# Foreign Fund Flows and Asset Prices:
# Evidence from the Indian Stock Market[*]

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## Abstract

We study the effect of foreign fund flows on asset prices by investigating the link between foreign institutional investor (FII) flows and stock returns in India. Stocks experiencing high innovations in FII order flow are associated with a permanent price increase, whereas stocks experiencing low FII order flow innovations are associated with a partly-transient price decline. The differential abnormal return between high and low innovation stocks is significant, largely unrelated to firm characteristics, and increasing during periods of market stress. The findings are consistent with price "pressure" induced by FII sales, as well as information being revealed through both FII purchases and FII sales.

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

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**Abstract**

We study the effect of foreign fund flows on asset prices by investigating the link between foreign institutional investor (FII) flows and stock returns in India. Stocks experiencing high innovations in FII order flow are associated with a permanent price increase, whereas stocks experiencing low FII order flow innovations are associated with a partly-transient price decline. The differential abnormal return between high and low innovation stocks is significant, largely unrelated to firm characteristics, and increasing during periods of market stress. The findings are consistent with price "pressure" induced by FII sales, as well as information being revealed through both FII purchases and FII sales.

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*"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, 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]

Cross-border capital flows can have a significant impact on the economies of emerging markets. For instance, in 1997, the currency and stock markets of several East Asian countries (e.g., Indonesia, Thailand, Malaysia, Philippines, and South Korea) suffered a major decline due to the flight of capital to safety. This "Asian Financial Crisis" spread from East Asia to Latin America and drove many developing countries into recession.

While the consensus view is that global capital flows play an extremely important role in financial asset returns, there is a paucity of research on the precise channel, the magnitude, and the longevity of the impact of capital flows on financial markets. In this study, we examine the case of an emerging market (India) to understand how foreign fund flows affect asset prices. We evaluate the domestic equity market performance in India both in terms of the magnitude of the immediate impact of foreign fund flows, as well as the permanence of this impact. We document that while foreign fund outflows are associated with a temporary price "pressure" on affected stocks, both inflows and outflows are also associated with a permanent price movement. Our study thus sheds light on the tradeoff between informational effects and transient volatility effects that arise in the context of global capital flows.

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[1] See "Volatility may force a rethink on short-term inflows into government bonds, Shaji Vikraman, Economic Times Bureau, February 3, 2014, 07.02AM IST.
[2] International Monetary Fund Country Report No. 14/57, February 2014 (Item No. 46, p. 20), available at http://www.imf.org/external/pubs/ft/scr/2014/cr1457.pdf.

Using a dataset containing stock-level daily trading data for FII purchases and sales, we separate stocks into those experiencing abnormally high and low FII flow innovations. To achieve this segregation, we employ a "panel regression" approach in which we estimate FII flows at the stock level based on lagged firm characteristics, lagged FII flows, and market-wide factors. The residuals from this estimation exercise can be considered as the abnormal or unpredictable component of FII flows and are used to rank stocks each week to form high and low FII flow *innovation portfolios*.[3] We then analyze 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 (on the 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 and reverses within one week (Figure 5). We also find that the transient effect accounts for nearly 16% of the annualized volatility of a typical stock. The differential cumulative abnormal return between high and low innovation stocks over a five-day period starting with the formation day is significant, both statistically and economically (relative to stock return volatility).

We decompose the abnormal returns on the portfolio formation day into overnight returns and during-day returns. We find that abnormal return differential between the high innovation stocks and low innovations stocks is entirely driven by during-day returns. This finding strongly suggests that abnormal FII flows cause *contemporaneous* asset price changes, rather than merely chasing the information revealed at the end of the previous day.

Importantly, we find that there is no pre-formation differential abnormal return between

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[3] 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.

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 or trading volume). We examine whether 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 both global market volatility (CBOE VIX) and local stock market volatility; however, the abnormal return differential is unrelated to correlated trading by FIIs (commonality in order flow).

We also check 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. This finding suggests 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 is driven by the buy-and-hold motives of FII traders.

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 CBOE VIX levels and days associated with low CBOE VIX levels relative to the median CBOE VIX level in the sample. The impact of FII flows is, in general, higher on days with high CBOE VIX levels as compared to days associated with low CBOE VIX levels. This finding also suggests that there is a volatility spillover from the developed markets into emerging markets via the portfolio rebalancing channel.

Overall, our results are consistent with (i) price "pressure" on stock returns induced by FII sales, given the partial reversal of formation day negative returns for stocks experiencing abnormally high FII sales and (ii) 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

Shleifer and Vishny (1997) and Gromb and Vayanos (2010), 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 CBOE VIX levels), 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.

An exception to our main finding is during the period of the "taper tantrum," which arose when the U. S. Federal Reserve hinted at a tighter monetary policy in the summer of 2013 (May $22^{nd}$ 2013, to be precise). Sahay et al (2015) document a significant capital outflow accompanied by sharp revisions in asset prices across the world, especially in emerging markets.[4] To study the effects of the taper tantrum on the Indian equity markets, we employ the panel regression model built with our historical data (until April 15th, 2013) on the out-of-sample data in the period around the taper tantrum (April $15^{th}$ 2013 to June $30^{th}$ 2013). As in the in-sample analysis, we create two portfolios based on extreme values of unanticipated FII buy order flow and FII sell order flow.

We find that, as compared to the in-sample period, the returns of the high innovation and the low innovation portfolios are more significantly different in the post-taper period (May $23^{rd}$ 2013 to June 30 2013) than in the pre-taper period (April $15^{th}$ 2013 to May $22^{nd}$ 20-13). The key source of the difference is that the transient portion of the return differential (between the high and

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[4] Emerging markets received approximately half the global capital flows during 2008-2013 in comparison to the 20 percent share that they received during 2002-2008. Sahay et al (2015) estimate a capital "overflow" of $500 billion in the post-crisis period; 80 percent of this overflow was directed at six of the largest emerging markets (China, Brazil, Mexico, Turkey, Indonesia and India).

low innovation portfolios) is much more exaggerated in the post-taper period as compared to the pre-taper period. The reversal in the return differential in the post-formation window reflects this temporary price effect. However, there continues to be a permanent return differential even after a 5-day window, as found in the in-sample analysis. This finding suggests that, the taper tantrum primarily induced a *greater* degree of non-information (e.g., portfolio-rebalancing) based FII flows, resulting in temporary asset-price impacts that were reversed subsequently, but information-based FII flows during the taper-period continued to have a permanent price impact, as experienced during normal times.

The rest of the paper is organized as follows. In Section 1, we discuss the motivation for our study, and relate it to the existing literature. In Section 2, we describe the data and methodology. In Section 3, we present the key empirical results. In Section 4, we provide robustness checks. Finally, in Section 5, we examine the taper tantrum period. We conclude in Section 6.

# 1. Motivation and Related Literature

## 1.1    Foreign Fund Flows and Price Volatility

Foreign fund flows in and out of Indian stock markets are now a sizeable portion of market activity. Table 1 shows the annual FII net flows in dollars, FII ownership and FII gross flows as a percentage of total traded value during the 2006-2013 period. Cumulative net investment flows from foreign institutional investors (FIIs) exceeded USD 113 billion. FII gross flows accounted for about 20% of the daily traded share value. During the same period, FII ownership averaged around 10%. The number of FIIs registered with the Securities and Exchange Board of India (SEBI) increased from 882 in March 2006 to 1,757 in March 2013; FIIs, on average, accounted for 20% to 30% of the total trades executed at the National Stock Exchange of India during the 2006-2013 period.

While FII participation in Indian equity markets has been steadily increasing, there is a widespread perception (as echoed in Governor Rajan's quote above) that foreign fund flows may be creating substantial volatility in markets, especially during periods of market stress. This concern is amplified in emerging markets given the illiquidity of their equity markets (relative to those of developed markets). Figure 1 highlights this issue. It shows the relation between annual FII net inflows in 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 during the 2001-2013 period. FII net inflows were positive in all years except 2008-2009. However, during the global financial crisis (2007-2009), 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 to the hypothesis that FII flows induce volatility in emerging markets.

If FII flows trigger volatility in emerging markets, policy-makers would be keen to find out more about the key drivers of these FII flows. Figure 2 explores this issue by depicting the relation between FII flows and macro events in developed countries. We plot the average FII net flows and the Chicago Board Options Exchange (CBOE) Market Volatility Index (henceforth, CBOE VIX) indicator on a weekly basis. A broader trend of a negative relation between FII net flows and CBOE VIX levels emerges during the 2008-2010 period.

Several events (shown in Figure 2) also illustrate the impact of global uncertainty on FII flows over short horizon intervals. For instance, the Indian capital market suffered its biggest decline on May 22, 2006, exactly at a time when the CBOE VIX was exhibiting a sharp increase, as can be seen in the bottom left corner of the figure. This behavior is consistent with flight-to-safety. Further, the immediate recovery in FII flows around the same date mirrors a sharp reduction in the CBOE VIX, suggesting not only that global risks are a key driver of FII flows, but also that FII flows are a critical channel of contagion between the U. S. markets and the Indian equity markets. In a similar vein, the flash crash in Indian capital markets on May 6, 2010 occurred shortly after a critical credit rating downgrade of Greece on April 27, 2010. Interestingly, variation in FII flows is also driven by local India events, as seen in the spikes in FII flows on November 26, 2008, when the Mumbai terrorist attacks occurred.

## 1.2 Related Literature

Recent research has shed some light on the possible impact of net capital flows on domestic markets by foreign investors. In particular, researchers have examined the extent of the transmission of economic shocks from one region of the world to another. They have also examined whether the associated price pressure effects are permanent or temporary. Our findings are similar to the findings of Coval and Stafford (2007), Frazzini and Lamont (2008), and Lou

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(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.

Coval and Stafford (2007) show that sudden increases (decreases) in fund flows cause mutual fund managers in the United States to significantly adjust their holdings, resulting in price pressure effects, which are transient but may take several weeks to reverse. Frazzini and Lamont (2008) find that mutual fund flows reflect retail investor sentiment and high inflows are associated with lower future returns. Lou (2012) examines the impact of flows at the individual stock level. However, his study differs from our study on two significant counts. First, Lou (2012) aggregates *quarterly* flow-induced trading by mutual funds. In contrast, our study examines the price impact of *daily* flow-induced demand shocks. Thus, our work analyzes the *short*-run immediate impact of flows, whereas his study analyzes the *long*-run impact of flows. Furthermore, the focus of his study is on the impact of *expected* flows on fund performance, whereas our focus is on the immediate price impact of *unexpected* fund flows (innovations in order flow).

The asymmetric response for the high and low innovation portfolios is similar to the findings in the empirical studies of block transactions (e.g., Holthausen et al. 1987; Chan and Lakonishok 1993; Keim and Madhavan 1996; and Saar 2001). The prevalent rationalization is that block *purchases* are motivated by information whereas block *sales* are motivated by portfolio rebalancing concerns. Our findings are consistent with a similar rationale for FII trading in emerging market stocks. On this front, a closely related paper, Jotikasthira, Lundblad, and Ramdorai (2012), reports that asset fire sales in the developed world affect fund flows to emerging

markets.[5] They argue that in emerging markets, the equity markets are influenced by this "push" factor and fund flows provide an additional channel of contagion.[6,] Anshuman, Chakrabarti, and Kumar (2012) find that during the financial crisis period, the influence of (aggregate) FII flows on Indian equity markets increased during periods when the U.S. markets experienced abnormal returns.

