks, which are less liquid, is driven by buy-and-hold motives of FII traders. In contrast, for large cap and mid cap stocks, the abnormal returns associated with excess FII sales exhibit some degree of price reversal. This finding suggests that FII trading in larger stocks is driven by information as well as portfolio rebalancing motives.

[12] We also examine the time series average of the difference in innovations on the high and low innovation portfolios in each of the three sub-samples. The differential innovation is 0.50, 0.57 and 0.41 for large cap, mid cap stocks and small cap stocks, respectively. These differential innovations are not monotonic in firm size. Also, FII_NET, which is a normalized measure of net FII flows, has a value of 0.00229 for large cap stocks and values of 0.019821 and 0.0091374 for mid cap and small cap stocks, respectively. Again, these measure of FII flows are non monotonic in firm size. Essentially, as compared to both these measures, total FII order flow is better correlated with Day 0 return differentials between the high and low innovation portfolios.

II.5 Impact of Global Market Stress

The financial crisis of 2008 provides an excellent opportunity to examine the role of capital flows in driving asset returns. Fratzscher (2011) finds that the capital outflows from emerging markets to the U.S. were largely a flight-to-safety effect. Thus, the financial crisis period provides a unique opportunity to examine the impact of foreign fund flows on emerging markets during times of stress.

To examine this effect, we identify portfolio formation days that are associated with high global market stress across all markets that fund foreign flows into Indian markets. We use the *VIX* index as a measure of global market stress. We therefore examine the role of high and low VIX periods in explaining the differential Day 0 returns. As shown in the previous section, time series of VIX influences the abnormal return differential associated with high and low FII flow innovations.

We explore these hypotheses more carefully in the following way. First, we split the sample into a crisis period sub-sample and a non-crisis period sub-sample. This segregation allows us to examine how the financial crisis affected the price impact of FII flows. Our conjecture is that the impact of FII flows would be greater during the crisis period. Second, we divide the portfolio formation days into two groups: one associated with low VIX and the other associated with high VIX. This test is useful in estimating the impact of VIX on the differential price impact of high and low FII flow innovations.

II.5.1 Crisis Period Effect

In Indian capital markets, the crisis period is usually identified as the period from January 2008 to December 2008.[13] The remainder of the sample period is classified as the non-crisis period. We examine the abnormal return differentials between portfolios with high and low innovations in FII flows in the crisis as well as the non-crisis periods. Table 8 (Panel A) shows the results. The abnormal return differential beween high and low innovation portfolios is

[13] As reported in Anshuman, Chakrabarti, and Kumar (2012), CNX NIFTY index experienced a secular decline from a value of 6144 on Jan 1st 2008 to a value of 3033 on Dec 31st 2008 and then experienced an increase in the first quarter of 2009. We also use the period of 2008 to define the crisis period in India. The results hold for alternative specifications of the crisis period.

much higher during the crisis period (2.43%) than in the non-crisis period (1.68%), i.e., there is nearly a 45 percent greater impact of FII flows during the crisis period, consistent with Hypothesis H4. This can also be more easily seen in Figure 6. Further, the price reversal experienced by the low innovation stocks in the post-formation window is also greater in the crisis period as compared to the non-crisis period. This finding suggests that there is greater transient volatility induced by unexpected FII sales during the crisis period. Overall, our analysis indicates that concerns about contagion effects during crisis times are well substantiated.

II.5.2 Volatility Index (*VIX*) Effect

Table 8 (Panel B) shows the results when the portfolio formation days are partitioned into high *VIX* days and low *VIX* days based on the median *VIX* levels. The abnormal return differential beween high and low innovation portfolios is much higher during high *VIX* days than on low *VIX* days. As seen in the case of the crisis period and the non-crisis period, the abnormal differential return on Day 0 is greater on days associated with high *VIX* (2.02%) as compared to days asscoiated with low *VIX* (1.55%), i.e., a difference of approximately 37 per cent, consistent with Hypothesis H5. As in the crisis period case, the price reversal in the post-formation window is greater on days associated with high *VIX*. Again, these findings indicate that transient volatility is also greater during times of global market stress.

III. Robustness Checks

In this section, we investigate the robustness of the results reported in the previous sections. First, we recognize that FII order flow may be persistent and therefore we redefine our sorting procedure in terms of cumulative innovations in FII flows over the previous 5-day period rather than in terms of the concurrent FII innovation. Second, we validate the panel regression model using out-of-sample data. Finally, we examine a parametric approach to identify the impact of FII flow innovations and also attempt to uncover any asymmetric (buy side versus sell side) as well as nonlinear effects associated with FII flow innovations. The findings are discussed below.

III.1 Cumulative Innovations Analysis

Since FII trading occurs continuously and because FII traders may strategically split their trades over several days, a daily measure of FII flow innovations, as we have used here, may fail to capture the true level of FII flow innovations. To account for such strategic trading behavior, we accumulate daily FII flow innovations over the (-5, 0) window and use this cumulative measure of innovations to form portfolios.

The results based on this measure of cumulative FII flow innovations are shown in Table 9 (Panel A). The results are qualitatively similar to earlier findings because FII order flow is known to exhibit strong persistence. However, differential abnormal returns on Day 0 is 0.79 per cent, somewhat lower than the 1.82 per cent when we use the daily measure of FII flow innovations to construct portfolios. Again, this difference is not altogether surprising, because persistence in orderflow implies that prices start moving upward (for the high innovation portfolio) or downward (for the low innovation portfolio) from Day -5 itself, thereby mitigating the effect on Day 0. We can see this by noting the values of *AB_RET* (-5,-1), the cumulative abnormal return over the (-5, -1) window, which is significantly negative (positive) for the low (high) innovation portfolio.

We also compute *AB_RET* (-10, -5) for the window (-10, -5), which is the relevant pre-formation window given that we are using a cumulative measure of FII flow innovations. We find that the low innovation portfiolo has a *positive* and significant return, which assures us that the *negative* abnormal returns over the window (-5, -1) and on Day 0 are not driven by pre-formation negative returns. When we consider the high innovation portfolio, the abnormal return in the pre-formation window, (-10, -5) is statistically *insignificant*, again assuring us that the *positive* abnormal return over (-5, -1) and (-1, 0) are not due to an effect carried over from the pre-formation window.

III.2 Out of Sample Analysis

Our measure of FII flow innovations is based on residuals obtained from a panel regression done on in-sample data. The validity of the panel regression model may therefore be questionable. In order to ascertain the impact of spurious effects associated with in-sample

model construction, we employ the in-sample panel regression model on an out-of-sample dataset over the period January 2012 to June 2013. We find that our results are robust to using out-of-sample data.

Table 9 (Panel B) shows that there are significant differences in abnormal returns for the high innovation and the low innovation portfolios. The Day 0 abnormal return for the high innovation portfolio is 0.71% and the Day 0 abnormal return for the low innovation portfolio is -0.80%, implying a differential abnormal returns of 1.51%. The reversal pattern is similar, but weaker than what we found for the in-sample data. As before, only the low innovation portfolio experiences a reversal in price. As compared to the in-sample anlaysis, the pre-formation window abnormal return differential is economically and statistically significant, but is of much lower magnitude than the the Day 0 effect.

III.3 Asymmetric and Non Linear effects of FII Flows

As compared to the non-parametric approach we have adopted in our analysis, we employ a parametric approach to exploit the information contained in the full sample. To do this, we examine asymmetric and nonlinear effects of FII flows. We regress abnormal returns on innovations in FII flows as well as the square of the innovation in FII flows. To account for asymmetric behavior, we introduce a dummy variable, which takes a value of 1 for negative innovations in FII flows.

The results are shown in Table 10. The dummy variable is significant for the overall sample, but it can be seen that this result is largely driven by high VIX days. Thus the impact of negative innovations in FII flows differs from that of positive innovations in FII flows. The nonlinear effect of FII flows is pervasive and independent of market stress levels. The asymmetric and nonlinear effects can be more readily observed in Figure 8, which shows the fitted regression lines in pictorial form. We can see that the asymmetric effect, which can be seen by the deviation of the dotted line from the full line, is most pronounced on days with high VIX levels. The nonlinear effects are seen for both positive and negative innovations in FII flows. These findings suggest that FII sales trigger more adverse reactions than corresponding FII purchases and confirm our findings from the non-parametric approach of Section II.

IV. Conclusion

Employing a unique database that provides data on foreign institutional investor (FII) flows at the individual stock level, we are able to examine the impact of FII flow innovations on stock returns in India. We find that stocks with high innovations are associated with a coincident price increase that is permanent, whereas stocks with low innovations are associated with a coincident price decline that is in part transient, reversing itself within five days. The results are consistent with a price "pressure" on stock returns induced by FII sales, as well as information being revealed through FII purchases and FII sales. We show that while FII outflows contribute to transient volatility for stocks experiencing the outflows, trading by FIIs also generates new information. Interestingly, price pressure effects are increasing in the magnitude of innovations but are largely unrelated to firm characteristics.

