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From Traditional Floor Trading to Electronic High Frequency Trading (HFT) – Market Implications and Regulatory Aspects[1]

ABSTRACT: In this paper, we study how the technology-driven rise in automated high frequency trading (HFT) strategies affects the functioning of today's financial markets. We focus on how HFT affects market quality as well as systemic risk and overall economic welfare. First, we describe the emergence of fully automated electronic markets as a prerequisite for HFT. We note that the generic term of HFT covers the activities of a large variety of high frequency traders who perform fundamentally different HFT strategies. A review of the results of different studies shows that the impact of HFT on liquidity, volatility and the speed of price discovery is mainly positive and that HFT activities in this sense can positively influence market quality. However, these benefits often do not persist in turbulent market conditions when they are needed most. In addition, studies show that negative externalities of HFT (e. g., flash crashes) pose a significant threat to financial stability. Based on these findings, we discuss current regulatory initiatives in Europe. We argue that regulation can only be successful if it targets HFT strategies separately and manages to ban harmful strategies (e. g., front running, quote stuffing) and maintain beneficial ones (e. g., market making).

I. Introduction

Since the creation of exchanges, the ability to achieve information faster than other market participants and the skill to benefit from this informational advantage played a crucial role in the determination of success and failure in trading. The means of both achieving and transferring information and the ways how market participants are able to trade on information changed a lot over the centuries and even more so in the last decades. In this process of change, new technologies for the processing of information are as relevant as the legal and institutional framework. E. g., the classical insider trading, which played a large role for the process of diffusion of new information into the market in a not too recent past, is banned in most countries today and thereby more

1 Paper prepared for the 36th Institute for Bank-Historical Research-Symposium on ‚Effizienz, Konkurrenz und Stabilität im Wertpapierhandel. Historische Erfahrungen und zukünftige Perspektiven' held at the Börse Stuttgart, May 14th 2014.

or less effectively prohibited.[2] Furthermore, the organizational form of trading has changed over time. In most exchanges open order books supplanted to a high degree the classical auction-like forms which were used to aggregate liquidity before.

Yet, the most important changes in the last decades are due to modern information technologies. This comprises both, the ability to transfer information with almost the speed of light through the respective electronic networks, and the ability to process information likewise tremendously fast in modern computer systems. At first sight, electronic data transfer seems to alleviate the role of distance. In former times, traders had to be physically present at the exchange if they did not want to trade on a long-outdated information base. If they were not, it depended on the distance and the respective state of technology how long orders had to travel to reach the market. This time can be reduced to a level below human perception today, and this holds for any distance on the globe if the respective high speed networks are employed. Electronic data transfer links the different exchanges of the world to one global network, and we could get the impression that it does not matter anymore from which place around the globe orders are coming from, as they arrive almost at the same time on the market.

The description of today's trading activities on exchanges in the present paper shows that this notion is wrong. Distance still matters, and maybe even more than in the past. High frequency traders, i. e., computers trading along the lines of predefined algorithms, can use informational asymmetries to their advantage almost immediately and can profit from this activity as long as their orders appear faster on the market than the orders of other market participants. Thus, too late is still too late, even if it is only for a split second. Such algorithmic trading systems search in a systematic way for opportunities to exploit their superior speed, outpacing any other computers that are slower, and leaving little room for the conventional human traders. In this competitive setting, also proximity plays an important role, as fast HFT-systems placed at a close distance to the exchange can extracts rents from their trading activities. It is not obvious if the advantageous speed of HFT-traders relates to a disadvantage for the other market participants, or if they thereby deliver some special benefits, e. g., with regard to market quality. As will be shown below, the evidence on this topic is rather mixed.

Overall, compared to earlier times, actors on financial markets in a digitalized world have access to much more information, and the means to process this information in almost no time. This development is mirrored in the high degree of transparency of the trading activities that many exchanges provide. Most of the trading is done electronically, and the respective news is available to all relevant market participants instantaneously. One could assume that this development greatly reduces the space for any kind of market manipulation. However, we show below that this also not the case. Again, the crucial point is that it is not the absolute but the relative speed in the

2 See Utpal Bhattacharya / Hazem Daouk / Brian Jorgenson / Carl-Heinrich Kehr, When an Event is not an Event. The Curious Case of an Emerging Market, in: Journal of Financial Economics 55 (2000), pp. 69–101, for an interesting, now historical, example.

processing of information that decides about success and failure. Thus, the operators of certain HFT-strategies can expect profits from trading strategies that slow down the information processing of other market participants, even if the absolute difference in the reaction time looks negligible small.

