FOREIGN FUND FLOWS AND ASSET PRICES:

EVIDENCE FROM THE INDIAN STOCK MARKET

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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?

FII Annual Net Flows and Market Returns

Financial Year

FII Net Inflows

Nifty Returns

FII Net Inflows (USD millions)

Nifty Returns

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

FII Net Equity Flows and Market Returns

FII Net Inflows vs. Nifty Returns

Financial Year

FII Net Equity Flows (USD millions)

Nifty Returns

-3

0

1

2

3
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 NET\textsubscript{i,t} = \frac{FII BUYS\downarrow t – FII SELLS\downarrow t}{RUPEE VOLUME E\downarrow t}, for i\textsuperscript{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

\[ FII\_NET_{i,t} = FirmFEff + \sum_{j=1}^{5} FII\_NET_{t-j} + \sum_{k=1}^{5} RET_{t-k} + \delta_1 SIZE + \delta_2 TOVER + \delta_3 RETAIL\_OSHP_{t-1} + \delta_4 INSTITUTIONAL\_OSHP_{t-1} + \alpha_1 AGGR\_FFLOW_{t-1} + \alpha_2 VIX_{t-1} + \alpha_3 \Delta VIX_{t-1} + \alpha_4 NIFTY\_RET_{t-1} + \alpha_5 S\_ & P500\_RET_{t-1} + \alpha_6 NIFTY\_VOLATILITY_{t-1} + e_{i,t} \]
### Firm Fixed Effects Panel Regression Model

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</table>

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

Cumulative Abnormal Returns of Low Innovation Portfolio
Cumulative Abnormal 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 (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.
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
- 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

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<th>Q1</th>
<th>Q5</th>
<th>Q5-Q1</th>
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<td>t-stat</td>
<td>Estimate</td>
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<tr>
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<td>-2.60***</td>
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<tr>
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### 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.

FII's may be avoiding small stocks for portfolio rebalancing purposes (to concerns about illiquidity).
The average FII ownership is 20.51% for large-cap NIFTY stocks, 15.99% for mid-cap stocks, and 12.04% for small-cap stocks.
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

During crisis period, FII Flows have 47% greater impact

Portfolio rebalancing is more significant during crisis
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
On *May 22\(^{nd}\) 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., $1 \times \sqrt{252}/36.16 = 43.90\%$ of the annualized volatility of a typical stock.
Taper Tantrum Period by Size (Large Cap Stocks)

Pre Taper period

Cumulative Differential Abnormal Returns between High and Low Portfolios
NIFTY Stocks (Pre-taper Period from April 15, 2013 to May 22, 2013)

Post Taper period

Cumulative Differential Abnormal Returns between High and Low Portfolios
NIFTY Stocks (Post-taper Period from May 23, 2013 to June 30, 2013)
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**

Cumulative Differential Abnormal Returns between High and Low Portfolios
Small-cap Stocks (Pre-taper Period from April 15, 2013 to May 22, 2013)

Cumulative Differential Abnormal Returns between High and Low Portfolios
Small-cap Stocks (Post-taper Period from May 23, 2013 - Jun 30, 2013)
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

Avg FII Net Flows vs VIX (weekly)

- 15th Sep 2008, Lehman crisis
- Sept-Oct 2008 US House of representatives rejects $700 billion bank bailout; bleak forecast from Fed Reserve
- 22nd Jan 2008, target fed funds rate lowered 75bp to 3.5%
- 21st Jan 2008, Sensex loses 1744pts
- 26th Nov 2008 Mumbai Terror attacks
- 20th Sep 2010, Target rate kept at 0-25bp
- 15th Sep 2008, Lehman crisis
- 22 May 2006, biggest Indian market crash
- 26th Nov 2008 Mumbai Terror attacks
- 20th Sep 2010, Target rate kept at 0-25bp
- 6th May 2010 Flash Crash, 27th Apr 2010, Greece credit rating comes down
- 22nd Jan 2008, target fed funds rate lowered 75bp to 3.5%
- 21st Jan 2008, Sensex loses 1744pts
- 20th Sep 2010, Target rate kept at 0-25bp
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- 6th May 2010 Flash Crash, 27th Apr 2010, Greece credit rating comes down
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.
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

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<tr>
<th>Firm Characteristics</th>
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### Abnormal Returns and Commonality in FII Order Flow

\[
Y_{t} = \alpha_{0} + \beta X_{t} + \gamma Z_{t-1} + \delta FII\_TRDS\_RSQ_{t-1} + \epsilon_{t}
\]

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</tr>
<tr>
<td>RETAIL_OSHP</td>
<td>-0.01</td>
<td>-0.13</td>
<td>-0.02</td>
</tr>
<tr>
<td>INSTITUTIONAL_OSHP</td>
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<td>1.25</td>
<td>0.02</td>
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<tr>
<td>FII_TRDS_RSQ\textsubscript{t-1}</td>
<td>-2.29</td>
<td>-0.95</td>
<td>-2.82</td>
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<tr>
<td>R\textsuperscript{2}</td>
<td>0.33</td>
<td></td>
<td>0.44</td>
</tr>
</tbody>
</table>
Asymmetric and Non-linear Effects of FII Flows

\[ AB_{RET} = \alpha_0 + \alpha_1 FII_{NET INNOV} + \alpha_2 DUM + \alpha_3 FII_{NET INNOV} \times DUM + \alpha_4 SQ_{FII_{NET INNOV}} + \alpha_5 SQ_{FII_{NET INNOV}} \times DUM + \text{error} \]

<table>
<thead>
<tr>
<th>Abnormal Returns (AB_RET)</th>
<th>Estimate</th>
<th>t-stat</th>
<th>Estimate</th>
<th>t-stat</th>
<th>Estimate</th>
<th>t-stat</th>
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<tbody>
<tr>
<td>Intercept</td>
<td>0.06</td>
<td>2.01**</td>
<td>0.01</td>
<td>0.24</td>
<td>0.13</td>
<td>3.25***</td>
</tr>
<tr>
<td>( FII_{NET INNOV} )</td>
<td>5.66</td>
<td>14.91***</td>
<td>6.82</td>
<td>12.41***</td>
<td>4.09</td>
<td>8.35***</td>
</tr>
<tr>
<td>( DUM )</td>
<td>0.10</td>
<td>2.48**</td>
<td>0.16</td>
<td>2.75***</td>
<td>0.01</td>
<td>0.25</td>
</tr>
<tr>
<td>( FII_{NET INNOV} \times DUM )</td>
<td>1.47</td>
<td>2.78***</td>
<td>1.64</td>
<td>2.15**</td>
<td>1.26</td>
<td>1.83*</td>
</tr>
<tr>
<td>( SQ_{FII_{NET INNOV}} )</td>
<td>-8.03</td>
<td>-9.27***</td>
<td>-10.03</td>
<td>-7.97***</td>
<td>-5.32</td>
<td>-4.77***</td>
</tr>
<tr>
<td>( SQ_{FII_{NET INNOV}} \times DUM )</td>
<td>16.82</td>
<td>13.87***</td>
<td>21.58</td>
<td>12.44***</td>
<td>10.36</td>
<td>6.44***</td>
</tr>
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FII Flows and Volatility – Information or Illiquidity?

FII Annual Net Flows and Market Volatility

- FII Net Inflows
- Nifty Annualized Volatility