

Press Cutting

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High-frequency trading: a game-changer for markets?

High-frequency trading has changed the way equities, and to a lesser extent, other assets, are traded. This makes many involved in trading nervous, and they have every reason to be.

Basildon, 40 kilometres east of London, is home to the servers of inter-broker dealers, institutional investors and propriety trading firms for whom one-thousandth of a second can mean the difference between making a profit and a loss.

At NYSE Euronext's data centre, firms rent this space to shave off minuscule fractions of a second to access markets data by being, literally, as close to the exchange as possible. To keep it fair, the cable that connects the individual servers to the host server is always the same distance, so that the time information travels between servers is the same for every tenant. The speed at which orders are executed is beyond human comprehension. Here, algorithms are in charge of executing orders at high speed, often within milliseconds or microseconds. Basildon is just one of many homes for such high frequency trading (HFT).

Courting strategy

Offering co-location services is a 'courting' strategy by exchanges and multilateral trading facilities to attract liquidity into their venues. This is important as the implementation of Markets in Financial Instruments Directive (MiFID) in Europe and the Regulation National Market System in the US have led to more competition and fragmentation of the market, according to Michael Horan, director of trading services at BNY Mellon-owned custodian and technological solutions provider Pershing.

This competition leads to liquidity being spread across multiple trading venues – establishing a lucrative market place for which HFT firms create algorithms that can buy on one exchange and sell on another almost simultaneously, and compete to arbitrage between the venues at a faster speed than other participants.

This has created symbiotic relationships between exchanges and HFT firms. The firms benefit from rebates they receive for so-called passive orders used for market-making, usually \$0.002. The exchange then charges the buyer of the stock a fee of usually \$0.003, according to a study into HFT by Finance Watch, a Brussels-based public-interest advocacy group.

Rebates thus encourage order flows from HFT liquidity-makers (the exchange pays only when trades have been executed). The more orders they quote, the narrower the spreads; a positive aspect. But, on the downside, this may also create fake liquidity because most orders are cancelled within fractions of a second, often to prod the market for extra liquidity or mislead market sentiment.

Vested interests

There is a vested interest between exchanges and trading firms that is hard to uninvent. The exact risks of HFT remain a mystery, which can be unsettling. The big issue is that there is no exact definition of what constitutes HFT. An expert in trading and markets who is familiar with the US Securities and Exchange Commission's work around HFT describes it as a strategy rather than a technology. Others focus on the technical superiority or the algorithm's purpose.

As HFT accounts for about 60% of US equity trading and 40% in the EU, comprehending its impact on the trading ecosystem is crucial.

Trading without HFT is already done at speeds of split seconds – speeds that are visible to the human eye, however. That is different when an HFT firm squeezes itself into the orderbook. “[HFT firms] can ‘take an offer’ or ‘hit a bid’ before the market even sees the order appear on the screen as the firm has technology that can ‘pounce’ on orders as soon as they see the message from the exchange,” says Mr Horan.

All that an HFT algorithm has time to do in a few microseconds or milliseconds is to take the price information – a binary signal that says a price has moved up or down – and then trade based on that, says Sean Gourley, a physicist who has worked for Nasa researching robotic search algorithms. “That’s about as complex as they can get to be as fast as they are.”

To be the fastest

Ironically, this makes algorithms ignorant of other variables. “If I am going to be the fastest, I have to consume less information. I reduce the number of strategies I can apply to that information, because more complex strategies take more computational time. So I have a reduction in information and strategies – so too does every other algorithm. As everyone competes to be the fastest, you get a high volume of trades and algorithms that all look very similar,” says Mr Gourley.

“It’s like speciation [the evolutionary process by which new species develop]. If there’s no diversity of species, they can all be wiped out by one virus. If you have diversity, there’s a tolerance in the system. That’s why we get micro-crashes [which happen constantly but too fast for anybody to notice] because algorithms are so similar.”

Algorithms are by no means just simple codes, but there is a trade off between speed and complexity when deploying algorithms. “More complex algorithms may take into account more parameters and events, but will take longer to execute to make a trading decision,” says Alexey Utkin, financial services practice leader at software developer DataArt.

Another issue is that algorithms mutate over time by ‘learning’ from the market. They still behave within certain bounds, but companies do not know their exact behaviour, but rather their limits. Algorithms are not really tested against other algorithms, says Mr Gourley, but against historic data. So when they encounter other algorithms once they are deployed, “they get into these weird feedback loops which they were not designed for”, he says.