In the next chapter, we describe the emergence of fully automated electronic markets as a prerequisite for HFT. Afterwards, we present some of the characteristics of HFT on today's capital markets. The fourth chapter deals with potential positive and negative effects of the significant amount of HFT we are confronted today. The last chapter concludes with a short discussion of different regulatory instruments to restrict the possible negative properties of HFT with regard to market quality and general welfare.

II. The Development of Electronic Trading on Exchanges

The evolution towards computer based trading, as it prevails today on stock exchanges worldwide, started about forty years ago. During this time span the trading changed from manual floor trading towards a market structure with automated trading.[3] The first step towards an integrated electronic trading system was the introduction of automated trading on the stock exchanges themselves. Computers made it possible to mechanize some of the trading steps, with the respective positive effects on cost and speed. In the beginning computers were only used to support the human traders, but over time the number of automated tasks increased, and it became an indispensable part of the exchanges' architecture.

An important starting point for this development was the creation of an electronic quoting system in the USA in 1971. Founded by the National Association of Security Dealers (NASD) and respectively called National Association of Securities Dealers Automated Quotations (NASDAQ), this system was a co-operative effort of the financial industry to support its telephone-based over-the-counter (OTC) trading activities. In this sense, in the beginning NASDAQ was no exchange and not even related to exchanges in the traditional sense. However, this combination of a quoting system and OTC-trading proved to be not very resilient in a crisis like, e. g., the stock market crash in 1987, as there was neither the need to quote nor the obligation to trade at quoted prices. To overcome these shortcomings, fully automated trading was implemented through the creation of a computer-based order matching system. As a consequence, the NASDAQ became the first purely electronic market, and very successful as such.[4]

The traditional exchanges had to react to this competitive challenge and the under-

3 See, e. g., Securities and Exchange Commission (SEC), Concept Release on Equity Market Structure, Release No. 34-61358, File No. S7-02-10 (2010).

4 See Anatoly B. Schmidt, Financial Markets and Trading. An Introduction to Market Microstructure and Trading Strategies. New York, NY 2011, p. 16 f.

lying technological development.[5] Stepwise, they had to switch to the new concepts. Deutsche Börse in Frankfurt (Main) started with the introduction of the IBIS-system in the late 1980's, which still had a rather limited scope and functionality. Fully automated exchanges were created in Europe during the 1990's.[6] The largest step in Germany was the implementation of the XETRA as a comprehensive electronic trading system in 1997, which today dominates trading in German stocks. As Jain shows in an international overview, this switch to electronic exchanges had immediate and mainly positive effects on the efficiency of stock markets.[7]

This development was not appreciated by everybody, as it fundamentally changed the concept of exchanges, the whole order process, and trading itself. For market participants this modification means that the price for a trade is no longer determined by traders manually on the floor but automatically by the automated trading system using electronic limit order books. The results are an increase in speed, more trading capacity, and highly sophisticated trading functions.[8] Market effectiveness in terms of liquidity increased, and information asymmetries were reduced due to more publically available information, lower trading costs and more transparent trading data.[9] Furthermore, the technological evolution simplified the market access for investors via internet or other electronic networks. It seemed as if this led to a decentralization of the market, making the traditional role of brokers and traders on the exchange by and by superfluous.

The following figure (Figure 1) visualizes some of the fundamental changes in trading that the New York Stock Exchange NYSE underwent after its rather late switch to electronic trading. Trading volume soared from 2005 to 2009 while execution time was greatly reduced. The average trade size declined due to reduced transaction costs, and the NYSE lost a great part of its market share to other electronic trading platforms that were seemingly more efficient in attracting trading activities. The observations are in line with the expected changes on stock exchanges after the introduction of electronic trading.

One reason for the described structural developments on exchanges, such as the NASDAQ, is the rise of new computer-based trading strategies in this new, electronic environment. These strategies use trading algorithms, which are mathematical trading rules, applied and executed by computer programs. Therefore this form of trading is often called algorithmic trading (AT). Thus, the human as decision maker is removed from the direct decision-making process of security transactions and substituted by computer software.

5 On the development in Germany see, e.g Norman Schenk, Informationstechnologie und Börsensysteme. Wiesbaden 1997, pp. 153 ff.