Our study not only reinforces the findings in recent literature that fund flows affect stock returns but also provides insights into when this relationship is likely to arise. We are able to demonstrate that price pressure is higher in times of global market stress. These findings suggest further research possibilities for identifying the precise mechanism by which information gets transmitted across global markets and also for identifying which sectors of the economy are more likely to be affected by shocks in global fund flows.

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Figure 1

FII Annual Net Flows into Indian Equity Markets and NIFTY Volatility during 2001-2012

The chart below shows the relationship between annual FII net inflows and the annualized standard deviation of the daily returns on the CNX NIFTY index for each fiscal year over the period, 2001-2012. FII net inflows were positive in all years except 2008. The data for chart have been taken from Table 1.

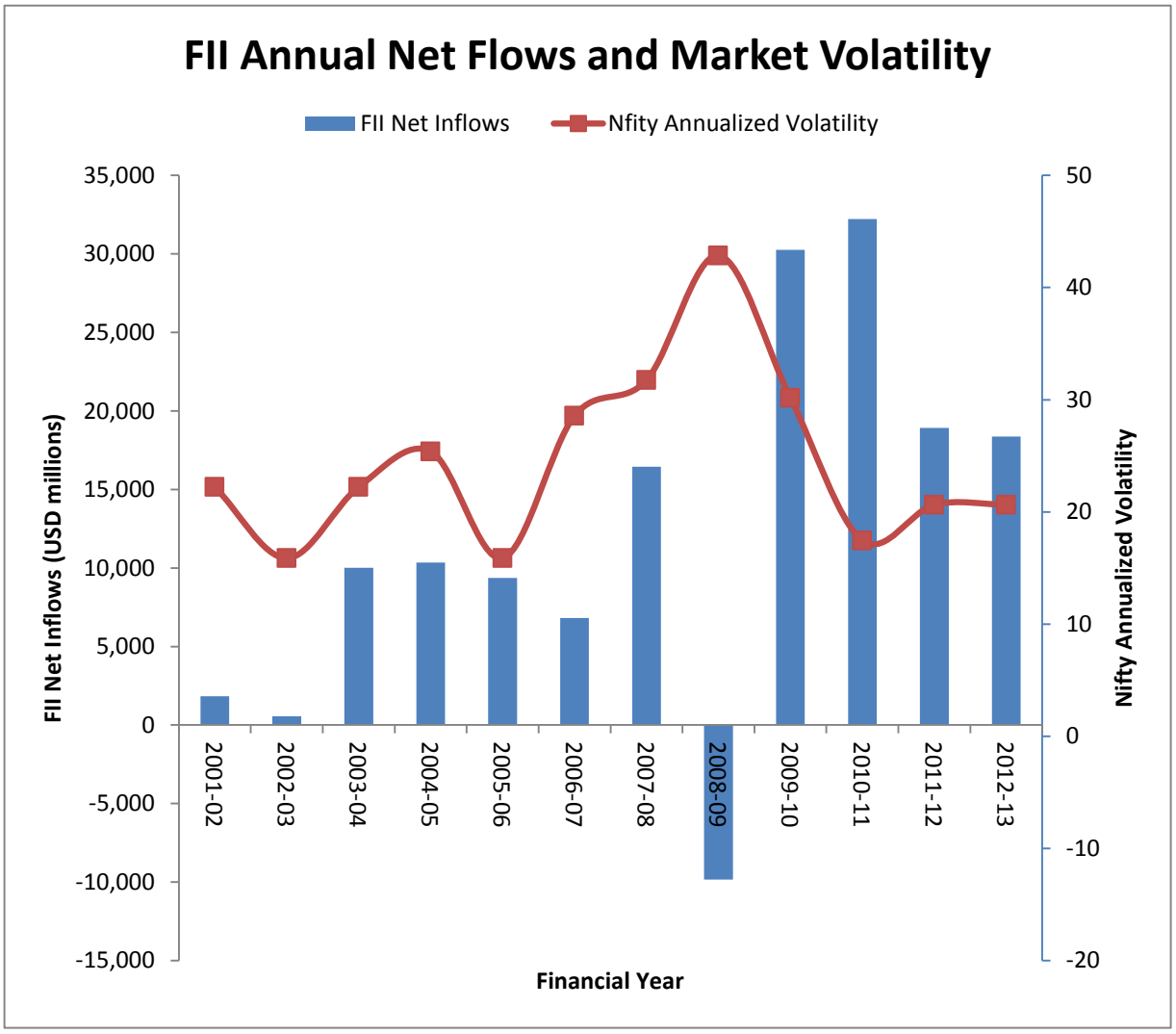


Figure 2

Weekly patterns in FII Net Flows vs VIX

The chart below depicts the weekly average VIX closing values on Y-axis and weekly FII Net Flows on Secondary Y-axis during the study period 2006-2011. Extreme FII flows (positive or negative) are associated with specific shocks to economy (US or India) and further associated with peak values of VIX.

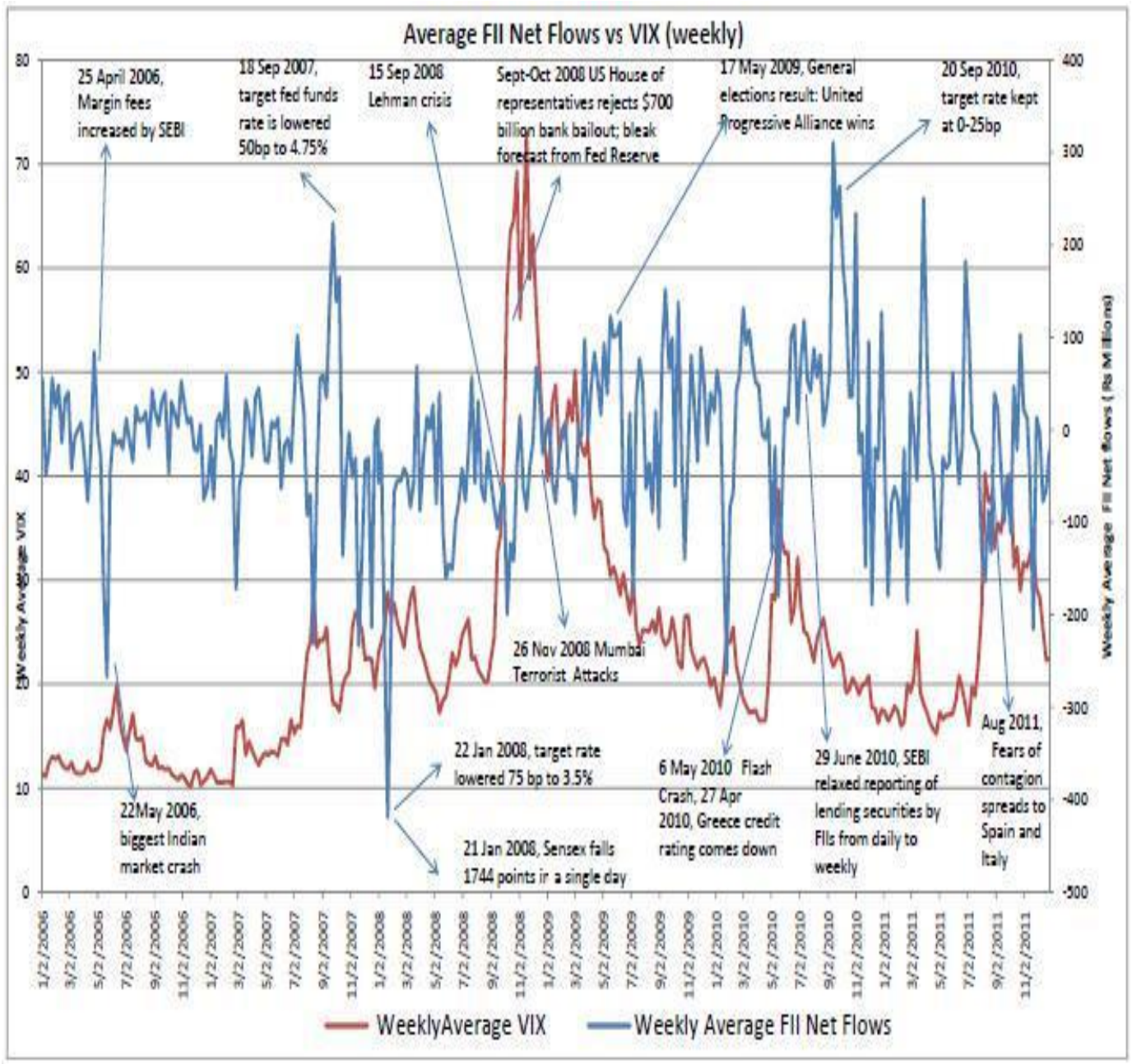


Figure 3

Cumulative abnormal returns of high innovation and low innovation portfolios in the (-5, 5) window surrounding the portfolio-formation day (Day 0)

This figure presents the behavior of cumulative daily abnormal stock returns for stocks that experience extremely high or low innovations in FII flows ($FII\_NET_{i,t}$), which is defined as the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total rupee value traded (across both FII and non FIIs) for the i^{th} stock on the t^{th} day. Residuals obtained from the fitted panel regression model are used to define innovations in FII flows. During the period 2006-2011, firms are ranked according to innovations in *FII_NET* at the beginning of every week (typically on every Monday) and sorted into five quintiles. Figure below shows the cumulative abnormal returns of high and low innovation portfolios during (-5, 5) window surrounding the portfolio formation day (Day 0) for FII innovations obtained from the fitted panel regression model.

