FOREIGN FUND FLOWS AND ASSET PRICES:

EVIDENCE FROM THE INDIAN STOCK MARKET

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Strong Views

- **Raghuram Rajan, Governor, Reserve Bank of India (RBI), February 3, 2014**

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

- **IMF Country Report, February 2014**

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

Research Gap

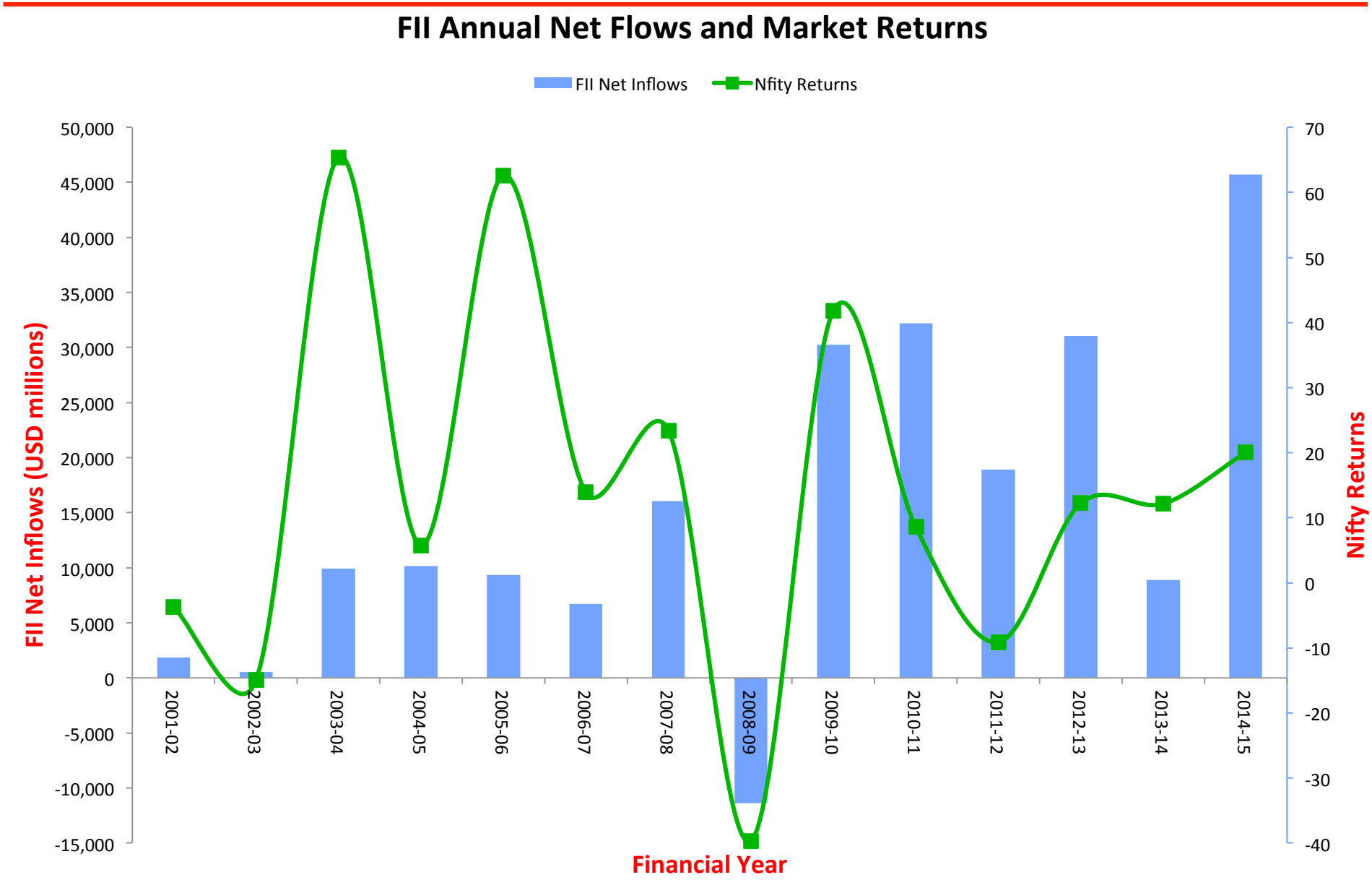
There is a **paucity of research** on how **capital flows affect financial markets**

In particular,

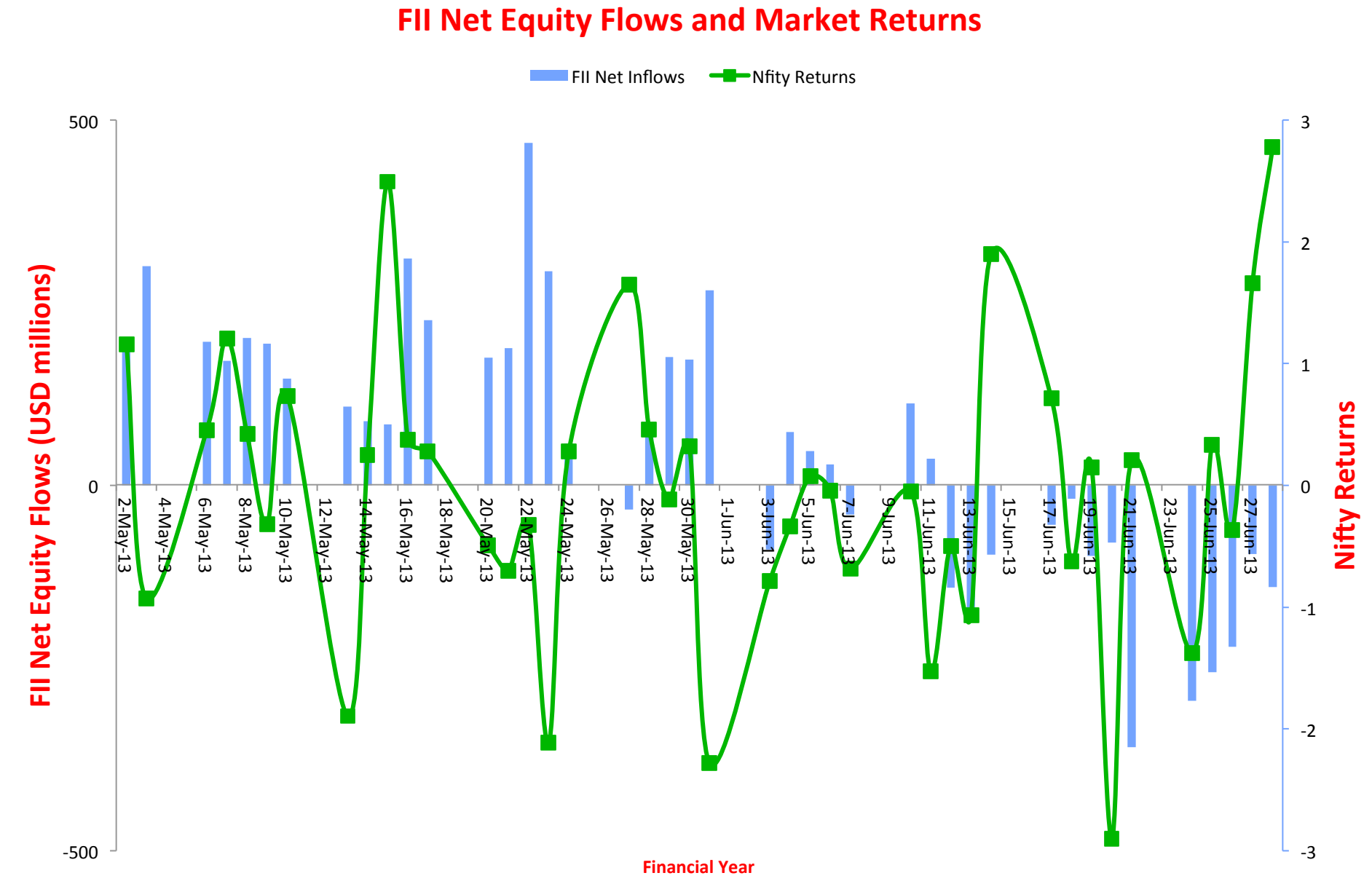
- What is the **precise mechanism** that causes this effect?
- What is the **magnitude** of the impact?
- What is the **longevity** of the impact?

