

INFORMATIONAL INEQUALITY: HOW HIGH FREQUENCY TRADERS USE PREMIER ACCESS TO INFORMATION TO PREY ON INSTITUTIONAL INVESTORS

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ABSTRACT

In recent months, Wall Street has been whipped into a frenzy following the March 31st release of Michael Lewis' book "Flash Boys." In the book, Lewis characterizes the stock market as being rigged, which has institutional investors and outside observers alike demanding some sort of SEC action. The vast majority of this criticism is aimed at high-frequency traders, who use complex computer algorithms to execute trades several times faster than the blink of an eye. One of the many complaints against high-frequency traders is over parasitic trading practices, such as front-running. Front-running, in the era of high-frequency trading, is best defined as using the knowledge of a large impending trade to take a favorable position in the market before that trade is executed. Put simply, these traders are able to jump in front of a trade before it can be completed. This Note explains how high-frequency traders are able to front-run trades using superior access to information, and examines several proposed SEC responses.

INTRODUCTION

If asked to envision what trading looks like on the New York Stock Exchange, most people who do not follow the U.S. securities market would likely picture a bunch of brokers standing around on the trading floor, yelling and waving pieces of paper in the air. Ten years ago they would have been absolutely right, but the stock market has undergone radical changes in the last decade. It has shifted from one dominated by manual trading at a physical location to a vast network of interconnected and automated trading systems.¹

Technological advances that simplified how orders are generated, routed, and executed have fostered the changes in market

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¹ Concept Release on Equity Market Structure, Exchange Act Release No. 34-61,358, 75 Fed. Reg. 3594, 3594-95 (Jan. 21, 2010) [hereinafter SEC Concept Release].

structure, and led to a fragmented marketplace composed of several exchanges all competing for trade volume.² For instance, the top three exchanges by trade volume (NASDAQ, NYSE, and BATS) account for only 43.6% of total trading volume.³ This fragmentation was further driven by SEC instituted regulations that were designed to foster competition between the exchanges after their privatization in 2005,⁴ known as Regulation NMS, or National Market System.⁵

SEC regulation spread the market out, while changes in technology ballooned the amount of trading and greatly increased the speed at which it could be done. For instance, in 2005 the NYSE accounted for over three-quarters of the stock market's trade volume.⁶ By 2009 that number had fallen to just 25%; however, average daily trade volume for the same period had increased more than 650%.⁷ Additionally, the time needed to execute a trade for an NYSE listed stock decreased from an average of ten seconds in 2005 to mere fractions of a second in 2009.⁸

This reduction in latency, or trading speed, coupled with the increased fragmentation and competition between exchanges in recent years, has given rise to a new phenomenon known as high-frequency trading (HFT).⁹ HFT does not have an official definition, but is widely believed to have a few common characteristics.¹⁰ First, high-frequency traders employ complex computer algorithms that use a defined set of inputs to automatically make decisions based on changing market conditions.¹¹ Second, they make trades very quickly, measured in milliseconds and even microseconds.¹² To put this into perspective, the

² See, e.g., Peter Gomber et al., High-Frequency Trading 6 (Mar. 2011) (unpublished manuscript), <http://ssrn.com/abstract=1858626>.

³ SEC Concept Release, *supra* note 1, at 3595.

⁴ Charles R. Korsmo, *High-Frequency Trading: A Regulatory Strategy*, 48 U. RICH. L. REV. 523, 533 (2014).

⁵ See Regulation NMS Release No. 34,51808, 70 Fed. Reg. 37,496, 37,497–99 (June 29, 2005).

⁶ SEC Concept Release, *supra* note 1, at 3595.

⁷ *Id.*

⁸ *Id.*; *How the Market Works: The Market of Innovation*, NASDAQ, <http://www.nasdaq.com/services/homw.stm> (last visited Dec. 28, 2015).

⁹ See, e.g., Gomber et al., *supra* note 2.

¹⁰ For the remainder of the paper “HFT” will be used to denote the practice of high-frequency trading, and “HFTs” will be used in place of high-frequency traders, or those who participate in high-frequency trading.

¹¹ SEC Concept Release, *supra* note 1, at 3606.

¹² See, e.g., Frank J. Fabozzi, Sergio M. Focardi & Caroline Jonas, *High-Frequency Trading: Methodologies and Market Impact*, 19 REV. OF FUTURES MKTS. (SPECIAL EDITION) 8 (June 2011).

average blink of a human eye takes about 400 milliseconds, which is an eternity to high-frequency traders.¹³ Third, they execute a massive number of trades per day. While it is quite difficult to estimate how many trades the average HFT firm executes per day, it is estimated that HFT as a whole accounts for 50–70% of the total trading volume in the U.S. equities market.¹⁴ Fourth, these firms do not hold a position at the end of the trading day. That is, unlike traditional investors, they do not hold a significant number of shares of any stock at the end of each day. And finally, high-frequency traders are proprietary traders, which means, they are trading with their own money, rather than on behalf of an investor.¹⁵

While most high-frequency traders share these characteristics, the trading strategies they use vary widely.¹⁶ Many of these strategies have been labeled as parasitic,¹⁷ and are one of the many reasons HFT has come under fire recently.¹⁸ Parasitic strategies are generally thought of as those designed to generate profits at the expense of other traders, without providing some market benefit in return.¹⁹ Although the full merits of HFT are outside the scope of this paper, it will instead focus on one of the parasitic trading practices employed, known as front-running.