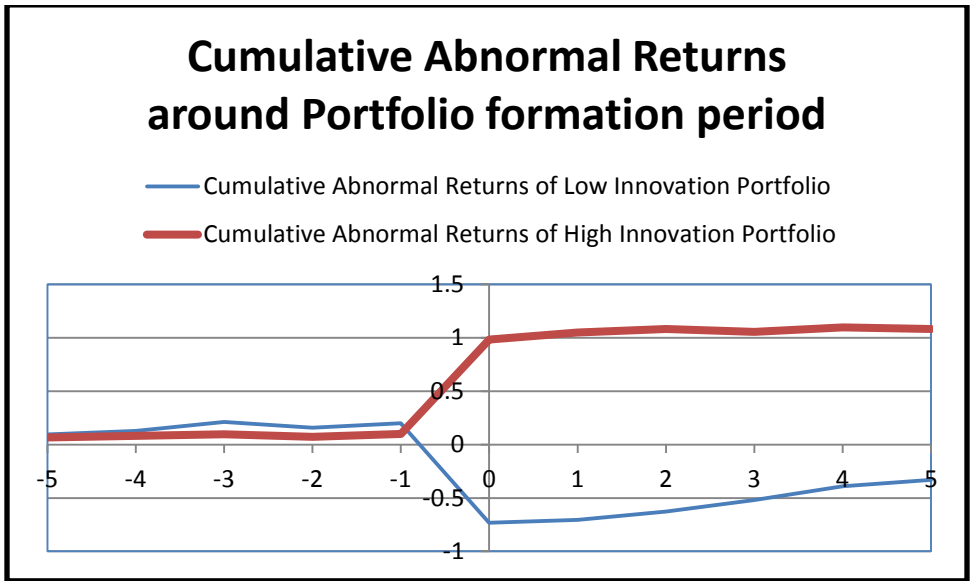


Figure 4

Time Series Variation in Abnormal Return Differential (between High Innovation and Low Innovation Portfolios) and Time Series Variation in VIX

FII flows ($FII\_NET_{i,t}$) are defined as the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total rupee value traded (across both FII and non FIIs) for the i^{th} stock on the t^{th} day. The panel regression model is used to define shocks (innovations) in FII flows. Residuals obtained from a pre-defined panel regression specification to define innovations in FII flows. During the period 2006-2011, firms are ranked according to innovations in *FII_NET* at the beginning of every week (typically on every Monday) and sorted into five quintiles. The figure below plots the time series relationship between the differential abnormal returns due to innovation and lagged *VIX*.

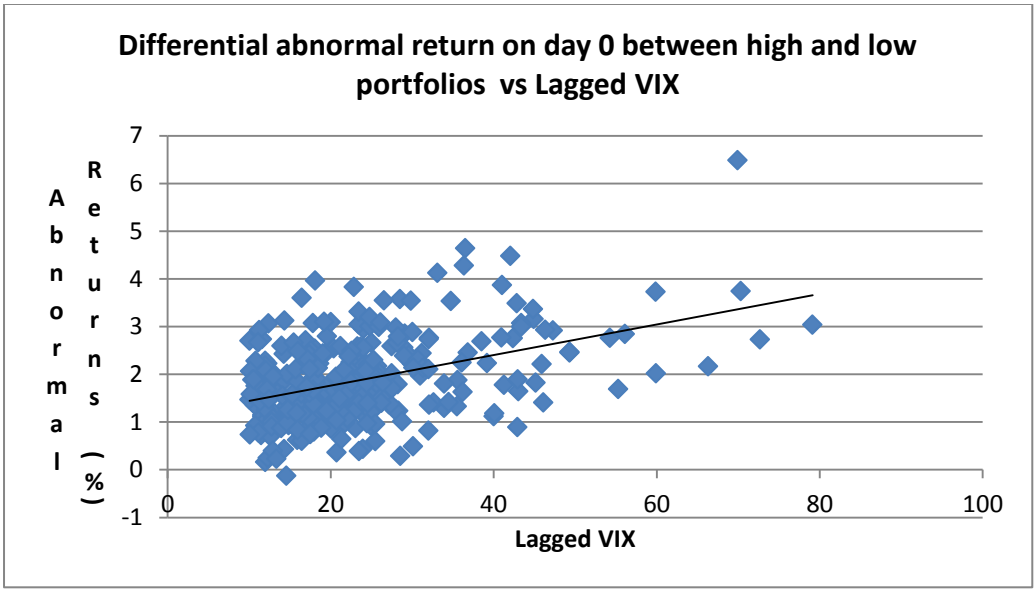
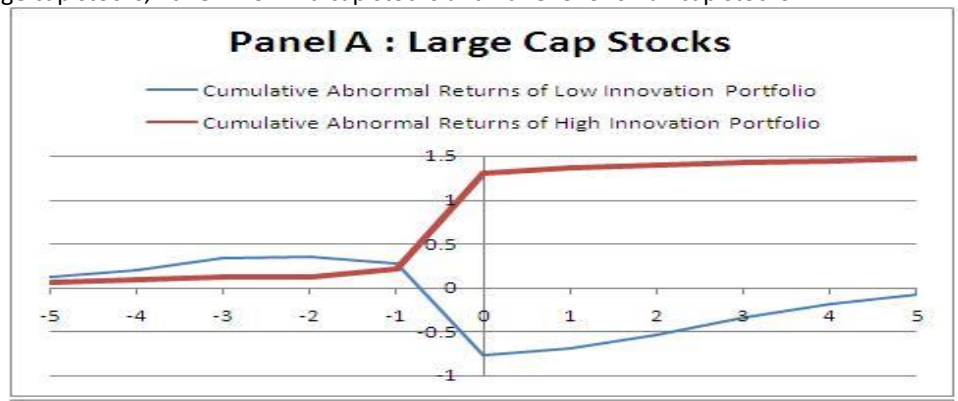
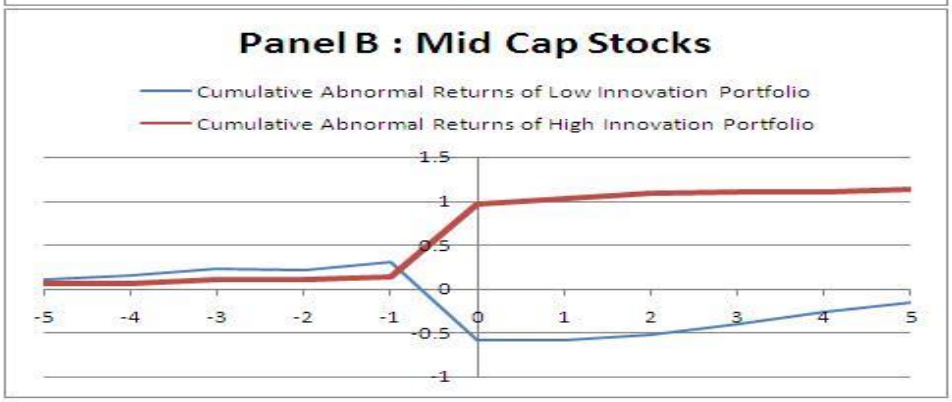


Figure 5

Cumulative Abnormal Returns around Shocks in FII Flows: Firm Size Effects

This figure presents the behavior of cumulative daily abnormal stock returns around shocks in FII flows separately for Large cap, Midcap and Small cap firms. FII flows ($FII\_NET_{i,t}$) are defined as the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total rupee value traded (across both FII and non FIIs) for the i^{th} stock on the t^{th} day. The panel regression model uses the residuals obtained from a pre-defined specification to define innovations in FII flows. During the period 2006-2011, firms are ranked according to innovations in *FII_NET* at the beginning of every week (typically on every Monday) and sorted into five quintiles. Panel A shows the cumulative daily abnormal return for high and low innovation portfolios formed on the basis of innovations from panel regression model for large cap stocks, Panel B for mid cap stocks and Panel C for small cap stocks.





