# Analysis of Indian Market Microstructure in light of algorithmic trading

## Thesis Abstract

Ever since its inception in early last decade, high frequency trading and algorithmic trading has been a prominent fixture in the research field of market microstructure. In spite of this, it is still an open question whether machine trading is beneficial for the overall capital market. There are many points of contestation, but the impact on liquidity and the impact on price discovery arguably are two primary points of debate. While understanding the overall welfare impacts of algorithmic trading is beyond the scope of our dissertation, we study the two above mentioned issues in relation to algorithmic trading in this dissertation. Besides, we also find whether and how algorithmic traders affect and get affected by corporate earnings announcements.

The pre-existing research, which has primarily used developed market data, is plagued by two major issues. First, most of the developed markets are not eager to share exhaustive order level data which identifies algorithmic trading. The implication is that majority of the research has been conducted using proxies for machine trading. The other issue is that most of the developed markets are fragmented. Therefore having data from one exchange is often not enough to document their behaviour as machine traders are expected to have multiple positions across exchanges. We use data from National Stock Exchange of India (NSE) which is not affected by either of these issues. The exchange itself marks each order message on whether it comes from an algorithmic terminal or not enabling us to track the life of each order from both algorithmic and non algorithmic traders. Also, the Indian cash equities market is more or less unfragmented with a two exchange system, and NSE itself has 75% of the volume of the total cash equities segment.

We find that the concern whether HFT elopes the market when market conditions are stressful is not true. We find that proprietary algorithmic traders (PAT), which mainly is comprised of HFT, increase the supply of liquidity when short-term volatility is high. PAT behaves this way probably because they look to earn the elevated spread during stressful periods but this result also in a way shows that fast traders have very less fear of adverse selection, due to their ability to adjust quotes very fast. Agency algorithmic traders (AAT) and non algorithmic traders (NAT), who are not as fast as PAT, decrease their supply of liquidity when short-term volatility is high. PAT behaviour is typical of market makers as they differentiate between the types of volatility when supplying liquidity. If the volatility is transitory then the supply of liquidity is abundant, whereas if the volatility is informational then the supply is restrained. We also find that after the price movement is extreme, the share of depth supplied by PAT increase, whereas, the share of the other trading groups decreases. The allegation that HFT causes abrupt price movements is also not found to be true as orderflow imbalance of HFT is not found to predict short-term returns. Interestingly, orderflow imbalance of AAT is found to predict short-term returns suggesting that AAT posses some stock specific information. Overall, we find that the existence of PAT is crucial for market liquidity and regulatory concerns against them are unwarranted.

Algorithmic traders send many limit orders to the exchange, but only few of them execute, making the order to trade ratio very high. It is not obvious what so many orders do to the trading price, help in the price discovery process or obscure the price. We find that AAT contributes more to the price discovery process than PAT. The result challenges the modern notion of “Speed is information” and suggests that stock specific information is still in the hands of investors who were traditionally considered informed, the institutional investors. AAT primarily executes the orders of institutional traders and thus AAT’s orders are informed. We also find no evidence to support the popular notion that fast traders (PAT) use limit orders to “mislead” market participants about future price movements. We thus find that two types of algorithmic traders perform two most primary functions of a capital market – PAT supplies liquidity and AAT helps in price discovery. Our results put algorithmic traders in positive light and suggest that they do more good than harm in stock markets.

How the presence of algorithmic traders affect a scheduled corporate event is not well documented. We thus revisit the problem of information asymmetry around corporate earnings announcements and find that in spite of the presence of sophisticated machine traders such as HFT, information asymmetry reduces after the announcement of earnings number. Both the liquidity and trading volume is abnormally low days before the announcement and shoots up on days after the announcement. We also find that AAT does not face information asymmetry themselves before the earnings announcement. This is probably the result of effective fundamental analysis done by institutional traders, which gets channelized to AAT through the orders which they execute of these traders. PAT regulate the liquidity supply based on the surprise content of the announced number, increasing the supply when the absolute surprise is large. The result corroborates our earlier findings of PAT and AAT regarding liquidity and price discovery.