Our study examines the Indian stock market to assess how **foreign institutional investor (FII) flows** affect the **Indian stock market**

How Do FII Investments Affect the Stock Market?



Net FII Equity Flows during Taper Tantrum Period May-June 2013



Salient Features of our Work

- Our study exploits a **unique database** with flow information at the **individual stock level** for India

- Almost all of the **existing studies** work on foreign investors **aggregate flows** in and out of emerging markets as data is not available at stock level

- Whereas our study, with access to stock level data of FII, examines how **immediate short-run stock returns** differ between stocks experiencing foreign fund inflows versus foreign fund outflows

Data

- Study Period: Jan 1, 2006 to Dec 31, 2011
  - Out of sample forecast period: Jan 1, 2012 to Jun 30, 2013

- Data analyzed in study
  - 223 most actively traded firms
  - Daily purchases and sales of FIIs and adjusted closing prices
  - CNX Nifty (local market index), S&P500 (global market index) and CBOE VIX (global risk-appetite)

FII FLOWS

- $FII\_NET_{i,t}$ = $FII\ BUYS_{\downarrow t} - FII\ SELLS_{\downarrow t} / RUPEE\ VOLUME_{\downarrow t}$, for i^{th} stock on day t

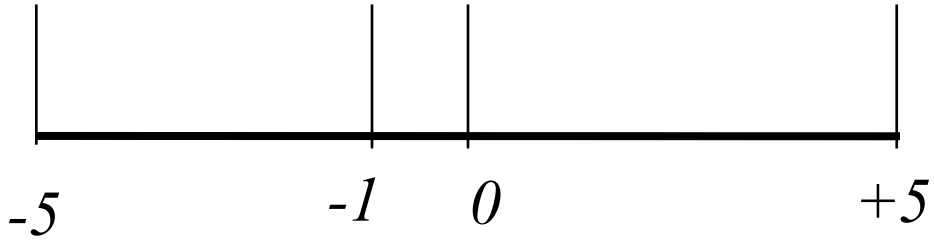
- *FII_BUYS* is the daily rupee value of purchases and *FII_SELLS* is the daily rupee value of sales

- *RUPEE_VOLUME* is the aggregate rupee value of daily FII as well as non-FII trading volume

FII_NET gives an economic measure of the daily net FII flows relative to the total daily rupee trading value

Empirical Design

- A **simple** way to infer information content of FII flows
- Every Monday, five portfolios are formed on basis of **innovations** in FII flows (2006-2011 period)
- Track **short-term** performance of HIGH and LOW portfolios



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

Innovations in FII Flows

- Following Hasbrouck (1988), information content of a trade can be inferred from **unanticipated component** of trading rather than total trade size

- **Residuals** (FII_NET_INNOV) from a **panel regression model** over 2006-2011 period

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

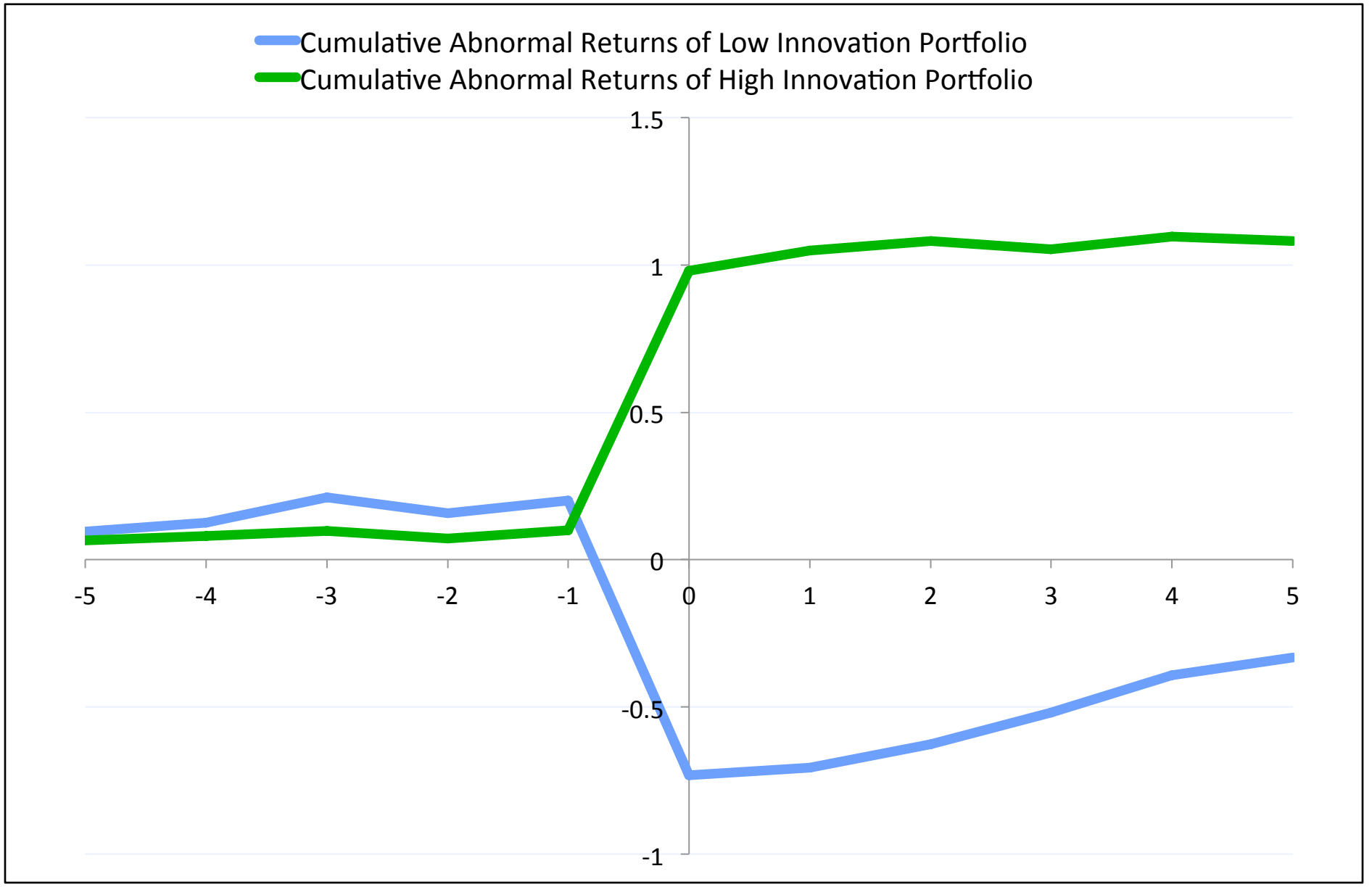
Firm Fixed Effects Panel Regression Model

