Case

Trading shares faster than the wing beat of a hummingbird

Albert Menkveld investigates 'high frequency trading'

‹ List of cases

Floor traders prefer not to use the term 'flash trade', as it has a negative connotation. Outsiders might get the impression the trading takes place so quickly that the traders themselves can no longer keep up with it... Insiders prefer the more neutral term 'high frequency trading'.

But how fast does such a modern share deal 'flash by' between computers? 'Alarmingly fast' is the answer. At least, that is what an ordinary person observing the process thinks. Because he can scarcely comprehend what exactly is happening – only that the time in which a fortune in securities switches owner on the international stock market can be measured in microseconds. In millionths of a second, 'robot investors' gather colossal quantities of shares, which leave their virtual portfolio just as quickly to subsequently appear in the portfolio of another. Profits accumulate and evaporate faster than the wing beat of a hummingbird. Who would not break out into a cold sweat in an era when the financial system is regularly creaking at the seams?

Photo: StudioVU/Riechelle van der Valk

Vidi laureate Albert Menkveld does not share such concerns. He is fascinated by financial econometrics, securities trading, liquidity, and asset pricing. And 'flash trading'. In Europe, London and Amsterdam are the leading centres for this relatively new form of share trading. 'Typically Dutch,' Menkveld laughs; his oration at VU University Amsterdam in 2013, as the first University Research Chair Professor, had the provocative title *Why not replace bankers with robots?* 'As soon as there is money to be earned as an intermediary, we are there in droves.'

Timespan of four seconds

Amazing or not: Menkveld can turn the apparently dry material of statistical and mathematical models into highly engaging stories. He launched his talk at TEDx Eindhoven (Friday 8 July 2016) by informing his audience that from the moment he walked onto the stage until the moment he started talking – a timespan of at most four seconds – many millions of shares had been traded worldwide, via 'trading robots'. Astronomically fast, far faster than the human mind can comprehend, computers measure the difference between the offer price and the asking price of shares. And based on this independently carry out transactions which in turn affect the valuation. *Ad infinitum*.

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>
> **- Albert Menkveld**

However, Menkveld offered his audience a reassuring conclusion. 'Have we created an uncontrollable monster? My research indicates: no, we haven't. And as long as the algorithms that the computers execute are written by humans, then it is clear who is holding the reins.'

A lingering doubt nevertheless remains as soon as Menkveld shows a photo of the 'Stone Age' Amsterdam stock exchange, with shouting traders in colourful clothes and with their inseparable order books, sometimes clutching four telephones at once – a feeling that strengthens when he exchanges that photo for one of the stock exchange of the future: a dead quiet server room packed full of mainframes bathed in a bleak fluorescent light. Is there anyone still in control here? Menkveld is not perturbed by that scenario. 'Ultimately, the advantages of high frequency trading (HFT) outweigh the disadvantages.'

The Amsterdam Stock Exchange, where it all began. Shares in seagoing, as risk spreading.

Eliminating the human factor

Menkveld sifted through more than one hundred scientific articles on HFT. He made a list of all the economic pros and cons. This survey will be published later this year in the *Annual Review of Financial Economics* and describes the economic arguments within the common denominators that he encountered in all of these studies. Seven ways in which speed plays a crucial role in the quality of the trading: 1. the direct influence of differences in speed between traders, 2. predatory trading by the fastest traders, 3. expensive 'arms race' between the fastest traders to be the first to trade in response to public news, 4. speed to connect buyers and sellers in different markets, 5. speed as a cause of price fluctuations that are reminiscent of a stroboscope, 6. differences in speed to make productive negotiation chains possible and 7. speed that simply satisfies the need of end investors.

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And that is quite remarkable, because HFT is not without controversy. Companies that make use of HFT are said to be guilty of unfair competition with respect to traditional share traders and their clients. There is alleged 'front running', professional jargon for trade with prior knowledge based on the placing of orders by investors. Especially when HFT traders communicate with the help of extremely fast microwaves, which are much faster than the already rapid fibre-optic cables. Following the publication of *Flash Boys* (2014) by Michael Lewis, the controversial book on this subject, the FBI launched an investigation into this matter. As the regulator, the Netherlands Authority for the Financial Markets (AFM) has also expressed grave concerns according to a report published last month.

To illustrate the immense international interests: a 244-metre-high former radio mast in the polder in the village of Houtem in the Belgian municipality Veurne was auctioned for five million euros by the Belgian state two years ago. The starting price for the auction of this so-called 'NATO connection tower of Houtem' was 250,000 euros. What made this pile of rusting steel so desirable all of a sudden? Answer: the steel peak lies exactly between the two leading financial centres of Europe: London and Frankfurt. The trading company Jump Trading LLC from Chicago acquired the strategically ideally situated mast and equipped it with 'microwave discs'. As a result of this, it now owns a perfect communication support point between the stock exchanges in these cities, thanks to which it can consistently beat its competitors by several microseconds. We can safely assume that the five million euros investment has long since paid for itself.

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Terabytes of transaction data

Trained at the Tinbergen Institute and at various renowned American centres, Menkveld refers to himself as an old school statistician. He delves into financial data the way Scrooge McDuck dives into his pools of money. With his Vidi grant from 2012 he purchased not only computers with considerable processing speed, but also many terabytes of transaction data from stock exchanges and pension funds from throughout the world. The researcher was able to purchase these datasets with a considerable discount as long as he could reasonably demonstrate that it was for scientific use. Because the datasets are by no means free of charge.

Menkveld works with massive quantities of ASCII text and dazzling numbers of transactions that would drive an average person mad. Not this researcher, however, who takes his time to order the data and discover patterns in it. How much data can the person tackle per day before his sight grows blurry? 'Yep, after a couple of hours you do need to do something else for a bit. However, that is not a bad thing, because after such a session, the computer needs to "process" batches again. Thanks to the Vidi grant, I was able to set up my laptop in such a way that I can have the computers in Amsterdam carry out my calculations even when I am abroad. That would have been impossible with the standard factory settings. I don't get bored. A computer crash does annoy me though. Or a change in the software causing me to spend hours searching to get my command lines right again. Fortunately, that does not happen often.'

Purported bankruptcy

There are obviously risks associated with trade in which computers independently appear to take far-reaching decisions. For example, several years ago a document appeared on the Internet about the imminent bankruptcy of United Airlines. The text was picked up by Google and later by Bloomberg, and the next thing you know the share value of the airline had plunged from twelve dollars to less than four dollars. What had happened? The message about a purported bankruptcy was more than ten years old, but had been given a new lease of life on the Internet where it was subsequently 'read' by a scan robot, which passed on the information to its 'trading robot'. The latter rapidly got rid of its United Airlines shares with disastrous consequences for the trading value. Nevertheless, several hours after the spectacular collapse of the shares, their value had effectively recovered thanks to human logic. Traders looked each other straight in the eye and came to the conclusion that what had now happened with United Airlines could not have been based on reasonable arguments.

All's well that ends well? Based on his scientific study Albert Menkveld concludes this is the case. And that is reassuring. As long as people are at the controls, the robot can carry on doing its work.

› Article The Economics of High-Frequency Trading: Taking Stock

› Vidi-project in the project database: The Social Cost of Illiquidity

› Website of the researcher

› In the sector widely read blog series