
FOREIGN FUND FLOWS AND STOCK RETURNS: EVIDENCE FROM INDIA

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Competing 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, but I am glad to say that even during the big sell-off in last July-August, long-term flows, whether debt or equity stayed with us."*

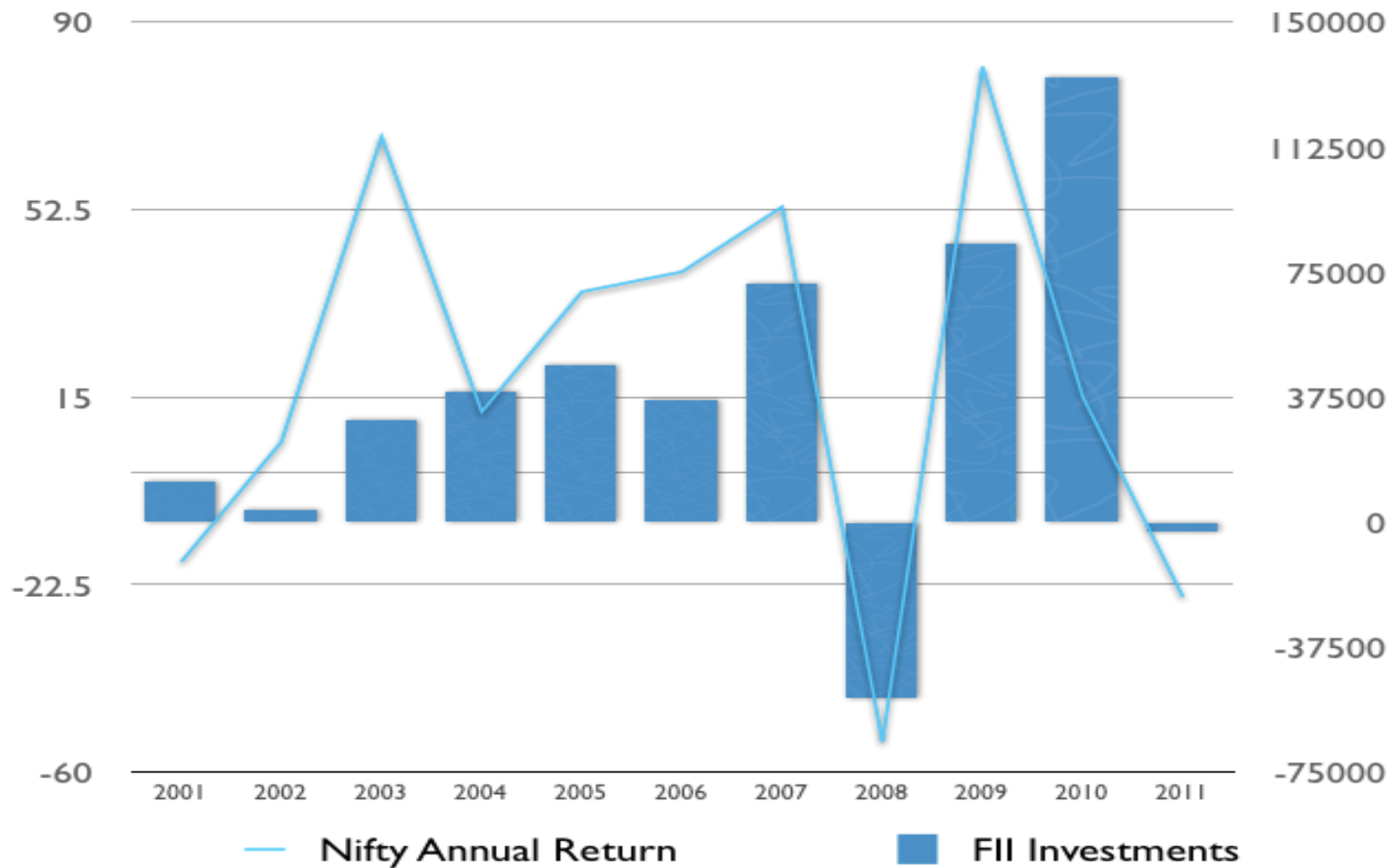
□ MF Country Report, February 2014.

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

How Do FII Investments Affect the Stock Market?