6 See Peter Gomber / Björn Arndt / Marco Lutat / Tim Uhle, High Frequency Trading (Working Paper, Goethe-Universität Frankfurt). Frankfurt am Main 2011.

7 See Pankaj Jain, Financial Market Design and the Equity Premium. Electronic vs. Floor Trading, in: Journal of Finance 60 (2005), pp. 2955–2985.

8 See SEC, Concept Release (cf. note 3).

9 See Jain, Financial Market Design (cf. note 7).

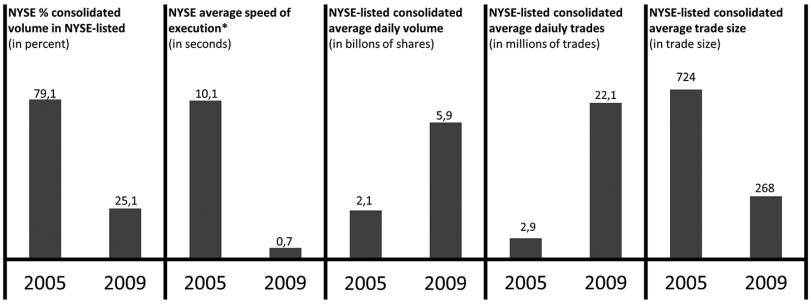

Figure 1: Development at the NYSE since the Introduction of Automated Trading
Note: * for small, immediately executable orders
Source: Own representation based on SEC, Concept Release (cf. note 3).

Such algorithms are also be used to determine buy- or sell-decisions with an intended long holding period. But the crucial point of algorithmic trading from the point of view of HFT is the connection of two properties: The promptness of computerized data processing combined with the tremendous increase in execution time to create trading strategies with an extremely short time-horizon. Hence HFT is a subset of algorithmic trading. In HFT-strategies, the time until an order is revoked often extents only to milliseconds (10^{-3} s) and can be reduced to even nanoseconds (10^{-9} s) in some cases. The holding periods can be respectively short if an actual trade occurred. In some market environments, HFT-algorithms generate thousands of orders within a second, provoking thousands of different quotes for a financial title within a very short period of time.[10] Seemingly, speed has become the most important factor in security trading. As a consequence, for the majority of high frequency traders the fundamental value of a financial title is of no importance, as there is no intention to hold this title for a time period that exceeds, at most, a few seconds.

However, speed is also perceived as the greatest threat to the stability of financial markets due to the increased activities of HFT. Another threat are erroneous algorithms or even the unintentionally synchronized behavior of similar algorithms which might lead to strong market reactions without a fundamental cause. Thus, HFT is associated whith a number of market failures, e. g., so-called flash crashs, that get corrected within seconds, and also for the destructive dynamism of market crashes with a more permanent reduction in market values. To know more about the effect of HFT on the financial markets it is important to take a closer look at the developpment of HFT over the years, the underlying trading strategies and the regulation coping with the surveillance of these strategies.

10 E. g., on June 7th, 2013, more than 100,000 quotes per second were observable for the shares of Amazon.

III. Characteristics of Today's HFT

A closer look at HFT reveals that there is not only one form of HFT, but there are rather various HFT strategies. Some strategies seem to be beneficial to financial markets while others are more harmful. Due to the increasing relvance of HFT for the financial markets, the European Markets in Financial Instruments Directive contains a definition of algorithmic trading. Thus, it is „[t]*rading in financial instruments where a computer algorithm automatically determines individual parameters of orders such as whether to initiate the order, the timing, price or quantity of the order or how to manage the order after its submission, with limited or no human intervention*".[11]

In this framework, HFT forms a subset of AT and is marked by some typical features. It is usally done as proprietary trading, with a large number of quotes, orders of usally rather small size, a rapid cancellation of orders, and very short holding periods. Consequently, HFT-strategies contain no overnight positions. To guarantee fast executions and the respective informational advantage, the operators of HFT reduce all types of latencies and pay high fees to use so-called colocation and proximity services. I.e., they are allowed to host their computers as close as possible to the central processing unit of the respective exchange or trading platform and thereby gain a slight but decisive head start. Furthermore, they focus on liquid securities that allow them to hide their trading activities in a respectively noisy market.[12]

High frequency trading became feasible with the introduction of fully automated trading facilities in the 1990's. However, data on the early years of this development is not available, as the respective institutions for obvious reasons preferred to act in obscurity. It must have been years of tremendous growth, as the market share of HFT became substantial, and today it can no longer overlooked. According to the TABB Group, its market share in 2012 was 39 percent in Europe and a solid 51 percent in the US. Thus, more than every second trading activity in the US is done by a high frequency trader, and its relative importance can greatly increase for some financial titles in some market conditions that might trigger a wave of HFT-activities. On the other hand, the level of HFT seems to have plateaued in the most developed markets, wheras growth is now concentrated in markets that did not experience much HFT in the past.