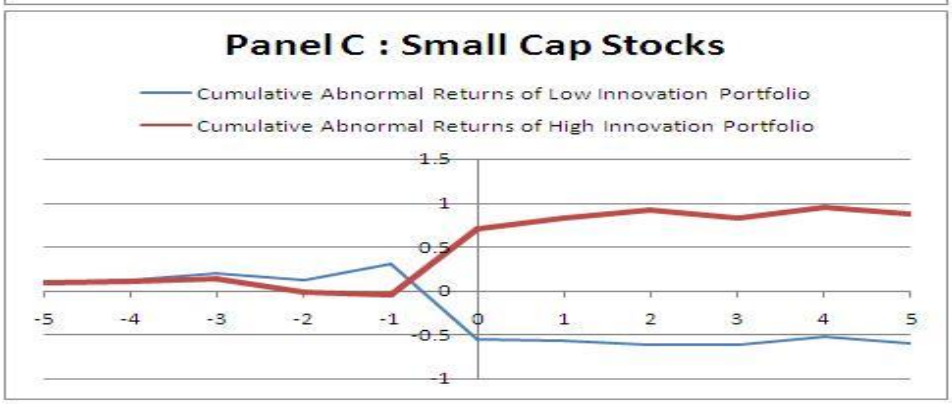


Figure 6

Cumulative Abnormal Returns around Shocks in FII flows: Effects of the Financial Crisis

This figure presents the behavior of cumulative daily abnormal stock returns around extreme shocks in FII flows (innovations) during Crisis (Jan to Dec 2008) and Non-crisis (excluding 2008: 2006-2011) periods. FII flows ($FII\_NET_{i,t}$) are defined as the difference between the FII_BUYS and FII_SELLS scaled by the total rupee value traded (across both FII and non FIIs) for the i^{th} stock on the t^{th} day. The panel regression model uses the residuals obtained from a pre-defined specification to define innovations in FII flows. During the period 2006-2011, firms are ranked according to innovations in *FII_NET* at the beginning of every week (typically on every Monday) and sorted into five quintiles. Panel A shows the cumulative abnormal stock returns for high and low innovation portfolios formed on the basis of innovations from panel regression during Crisis period and Panel B for Non-crisis period.

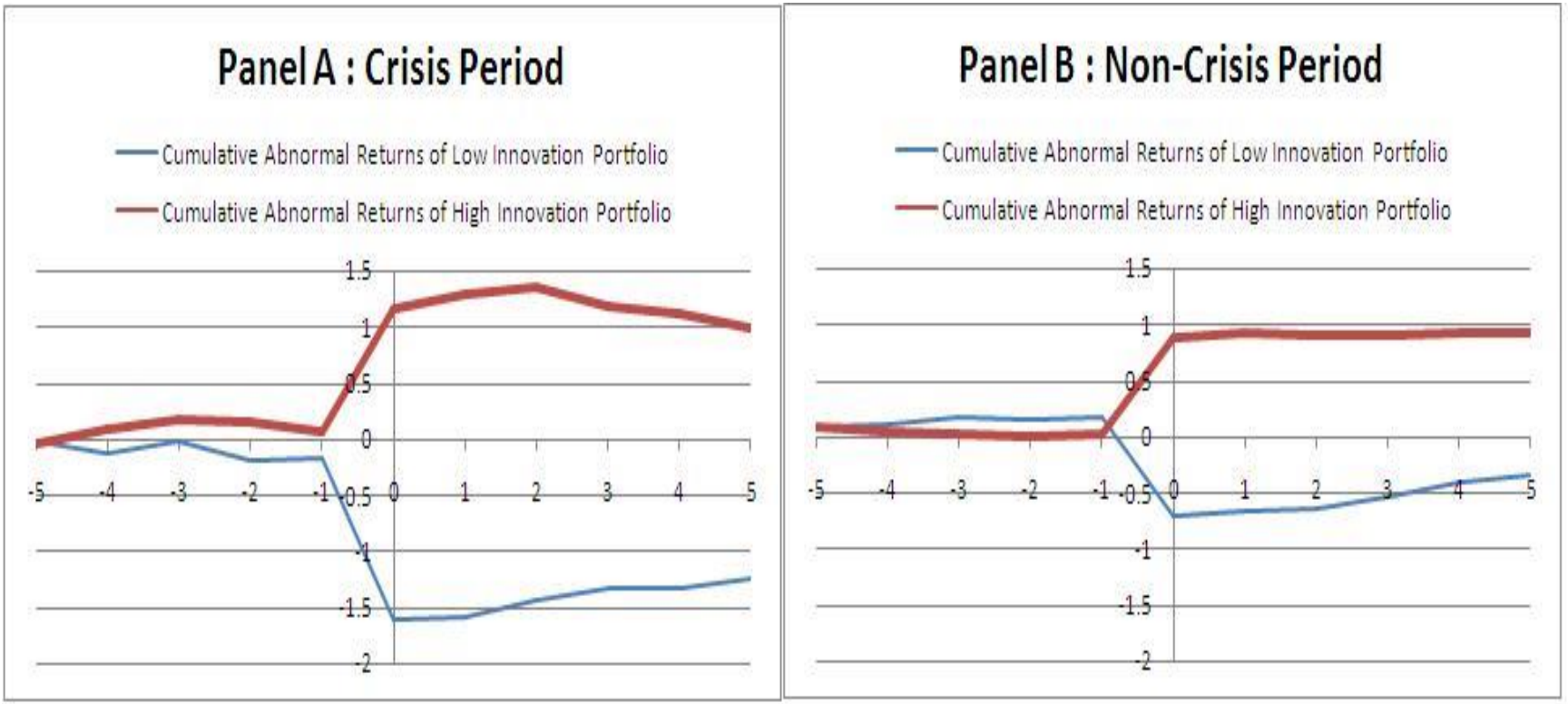


Figure 7

Cumulative Abnormal Returns around Shocks in FII flows: High vs Low VIX days

This figure presents the behavior of cumulative daily abnormal stock returns around extreme shocks in FII flows (innovations) during high VIX days and Low VIX days. FII flows ($FII\_NET_{i,t}$) are defined as the difference between the FII_BUYS and FII_SELLS scaled by the total rupee value traded (across both FII and non FIIs) for the i^{th} stock on the t^{th} day. The panel regression model uses the residuals obtained from a pre-defined specification to define innovations in FII flows. During the period 2006-2011, firms are ranked according to innovations in *FII_NET* at the beginning of every week (typically on every Monday) and sorted into five quintiles. Panel A shows the cumulative daily abnormal stock returns of high and low innovation portfolios formed on the basis of innovations from panel regression for High VIX days and Panel B for Low VIX days.

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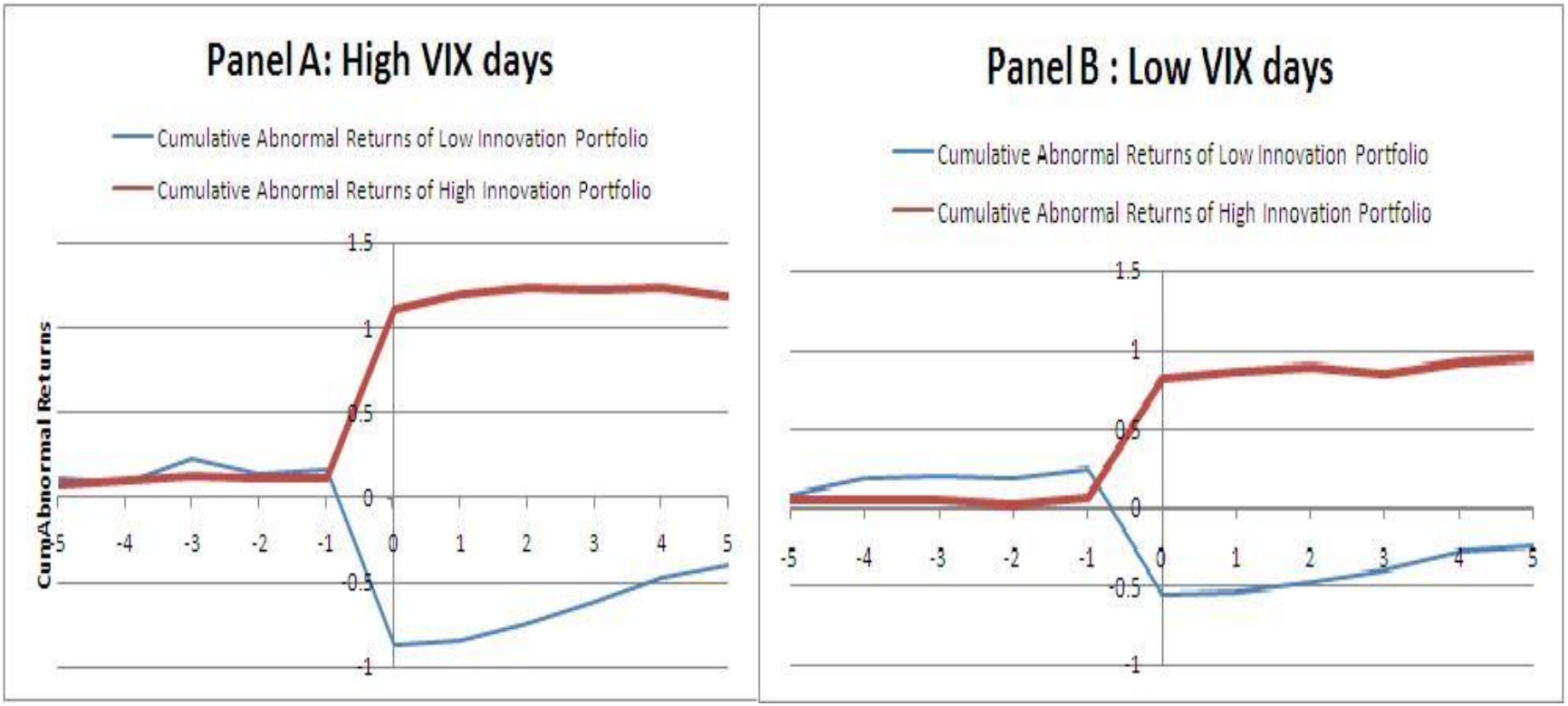