Given the lack of foreign investor trading data at the individual stock level, studies have focused on aggregate flows in and out of the emerging stock markets. Researchers have identified foreign flows that can be considered reasonably "exogenous" to the stock market fundamentals of the emerging market. An alternative approach would be to examine the *cross-sectional* return performance of firms within an emerging stock market that are affected differentially by foreign fund flows. We adopt the latter approach to assess how stock returns differ between stocks experiencing foreign fund inflows versus foreign fund outflows on a given day, thereby controlling for any aggregate or common information affecting all stocks on that day. We are able to accomplish this task by accessing an exclusive dataset that provides information about *daily* FII flows at the individual stock level for the most actively traded stocks in the Indian stock market during the 2006-2013 period.

## 2. Data and Methodology

The data come from three sources. The first source is a proprietary data set of daily stock-wise FII trading (purchases and sales) obtained from the National Stock Exchange (NSE); the

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[5] Several others 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.
[6] Jotikasthira, Lundblad, and Ramdorai (2013) also examine the relation between global fund flows and domestic real economic activity. They find that shocks in fund flows affect the investment policy of Chinese and Indian firms.

second source is the Prowess database created by the Centre 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&P 500 Index and the CBOE VIX Index of the U.S. market. The sample period is from January 1, 2006 to June 30, 2013. We use data from January 1, 2006 to December 31, 2011 for an in-sample analysis and the data from January 1, 2012 to June 30, 2013 for out-of-sample tests.

Our sample consists of 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. This filter allows us to exclude stocks that are infrequently traded. The resulting sample consists of 272 stocks that 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 and 5 stocks are dropped because of missing data on institutional and retail ownership. Further, the FII share of trading volume on any trading day is censored at $\pm$ 95% and daily stock returns are censored at $\pm$ 20%. Our final data set consists of an unbalanced panel of 223 unique stocks with 279,864 stock-day observations.

The CNX NIFTY Index data series is used to measure broader 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 are used to capture the

broad global market performance and the "risk appetite" of the global financial sector, respectively.

## 2.1 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:

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

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:

$$NIFTY\_RET_t = 100 * \ln\left(\frac{NIFTY_t}{NIFTY_{t-1}}\right). \tag{2}$$

Abnormal returns for the $i^{th}$ stock on day $t$ are defined as excess returns over the expected returns obtained from the market model using 52 prior weekly observations.[7]

$$AB\_RET_{it} = RET_{it} - E(RET_{it}) = RET_{it} - \alpha_i - \beta_i NIFTY\_RET_t. \tag{3}$$

We define net FII flows as the difference between the daily rupee value of purchases (*FII_BUYS*) and the 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*).

$$FII\_Net_{it} = \frac{FII\_BUYS_{it} - FII\_SELLS_{it}}{RUPEE\_VOLUME_{it}}, \tag{4}$$

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

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[7] This procedure follows the same methodology for estimating a market model as described in Mackinlay (1997).

the daily net FII flows relative to the total daily rupee trading value.[8]

Table 2 presents the variable definitions. Table 3 presents the descriptive statistics of the 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 return on the NIFTY Index is 0.0333%, and on the S&P 500 Index, is 0.0014%. The mean $\beta$ of the stocks is 1.00 and the annualized idiosyncratic volatility is 36.16%. The CBOE VIX (*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.

## 2.2   Empirical Design

In this paper, we rely on a simple procedure to infer the information content of FII flows. We construct portfolios at the beginning of each week based on the innovation in FII flows and then examine the short-run performance of these portfolios and how it is related to innovations in FII flows.

This approach is described in Figure 3. We first estimate (daily) innovations in FII flows using the residuals from a panel regression model. Every Monday (or the first trading day of each week), we form five portfolios based on the residuals from the panel regression model, which captures the average daily trading behavior of FIIs over the entire sample period (2006-2011). The residuals, which measure unexpected FII flows, are used to form portfolios every Monday. These portfolios are tracked over a ten day window around the portfolio formation day,

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[8] Some studies have used an alternative definition in which net FII trading is normalized by the sum of FII purchases and sales. However, since FII trading can vary significantly with size, normalization by overall trading volume, as used in our measure, better captures the economic significance of FII trading in that stock.

as depicted in Figure 3. We examine the abnormal return on these portfolios over a 10-day trading window centered on 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. In particular, we examine the cumulative abnormal returns of the tail portfolios, i.e., the difference between the abnormal returns of the HIGH innovation and LOW innovation portfolios over the pre-formation (-5, -1) window, the (-1, 0) portfolio formation day, and the (0, 5) post-formation window. These return measures are used to infer the impact of unexpected FII flows on stock prices.

## 2.3   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*), and percentage of retail (*RETAIL_OSHP*) and institutional ownership (*INSTITUTIONAL_OSHP*) in non-promoter holdings.

To capture time-varying effects, we also include the following lagged market variables: aggregate FII (*AGGR_FFLOW*), volatility index (*VIX*), differences in the volatility index (*ΔVIX*), S&P 500 returns (*S&P500_RET$_t$*), and NIFTY returns (*NIFTY_RET$_t$*). The volatility index (*VIX*) and the market return variables capture the role of funding constraints. Aggregate FII flows (*AGGR_FFLOW*), defined as (total *FII_BUYS* – total *FII_SELLS*) / total traded rupee value on day *t* for all stocks, captures the commonality in order flow. The model specification is described below:

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

(5)

The above regression serves the purpose of a first-pass panel regression.[9] The regression residuals define innovation (*FII_NET_INNOV*). Note that *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-square value is around 19%. *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 are 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 is 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 relation between FII flows and firm size is not surprising. The negative relation with institutional ownership may reflect mean reversion arising either due to ownership constraints (there are regulatory limits on FII ownership in each stock) or portfolio rebalancing motives (rather than buy-and-hold motives) of FII traders.

The other variables with significant coefficients are market stress (*VIX*), the first difference in market stress (*ΔVIX*), and aggregate FII flows (*AGGR_FFLOW*). The coefficient on lagged S&P 500 returns is insignificant while the coefficient on lagged NIFTY returns is negative. The

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[9] 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.

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residuals obtained from this panel regression (*FII_NET_INNOV*) are used as a proxy for surprises or innovations in FII flows.

To ascertain the robustness of *FII_NET_INNOV*, we examine the association between concurrent returns and predicted component of flows (expected FII Flows based on the panel regression model). We find that the simple correlation is only.01609, which is economically insignificant (statistically significant at the 5 % level; however, given the large number of observations of approximately 240,000, a 5% significance level is quite weak). We also find that the contemporaneous correlation between returns and FII innovations is 0.21. These statistics suggest that innovations in FII flows are a superior indicator of abnormal returns than predicted FII flows.

## 2.4   Information Flow

While a significant portion of FII flows originate directly from FIIs based in the U.S.,[10] several FIIs tend to employ offshore tax havens (e.g. Mauritius) to place their orders. However, it is likely that the *information that triggers FII flows*, even when the FIIs are based outside of the U.S., is originating from the U.S., e.g., the Federal Reserve's policy announcements. We can therefore consider the linkages between the U.S. financial markets and the Indian financial markets as a good representation for understanding how the flow of information is reflected in FII orders.

Figure 4 shows the opening and closing time of NYSE/NASDAQ in the U.S. and the NSE in India, and the potential flow of information across the two exchanges. Given the time difference

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[10] It is difficult to locate evidence on the amount (value) of FII trading sourced from the U.S. However, it is likely that about 30%-40% of the FIIs are based in the U.S. We make this conclusion by referring to two reports that cover either end of our sample period.  A Ministry of Finance report from 2005, titled, "Report of the Expert Group on Encouraging FII Flows and Checking the Vulnerability of Capital Markets to Speculative flows" states that around 40% of the registered FIIs (see page 4) are based in the U.S. The SEBI Annual Report for 2015 states that the highest number of foreign portfolio investors were based in the U.S. (2993), followed by Luxembourg (971), Canada (638), and Mauritius (608).

between India and the U.S., there is no overlapping time interval between the operations of the stock exchanges in these two countries. There is a time gap of around 8 hours between the closing time on the NYSE and the opening time on the NSE the following day. This non-overlapping of operational times allows for cleaner identification of the information impact of an event in one country on the returns in the other country. In particular, we form our flow-innovation sorted portfolios every Monday; thus, after the Friday closing of exchanges in the U.S. there is sufficient time for assimilation of information before the markets open in India on Monday morning. FIIs, based in the U.S., would find it easy to react to events in the U.S. by altering the flow of funds to India on Monday. If they are constrained to take immediate action, they would place their orders at the opening of trading on Monday. They could also use the entire trading session on Monday to strategically spread their orders over time. Innovations in FII flows on Monday would thus capture the unexpected trading by FIIs unrelated to the usual FII activities on Mondays.

In summary, our empirical design reflects two key advantages: (i) The_time difference between the U.S. and India implies that information flow between the exchanges is sequential (as opposed to contemporaneous), which allows clear identification of announcement effects of an event in the U.S., and (ii) The panel regression model filters out the expected FII flows and identifies that part of FII flows that is likely to be related to unanticipated news emanating from global cues.

## 3. Analysis

### 3.1 Hypothesis related to Fund Flows

If cross-border fund-flow is a phenomenon unrelated to domestic market 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. 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 that information is asymmetrically incorporated on the 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 (e.g., Holthausen et al. 1987; Chan and Lakonishok 1993; Keim and Madhavan 1996; Saar 2001). One explanation for this asymmetric impact is that block purchases are motivated by information, whereas block sales are motivated by portfolio rebalancing concerns. Given these possibilities, we propose alternative hypotheses as follows.

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

**H1b**. Abnormal 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 relation between the magnitude of the price effect and the magnitude of abnormal

fund flows. A positive relation confirms price pressure effects, as has been demonstrated in the classic study by Scholes (1972), who studied price pressure associated with secondary distributions of firms on the New York Stock Exchange. Hypotheses H2 and H3 examine this aspect of the price pressure hypothesis.

**H2.** The price pressure associated with abnormal 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 abnormal 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 abnormal fund flows affect asset returns, we should expect that the 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, CBOE VIX level and the financial crisis period, as posited in the hypotheses below.

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

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

## 3.2   Abnormal Returns Associated with Innovations in FII Flows

Hypotheses H1, H1a, and H1b are examined in this section. Table 5 (Panel A) presents results 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 six-year sample period, there are 315 portfolio formation days. The table presents the findings for the portfolios with the lowest innovations (Q1) in *FII_NET* and 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 are the cumulative abnormal returns (CARs) over the (-5, -1) window, the abnormal returns on the portfolio formation day (Day 0), and the cumulative abnormal returns over the (0, 5) window.

Before proceeding with the innovations based measure of abnormal FII flows, we use predicted flows to form portfolios and track the abnormal performance of these portfolios over time. If the innovations capture the "unpriced" component of abnormal flows, we should find that there should be no abnormal performance associated with portfolios formed on the basis of predicted flow. Indeed, we find that the Day 0 abnormal return differential between portfolios with high predicted flows and low predicted flows is a statistically insignificant 0.02% (t-statistics = 0.54). These findings are consistent with Hasbrouck's (1988) argument that the relation between returns and flows should be driven by the unanticipated component of flows. In our study, we find that the Day 0 abnormal return differential is significant both for raw FII flows and innovations in FII flows, but is insignificant for predicted flows; we are thus assured that it is the unanticipated component of FII flows that is driving contemporaneous returns.