The following chart (Figure 2) presents the market share of high frequency trading on different European exchanges and trading plattforms in 2013. It is observable that HFT is more intense on less regulated trading plattforms than on ordinary regulated exchanges. Some smaller exchanges. like the Börse Stuttgart, created trading rules that are detrimental to HFT and thereby reduced or even banned HFT, as it did not fit

11 Article 4(1)(39) MiFID II Directive (European Parliament and Council, Directive 2014/65/EU of the European Parliament and of the Council on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU (MiFID II, 2014)).

12 See Arne Breuer, An Empirical Analysis of Order Dynamics in a High Frequency Trading Environment. Sternenfels 2012.

into their business model. Other exchanges and in particular trading plattforms gave rebates for HFT-activities to attract more volume.

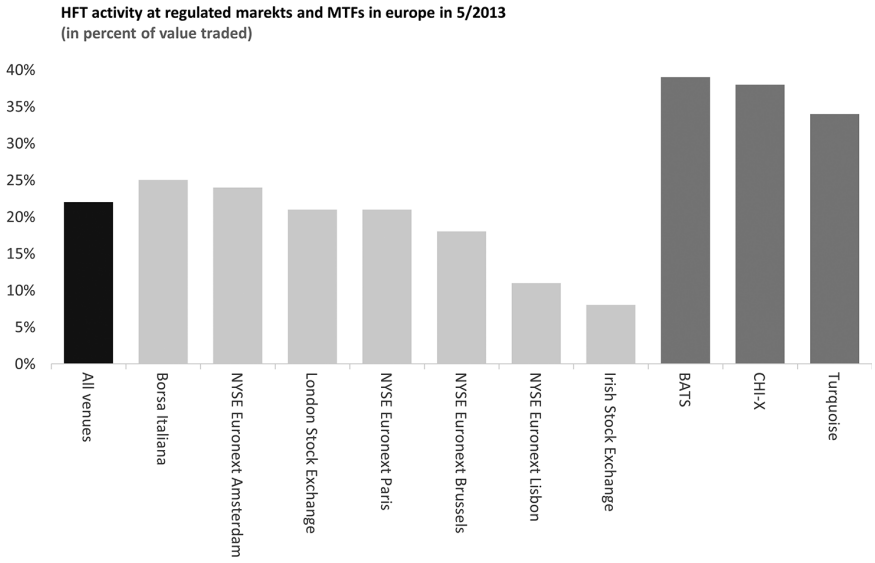

Figure 2: HFT Activity

Source: Own representation based on European Securities and Markets Authority (ESMA), ESMA Report on Trends, Risks and Vulnerabilities, No. 1, 2014.

In one respect, high frequency trading is rather similar to another disputed capital market institutions, the hedge fund. There are manifold arrangement opportunities. Also, under the umbrella of HFT, we can find a great variety of different trading strategies. The following figure provides an overview. There are three overarching strategies. In market making strategies the algorithmic trader places his orders with a price within the bid-ask spread. This strategies are considered to be beneficial for financial markets, as they are supposed to provide additional liquidity. The aim of liquidity detection strategies is to find hidden positions and orders in order books to achieve an superior knowledge of the order book depth than other traders. These strategies can harm financial markets. The adverse selection strategies try to exploit inefficencies on the market, e. g., imbalances in security prices. Moreover, there are further strategies, such as quote stuffing, which is disscussed further as part of the negative extarnalities in chapter 4.2 of this paper.[13] For a truly comprehensive view on HFT, these strategies had to be assessed seperately, as they might contain rather different implications for the markets and general welfare.

