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# High-Frequency Trading: Good, Bad Or Just Different?

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Mike O'Hara has interviewed scores of traders, connectivity providers, academics and exchange operators for his web site, the High Frequency Trading Review. He always opens his interviews with the same question: "What is [high-frequency trading](#) (HFT)?"

He never gets the same answer twice.

"The problem is that 'high-frequency' is a relative term," says O'Hara, a former floor trader at the London International Financial Futures Exchange (Liffe). "There are, however, some common threads in all definitions: It's computer-driven; it generates a large number of orders in a short space of time; it's dependent on low-latency, fast access to execution venues; its positions are held for short periods of time; it ends the day flat and it's characterized by a high order-to-trade ratio."

“The classic market maker was given a privileged position in exchange for being obliged to ... show his bid and offer.

— Richard Olsen

Armed with those common threads, scores of researchers, regulators and practitioners have been examining the impact this new breed of algorithmic trader is having on the markets. Papers released in the first few months of this year (many of which are available via O'Hara's site) alternately have credited HFT with making upstart exchange Chi-X a success, accused HFT practitioners of introducing new and dangerous types of volatility into the markets and vindicated HFT for the May 6, 2010 "flash crash" that sent the Dow Jones Industrial Average on a yo-yo ride of more than 900 points in a matter of minutes, and pushed some individual equities to a penny.

By extrapolating from the findings of several papers, you easily can conclude that "good" HFT both delivers liquidity and makes money, while "bad" HFT disrupts markets, extracts liquidity and loses money. If that's the case, disruptive trading strategies will pass away like last year's summer cold. If bad HFT strategies prove more virulent, however, they may require more aggressive treatment.

## What is disruption?

Aite Group analyst Paul Zubulake is an unabashed defender of HFT. He even wrote a book called "The High Frequency Game Changer: How Automated Trading Strategies Have Revolutionized the Markets" (Wiley Trading).

"If you're the kind of trader who sits there looking at charts and clicking when he sees an opportunity, then you will say the market has been disrupted, because the kind of behavior you trade on may have changed," he says. "But if you're a longer-term trader, or a hedger, you'll find that tighter spreads and better liquidity make it easier to unload large positions than it's ever been."

That, he says, is the true measure of the market's success — at least in the case of futures — because futures markets exist to provide a vehicle for hedging and price discovery.

Niki Beattie, who founded and now runs Market Structure Partners, agrees. "In general, HFT is not the great concern that everyone thinks it is," she says. "New technologies always are disruptive and cause worry to those who don't understand

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them, and they challenge the incumbents by being innovative, but they usually lead the way in terms of how the whole industry will change and we should not be afraid of change."

Hirander Misra, chief executive of connectivity provider Algo Technologies Ltd. and former chief operating officer of Chi-X, adds that mechanisms are in place to purge those activities deemed disruptive.

"At Chi-X, we used to monitor and audit trade ratios and if we found a firm doing anything funny, we'd ring them up, and they'd stop," he says. "If we hadn't done that, other algos would have come up with strategies that bait bad behavior and punish it."

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He also dismisses fears that HFT strategies can run amok, like the dinosaurs in "Jurassic Park." "That's not their nature," he says. "These are short-term traders; they're looking to neither cause nor benefit from large moves; they're in and out in a few seconds." He adds, these are simple, well-supervised strategies.

"Behind every algorithm stands a human being who is watching it, recalibrating it," he says. "Most of the people running these strategies have stringent risk controls, because they're playing with their own money. They're very conservative in terms of stop-losses and things like that, which often is lost when politicians speak out."

Still, the European Commission has made HFT a central focus in the current review of its [Markets in Financial Instruments Directive](#) (MiFID), and U.S. Securities and Exchange Commission Chairperson Mary Schapiro is calling for tougher regulation of HFT.

The basic question that regulators are asking is whether HFT enhances liquidity in ways that longer-term algorithmic strategies don't — or whether it disrupts trade? If the answer is "both of the above," they'll be asking whether enhanced liquidity outweighs the disruption.