Front-running is defined as using the knowledge of a large, incoming order to take a favorable position in the market.²⁰ Put simply, knowing that a large order is incoming, front-running constitutes buying and immediately relisting that particular stock at a higher price, before the order is executed. A simple analogy may help illustrate the issue. Imagine a stockbroker with a serious craving for Cheerios. That broker

¹³ MICHAEL LEWIS, *FLASH BOYS: A WALL STREET REVOLT* 72 (W.W. Norton & Co. 2014).

¹⁴ See SEC Concept Release, *supra* note 1, at 3606; Fabozzi, Focardi & Jonas, *supra* note 13.

¹⁵ See, e.g., Diego Leis, High Frequency Trading Market Manipulation and Systemic Risks From an EU Perspective 20 (Feb. 29, 2012) (unpublished manuscript), <http://ssrn.com/abstract=2108344>.

¹⁶ SEC Concept Release, *supra* note 1, at 3607–09.

¹⁷ For example, “order anticipation strategies” such as front-running attempt to predict or sniff out what other traders are doing, and trade in front of them. Similarly, “momentary ignition strategies” attempt to fool others that a market shift is taking place by rapidly placing and canceling a large number of orders. See, e.g., LARRY HARRIS, *TRADING AND EXCHANGES: MARKET MICROSTRUCTURE FOR PRACTITIONERS* 245 (2002); SEC Concept Release, *supra* note 1, at 3609.

¹⁸ See generally Álvaro Cartea & José Penalva, Where is the Value in High Frequency Trading? 2–3 (Feb. 2012) (unpublished manuscript), <http://ssrn.com/abstract=1712765>.

¹⁹ See, Korsmo, *supra* note 4, at 557.

²⁰ Fabozzi, Focardi & Jonas, *supra* note 12, at 24.

checks the price for Cheerios on his phone and sees that they are on sale for \$2.49 at the nearest grocery store. He then places an order for one box of Cheerios and heads to the store to pick them up. When he gets there, the manager informs him that unfortunately someone had purchased all of the boxes of \$2.49 cheerios before they were able to fill his order. Fortunately, however, that same person is happy to sell him a box for \$2.50. Switch Cheerios with shares of Apple, and you have front-running in a nutshell, sometimes referred to as an “order-anticipation strategy.”²¹ Since it is a parasitic trading strategy, front-running does not provide any offsetting benefit to the marketplace. Front-runners “profit only when they can prey on other traders. They do not make prices more informative, and they do not make markets more liquid.”²² Now in the analogy above, one cent may not seem like a big deal, but when the broker starts buying 10,000 or 100,000 boxes of Cheerios at a time, the issue becomes more apparent.

In the wake of Michael Lewis’ book “Flash Boys,”²³ several predatory strategies have been incorrectly labeled as front-running. While rebate-arbitrage,²⁴ latency-arbitrage,²⁵ and a myriad of other predatory trading strategies are employed by high-frequency traders, they do not fall under the domain of order-anticipation strategies, and thus will not be discussed in this piece. Part I of this Note begins by briefly explaining the current market structure of the U.S. equities markets, and highlighting some key regulations in its operation. Part II moves to discuss exactly how these trades are being front-run and why this is an issue worth correcting. Part III details what enables high-frequency traders to front-run trades, and Part IV concludes with a discussion of potential SEC responses.

I. CURRENT MARKET STRUCTURE

The current structure of the U.S. equities market and certain key regulatory provisions create an environment that makes front-running

²¹ See, e.g., Richard Livingston, *Murky Dangers in Dark Pools*, THEAGE (Aug. 25, 2012), <http://www.theage.com.au/money/investing/murky-dangers-in-dark-pools-20120827-24v9n.html> (providing a similar analogy).

²² HARRIS, *supra* note 17, at 251.

²³ LEWIS, *supra* note 13.

²⁴ Rebate-arbitrage is a trading strategy that seeks to capture the incentives, or kickbacks, many exchanges offer for trading on their exchange without actually providing the liquidity or volume those incentives are meant to entice. *See id.* at 172.

²⁵ Latency-arbitrage is generally defined as using extremely fast trading speed to capture differences in price on multiple exchanges before the exchanges are able to update listings to reflect the current best market price. *See* Gomber et al., *supra* note 2, at 29–30.

possible. The vast majority of equities trading in the U.S. takes place on one of the nine registered exchanges (e.g., NYSE), or in a dark pool.²⁶ Registered exchanges, as the name implies, have to register with the SEC and meet certain statutory requirements.²⁷ Dark pools on the other hand, are essentially unofficial exchanges that are less heavily regulated, and offer a certain amount of anonymity that is not found on the official exchanges.²⁸ Both the registered exchanges and dark pools are run by an automated trading system (ATS) that automatically receives, processes, and executes orders at extremely high speeds.²⁹ Additionally, registered exchanges and dark pools are governed by Regulation NMS, or National Market System, though there are some important differences.³⁰

Regulation NMS was designed to create a linked national market system and foster competition among the exchanges.³¹ This was accomplished primarily in two ways. First, Regulation NMS created a consolidated market data system.³² This system collects “consolidated quote data” and “consolidated trade data.”³³ Consolidated quote data is the record of all the best bids and offers from each of the registered exchanges.³⁴ Consolidated trade data is the record of every trade that is executed, even on dark pools or other alternative trading systems.³⁵ This distinction is the major difference between the registered exchanges and dark pools. Dark pools are not required to report bids and offers (consolidated quote data); as such, investors can remain somewhat anonymous and forgo tipping off the market about a large incoming trade.³⁶

All of this data is combined into a consolidated data feed, also known as the Securities Information Processor (SIP), and made available to all market participants.³⁷ The SIP combines the data from each of the exchanges to calculate, among other things, the National Best Bid and

²⁶ SEC Concept Release, *supra* note 1, at 3597–98.