13 See Gomber / Arndt / Lutat / Uhle, High Frequency Trading (cf. note 6).

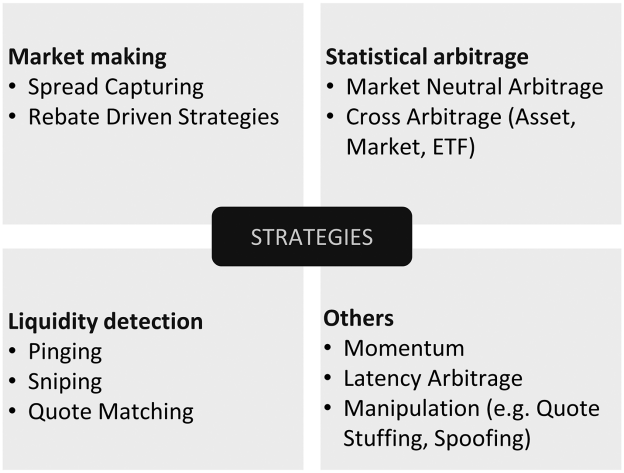

Figure 3: Overview on Common HFT Strategies
Source: Own representation based on Gomber / Arndt / Lutat / Uhle, High Frequency Trading (cf. note 6).

IV. Market Implications and welfare effects of HFT

1. Market Implications – Market Quality

Market quality is a multi-dimensional concept that variegates somewhat in different scientific studies. In the following, we aggregate the different potential dimensions on three, i. e., liquidity, volatility and price discovery. A high level of liquidity is seemingly positive, as it allows market participants to enter and leave the market without strong adverse price effects that would reduce their investment profits. High volatility makes investing riskier and is therefore seen as a negative prerequisite of a market, at least as long as volatility is not driven by fundamental changes in the value of financial titles. Price discovery finally deals with the question if the market price truly represents the available information about the fundamental value of the respective financial title. The influence of HFT on these three dimensions of market quality is intensely discussed in the literature. However, there is no unanimous view on how HFT affects them. One of the reasons might be, that scientific research on the impact of HFT on this topic started rather late, as HFT apparently managed to stay more or less invisible to the research community for more than a decade. Nonetheless, today we can refer to some work mainly done in the last five years that provide some valuable insights.

However, empirical studies on the effects of high frequency trading must be seen with caution, as data is not abundant and comprehensive. Some exchanges temporarily provided incentives for traders to flag high frequency trading and made some data sets based on this information available to researchers. Other researchers created

proxies to estimate the intensity of HFT.[14] In any case, high frequency trading is not directly observable for research purposes, and data sets might be rather noisy or even biased in this respect. On the other hand, the result of theoretical papers greatly depends on the specification of the respective model. Thus, the three theoretical studies we scrutinized provide rather opposed insights. Furthermore, not all the dimensions of market quality are implied in the respective setting.

Figure 4 below provides an overview of some of the results. All studies, except one (Kirilenko et al.),[15] perceive positive effects on liquidity.[16] The presumption is that if high frequency traders are active in markets, they create additional orders. These additional orders reduce the price impact of potential new orders and reduce spreads. Applying particular HFT-strategies, the computer slightly undercuts existing orders and thereby mechanically diminishes the spread. It is, due to the extremely short duration of many HFT-orders, not evident that third parties will be able to trade on this perceived additional liquidity. Yet, we can conclude that under normal market conditions the conventional measures of liquidity are positively influenced by HFT activities.

With regard to volatility the results are more divers, both in the theoretical and in the empirical studies. However, the conventional empirical studies do likewise observe a positive effect, except Brogaard et al.,[17] where the result remains insignificant. Finally, with regard to price discovery the empirical studies, except, again, Kirilenko et al.,[18] achieve positive results from HFT. Thus, new information gets incorporated faster into the market price if the level of high frequency trading is high. This is no surprise, as computers scrutinize the market for any signal that might hint at a potential change in the valuation of a financial title, and might even front-run the respective value strategies to exploit this information. In this sense, we can expect that price discovery is enhanced. Whereby, this is a limited concept of price discovery. It does not take the incentives to detect costly information into account that otherwise would remain hidden to the market. It only deals with information that is already available somewhere.

The work of Kirilenko et al.[19] differs from the other empirical studies, as they deal with HFT trading in a special market situation, i. e., the flash crash on May 6th, 2010. In this special situation the DOW lost about 9 percent in a few minutes that were mainly recovered shortly afterwards. According to their insight, this flash crash was not triggered by HFT. However, they argue that high frequency traders own no sufficient inventory and will therefore abstain from trading whenever they must fear that a greater

14 E. g., Breuer, Empirical Analysis (cf. note 12)

15 Andrei Kirilenko / Albert S. Kyle / Mehrdad Samadi / Tugkan Tuzun, The Flash Crash. The Impact of High Frequency Trading on an Electronic Market (Working Paper). [s. l.] 2014.

