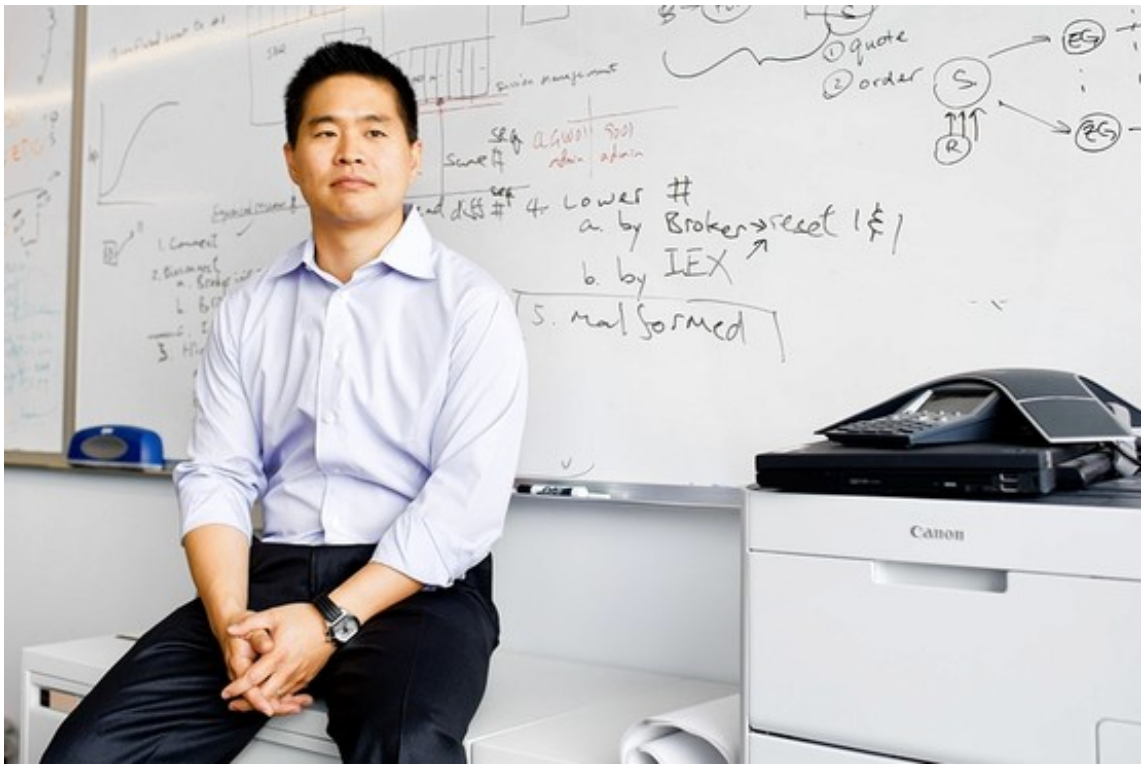
IEX as a Market Based Solution to Buy-Side Investors and the Future of Global Market Microstructure



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1. Abstract

If institutional investors have problems with HFTs, the IEX might be an alternative to other trading platforms. After the approval of the IEX as a stock exchange this summer, there might be a rise of other similar trading systems. Several other market participants such as the NYSE, Citadel and so on, have expressed their criticism of this new exchange. The IEX have proved to be a strong player in among other larger market players, and it is receiving orders from large institutional investors. In a short span of time they have managed to gain a market share of almost 2% in the US equity market. The exchange is essentially a new, but slower, stock exchange, courtesy of the introduction of their speed bump. The speed bump has gained interest by an increasingly greater amount of large institutional investors. Previously, these market participants would not be able to fully fill their relatively total orders, due to high-frequency traders being able to intercept and front run most their orders because of their speed advantage. Throughout this paper, the available quality research on the topic is presented, this includes academic literature and an array of discussion papers. Our research suggests that the IEX is positioned well to continue their impressive market share growth also in the future. The other exchanges must adapt to compete with this new, alternative exchange not be left behind. It has also been discovered that the IEX have being doing a lot of things right, to be in the position they are today. The introduction of the speed bump, towards institutional investors, is their number one weapon in offering large buy-side investors with a market based solution to execution problems arising due to the increased use of high-frequency trading. Their trading model might serve to foreshadow what global market microstructure will move towards in the future. With their founder and CEO, Brad Katsuyama, famous from the Michael Lewis bestseller “Flash Boys”, gaining a lot of attention for his openness and honesty, the IEX is quickly building a reputation of being the trustworthy and transparent exchange that it aims to be.