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 while the high innovation portfolio (Q5) is associated with positive returns. The (abnormal) return difference between the high-low innovation portfolios (Q5 - Q1) is also statistically significant. The differential abnormal return between stocks with high innovation and low innovation is equal to 1.82%. These findings indicate that FII inflows are associated with price appreciation and FII outflows are associated with price declines.

A key concern regarding our study is the direction of causality. It is possible that information, asset price changes, drive abnormal FII flows, rather than the other way around. One requires intraday data to completely ascertain the direction of causality in this relation. However, we are more inclined toward the hypothesis that abnormal flows drive asset prices. First, it is difficult to imagine that FII investors, who are based outside India (mostly in the western hemisphere - see footnote 11) would actively monitor information generated in Indian markets given that it is late night in the U. S. Figure 4 shows the significant time difference and non-overlapping hours of operations of the U.S. and Indian stock exchanges.  It is more likely that FIIs take clear views on their portfolio holdings at the close of trading in the U.S., and transmit their orders for execution in Indian stock exchanges in the immediately following trading session.

To probe this issue further, we decompose the abnormal return on portfolio formation day into two components: the overnight return based on the closing price on Day -1 and the opening price on Day 0 and the during-day return based on the opening price of Day 0 and the closing price on Day 0. It is strikingly clear that the abnormal return on Day 0 is mainly driven by during-day returns. The overnight returns are smaller and similar for both Q1 and Q5 portfolios and the

differential abnormal overnight return is insignificant (both, statistically and economically). The during-day differential abnormal returns is, however, significant. The decomposition of abnormal returns into overnight returns and during-day returns strongly suggests that FII trading is critically linked with asset returns.[11]

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.[12] The CAR in the post-formation window (0, 5) is significantly positive (0.36%) for the low innovation portfolio (Q1), but insignificantly positive (0.04%) for the high innovation portfolio (Q5). This pattern indicates reversal of prices in the post-formation window. However, there is significant reversal *only* for the low innovation portfolio. Thus, the statistically significant differential CARs (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 CAR differential (Q5 - Q1) over the pre-formation window, (-5, -1), is statistically insignificant (-0.08%).

These results can be more easily seen in Figure 5, which shows the CARs over the (-5, 5) window. High innovation stocks experience a significant coincident price appreciation, whereas

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[11] It is possible that the open prices used to measure overnight returns in our sample are stale, because they are represent the first transacted price of the trading day. To ascertain the impact of this phenomenon, we examined overnight returns and during-day returns for a sub-sample of large cap stocks, which were placed under a call auction procedure from 18th Oct. 2010. We found that the results were virtually identical for this sub-sample, which covers the period Oct. 18th 2010 to Dec. 31st 2011 (the end point of our in-sample data). For instance, the overnight differential abnormal return (Q5 – Q1) was 0.05% (t-statistic of 1.25), whereas the during-day differential abnormal return (Q5 – Q1) was 1.89% (t-statistic of 20.05). These numbers are similar to the numbers reported in Table 7 for large-cap stocks over the entire in-sample period. These results suggest that our measure of overnight returns and during-day returns are not affected by the stale price issue.

[12] 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.

low innovation stocks experience a significant coincident price decline.[13] The CARs in the post-formation period remain flat for the high innovation portfolio. However, for the low innovation portfolio, the CARs start 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 Hypotheses 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 5, we can see that approximately 40% of the abnormal returns on Day 0 are reversed in the post-formation period. Given that the volatility of a typical stock is around 36.16%, a return reversal of approximately 0.36% indicates that the transient effect accounts for $0.36*\sqrt{(252)}/36.16$, or nearly 16% of the annualized volatility of a typical stock.[14]

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

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[13] This result holds for raw returns as well abnormal returns; all results reported in the paper refer to abnormal returns.
[14] 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 for smaller stocks.

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.

We consider a couple of robustness checks regarding our findings. First, we replicate the portfolio formation procedure using predicted value of *FII_NET* instead of innovations in *FII_NET* derived from the panel regression model. We find that the differential abnormal returns between the high predicted FII flows portfolio and the low predicted FII flows portfolio on Day 0 is economically and statistically insignificant (-0.02 with a t-statistic of 0.54). This finding provides further credence to our empirical approach of using FII flow innovations rather than raw FII flow to form portfolios. Filtering out the predictable component of FII flows allows us to make reasonable inferences about the marginal impact of FII flows on asset prices.[15]

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

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[15] We find that the pre-formation window (-5, 1) exhibits a high abnormal return differential of 3.20%. This result is consistent with what we find in the panel regression model. *FII_NET* is found to be positively related to previous period returns, reflecting trend chasing behavior of FIIs. Thus, portfolios formed on the basis of predicted FII flows are already skewed toward stocks that experience high past returns. In particular, by construction, the high predicted FII flow portfolio will contain securities that have performed well and the low predicted FII flow portfolio will consist of securities that have done poorly.

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 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 FII trading also generates new information.

## 3.3 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 whether variation in the time series of these effects can due to market-wide factors. Figure 6 shows the time series relation 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 CBOE VIX levels may be causing FII flows to be driven more by portfolio rebalancing 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 U.S. and India), ownership structure in terms of retail and institutional ownership, and aggregate FII flows:

$$Y_t = \alpha_0 + \beta\, X_t + \gamma\, Z_{t-1} + \varepsilon_t. \tag{6}$$

The results are reported in Table 6. 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 return 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 what we posit in Hypothesis H4. NIFTY lagged returns and 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 abnormal 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.

## 3.4   Size Effect

Next, we examine the impact of firm size on how FII trading affects stock returns. Typically, 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, or the CNX SMALLCAP indices, respectively, of the National Stock Exchange (NSE). Table 7 shows the differential abnormal returns between the high and low innovation portfolios by market size. Abnormal returns on Day 0 are directly related to firm size. Large-cap stocks (as in the NIFTY Index) experience a Day 0 abnormal return differential of 2.14%. In contrast, the mid-cap and small-cap stocks experience abnormal return

differentials of 1.71% and 1.62%, respectively. Figure 7 presents the CAR plots across the (-5, +5) window. 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 the least for small cap stocks. This finding is consistent with what we posit in Hypothesis H3.

We find 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 less frequently in small-cap stocks than in mid-cap and large-cap stocks. We can see that positive relation between Day 0 abnormal return differentials between high and low innovation portfolios and firm size is probably due to the fact that FIIs are more actively trading in larger stocks.

Across all the panels, it is apparent that the Day 0 differential abnormal returns are mainly driven by during-day price changes rather than overnight returns. More interestingly, the importance of during-day returns is related to size, and large cap stocks experience the greatest during-day differential abnormal returns on the portfolio formation day. This finding is consistent with the fact that FIIs are more actively trading in large-cap stocks as compared to small-cap stocks, and it is their trading that affects asset returns.

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 either side of the market. This is consistent with the view that FII trading in smaller stocks, which are less liquid, is driven by the 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 and portfolio rebalancing motives.

## 3.5   Impact of Global Market Stress

The global financial crisis 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 recent financial crisis period provides a unique opportunity to examine the impact of foreign fund flows on emerging markets during times of market stress.

To examine this effect, we identify portfolio formation days that are associated with high global market stress, as measured by the CBOE VIX Index as a measure of global market stress. 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. Second, we divide the portfolio formation days into two groups: one associated with low CBOE VIX levels and the

other associated with high CBOE VIX levels. This procedure is useful in estimating the impact of the CBOE VIX on the differential price impact of high and low FII flow innovations.

### 3.5.1 Crisis Period Effect

In Indian capital markets, the financial crisis period is identified as the period from January 2008 to December 2008.[16] 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 both periods. Table 8 (Panel A) shows the results. The abnormal return differential between high and low innovation portfolios is much higher during the crisis period (2.43%) than in the non-crisis period (1.68%), i.e., there is nearly a 45% greater impact of FII flows during the crisis period, consistent with Hypothesis H4. This can also be more easily seen in Figure 8. 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. Overall, our analysis indicates that concerns about contagion effects during crisis periods are well substantiated.

### 3.5.2 Volatility Index Effect

As can be seen in Figure 2, there is significant time variation in the CBOE VIX. It reached a peak value around September-October 2008 when the U.S. House of Representatives rejected a $700 billion bank bailout. In contrast, the CBOE VIX was at a very low level in the first quarter of 2007. To investigate the role of time variation in global perceptions of market risk, we partition the sample into into high *VIX* days and low *VIX* days based on the median *VIX* levels. Table 8 (Panel B) and Figure 9 show the results, when the portfolio formation days are partitioned on the CBOE

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[16] As reported in Anshuman, Chakrabarti, and Kumar (2012), the CNX NIFTY Index declined from 6,144 on January 1, 2008 to 3,033 on December 31, 2008 and then increased in the first quarter of 2009.

VIX.

The abnormal return differential between 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 a high *VIX* (2.02%), as compared to days associated with a low *VIX* (1.55%), which is a 37% difference, 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.

## 4. Robustness Checks

We summarize below the results of several robustness checks (complete results with tables and figures appear in a separate online appendix). First, we test the robustness of our findings to an alternative specification of the FII flow measure. Overall, the qualitative nature of the return differential pattern for this alternative measure is similar to what has been reported for the FII flow measure used in the paper. Next, we examine whether our results differ for stocks associated with derivative contracts and stocks for which derivative trading is not allowed. Our results show that there is no qualitative difference. We then employ a parametric approach to identify the impact of FII flow innovations and also attempt to uncover any asymmetry (buy side vs. sell side), as well as any nonlinear effects associated with FII flow innovations. We find that FII sales trigger more adverse reactions than corresponding FII purchases; these results match the findings from the non-parametric approach used in the paper.

We also recognize that FII order flow may be persistent and therefore we redefine our portfolio formation criterion in terms of cumulative innovations in FII flows over the previous 5-

day period rather than in terms of the concurrent FII innovation. The results are qualitatively similar to earlier findings because FII order flow is known to exhibit strong persistence. However, the differential abnormal return on Day 0 is 0.79%, somewhat lower than the 1.82% 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, thereby mitigating the effect on Day 0.

Another issue is commonality in FII trading. If institutional investors herd, either due to behavioral biases or market frictions (e.g., short selling constraints or funding constraints that are equally binding on all market participants), their behavior may influence the price reactions we observe. We find that while there is commonality in order flow of FIIs, it has no material impact on abnormal returns. This finding reinforces our earlier conclusion that abnormal returns reflect information being revealed through FII buying and selling activities rather than other exogenous factors. Finally, we validate the panel regression model using out-of-sample data during the period January 2012 to June 2013. We find that our results are qualitatively similar in out-of-sample data. Overall, these additional checks assure us that the key findings of this study are robust.

## 5. Impact of FII Flows during the Taper Tantrum Period

After the financial crisis of 2008, the U. S. Federal Reserve set in motion a series of unconventional monetary policy initiatives, including substantial purchases in the government bond and mortgage-backed securities markets. In 2013, starting May 22nd to be precise, the Federal Reserve announced its intention to undertake measures to tighten the money supply by tapering the bond purchase program put in place post-2008. Sahay et al (2015) document a significant "taper tantrum" in the

form of capital outflows accompanied by sharp revisions in asset prices across the world, especially in emerging markets.  In the case of India, the immediate impact of the taper tantrum on capital flows was significant, as can be seen on Figure 10.  Net portfolio flows (including both debt and equity markets) swung from a peak of $800 million to -$800 million in the post-taper period (from May 20th 2013 to June 27th 2013).