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*
$AGGR\_FFLOW_{t-1}$	0.1013	**7.75*** **
SIZE	0.0109	**6.70*** **
$RETAIL\_OSHP_{t-1}$	0.0017	**4.22*** **
$INSTITUTIONAL\_OSHP_{t-1}$	-0.0005	**-2.74*** **
VIX_{t-1}	-0.0003	**-4.39*** **
ΔVIX_{t-1}	-0.0006	**-6.59*** **
$NIFTY\_VOLATILITY_{t-1}$	-0.1371	**-2.37** **

Adj. R^2	0.1929
Durbin-Watson stat	2.0037
F-statistic	277.4851
N	279864
Number of Firms	223

Past returns (lag 3 and beyond), S&P500 and Nifty returns, and turnover are insignificant

Cumulative Abnormal Returns



FII Flows and Return Shocks: Summary

- HIGH innovation stocks experience a coincident (portfolio-formation day) price increase that is **permanent (0.88%)**

- LOW innovation stocks experience a coincident price decline (-0.93%) that is in part **transient**, reversing itself partly within a week

- Thus, both FII buys and FII Sales induce a **permanent (information) effect** on stock returns, but FII sales also induce a **transient** effect

Price Pressure is confirmed; abnormal return on Day 0 is positively related to the size of the innovations.

Asymmetric impact (Buy and sell side)

- Buy and Hold strategies induce permanent impact
- Portfolio Rebalancing strategies induce transient effects

Information-based trading on buy side

Information-based trading as well as portfolio rebalancing strategies on sell side

- Similar results found in studies of block trades

Transient Volatility Effects of Portfolio Rebalancing

- On sell side approximately **40% of the abnormal returns on Day 0 are reversed** in the post-formation period.

- The return reversal on Day 0 is **0.36%**.

- 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**.

What explains Q5 – Q1 returns?

Differential returns are

- **unrelated** to time series variation in **firm characteristics** (e.g., volatility, beta or systematic risk, idiosyncratic risk, size, price impact or trading volume)
- except **Amihud Illiquidity** (economic significance is negligible)
- **greater** during times of **global stress** (a rise VIX as well as local stock market volatility)

Time Series Variation in Differential Returns

	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*
$NIFTY\_RET_{t-1}$	0.13	4.60***	0.17	4.20***	0.06	1.99**
VIX_{t-1}	-0.01	-1.15	0.00	0.02	0.02	3.41***
$NIFTY\_VOL_{t-1}$	-7.15	-0.71	1.32	0.14	32.70	3.95***
Adj. R^2	0.24		0.20		0.24	

Volatility and illiquidity matter

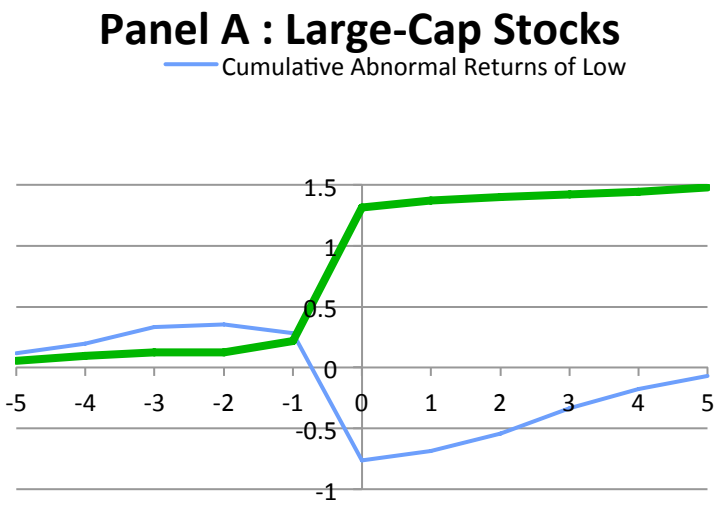
Size, beta, idiosyncratic risk, S&P 500 returns, change in VIX, aggregate flows, and, retail and institutional ownership are insignificant

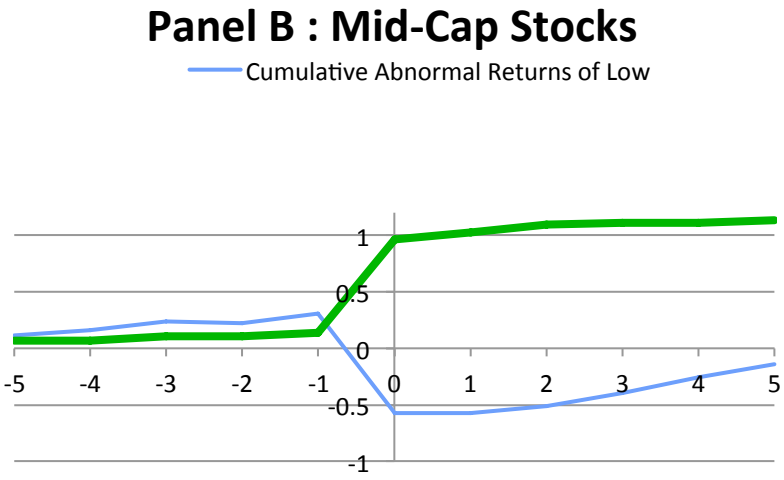
Impact of Firm Size

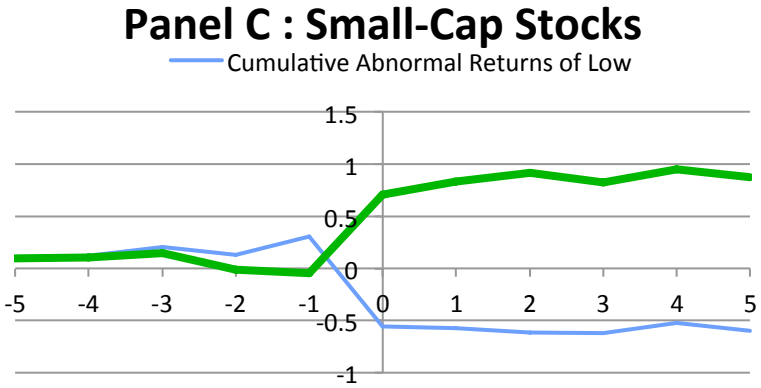
- Large stocks have the highest impact.
- Reversals in post formation period are inversely related to firm size.
- Small stocks: no reversals on sell side.
- **This is consistent with FII trading being the driver of differential returns.**

