

Does high-frequency trading improve market quality?

Ryuichi Yamamoto^{a*}

*^a Faculty of Political Science and Economics,
Waseda University,
Tokyo 169-8050, Japan*

Extended Abstract

Upon the development of computer technology, major stock exchanges have replaced the human intermediation with an automated order matching platform for stock trading. Recently, the financial markets have further transformed the computer trading system, and thus have facilitated order acceptance notices as well as information distribution of transaction prices and quotes to stock traders. For example, the Tokyo Stock Exchange introduced the Arrowhead in January 4, 2010, which can confirm an order acceptance in 1 millisecond and distribute the updated order book information to the public in 2.5 milliseconds. In response to the introduction of the sophisticated trading platform, market participants attempt to obtain a speed advantage of the milliseconds by investing in computer technologies, and take an extraordinarily quick action on arbitrage chances. As a result, high-frequency (hereafter HF) trading has been pervasive in recent stock trading. HF traders conduct stock trading with its programmed computer system, which quickly implements trading decisions, sending orders to the exchanges and managing them. Brogaard (2011), for example, shows that 77% of all trades were conducted by HF traders in his Nasdaq data for 120 stocks. While improving the trading system, we observed the Flash Crash in e-mini S&P 500 futures market on May 6, 2010, which accompanied with a considerable price drop by almost 10% within 15 minutes before rebounding. Kirilenko, Kyle, Samadi, and Tuzun (2011) claim that HF traders liquidated their positions and exacerbated the downturn, and thus they are a new source of market fragility.

* Corresponding author. Tel.: +81 3 3208 0534; fax: +81 3 3204 8957

Email address: ryuichi@waseda.jp (R. Yamamoto)

The flash crash during a period with the growing and substantial use of HF trading has let researchers, policy makers, and practitioners to hotly debate the impact of HF trading on the market quality. Why does HF trading account for a large fraction of trading volume? Furthermore, does HF trading make stock markets more fragile or robust? Does it foster price discovery and liquidity of the market? How about the impact on welfare in the economy? If the HF trading has negative effects on the economy, what regulations the policy makers should impose on HF trading? This study provides possible answers on these questions not only by proposing an agent-based limit order market with HF and non-HF traders but also by demonstrating under which conditions HF trading benefits and costs the market. For a case that the HF trading negatively contributes to the market, our model suggests that transaction tax and cancellation fee are the possible policy choices for mitigating the negative impact.

In our model, traders place market or limit orders to the limit order book. HF traders have fast trading technologies, and thus can revise the quotes of their limit orders at a faster rate than slower traders, denoted as non-HF traders in our study, after the arrival of fundamental news. The difference in information processing speed generates an information asymmetry between HF and non-HF traders. Thus, HF traders have a reduced opportunity of being picked off. HF traders can pick off the limit order placed by non-HF or slower traders and has a chance to make a profit, and thus non-HF traders increase the picking-off risk. This study evaluates the benefits and costs of HF trading by investigating its impacts on depth, spread, volatility, price efficiency, and overall welfare.

We demonstrate that HF and non-HF traders tend to place more aggressive orders, such as market orders, when a small fraction of HF traders stays in the market. But the frequencies placing the aggressive orders decrease as HF traders become majority in the market. Since the limit orders are more likely to be placed by HF traders as the fraction of HF traders increases, we observe higher tendency for the cancellation of the limit orders. Our results show the reduction of depth, volatility, and price deviations from the fundamental values, but the increase in spread as more HF traders exist in the market. However, the overall profits decrease in an economy with more HF traders in the market. We show that imposing transaction tax or cancellation fee on HF traders work for improving market quality and increase the overall profits, suggesting that the two policies are effective for the stabilization of recent financial markets dominated by HF traders.

References

Brogaard, J., 2011. High Frequency Trading and its Impact on Market Quality. Working paper.

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