16 See also Terrence Hendershott / Charles M. Jones / Albert J. Menkveld, Does Algorithmic Trading Increase Liquidity?, in: Journal of Finance 66 (2011), pp. 1–33, on HFT and liquidity.

17 Jonathan Brogaard / Terrence Hendershott / Ryan Riordan, High-frequency trading and price discovery, in: Review of Financial Studies 27 (2014), pp. 2267–2306.

18 Kirilenko / Kyle / Samadi / Tuzun, Flash Crash (cf. note 15).

19 Ibid.

proportion of their orders might get executed. To prevent this unwanted result in case of, e. g., an imminent crash, the HFT-orders get an extremely short latency or simply vanish from the market. Consequently, the crash becomes more severe, and fragility of markets is increased. The contribution of HFT to market quality vanishes exactly when it is needed most, and the respective liquidity reveals itself as fake, so-called shadow liquidity.

Authors	Sample period	Market	Method	Liquidity	Volatility	Price discovery
Brogaard et al. (2014)	08 – 10/ 2012	NASDAQ OMX Stockholm	Empirical	↑	→	↑
Martinez, Rosu (2013)	-	-	Theoretical	↑	↓	↑
Hasbrouck, Saar (2013)	10/ 2007 & 06/ 2008	NASDAQ	Empirical	↑	↑	↑
Brogaard et al. (2012)	End of year 2009	NASDAQ, BATS	Empirical	↑	-	↑
Bias et al. (2011)	-	-	Theoretical	-	-	↓
Kirilenko et al. (2011)	06/ 2010 (Flash Crash)	E mini S&P 500	Empirical	↓	↓	↓
Civitanic, Krilenko (2010)	-	-	Theoretical	↑	↑	↑
Brogaard (2010)	2008,2009 & 02/ 2010	NASDAQ	Empirical	↑	↑	↑
↑	Overall, the literature tends to find that HFT improves market quality!					

Figure 4: Overview on Different HFT Studies
Source: Bruno Biais / Thierry Foucault / Sophie Moinas, Equilibrium High Frequency Trading (Working Paper). [s . l.] 2011; Jonathan Brogaard, High Frequency Trading and its Impact on Market Quality. Diss. Kellogg School of Management, Northwestern University, Evanston, IL 2010; Jonathan Brogaard / Björn Hagströmer / Lars Nordén / Ryan Riordan, Trading Fast and Slow: Colocation and Liquidity in: Review of Financial Studies 28 (2015). pp. 3407–3443; Jonathan Brogaard / Terrence Hendershott / Ryan Riordan, High Frequency Trading and Price DiScovery (ECB Working Paper SerieS no 1602). Frankfurt am Main 2013; Jaksa Cvitanic / Andrei A. Kirilenko, High Frequency Traders and Asset Price (Working Paper). [s. l.] 2010.; Joel Hasbrouck / Gideon Saar, Low-latency Trading, in: Journal of Financial Markets 16 (2013), pp. 646–679; Kirilenko / Kyle / Samadi / Tuzun, Flash Crash (cf. note 15); Victor Martinez / Ioanid Rosu, High Frequency Traders. News and Volatility (Working Paper). [s. l.] 2012; own representation.

2. Market Implications – Negative Externalities

Thus, high frequency trading might create several negative externalities. Some of these are linked to special HFT-strategies, whereas others have a more general relevance. The special ‚need for speed' comprised in all HFT-strategies might harm other invest-

ment strategies based on fundamentals. Such investors experience only reduced incentives to generate new information, as most of the profits from the ensuing change of the market price are abstracted by the HFT-traders. They might try to defend their information rent through themselves using electronic trading systems to implement their information-based strategy with a minimum market impact. However, both such systems and the required high-speed access to the exchanges are costly, and most market participants have to do without. Consequently, these market participants will invest less into new information, and some might even exit the market.

In this sense, the tremendous speed of price discovery comes at a cost, because the new price might contain less information than a hypothetical price in markets without HFT. This disadvantage of high frequency trading might be reduced in the future due to new technological developments. The progress in textual analysis will permit computers to trade on some kind of fundamentals, in particular if the respective information is available on the internet and therefore can be processed electronically.[20] The respective systems are developing fast, although the ambiguity of language poses a severe hurdle to such concepts. The well-known problems of computers to understand human concepts like humor and sarcasm might make trading on such a basis still very fault-prone today.