FIIs may be avoiding small stocks for portfolio rebalancing purposes (to concerns about illiquidity)

Firm Size Effects







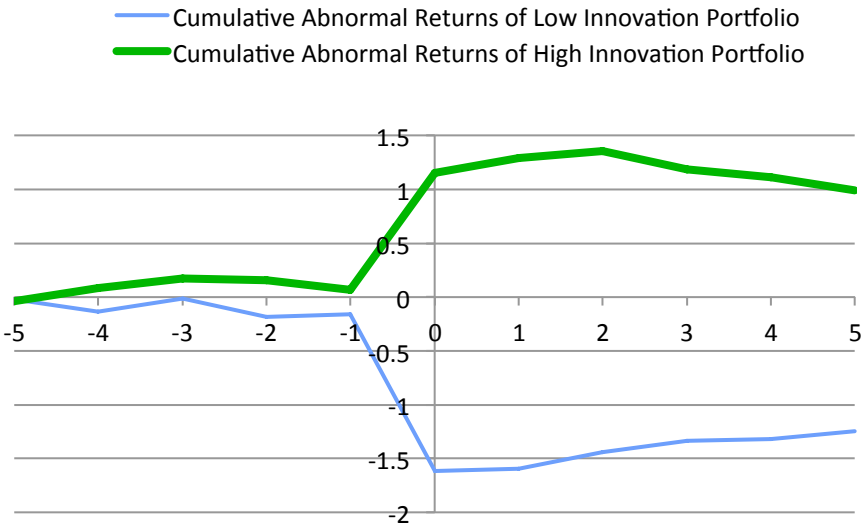
The average FII ownership is 20.51% for large-cap NIFTY stocks, 15.99% for mid-cap stocks, and 12.04% for small-

Impact of FII Flows during periods of Market Stress

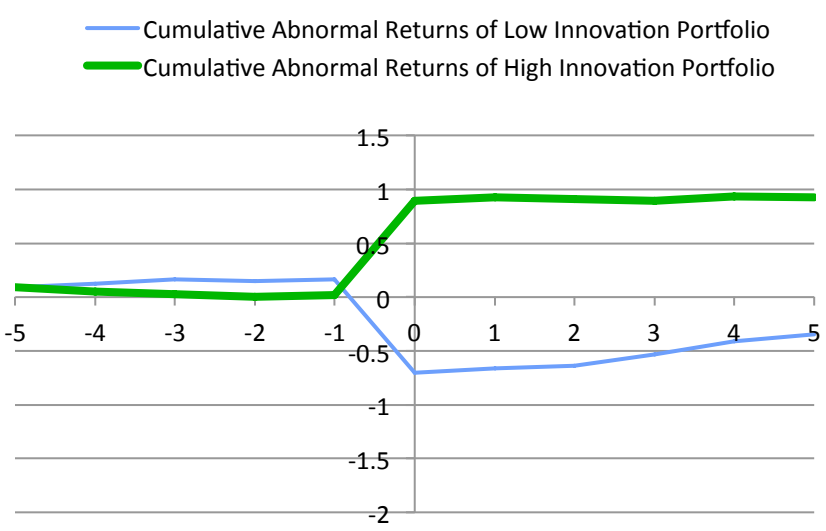
- First, we conjecture is that the impact of FII flows would be greater during the financial crisis period
  - We split the sample into a crisis period sub-sample and a non-crisis period sub-sample. This segregation allows us to examine how the financial crisis affected the price impact of FII flows.
- Second, we conjecture that the impact of FII flows would be greater on days associated with high CBOE VIX.
  - 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 segregation allows us to examine how the price impact of FII flows is related to market volatility

Effects of the Crisis Period

Panel A : Crisis Period



Panel B : Non-Crisis Period

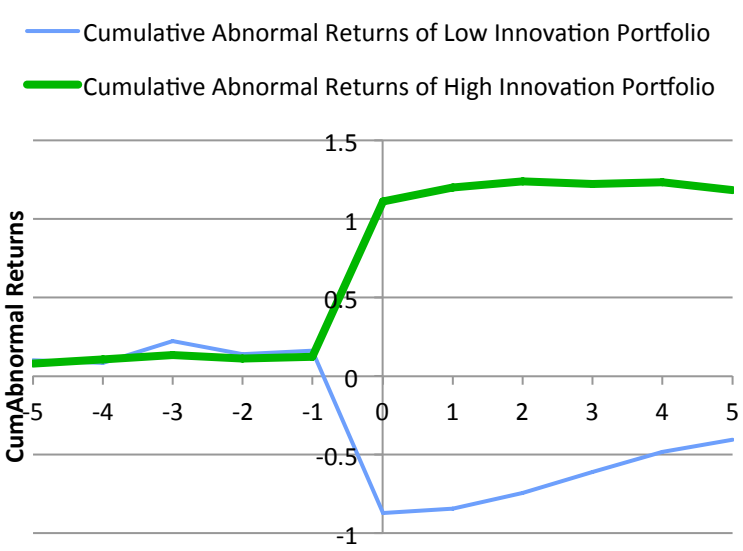


During crisis period, FII Flows have 47% greater impact

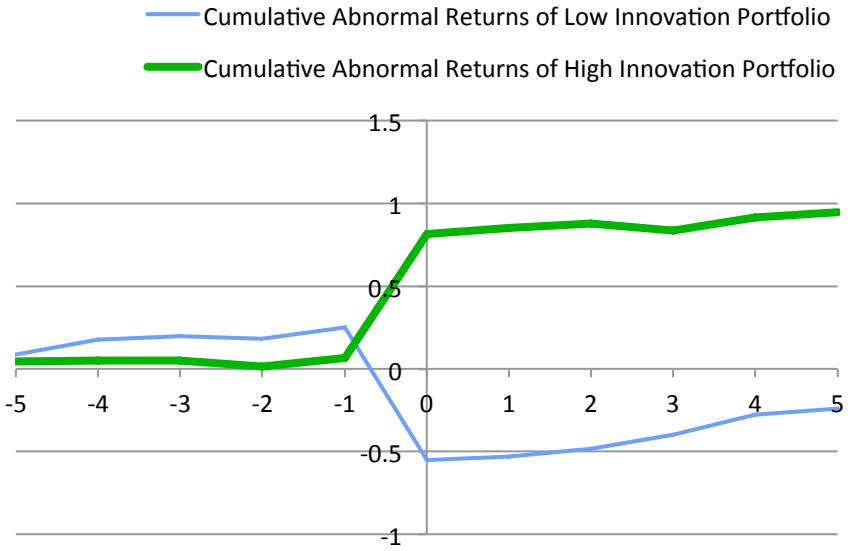
Portfolio rebalancing is more significant during crisis