²⁷ *See id.* at 3598.

²⁸ Edwin Batista, Note, *A Shot in the Dark: An Analysis of the SEC's Response to the Rise of Dark Pools*, 14 J. HIGH TECH. L. 83 (2014).

²⁹ SEC Concept Release, *supra* note 1, at 3598.

³⁰ *Id.* at 3600–01.

³¹ *See id.*

³² *Id.*

³³ *Id.*

³⁴ *Id.*

³⁵ *Id.*

³⁶ Batista, *supra* note 28; Korsmo, *supra* note 4, at 535.

³⁷ *See* SEC Concept Release, *supra* note 1, at 3600–01; *What is a SIP and What Role Should it Play?*, MODERN MARKETS INITIATIVE (Jan. 16, 2014), <http://modernmarketsinitiative.org/sip-role-play> [hereinafter *What is a SIP?*].

Offer prices (NBBO).³⁸ The NBBO is the current best bid and offer price (to buy and sell, respectively) of every listed stock.³⁹

Second, Regulation NMS implemented something known as the “Order Protection Rule.”⁴⁰ This rule requires that any trading venue must execute an order at the current best price in the nation, or the NBBO.⁴¹ If the venue is unable to do that, (for instance, if the national best price is not offered on their exchange, or if there are not enough shares to fill the order) it must either cancel the order or route it to another exchange with the best price.⁴² Both the consolidated data market system and the Order Protection Rule have been fundamental to the rise of front-running activity in recent years.

II. FRONT-RUNNING

Front-running in the U.S. equities market has developed into a high-stakes cat and mouse game. As investors discover they are being front-run, they explore new ways of executing their orders; and in turn, high-frequency traders develop new tools and methods to front-run them.⁴³ Currently there are three known ways in which front-running occurs, depending on how brokers execute the orders; however, the nature of this trade practice makes it impossible to say whether this is an exhaustive list.⁴⁴ The first two methods are variations of what is generally known as electronic front-running, while the third is called dark pool arbitrage.

A. Electronic Front-Running

1. Large Block Orders

The first widely used method of front-running (though used less often in light of recent events) occurs when an investor submits an order

³⁸ *What is a SIP?*, *supra* note 37; Shengwei Ding, John Hanna & Terrence Hendershott, *How Slow Is the NBBO? A Comparison with Direct Exchange Feeds*, 49 THE FIN. REV. 313–14 (2014).

³⁹ Ding, Hanna & Hendershott, *supra* note 38.

⁴⁰ See Regulation NMS Release No. 34,51808, 70 Fed. Reg. 37,496, 37,501–02 (June 29, 2005).

⁴¹ *Id.*

⁴² *Id.*

⁴³ It is worth noting that the investors mentioned here are large institutional investors. Someone trading for his or her personal account, or in relatively small quantities is at no risk for being front-run. However, this is still relevant to these individuals, as a large number of institutional investors are pension and retirement funds.

⁴⁴ See Fabozzi, Focardi & Jonas, *supra* note 12, at 25; Leis, *supra* note 15, at 21.

for a large block of shares.⁴⁵ Assume that a broker has a client who wants him to buy 100,000 shares of XYZ Company. The broker checks the price of XYZ and sees that there are 180,000 shares available at \$10.50: 30,000 shares on Exchange 1, 50,000 on Exchange 2, 60,000 on Exchange 3, and 40,000 on Exchange 4. He submits the order at market price expecting to receive 100,000 shares for \$1,050,000, but instead somehow ends up paying \$1,051,400. Why?

Before the broker ever placed the order, some (or many) high-frequency traders placed a large amount of sell orders in a huge selection of stocks, one of which happened to be XYZ Company.⁴⁶ These sell orders are usually in lots of 100 shares, the minimum required to be at the front of any price queue.⁴⁷ As the broker's 100,000 share order came into Exchange 1, he purchased all 30,000 shares available at \$10.50, including the sell order from the high-frequency trader. Because Exchange 1 is not able to fill the entire order at the NBBO, the Order Protection Rule requires it to send the order elsewhere to get the remaining 70,000 shares. Now, armed with the knowledge that this order is on its way to the next exchange, the high-frequency traders race there before it can be executed and purchase all the available shares of the stock.⁴⁸ At this point, they can either sell the shares back to the broker at an inflated price, say \$10.52, or hold them in hopes that the large order drives the price up even higher.⁴⁹

2. Sliced Orders

Often times it is not feasible to submit a large block order, such as when there are not enough shares available at the preferred price.⁵⁰ In these instances traders often "slice" their orders or use an algorithm to break them into smaller pieces that match the market and do not move the price.⁵¹ For example, assume once more that a broker is trying to buy

⁴⁵ The remainder of the examples will talk exclusively about bids, or purchase orders, but the methods used are simply reversed for large offer, or sell orders.