The "taper tantrum" phase provides us with an opportunity to evaluate the role of unconventional monetary policy on the relation between unanticipated FII flows and asset prices. In particular, we wish to see how FII flows affected asset prices during the taper-tantrum period; were the flows as informative as we found them to be in the pre-taper period, or were they largely driven by non-information based motives such as portfolio rebalancing by the FIIs?[17]

Since the first formal indication of the taper was announced on May 22nd 2013, we consider out-of-sample data from April 15th 2013 to June 30th 2013 and split it into two periods: April 15th 2013 to May 22nd 2013 as the pre-taper and May 23rd 2013 to June 30th as the post-taper period.  We employ a more updated in-sample period, using the data from Jan 1, 2006 until April 15th 2013; for the earlier out-of-sample period analysis, the in-sample period was from Jan 1st 2006 to Dec 31st 2011, and out-of-sample data was from Jan 1st 2012 to June 30th 2013).  We build an updated panel regression model (with data until April 15th 2013) to infer the innovations in FII (daily) flows during the taper tantrum period. As done earlier, we form portfolios based on FII innovations and examine the difference between the returns of the high innovation portfolio and the returns of the low innovation portfolio (Q5-Q1). The portfolios are constructed at the beginning of every week

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[17] Our investigation is in part motivated by the concerns raised in Feroli, Kashyap, Schoenholtz, and Shin (2014): "…*we find some empirical backing for the proposition that financial market disruptions can arise without leverage…We also uncover connections between destabilizing flows and shocks to monetary policy. Less clear is whether such destabilizing effects are large enough and persistent enough to warrant policy makers to reassess in a fundamental way the tradeoff between stimulating real activity and financial stability. Further research is needed in this area.*"

and we track the difference in daily beta adjusted excess returns. The CAR plots are shown in Figure 11. [18]

Panels A and B of Figure 11 show the plots for two periods (pre-taper and post-taper) for the entire sample of stocks, along with 95% confidence interval bands. The pre-taper plot (Panel A) indicates a slight reversal in the differential returns between the high and low innovation portfolios (Q5-Q1), but there continues to be a significant permanent effect even 5 days after the portfolio formation. The post-taper plot (Panel B) is similar, except that the reversal in the differential returns is significantly more than in the pre-taper period; however, there continues to be a permanent, albeit lower, effect even 5 days after portfolio formation (assuming a 95% confidence level requirement). This finding suggests the taper period is associated with slightly different dynamics of the impact of FII flows on stock returns; this difference results in some degree of price reversal.

Figure 12 includes plots based on sub-samples of stocks based on size (Large, Mid-cap and Small-cap) for both the pre-taper and post-taper periods (Panel A, Panel B, and Panel C, respectively). We can see that that the price reversals associated with the taper phenomenon are largely driven by the large and mid-cap stocks. In the small-cap sub-sample, there is no transient effect, both in the pre-taper and the post-taper periods. This finding is consistent with the fact that FII trading is largely concentrated on large-cap and small-cap stocks,[19] and therefore taper-induced

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[18] The taper period is likely to be associated with significant shifts in risk premium, as compared to the risk premium in the in-sample data. Therefore, to focus on the marginal impact of the taper phenomenon, we present plots for the cumulative returns differential between the high innovation and the low innovation portfolios rather than CAR plots for the high and low innovation portfolios separately, as we did for the in-sample analysis. For completeness, we also constructed the CAR plots for the high and low innovation portfolios separately and found them to be qualitatively similar to the plots for the in-sample period.

[19] The mean FII ownership as non-promoters (i.e., ownership due to portfolio flows) for the sample of firms over the study period depends on firm size. The average FII ownership related to portfolio flows is 20.51% for the large-cap NIFTY stocks, 15.99% for the mid-cap stocks, and 12.04% for the small-cap stocks. The t-statistic for the

temporary FII order flows cause price reversals only in large-cap and mid-cap stocks. We also find that independent of the size, the pre-taper period and the post-taper period reflect a permanent impact caused by FII flows, suggesting that the information-based flows have similar effects during the taper period as in normal times.

Overall, this analysis suggests that, the taper tantrum of May 2013 primarily produced some non-information (e.g., portfolio-rebalancing) based FII flows for Indian equity markets, resulting in temporary asset-price impacts that caused subsequent price reversals. Nevertheless, the usual permanent impact of information-based FII flows continued to exist in the taper period, similar to the findings in normal times.

## 6. Conclusion

Employing a unique database that provides data on foreign institutional investor (FII) flows at the individual stock level in India, we are able to examine the precise impact of FII flow innovations on asset prices. 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 increase with the magnitude of innovations, but are largely unrelated to firm characteristics.

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difference between the means of large-cap NIFTY stocks and mid-cap stocks is 12.64 and that between mid-cap stocks and small-cap stocks is 12.15, both differences being significant at the 1% level.

Our study not only reinforces the findings in recent literature that fund flows affect stock returns (and asset prices, more generally), but also provides insights into when this relation is likely to arise. We demonstrate that price pressure is higher during periods of global market stress. These findings suggest further research possibilities for identifying the precise mechanism by which information gets transmitted through trading across global markets and also for identifying which sectors of the economy are more likely to be affected by asset price movements in response to shocks in global fund flows.

Emerging market regulators fear the adverse real effects of volatile capital flows and often employ drastic measures to curb capital flows. From a policy perspective, our findings suggest that, instead of placing restrictions on FII flows, regulators should recognize that (i) while FII outflows contribute to transient volatility for stocks experiencing the outflows, (ii) trading by FIIs also generates new information. The second result suggests that, as in developed markets, even in emerging markets, trading, and in particular, FII trading, is central to generating information. These relative effects of foreign fund flows must be balanced against each other while evaluating their desirability for emerging markets.

A caveat to our findings is the period of the taper tantrum of 2013 period after the Federal Reserve's announcement of a possible withdrawal of quantitative easing measures. We find that the differential price impact of unanticipated FII buy order flow and sell order flow consists of a greater temporary component than during normal periods, which is subsequently reversed, but there continues to be a permanent component, as during normal periods.

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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 relation 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.
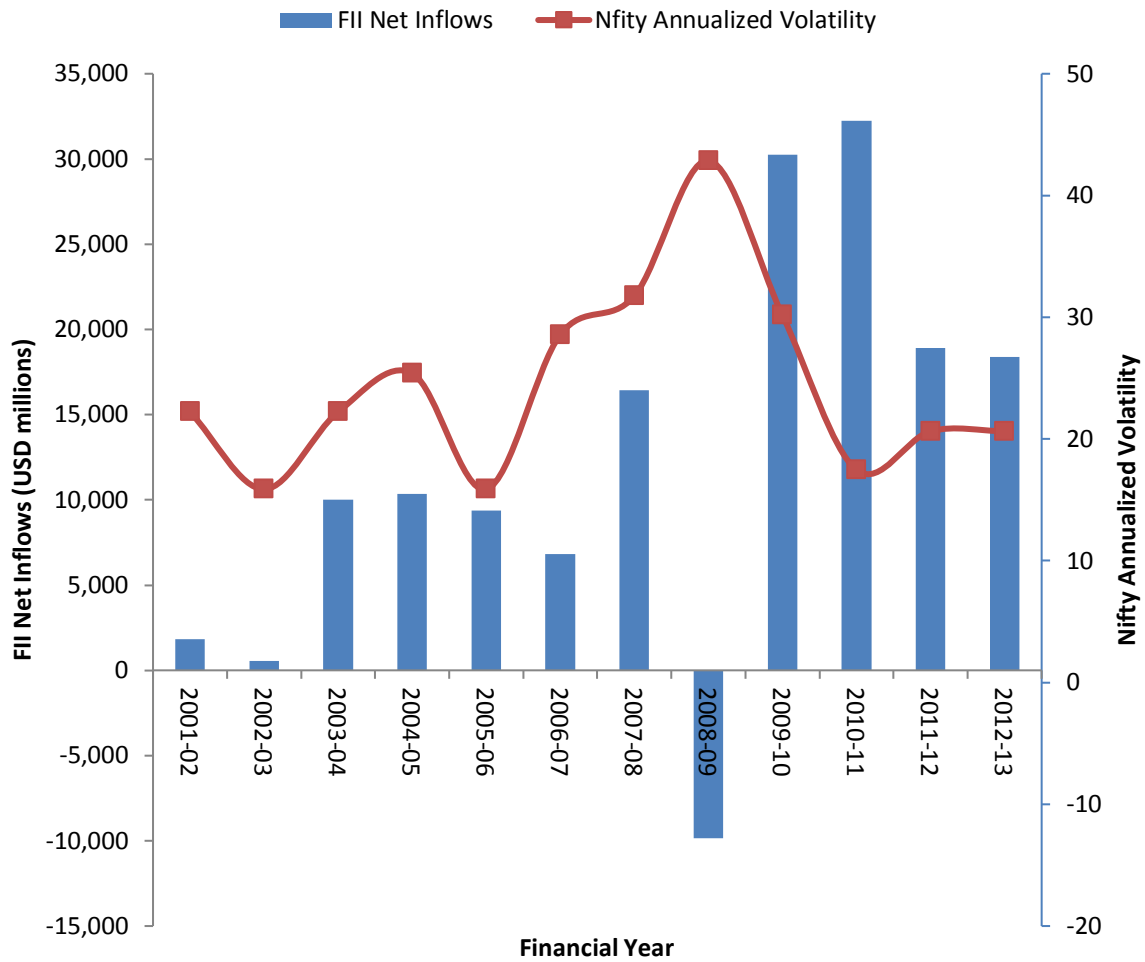
**Figure 2**