Effects of Global Market Stress

Panel A: High VIX Days



Panel B : Low VIX Days



During high VIX days:

1. **FII Flows have 31% greater impact**
2. **Price reversal (transient volatility) is greater**

Robustness Checks

- Abnormal returns are **not driven by commonality** in FII Flows

- **Parametric approach** confirms that abnormal returns are **asymmetric** (buy and sell side) and **non linear in innovations**

- Robust to **redefining innovations** in FII flows as cumulative innovations

- Findings are robust to **out of sample** tests

Impact of FII flows during the Taper Tantrum period

- On **May 22nd 2013**, the Federal Reserve announced its intention to **tighten money supply** by tapering the bond purchase program put in place post-2008

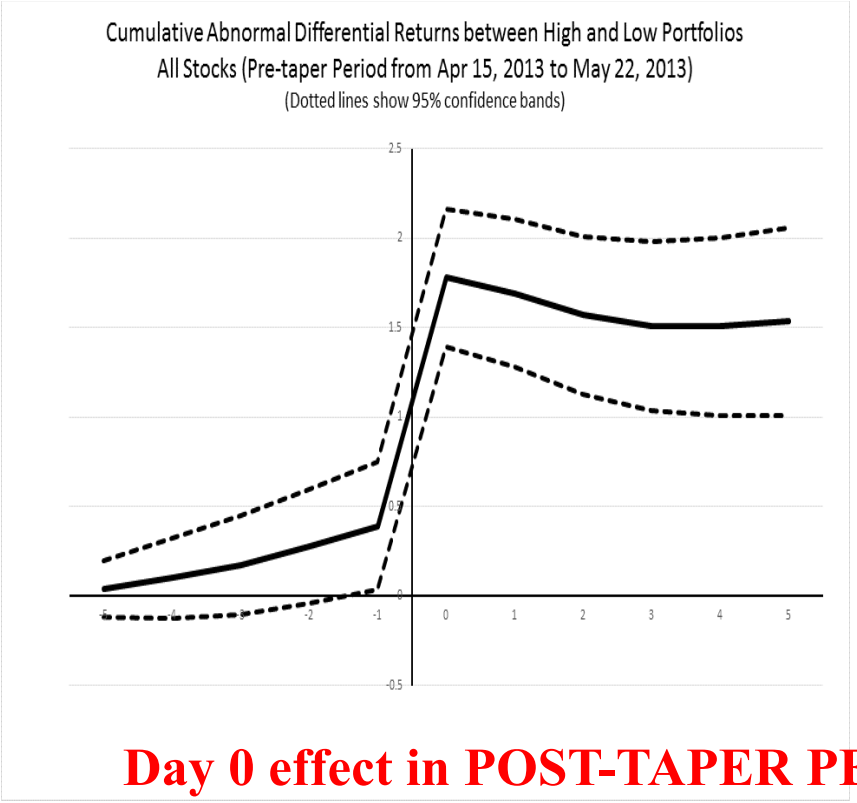
- Emerging markets experienced **significant capital outflows during the taper tantrum period** (May-June 2013), as documented in Sahay et al (2015)

- The "taper tantrum" period helps us analyze the **role of unconventional monetary policy** on the impact of FII flows on asset prices.

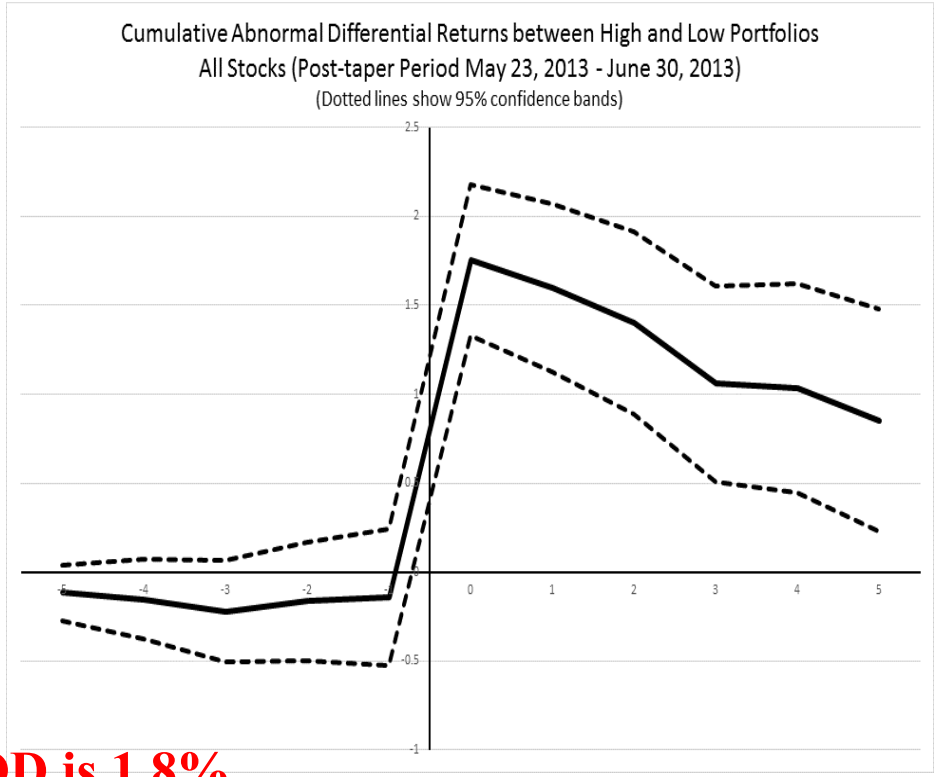
Impact of FII Flows : Taper Tantrum Period