⁴⁶ The most volatile stocks are most often targeted by HFTs, as the price volatility makes it easier to benefit from price swings. *See Equity Market Structure Literature Review Part II: High Frequency Trading*, U.S. SEC. AND EXCH. COMM'N (Mar. 18, 2014), http://www.sec.gov/marketstructure/research/hft_lit_review_march_2014.pdf.

⁴⁷ LEWIS, *supra* note 13, at 73.

⁴⁸ *See id.* at 172; SEC Concept Release, *supra* note 1, at 3609.

⁴⁹ *See* LEWIS, *supra* note 13, at 172; SEC Concept Release, *supra* note 1, at 3609.

⁵⁰ Korsmo, *supra* note 4, at 546–48 (explaining that traders often break up large trades in order to prevent an unfavorable price movement).

⁵¹ Fabozzi, Focardi & Jonas, *supra* note 12, at 22; Korsmo, *supra* note 4, at 546–48.

100,000 shares of XYZ Company at \$10.50, however, now only 2,000 shares are available at that price. Rather than submitting the entire order and driving up the price, he uses an algorithm that will buy the 100,000 shares in smaller lots over the next few minutes. Yet again, however, he ends up overpaying for the shares (or not getting them at all). Why?

This time around there was no large order to race to the next exchange, but the broker was still front-run. There are three likely ways in which a high-frequency trader could sniff out a hidden order. First, the high-frequency traders could have used sophisticated pattern recognition software that detected a large order by analyzing things such as trade volume, order size, etc.⁵² Second, the high-frequency traders could have identified the broker making the trade by using a latency table.⁵³ A latency table is a table that can be used to identify traders based on how long it takes a trade to be routed to an exchange.⁵⁴ For example, if it always takes 287 microseconds for a certain broker's trade to travel between two specific exchanges, a glance at the latency table will identify the broker. Once the broker is identified, a simple look at historical trading data can help predict an incoming trading pattern.

The last and most common way high-frequency traders identify a sliced order is by repeatedly pinging the exchanges.⁵⁵ Pinging or "sniping" is a process that involves issuing hundreds of "immediate-or-cancel" orders in a matter of milliseconds.⁵⁶ An immediate-or-cancel order does exactly what you would expect: if it is not filled instantly, the order gets canceled. High-frequency traders use these orders to rapidly cycle through a wide range of orders, hoping to stumble upon a large hidden order.⁵⁷ Once an order is detected, high-frequency traders will once again trade in front of the incoming order to capture the resulting price move.⁵⁸

The speed at which all of this occurs is nearly incomprehensible. High-frequency traders place tens of thousands of orders to buy and sell per second.⁵⁹ Algorithms analyze the data these orders generate and

⁵² SEC Concept Release, *supra* note 1, at 3609.

⁵³ LEWIS, *supra* note 13, at 74. Latency tables are described by an individual interviewed by Lewis, but no information about them exists otherwise. Though again, this is highly valuable and proprietary information that HFTs would not likely divulge.

⁵⁴ *Id.*

⁵⁵ SEC Concept Release, *supra* note 1, at 3609; Korsmo, *supra* note 4, at 548.

⁵⁶ Fabozzi, Focardi & Jonas, *supra* note 12, at 25; Leis, *supra* note 15, at 24–25.

⁵⁷ Fabozzi, Focardi & Jonas, *supra* note 12, at 25; Leis, *supra* note 15, at 24–25.

⁵⁸ SEC Concept Release, *supra* note 1, at 3609; Leis, *supra* note 15, at 24–25.

⁵⁹ See, e.g., *Bad HFT Algo Blasts 2.5 Million Bogus Orders*, NANEX RESEARCH (Feb. 12, 2014), <http://www.nanex.net/aqck2/4563.html>.

rapidly take a position ahead of predicted incoming orders.⁶⁰ This all happens several times faster than you can finish reading this sentence.

B. Dark Pool Arbitrage

In response to much of the electronic front-running, some traders elected to move large trades into dark pools.⁶¹ Because dark pools do not have to report bids or offers until they are filled, the rationale was that large orders could be placed in dark pools and sit there until they were filled with no threat of being front-run by high-frequency traders.⁶² Unfortunately, this has not been the case. Several dark pools have been accused of selling access to high-frequency traders and are now facing lawsuits and regulatory action.⁶³ Once high-frequency traders have access to a dark pool, they can easily front-run trades inside. According to Brad Katsuyama, President of IEX Group, a dark pool designed to eliminate front-running, “[y]ou could front-run an order in a dark pool on a bicycle.”⁶⁴

When an investor places a large order inside a dark pool, the order should sit hidden until it is matched from within the dark pool, or it is matched with shares on an official exchange. For instance, if a broker places an order in a dark pool to buy 100,000 shares of XYZ Company at \$10.50, it should sit until the order can be filled and no one should know it is there. If 100,000 shares of XYZ Company are offered for sale at \$10.47 somewhere in the market, those shares should be matched with the buy order waiting in the dark pool. Instead, these orders are commonly filled at a price between the order and best available share price, \$10.49 for instance.