Figure 8

Asymmetric and Non Linear Effects of FII Flows

This figure presents the sensitivity of abnormal returns for changes in FII Net Innovations, depicting possible asymmetric impact, based on the regression results reported on Table 10. Panel A shows the sensitivity of abnormal returns for asymmetric (blue colour) and symmetric (red colour) changes in FII Net Innovations for all stocks. Similarly, Panel B and Panel C shows these graphs for High VIX days and Low VIX days respectively.

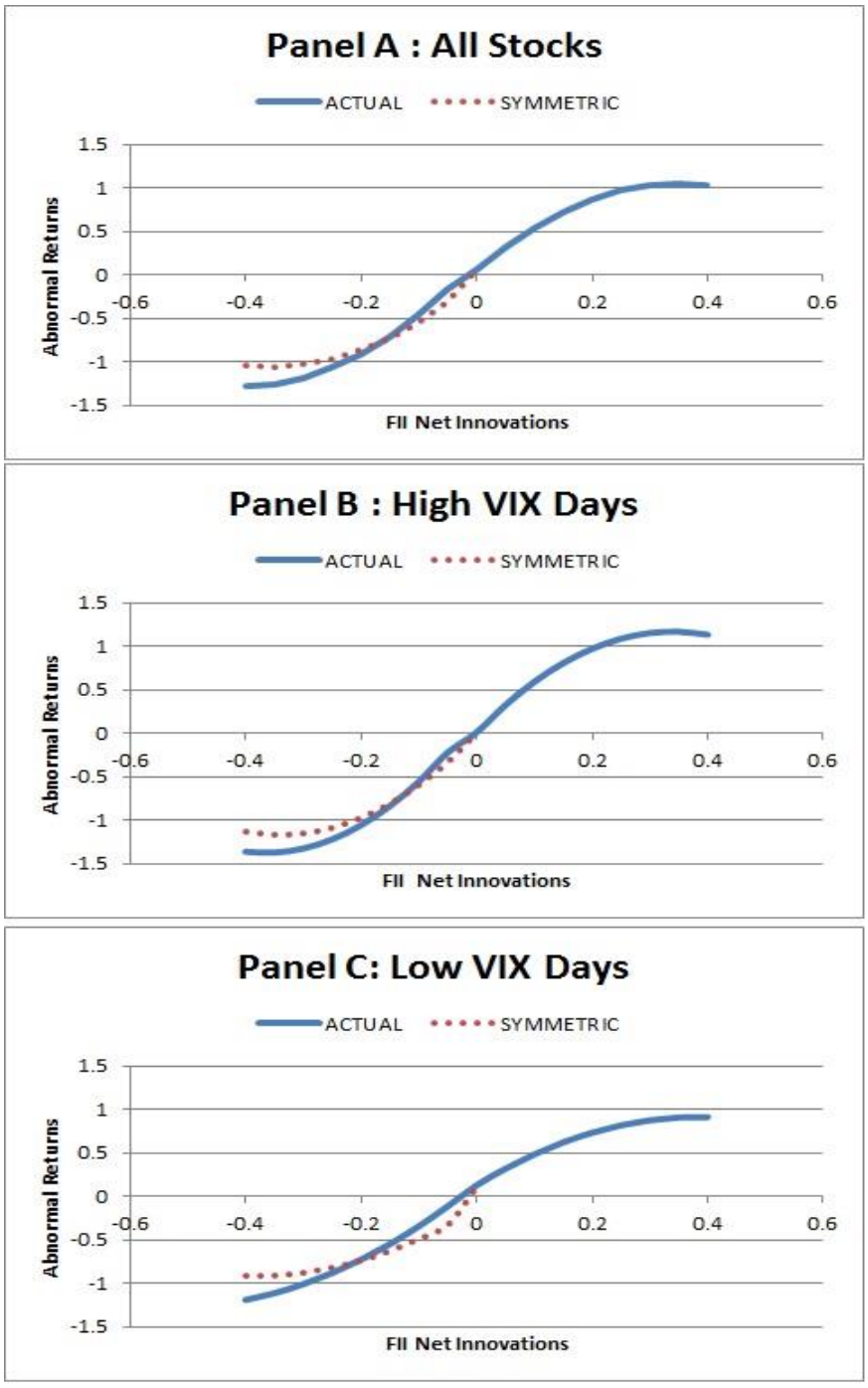

Table 1

Summary of Foreign Institutional Investor (FII) Trading Activity

This table presents a broad overview of FII trading statistics in Indian market during the study period. The first column reports FII Net flows (buy - sell) in Indian markets in millions of dollars, the second column reports the average percentage of FII ownership of firms listed on the Indian markets. The third major column reports the daily average ratio of FII gross (buy + sell) flows to twice the total traded value for all firms in the sample as well as separately for Large-cap, Mid-cap and Small-cap firms within the sample firms.

FIIs Flows

Financial Year	FII net flows[a] (In USD Million)	FII Ownership[a] (%)	Daily average ratio of FII gross flows to twice total traded value in sample firms			
			All	Large-cap	Mid-cap	Small-cap
2006-07	6,821	10.78	20.57	25.47	15.53	11.11
2007-08	16,442	10.62	23.18	28.18	17.99	13.80
2008-09	-9,837	8.40	19.02	21.24	15.45	8.74
2009-10	30,253	9.58	16.13	19.78	11.08	6.42
2010-11	32,226	10.32	21.32	24.99	16.85	9.99
2011-12	18,923	6.00	22.49	25.98	17.53	8.87
2012-13	18,377	6.00	22.68	27.70	15.61	7.15

[a] Source: NSE ISMR reports

Table 2
Variable Definitions

RET_{it}	Daily continuous compounded return of the i^{th} stock, $\ln(P_t/P_{t-1})$ where P_t is adjusted closing price of stock *i* on day *t*
AB_RET_{it}	Excess Return over the market return, defined from a market model regression
$NIFTY\_RET_t$	Dailycontinuous compounded return on CNX NIFTY index on day *t*
$S\&P500\_RET_t$	Daily continuous compounded return on S&P500 Index on day *t*
$SIZE_{i,t}$	Market Capitalization of the stock *i* on day *t*
$RUPEE\_VOLUME_{i,t}$	Total value traded for stock *i* on day *t*
$FII\_BUYS_{i,t}$	Total rupee value of FII purchases for stock *i* on day *t*
$FII\_SELLS_{i,t}$	Total rupee value of FII sales for stock *i* on day *t*
$FII\_NET_{i,t}$	Difference between the *FII_BUYS* and *FII_SELLS* scaled by the total value traded across both FII and non-FIIs (*RUPEE_VOLUME*) for the i^{th} stock on day *t*
$AB\_RET\ (t_1, t_2)$	Cumulative average abnormal returns for all the stocks in a portfolio on day *t* accumulated over the interval (t_1, t_2)
$AMIHUD\_ILLIQ_{i,t}$	Ratio of absolute return over traded value on day *t* for stock *i*
$TOVER_{i,t}$	Ratio of total traded value to market capitalization
LOCAL βETA	Slope coefficient of the *NIFTY_RET* in the market model regression estimated using 52 weekly returns prior to portfolio formation day, *t*
GLOBAL βETA	Slope coefficient of the *S&P 500_RET* in the market model regression estimated using 52 weekly returns prior to portfolio formation day, *t*
IDIO_RISK	Annualized standard deviation of residuals of the market model regression using 52 weekly returns prior to portfolio formation day, *t*
VOLATILITY	Annualized standard deviation of daily returns of the stock
VIX (ΔVIX)	Volatility Index (Change in Volatility Index) value of the CBOE
IVIX (ΔIVIX)	India Volatility Index (Change in Indian Volatility Index)
NIFTY_VOLATILITY	Garman-Klass range based daily volatility estimate of NIFTY
$AGGR\_FFLOW_t$	Aggregate FII Flows, defined as the difference between total *FII_BUYS* and total *FII_SELLS* scaled by the total value traded on day *t* for all stocks
$FII\_NET\_INNOV_{i,t}$	Residuals from fitting a firm fixed effects panel regression model to *FII_NET*
PRE (POST)	Refers to the week before (after) portfolio formation day *t*
PROMOTER_OSHP	Percentage of promoter shareholding
INSTITUTIONAL_OSHP	Percentage of Institutional ownership in non-promoter shareholding
RETAIL_OSHP	Percentage of Retail ownership in non-promoter shareholding