2. Introduction

"We wanted the buy side to own us, and we wanted the sell side to be our members", Brad Katsuyama told Bloomberg in an interview on the 12th of October 2016. The IEX, the Investors Exchange, was created by Katsuyama in response to debatable trading practices that had become generally used across traditional public stock exchanges and as well as other alternative trading venues. Their mission is to provide "fair play" through a transparent and straightforward manner, while also protecting the institutional buy-side investors from the likes of high-frequency traders.

This term paper is about how the Investors Exchange (IEX) provides a new market based solution, due to the order execution problems arising because of the increased use of HFTs. Throughout this paper, the focus will be on how the IEX presented institutional buy-side investors with a new trading platform suited for their needs, and how this alternative to other, more traditional, exchanges might serve to change the future of global market microstructure. This paper attempts to answer the following research question:

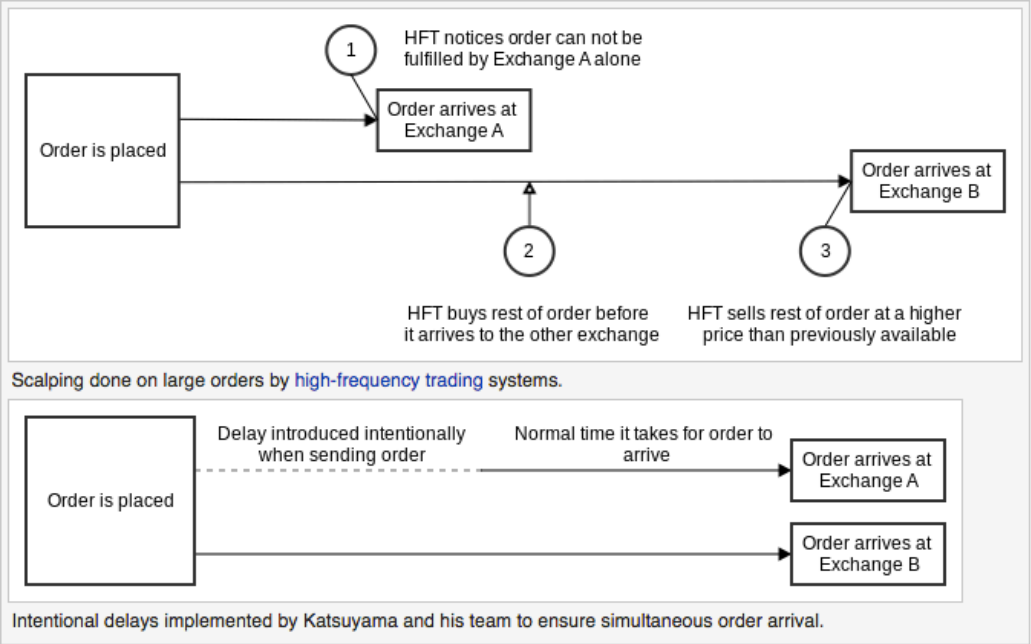
"How did the introduction of the IEX provide a market based solution for buy-side investors to order execution problems arising due to the increased use of HFT, and how does the IEX model provide an insight into the future of global market microstructure?"

2.1 Presentation of HFT

High frequency trading (HFT) is a new element introduced into world markets driven by the rapid development in technology. There is not one single clear definition of HFT, except that HFT is trading with a higher frequency that other market participants (NBIM, 2013). Some use HFT to describe firms that use proprietary trading at very high speeds and frequencies by using algorithms and computers to automate trade signals and executions. Others have an opinion that HFT is not a new phenomenon, but simply is a more effective way to implement old trading strategies, by using computers and other technological innovations (NBIM, 2013). It is important to acknowledge the differences between HFT and Algorithmic trading (AT) although many similarities exist. In short, AT operates based on predefined rules to finesse trade execution, because of the similarities it's often said that HFT is a subgroup of AT. A difference to AT is that HFT can use its speed to discover a trade before it happens. The HFT computer will then execute a trade before the original buyer or seller. When the original trade does get

executed, there's an HFT computer on the other end, who profits from the price being changed. The figure below gives an overview, in simple terms, of how HFT works and how Katsuyama and his team at the IEX solved this problem.