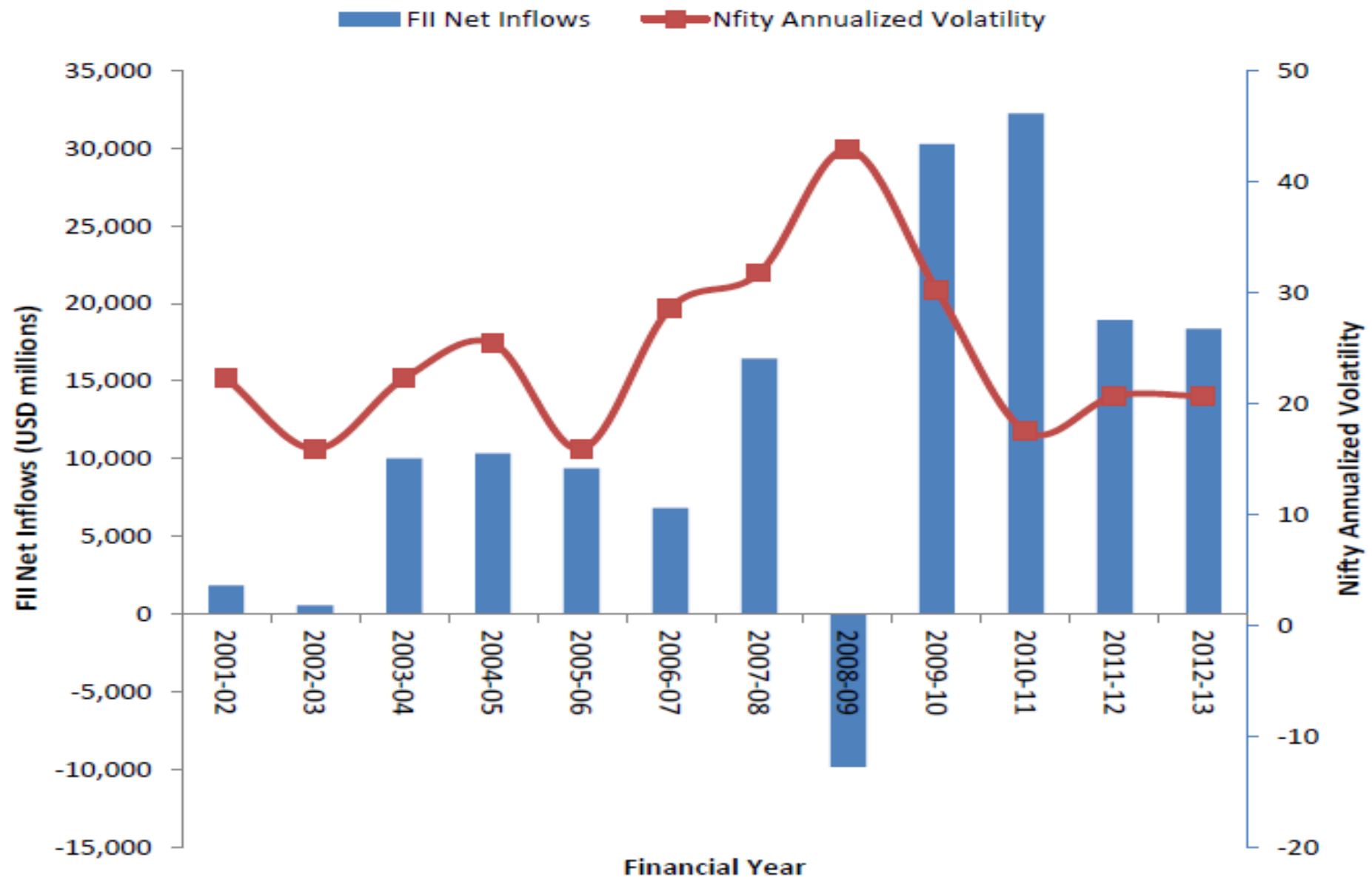
April 2, 2012, MINT

FII Equity Investments Versus Nifty Returns



FII Flows and Volatility – Information or Illiquidity?

FII Annual Net Flows and Market Volatility



Related Literature

- 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.
- HOWEVER, this and similar studies rely on AGGREGATE FLOWS to emerging markets.
- - Our study exploits a unique database with flow information at the individual stock level for India.

With stock level FII trading data:

- ☐ All the existing studies work on foreign investors aggregate flows in and out of emerging markets as data is not available at stock level
 - Considers foreign fund flows as “exogenous” to stock market fundamentals

- ☐ Whereas our study, with access to stock level data of FII, examines how 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
 - ❑ 228 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-appettite)
- ❑ Data sources:
 - Proprietary data from National Stock Exchange (NSE) for daily stock level FII trade data
 - The remaining data have been sourced from CMIE Prowess and www.finance.yahoo.com

FII FLOWS

$$\square FII_Net_{i,t} = \frac{FII_BUYS_t - FII_SELLS_t}{RUPEE_VOLUME_t}, \text{ for } i^{\text{th}} \text{ stock on day } t$$

$\square$ *FII_BUYS* is the daily rupee value of purchases and *FII_SELLS* is the daily rupee value of sales

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

$\square$ *FII_NET* gives an economic measure of the daily net FII flows relative to the total daily rupee trading value.

