High Frequency Trading

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High-frequency-trading (hereafter HFT) is one of the major recent innovations in financial markets. It was estimated in 2010 by consultancy *Tabb Group* to make up 56% per cent of equity trades in the US and 38% in Europe. HFT employs sophisticated computer programs to analyze market data in the search for trading opportunities that may open up for anything from a few fractions of seconds to a few hours. Computers then map this information into trading strategies and orders. The speed of this process is baffling. The "latency" between the arrival of information at the computer and the execution of the order is of the order of milliseconds, far faster than humans can even register the initial information. High frequency traders compete for speed both by having the most powerful computers, connections and programs and by paying premiums for the privilege of locating their computers as close as possible to that of the exchange. As illustrated in Figure 1, they turn over their positions many times a day.

HFT has been the subject of intense public debate and controversy. Some commentators argue that it increases trading volume and liquidity, lowers trading costs and helps price discovery, and is therefore a socially beneficial financial innovation. Others claim it increases volatility and systemic risk and creates a non-level playing field. Some regulators have expressed concern. For example, SEC Chairman Mary Schapiro said in a speech on September 22, 2010, "...high frequency trading firms have a tremendous capacity to affect the stability and integrity of the equity markets. Currently, however, high frequency trading firms are subject to very little in the way of obligations either to protect that stability by promoting reasonable price continuity in tough times, or to refrain from exacerbating price volatility." But other regulators have shown tacit acceptance or support. The goal of this article is to analyze the cost and benefits of HFT, with a view at informing the policy debate.

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One benefit HFT is that it can help ensure that related assets remain consistently priced. Consistent with this point Chaboud, Chiquoine, Hjalmarsson and Vega (2009) find that, in the foreign exchange market, robot traders quickly identify arbitrage opportunities between euro-dollar, dollar-yen, and euro-yen rates, bringing currencies back in line. Another benefit of HFT is to help traders cope with market fragmentation. The recent emergence of multiple trading platforms, in Europe as well as in the US, has led to market fragmentation (illustrated in Figure 1). In this context, quotes and depth are dispersed among market venues, and market participants need to monitor prices and volumes as rapidly as possible, search for the most attractive bids and offers across venues, and split orders to reduce price. The HFT technology is very valuable in this context.

HFT can, however, generate four types of problems in markets.

First, there is a risk that high-frequency traders engage in manipulative strategies. One such strategy, called “stuffing” involves the placement of an unwieldly number of orders generating congestion and impairing market access for slow traders, giving free rein to fast traders to execute profitable trades at the expense of slower traders. Another manipulative strategy, called “smoking", involves the placement of alluring quotes, attracting slow market orders, but rapidly revised onto less generous terms, before the slow orders reach the market. Yet another strategy is nicknamed “spoofing.” When the fast trader wants to buy, he first places a bid, and then large ominous limit sell orders, to scare slow traders into hitting this bid.

Second, HFT can generate adverse selection. Empirical research shows that fast orders are better informed than slow ones. Figure 3, borrowed from Hendershott and Riordan (2009), illustrates this point by plotting the impulse response function (measuring the informational impact of trades) for HFT and human trades. It shows that market orders from HFTs convey more information that human orders. The flip side of the informational edge is the adverse selection cost borne by slow traders. For example, Chaboud, Chiquoine, Hjalmarsson and Vega (2009) find that for human traders limit order executions are (to some extent) bad news, while for computers they are profitable.

Third, high-frequency traders can enjoy market power. Regulators monitoring financial markets observe that a small number of high-frequency traders often generate a very large proportion of the order flow. This is not only due to the large number of fast orders that are quickly cancelled. Since (as explained above) slow traders are more exposed to adverse-selection than fast traders, the latter are in a better competitive position to place limit-orders, and therefore end up often setting the inside quote. Now, acquiring the technology necessary for HFT involves significant fixed costs. While for investors completing a large volume of trading, investing in this technology is profitable, it is not for less active investors. Hence, in equilibrium there is a non-level playing field, where a small number of very actively trading fast players coexists with slower traders, conducting fewer trades.