Figure 1 - How HFT works and Katsuyama's solution



2.2 Presentation of the IEX

The Securities and Exchange Commission (SEC) approved the IEX to start a new official U.S. stock exchange (WSJ, 2016). The IEX was founded in 2012, and it opened for trading via a private trading platform in 2013, in essence what is known as a dark pool, which is still active. The main difference of traditional stock exchanges and the IEX, is that they are the first to offer a trading venue that slows the speed of trading. The "speed bump" appeals to investors who think they are disadvantaged by other exchanges that have designed markets to appeal to HFTs. The speed bump adds 350 microseconds to the arrival and departure times of orders. This is a break from the ever-faster trading, which exchanges and regulators have experienced the last decade. The IEX's mission is to be "a fair, simple and transparent stock exchange dedicated to investor protection" (IEX, 2016).

Michael Lewis's popular *Flash boys*, was based on the up rise of HFT and Brad Katsuyama's experience as a trader working for the Royal Bank of Canada (RBC). After detecting that someone was taking advantage of his trades and thus giving him poorer execution prices, Brad

came up with an idea of delaying his orders that ultimately lead him to founding the IEX. The companies' current President Ronan Ryan also features in the book which served to open the eyes of many market participants about the growing issue of HFT.

2.3 Presentation of dark pools

Dark pools are private off-exchange platforms that gives investors, such as hedge funds and pension funds, the chance to trade stocks anonymously. Unlike stock exchanges, dark pools are not easily accessible to the general public. Dark pools are known for its lack of transparency, which gives opportunities in ways that are neither good or bad. It was introduced in the late 1990s from a desire by big players to trade large orders without impacting the markets. Dark pools have been cast in a very unfavourable light by Michael Lewis' book *Flash Boys*, but it is argued that dark pools do serve a purpose. However, do the dark pools lack of transparency make them vulnerable to potential conflict of interests by their owners and by predatory trading practices by high-frequency traders (Investopedia, 2016). *Flash Boys* revealed the truth behind dark pools, HFT and predatory trading, but the book also mentions the IEX. IEX started as a dark pool in late 2013, and found a solution with the 350-microsecond delay, which resulted in a dark pool that made predatory trading impossible. The SEC finally approved the IEX to be an official exchange on June 17, 2016, after a long process of denying the exchange the official recognition, and IEX brought their 350-microsecond delay to the now official exchange. IEX went from a dark pool to an exchange not only because of the business, but because of their mission to create a more transparent market, thus meeting a growing demand for such an exchange in the US market (Bloomberg, 2016).

This paper will focus on the IEX, and how it will provide an insight into the future of the global market microstructure. Furthermore, it aims to consider the relevant literature and theories regarding HFT and surrounding topics. This will provide a solid foundation for further discussion concerning the IEX and HFT. Moreover, the paper will present and discuss its main findings and highlight the most important aspects in accordance with the formulated problem.

3. Literature on the topic of HFT

With IEX now providing institutional investors an alternative to the traditional exchanges to avoid possible market disadvantages, such as an increase in total transaction cost, as a result of HFT activity, it is interesting to consider the academic literature available on the subjects of market quality and the evolution of market microstructure in relation to the emergence of HFT. This section will attempt to present relevant theory and to consider this with the IEX model in mind. Given the impact of recent changes and the increased complexity of the marketplace, it is essential for the buy-side investor to understand how this new environment affects the cost of his or her trading activity, liquidity risk and choice of investment strategy. How HFT activity affects the order-flow of long term buy-side participants will help to enlighten what investors switching to the IEX want to avoid in more traditional marketplaces.

If transaction costs are low, institutional investors, as all other market participants, can hold the assets most suited to their investment strategy, and informed participants are better able to trade on their private information and impound it into asset prices. Thus, it is important to investigate how recent developments in financial market microstructure impact institutional transaction costs. Brogaard et al (2014) argues that their study finds an association between the latency changes and HFT activity but no measurable association between these latency changes and execution costs. This means that using the latency changes as an instrumental variable illustrates no link between HFT and execution costs. Such a finding suggests no need for increased regulation of HFT, and that there is no market for IEX's product taking only execution costs into mind.