The large amount of trading activities of HFT creates a lot of data that has to be processed by exchanges, and also by the other market participants. Although all participants regularly upgrade their processing resources, the sheer size of this data creates a severe operational risk. The capacity might be more than sufficient most of the time. However, if the amount of orders from HFT explodes, as might happen if, e. g., different algorithms get entangled in a fight, the processing might slow down, and in some cases the system totally break down due to the unexpected overload. Thus, the price quality is reduced significantly, and the processing of orders and information can be even blocked. Markets are no longer arbitrage free, and some parties experience unsystematic losses and profits from trades on these price differentials.

Some HFT-strategies intend to systematically exploit this weakness. For the operators of these systems, placing orders can be compared with sending spam e-mails. It is almost free of charge for the sender but creates high costs on the side of the recipients. So called quote stuffing strategies therefore create a large amount of orders. Most of these orders were never meant to be executed and are withdrawn immediately. Nonetheless, trading venues and the other market participants process these orders and take the respective effects on the order book into regard. The HFT-traders can distinguish between the spam they create and true trading activities. Thus, they have to process less data and therefore react faster than other market participants. The transaction that generates the profit is hidden in plethora of noise, and it usually profits from an arbitrage window created with this noise.

The figure below shows the effect of such strategies on the order book of the share

20 See Hans-Peter Burghof / Sebastian Schroff / Ulli Spankowski, Applied Web-based Sentiment Analysis in Financial Markets, in: Banking and Information Technology 13 (2012), pp. 26–34.

of Michal Kors Inc. on February 14th, 2012. It shows about 40 seconds on this day divided into 50 millisecond intervals. Several high frequency traders bombarded the market with millions of orders, creating thousands of changes of the best offer price over several minutes. Seemingly, they entered into a so-called speed-war, testing who could in the best way exploit the limited data-processing capacity of the trading venue and the other market participants. The highest level of activity was reached with more than 18,000 quotes per second, which is far more than anything experienced in normal times.

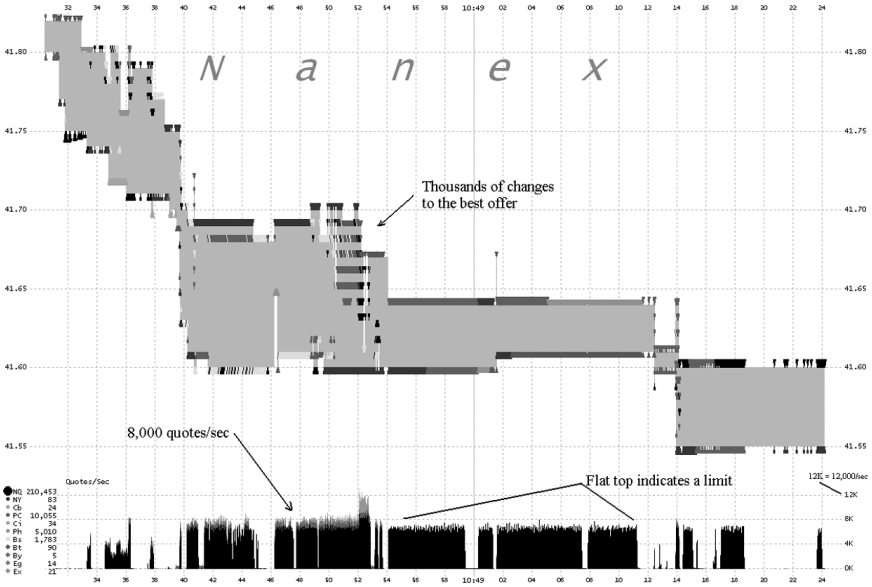

Figure 5: Quote Stuffing in Michael Kors Inc. (KORS) on February 14th, 2012
Source: http://www.nanex.net/aqck/2816.html (accessed 2014–05–10).