**Average Weekly FII Net Flows vs. CBOE VIX**

The chart depicts the weekly average CBOE VIX closing values and weekly average FII net flows during the 2006-2011 period. Extreme FII flows (positive or negative) are associated with specific shocks to the economy (U.S. or India) and further associated with peak values of CBOE VIX.
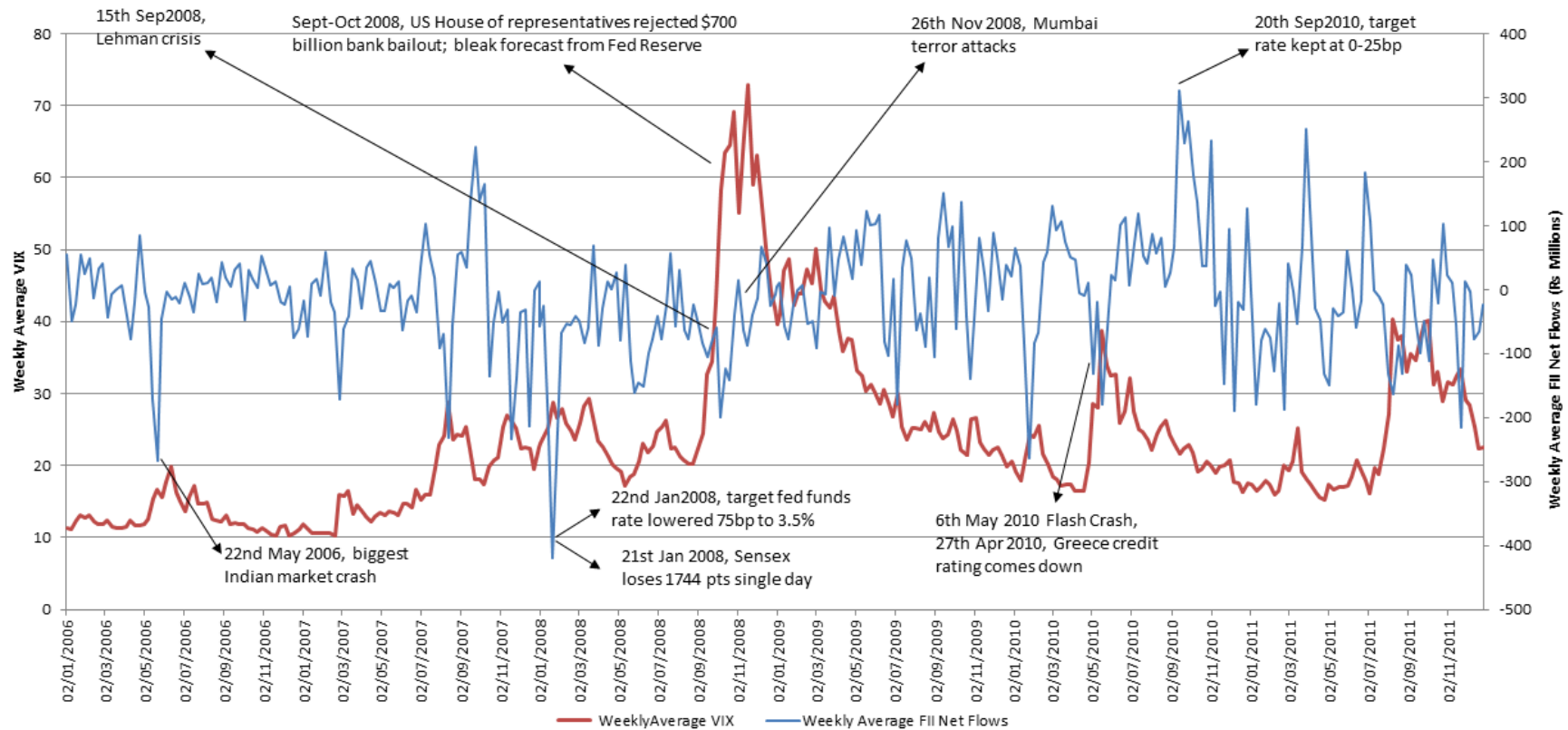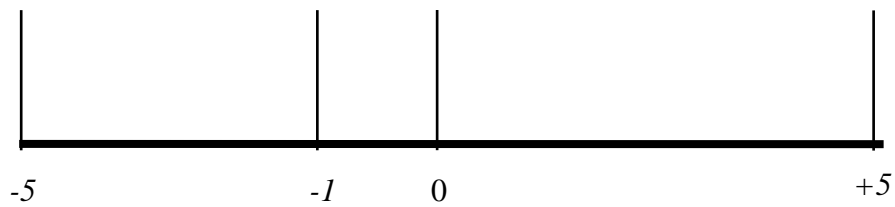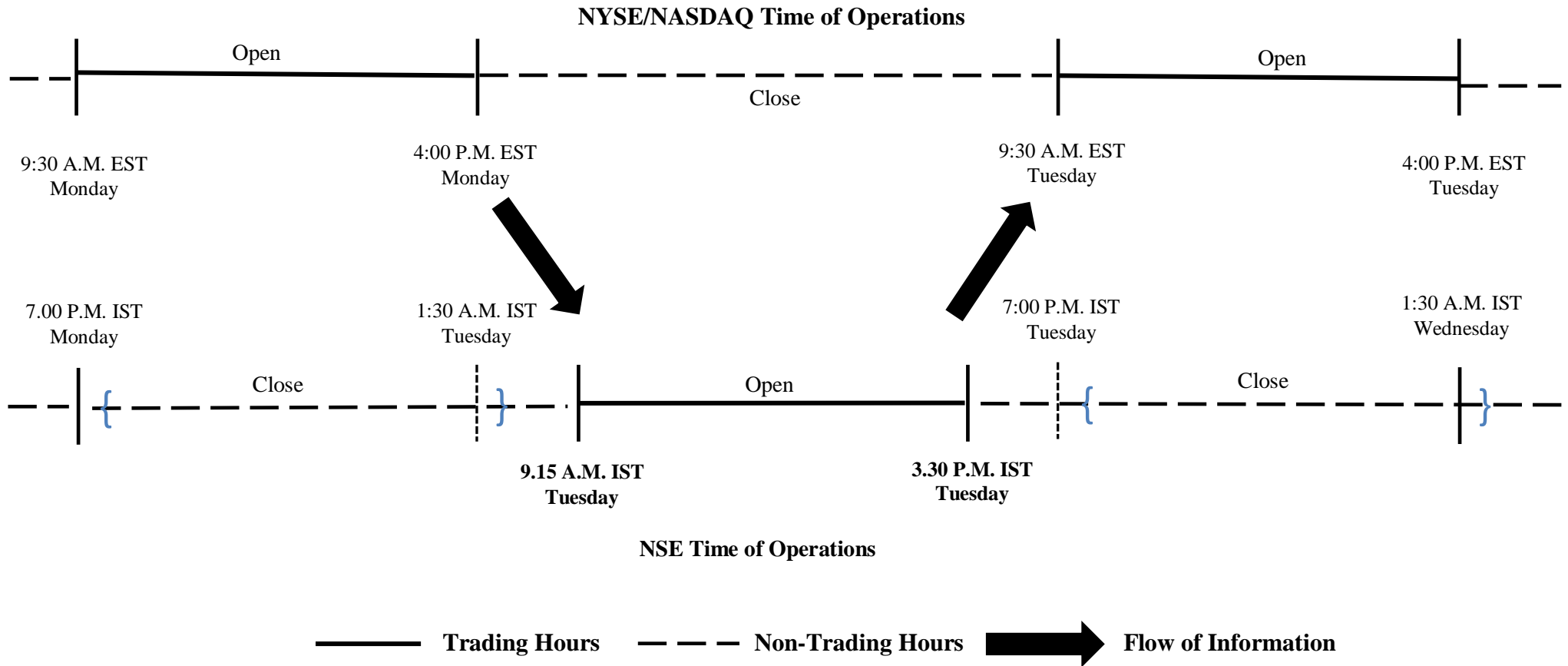
**Figure 3**

**Portfolio Formation Procedure**

This figure describes the portfolio formation procedure. Every Monday (Day 0), five portfolios are formed on the basis of innovations in FII flows (2006-2011 period). The cumulative abnormal returns on these portfolios is tracked over the 10-day window surrounding the portfolio formation day (Day 0). In particular, we are interested in the cumulative difference between the abnormal returns in the HIGH innovation and the LOW innovation portfolios.



-5          -1      0                    +5

*Portfolio-formation day: Day 0*
*Pre-formation Window: (-5, -1)*
*Post-formation Windows: (0, 5)*

**Figure 4. This figure shows the timing overlap between the NYSE/NASDAQ and the NSE.**

**NYSE/NASDAQ Time of Operations**

Open

Close

Open

9:30 A.M. EST
Monday

4:00 P.M. EST
Monday

9:30 A.M. EST
Tuesday

4:00 P.M. EST
Tuesday

7.00 P.M. IST
Monday

1:30 A.M. IST
Tuesday

7:00 P.M. IST
Tuesday

1:30 A.M. IST
Wednesday

Close

Open

Close

**9.15 A.M. IST**
**Tuesday**

**3.30 P.M. IST**
**Tuesday**

**NSE Time of Operations**

———— **Trading Hours**    — — — **Non-Trading Hours**    ▬▶ **Flow of Information**

**Note:**
1. Indian Standard Time (IST) is nine and half hours ahead of New York, USA during Daylight Saving (DST) and ten and a half hours during Non-DST.
2. { } shows NYSE/NASDAQ time of operation during Non-DST: 8:00 p.m. IST to 2:30 a.m. IST.
   Source:  https://en.wikipedia.org/wiki/List_of_stock_exchange_opening_times#cite_note-11

**Figure 5**

**Cumulative abnormal returns of high innovation and low innovation portfolios**

Residuals obtained from a panel regression model are used to estimate shocks (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. During the 2006-2011 period, firms are ranked according to innovations in *FII_NET* at the beginning of every week (typically on every Monday) and sorted into five quintiles. This figure presents the cumulative daily abnormal stock returns for stocks that experience extremely high or low innovations in FII flows.
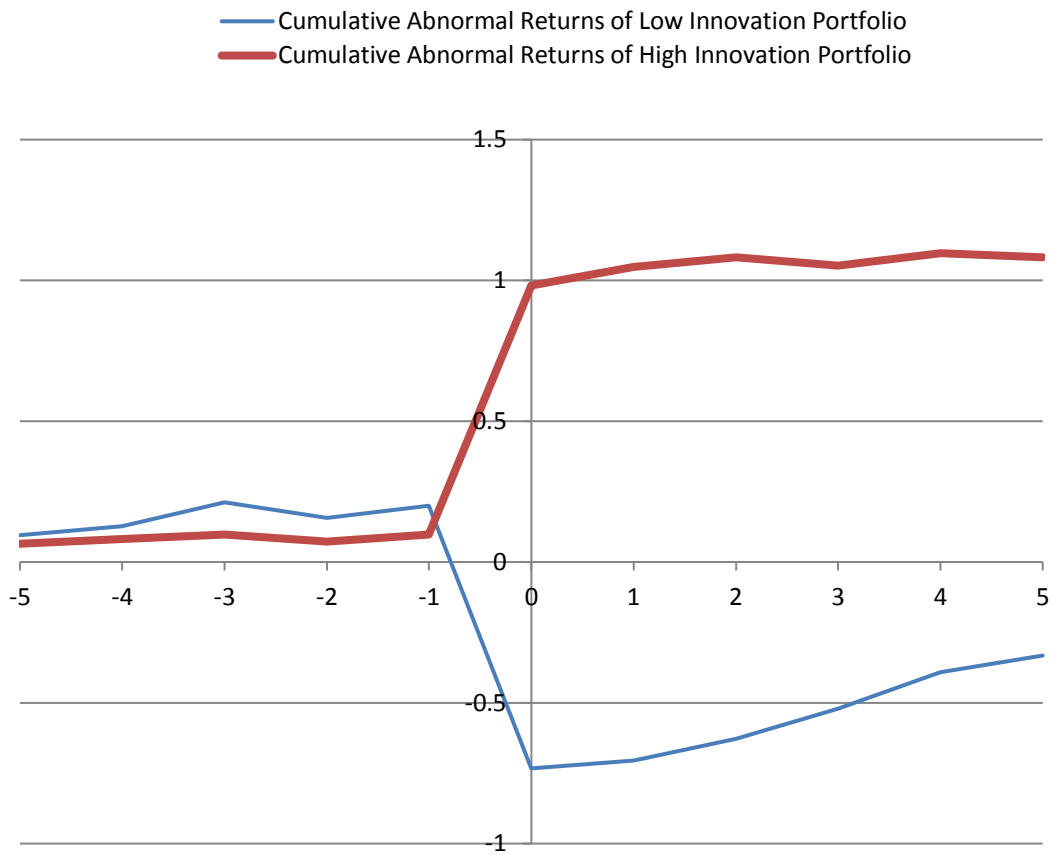
**Figure 6**