This, to some extent, positive view of the emergence of HFT is developed further by O'Hara and Ye (2009), who argues that market fragmentation does not harm markets. Their main argument, however, is built around the fact that increased fragmentation tends to reduce execution cost of instruments with low liquidity. Assuming large institutional investors favour more liquid stocks leads to this positive market fragmentation argument not applying to them. Generally, for markets in well-developed economies with the appropriate regulation, such as the US, increased market fragmentation will not decrease market quality. A more diverse market creates opportunities for proprietary traders and HFTs to grow, gaining ground over traditional and slower market-making activities. Kumar et al (2011) estimates that HFTs account for over 70% of all US equity exchange trading volume, an increase from 10% in 2000.

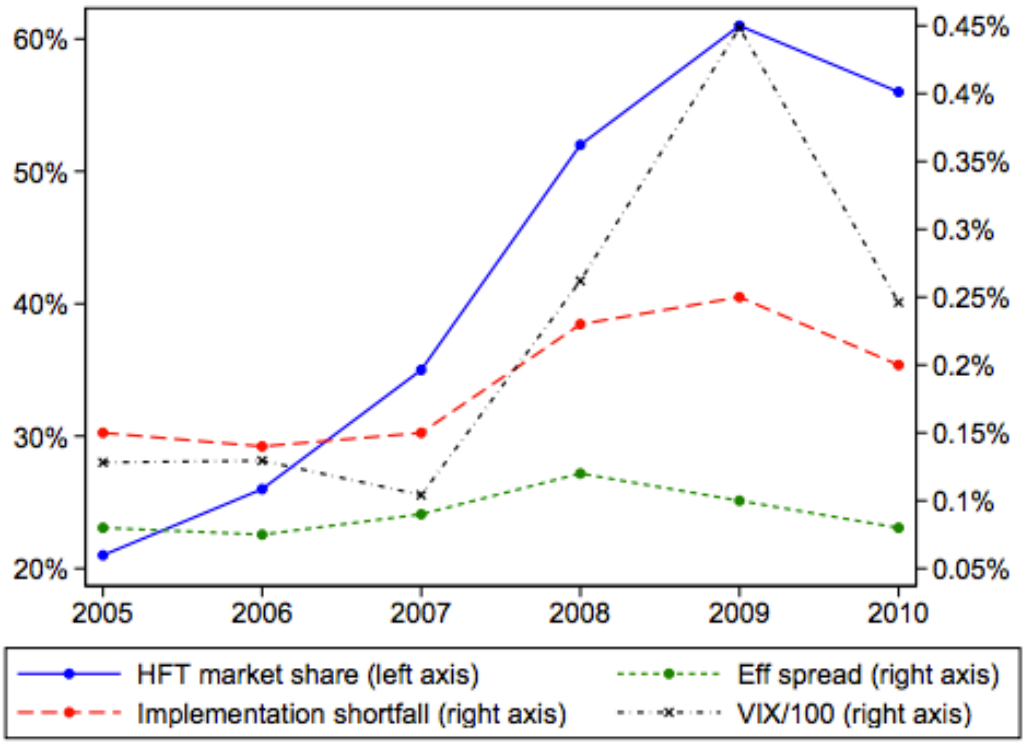
Pragma Securities (2012) considers the hidden cost of deep liquidity resulting from HFT. The essay argues that HFTs crowd out directional traders' passive orders, force them to cross the spread more often, resulting in higher total trading costs for these investors. The mix of the maker and taker system of exchange fees and rebates, in addition to the penny tick size, effectively distorts the market, and thus forces larger investors to indirectly subsidizing the activity of HFTs. This is one of the issues that Brad Katsuyama wanted to fight when he founded the IEX. The essay from Pragma convincingly argues that the presence of HFTs disturbs the natural equilibrium of markets and that buy-side investors ultimately pays the price. This is an effective reasoning to why an increasing number of market participants in the studied segment should consider the option of moving their trades to the IEX, and furthermore emphasizes the need for such a marketplace.

