Algorithmic trading in India: Concerns, research and regulation

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- Similar is the case in India as well.

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- **Ambiguity here:** How to define and identify HFT?

Defining HFT

- **SEC's definition**: HFTs are **proprietary trading firms** that use high speed systems to monitor market data and submit large numbers of orders to the markets.

- They are characterized by:

  1. the use of **extraordinarily high-speed** and **sophisticated computer programs** for generating, routing, and executing orders;
  2. use of **co-location services** and individual data feeds offered by exchanges and others to minimize network and other types of latencies;
  3. **very short time-frames** for establishing and liquidating positions;
  4. the submission of numerous orders that are **cancelled shortly** after submission; and
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Note: All AT ain't HFT.

High frequency trading percentage, worldwide

	Source	HFT	Reported year
		(% of TTV)	
US	Tabb Group	49	2016
Japan	Studies	20-45	2014, 2015
Australia	ASIC	28	2015
Canada	IIROC Study group	27	2014
Europe	ESMA	24	2014

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In India, no official estimates available.
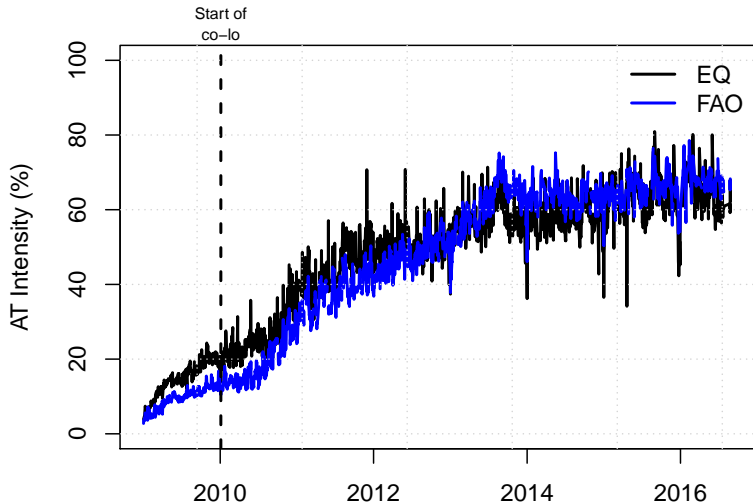
- With the rise in AT, HFT, benefits indisputable.
- However, concerns regarding possible negative impact. These include:

  1. HFT are primarily liquidity takers, and flee the markets during stress periods.
  2. AT, HFT engage in market manipulative activities.
  3. Could increase the level of systemic risk in the markets.
  4. Creates a two-tiered market structure which favors those with access to high speed.

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- But the structure of the US markets is *very different* from that of the Indian markets (or even markets elsewhere).
- Yes, the ability to trade faster has *changed* the structure of the markets.
- But important to understand *how* it has changed in order to know the implications.

Thus, the need for data analysis.

- Research on AT, HFT in India constrained by data issues and capacity constraints.
- Two studies in the context of NSE equity markets:
  1. Boehmer and Shankar (2013) find that increase in AT does not result in high levels of systemic risk.
  2. Aggarwal and Thomas (2014) find that
     1. higher AT improves market liquidity, reduces volatility and increase price efficiency.

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     1. higher AT improves market liquidity, reduces volatility and increase price efficiency.
     2. does not increase the incidence of extreme price movements.
     3. key: improvement in market quality of *small market cap* stocks.

Research at IGIDR

1. How has the market structure changed in terms of trading behavior and liquidity provisioning?

2. How has AT affected market quality? Does higher AT cause higher incidences of price instability?

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Data details

1. Tick by tick orders and trades data from NSE, timestamped in jiffies from 2008 onwards
2. Each order and trade marked by the exchange as AT or non AT.
3. Using this data, order book is re-created.
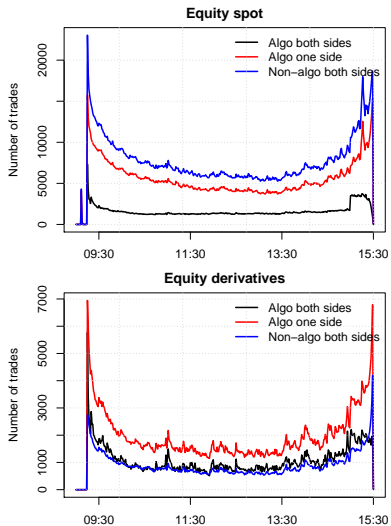4. But **note**, this data do not have any information on trader's ids.