Former London Stock Exchange boss Dame Clara Furse is heading up what may prove to be the most comprehensive review of HFT's impacts on market structure. Under the U.K. government's Foresight Project that

is run by the Department of Business Innovation and Skills, she'll be working with leading practitioners and academics to come up with science-based recommendations for regulators.

### Major players

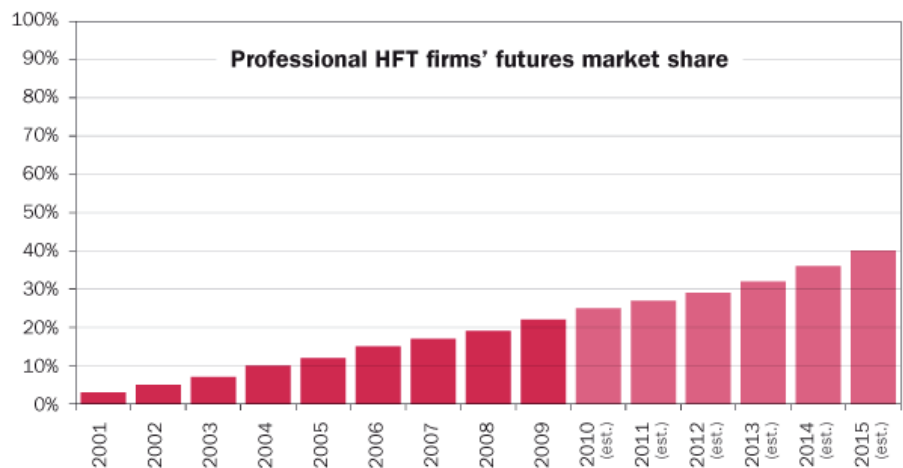
Algorithmic trading pre-dates the advent of electronic exchanges, but it's become more advanced as electronic trade-matching became the norm. With the advent of direct market access (DMA), every major exchange has a large subset of members who inject their trades directly onto a platform, often from facilities just feet away from the exchange's own trade-matching engine. As in the floor days of old, this means that some traders have a front seat, while others are in the rafters.

In January, Tabb Group estimated that HFT accounts for up to 77% of the volume on U.K. equity exchanges, but many participants question that figure.

Misra believes the actual figure is closer to 60% on equity exchanges, and lower on futures exchanges. Those figures are more in line with the ones Zubulake published last year in the Aite report, "High Frequency Trading in the Futures Markets." He concluded that professional HFT firms were on a pace to account for just 25% of futures volume in 2010 — a projection he believes proved fairly accurate at year-end, though is significantly lower than many other estimates (see "Not as big as you think").

## NOT AS BIG AS YOU THINK

While estimates for high-frequency futures market shares of well over 50% have been floated, Aite estimates are much lower.



Source: Aite Group

He points out, however, that not all algorithmic trading is HFT, and that the total amount of volume generated via an application programming interface (API) probably topped 60% last year, which may explain the discrepancy.

### Nothing new

Early algorithms simply used computers to automate pricing models and technical tools, then to break-up and enter trades without showing size. Later algorithms began to mimic the actions of old-time floor traders. Charges of disruption have plagued the algo traders from the start.

Roughly a decade ago a Greek trader made headlines in Germany after developing an algorithm that identified the placement of other traders' stops. He used this information to nudge the market into "false" rallies or breaks, at the end of which he'd flip his position — earning him the nickname "the Flipper." It was a new phenomenon in electronic markets, but floor traders recognized it as the old game of "running the stops."

Today's "quote stuffing" algorithms, which post and then cancel orders in an effort to spark a move, are likewise not much different from strategies once employed by locals — for better or worse.

"It's also exactly the kind of behavior that the market can deal with on its own," Misra says. "If the exchange doesn't stop quote stuffing the way we used to at Chi-X, other algos will do the job for them by anticipating a false quote and hitting it before it can be cancelled. Quote stuffing is actually a simple practice to anticipate, and a dangerous one to carry out."