Satchell (2012) considers the overall welfare impact of the emergence of HFT. This is interesting to consider in relation to the opening of IEX. Satchell argues that even if the introduction of HFT leads to a Pareto improvement, provided by the fact that all market participants benefit from reduced transaction costs. It may be the case that 99 per cent of the gains make their way to the traders, while the remaining 1 percent accrues to the investors whose positions are constantly being front-run, this way offsetting the gains from lower costs. In terms of evaluating the overall welfare effect one can look at the effect of HFT on all market participants. Per Satchell, the available evidence shows that the increased use of HFT is of benefit to the traders themselves, the marketplaces or exchanges that allow it and the sellers of products whose use is intrinsic to the process associated with the HFT. Whether it is of benefit to fund managers is to Satchell not clear-cut, but with most of the available literature suggesting that it is a disadvantage, this paper will also favour this view. For regulators, HFT is obviously not beneficial as it complicates regulatory control. To summarize, most market participants do benefit from the emergence of HFT, with buy-side investors being one of the exceptions. This insight what was Katsuyama aimed to build his IEX upon.

Kervel and Menkveld (2016) argues that the market structure debate should re-center around end user costs. In this paper the authors consider how trading cost for institutional investors are affected by whether HFTs decide to lean against the large orders, disguised by small child orders, of these investors or if they go with it. Their study suggests that institutional trading cost is 46% lower when HFT lean against the order, but 169% higher when they go with it. The figure overleaf, from Kervel and Menkveld's paper, plots trading costs in U.S. equity markets

from 2005 to 2010, a time when HFT participation grew from about 21% to 56%. As the graph illustrates, implementation shortfall for institutional orders grew from 15 basis points (bps) to 20 bps, an increase of 33%. This supports the growing concern of investors.

Figure 2 - HFT participation and institutional trading costs (Kervel and Menkveld, 2016)



Kervel and Menkveld further claims that as trading data is hard to come by, end user, retail and institutional investors should make their trade data easily available so that regulators can use said data to develop suitable regulations to make today's markets fairer and more transparent. This again is exactly what the IEX presents. A fair and transparent marketplace that corrects the advantages and disadvantages of HFT to buy-side investors. By not selling latency, the IEX does not cater to just one specific class of the market, but provides the same opportunity for all market participants. The story of the IEX, and how Katsuyama's model might foreshadow how global market microstructure will develop in the future will be discussed in the following section.

4. Brad Katsuyama's mission

When asked the question: "The customers on IEX, the people you talk to, what's important to them? What do they think is your advantage, vs. other exchanges?" in Brad Katsuyama's recent interview with Bloomberg, he replied: "I think, most important, is they feel like we represent their interest" (Bloomberg, 2016). Katsuyama went on to argue that institutional investors had become the last to know, they were on the outside looking in. At the IEX, Katsuyama alongside his president Ronan Ryan, an electronic expert that worked with Katsuyama at the RBC and are also an important character in *Flash Boys*, has implemented several core strategies to ensure that the exchange is as transparent and fair as possible. The specifics of these implementations will be discussed separately.

4.1 Disclose the matching rules utilized in the exchange's computerized order matching engine

After Katsuyama's personal dealings with being front-run while executing orders for long-term investors as a trader at RBC, he puts a lot of emphasis on avoiding such practice at the IEX. This is done by disclosing the matching rules used in the exchange's computerized order matching engine. The IEC states that "a matching engine that is designed to calculate the true price for a stock uses real-time pricing information consolidated from displayed protected markets to prevent its market participants from receiving and acting upon changes in market data before the market itself, on the market's own matching engine" (IEX, 2016). This matching engine, that they have named "True Price", determines a trading venue's ability to price trades of a stock which are pegged to or derived from the National Best Bid and Offer (NBBO).