**Time Series Variation in Abnormal Return Differential with CBOE VIX**

Residuals obtained from a panel regression model are used to estimate shocks (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. 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 shows the time series relation between the differential abnormal returns (between high innovation and low innovation portfolios) due to innovation and lagged $VIX$.
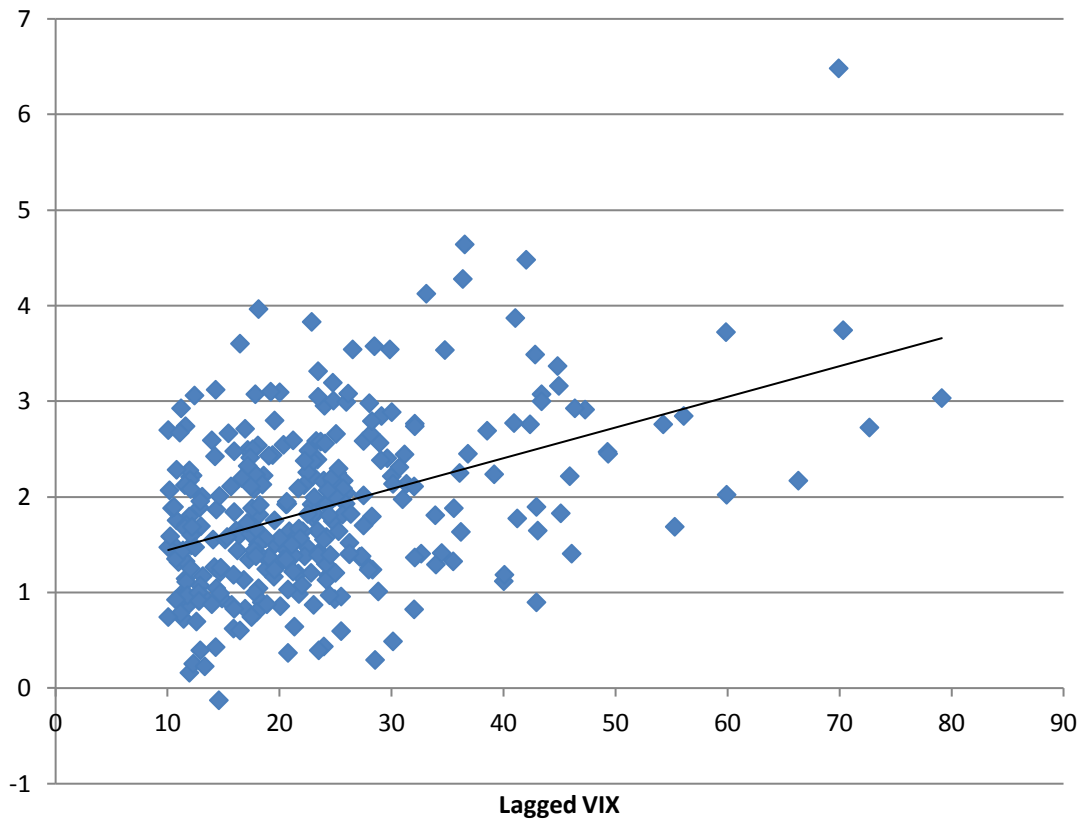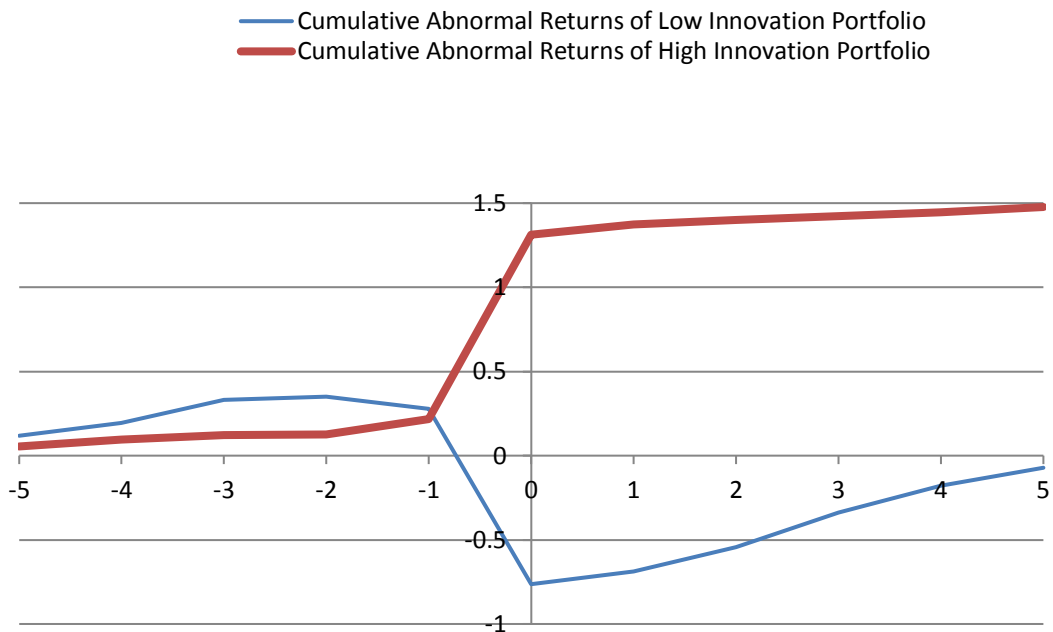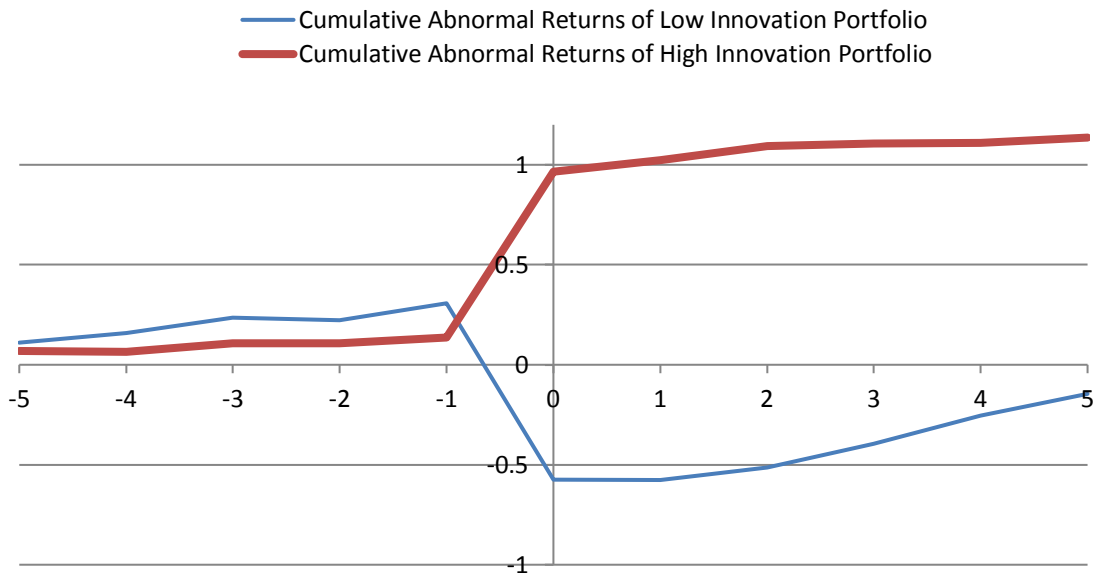
**Figure 7**

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

Residuals obtained from a panel regression model are used to estimate shocks (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. During the 2006-2011 period, 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 the panel regression model for large-cap stocks, Panel B for mid-cap stocks, and Panel C for small-cap stocks.

## Panel A : Large-Cap Stocks

——Cumulative Abnormal Returns of Low Innovation Portfolio
——Cumulative Abnormal Returns of High Innovation Portfolio

# Panel B : Mid-Cap Stocks

—— Cumulative Abnormal Returns of Low Innovation Portfolio
—— Cumulative Abnormal Returns of High Innovation Portfolio



# Panel C : Small-Cap Stocks

—— Cumulative Abnormal Returns of Low Innovation Portfolio
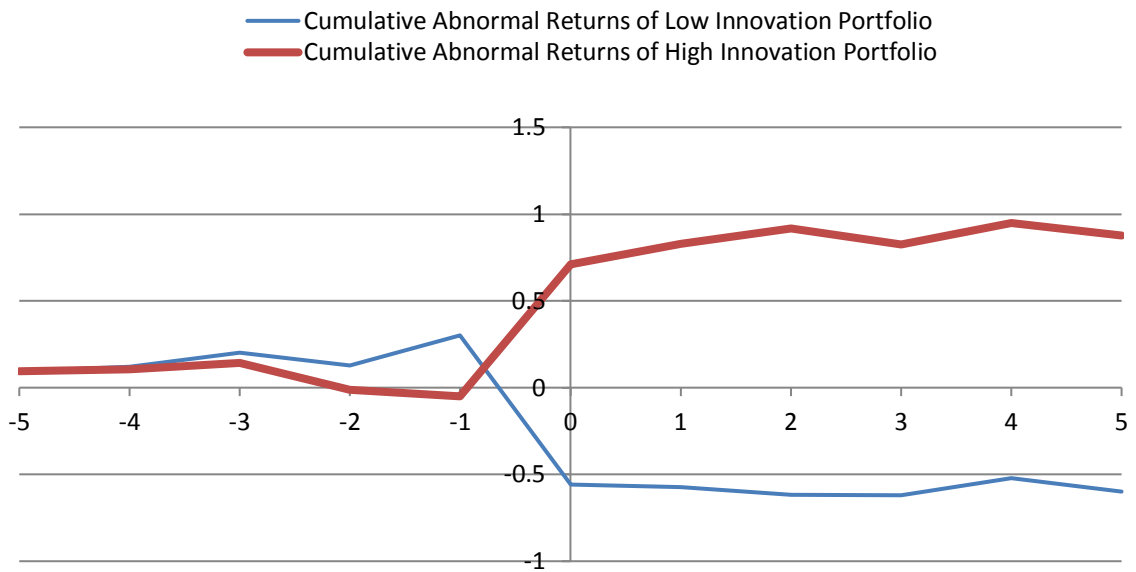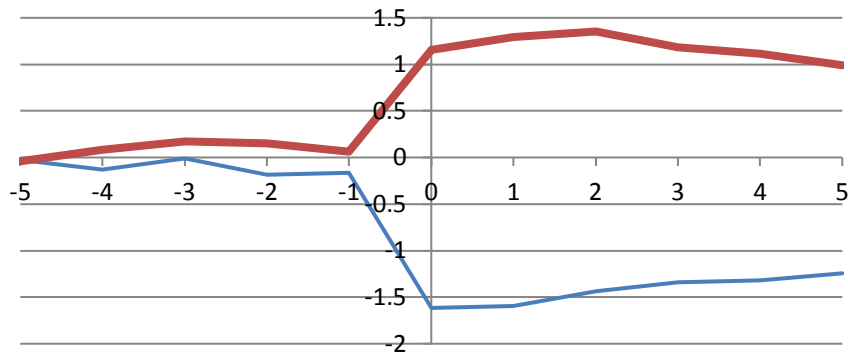—— Cumulative Abnormal Returns of High Innovation Portfolio

Figure 8

**Cumulative Abnormal Returns around Shocks in FII Flows: Effects of the Recent Financial Crisis**

Residuals obtained from a panel regression model are used to estimate shocks (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. During the 2006-2011 period, 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 the crisis period (January to December 2008) and Panel B for the non-crisis period (excluding 2008: 2006-2011).
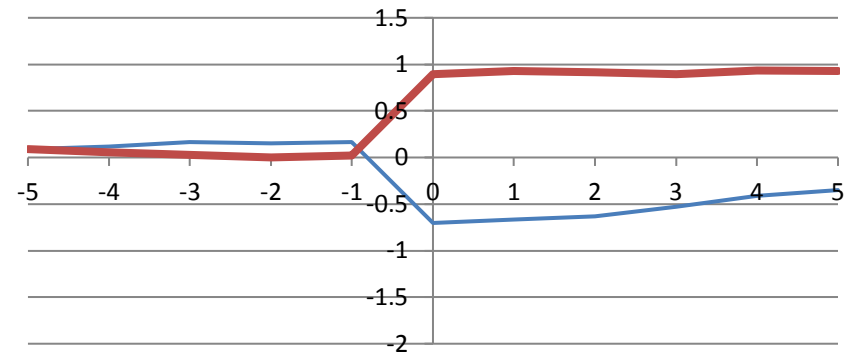
**Figure 9**

**Cumulative Abnormal Returns around Shocks in FII Flows: High vs. Low CBOE VIX Days**

Residuals obtained from a panel regression model are used to estimate shocks (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. During the 2006-2011 period, 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 regressions for high CBOE VIX level days and Panel B for low CBOE VIX level days.