These trades, though hidden, were once again front-run by high-frequency traders. To detect hidden orders within a dark pool, high-frequency traders utilize the same “pinging” and order cancellation techniques described above.⁶⁵ Once an order has been sniffed out, the

⁶⁰ See SEC Concept Release, *supra* note 1, at 3609.

⁶¹ SCOTT PATTERSON, DARK POOLS: HIGH-SPEED TRADERS, A.I. BANDITS AND THE THREAT TO THE GLOBAL FINANCIAL SYSTEM (2012); Batista, *supra* note 28; Allen Wastler, *Dark Pools Letting Some Light in Now?*, CNBC (Jan. 28, 2013), <http://www.cnbc.com/id/100409045>.

⁶² PATTERSON, *supra* note 61; Batista, *supra* note 28.

⁶³ For example, Barclays is facing a suit that alleges they defrauded their investors by lying about HFTs having access to their dark pool. See Complaint, *Schneiderman v. Barclays Capital Inc.*, No. 451391/2014 (N.Y. Sup. Ct.); see also Chad Bray, *Credit Suisse Is Facing Inquiries Over Its ‘Dark Pool’*, NYTIMES DEALBOOK (July 31, 2014), <http://dealbook.nytimes.com/2014/07/31/credit-suisse-facing-regulatory-inquiries-over-dark-pools/>.

⁶⁴ LEWIS, *supra* note 13, at 123.

⁶⁵ See *id.* at 114–17, 228; Fabozzi, Focardi & Jonas, *supra* note 12, at 25.

high-frequency traders will sit on it, waiting for a shift in the market that would otherwise fulfill the trade,⁶⁶ such as when 100,000 shares of XYZ are offered below the \$10.50 bid price. At this moment, the high-frequency traders will race to the offered shares, buy them before the trade can be executed, and then sell them to the order waiting in the dark pool for the old, now stale, price before it can be updated.⁶⁷

At the end of the day, all methods of front-running involve HFTs beating regular investors to the punch and outrunning market orders that would otherwise be filled. These firms act as a middleman to skim pennies off of trades that would have been executed in their absence. High-frequency traders do this without providing a benefit to the marketplace,⁶⁸ such as increased liquidity, or carrying an affirmative obligation like market makers in the past.⁶⁹ This is all enabled by HFTs' speed and informational advantage.

III. INFORMATIONAL ADVANTAGE

HFT is dependent on speed; so dependent that firms are willing to pay tens of thousands of dollars to shave a couple of milliseconds off of their latency time.⁷⁰ But these HFT firms are not trying to stay ahead of institutional investors; rather they are competing against all of the other HFT firms. The two main ways HFT firms gain a speed advantage, and in turn informational advantage, is by using direct data feeds and colocation.

A. Direct v. Consolidated Data Feeds

Regulation NMS created a national consolidated data feed, also known as the Securities Information Processor ("SIP").⁷¹ This consolidated data feed takes trading data from each individual trading venue and aggregates it into a single feed that represents the NBBO.⁷² The SIP shows a real time snapshot of the U.S. equities market, and is

⁶⁶ See LEWIS, *supra* note 13, at 114–17, 228.

⁶⁷ *Id.*

⁶⁸ Harris, *supra* note 17.

⁶⁹ In the past certain traders known as "specialists" were given premier access to the marketplace, but in return they had to fulfill certain affirmative obligations. For example, most specialists were required to maintain active quotes in a certain market. If one side of a market dried up, they had to actively buy or sell for that side in order to maintain a certain level of liquidity. See *Specialist*, INVESTOPEDIA, <http://www.investopedia.com/terms/s/specialist.asp> (last visited Dec. 28, 2015).

⁷⁰ See generally LEWIS, *supra* note 13, at 62–65.

⁷¹ SEC Concept Release, *supra* note 1, at 3600–01.

⁷² See SEC Concept Release, *supra* note 1, at 3600–01; *What is a SIP?*, *supra* note 37.

used by nearly every investor.⁷³ Even more importantly, the SIP is used by regulators to determine the NBBO at any particular point in time. Additionally, the SIP is used by each registered exchange, in at least some capacity, to price trades and determine the NBBO in their market.⁷⁴

While the SIP, a consolidated feed, is certainly the most widely used, it is not the only method to observe the market in real time. The vast majority of high-frequency traders use a different aggregation method, known as direct feeds.⁷⁵ Direct feeds, as the name implies, are purchased directly from the exchanges and then aggregated by the purchaser.⁷⁶ Regulation NMS does not require exchanges to synchronize data delivery to consolidated and direct feeds, but forbids any one from providing information to a direct feed faster than the SIP.⁷⁷ In fact, the SEC recently fined the NYSE for doing just that.⁷⁸

If the exchanges are not allowed to provide data to direct feeds more quickly, why are HFT firms paying tens of thousands of dollars per month for access? Because even though direct feeds do not provide faster access, HFT firms are able to aggregate the data and create a picture of the market much faster than the SIP.⁷⁹ Exactly how much faster is still up for debate. In 2010, the SEC estimated the delay between the SIP and direct data feeds to be less than ten milliseconds.⁸⁰ However, in 2013 Nanex Research presented evidence that the true delay was in fact twenty two milliseconds, an eternity in the age of HFT.⁸¹ Even using the SEC's estimate, their findings stand in opposition of the stance taken in the case against the NYSE. In the press release, the Director of the SEC's Division of Enforcement is quoted as saying, "[i]mproper early access to market data, even measured in milliseconds, can in today's markets be a

⁷³ *The Stock Market's Perception Problem*, NANEX RESEARCH (Aug. 1, 2014), <http://www.nanex.net/aqck2/4666.html>. (The SIP has nearly 2.5 million subscribers.)