4.2 Only offer a limited number of plain and conventional order types

Most exchanges are offering a large number of different order types that investors use to their advantage. These include options such as choice of order display, trading on one or multiple exchanges, and pricing conditioned on market state. Whenever a new order type is considered, the exchanges apply for approval by the regulator. At the present these regulators are not very strict, and exchanges who want new order types can often get it (NBIM, 2013). However, there is a risk that trading venues could compete for liquidity by implementing new order types on the request of specific market participants that only benefit a select few. At the IEX they offer five order types, these are market order, limit order, primary peg, midpoint peg and a discretionary peg. The latter is a primary peg that might execute up to a midpoint price when the quote is balanced. In addition to these orders, several alternative parameters can be fixed to

the orders. This way, the IEX have fewer order types than most other traditional stock exchange. The simplicity of only offering a limited number of order types is in line with IEX's mission of providing a fair, simple, transparent stock exchange, committed to investor protection. Also, this limited number of order types reflect how the IEX try to treat every participant equally. The exchange is, by doing this, providing a new trading platform, that might serve to attract many institutional investors looking for a chance to compete, soon.

4.3 Charging fixed fees on most orders, or a flat percentage rate on small orders

Contrary to the other exchanges in the US, the IEX are charging fixed fees on most orders. Small orders have a flat percentage rate, which also results in an equal price for big and small traders. This implementation further emphasizes the transparency and fairness of the exchange, as they put the investor in the driver's seat.

4.4 and 4.5 Assuring that the market pricing data arrives at external points of presence simultaneously and slight delay in market pricing data to all customers (no co-location)

This way, the IEX is different to any other current U.S. stock exchange. The speed bump of 350 microseconds both ways, provides the institutional investor the opportunity not to be taken advantage of by a trader with a speed advantage. At other exchanges this is not possible, due to the HFTs intercepting the transaction, and correspondingly raising the price. This latency implementation is at the heart of what makes the IEX so attractive to the institutional investor.

While at the RBC, Katsuyama would explain to investors why they were having problems executing their trades at the price they were seeing on their screens, and he explains the background of the "speed bump" implemented at the IEX: "Here's an explanation for this experience you're having when you can't buy or sell what you see. That level of trust parlays into us as an exchange. Most of them benefit from things like discretionary peg and our speed bump because it means a client on the West Coast can send an order, and once that order makes it to IEX, it's IEX's responsibility to price that order if we receive instruction to peg it." (Bloomberg, 2016).

4.6 Withhold from paying for order flow

Rebate trading is when the trader is paid by a service provider, such as a stock exchange or an alternative trading platform. It is essentially a trade promotion incentive. This is a technique of

day trading and profiting in the stock market. It is still possible to trade manually, but with the introduction of Electronic Communication Networks (ECNs), for instance HFTs, made it much easier to make more profits.

5. Discussion

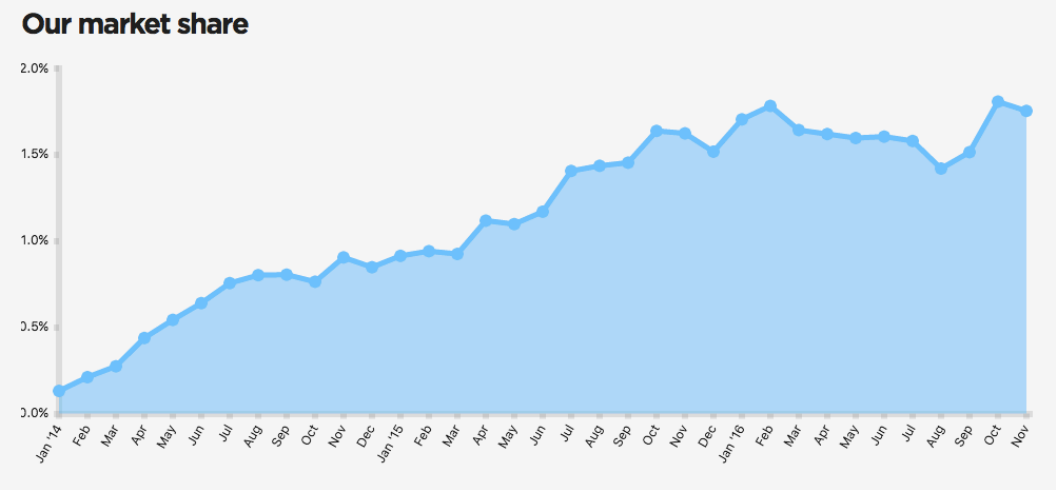
"They are using us for a particular reason. At the heart of it, these people are seeing it in their executions.", Brad Katsuyama mentioned in his latest interview. Institutional investors are looking to minimize their implementation shortfall, the average price at which the entire order executed relative to the price at which it started, when executing large orders. Recent studies have suggested that the increased presence of HFT has raised transactions costs for this type of traders. This is the heart of Katsuyama's vision for why his exchange will, in the long run, attract more and more buy-side players as they seek to escape being front run by computers. The aim of this section is to develop a discussion around whether the IEX is a viable option for the institutional investor, if they can continue their strong market share growth, why larger and more traditional exchanges has not implemented changes, and how market microstructure is likely to develop in the future.