Descriptive Statistics (1)

Variable	Mean	Median	Minimum	Maximum	Std. dev.
Panel A : Firm characteristics					
RET (%) Daily Returns	0.0202	-0.0397	-20.0000	20.0000	3.0382
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
AMIHUDDILLIQ	1.66	0.06	0.00	137.60	12.76
LOCAL_βETA	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

Descriptive Statistics (2)

Panel B : Market Wide Factors

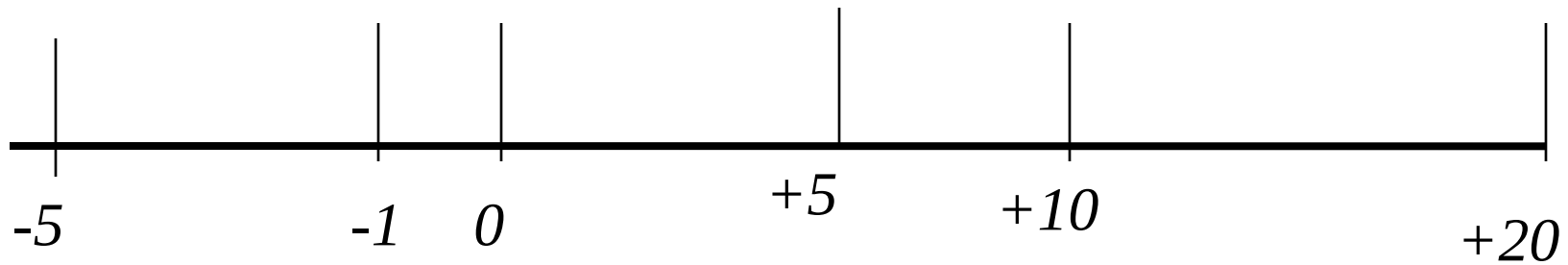
<i>NIFTY_RET (%)</i>	0.0333	0.0886	-13.0142	16.3343	1.8537
<i>S&P 500_RET(%)</i>	0.0014	0.0669	-9.4695	10.9572	1.5712
<i>VIX</i>	23.3676	21.1800	9.8900	80.8600	11.2043
<i>ΔVIX (first difference in VIX)</i>	0.0398	-0.3914	-35.0588	49.6008	7.3871
<i>AGGR_FFLOW</i>	-0.0053	-0.0020	-0.2004	0.1821	0.0439

Panel C : FII Flows

<i>FII_BUYS (Rs. millions)</i>	81.8121	4.8677	0.0000	33788.043	272.9893
<i>FII_SELLS (Rs. millions)</i>	84.2778	3.8290	0.0000	23831.583	280.0172
<i>FII_NET</i>	0.011832	0.0000	-0.9500	0.95	0.218543

Empirical Design

- Employ a simple way to infer information content of FII flows
- Every Monday, five portfolios are formed on basis of FII flows
- Tracks short-term performance of HIGH and LOW portfolios



Portfolio-formation day: Day 0

Pre-formation Window: (-5, -1)

Post-formation Windows: (0, 5) (0,10) and (0, 20)

Portfolio Formation Basis: Two Variations

❑ NAIVE MODEL

- Uses FII_NET as a proxy for extreme FII flows.
- Highly positive values indicate excess buying and highly negative values indicate excess selling

❑ INNOVATIONS MODEL

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

Uses residuals (FII_NET_INNOV) from a panel regression model

$$FII_NET_{i,t} = FirmFE_{i,t} + \sum_{j=1}^5 FII_NET_{t-j} + \sum_{k=1}^5 \gamma_k Ret_{t-k} + \delta_1 SIZE + \delta_2 TOVER + \phi_i MktFactors_t + \varepsilon_{i,t}$$

Fixed Effects Panel Regression Model

Variable	Coefficient	t-Statistic
Intercept	-0.1377	-5.1521***
FII_NET_{t-1}	0.2880	96.5636***
FII_NET_{t-2}	0.1122	41.5933***
FII_NET_{t-3}	0.0631	22.5920***
FII_NET_{t-4}	0.0438	16.3155***
FII_NET_{t-5}	0.0499	19.4840***
RET_{t-1}	0.0011	6.9012***
RET_{t-2}	0.0002	0.9128
RET_{t-3}	0.0001	0.3011
RET_{t-4}	-0.0004	-1.8028*
RET_{t-5}	-0.0001	-0.4402
$AGGR_FFLOW_{t-1}$	0.1192	5.5158***
$SIZE$	0.0062	5.7991***
$TOVER$	-0.1007	-2.8580***
VIX_{t-1}	-0.0004	-5.8159***
ΔVIX_{t-1}	-0.0006	-3.6759***
$S\&P\ 500_RET_{t-1}$	0.0007	0.7699
$NIFTY_RET_{t-1}$	-0.0003	-0.6507
Adjusted R-square		0.19
Durbin-Watson stat		2.00
F-statistic		303.00***
No. of observations		311984
Number of Firms		228