All Stock sample

Pre Taper period



Post Taper period

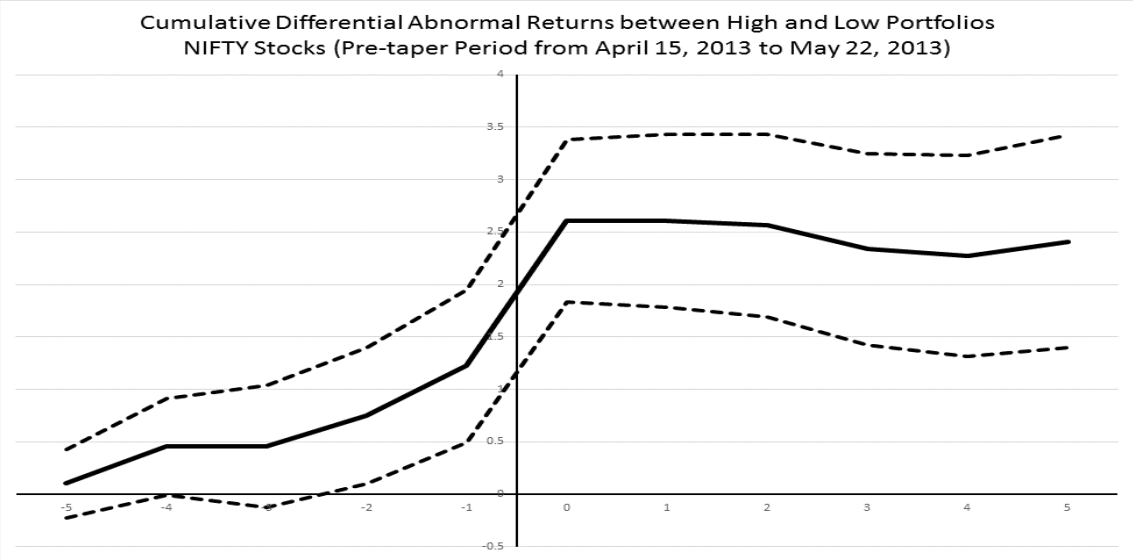


Day 0 effect in POST-TAPER PERIOD is 1.8%.

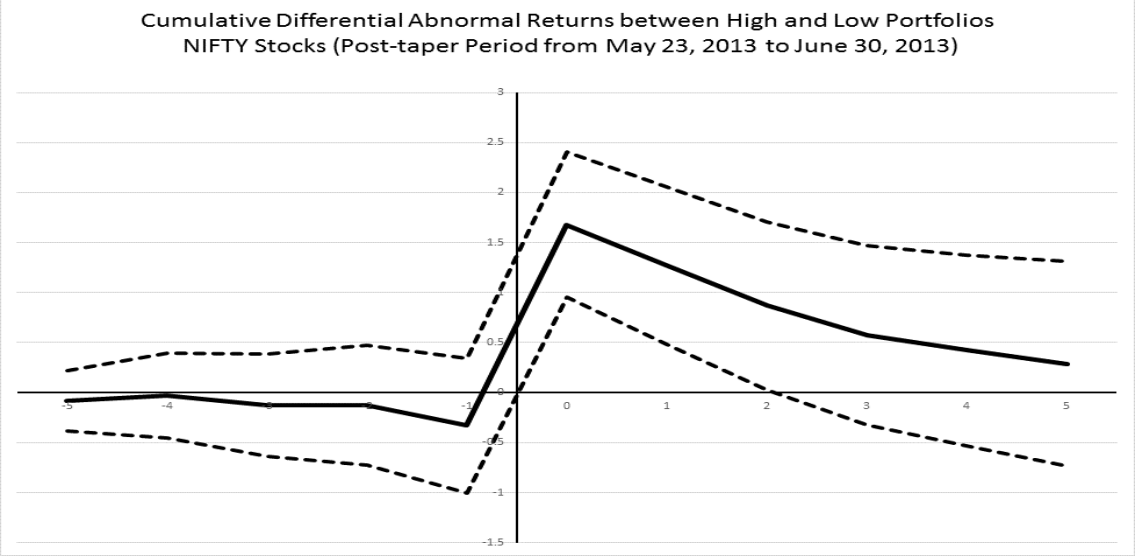
Price reversal, over (0,5) window accounts for 1%, i.e., 1*√(252)/36.16 = 43.90% of the annualized volatility of a typical stock.

Taper Tantrum Period by Size (Large Cap Stocks)

Pre Taper period

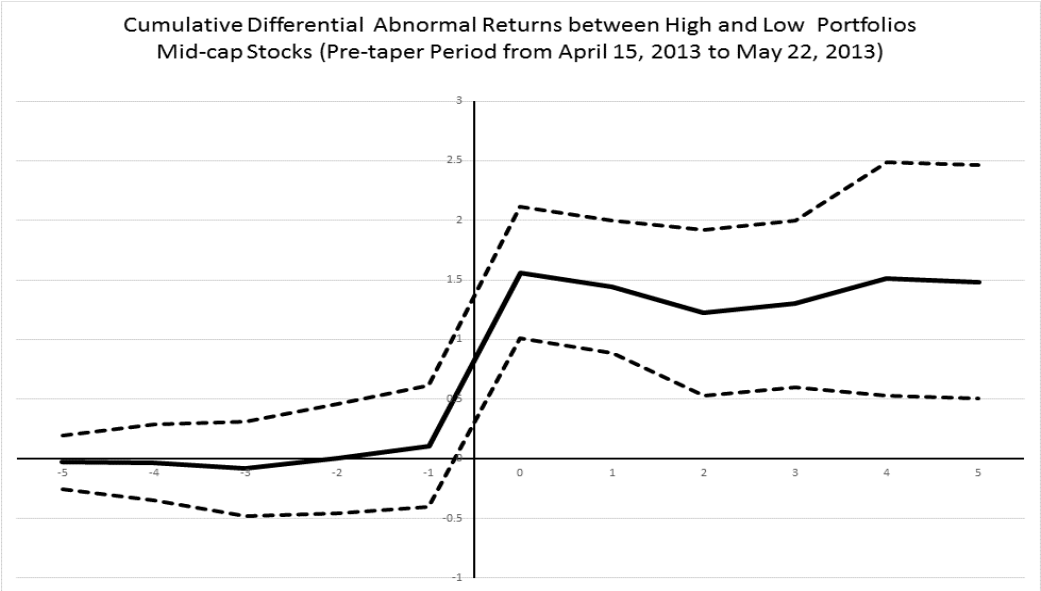


Post Taper period

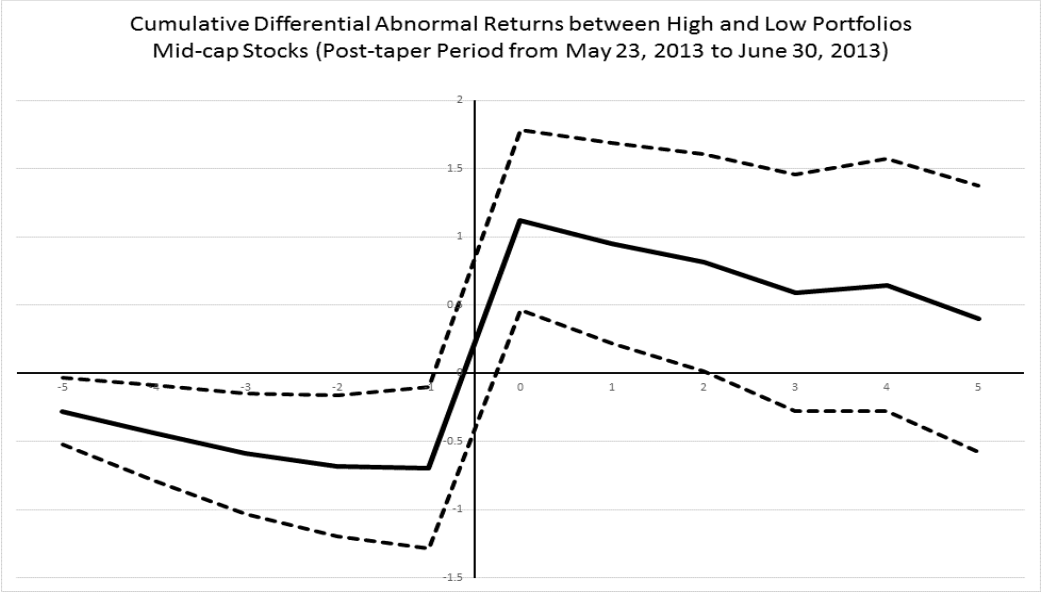


Taper Tantrum Period by Size (Mid Cap Stocks)