Take, for example, the ‘Flash Crash’ in May 2010 when the Dow Jones Industrial Average lost 9.2%, then regained some ground within 20 minutes and finished the trading day down 3.2% (although a looming Greek debt crisis strained markets). And Knight Capital’s ‘Knightmare’ in August 2012, when it lost \$461m as soon as it opened for trade on the NYSE with an upgraded version of its system.

Such examples support the view that HFT adds risk and volatility to the market. Order quotes may get too numerous, algorithms may react to these market movements and in turn start other algorithms. “You end up with a cascade effect that can create volatility,” says Birgit Ortkemper, senior legal advisor at Germany’s federal financial supervisory authority BaFin.

Know your algorithm

To prevent or reduce the risk of such volatility, the market needs to know the kind of algorithm that they are encountering. For instance, a momentum algorithm will look for price movements. If it spots a pattern, it will bet that a price will move up or down again and trade against it. “A more complex algorithm would be the pairs-trading algorithm, which looks for two stocks correlated on price movements. The algorithm does not know, nor does it need to, the reason for the correlation,” says Mr Gourley.

The algorithm may hunt price movements by placing a large number of orders at differing prices and volumes at various venues, but sometimes HFT algorithms try to move markets in their favour. Known as ‘quote stuffing’, this practice can inhibit price discovery, actual trading, liquidity and increase volatility as it

leads other market participants to act on phantom data, says Mr Utkin. Its purpose, he says, can range from “smoke bomb [ie, a deception] to abuse”.

HFT firms rely on the speed of their technology – low latency – to cancel bids as soon as somebody bites, widely considered as a cynical attempt to slow down other algorithms as they take more time to process the high number of bids or offers and figure out which ones are genuine. For instance, an HFT algorithm may send quotes of 10,000 shares each into five different markets. If someone with higher latency technology sends an offer for 50,000 shares, they may only get 10,000, “because by the time you’ve taken the offer at one venue, the HFT [algorithm] will have cancelled all other offers”, says Robert Boardman, managing director for Europe, the Middle East and Africa (EMEA) at broker ITG.

That is a constant frustration for clients, says Mr Boardman. The anonymity of electronic trading makes this type of misleading behaviour possible. “If you did that in the real world, you would lose your credibility,” he says. Due to this anonymity, it is hard to see who someone is trading against. Statistically, it is likely that long-only investors will trade against an HFT firm due to their market share.

Encouraging liquidity?

HFT does have its benefits, however. “HFT firms fill the void investment banks left behind when they shut down their propriety desks after MiFID and the financial crisis,” says Mr Horan. “Without HFT, spreads would be wider, the market would be a much harder place to trade in due to lack of liquidity.” Low latency is a risk management tool, says Andrew Morgan, co-head of equities trading for EMEA at Deutsche Bank. “It’s not an attempt to spoof the market but a function of market-making in a fragmented environment,” he argues.

Yet, many argue that this liquidity is “false liquidity”, as Martin Schulz, president of the European Parliament, told *The Banker* in December 2012. “True liquidity is provided by real investors building their portfolios for a longer period of time and by market-makers who are there to help match selling and buying,” he said.

It is possible to imagine a scenario where a large buy-side institution that needs to trade large orders may put its order into an ‘iceberg’ algorithm that breaks it into smaller blocks to trade throughout the day. An HFT firm on the other side of the orderbook will hunt such intentions, trade against the investor and so “affect the ability of the buy-side firm to achieve best execution”, says Mr Horan.

There are algorithms that can reverse-engineer such iceberg algorithms. If they realise these trades come from one source, they can get ahead of the market. These ‘shark’ algorithms are designed to find icebergs. But it gets more intricate than this. “There are algorithms that hunt sharks which are too optimistic about [finding] iceberg algorithms – then you can trade against these sharks. Or, you ‘ghost’ an algorithm – giving them [fake] signals that your algorithm is an iceberg to lure the sharks into going short and trade against them. You can think of unlimited strategies,” says Mr Gourley.

It is common for an HFT algorithm to buy stocks just before an investor and sell to them at a higher price. If that happened with traditional trading, it would be considered front-running – which is illegal. Indeed, such ‘gaming’ is a violation of the rules of the US Commodity Futures Trading Commission.

“This practice pushes liquidity away into dark pools, something the regulators are not keen on,” says Mr Horan. “With the advent of MiFID, the objective was to keep as much order flow transparent in public, ‘lit’ orderbooks.” HFT may be changing that as traders try to hide from the HFT algorithms. According to data from BATS stock exchange, trading on dark pools and other private venues accounts for about 35% of all US stock trading, compared with 22% at the New York Stock Exchange.