Hypotheses related to fund flows

- ☐ H1 : Foreign fund flows have systematic impact on market prices of domestic assets
 - Information based trading or Portfolio rebalancing effects
- ☐ H2 : Price pressure associated with foreign flows should be positively related with the size of shock in foreign flows
- ☐ H3 : The price impact of foreign flows should be positively related to firm size as foreign flows increase with firm size
- ☐ H4 : Price impact of foreign fund flows should be positively related to the uncertainty in market (VIX)
- ☐ H5 : Price impact of foreign fund flows should be greater during the periods of financial crisis as compared to normal periods

Price Impact of Fund Flows: Permanent or Transitory?

Abnormal Return difference between High (Q5) and Low (Q1) FII Innovation portfolios

Panel B: Panel Regression Model of FIIFlow Innovations						
	Q1		Q5		Q5-Q1	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Return behavior around the days of shocks in <i>FII_NET</i>						
<i>AB_RET</i> (-5, -1) %	-0.01	-0.13	-0.11	-2.68 ^{***}	-0.10	-1.75 [*]
<i>AB_RET</i> (-1, 0) [Day 0 Returns] %	-0.98	-44.8 ^{***}	0.90	39.93 ^{***}	1.88	59.88 ^{***}
<i>AB_RET</i> (0, 5) %	0.28	5.44 ^{***}	-0.08	-1.73 [*]	-0.36	-5.13 ^{***}

Differential Return between Portfolios based on High and Low Measures of FII Flow Innovations

- HIGH innovation stocks experience significantly greater Day-0 return shocks than LOW innovation stocks.
- HIGH innovation stocks earn significantly lower returns than LOW innovation stocks in the post-formation window.
- HIGH innovation stocks earn similar returns as LOW innovation stocks in the pre-formation window. [Note, in the Naive Model, the returns slightly differ]

Findings Dissected Further...

- In the pre-formation window returns are insignificant for both HIGH and LOW innovation stocks.
- Day 0 return is
 - significantly positive for HIGH innovation stocks
 - significantly negative for LOW innovation stocks
- The returns in the post-formation window are largely driven by the high positive returns on the LOW innovation stocks, indicating reversals
 - The 2-week magnitude of reversal is about one-fifth of daily volatility of the representative stock in the sample

Flow induced price changes are...

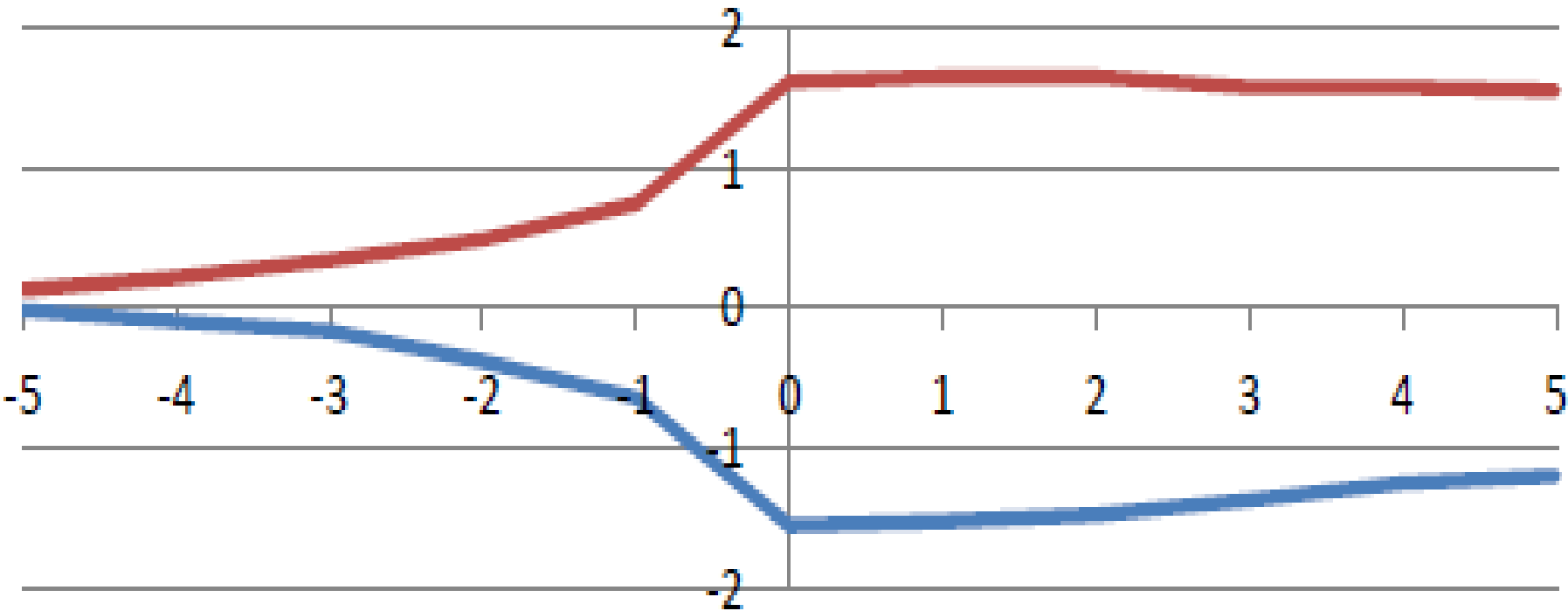
- FII flows have systematic impact on future returns
 - Extreme Positive Innovations will have positive returns that are permanent
 - Extreme Negative Innovations will have negative returns that are partly transient