⁷⁴ *Id.*

⁷⁵ See SEC Concept Release, *supra* note 1, at 3606.

⁷⁶ Ding, Hanna & Hendershott, *supra* note 38, at 315–16.

⁷⁷ Regulation NMS Release No. 34,51808, 70 Fed. Reg. 37,496, 37,567 (June 29, 2005).

⁷⁸ Matt Krantz, *Rigged Market? SEC Busts the NYSE*, USA TODAY (May 1, 2014), <http://americasmarkets.usatoday.com/2014/05/01/rigged-market-sec-busts-the-nyse/>.

⁷⁹ *HFT Front Running, All The Time*, NANEX RESEARCH (Sept. 30, 2013), <http://www.nanex.net/aqck2/4442.html>.

⁸⁰ SEC Concept Release, *supra* note 1, at 3611.

⁸¹ *HFT Front Running*, *supra* note 79.

real and substantial advantage that disproportionately disadvantages retail and long-term investors.”⁸²

Without question, access to direct data feeds provides high-frequency traders with a distinct informational advantage.⁸³ They can get consolidated market data substantially sooner than other market participants, enabling them to engage in practices such as front-running and dark pool arbitrage.

B. Colocation

With all of the trading exchanges now being run by a bank of computer systems, and without the need for an actual trading floor, one would expect the physical locations housing the exchanges to shrink. But in fact, they have grown—some rather substantially.⁸⁴ This expansion was fueled by demand from high-frequency traders to locate their trading systems closer and closer to the exchange system.⁸⁵ The practice of housing your machine inside of an exchange, or “renting a rack,” is known as colocation.⁸⁶ The reason high-frequency traders want to be so close to the exchange server is to reduce the latency between it and their own systems—that is to reduce the time it takes for messages to travel between them.⁸⁷ Data is carried between these machines through fiber optic cables, which pass messages as rapid flashes of light. Light travels in a vacuum at 186,000 miles per second, or 186 miles per millisecond. This speed drops substantially inside a fiber optic cable, and the impact of reducing distance becomes even greater. Miles are equal to milliseconds, yards to microseconds, and feet can even be equated to nanoseconds.⁸⁸ None of these are perceptible to humans, but in the race to be first, nanoseconds begin to add up. Colocation services offer a definite and measurable competitive advantage over other market participants, and are regarded by many as a clearly unfair practice.⁸⁹

⁸² SEC Press Release 2012-189, *SEC Charges New York Stock Exchange for Improper Distribution of Market Data* (Sept. 14, 2012) (on file with author).

⁸³ Email from Sal L. Arnuk & Joseph Saluzzi, Themis Trading, to Ms. Elizabeth M. Murphy, Secretary, U.S. Sec. and Exch. Comm’n. (Apr. 21, 2010) (on file with author); *HFT Front Running*, *supra* note 79.

⁸⁴ The NYSE has grown to nearly 10 times its size when there was a physical trading floor.

⁸⁵ See generally LEWIS, *supra* note 13, at 62-65.

⁸⁶ SEC Concept Release, *supra* note 1, at 3610.

⁸⁷ Gomber et al., *supra* note 2, at 15; SEC Concept Release, *supra* note 1, at 3610.

⁸⁸ A nanosecond is one billionth of a second.

⁸⁹ Gomber et al., *supra* note 2, at 34-35; email from Arnuk & Saluzzi, *supra* note 83.

The primary argument in favor of direct data feeds and colocation is that these services are available to anyone. However, each of these services costs tens of thousands of dollars per month, per exchange.⁹⁰ The ability for exchanges to sell direct data feeds and colocation inside the exchange building creates a two-tiered market system consisting of those with the resources to purchase an informational advantage, and those without.⁹¹ Regulation NMS, which was designed to level the playing field, has instead created a marketplace with stark inequality between participants.

IV. WHY IS THIS PROBLEMATIC?

While the actions of high-frequency traders and the current equities market structure likely come across as intuitively ‘unfair,’ the real problem is much more far-reaching. Asymmetric access to information and an advantageous trade structure⁹² have resulted in a two-tiered system in which the privileged class is able to prey upon the other.⁹³ Put simply, because some firms are able to purchase faster access to market information, those who do so have a distinct advantage over those who do not. This creates a textbook two-tiered system of ‘haves’ and ‘have nots.’ The creation of a two-tiered system is, however, not the only problem resulting from HFTs and asymmetric information. Concerns have been raised about a number of issues ranging from inherent unfairness⁹⁴ to market destabilization, but a finer discussion of these problems is beyond the scope of this note.

⁹⁰ For example, the total fees for all direct data feeds on the BATS exchange amount to \$13,000 per month. Fee schedule available at http://www.batstrading.com/resources/regulation/rule_book/BZX_Fee_Schedule.pdf.

⁹¹ See Gomber et al., *supra* note 2, at 34–35; email from Arnuk & Saluzzi, *supra* note 83.