Pre Taper period

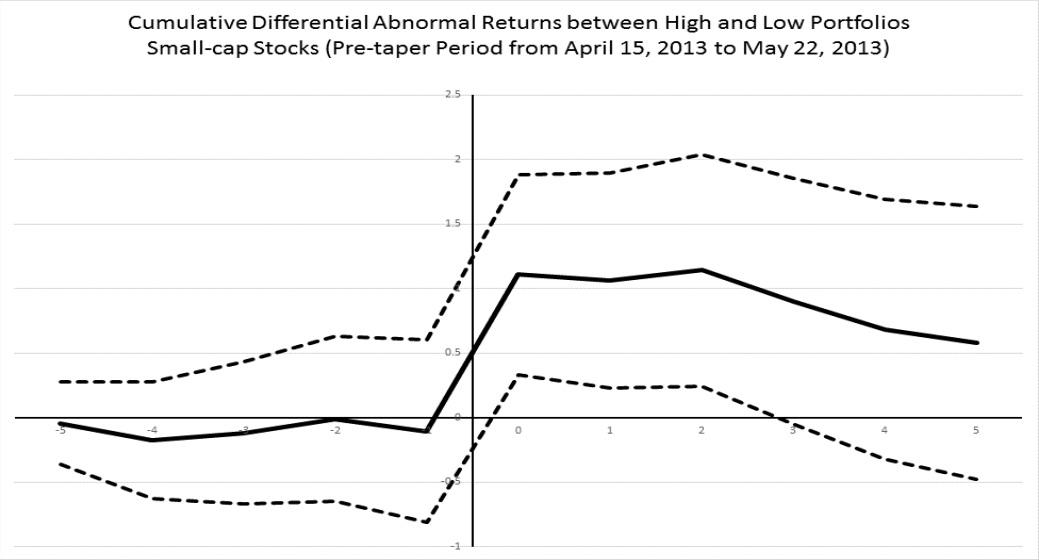


Post Taper period

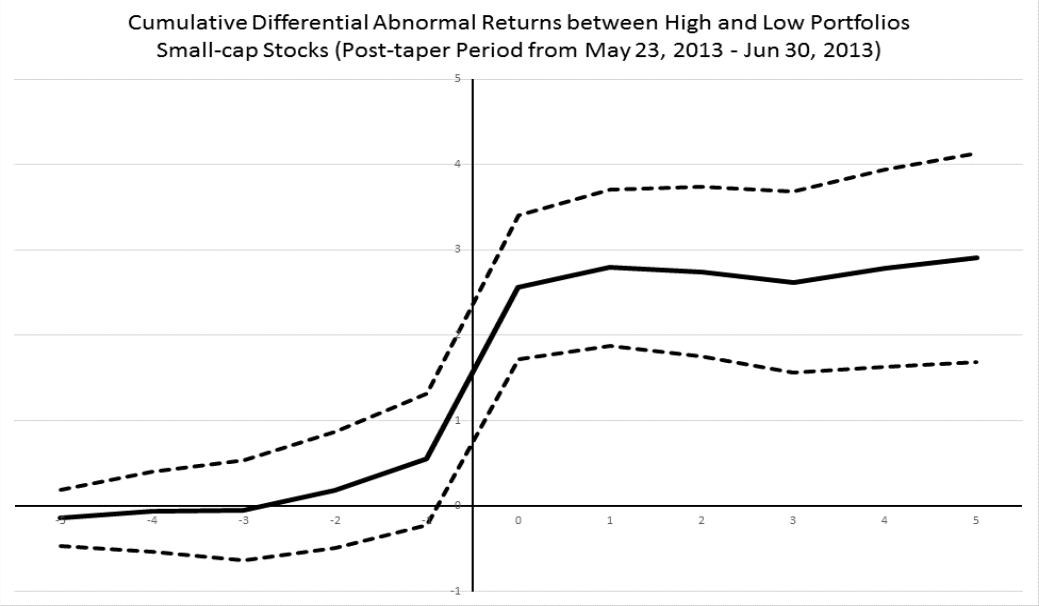


Taper Tantrum Period by Size (Small Cap Stocks)

Pre Taper period



Post Taper period



Conclusions (1)

- Stocks with high innovations in FII flows experience a coincident price increase that is permanent
- Stocks with low innovations are associated with a coincident price decline that is in part transient, reversing itself within five days
- Reversals are greater during the taper tantrum period, but permanent effect is still present
- The results are consistent with a **price "pressure"** on stock returns induced by FII sales (**portfolio rebalancing**), as well as **information being revealed** through FII buys and sales

Conclusions (2)

- A trade-off in the effect of FII flows on stock markets
  - FII **outflows** contribute to **transient volatility,** suggesting that "limits to arbitrage" is at work when global risk appetite is low, providing opportunity for liquidity providers to generate excess returns.
  - Trading by FIIs also **generates new information,** suggesting that private information is the key driver of trading-time volatility
- Price pressure effects are increasing in FII flow surprises and global "stress"

Policy question: Throw sand in the wheels of FII flows or build greater domestic market depth?

