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Impact of Algorithmic Trading in the Indian Equity Derivatives Market

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Thesis Abstract

Over the last decade, stock exchanges all over the world have witnessed signi cant growth in algorithmic trading activity. Algorithmic trading refers to the practice of generating and submitting orders through the use of computer systems without any real-time manual intervention. At present, almost half of the trading volume of most of these exchanges is contributed by algorithmic traders. In spite of this phenomenal growth in algorithmic trading activity, the debate regarding the role of algorithmic traders in the nancial markets is yet to be settled. Due to their advantage of speed, it is often speculated that algorithmic traders may be able to manipulate nancial markets to their advantage. Non-sophisticated (retail) participants in the market have multiple times called for sanctions against algorithmic traders; more speci cally against the subset of algorithmic traders engaged in high-frequency trading (HFT). Academic research in this domain has been primarily restricted to developed markets, and that too in the equity markets. In terms of volume of trade, derivatives markets are much larger compared to equity markets. Derivatives markets can broadly be classi ed into equity derivatives and index derivatives. In this dissertation, we attempt to analyze the role played by algorithmic traders in the equity derivatives market.

Academic research on algorithmic trading based on data from developed markets (primarily US) su er from two major de ciencies. The rst problem is related to the identi cation of algorithmic traders. Stock exchanges of developed markets are reluctant to share the data regarding exact identi ers for algorithmic traders citing breaches of privacy. As a result, most researchers have been forced to use proxies for identifying algorithmic trading activity. The second problem is market fragmentation. Most developed markets are fragmented in nature with multiple stock exchanges making up the entire market. As such, inference from the analysis carried out using data from one of these exchanges may not be generalizable for the entire market.

We overcome both these limitations by using a unique dataset from the National Stock Exchange (NSE) of India. The dataset provides exact identi ers for orders generated from algorithmic trading terminals. Unlike developed markets, NSE represents an almost un-

fragmented market with more than 75% of market turnover in the spot market and more than 88% in the derivatives segment [1].

In our first essay, we look at the differential response of algorithmic and non-algorithmic traders to regulatory changes. We inspect the impact of a market-wide upward revision in minimum contract size on trading behavior in the Indian market during 2015. Algorithmic (algo) traders use their advantage of speed to execute a large number of small-sized trades in a very short time. In the presence of a minimum trading unit (MTU) restriction, they are forced to trade at the smallest possible sizes - often restricted by the MTU. We show that MTU restriction acts as a binding constraint for traders while optimizing trade sizes. We also find this restriction is more binding on algorithmic traders, who participate in more than two-thirds of all the trades. We find that post-revision, algo traders continue to trade at the minimum possible sizes, but the difference in trade sizes between algo and non-algo trades reduce due to the revision. We observe a significant negative shock due to the announcement of contract size revision on traded volume. However, the subsequent actual implementation of the contract size revision had no significant impact (on traded volume).

In the second essay, we look at the role of algorithmic traders in regards to information flow between the spot and futures market. We inspect the intraday lead-lag relationship between the spot and futures market for a sample set of 160 stocks in National Stock Exchange (NSE) of India using six months of data during Jan-Jun 2015. Instead of looking at the relationship between the price movements of the two markets, we look at the order imbalance in these two markets to establish the direction of information flow. We show that information in the futures market leads the spot market by one minute. We split the order imbalance due to the different category of traders. We find that algorithmic traders (including HFT) are not informed, and the information flow is primarily established through non-algorithmic traders. The results are consistent even during periods of extreme price movements.

[1] Based on 2015 data.

The evidence from our second essay suggests that algorithmic traders do not have directional information. But are algorithmic traders informed about future volatility? Our third essay tries to answer this question. We construct demand for volatility through the trading volume in stock options and relate this to future realized volatility in the spot market. Using six months (Jan - Jun 2015) of trading data in both stock and stock options market for 160 stocks, we find that non-algorithmic traders and not algorithmic traders are informed about future volatility. Both proprietary and agency algorithmic traders behave similarly in this regard. We also find that the predictability for future realized volatility in the spot market does not last beyond two trading days. We use both scheduled earnings announcements and unscheduled corporate announcements as exogenous information events. The primary results are robust for various measures of realized volatility.