HIGH FREQUENCY TRADING
(IMPACT ON INDIAN STOCK MARKETS)

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ABSTRACT
The growth of High frequency trading (HFT) has shown its impact on financial stability, market quality, information asymmetry and regulatory framework. There are different thoughts over positive impact of HFT (increased market liquidity, market depth and decreasing bid-ask spread) and associated risks with HFT such as technology failure, high message traffic, extreme events. Hence the thoughtful discussion over high frequency trading is of contemporary relevance because of its novelty and the uncertainty related to many of current trading strategies. Algorithmic trading strategies will constantly evolving as both old and new emerging markets became highly digitized. In general, trades in the market are caused by a decision and the execution of the trade has been programmed by traders. In High frequency trading, a decision to trade is based on a huge number of parameters, majority of which are digitized. This paper studied about introduction of High frequency trading, growth and impact of HFT on markets and Role of technology in High frequency trading.

Key words: High frequency trading, Deployed strategies, market liquidity, Technical analysis.

INTRODUCTION
Technology has been playing a crucial role in the growth of securities markets since 1990s. Though it started working in the backend functions of exchanges like clearing and settlement, but it is playing a more conflict-ridden role in the trading process. In the beginning of 1970s, there was a big debate on stirring from open outcry markets to electronic limit order book markets. The latter one was recognized as the focal form of trading in the last decade only. Even now there is a similar kind of controversy over the role of algorithmic trading in exchanges, in which
computer algorithms directly place orders to trade. In 1990s, the Policy makers who supported the use of technology by directing best execution practices, are now finding interventions to limit the high frequency trading in 2010s. Order execution algorithms determine the way in which systematic execution of a portfolio is actually done (Rajan Lakshmi A and V.N. Sailaja 2017). How algorithmic trading (AT) affects the quality of securities markets has been extensively analysed previously. These analyses, however, faced challenges in establishing causal linkages between changes in AT and changes in market quality (Biais and Foucault, 2014). Using a novel dataset and market setting, we set out to address some of these challenges.

High Frequency Trading (HFT) involves the application of complicated, algorithmic-based trades by powerful computers. The objective of HFT is to take advantage of minute discrepancies in prices and trade on them quickly and in huge quantities. These practices will work as long as computer systems are in our lives. Because, computers get more technically advanced, trading practices have increased in size and algorithms have become more sophisticated. The trades are done with very high speed. Remarkably, HFT firms have moved their server farms near an exchange computer to further increase trading speeds.[1]

HFT firms developed a bundle of strategies to take advantage of various market scenarios. Algorithms trade on price movements past a certain threshold, corporate actions, price ceilings, price floors, and discrepancies in bid/ask spreads. The trades are executed without any human action except for initial programming. In most cases, the trades are executed before individual investors know the quotes of prices, or that the trades happened at all.

For instance, a computer recognizes when one exchange quotes an ask price of one cent more than the quote on another exchange. This computer then trades in extraordinarily large volumes on this information, taking advantage of the arbitrage opportunity in a split second. Before individual and other investors who do not possess the same sophisticated technology realize, the one-cent spread between the two exchanges is erased and the stock price trades at the same level.

HFT firms have become more fragmented. In the past, large investment firms who had proprietary trading arms experimented with HFTs as a way to supplement their human traders’ activities. Now there are entire hedge funds devoted to this strategy. Managers pool capital based on a proven computer technology and allow the program work for them. In addition, large trading shops incorporate these HFT strategies as part of their overall practice. Such large volumes of
HFT trades are being executed will result in to more liquidity. By some estimates, HFT makes up 60 to 70% of all trades done in the US on a daily basis.\footnote{Other estimates project that if these strategies keep proliferating at their current rate, 80% of trades will be HFT trades by 2012.} OBJECTIVES:
1. To know about Is HFT beneficial to market quality or not
2. To analyse market data to take decisions and executes them with the help of ‘decision support tool’ on predefined parameters.
3. To identify the opportunities for all types of market trends, such as uptrend, downtrend or even rangebound market.

Need for the study:
1. HFT is useful to increase the number of parallel processes which are to be executed by a trader and also to reduce the time required to react to the market events. It also removes the possibility of human errors and reduces the influence of emotions while taking decisions.
2. It cuts down transaction costs, and allows investment managers to take control of their own trading processes. (Rajan Lakshmi Aand V N Sailaja)
3. Decisions can be taken at a faster pace due to the automation of trading strategies. The speed of execution has moved from milliseconds to microseconds and is expected to move to nanoseconds. Technocrats are rigoursly working on increasing efficiency of the software, network and hardware. Though the execution of the algorithms are not directly impacting decision making, but they play a strategic role in identifying opportunities.
4. Algorithms can calculate and identify arbitrage opportunities across multiple segments, multiple expiries (near vs far) or multiple instruments (futures vs options).

