

Regulating fast, technology-driven trading may have unintended consequences

April 3 2017

Regulatory changes aimed at encouraging very fast, technology-driven trading on the JSE may have some unintended consequences.

Global markets have undergone several transformations since the repeal of the Glass-Steagall act in 1999. This enabled US-based global investment banks to trade on behalf their own proprietary interests, as well as the interests of their customers.

While the JSE is technically an older, medium sized market by capitalisation in the global network, its electronic trading platform in Johannesburg and fee model are relatively new.

In September 2013 the JSE overhauled its transaction billing system to eliminate the minimum fee of 4.00 ZAR per trade (excl. VAT), allowing fees to comprise a significantly smaller part of single-transaction commissions. At least one anticipated benefit was to make algorithmic buying and selling of large orders feasible by facilitating strategies of smaller, less obvious trades.

In addition to this, the exchange's matching system [computer hardware and software], was brought back from London to South Africa and a new co-location service on the JSE's premises, for investors to house their computerised trading systems, were announced.

"These regulatory changes were aimed at encouraging very fast, technology-driven trading on the JSE," says Prof Diane Wilcox of the

QuERI Lab Research group in the School of Computer Science and Applied Mathematics at the University of the Witwatersrand. "In developed markets, minimal transaction costs per trade make the processing of trillions of orders per day possible. Like any large-scale, safety-critical system, an electronic trading platform is vulnerable to process error and 'viruses'. For markets, the latter can include trading strategies which abuse technological advantage to extract risk-free profit or manipulate prices. If a market enables too many predatory trading algorithms then capital is leaked away from optimal investment and information contained in prices becomes less reliable."

Wilcox and her colleagues, Prof Tim Gebbie and graduate students Mr Michael Harvey and Dr Dieter Hendricks, presented their research on unintended consequences of the regulatory changes at the JSE in a recent paper on deviations in price impact.

For sustainability, market makers need to ensure market quality to attract and protect investment, and hence, the price-formation process. To this end, various measurements can be monitored. In 2003, a team of physicists reported on an investigation in the journal *Nature*, which applied advanced dimensional analysis to large volumes of data from the New York Stock Exchange. They uncovered evidence for a new demand- supply relationship which related price-change to volume of transaction.

"Persistent deviations in price impact and other market quality estimators can be symptomatic of the presence of disruptive arbitrage," say Wilcox. "Thus, tracking such measurements is similar to monitoring the health of a patient or high-performance athlete. Significant changes in expected levels can be used to halt trading under extreme conditions."

"Major market participants, who now rely on mathematical algorithms rather than human traders, have acquired more computing power and

software development to stay competitive, but these costs are still passed on to the consumer ," says Gebbie.

The work of the QuERILab team reports on the occurrence of an anomaly in the price impacts of small transaction volumes for financial stocks. It was found that the price impact corresponding to smaller volume trades was greater than expected, relative to prior estimates for stocks comprising the FINI index. Such deviations can have significant implications for risk management. The research shows how a decrease in direct transaction costs resulted in an unexpected increase in indirect costs through price impact.

"Our investigation is aimed at improving the understanding market microstructure. This refers to the combination of regulation and expected properties of data recorded in a high-precision electronic order book of different types of orders and transactions which match buyers and sellers ," says Wilcox.

"Empirical studies of price formation suggest that regulatory changes, particularly those encouraging varieties of technology-driven races associated with speed of trading and increased volume, may have unintended consequences for costs to end-users, such as pension funds, by introducing novel risks within markets or increasing market fragility.
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Some stakeholders support the view that competition between more local stock exchanges offers insurance against these new risks, while others advocate for more regulation in public interest.

An inevitable part of the "arms race" at stock markets around the world is an increased need for skilled risk measurement and management in financial markets. Where previously traders coped with astute, quick calculations on noisy trading floors, the transformation to electronic

order books brought a shift in the required quantitative skills for understanding price formation.

"The application of high performance computing to analyze large volumes of historical data and respond to new information to make trade decisions within milliseconds [0.001 of a second] or microseconds [0.000001 of a second], has caused a massive disruption in the industry," says Gebbie.

"It is a bit like what Uber has done to parts of global taxi industry, but in the [trading](#) world. Experienced traders, who needed business savvy and some asymmetric access to [market](#) information – perhaps based on social networks and skill accumulated over many years, have been and are being replaced by scientists and engineers, who combine analytic skill and knowledge of the technological developments in markets to optimise allocation of capital," says Gebbie.

More information: M. Harvey et al. Deviations in expected price impact for small transaction volumes under fee restructuring, *Physica A: Statistical Mechanics and its Applications* (2017). [DOI: 10.1016/j.physa.2016.11.042](#)

Provided by Wits University

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