## Panel A: High VIX Days
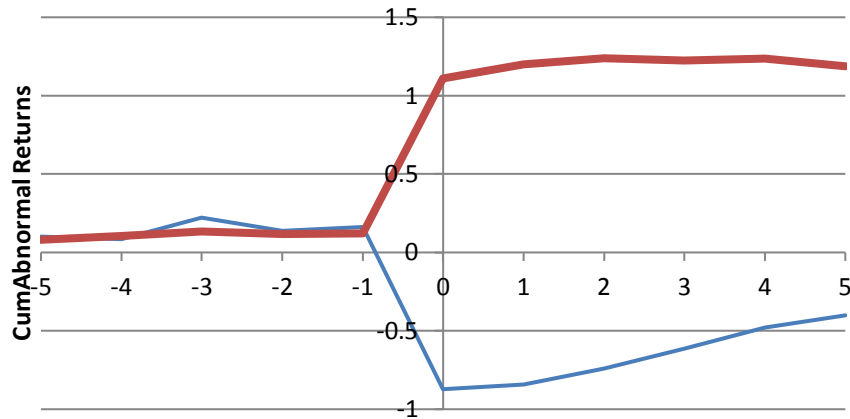
## Panel B : Low VIX Days
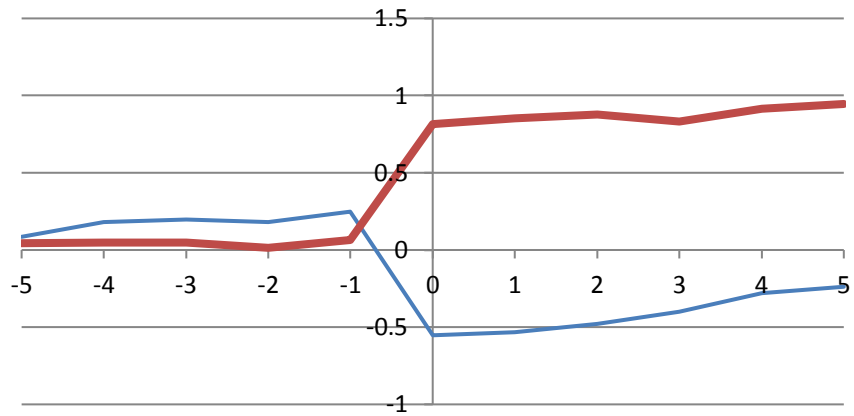
**Figure 10**

**Net FII Portfolio Flows (Debt and Equity) during the Taper Tantrum Period (May – June 2013)**



Net FII Portfolio Flows (Equity and Debt) during May - June 2013
(US$ million)
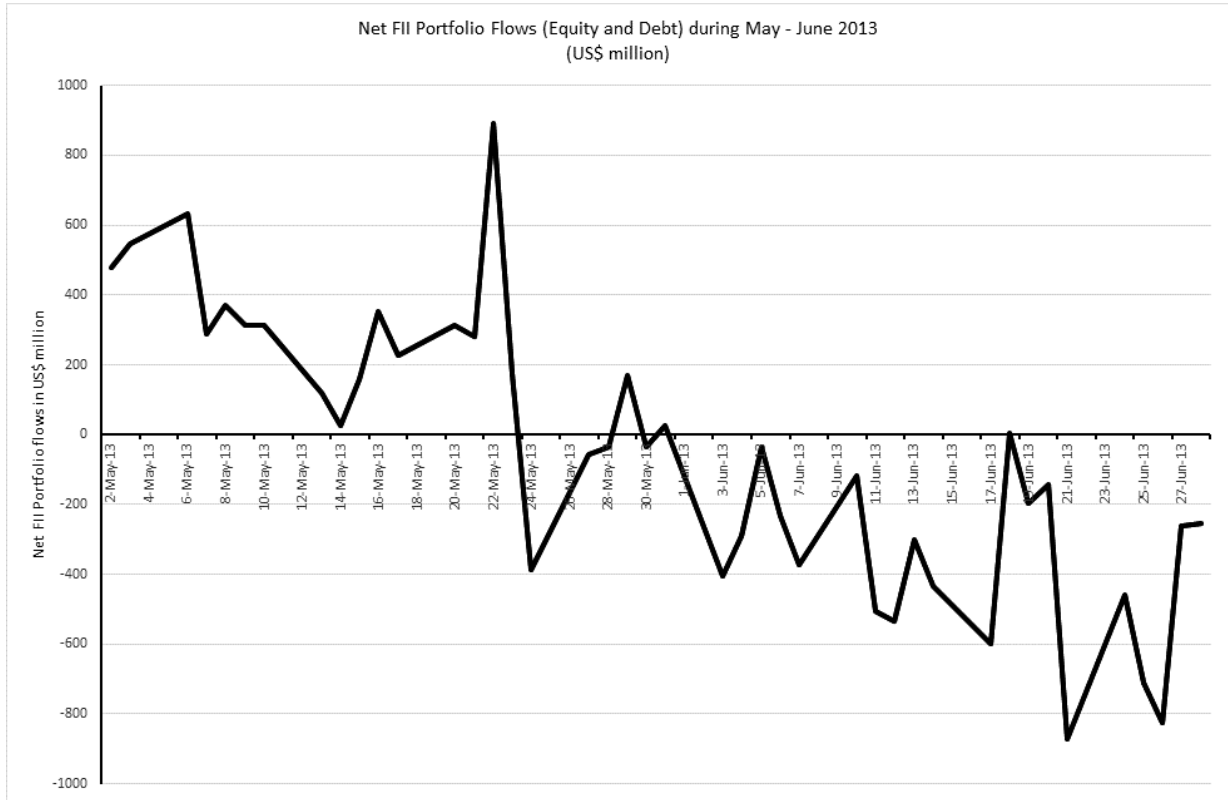
**Figure 11**
**Impact of FII Flows during Taper Tantrum Period**

Panel A: All Stocks (Pre-taper period)

Cumulative Abnormal Differential Returns between High and Low Portfolios
All Stocks (Pre-taper Period from Apr 15, 2013 to May 22, 2013)
(Dotted lines show 95% confidence bands)
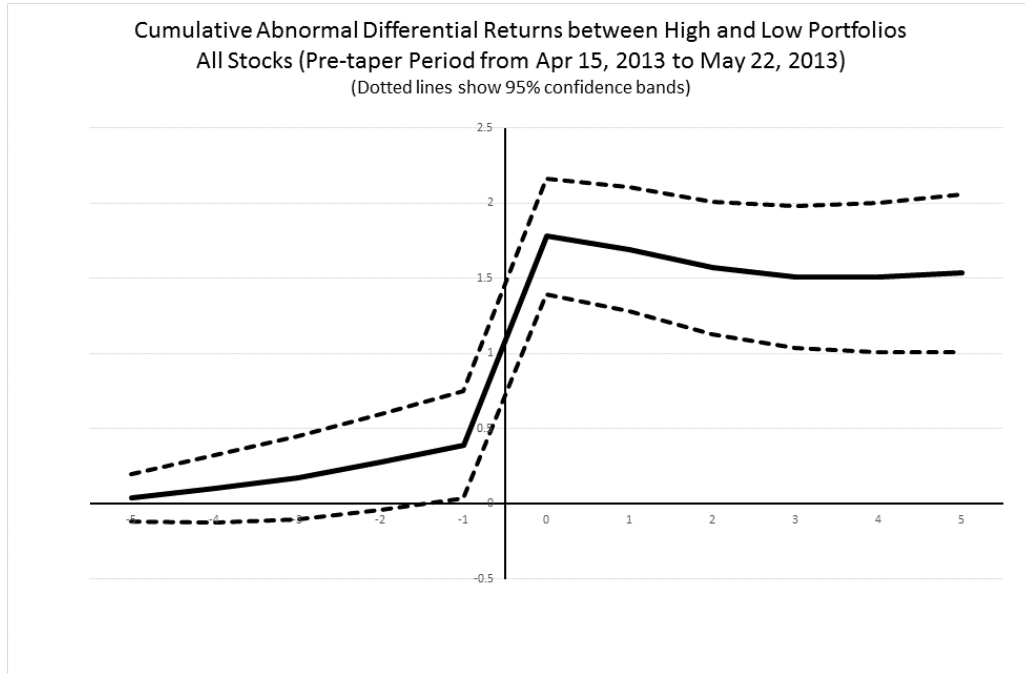
Panel B: All Stocks (Post-taper Period)

Cumulative Abnormal Differential Returns between High and Low Portfolios
All Stocks (Post-taper Period May 23, 2013 - June 30, 2013)
(Dotted lines show 95% confidence bands)
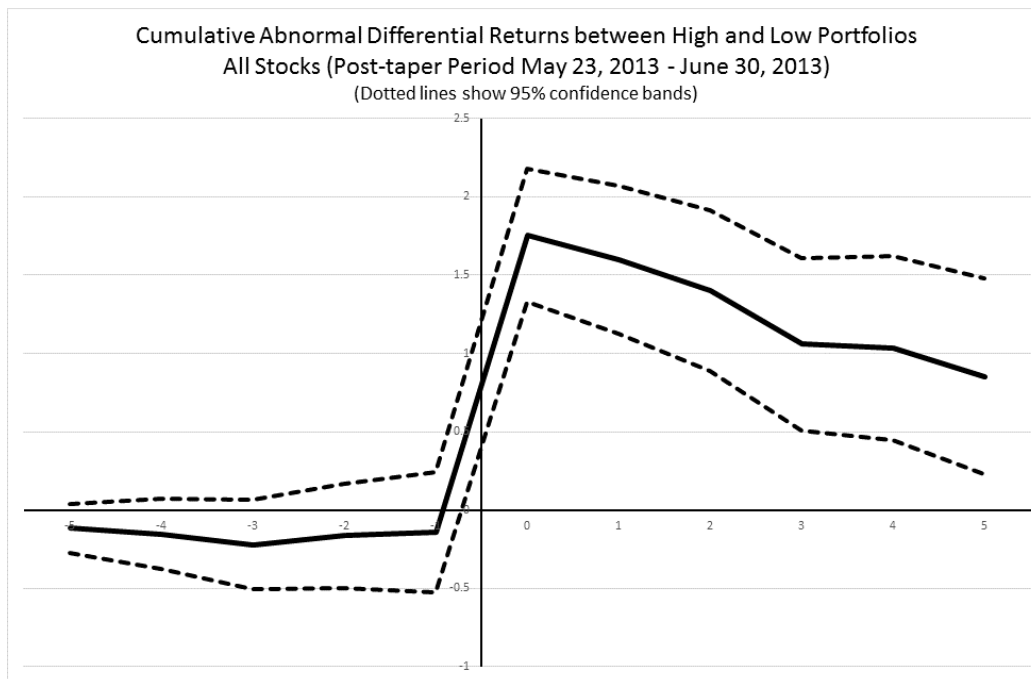
**Figure 12**
**Impact of FII Flows during the Taper Tantrum Period for Size Based Sub-samples**