It is believed that Katsuyama's unique experience while at the RBC provided him with an understanding of how the microstructure could be altered to suit the institutional investor. With this knowledge, he established an ATS, to enhance the current microstructure. The ATS had implemented a latency problem, which enabled investors to place orders that reached other exchanges and trading platforms simultaneously. Previously, HFTs would notice that one of the exchanges could not fulfill the order, and thus they bought the remainder, before it arrived at another exchange, before selling it at a higher price to the original buyer. A simple fix to a major problem, but it has been illustrated that it is effective. Furthermore, by not making it possible for HFT players to pay for a speed advantage, and by treating all market participants equally, the IEX does present what the future of markets should look like. For Katsuyama, it has never been about favouring the institutional investors that he used to work for, he only wants to level the playing field. The idea that the IEX can make money more ethically by attracting long-term investors based on trust and transparency, amid a popular opinion raised by Michael Lewis that the U.S. stock markets is essentially rigged, is his simple, but brilliant vision for his newly approved exchange. On the other side, in a traditional environment filled by norms and elitists, like no other industry, introducing something new, like the IEX does, and getting incredibly smart people to trust you with it, is not at all an easy job. Only time will tell

if Katsuyama and his team at the IEX can continue their strong market share growth, which will be discussed in the following paragraph.

The IEX was opened as an official U.S. stock exchange on June 17, 2016. Since October 25, 2013, their router has been open for trading. The graph below illustrates the exchange's impressive market share growth over the last 2 years. From a market share of 0.2% in January 2014, they have grown to steady figures around the 1.8% mark and an average matched volume of 115,130,921 (IEX, 2016). It is interesting to further investigate where this strong growth originates from and whether it is likely to continue in the future.

Figure 3 - The IEX's increasing market share (IEX, 2016)



The upswing in IEX's market share is a product of several major institutional brokers moving more and more of their traders to Katsuyama's exchange. These include Goldman Sachs, Bank of America Merrill Lynch, Credit Suisse, Morgan Stanley among others. The fact that this is all large players in the financial industry is very positive regarding the prospects of the IEX. Looking at the statistics on the official IEX website, one can see that 43.51% of total volume is in instruments with a market capitalization of over 10 billion dollars. This further emphasizes that most the trades conducted at the exchange are by large-scale institutional investors. While this might give Katsuyama and his team some comfort as the presence of these major players secure the exchange daily order flow, it is also a concern as to the IEX's reliance on these banks to provide liquidity. Another risk element for the team at IEX is that their current competitive advantage is solely based on a characteristic that would be easy for other exchanges to emulate, their handling of speed. Whether it is likely that we will see more traditional exchanges fighting HFT in a similar fashion in the coming years is hard to have an opinion about, but regardless it

is something for Katsuyama to keep in mind. A possible increase in the regulation at the NYSE or NASDAQ in the future to protect institutional investors, is a topic that deserves attention and this will be discussed in the following section.

HFT stands for as much as 50% of the daily traded volume at other U.S. exchanges such as the NYSE and NASDAQ. This fact alone supports the belief that is it highly unlikely for these traditional exchanges to implement new regulation to decrease the use of HFT and, this way, protect buy-side participants. The exchanges make their money by executing orders and although they might lose some of their business to Katsuyama and the IEX, they will still be highly profitable. However, some change in regulation to better protect institutional investors without completely removing HFTs is more likely to be implemented. This leads to the question then being if this will be enough to win back market participants who, right now, seem to favour the IEX model and are moving their orders to Katsuyama. It could all, at some point, boil down to trust. With several of the largest players on Wall Street both being involved in executing large orders for institutional clients, in addition to investing in development of HFT systems, a loss of reputation as public opinion of HFT decreases even more is likely to lead to a loss of customers for these banks. Companies such as Goldman Sachs, might be faced with a choice: keep HFT division and lose most the banks institutional investors, or shut down HFT activity to rebuild reputation as a trustworthy player with the client in mind. A factor here will be developments in future technology that might even outcompete HFT. What the future of global market microstructure might hold in terms of technology is the focus of the following paragraph.

