Stock markets becoming increasingly networked due to high-frequency traders

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During the last twenty years, the trading in stock markets has undergone significant changes. Researchers from the University of Turku and the University of Palermo have investigated the role of high-frequency

traders in the markets.

Technological evolution and innovations both in the technology used by stock exchanges and the resources of the traders using their services have made faster trading possible. As a result, high-frequency trading in sub millisecond scale has increased.

However, not everyone has the opportunity to use high-frequency trading, and generally, the scales can be anything from microseconds to tens of thousands of seconds. The role of high-frequency traders has given rise to broad debate over the past years.

"On the one hand, people have argued that the presence of high-frequency traders makes the operation of the markets more efficient and lowers the trading expenses. On the other hand, there have been arguments that this type of trading increases the volatility of the markets, meaning strong fluctuation of prices, and makes them more prone to crashes," says University Research Fellow, Docent Jyrki Piilo from the University of Turku.

The researchers used data from the years 2004–2006, 2010–2011, and 2018. In the first decade of this millennium, the high-frequency trading was still limited while in the second decade it has become much more widely spread due to significant technological development.

"Using statistical analysis of data and the modern methods of network theory, the study allows us to see how the actions of the market members and their reactions to other members' actions has changed over the years," says Dr. Federico Musciotto from the University of Palermo.

A member of the market can trade for their own account or complete commissions for other traders on their request. The study also shows what kind of role the high-frequency traders have in this transformation.

"Based on the data, we have constructed the trading networks of market members, which allows us to detect in which pairs of market members there is a preference to trade with each other and for which pairs there is avoidance to trade with each other. In other words, the results show which type of market members have a preference to react for the order to buy or sell of other type of market member, and which type of market members avoid trading with each other," says Professor Rosario N. Mantegna from the University of Palermo.

The central outcome of the study is that the markets have become significantly more networked as trading has become faster through technological development. The networked character has increased significantly over the years—even though the anonymity in the markets has also increased.

Over the years, there has been a clear increase in the preference for the high-frequency traders to trade with other types of traders. Instead, high-frequency traders avoid mutual trading between themselves, as do other types of traders also. In general, the increasing presence of high-frequency traders has led to the increased networked structure of the market where the strong preferential trading patterns between specific pairs of market members can last up to several months.

Made possible by their technological edge and fast trading compared to others, the high-frequency traders have the ability to perform strategic trading decisions not accessible to other market members or investors, and thereby significantly influence the liquidity of the markets.

The networked structure of the market and the competition among market members are not necessarily the optimal solutions for the best operation of the markets—the results emphasize the importance of the debate and further investigations of how we can ensure the fair and efficient operation of the markets, summarizes Mantegna.

More information: Federico Musciotto et al, High-frequency trading and networked markets, *Proceedings of the National Academy of Sciences* (2021). DOI: 10.1073/pnas.2015573118