Scope of the Study
- Though HFT methods are applied in all tradable securities like equities, derivatives, commodity and forex, this research focuses only on equity markets. A large number of medium and retail investors trade and speculate in equities.
- The Present study covers only the equities listed on two popular Indian stock exchanges, viz. National Stock Exchange (NSE) and Bombay Stock Exchange (BSE).
HFT started gaining momentum circa 2009 and Indian regulator SEBI has certain guidelines in place. So, this study considers FY2009-10 as the starting year for any historical evidences, and data correlation.

**Research Methodology**

Use the daily and EOD tick data from both BSE and NSE to identify the volumes traded and identify the Most traded stocks of the data from FY2009. This will act as primary source of data.

- Data for this study can be obtained from BSE and NSE websites respectively.
- Identify volumes traded by retail investors, domestic institutional investors, foreign institutional investors
- Use tick data to identify and establish a hypothesis that HFT methods are used. Use statistical methods as needed.

**Literature Review**

**High-Frequency Trading Competition**

Jonathan Brogaard,1 Corey Garriott2 and Anna Pomeranets2 1 Foster School of Business University of Washington brogaard@uw.edu 2 Financial Markets Department Bank of Canada Ottawa, Ontario, Canada K1A0G9cgarriott@bankofcanada.caapomeranets@bankofcanada.ca

The approach in this paper helps to isolate the role of competition from the role of speed and aims to understand the channel by which competition affects markets. Our findings complement papers on HFT market quality. We show that competition among HFT firms, not just speed, plays a role in how they behave in the market and consequently that are partially responsible for the documented relationships between HFT and market quality

*Are high-frequency traders anticipating the order flow? Cross-venue evidence from the UK market*

HFTs may be reacting more quickly to news and other public information. Additional research will be needed to eliminate the possibility that the driver of such patterns is a faster reaction to public information.


This study shown that with a more realistic formulation of the mean-variance tradeoff, and even with no momentum or mean reversion in the price process, substantial improvements are possi-
ble for adaptive strategies that spend trading gains to reduce risk, by accelerating execution when the price moves in the trader's favour.


This study focused on construction a model in which the trader uses information from observations of price evolution during the day to continuously update his estimate of other traders' target sizes and directions.


It is shown that the progress over static trajectories is due to correlation between the trading gains/losses in each period and the market impact costs in the remainder: If the price moves in your favour in the early part of the trading, spend those gains on market impact costs by accelerating the rest of the program. If the price moves against you, reduce future costs by trading more slowly.

**HIGH FREQUENCY TRADING**

Arguments in Favor of HFT

**1. Liquidity**

For markets to function properly and for investors to have confidence putting their money into the stock markets around the world, there must be an adequate amount of liquidity. Investors want to know whether they are able to sell their investment at a later point of time when they invest money in the market. HFT strategies improve market liquidity for the amount and volume of the trades. HFT traders act as improvised market makers who buy and sell when no one will. In fact, the spreads they make off their trades are “likely less than what was taken out of the system previously by traditional market makers.”

**2. Market Efficiency**

HFT contributes to market efficiency. According to the efficient market hypothesis stock prices already have all public and non-public information priced into them. Without the large HFT trades that take advantage of the market’s inefficiencies, there would be larger bid/ask spreads. Consequently, investors may be less satisfied with the prices they get in their trades.
3. Reduced Costs
Increasing liquidity and market efficiency may also contribute to falling trading costs for smaller investors. A major cost to mutual funds results from the bid/ask spread. This cost may be mitigated by the activities of HFT that narrow bid/ask margins. Narrower spreads also reduce costs that arise from large fund transactions which affect the final price of a security. HFT traders are able to break these big trades into a many small trades to reduce the effect of a large buy or sell order.

4. Profitability
One last benefit provided by HFT strategies is their profitability. There is no reliable information on the profitability of HFT firms. Hedge funds do not like to disclose their strategies or profits. Despite the lack of concrete information, HFT profit potential can be inferred from statistical data. The below chart shows the Sharpe ratio potential on a typical HFT strategy as opposed to slower implemented trades.

<table>
<thead>
<tr>
<th>High Frequency Trading Profitability Potential</th>
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<tr>
<td>Trading Frequency</td>
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<tr>
<td>10 Seconds</td>
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<td>1 Minute</td>
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<td>10 Minutes</td>
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<td>1 Hour</td>
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*The Sharpe ratio is also called the Reward-to-Variability Ratio. It measures the excess return per unit of risk.