The future of global market microstructure will highly depend on progress in modern technology. Whether the IEX serves to foreshadow how exchanges will develop to further suit the needs of their clients and customers, is too early to say something definite about. However, Katsuyama's insight and the model at the IEX has opened up one of the most traditional industries in the world, and has created a widespread discussion on a topic usually reserved to finance geeks, namely the topic of market microstructure. The evolution of modern technology is accelerating towards artificial intelligence, because of this, regulatory control to ensure that the interests of all market participants is considered, is more important than ever in the global market microstructure development.

6. Findings

HFT research and the recent success of Katsuyama and his team at the IEX supports the argument of Kervel and Menkveld that states that the market microstructure debate should be focused on end user costs. There is a reason to why an increasing number of buy-side investors are choosing to use the newly approved Investors' Exchange to execute their trades. Katsuyama reveals, in his recent interview with Bloomberg, that a number of institutional investors have indicated that they trust him, the IEX and that they have huge respect for his followers. The IEX has come to stay, as "There's too much scrutiny on this for it to survive based on hand-waving" (Bloomberg, 2016). People are clearly seeing a decrease in both executions cost as well of getting rid of the feeling of being taken advantage of. This section will aim to provide the paper's main findings in relation to the formulated problem.

Comprehensive and quality research on the topic of HFT and its impact on world markets is scarce. However, the articles mentioned in this report tend to favour the view that, generally, institutional investors are in fact worse off now, as a direct consequence of the emergence of debatable practises used to take advantage of this type of market participant. Norwegian Bank Investment Management (NBIM) concluded their discussion note on HFT in 2013 by stating that the issues of concern to large, long-term investors deserving of attention include the anticipation of large orders by some HFT's leading to potential adverse market impact, transient liquidity due to high propensity for HFT's to rapidly cancel quotes real-time and the un-level playing field amongst market makers from low latency ultra HFT strategies. These findings agree with the findings of this paper. With this being established, one can turn to focus to the introduction of the IEX and its impact.

By reaching a daily market share of almost 2 percent this early in its development phase, the IEX is clearly illustrating that it caters to a need in the market. Large players are moving their trades to Katsuyama, Ryan and the rest of their team, so that it evident that the introduction of the exchange has provided buy-side investors with a solution to their execution problems. Whether this strong growth will continue is dependent on a number of factors, but maybe most importantly the reaction of more traditional exchanges and improved regulation. Markets will, without a doubt, continue to evolve rapidly over the next decades and the emergence of both HFT and the IEX as a result, is a strong indication that continued research and the development of trading strategies, as well as the debate raised by many on appropriate market structure, are

increasingly crucial responsibilities of assets managers and other market players (NBIM, 2013). The IEX could, in line with what has been discovered and discussed throughout this paper, indeed provide investors with an insight into what the future of global market microstructure, at least should, aim to look like.

7. Conclusion

In conclusion, June 17th 2016 might prove to symbolize a historic day in the history of financial markets as the IEX officially opened for trading as a recognized exchange. Brad Katsuyama, Ronan Ryan and the rest of the team at the IEX has successfully provided buy-side investors with a market based solution to the execution problems that arose as a direct result of the emergence of HFT. This paper has attempted to summarize the best available literature on the subject to fully understand how HFT impacts everyday trading. It must be acknowledged again that such research is, at this point in time, scarce and that all market participants should feel a responsibility to be involved in making sure that sufficient research is done on the subject to ensure that the right measures are taken by policy makers. The IEX is expected to continue their strong market share growth in the near future, but it depends on many factors including regulatory control and advances in technology. Whether or not the IEX model provides an insight into the future of global market microstructure is too early to say, but it is hard to see how a turn to more transparent and fair world markets could impact the financial world negatively.

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