- Support for H1a , H1b and H2

Cumulative Returns (Naïve Model)

Panel A: Naïve Model

- Cumulative Returns of Low Innovation Portfolio
- Cumulative Returns of High Innovation Portfolio

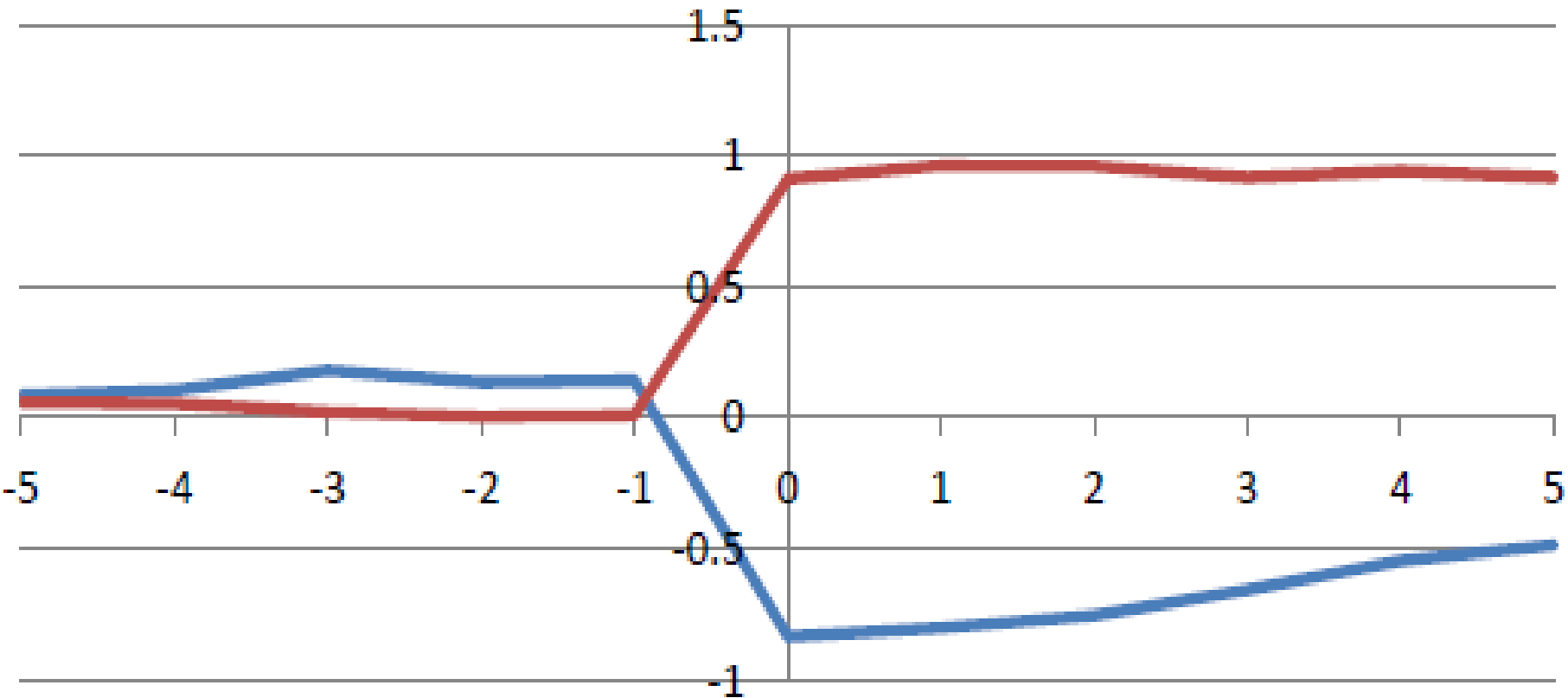


Cumulative Returns (FII Innovations)

Panel B: Panel Regression Model

Cumulative Returns of Low Innovation Portfolio

Cumulative Returns of High Innovation Portfolio



FII Flows and Return Shocks: Summary

- HIGH innovation stocks experience a coincident (portfolio-formation day) price increase that is permanent
- LOW innovation stocks experience a coincident price decline 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

Are these due to difference in firm characteristics of High and Low Portfolios?