⁹² While a thorough discussion of trade structure is beyond the scope of this note, order routing protocols and most order types are both designed to be heavily in favor of HFTs. Exchanges operate in this way in order to capture the massive trade volume that HFTs generate. While no exchange will admit to favoring one type of client over another, a NYSE official did report that they are always competing for market share, and try to create products that will attract more volume. See Laurie Carver, *Exchange Order Types Prompt Fears of HFT Conspiracy*, RISK MAGAZINE (Apr. 23, 2013), <http://www.risk.net/risk-magazine/feature/2261626/exchange-order-types-prompt-fears-of-hft-conspiracy>.

⁹³ See generally Eliot Lauer, Jason Gottlieb & Alyssa Astiz, *High-Frequency Trading: Are the Exchanges the Next Targets?*, 45 SEC. REG. & L. REP. 1042 (June 3, 2013), http://www.curtis.com/siteFiles/News/curtis_lauer_gottlieb_astiz_article.pdf.

⁹⁴ After discussing the unfairness of asymmetric market information, Angel and McCabe conclude that it is not the ability to purchase better access to

The problems arising from a two-tiered system are severe, ranging from waning investor confidence to the eventual exit of certain participants from the marketplace.⁹⁵ This is especially problematic for the U.S. equities market, as a well-functioning market for securities is vital to a robust economy. As investors lose confidence in the ability to effectively compete or to have their orders filled at the anticipated price, they are less willing to take action in the market. Some will even exit the market all together, as evidenced in various empirical studies.⁹⁶ As fewer investors are willing to trade shares, the marketplace becomes more illiquid. Illiquidity directly affects the value of the underlying securities, and makes it more difficult for companies to secure a large amount of capital.⁹⁷ There is some evidence that this phenomenon has already been occurring.⁹⁸ For example, the average number of firms going public each year from 1990-2000 was 530.⁹⁹ This number has fallen to roughly 125 since 2001, a decrease of over 400%.¹⁰⁰ This has a direct and substantial effect on the economy as a whole.

Some critics claim that colocation and direct data feeds do not result in a two-tiered market system. The main argument raised is that these services are available for anyone who wishes to purchase them, and that the asymmetric information is a result of capitalism that needs no regulatory intervention.¹⁰¹ This reasoning is flawed for several reasons. First, the argument that anyone can purchase and utilize these services

information that is unfair, but rather the exploitative use of said information. “It is thus the use of the technology, rather than the technology itself, that determines fairness or unfairness.” See James Angel & Douglas McCabe, *Fairness in Financial Markets: The Case of High Frequency Trading*, (Dec. 2010) (unpublished manuscript), <http://ssrn.com/abstract=1737887>.

⁹⁵ See Stephanie Ryder, *How to Prevent Future Flash Crashes and Restore the Ordinary Investors' Confidence in the Financial Market: The Implementation of Circuit Breakers and Speed Limits to Help Enforce the Market Access Rule*, 12 J. TELECOMM. & HIGH TECH. L. 265, 281–83 (2014).

⁹⁶ See, e.g., *Computerized Trading: What Should the Rules of the Road Be?: Hearing Before the Subcomm. on Sec., Ins. and Inv. of the S. Comm. on Banking and Urban Affairs*, 112th Cong. 20 (2012) (statement of David Lauer) (on file with author) (“[T]he flight of the retail investor during a period of incredible stock market returns is a sure sign that this exodus is a result of mistrust rather than economic conditions.”).

⁹⁷ *Id.*

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ See, e.g., Holly A. Bell, *High Frequency Trading: Do Regulators Need to Control this Tool of Informationally Efficient Markets?*, CATO INSTITUTE POLICY ANALYSIS (July 22, 2013), http://object.cato.org/sites/cato.org/files/pubs/pdf/pa731_web_1.pdf.

presupposes that all parties will benefit from them equally. However, this is not the case. These very expensive marginal increases in speed are much more likely to benefit high-frequency traders, who have the ability to execute thousands of trades per day, more than average institutional investors, who use more long-term trading strategies.¹⁰²

Second, while the SEC certainly has no duty to ensure that all parties are equal, creating barriers between market participants is in direct opposition with the stated purpose of Regulation NMS.¹⁰³ In fact, the SEC has already commented on information asymmetry creating a two-tiered market system. In the proposed rule to eliminate flash orders,¹⁰⁴ the SEC said, “[t]he flashing of order information could lead to a two-tiered market in which the public does not have access, through the consolidated quotation data streams, to information about the best available prices for U.S.-listed securities that is available to some market participants through proprietary data feeds.”¹⁰⁵ While this release was focused on flash orders, the conclusions drawn by the SEC apply nonetheless. Informational asymmetries allow certain high-frequency traders to engage in predatory trading practices that take advantage of other investors who are not able or willing to pay for the same premier access to information. This two-tiered system is hazardous to the health of the equities market, and in turn to the economy as a whole.

V. POTENTIAL SEC RESPONSES

While there have been a myriad of proposed responses to the problems this type of predatory trading generates, the more promising of these can be divided into target responses, and market and regulatory reforms. Targeted responses aim solely at combating the negative effects of HFT, whereas market and regulatory reforms seek to understand and reform the underlying issues that gave rise to this type of behavior.