Fourth, HFT could generate systemic risk. Chaboud et al (2009) find that algorithmic trades tend to be correlated, suggesting that the HFT strategies used in the market are not as diverse as those used by human traders. In this context, shocks hitting the small number of very active algorithmic traders might affect the entire market. And, because high-frequency trading firms are often very lightly capitalized, this could generate failures. Handling the corresponding counterparty risk could be daunting, given that HFT firms turn over their positions many times a day, while clearing systems operate at a much lower frequency. Combined, these elements could generate systemic market disruptions.

To mitigate these problems, it would be prudent to put in place adequate regulations. As written by Kirilenko et al (2010) in their conclusion: "technological innovation is critical for market development. However, as markets change, appropriate safeguards must be implemented to keep pace with trading practices enabled by advances in technology."

The European Commission has included the analysis of HFTs in its review of the "Market In Financial Instruments Directive". It considers the possibility to subject HFT firms to regulatory oversight and capital requirements. This would help prevent systemic risk creation by HFT firms. First, capital buffers would reduce the likelihood that HFT firms would be destabilized by liquidity shocks and would in turn destabilize their counterparties. Second, capital requirements could increase the "skin in the game" of the manager owners of HFT firms, and reduce the moral hazard problem associated with limited liability.

Another way to mitigate the distortions created by HFT, would be to impose a minimum latency, e.g., one tenth of a second. Some oppose minimum latency requirements on the grounds that such limits are a backward and hopeless attempt to avoid technological progress. The same criticism, however, applies to speed limits on the roads. And it is hard to believe that going from a latency of a millisecond to a latency of one tenth of a second would significantly hinder the information aggregation function of the market.

Finally note that while HFT can improve market efficiency, which is beneficial to all, it also generates market power and informational rents for fast traders. The larger these rents, the greater the equilibrium investment in HFT technology. This contrasts with the socially optimal level of investment in HFT, and creates the scope for excessive, rent-motivated, investment in HFT, subject to the Posner (1975) critique: "The existence of an opportunity to obtain monopoly profits will attract resources into efforts to obtain monopolies, and the opportunity costs of those resources are social costs of monopoly too." An appropriate policy response to such excessive investment could be to levy Pigovian taxes on HFT.

Overall, such regulations could be difficult to implement. The main pitfall to avoid would be the regulation of some segments of the market (e.g., exchanges) and not others (e;g., dark pools or internalizers), or of some countries but not others. The challenge will therefore be to implement prudent regulations, while maintaining a level playing field.

References

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Figure 1

Position of the high frequency trader studied by Jovanovic and Menkveld (2010), aggregated across Euronext and ChiX, during one day (January 30, 2008.)