Q5 (High) - Q1 (Low)	Naive Model of FII_NET			Panel Regression Model of FII_NET		
	Difference	t-stat	p-val	Difference	t-stat	p-val
Firm characteristics						
PRE_VOLATILITY (%)	-0.64	-2.03	0.04	0.16	0.52	0.60
POST_VOLATILITY (%)	-1.21	-3.73	0.00	-0.46	-1.43	0.15
PRE_RUPEE_VOLUME	-112.34	-10.28	0.00	-4.08	-0.40	0.69
POST_RUPEE_VOLUME	-118.53	-10.45	0.00	-7.77	-0.74	0.46
PRE_AMIHUD_ILLIQ	-1.79	-1.03	0.30	-2.15	-1.23	0.22
POST_AMIHUD_ILLIQ	0.26	1.37	0.17	-0.09	-1.69	0.09
PRE_SIZE	-34584.20	-7.23	0.00	-359.03	-0.08	0.94
POST_SIZE	-28752.66	-6.02	0.00	4417.39	0.96	0.34
PRE_LOCAL_BETA	-0.06	-8.18	0.00	0.00	-0.31	0.76
POST_LOCAL_BETA	-0.04	-5.51	0.00	0.01	1.30	0.19
PRE_GLOBAL_BETA	0.00	0.37	0.71	0.00	0.01	1.00
POST_GLOBAL_BETA	-0.02	-1.36	0.17	0.01	0.83	0.41
PRE_IDIO_RISK (%)	0.06	0.44	0.66	0.09	0.66	0.51
POST_IDIO_RISK (%)	0.07	0.47	0.64	0.10	0.68	0.50

Firm Characteristics

- HIGH innovation stocks have similar firm characteristics as LOW innovation stocks (both pre- and post-formation).
 - Except for post-formation illiquidity:
LOW innovation stocks are more ILLIQUID than HIGH innovation stocks
- ➔ THIS MAY EXPLAIN THE NEGATIVE RETURN DIFFERENTIAL IN THE POST-FORMATION WINDOW

Time Series Variation in Return Shocks

- ☐ Can time series variation of differential abnormal returns can be explained by time series variation of market wide factors?
- ☐ Cross sectional average of differential returns between High and Low innovation portfolios on each portfolio formation day (Y_t) is regressed on firm specific factors (X_t), lagged market wide factors (Z_{t-1}) and expected FII Flows and unexpected FII Flows

$$Y_t = \alpha_0 + \beta X_t + \gamma Z_{t-1} + \delta EXP_FFLOW + \tau FII_NET_INNOV + \varepsilon_t$$

Time Series Variation in Differential Day-0 Returns						
Differences in Returns between HIGH and LOW innovation stocks						
Q5 (High) - Q1 (Low)	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Intercept	1.89	37.71 ^{***}	1.10	10.01 ^{***}	-0.55	-1.25
AMIHU _{ILLIQ}	0.00	2.11 ^{**}	0.00	5.14 ^{***}	0.00	4.54 ^{***}
Log(RUPEE_VOLUME)	0.06	0.43	-0.07	-0.57	-0.10	-0.84
Log(SIZE)	-0.13	-0.87	-0.08	-0.55	-0.03	-0.19
LOCAL_BETA	0.00	0.01	0.01	0.02	0.22	0.94
GLOBAL_BETA	0.08	0.39	0.14	0.78	0.17	0.97
VOLATILITY	-0.11	-0.54	-0.08	-0.62	-0.04	-0.28
IDIO_RISK	-0.11	-0.61	-0.13	-0.87	-0.08	-0.50
NIFTY_RET _{t-1}	-		0.06	1.91 [*]	0.05	1.66
S&P 500_RET _{t-1}	-		-0.04	-0.40	-0.04	-0.48
VIX _{t-1}	-		0.03	6.95 ^{***}	0.03	6.70 ^{***}
ΔVIX _{t-1}	-		0.01	0.69	0.01	0.57
AGGR_FFLOW _{t-1}	-		-2.25	-1.92	-1.12	-0.93
EXP_FFLOW	-		-		1.23	0.88
FII_NET_INNOV	-		-		1.98	1.14
Adjusted R-square	-0.02		0.20		0.24	
F-statistic	0.30		7.44 ^{**} *		8.05 ^{***}	

Time-series Variation in Differential Day 0 returns

Day 0 differential returns are

- unrelated to time series variation in firm characteristics
- Greater during times of illiquidity and a rise in the global stock market (VIX), consistent with claim in Hypothesis H4.
- are driven by differences in innovations in FII flows (given the significant intercept term)

Results are robust to Fama-MacBeth cross-sectional regressions at stock level

Do the firm size matters on how FII trading affects returns?