As quote stuffing is a main driver for system outages at trading venues, the exchanges themselves should be interested in banning this kind of strategy. On the other hand, many exchanges draw a large proportion of their income from HFT-activities and might therefore be unable to act with sufficient firmness. Thus, quote stuffing creates a strong case for regulatory intervention, as from the perspective of any other market participant this is pure market manipulation.[21]

However, even if the increased trading activities remain on a feasible level for trading venues and other market participants, the question remains if market quality really

21 See the discussion in Christoph Lattemann / Peter Loos / Johannes Gomolka / Hans-Peter Burghof / Arne Breuer / Peter Gomber / Michael Krogmann / Joachim Nagel / Rainer Riess / Ryan Riordan / Rafael Zajonz, High Frequency Trading – Costs and Benefits in Securities Trading and its Necessity of Regulations, in: Business & Information Systems Engineering 4 (2012), pp. 93–108.

profits from the increased order flow. At first sight, this is the case. HFT provides additionally orders and often places the best orders and thereby reduces the bid-ask spread, although usually only slightly. Thus, markets seem to be more liquid with HFT. Some argue that high frequency traders using market making strategies even play the role of a market maker, as they often permit a better price for market orders.

Several studies show that this only holds under favorable market conditions. Spankowski[22] finds that trading activities on Multilateral Trading Facilities (MTFs) – where HFT is preferably active – reduce significantly in times of increased market turbulences. The already cited study of Kirilenko et al.[23] argues along the same line. Thus, as discussed in part IV.1 of this paper, much what HFT provides is only sunshine liquidity. And obviously, high frequency traders are not obliged to act as market maker and will therefore perform this task only as long as it isn't risky, thus this also sunshine market-making only. Hence, recent studies show that it is rather dangerous to rely on HFT, especially in times of increased volatility. In this sense, HFT might even be detrimental to market stability.

V. Regulatory Aspects

The increasing intensity of regulation after the financial crisis from 2007 onwards also led to a regulation of high frequency trading. This holds although there is no known causal relationship between this crisis and HFT. However, high frequency trading is difficult to understand and opaque. It contains strong elements of speculation and takes place at breathtaking speed that frustrates ex-post controls. Moreover, it shows no evident link to the so-called real economy and its financing need. Thus, in a climate of distrust of politicians and the public in financial markets and their ability of self-regulation HFT is an ideal field of consensual regulatory intervention.

This is not to say that a regulation of HFT cannot be justified from a welfare perspective. As discussed above, some strategies might truly have negative impact, and private exchanges might not be able to deal with the problem due to some conflicts of interest. On the other hand, our knowledge about the effects of HFT on markets is still rather limited and not unambiguously verifiable. The recently designed regulatory setting for HFT should therefore be understood as first concept that should be adjusted if new insights become available.

In 2013, the German parliament decreed a High Frequency Trading Act to control potential risks from HFT. This law is very much focused on information about the implemented HFT-strategies. Based on this information, the German financial markets' regulatory agency BaFin (‚Bundesanstalt für Finanzdienstleistungsaufsicht') receive enforcement powers to even stop certain algorithmic trading strategies. Therefore,

22 Ulli Spankowski, The Role of Traditional Exchanges in Fragmented Markets – An Empirical Analysis post MIFID. Diss. University of Hohenheim. Stuttgart 2015, pp. 212–214 (urn:nbn:de:bsz:100-opus-11139).

23 Kirilenko / Kyle / Samadi / Tuzun, Flash Crash (cf. note 15).

HFT have to register as financial services institutions and need a respective license. Similar proposals can be found in the actualized version of the European financial markets directive MIFID II that was implemented in 2014 and is expected to be applicable on financial markets from 2018 onwards, and in the guidelines of the European Securities and Markets Authority ESAM on algorithmic trading from 2012.

On a technical base, several measures are proposed and partially implemented. Thus, any trading venue should have sufficient capacities to deal with the order flow from HFT. To prevent excesses, it has to install excessive usage fees for heavy users. To achieve an information basis, all orders generated by algorithms must be flagged, and an order-to-trade ratio should be at least published to demonstrate the relative importance of HFT strategies. Furthermore, an appropriate minimum tick size on all trading venues might reduce the potential for algorithmic strategies to frontrun other trading activities. And finally, a minimum latency of orders could stop quote stuffing strategies to manipulate the markets.

Thus, regulators today consider and test a large set of rules to control the potentially negative effects of algorithmic trading. However, the evolution of trading will continue, and to some degree as a reaction to the new regulation. Even if regulators are able to handle different HFT strategies today, there will be new ones implemented tomorrow that will require a thorough economic analysis. Therefore, a perfect regulation capturing all HFT varieties is rather unlikely. As a consequence, regulation needs to be adaptive to cope with future threats. At the same time, it should deal with the changes in a constructive way to prevent that the methods of trading in financial titles become, due to overregulation, an anachronisms in a digital world.

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