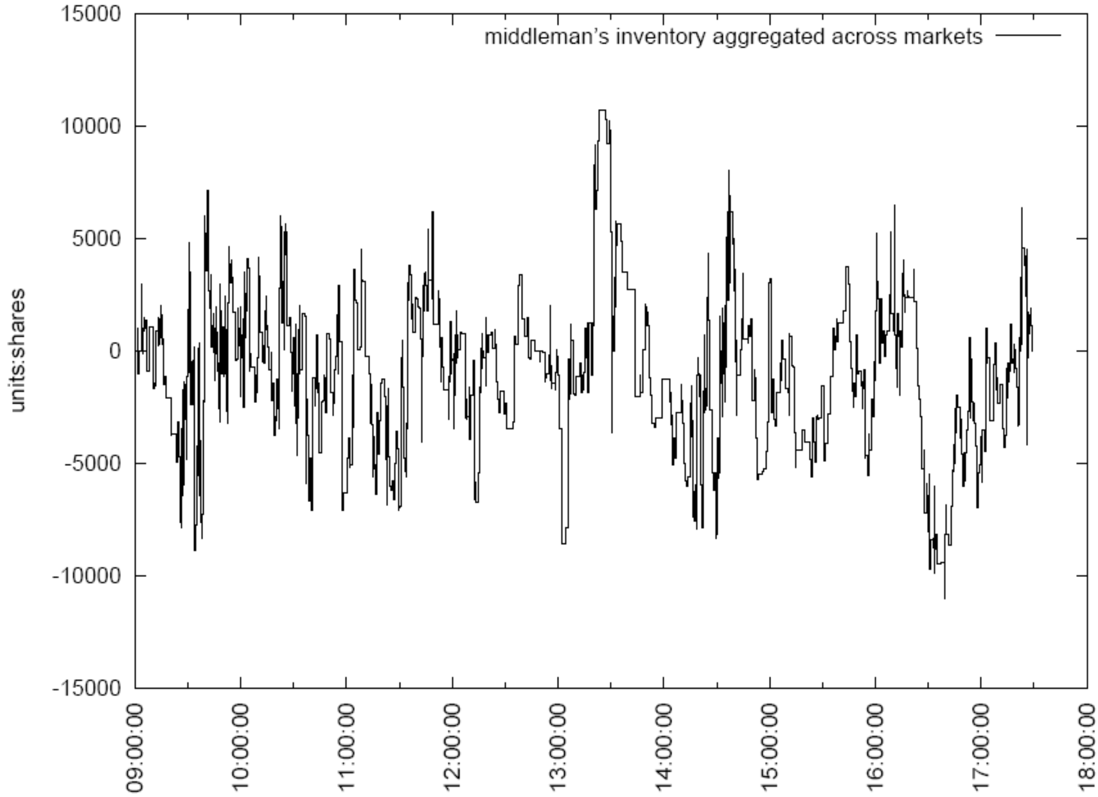

Figure 2

Market share (in Euros) of the major equity trading platforms in Europe in 2010 (FESE data)

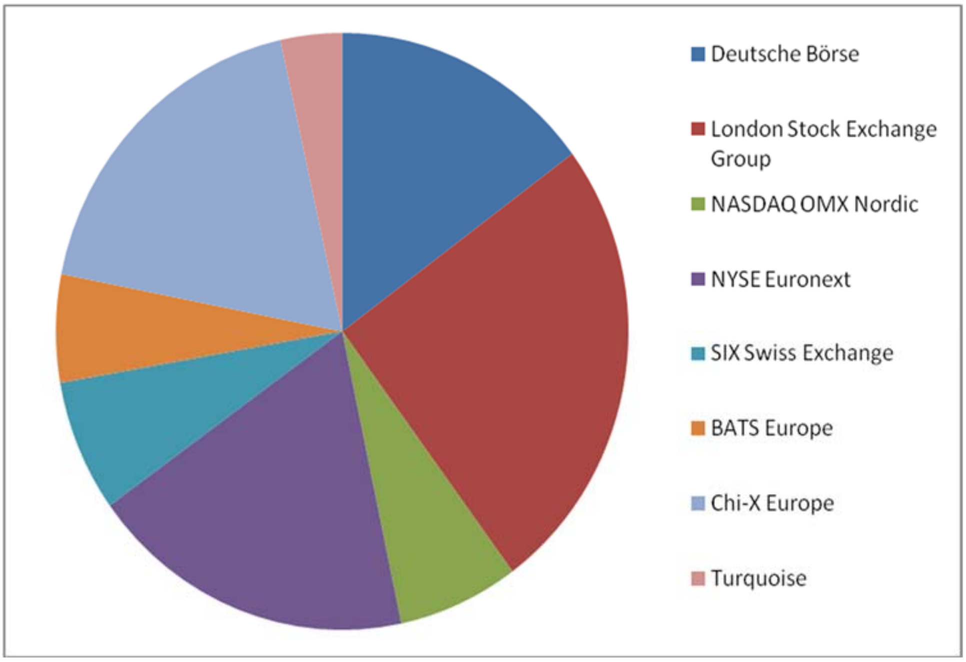

Figure 3:

Cumulative impulse response function (measuring the informational impact of trades) for HFT and human trades. Hendershott and Riordan (2009).