SIZE	Q1		Q5		Q5-Q1	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Large Cap						
<i>AB_RET (-5, -1) %</i>	0.07	0.92	0.04	0.59	-0.03	-0.28
<i>AB_RET (-1, 0) [Day 0 Returns] %</i>	-1.07	47.83 ^{***}	1.10	46.98 ^{***}	2.18	37.89 ^{***}
<i>AB_RET (0, 5) %</i>	0.53	5.74 ^{***}	0.02	0.26	-0.51	-3.91 ^{***}
Mid Cap						
<i>AB_RET (-5, -1) %</i>	0.04	0.64	-0.08	1.36	-0.12	-1.40
<i>AB_RET (-1, 0) [Day 0 Returns] %</i>	-0.95	69.43 ^{***}	0.84	49.11 ^{***}	1.79	39.95 ^{***}
<i>AB_RET (0, 5) %</i>	0.28	3.96 ^{***}	-0.05	0.74	-0.33	-3.34 ^{***}
Small Cap						
<i>AB_RET (-5, -1) %</i>	0.06	0.66	-0.25	2.70 ^{***}	-0.32	-2.34 ^{**}
<i>AB_RET (-1, 0) [Day 0 Returns] %</i>	-0.88	23.16 ^{***}	0.79	19.29 ^{***}	1.67	23.82 ^{***}
<i>AB_RET (0, 5) %</i>	-0.12	1.09	0.03	0.30	0.16	0.98

Impact of Financial Crisis

Panel A : Impact of FII Flows - Financial Crisis

Non-Crisis Period	Q1		Q5		Q5-Q1	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
<i>AB_RET</i> (-5, -1) %	0.04	0.93	-0.12	2.90 ^{***}	-0.16	-2.65 ^{***}
<i>AB_RET</i> (-1, 0) [Day 0 Returns] %	-0.88	85.23 ^{***}	0.86	173.42 ^{***}	1.74	54.98 ^{***}
<i>AB_RET</i> (0, 5) %	0.29	5.75 ^{***}	-0.03	0.70	-0.32	-4.51 ^{***}
Crisis Period						
<i>AB_RET</i> (-5, -1) %	-0.23	1.70 [*]	-0.06	0.45	0.17	0.90
<i>AB_RET</i> (-1, 0) [Day 0 Returns] %	-1.46	31.47 ^{***}	1.10	17.15 ^{***}	2.56	25.52 ^{***}
<i>AB_RET</i> (0, 5) %	0.22	1.35	-0.32	2.19	-0.54	-2.47 ^{**}

•Crisis period : Jan to Dec 2008

•Day 0 abnormal return differential between High and Low portfolios is much higher during Crisis period compared to Non Crisis period...approx 47% greater impact of FII flows. Reversal of low portfolio is higher during Crisis. Supports H4

Impact of Global Market Volatility

Panel B: Impact of FII Flows - VIX

	Q1		Q5		Q5-Q1	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
High VIX days						
<i>AB_RET</i> (-5, -1) %	0.03	0.50	-0.02	0.36	-0.06	-0.61
<i>AB_RET</i> (-1, 0) [Day 0 Returns] %	-1.09	90.04 ^{***}	1.03	64.85 ^{***}	2.12	43.87 ^{***}
<i>AB_RET</i> (0, 5) %	0.32	4.19 ^{***}	-0.13	1.82 [*]	-0.46	-4.26 ^{***}
Low VIX days						
<i>AB_RET</i> (-5, -1) %	-0.05	0.87	-0.21	4.11 ^{***}	-0.16	-2.10 ^{**}
<i>AB_RET</i> (-1, 0) [Day 0 Returns] %	-0.85	75.99 ^{***}	0.76	55.16 ^{***}	1.62	41.59 ^{***}
<i>AB_RET</i> (0, 5) %	0.22	3.61 ^{***}	-0.03	0.47	-0.25	-2.88 ^{***}

Abnormal return differential between high and low portfolios is much higher during High VIX days compared to LOW VIX days...approx 31% higher. Price reversal in post formation days are also higher for High VIX days. Transient volatility is greater during times of high global market stress. Supports H5.

Robustness checks – FII spread their trades over days

Accumulate daily FII flow innovations over (-5,0) window and use this cumulative measure to form portfolios rather than using day 0 flows only.

Similar results...0.81% against 1.88% on day 0 return. FII order flow exhibits strong persistence and prices start moving up or down from day -5 itself. Here pre-formation window is (-10,-5).