Regulation efforts

The solution to this anonymous war between algorithms could be better governance. But who should be regulated? “You can’t legislate against technology. You can’t stop someone from being good at something because they have superior technology,” argues Mr Horan. That broadly leaves the option of governing certain aspects or banning HFT completely.

“[But] you don’t ban the internet just because there are some dodgy websites on there,” says Bradley Wood, partner at capital markets consultancy GreySpark.

Instead, algorithms could be classified and assigned certain obligations based on their characteristics. For example, are they market-making? If so, they may be obliged to provide liquidity during periods of stress. But Mr Morgan argues that “there’s never been an obligation for any market -maker to be in the market at stress times”.

Most agree that self-serving or manipulative tactics, such as quote stuffing, should be banned, while circuit breakers should be compulsory for all HFTs. These would kick in if an algorithm behaves unusually and the stock price fluctuates by a certain level.

Most exchanges already have such a circuit breaker. At Deutsche Bourse, this is one of many mechanisms to safeguard trading along the whole value chain, including brokers, the exchange and clearing houses. “This makes the safeguards heterogeneous in their structure, further reducing the operational risk in trading and clearing, which contributes to fair and orderly trading on our markets,” says Miroslav Budimir, senior vice - president of cash market development at Deutsche Bourse.

Speed limits

Another solution could be resting times or speed limits, one of the main proposals of MiFID 2. Views are split on this approach. Mr Gourley believes that the time has come to slow down algorithms. “If we don’t limit how fast algorithms can trade, then there will always be a benefit to being the fastest,” he says.

Most oppose curbing speeds or doubt it is the solution, however, including the UK government in its Foresight report into HFT. A 500-millisecond minimum rest as proposed under MiFID 2, for instance, may disadvantage traditional investors because they would not be able to react during the holding period – unlike HFT firms who can create algorithms to ‘fish’ out these resting and upcoming orders, warns BaFin’s Ms Ortkemper.

Yet some speed limits are necessary, argues Mr Gourley, to give the algorithms more time to calculate more complex moves. He proposes 100 milliseconds as the smallest temporal unit of trading. That way, everyone could trade at no faster than 100-millisecond increments.

Given that the HFT community accounts for such a big part of the market, it would be “unwise to impact that liquidity by inhibiting [HFT] activity without having a full appreciation of the implications”, warns Mr Morgan. However, there are others who believe that would be tough on regulators who usually lack the skills of typical algorithmic coders, who often have PhDs in maths or physics.

Germany's example

Perhaps they could learn from the example in Germany. In March, BaFin introduced an HFT law. Although France introduced a financial transaction tax with a specific case for HFT in 2012, there is no comparable HFT law elsewhere, says Randolph Roth, head of market structure at derivatives exchange Eurex.

Everybody who falls under the German HFT definition has to be regulated, except when they are based in another EU country and have an appropriate regulatory status, either MiFID or other local laws, which can be ‘passport’ to Germany. This is dissimilar to the law in France, which, as Credit Suisse concluded in a recent study on HFT, is unlikely to affect HFT firms as most that trade in French equities are based outside of France. Ms Ortkemper says BaFin expects to “include the experience and the conclusion of this experience” into European discussions on HFT regulation.

The German law mandates the flagging of algorithmic orders and this has to be clear enough that trading surveillance offices and exchange supervisory authorities can distinguish if an algorithm generated an individual order.

The German law is not completely new. Four of its seven points (additional rights for the exchange supervisory authority and BaFin, price discovery protection, requirements to set appropriate tick sizes, and

organisational requirements for investment firms) merely formalise more explicit regulations that already exist on a German or European exchange level, says Mr Roth. While it is possible that some HFT firms may retreat if the law is a hurdle and/or their business is marginal in Germany, Mr Budimir and Ms Ortkemper agree that it is unlikely to significantly impact liquidity in the long-term. Besides, regulators worldwide are discussing HFT governance.

Can regulation catch up with HFT? It will have to. The markets have crossed the algorithmic Rubicon and cannot be un-invented, but the race to zero seems to be slowing. Profits are falling. At Getco, a large HFT firm that bought Knight Capital, profits slumped 90% to \$16m in the year to the end of 2012. Is the race coming to equilibrium? "There is no longer a major competitive advantage by squeezing yet another milli- or microsecond out," says Mr Wood.

The focus is shifting to newer strategies; reading the news, for instance. Once algorithms can read the news, it is likely that they will write the news, feeding wrong information on purpose to mislead counter-trade algorithms. It is this type of risk that needs to be governed. Likewise, those that deploy HFT strategies should have a vested interest in a harmonious trading market. After all, if they disrupt the market too much, everyone suffers.

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