Table 3
Descriptive Statistics

This table presents descriptive statistics of the sample firms (223) listed on the National Stock Exchange of India (NSE) and the associated foreign institutional investor (FII) daily trading flows for the period Jan 1, 2006 to Dec 31, 2011. Panel A shows the firm characteristics. *SIZE* refers to the market capitalization of the firm, *RUPEE_VOLUME* is the daily rupee trading value of the firm, *VOLATILITY* is the annualized standard deviation of daily returns of the firm, *LOCAL_ (GLOBAL_) βETA* is the slope coefficient on the NIFTY (S&P500) index returns in the market model estimated using weekly returns, and *IDIO_RISK* is the annualized standard deviation of residuals of the market model regression using weekly returns. *AMIHUD_ILLIQ* is the ratio of absolute return on traded value over day *t* for the i^{th} stock. Panel B presents summary statistics of market wide factors: S&P500 index returns, *VIX*, the volatility index from the Chicago Board of Options Exchange (CBOE), the CNX NIFTY index returns and the India VIX (*IVIX*). Returns (*RET*) are calculated as 100*ln (P_t/P_{t-1}) where P_t is the adjusted closing price on day *t*. *NIFTY_VOLATILITY* is the Garman-Klass range based volatility of NIFTY. *AGGR_FFLOW* (aggregate FII flows) defined as (total *FII_BUYS* – total *FII_SELLS*) / total traded value on day *t* for all stocks. Panel C presents summary statistics of daily FII flows (Purchases, Sales, and Net) in Rs. millions. $FII\_NET_{i,t}$ is the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total rupee value traded across both FII and non FIIs (*RUPEE_VOLUME*) for the i^{th} stock on the t^{th} day. Daily stock-wise FII flow data are obtained from proprietary data provided by the National Stock Exchange. The other data are sourced from CMIE Prowess and www.finance.yahoo.com.

Variable	Mean	Median	Minimum	Maximum	Std. dev.
Panel A : Firm characteristics					
RET (%)	0.02	-0.04	-20.00	20.00	3.04
SIZE (Rs. millions)	169777.89	52290.47	862.48	4681984.10	353766.20
RUPEE_VOLUME(Rs. millions)	412.66	145.23	4.77	6006.75	704.42
TOVER	0.38	0.16	0.00	70.60	0.99
PROMOTER_OSHP	51.48	52.32	0.00	90.41	19.04
INSTITUTIONAL_OSHP	36.07	34.81	4.17	93.59	16.08
RETAIL_OSHP	12.45	10.90	0.30	77.50	8.99
AMIHUD_ILLIQ	1.66	0.06	0.00	137.60	12.76
LOCALβETA	1.00	0.98	-9.61	9.63	0.48
GLOBAL_ βETA	-0.11	-0.08	-7.66	9.30	0.54
VOLATILITY (annualized)	47.06	47.08	22.56	72.14	9.43
IDIO_RISK (%)	36.16	34.13	0.00	86.18	12.42
Panel B : Market Wide Factors					
NIFTY_RET (%)	0.0333	0.0886	-13.0142	16.3343	1.8537
S&P 500_RET(%)	0.0014	0.0669	-9.4695	10.9572	1.5712
VIX	23.37	21.18	9.89	80.86	11.20
ΔVIX (first difference in *VIX*)	0.0398	-0.3914	-35.0588	49.6008	7.3871
IVIX	26.64	24.66	15.22	56.07	8.25
ΔIVIX	-0.02	-0.05	-7.19	6.21	1.54
NIFTY_ VOLATILITY	21.11	16.99	4.29	165.57	14.60
AGGR_FFLOW	-0.0053	-0.0020	-0.2004	0.1821	0.0439
Panel C : FII Flows					
FII_BUYS (Rs. millions)	81.81	4.87	0.00	33788.04	272.99
FII_SELLS (Rs. millions)	84.28	3.83	0.00	23831.58	280.02
FII_NET	0.01	0.00	-0.95	0.95	0.22

Table 4
Panel Regression Model

This table reports the results of firm fixed effects panel regression of $FII\_NET_{i,t}$ on past *FII_NET* and past stock returns along with size and daily turnover of the firm and market wide factors. The unbalanced sample includes 223 firms and 279,864 firm-day observations for the period 2006-2011. The panel regression specification is as follows:

$$FII\_NET_{i,t} = FirmFEff + \sum_{j=1}^{5} FII\_NET_{t-j} + \sum_{k=1}^{5} \mathrm{Re}t_{t-k} + \delta_1 SIZE + \delta_2 TOVER + \delta_3 RETAIL\_OSHP_{t-1} + \delta_4 INSTITUTIONAL\_OSHP_{t-1}$$
$$+ \alpha_1 AGGR\_FFLOW_{t-1} + \alpha_2 VIX_{t-1} + \alpha_3 \Delta VIX_{t-1} + \alpha_4 NIFTY\_RET_{t-1} + \alpha_5 S\&P500\_RET_{t-1} + \alpha_6 NIFTY\_VOLATILITY_{t-1} + e_{i,t}$$

where *i* refers to stock *i* and *t* refers to day *t*; *FII_NET* is the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total value traded (across both FII and non FIIs); RET_t is the daily continuous compounded return of the stock; *SIZE* is the log of market capitalization; *TOVER* is the ratio of total traded value to market capitalization, *RETAIL_OSHP* and *INSTITUTIONAL_OSHP* are the percentage of retail and institutional ownership in the firm. Market wide factors include *AGGR_FFLOW* (aggregate FII flows) defined as (total *FII_BUYS* – total *FII_SELLS*) / total traded value on day *t* for all stocks; level (*VIX*) and changes in *VIX* (*ΔVIX*); and lagged returns on S&P 500 index and NIFTY index. The table reports the coefficient estimates along with time-clustered robust t-statistics. *, ** and *** indicate significance levels of 0.10, 0.05 and 0.01, respectively.

Variable	Coefficient	t-Statistic
Intercept	-0.2601	-6.22***
FII_NET_{t-1}	0.2868	67.41***
FII_NET_{t-2}	0.1128	32.02***
FII_NET_{t-3}	0.0633	22.72***
FII_NET_{t-4}	0.0423	14.98***
FII_NET_{t-5}	0.0503	18.84***
RET_{t-1}	0.0012	6.46***
RET_{t-2}	0.0002	1.79*
RET_{t-3}	-0.0001	-0.78
RET_{t-4}	-0.0002	-1.17
RET_{t-5}	-0.0001	-0.67
$AGGR\_FFLOW_{t-1}$	0.1013	7.75***
SIZE	0.0109	6.70***
TOVER	-0.1062	-1.06
$RETAIL\_OSHP_{t-1}$	0.0017	4.22***
$INSTITUTIONAL\_OSHP_{t-1}$	-0.0005	-2.74***
VIX_{t-1}	-0.0003	-4.39***
ΔVIX_{t-1}	-0.0006	-6.59***
$NIFTY\_VOLATILITY_{t-1}$	-0.1371	-2.37**
$S\&P\ 500\_RET_{t-1}$	0.0006	1.34
$NIFTY\_RET_{t-1}$	-0.0001	-0.44
Adjusted R-square	0.1929	
Durbin-Watson stat	2.0037	
F-statistic	277.4851	
No. of observations	279864	
Number of Firms	223	

Table 5

Abnormal Returns and Firm characteristics Around Portfolio Formation Day (Day 0)

FII flow ($FII\_NET_{i,t}$) is defined as the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total value traded (across both FII and non FIIs) for the i^{th} stock on t^{th} day. During the period 2006-2011, firms are ranked according to innovations in *FII_NET* at the beginning of every week (typically on every Monday) and sorted into five quintiles. The mean estimate and t-statistics for the high innovation (Q5), low innovation (Q1) and the difference between the high and low (Q5-Q1) portfolios are reported in this table.