	Q1		Q5		Q5-Q1	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Panel A: Cumulative Innovation in FII flows						
<i>AB_RET (-10, -5)%</i>	0.37	6.29 ^{***}	0.06	1.09	-0.31	-3.77 ^{***}
<i>AB_RET (-5, -1) %</i>	-1.61	160.90 ^{***}	1.44	116.21 ^{***}	3.04	51.07 ^{***}
<i>AB_RET (-1, 0) [Day 0 RET]%</i>	-0.40	23.61 ^{***}	0.41	23.91 ^{***}	0.81	25.33 ^{***}
<i>AB_RET (0, 5) %</i>	0.43	9.09 ^{***}	-0.13	2.65 ^{***}	-0.56	-7.99 ^{***}

Robustness checks – Out of Sample analysis

For validity of panel regression model, we do an out of sample (Jan 2012 to Jun 2013) check.

Day 0 abnormal return differential is 1.55%. As earlier, only low innovation portfolio experiences reversal but weaker than in-sample analysis

	Q1		Q5		Q5-Q1	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Panel B : Out of Sample data						
AB_RET (-5, -1) %	-0.18	2.57 ^{**}	0.08	1.30	0.26	2.77 ^{***}
AB_RET (-1, 0) [Day 0 Returns] %	-0.79	37.80 ^{***}	0.76	38.61 ^{***}	1.55	33.87 ^{***}
AB_RET (0, 5) %	0.19	2.35 ^{**}	-0.02	0.22	-0.21	-1.88 [*]

Conclusions (1)

- Stocks with high innovations are associated with 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 two weeks.

The results are consistent with a price “pressure” on stock returns induced by FII sales, 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 for stocks experiencing the outflows
 - Trading by FIIs also generates new information
 - French and Roll (1986) suggest 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?

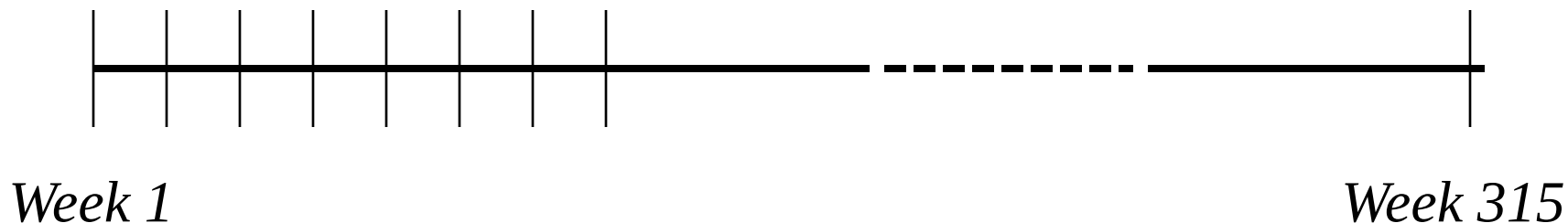
Future Directions

- How and why does global market volatility drive the FII flow, e.g., due 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 and their price impacts affect the different sectors of the real economy, if they do?
- Role of restrictions (or relaxations) on FII investments in ascertaining price impacts.

Additional....

Alternative Test: Fama-MacBeth Regressions

Every week, cross-sectional regressions of Day-0 (or post-formation) returns are run against firm characteristics



The time-series averages of the coefficients obtained from cross-sectional regressions are reported along with t-statistics and p-values

Fama-MacBeth Regressions

$$RET_{it} = \alpha_0 + \alpha_1 * FirmFactors + \varepsilon_{it}; i = 1 \text{ to } 228 \text{ and for every } t$$

	Estimate	t-stat
Dependent Variable: Day 0 Returns, AB_RET (-1, 0) %		
Intercept	0.53	1.38
PRE_AMIHUD_ILLIQ	-0.03	-0.57
Log(PRE_RUPEE_VOLUME)	0.00	-0.10
Log(PRE_SIZE)	-0.02	-0.85
PRE_LOCAL_BETA	-0.05	-0.74
PRE_GLOBAL_BETA	-0.04	-0.88
PRE_VOLATILITY	0.00	0.28
PRE_IDIO_RISK	0.00	0.18
Average Adjusted R-sq		0.074

Day 0 returns are unrelated to firm characteristics

Residuals from FM regressions related to Mkt wide factors?

Q5 (High) - Q1 (Low)	Estimate	t-stat
Intercept	0.99	9.27 ^{***}
AGGR_FFLOW _{t-1}	-1.70	-1.63
NIFTY_RET _{t-1}	0.05	1.62
S&P 500_RET _{t-1}	-0.10	-1.39
VIX _{t-1}	0.03	5.56 ^{***}
ΔVIX _{t-1}	0.00	0.14
Adjusted R-Square	0.19	
F-statistic	15.85 ^{***}	

Global volatility (VIX) has a strong positive impact on Day 0 returns that are uncorrelated to firm characteristics.