### The impacts

The bulk of the research into the impact of HFT on markets has been in equities, where HFT gradually has pushed aside old-style market-making — a development that even Zubulake concedes may open the door to practices he'd consider "disruptive."

"If you look at HFT in illiquid equities or equity options, you may find practices that need to be curtailed," he says.

Richard Olsen, co-founder of FX market maker Oanada, says that modern electronic exchanges fail to address the difference between liquidity providers ("market makers") and liquidity takers, especially in equities. Classic market makers were given privileged access in exchange for making bids and offers around a price — a role played by locals in the more liquid futures markets. In equities, market makers had to show their bids and offers.

"If the spread is narrow, then the other market participants know that this is an efficient transaction price," says Olsen. "But if the spread is wide, the other participants know that the market maker has knowledge that they don't."

HFT practitioners are given privileged access, but aren't required to quote two-way prices — something Olsen believes creates an inherent instability in the market. "We can solve this problem by changing the rules for the

limit order book," he says. "Instead of ranking the limit orders on the basis of the best bid or ask, the ranking has to be done on the basis of the best spread."

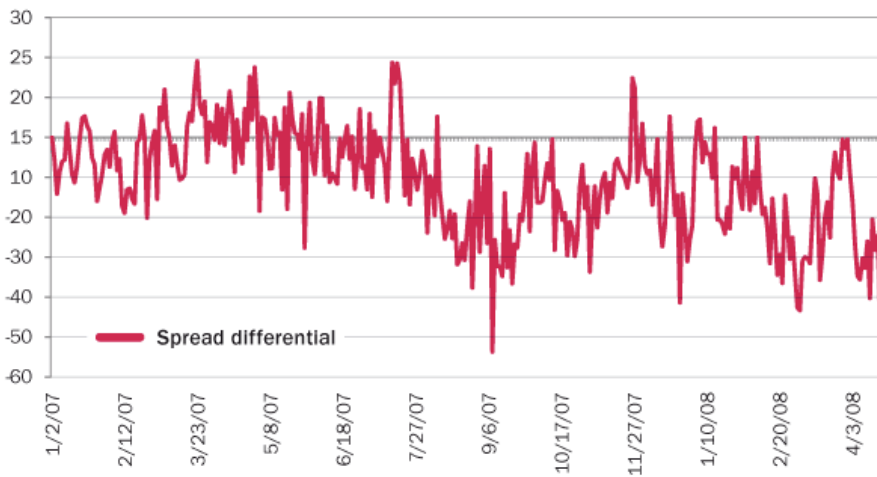
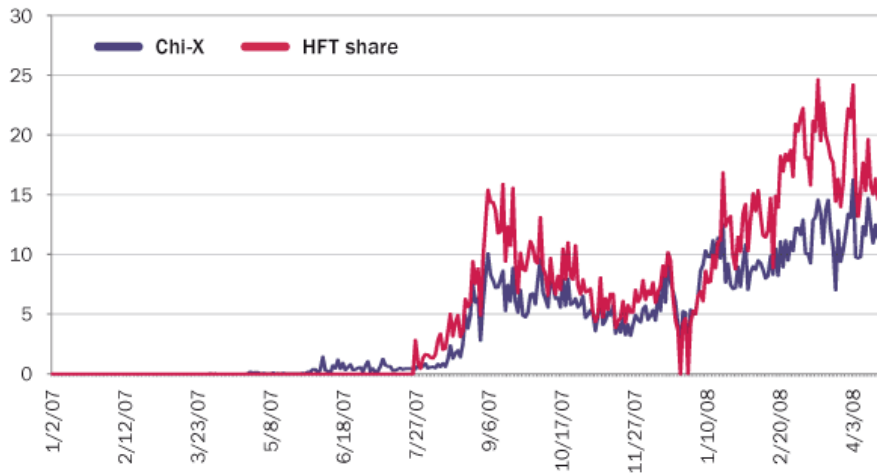
### The studies

Misra's old firm, Chi-X, opened to a flurry of hype in April 2007 but didn't start attracting significant volume until September 2007, when its share of Dutch index stocks more than quintupled — from consistently less than 2% of the market to consistently more than 10%.