Gigantic data from NSE

- Data size: more than 80 GB per day
- Systems at IGIDR:
    1. 48 CPU cores
    2. Memory: 320 GB
    3. Storage: 99TB
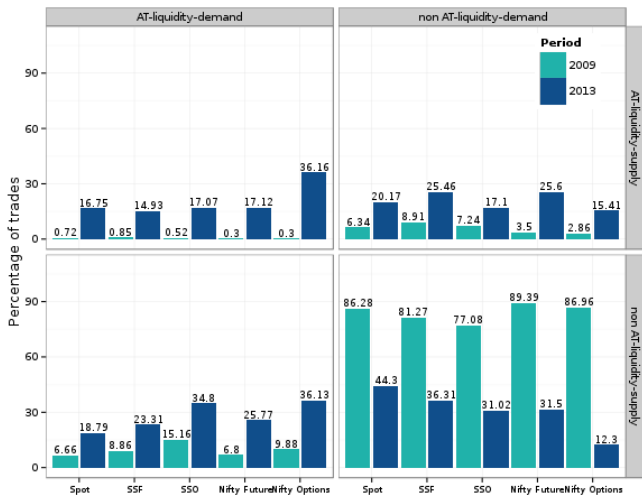
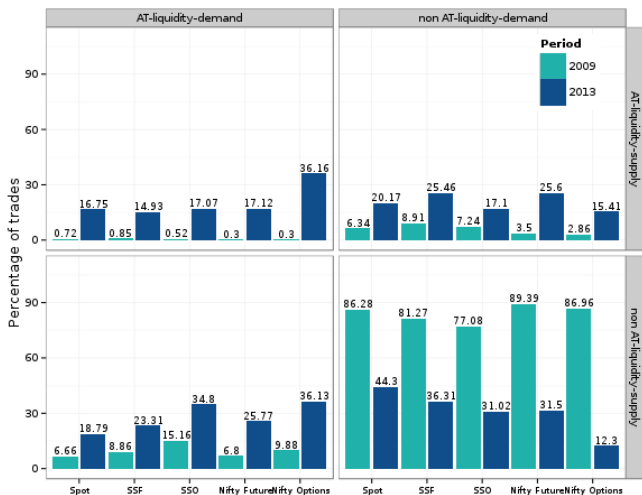# Per minute trades
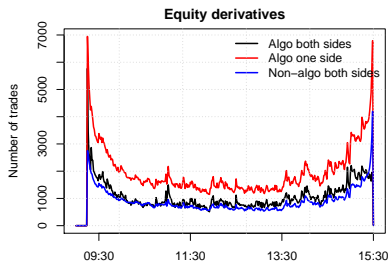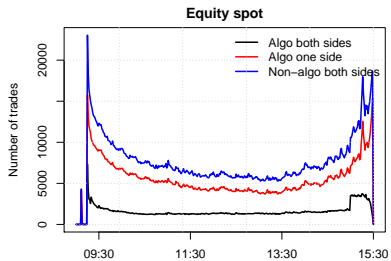
Per minute trades

Non AT have equal and high share in trades, indicating that AT do not crowd out non AT.

Do AT supply liquidity or demand liquidity?

The share of ATs in liquidity demand matches with their share in liquidity supply in all segments except options.

What is the fill rate and the cancellation rate on NSE?

Stocks:

All values in %

	Spot		Futures		Options	
	2009	2013	2009	2013	2009	2013
Algo	12.42	**62.19**	39.18	**93.30**	20.56	**84.89**
Traded	3.91	**12.37**	1.59	2.20	0.74	2.61
Cancelled	8.31	**49.73**	37.52	**90.91**	19.65	**82.03**
Non Algo	87.58	37.81	60.82	7.70	79.44	15.11
Traded	56.11	**25.69**	14.17	3.00	24.95	6.03
Cancelled	21.75	7.24	44.88	3.20	44.05	6.52

Significant increase in cancellations – a well documented phenomeon worldwide. Can have legitimate reasons.