This table reports the results for portfolios formed on the basis of FII flow innovations obtained from the panel regression model. Panel A reports the abnormal returns (*AB_RET*) – namely, excess returns over the market return defined from a (CAPM) market model regression – in the pre-formation window (-5, -1), the portfolio-formation day (Day 0), and the post–formation window (0, 5). Panel B reports the firm characteristics of the high (Q5), low (Q1) and the difference between the Q5-Q1 portfolios. *PRE_* (*POST_*)*VOLATILITY* is the annualized standard deviation of daily returns for 5days before (after) the day of portfolio formation; *PRE_ (POST_) RUPEE_VOLUME* is the average of daily rupee trading value in Rs. millions during the 5 days before (after) the day of portfolio formation; PRE*_(POST_) AMIHUD_ILLIQ is the mean* ratio of absolute return on traded value over day during the week before (after) portfolio formation day *t*. *PRE_ (POST_) SIZE* is the average market capitalization in Rs Millions of the firm during five days before (after) the day of portfolio formation; *PRE_(POST_) INSTITUTIONAL_OSHP* is the average percentage of institutional ownership and *PRE_(POST_) RETAIL_OSHP* is the average percentage of retail ownership before and after the portfolio formation day. *PRE_LOCAL_* (*GLOBAL_*) β*ETA* is the slope coefficient on the NIFTY (S&P 500) index in the market model regression estimated using 52 weekly returns prior to the day of portfolio formation; and *IDIO_RISK* is the annualized standard deviation of residuals of the market model regression. The number of stocks in the sample is 223. Newey-west standard errors are used with six lags to obtain t-statistics. *, ** and ***indicate that the estimate value differs from zero at significance levels of 0.10, 0.05 and 0.01, respectively.

PANEL A: Return behavior around the days of shocks in *FII_NET*

	Q1		Q5		Q5-Q1	
	Estimate	**t-stat**	**Estimate**	**t-stat**	**Estimate**	**t-stat**
AB_RET (-5, -1) %	0.06	1.17	-0.00	-0.19	-0.08	-1.07
AB_RET (-1, 0) [Day 0 Returns] %	-0.93	-33.98***	0.88	31.60***	1.82	22.81***
AB_RET (0, 5) %	0.36	5.73***	0.04	0.62	-0.31	-4.76***

PANEL B: Firm Characteristics

Firm characteristics	Q1 Estimate	Q5 Estimate	Q5-Q1 Estimate	Q5-Q1 t-stat
PRE_RUPEE_VOLUME	402.18	390.25	-12.20	-0.95
POST_RUPEE_VOLUME	413.53	399.03	-14.50	-1.09
PRE_AMIHUD_ILLIQ	2.71	0.33	-2.38	-1.18
POST_AMIHUD_ILLIQ	0.34	0.26	-0.08	-1.25
PRE_SIZE	198241.00	196621.00	-1.62	-0.28
POST_SIZE	196357.00	199817.00	3.46	0.60
PRE_LOCAL_βETA	0.92	0.92	-0.00	-0.38
POST_LOCAL_βETA	0.91	0.92	0.00	0.73
PRE_GLOBAL_βETA	-0.09	-0.11	0.01	1.20
POST_GLOBAL_βETA	-0.10	-0.11	0.00	0.48
PRE_VOLATILITY (%)	2.29	2.29	0.00	0.38
POST_VOLATILITY (%)	2.37	2.33	-0.04	-1.94*
PRE_IDIO_RISK (%)	4.80	4.81	0.00	0.31
POST_IDIO_RISK (%)	4.79	4.80	0.00	0.28
PRE_ INSTITUTIONAL_OSHP	37.56	37.59	0.01	0.04
POST_ INSTITUTIONAL_OSHP	37.63	37.65	0.00	0.02
PRE_ RETAIL_OSHP	23.22	23.47	0.00	1.44
POST_ RETAIL_OSHP	22.95	23.25	0.00	1.73*

Table 6

Time Series Variation in Returns of Portfolios Based on FII Flow Innovation

FII flow ($FII\_NET_{i,t}$) is defined as the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total value traded (across both FII and non FIIs) for the i^{th} stock on t^{th} day. Firms are ranked according to innovations in *FII* flows at the beginning of every week (typically on every Monday) and sorted into five quintiles. Q5 refers to the high innovation portfolio and Q1 refers to the low innovation portfolio. This table reports the results of regressions relating the abnormal return (*AB_RET*) on day 0 for low (Q1), high (Q5), and difference between high and low (Q5-Q1) innovation portfolios (Y_t) to pre-formation firm specific characteristics (X_t) and market-wide factors (Z_{t-1}),

$$Y_t = \alpha_0 + \beta\, X_t + \gamma\, Z_{t-1} + \varepsilon_t.$$

The table reports regression results of Abnormal Returns on day 0 (*AB_RET*) as the dependent variable. The first major column is for Low (Q1) innovation portfolio, the second major column is for High (Q5) innovation portfolio, and the last major column is for the difference between the high and low innovation (Q5-Q1) portfolio on the portfolio formation day. The vector X_t includes mean of low and high innovation portfolio, mean difference between high and low quintile portfolio for pre-formation firm characteristics: *LOCAL_* (*GLOBAL_*) β*ETA* is the slope coefficient on the CNX NIFTY (S&P 500) index returns in the market model regression estimated using 52 weekly returns prior to portfolio formation day; *IDIO_RISK* is the standard deviation of the residuals obtained from the market model regression; *SIZE* is the average market capitalization; *RUPEE_VOLUME* is the daily average traded value; *VOLATILITY* is the standard deviation of daily returns over five days prior to the day of portfolio formation day. *RETAIL_OSHP* and *INSTITUTIONAL_OSHP* are the percentage of retail and institutional ownership prior to the portfolio formation. The vector Z_t includes the market wide factors: *AGGR_FFLOW* (aggregate FII flows) defined as (total *FII_BUYS* – total *FII_SELLS*) / total traded rupee value on day *t* for all stocks; *VIX* and changes in *VIX* (*ΔVI*X); and lagged returns on S&P 500 index and NIFTY index. The sample consists of 285 weekly observations. The number of stocks in the sample is 223. The table reports coefficient estimates and time-clustered robust t-statistics. *, ** and *** indicate significance levels of 0.10, 0.05 and 0.01, respectively.

	ABNORMAL RETURN on Day 0					
	Q1		**Q5**		**Q5-Q1**	
	Estimate	**t-stat**	**Estimate**	**t-stat**	**Estimate**	**t-stat**
Intercept	-9.73	-2.60**	12.84	3.14***	0.97	7.77***
AMIHUD_ILLIQ	0.00	8.19***	0.06	2.39**	0.00	4.36***
Log(*RUPEE_VOLUME*)	-0.08	-0.52	0.60	3.08***	-0.20	-1.77*
Log(*SIZ*E)	0.38	2.03**	-0.81	-3.90***	0.15	1.08
LOCAL_ϐETA	0.07	0.20	-0.72	-1.11	-0.10	-0.30
GLOBAL_ϐETA	0.03	0.15	-1.10	-2.29**	0.27	1.11
VOLATILITY	-0.10	-1.39	0.02	0.21	-0.09	-0.65
IDIO_RISK	0.04	0.59	-0.01	-0.26	0.18	1.13
$NIFTY\_RET_{t-1}$	0.13	4.60***	0.17	4.20***	0.06	1.99**
*S&P 500_* RET_{t-1}	-0.06	-1.56	-0.11	-1.39	-0.01	-0.14
VIX_{t-1}	-0.01	-1.15	0.00	0.02	0.02	3.41***
ΔVIX_{t-1}	-0.02	-1.90*	-0.01	-0.72	0.01	0.99
$NIFTY\_VOL_{t-1}$	-7.15	-0.71	1.32	0.14	32.70	3.95***
$AGGR\_FFLOW_{t-1}$	1.49	1.40	0.50	0.39	-0.81	-0.68
RETAIL_OSHP	0.00	-0.04	-0.06	-1.93*	-0.01	-0.29
INSTITUTIONAL_OSHP	0.02	1.20	-0.04	-2.36**	0.01	0.40
Adj R-square	0.24		0.20		0.24	

Table 7

Size Effect

This table presents the differential abnormal returns between stocks experiencing high innovation in FII flows (excess purchases) and stocks experiencing low innovations in FII flows (excess sales). FII flow ($FII\_NET_{i,t}$) is defined as the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total value traded (across both FII and non FIIs) for the i^{th} stock on t^{th} day. Firms are ranked according to innovations in *FII* flows at the beginning of every week (typically on every Monday) and sorted into five quintiles. Q5 refers to the high innovation portfolio and Q1 refers to the low innovation portfolio. Q5-Q1 refers to the differential abnormal returns between the Q5 and Q1 portfolios.

The panels below report mean value and t-statistics for the abnormal returns (AB_RET) on the high innovation (Q5), the low innovation (Q1) portfolios and their (Q5-Q1) difference in the pre-formation window (-5, -1), the portfolio-formation day (Day 0), and the post–formation window (0, 5). The first, second and third major rows report results for large-cap, mid-cap and small-cap stocks, respectively. The number of stocks in the sample is 223. The table reports mean estimates and robust Newey-West t-statistics, calculated with six lags. *, ** and ***indicate that the estimate value differs from zero at significance levels of 0.10, 0.05 and 0.01, respectively.