Future Directions

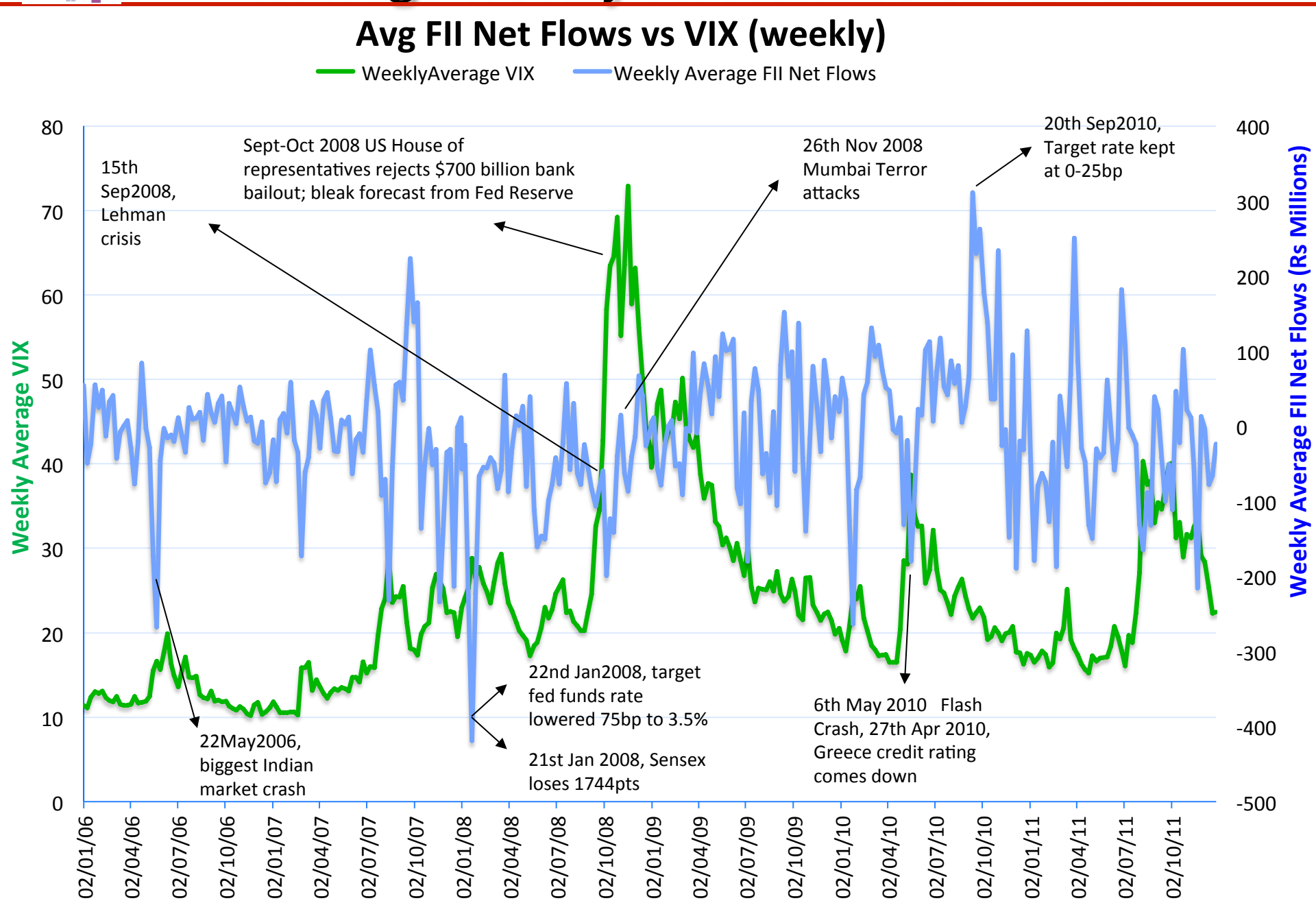
- How and why does global market volatility drive the FII flow, e.g., due to **profit-booking or fire sales by foreign funds**, which in turn affects Indian stock markets?

- What are the **mechanisms by which contagion occurs**?
  – Short selling constraints, limited arbitrage capital for liquidity provision, limited depth of domestic trading, …

- How exactly do FII flows affect the different sectors of the **real economy**?

- **Role of restrictions** (or relaxations) on FII investments in ascertaining price impacts

Average Weekly FII Flows vs CBOE VIX



Related Literature (1)

- Warther 1995; Edelen and Warner 2001; Goetzmann and Massa 2003; Teo and Woo 2004 have shown that **aggregate mutual fund flows affect contemporaneous stock returns**.

- Coval and Stafford (2007) show that shocks in fund flows causes mutual funds to significantly adjust their holdings, resulting in **price pressure effects**, that are transient but can take several weeks to be reversed fully

- Jotikasthira, Lundblad and Ramdorai (2012) find evidence that such **asset fire sales** in the developed world affect fund flows to emerging markets, creating a **"push" factor of contagion**

Related Literature (2)

Lou (2012) also examines the impact of flows at the stock level.

However,

- Lou uses aggregates *quarterly* flow-induced trading by mutual funds. We examine *daily* flow-induced demand shocks. ➔ we analyze the **short-run immediate impact** whereas his study analyzes the *long*-run impact of flows.

- Lou examines *expected* flows on fund performance, whereas our focus is on the immediate price impact of **unexpected fund flows** (innovations in order flow).

Do Firm Characteristics Explain the Differential Returns?

PANEL B: Firm characteristics	Q1	Q5	Q5-Q1	
Firm Characteristics	**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*

Abnormal Returns and Commonality in FII Order Flow

$$Y_t = \alpha_0 + \beta X_t + \gamma Z_{t-1} + \delta FII\_TRDS\_RSQ_{t-1} + \varepsilon_t .$$

Parameter	Abnormal Return on Day 0					
	Q1		Q5		Q5-Q1	
	Estimate	*t* -stat	Estimate	*t*-stat	Estimate	*t*-stat
Intercept	1.65	0.27	22.60	1.89*	0.95	**3.25****
AMIHUD_ILLIQ	-0.30	-2.34**	-0.02	-0.05	0.06	0.54
Log(*RUPEE_VOLUME*)	-0.32	-1.37	0.04	0.11	-0.01	-0.04
Log(*SIZE*)	0.19	0.74	-0.76	-1.30	0.15	0.55
LOCAL_BETA	-0.85	-0.71	-1.46	-1.23	0.41	0.30
GLOBAL_BETA	-0.38	-0.54	-0.37	-0.30	0.10	0.11
VOLATILITY	-0.15	-0.92	-0.23	-0.76	0.09	0.23
IDIO_RISK	0.06	0.50	-0.01	-0.10	0.02	0.05
$NIFTY\_RET_{t-1}$	0.13	1.53	0.19	2.43**	0.17	**2.50****
$S\&P\ 500\_\ RET_{t-1}$	-0.06	-0.61	0.14	1.15	0.10	0.76
VIX_{t-1}	-0.01	-0.54	0.01	0.85	0.02	1.51
ΔVIX_{t-1}	-0.02	-1.14	0.00	0.25	0.03	1.72*
$NIFTY\_VOL_{t-1}$	6.35	0.38	7.63	0.37	21.04	1.47
$AGGR\_FFLOW_{t-1}$	-0.97	-0.35	-0.95	-0.31	0.39	0.13
RETAIL_OSHP	-0.01	-0.13	-0.02	-0.25	0.06	1.21
INSTITUTIONAL_OSHP	0.04	1.25	0.02	0.35	0.04	1.71
$FII\_TRDS\_RSQ_{t-1}$	-2.29	-0.95	-2.82	-0.90	-4.72	-1.61
R^2		0.33		0.44		0.47

Asymmetric and Non-linear Effects of FII Flows

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

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

FII Flows and Volatility – Information or Illiquidity?