

# Microseconds under a Microscope

HFT CONTROVERSY HIGHLIGHTS TENSION BETWEEN INNOVATION AND REGULATION

By Sherree DeCovny

Latency between markets has been an issue since automation was introduced. But in the last decade, massive improvements in technology have driven trade order processing speeds down to microseconds. Meanwhile, governments have introduced competition in the securities markets, which has led to fragmentation. This powerful combination is having a major impact on the financial markets.

High-frequency traders (HFTs) deploy algorithms to exploit latency advantages and improve performance by co-locating their servers in the same data center as the exchange's matching engine. Estimates vary, but nowadays, HFT may represent about half the US equity trading volume and up to about one-third of the volume on some foreign exchange platforms. It has also proliferated in Europe, Canada, Australia, and other regions.

The influence HFT firms now have on the markets is a source of controversy. For

starters, HFT firms supply much of the displayed liquidity, but unlike market makers, they do not have affirmative obligations. Market makers are required to quote a certain percentage of time or in a certain percentage of instruments. They are responsible for ensuring a fair and orderly market, and they are provided sufficient incentives to offset the risks associated with that activity. For years, participants have been calling for HFT firms to be classed as market makers, pointing to the flash crash of 6 May 2010 as evidence of the risk of not doing so.

Moreover, some participants consider HFT firms predators, although free-market competition should solve that problem. Participants who think they are not getting good executions at a particular venue because of the liquidity providers, order types, or ownership structure can take their business elsewhere. If no one likes the way a certain venue is run, it will fail.

## SLOWING IT DOWN

High-frequency predatory strategies take advantage of structural inefficiencies in the market and derive edge from low-latency technologies, such as co-location, explains Ronan Ryan, chief strategy officer at equity trading venue IEX Group.

Owned by buy-side firms, IEX makes it nearly impossible to game the other participants on its platform by putting distance between the front door or gateway and the matching engine.

IEX's matching engine and smart order router is co-located in the CenturyLink Savvis Data Center in Weehawken, New Jersey. Some HFT firms and dark pools as well as BATS Global Markets are also in that building, but no one in that facility can cross-connect to IEX there. Instead, the gateway (or point of presence) is in Equinix's data center in Secaucus, New Jersey (the same facility where some HFT firms and dark pools, as well as Direct Edge, National Stock Exchange, and Chicago Stock Exchange, are co-located).

IEX wanted to keep a buffer between where firms connect to the platform and the matching engine. The propagation delay on the network between those two data centers is 41 microseconds, but IEX added another 309 microseconds by coiling more than 38 miles of fiber in a box.

The market is continuous, and there is no minimum resting time for orders on the book. Marketable orders may be executed immediately. Participants also may post an order or send in an immediate cancel order. Once a trade occurs, the acknowledgement is also delayed by 350 microseconds.

This delay is acceptable to the high-frequency firms that participate on IEX, and it has been effective in deterring predators. Predators try to interpret trade signals and front-run to another venue when they think there is more size to come, but IEX's delay negates the value of that signal.

Ryan believes this design works in the best interest of investors and is aligned with the spirit and intent of Regulation National Market System (Reg NMS), which offers trade-through protection. Under Reg NMS, a trading venue cannot print a trade at an inferior price to one that is offered by any of the lit exchanges.

This is where market data speed comes into the equation. Market data is delivered in two ways. NASDAQ and NYSE each run a consolidated feed known as a Securities Information Processor (SIP), which disseminates the National Best Bid and Offer (NBBO) for their listed stocks. The SIP takes about 2,000 microseconds to disseminate market data. The other way to take in market data is via a direct feed, which can disseminate data in 200 microseconds using a microwave network.

Exchanges have a regulatory obligation to not print trades on their venue at inferior prices. Yet firms co-located right next to them know the real prices 10 times faster than the exchanges do. Ryan calls that "stale quote arbitrage."

IEX takes direct feeds and builds the NBBO based on the data in 270 microseconds. Then, all participants must traverse the coils of fiber with the 350 microsecond delay.

### KEY POINTS

HFT firms are significant liquidity providers, but they are criticized for not having market-maker obligations and for using predatory strategies.

Some trading platforms have introduced latency delays to level the playing field for all participants and deter predators.

Exchanges and regulators are trying to monitor HFT's effect on market quality.

## WATCHFUL EYE

Critics of HFT often blame exchanges for trying to attract these firms and for pandering to their needs. To be fair, most exchanges are for-profit entities, and they have a duty to satisfy their customers and produce shareholder returns. Transaction volumes have slipped since the financial crisis, and even before that, their margins had fallen to the point where they had to diversify into other products and services or die. They are doing what companies in any other industry would do under the circumstances. At the same time, they recognize that there are players in the markets who deploy disruptive strategies, and they take their responsibility to police such activities seriously.