That surge coincides with the arrival of "Trader X" — an HFT who showed up simultaneously on Euronext and Chi-X roughly six months after Chi-X's debut (see "Trader X and the Making of Chi-X"). Dutch finance professor Albert Menkveld says that's no coincidence. He crunched numbers from both Chi-X and Euronext over a critical 200-day period spanning Trader X's arrival, and published a paper called "High-Frequency Trading and the New-Market Makers" in March 2011.

## TRADER X AND THE MAKING OF CHI-X

HFT practitioner "Trader X" generated roughly half the volume on Chi-X, contributing to the upstart's success and narrowing spreads overall. The top chart shows both Chi-X's share of Dutch stocks and Trader X's participation. The bottom plots the average bid-ask spread of Dutch stocks relative to the spread of Belgian stocks.



Source: Albert Menkveld

According to Menkveld, Trader X generated 43.7 million of Chi-X's 99.2 million trades from Sept. 4, 2007 to June 17, 2008, and the bid/ask spread on shares he was active in narrowed by more than 20%. That was good for the market on the whole because the rest of the participants found it cheaper to get in and out.

By examining the behavior of bid/offer spreads and then matching that behavior up with Trader X's positions, Menkveld also found evidence that Trader X acted as a market maker quite often -- and that he gave up significant slippage when he traded as a liquidity taker who hit someone else's bid or offer.

Those findings, combined with other studies and models, shine a fascinating light on the role of liquidity makers, liquidity takers and the profitability of HFT, because they show that Trader X made money when he was giving liquidity to the market by placing limit orders, but wasn't doing so well when he was taking liquidity by hitting someone else's bid/offer spread. We don't know whether these differences are greater than the market's pricing prejudices for liquidity "makers" vs. liquidity "takers," but must be taken with a grain of salt as many of these strategies were created to take advantage of those pricing models.

Just a week before Menkveld published his findings, two Americans published "A Dysfunctional Role of High-

Frequency Trading in Electronic Markets," which used modeling to conclude that HFT strategies don't deliver the same benefits as standard arbitrage. While past advances in trading technology may have made markets smoother and more liquid, they say, this iteration could have the opposite effect.

"Contrary to arbitrageurs who make financial markets more efficient by taking advantage of and thereby eliminating mispricings, high-frequency traders can create a mispricing that they unknowingly exploit to the disadvantage of ordinary investors," write authors Robert Jarrow and Philip Protter. "This mispricing is generated by the collective and independent actions of high-frequency traders, coordinated via the observation of a common signal."

Their report is not based on analysis, but on modeling. They created a model that assumed no bid-offer spreads and perfect liquidity, and then unleashed HFT strategies on it. They found that such techniques created market aberrations, which they then capitalized on and corrected, and theorized that scores of small proprietary trading shops inadvertently can exaggerate moves by simultaneously deploying similar algorithms at the same time, in response to the same signals, causing the very moves they benefit from and becoming a virtual "Flipper."

And yet another report, called "The Flash Crash: The Impact of High-Frequency Trading on an Electronic Market," found that HFT strategies had virtually no impact on the May 6 flash crash because they were in and out hundreds of times as the market plunged. Traditional prop shops, however, may have pushed the market down a bit toward the bottom when they were scrambling to liquidate long positions.

But the most telling of all is titled "Empirical Limitations on High-Frequency Trading Profitability," and was published by three scientists at the University of Pennsylvania. They mapped out all the inefficiencies in the \$50 trillion per year U.S. equities markets and concluded that the total amount of money that HFT strategies of 10 seconds or shorter can extract is just \$21 million. The real money, they said, will continue to be found in strategies with a slightly longer time horizon — long, of course, being a relative term.

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