SIZE	**Q1**		**Q5**		**Q5-Q1**	
	Estimate	**t-stat**	**Estimate**	**t-stat**	**Estimate**	**t-stat**
Large-Cap						
AB_RET (-5, -1) %	0.12	1.47	0.11	1.39	-0.00	-0.08
AB_RET (-1, 0) [Day 0 Returns] %	-1.04	-23.33***	1.10	23.92***	2.14	30.43***
AB_RET (0, 5) %	0.64	6.63***	0.09	1.01	-0.53	-4.22***
Mid-Cap						
AB_RET (-5, -1) %	0.15	1.98	0.03	0.36	-0.13	-1.47
AB_RET (-1, 0) [Day 0 Returns] %	-0.88	-21.25***	0.83	20.44***	1.71	35.67***
AB_RET (0, 5) %	0.38	4.25***	0.10	1.20	-0.28	-2.95***
Small-Cap						
AB_RET (-5, -1) %	0.17	1.22	-0.17	-1.21	-0.34	-2.66***
AB_RET (-1, 0) [Day 0 Returns] %	-0.86	-13.53***	0.76	11.86***	1.62	23.47***
AB_RET (0, 5) %	-0.08	-0.53	0.13	0.82	0.21	1.33

Table 8

Impact of FII flows during Periods of Market Stress

This table presents the differential abnormal returns (*AB_RET*) between stocks experiencing high innovation in FII flows (excess purchases) and stocks experiencing low innovations in FII flows (excess sales) during periods of global market stress. FII flow ($FII\_NET_{i,t}$) is defined as the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total value traded (across both FII and non FIIs) for the i^{th} stock on t^{th} day. Firms are ranked according to innovations in *FII* flows at the beginning of every week (typically on every Monday) and sorted into five quintiles. Q5 refers to the high innovation portfolio and Q1 refers to the low innovation portfolio. Q5-Q1 refers to the differential abnormal returns between the Q5 and Q1 portfolios.

Panel B divides the sample into days associated with high VIX and low VIX. The panels below report mean estimates and t-statistics for the abnormal returns (*AB_RET*) on the high innovation (Q5), low innovation (Q1) and the difference between high and low (Q5-Q1) portfolios in the pre-formation window (-5, -1), the portfolio-formation day (Day 0), and the post–formation window (0, 5). Panel A examines the impact of the financial crisis by considering two sub-samples for non-crisis (first major row) and the crisis period (second major row). Panel B divides the sample into days associated with High VIX (above its median) and Low VIX (below its median). The number of stocks in the sample is 223. The table reports mean estimates and robust Newey-West t-statistics, calculated with six lags. *, ** and *** indicate that the estimate value differs from zero at significance levels of 0.10, 0.05 and 0.01, respectively.

Panel A: Impact of FII Flows - Financial Crisis

Non-Crisis Period	**Q1**		**Q5**		**Q5-Q1**	
	Estimate	**t-stat**	**Estimate**	**t-stat**	**Estimate**	**t-stat**
AB_RET (-5, -1) %	0.17	3.06***	0.02	0.49	-0.15	-2.39**
AB_RET (-1, 0) [Day 0 Returns] %	-0.82	-29.95***	0.86	32.00***	1.68	49.81***
AB_RET (0, 5) %	0.42	6.67***	0.15	2.43**	-0.28	-3.92***
Crisis Period						
AB_RET (-5, -1) %	-0.40	-2.35**	-0.16	-0.97	0.24	1.37
AB_RET (-1, 0) [Day 0 Returns] %	-1.45	-17.81***	0.97	10.34***	2.43	23.45***
AB_RET (0, 5) %	0.05	0.26	-0.46	-2.64***	-0.53	-2.65***

Panel B: Impact of FII Flows - VIX

	Q1		**Q5**		**Q5-Q1**	
High VIX days	**Estimate**	**t-stat**	**Estimate**	**t-stat**	**Estimate**	**t-stat**
AB_RET (-5, -1) %	0.00	0.04	-0.01	-0.15	-0.01	-0.14
AB_RET (-1, 0) [Day 0 Returns] %	-1.04	-25.52***	0.99	23.40***	2.02	40.59***
AB_RET (0, 5) %	0.40	4.34***	-0.01	-0.10	-0.41	-4.16***
Low VIX days						
AB_RET (-5, -1) %	0.14	2.13	-0.01	-0.11	-0.16	-2.00**
AB_RET (-1, 0) [Day 0 Returns] %	-0.80	-23.41***	0.75	22.68***	1.55	36.54***
AB_RET (0, 5) %	0.29	3.83***	0.10	1.30	-0.21	-2.30***

Table 9

Robustness Checks

This table presents the differential abnormal returns and price impact between stocks experiencing high innovation in FII flows (excess purchases) and stocks experiencing low innovations in FII flows (excess sales). FII flow ($FII\_NET_{i,t}$) is defined as the difference between the *FII_BUYS* and *FII_SELLS* scaled by the total value traded (across both FII and non FIIs) for the i^{th} stock on t^{th} day. Firms are ranked according to innovations in *FII* flows at the beginning of every week (typically on every Monday) and sorted into five quintiles. Q5 refers to the high innovation portfolio and Q1 refers to the low innovation portfolio. Q5-Q1 refers to the differential abnormal returns between the Q5 and Q1 portfolios.

The panels below report mean value and t-statistics for the abnormal returns (*AB_RET*) on the high innovation (Q5), the low innovation (Q1) portfolios and their (Q5-Q1) difference in the pre-formation window (-5, -1), the portfolio-formation day (Day 0), and the post–formation window (0, 5). In Panel A, we re-define FII flow innovations on the basis of past cumulative innovations over the last five days. The pre-formation window relevant in this case is (-10, -5). In Panel B, we examine out-of-sample (Jan 2012- Jun 2013) behavior of the panel regression model used to define FII flow innovations. FII flow innovations in the out-of-sample period are based on the panel regression model constructed from in-sample data over the period 2006-2011. The number of stocks in the sample is 223. The table reports mean estimates and robust Newey-West t-statistics, calculated with six lags. *, ** and ***indicate that the estimate value differs from zero at significance levels of 0.10, 0.05 and 0.01, respectively.

	Q1		Q5		Q5-Q1	
	Estimate	**t-stat**	**Estimate**	**t-stat**	**Estimate**	**t-stat**
Panel A: Cumulative Innovation in FII flows						
AB_RET (-10, -5)%	0.15	2.40**	-0.08	-1.39	-0.24	-3.51***
AB_RET (-5, -1) %	-1.50	-27.26***	1.46	27.12***	2.96	45.44***
AB_RET (-1, 0) [Day 0 RET]%	-0.38	-13.02***	0.41	15.90***	0.79	23.89***
AB_RET (0, 5) %	0.48	7.80***	-0.00	-0.01	-0.49	-6.98***
Panel B : Out of Sample data						
AB_RET (-5, -1) %	-0.10	-1.57*	0.14	2.26**	0.24	2.69***
AB_RET (-1, 0) [Day 0 Returns] %	-0.80	-24.68***	0.71	22.66***	1.51	33.49***
AB_RET (0, 5) %	0.30	3.62**	0.10	1.35	-0.20	-1.77*

Table 10

Asymmetric and Non Linear Effects of FII Flows

This table presents the evolution of price impact curve by regressing Abnormal Returns against FII innovations allowing for possible asymmetry and non-linearity. The following regression equation is estimated separately for all firms (ALL), for different size deciles (NIFTY, MIDCAP and SMALL CAP) and as well for days experiencing different levels of market stress (High VIX and Low VIX).

$$AB\_RET = \alpha_0 + \alpha_1 FII\_NET\_INNOV + \alpha_2 DUM + \alpha_3 FII\_NET\_INNOV * DUM + \alpha_4 SQ\_FII\_NET\_INNOV + \alpha_5 SQ\_FII\_NET\_INNOV * DUM + e$$

In the above regression, *DUM*, is a dummy variable that takes value 1 for negative FII Innovations and for positive or zero FII Innovations. The table reports estimates and t-stats of robust standard errors. The table reports mean estimates and robust Newey-West t-statistics, calculated with six lags. *, ** and ***indicate that the estimate value differs from zero at significance levels of 0.10, 0.05 and 0.01, respectively.

	ALL firms		High VIX Days		Low VIX Days	
Abnormal Returns (AB_RET)	**Estimate**	**t-stat**	**Estimate**	**t-stat**	**Estimate**	**t-stat**
Intercept	0.06	2.01**	0.01	0.24	0.13	3.25***
FII_NET_INNOV	5.66	14.91***	6.82	12.41***	4.09	8.35***
DUM	0.10	2.48**	0.16	2.75***	0.01	0.25
*FII_NET_INNOV*DUM*	1.47	2.78***	1.64	2.15**	1.26	1.83*
SQ_FII_NET_INNOV	-8.03	-9.27***	-10.03	-7.97***	-5.32	-4.77***
*SQ_FII_NET_INNOV*DUM*	16.82	13.87***	21.58	12.44***	10.36	6.44***

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