Panel A: NIFTY Stocks
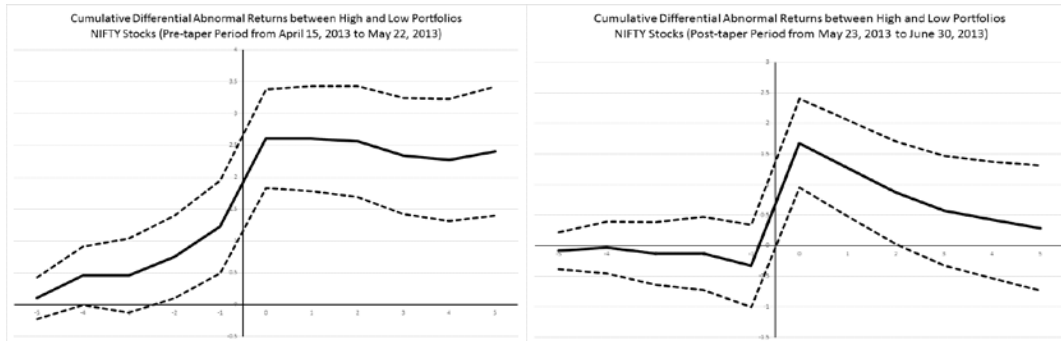
Panel B: Mid-cap Stocks
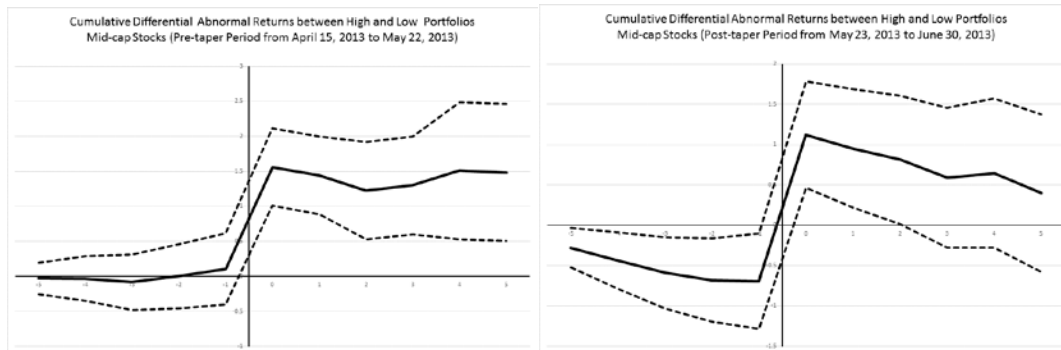
Panel C: Small-cap Stocks
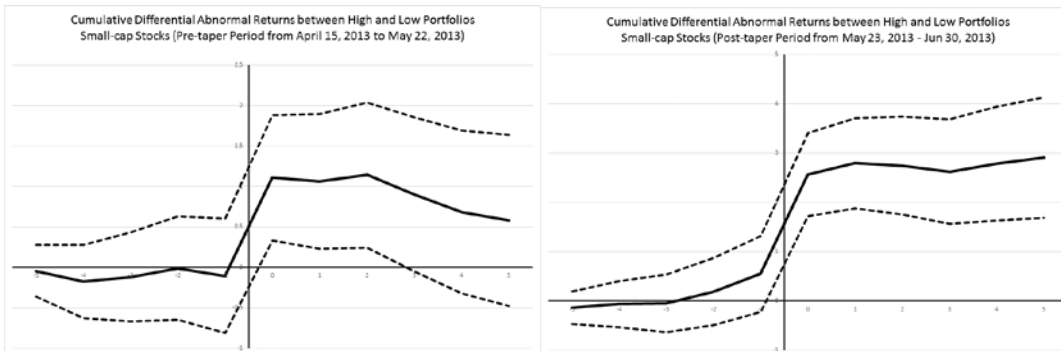
# Table 1
## Summary of Foreign Institutional Investor Trading Activity

This table presents a broad overview of FII trading statistics in Indian market during the study period. Column (1) reports the financial year, Column (2) shows FII net flows (buy - sell) in Indian markets in millions of dollars, while Column (3) reports the average percentage of FII ownership of firms listed on the Indian markets. Column (4) 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.

## 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 |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 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 the adjusted closing price of stock $i$ on day $t$. |
| $AB\_RET_{it}$ | Excess Return over the market return, defined from a market model regression. |
| $NIFTY\_RET_t$ | Daily continuously compounded return on the CNX NIFTY Index on day $t$. |
| $S\&P500\_RET_t$ | Daily continuously compounded return on the 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 $(t_1, t_2)$, based on closing prices. |
| $AMIHUD\_ILLIQ_{i,t}$ | Ratio of absolute return over traded value on day $t$ for stock $i$. |
| $TOVER_{i,t}$ | Ratio of total traded value to market capitalization. |
| $LOCAL\ \beta ETA$ | Slope coefficient of the $NIFTY\_RET$ in the market model regression estimated using 52 weekly returns prior to portfolio formation day $t$. |
| $GLOBAL\ \beta ETA$ | 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. |
| $VIX\ (\Delta VIX)$ | Change in CBOE VIX value. |
| $IVIX\ (\Delta IVIX)$ | India Volatility Index (Change in Indian Volatility Index). |
| $NIFTY\_VOLATILITY$ | Garman-Klass range based daily volatility estimate of NIFTY Index. |
| $AGGR\_FFLOW_t$ | 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 (NSE) of India and the associated foreign institutional investor (FII) daily trading flows for January 1, 2006 to December 31, 2011. Panel A shows the firm characteristics. Panel B presents the relations with market-wide factors. See Table 2 for variable definitions Daily stock-wise FII flow data are obtained from proprietary data provided by the NSE. 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 2006-2011 period. The panel regression specification is as follows:

$$FII\_NET_{i,t} = FirmFEff + \sum_{j=1}^{5} FII\_NET_{t-j} + \sum_{k=1}^{5} Ret_{t-k} + \delta_1 SIZE + \delta_2 TOVER + \delta_3 RETAIL\_OSHP_{t-1} + \delta_4 INSTITUTIONAL\_OSHP_{t-1}$$

$$+ \alpha_1 AGGR\_FFLOW_{t-1} + \alpha_2 VIX_{t-1} + \alpha_3 \Delta VIX_{t-1} + \alpha_4 NIFTY\_RET_{t-1} + \alpha_5 S\&P500\_RET_{t-1} + \alpha_6 NIFTY\_VOLATILITY_{t-1} + e_{i,t},$$

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; for other variable definitions, see Table 2. 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*** |
| $\Delta VIX_{t-1}$ | -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 |
| Adj. $R^2$ | 0.1929 | |
| Durbin-Watson stat | 2.0037 | |
| F-statistic | 277.4851 | |
| $N$ | 279864 | |
| Number of Firms | 223 | |

## Table 5
## Abnormal Returns and Firm Characteristics around Portfolio Formation Day (Day 0)

This table reports the returns behavior of portfolios formed on the basis of FII flow innovations obtained from the panel regression model. 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. Panel A reports the abnormal returns (*AB_RET*) – namely, excess returns over the market return defined from a 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 high (Q5), low (Q1) and the difference between the Q5-Q1 portfolios. See Table 2 for variable definitions. 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 (Close$_{-1}$ to Open$_0$) %* | 0.22 | 9.52\*\*\* | 0.25 | 11.27\*\*\* | 0.03 | 0.96 |
| *AB_RET (Open$_0$ to Close$_0$) %* | -1.19 | -43.26\*\*\* | 0.60 | 20.82\*\*\* | 1.79 | 44.97\*\*\* |
| *AB_RET (0, 5) %* | 0.36 | 5.73\*\*\* | 0.04 | 0.62 | -0.31 | -4.76\*\*\* |

\**AB_RET ($t_1$, $t_2$)* is the return based on the closing prices on day $t_1$ and day $t_2$, unless explicitly stated otherwise.

**PANEL B: Firm characteristics**

|  | Q1 | Q5 | Q5-Q1 | |
|---|---|---|---|---|
|  | **Estimate** | **Estimate** | **Estimate** | ***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

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 ($Z_{t-1}$). 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.

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

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. See Table 2 for variable definitions. 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(*SIZE*) | 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. $R^2$ | 0.24 | | 0.20 | | 0.24 | |

## Table 7
## Size Effects

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). 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 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) ), the overnight (Close$_{t-1}$ to Open$_t$) return, the day-time returns (Open$_t$ to Close$_t$) return for Day t=0 and 1, and the post–formation window (0, 5). 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)%* | -1.04 | -23.33[***] | 1.10 | 23.92[***] | 2.14 | 30.43[***] |
| *AB_RET (Close$_{-1}$ to Open$_0$) %* | 0.13 | 3.18[***] | 0.23 | 5.85[***] | 0.09 | 1.61 |
| *AB_RET (Open$_0$ to Close$_0$) %* | -1.19 | -22.97[***] | 0.83 | 15.67[***] | 2.03 | 27.26[***] |
| *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)%* | -0.88 | -21.25[***] | 0.83 | 20.44[***] | 1.71 | 35.67[***] |
| *AB_RET (Close$_{-1}$ to Open$_0$) %* | 0.25 | 9.49[***] | 0.23 | 6.48[***] | -0.02 | -0.48 |
| *AB_RET (Open$_0$ to Close$_0$) %* | -1.15 | -29.42[***] | 0.55 | 13.55[***] | 1.70 | 30.23[***] |
| *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)%* | -0.86 | -13.53[***] | 0.76 | 11.86[***] | 1.62 | 23.47[***] |
| *AB_RET (Close$_{-1}$ to Open$_0$) %* | 0.29 | 5.52[***] | 0.40 | 10.14[***] | 0.11 | 1.72 |
| *AB_RET (Open$_0$ to Close$_0$) %* | -1.18 | -19.15[***] | 0.39 | 6.08[***] | 1.57 | 17.64[***] |
| *AB_RET (0, 5) %* | -0.08 | -0.53 | 0.13 | 0.82 | 0.21 | 1.33 |

*AB_RET (t$_1$, t$_2$)* is the return based on the closing prices on day *t$_1$* and day *t$_2$*, unless explicitly stated otherwise.

**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. 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 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 reports the impact of the financial crisis on two sub-samples for the non-crisis and crisis periods. In Panel B, the sample is divided into days associated with high CBOE VIX levels (above its median) and low CBOE VIX levels (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**

| High VIX days | Q1 | | Q5 | | Q5-Q1 | |
|---|---|---|---|---|---|---|
| | 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*** |