As shown, the possibility for higher returns exists based on the strategy alone. In fact, the Sharpe ratio is over 200% higher for the 10 second trading frequency than for the 1 minute frequency. The ratio indicates the enormous potential of these strategies and how they can be used to take advantage of market events without significant man-hours spent on research and other due diligence. Computers monitoring and trading in stock markets. The computers can do mil-
lions of transactions in matter of seconds with better connectivity and processing speed, compared to an ordinary human trader. “There is no equity in equity markets. The market puts ‘money-eyed’ people with technology like algo trading in an advantages position, compared to ordinary retail investors,”

**The Mysterious Black-Box**

“High Frequency Algo Trading requires the ability to react to events in the market very fast. It is the biggest contributors of liquidity to the markets,” says RajibRanjan Borah, Co-founder and Director of Quant-Insti, one of India’s major Algo trading training institutes.

Algo traders claim it has immense advantages over the conventional trading. It brings a lot of money to the market. It reduces bid-ask spreads—with faster connectivity you are able to find out where the best price is offered, and trade at that price.

They also claim it improves trade volumes and price efficiency, and reduced market volatility. But many still perceive it as mysterious black-box owing to its complexities.

American financial journalist Michael Lewis in his celebrated book “Flash Boys” accused it of rigging markets. “People no longer are responsible for what happens in the market, because computers make all the decisions,” he says in the book.

**DMA and Co-location**

Algo trading has been there in the US since the 1980s. In India it was allowed only in April 2008 with the introduction of direct market access (DMA) -- allowing of electronic ways of interaction with the stock markets.

It got a boost when ‘co-location’ was allowed in India. Co-location refers to an exchange allowing some traders, usually large traders, to place their computer servers next to that of the servers of the exchange for a price.

This allows speedy communication between the two. It means those traders can trade faster than other traders. It has been criticized by many for putting smaller traders in a disadvantage position. Business Line on August 9 reported that SEBI is considering installing a two-queue system for traders, one for brokers with a co-location advantage and another for those without.

It is also considering a lock-in period for algorithmic trades. “Co-location means those who can pay get the advantage in trading. That is unfair,” says Nagappan.
Regulations
In India, the regulator SEBI allows algorithmic trading in all segments -- equities, derivative and commodities. When asked about the regulatory preparedness, SEBI replied to HT that it has issued broad guidelines on Algo/HFT trading in 2012 and 2013 and has specified regulatory requirements for exchanges offering Co-location facility, in May, 2015. The regulations include minimum order level checks, a consolidated audit trail, and framework for penalizing cases of high order-to-trade ratios.
New algorithms are also tested before they go live. SEBI also said it has constituted a Technical Advisory Committee (TAC) to advise it on addressing technological challenges, including co-location, algorithmic trading, and smart order routing.

Algo trade– India Vs west
The major malpractices of algo traders globally have been spoofing and quote stuffing. They place orders with no intention of executing them, creating an illusion of demand to get favorable prices.

“India has the Security Transaction Tax which is on the value of the trade rather than the number of transactions. In the US, for instance, you have to pay the same amount of tax for a $100 transaction and a $10 million transaction. But it is not so in India,” says Manish Jalan, CEO Samssara Capital Technologies LLP, an algorithmic trading company based in Mumbai.
This prevents too much High Frequency Trades happening in a short time that could potentially lead to flash crashes, he says. “We don’t have too many exchanges.
This also ensures there are no unfair advantages to Algo traders through inter-exchange arbitrage,” he adds. Usually the algo-trading companies in the US make profit by finding out those exchanges where the value of a particular share would be lesser by slightest margin from other exchanges. With the multi- exchange connectivity and speed, they then buy large number of those shares and sell those in slightly higher prices in other exchanges.
The profit is made through increasing the trade volume. “Algo trading is affecting genuine investors,” says Nagappan. “Unlike the computers an ordinary trader would not be able to keep track of the market each minute. And he loses out,” he adds.
“Since conventional traders are finding it difficult to compete with algorithms for the same task there is a lot of hue and cry. Like any other industry, things evolve and the old ways need to
catch up by learning new skills. There is always a lot of resistance to change, but eventually the fittest survives,” says Borah.

“Any trading strategy that could manipulate the markets can be executed manually or algorithmically. It is the trading strategy which aims to manipulate, and not the platform,”

CONCLUSION

Over the last three decades, financial markets have seen tremendous developments in the use of technology. One such development is the application of algorithms to place orders for trade execution on electronic exchanges. While this was considered beneficial to investors to achieve best trade execution initially, today, however, algorithmic trading (AT) is being targeted. The advantage of this paper is a unique data set with clear identification, allowing for a research design to overcome the endogeniety bias. The analysis uses a change in technology when the National Stock Exchange introduced co-location services during this time period, which caused an increase in AT intensity. The design also identifies pairs of securities that are matched by firm characteristics but have different levels of AT activity. The underlying assumption is that if there is a difference in the market quality after colocation, which is different for the security with high AT compared to the security with low AT, the change can be attributed to AT.
REFERENCES