As Kevin McPartland, principal for market structure and technology at Greenwich Associates, says, “You don’t want to dis-incentivize new participants and innovation, but you do want to carefully monitor for any inappropriate behavior.”

## BEFORE REGULATORS DECIDE WHETHER HFT IS GOOD OR BAD FOR THE MARKETS, THEY SHOULD USE THEIR MANDATE TO DEFINE AND BUILD OPERATIONAL MEASURES OF FAIRNESS AND EFFICIENCY AND MONITOR CHANGES IN RESPONSE TO HFT.

Monitoring is no easy feat. Over the past several years, data volumes have grown from about 10 million messages per day in some markets to more than 250 million as more orders are being entered and canceled. As a result, it has been necessary to fine-tune the surveillance algorithms that look for abusive behavior and ensure the display of data in a way that can be analyzed efficiently.

“A decade ago, when you got an alert you would look at the order book at specific points in time and a few seconds either side of that. Nowadays, a few seconds either side of an alert, you’re probably covering about 20,000 events in a single instrument,” says Lorne Chambers, global head of sales and account management for SMARTS Integrity, NASDAQ OMX.

From a technical perspective, the efficiency, scalability, and performance of the surveillance applications have been improved so they can now monitor even the largest exchanges. They can search faster and on a broader scale, and the alerts can be fine-tuned to profile different participants to detect abnormal behavior. For example, say that Trader X always cancels many orders, whereas Trader Y does not. But if Trader Y’s cancel rate increases suddenly, that change in behavior should trigger an investigation.

Before HFT activity can be monitored, it is necessary to identify

which participants are executing these types of strategies. One indicator is a high order-to-trade ratio combined with a flat position at the end of the day. With this information, it is possible to determine the impact of HFT on the market by matching the activity of the traders that have been identified as HFT according to the selected metrics against the surveillance alerts database.

“If you find, for example, that those participants represent 2% of the market but 20% of the alerts, then that might be a cause for closer investigation,” says Chambers. “But if, collectively, they represent 20% or 50% of the trading volume and less than that in the alert count, then perhaps you could argue that HFT isn’t actually bad.”

## MARKET QUALITY

The HFT debate must factor in its effect on overall market quality. Mike Aitken, CEO of the Capital Markets Cooperative Research Center (CMCRC) in Australia, is an expert in this area, and he warns against fear mongering directed toward HFT firms.

“Based on evidence that I have collected, ill-conceived attempts to impede high-frequency trading will have a severe impact on liquidity,” he says. “This, in turn, will raise the cost of trading for investors and the cost of capital for corporates.”

The CMCRC studies fairness, efficiency, and market quality using a “Market Quality Dashboard.” Efficiency is determined by metrics for transaction costs and price discovery. Fairness is determined by estimates of insider trading, market manipulation, and broker–client conflict, such as front running. But the imprecise definition of HFT poses challenges.

“Because brokers don’t tell us when they are trading as principal and agent as part of the trading record, we can’t measure broker–client conflict, so we can’t measure fairness properly,” he says.

Before regulators decide whether HFT is good or bad for the markets, they should use their mandate to define and build operational measures of fairness and efficiency and monitor changes in response to HFT. They can start by tagging orders with client identifiers so they know which orders are coming from HFTs and when brokers are trading as principal and agent. Australia will begin such a program in October 2014. When trades get faster, Australian authorities can investigate to determine the root cause, such as when risk and compliance checks are compromised.

Regulators in Europe, the US, and Canada have a close watch on HFT, and law enforcement agencies are doing their own investigations. So far, none of them have produced proof that these firms should be banned, but HFT obviously will remain a part of a much larger market structure debate.

Sherree DeCovny is a freelance journalist specializing in finance and technology.

### KEEP GOING

“High-Frequency Trading and Its Impact on Markets,” *Financial Analysts Journal* (May/June 2014) [[www.cfapubs.org](http://www.cfapubs.org)]

“In the Dark: The Latest Hype about High-Frequency Trading Overlooks Deeper Problems,” *CFA Institute Magazine* (May/June 2014) [[www.cfapubs.org](http://www.cfapubs.org)]

“High-Frequency Trading: How It’s Changing the Market,” *Enterprising Investor* (2 April 2014) [[blogs.cfainstitute.org/investor](http://blogs.cfainstitute.org/investor)]

“Poll: Does High-Frequency Trading Do More Harm Than Good?” *Enterprising Investor* (10 April 2014) [[blogs.cfainstitute.org/investor](http://blogs.cfainstitute.org/investor)]