Is high percentage of cancellations indicative of *fleeting orders*? Evidence on orders cancelled in < 1 s

As % of orders entered

	Market cap quartiles			
Placement	**Q1 (Highest)**	Q2	Q3	**Q4 (Lowest)**
Panel A: Spot				
At best price	***2.47***	***5.22***	***7.12***	***5.14***
Upto top 2 or 3	5.46	7.25	6.54	3.82
Upto top 4 or 5	5.59	5.09	3.07	1.56
Beyond top 5	23.31	10.55	5.5	2.08
Total	**36.83**	**28.11**	**22.23**	**12.6**
Panel B: SSF				
At best price	3.66	6.18	4.96	5.7
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Upto top 4 or 5	9.83	10.89	12.09	11.3
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Less than 8% of the fast orders cancellations at the best prices. A majority of the fast order cancellations occur away from the best prices.

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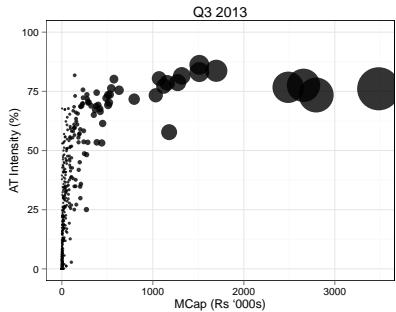
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4. Most of these 'fast' cancellations away from the touch.

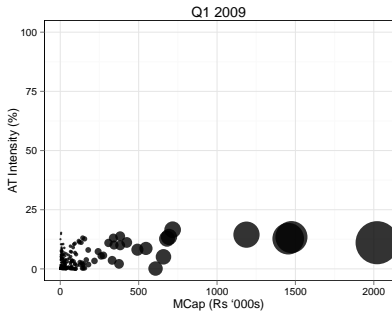5. Large percentage of cancellations, is a feature of limit order markets, and can have legitimate reasons.

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Part I

Impact of AT on market quality

Cross-sectional variation in AT

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- Undertaken extensive research and consultative approach before introducing any regulation.
- Key regulations:
  1. Registration of AT. Emphasis on testing, monitoring and reporting of changes in algorithms.
  2. Pre-trade risk measures such as maximum order size, price, position limits.
  3. Post-trade risk measures such as trade reporting, order throttles.
  4. Strengthening the surveillance system at the level of exchanges as well as regulators.
  5. Real time monitoring of trading activity (MIDAS, ASIC).

- **Pre-trade controls**: Trading limits, position limits and exposure limits for all clients.
- Mandatory requirement at the level of broker to carry **validations of all risk parameters** including (but not limited to) quantity limits, price range checks, order value and credit checks.
- Order to trade ratio restrictions and penalties on orders from algorithmic traders.
- System audit of algorithmic trading system every six months.
- Directed the stock exchanges to strengthen their surveillance mechanism to prevent market manipulation.

- Proposes **seven measures** which primarily focus on reducing the latency advantage of co-located traders.
- **Does not** demonstrate market failure using hard evidence, does not indicate **how benefits outweigh the costs**.
- **Lacks clarity**. Example: With already existing measure such as OTR fee, does not justify the need for maximum message to trade ratio.
- Unless carefully analysed, the proposal measures may result in several unintended consequences.

In summary,

- Technology is here to stay, need to manage its usage rather than reduce it.
- Algorithmic trading is only a more speedy powerful mechanism to manage trading process.
- Humans still are in charge of what goes on exchange platforms.
- No evidence that higher AT adversely affects the markets.
- Good regulation making must be based on **scientific evidence** and **extensive consulting**.
- Given the access to data, it is important to
    - Identify the areas of concerns in the context of the Indian markets.
    - demostrate market failure, review past regulations and study the impact.
    - analyse the costs and benefits of the interventions.
- Consider market solutions such as 'Long life orders', analyse the global experience.
- Blanket interventions extremely costly. Any intervention must be first rolled out on a pilot basis (eg. SEC tick size pilot).

References

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Thank you

Comments / Questions?

http://www.ifrogs.org/