A. Targeted Responses

1. Redefinition in the HFT Era

One of the major issues with policing HFT abuses is the definitional divide between HFT and LFT (low-frequency trading). Front-running, for example, can be defined as trading on the basis of

¹⁰² Michael A. Goldstein, Pavitra Kumar, and Frank C. Graves, *Computerized and High-Frequency Trading*, 49 THE FIN. REV. 2, 177–202 (2014).

¹⁰³ SEC Concept Release, *supra* note 1, at 3600–01.

¹⁰⁴ Now banned, the term flash order describes a practice in which exchanges used to flash new incoming order information to users with direct feeds fractions of a second before that information was released to the public.

¹⁰⁵ Elimination of Flash Order Exception from Rule 602 of Regulation NMS, 74 Fed. Reg. 48,632, 48,634 (proposed Sept. 18, 2009).

non-public information about an upcoming trade in the same security.¹⁰⁶ To prove wrongdoing under this definition, one must show the possession of non-public information, and that a trade based on that information actually occurred. Before HFT, information was non-public if it had “not been disseminated in a manner which makes it generally available to the trading public through recognized channels of distribution.”¹⁰⁷ In the world of HFT, however, this definition breaks down. Is information public if some traders have access to it before others? Does the analysis change if everyone can assess the information simultaneously, but only by paying a fee? What if anyone can access individual pieces of information, but only by using an algorithm to consolidate the pieces can you see the whole puzzle?

The ban on front-running, and other similar prohibitions, were enacted to protect traders, but only from abuses in the manner of trading at the time. In the past decade, trading has evolved, but the definitions in these protections have not. The SEC should consider amending many of the provisions banning front-running, and other parasitic trading practices, to reflect the evolution of the equities market. However, as shown above, the SEC must be careful to strike a delicate balance between protecting investors and stifling innovation.

2. Real Time Monitoring

Another difficulty with policing predatory trading is reconstructing what actually happened in the market. An enormous amount of trading data is generated every day. For example, on January 30th, 2015, there were 5,766,661 trades executed on the NYSE.¹⁰⁸ The number of orders generated daily is in the tens of billions. Wading through all of this data is a monumental task, to say the least. Following the flash crash on May 6th, 2010, it took regulators several months to reconstruct less than an hour of trading data.¹⁰⁹ This prompted the creation of the CAT, or consolidated audit trail.

¹⁰⁶ See Exchange Act Release No. 14156, 1977 WL 190058 (Nov. 9, 1977).

¹⁰⁷ Jerry W. Markham, ‘Front-Running’ — *Insider Trading Under the Commodity Exchange Act*, 38 CATH. U. L. REV. 69, 124 (1998).

¹⁰⁸ See *Daily NYSE Group Volume in NYSE Listed, 2015*, NYSE MARKET DATA, http://www.nyxdata.com/nysedata/asp/factbook/viewer_edition.asp?mode=table&key=3141&category=3 (last visited Nov. 10, 2015).

¹⁰⁹ Gregg E. Berman, Senior Advisor to the Director, U.S. Sec. Exch. Comm’n., Speech to 11th Annual SIFMA Market Structure Conference: Market Participants and the May 6 Flash Crash (Oct. 13, 2010).

The CAT is designed to capture and consolidate all customer and order event information across all exchanges.¹¹⁰ This will, in theory, allow the SEC to more effectively regulate against illegal trading practices.¹¹¹ The final rule, passed in July of 2012, has yet to be implemented. As of February 2015, it is currently undergoing amendments concerning the “Process of Selecting a Plan Processor and Developing a Plan for the Consolidated Audit Trail.”¹¹² Having a fully constructed record of all market data will be very useful during the investigation of significant market events, but probably not so much otherwise. Even if the information is readily available, it will still be an arduous task for regulators to wade through the sheer volume of activity in the marketplace. While this is certainly a step in the right direction, the SEC should consider adding some form of real-time monitoring to the CAT. This could likely be accomplished with an algorithm (like the ones used by HFTs) designed to flag suspicious trading activity for immediate action. Real-time monitoring would increase the usefulness of the CAT, while reducing the amount of time regulators have to spend wading through the audit trail.

3. *Speed Bumps*

Another potential response is an SEC mandated speed bump. This speed bump would be an intentional delay between when orders are received and when they are executed at each of the exchanges. While speed is paramount in today’s trading environment, this delay would be on the scale of a few milliseconds or even microseconds. It would be small enough that only traders employing these HFT strategies would be affected.

A speed bump works by eliminating any advantage of getting there first, which is what allows high-frequency traders to front-run trades. A uniform delay on all trades, however, will not accomplish that goal. If an exchange were to delay all trades by, say, 0.5 seconds, HFT orders that got there first would still end up being executed first. The solution to that problem is a randomized delay. If an exchange were to implement a randomized delay that ranges from 10 to 200 milliseconds, for example, the first order to arrive at the exchange will not necessarily be the first one executed.¹¹³ This eliminates the pseudo first-mover

¹¹⁰ See Consolidated Audit Trail, Exchange Act Release No. 67457, 104 SEC Docket 748 (July 18, 2012).

¹¹¹ *Id.*

¹¹² See Joint Industry Plan, Exchange Act Release No. 74223, 2015 WL 500130 (Feb. 6, 2015).

¹¹³ Bob Pisani, *HFT: The Latest on Rebates, Taxes and 'Speed Bumps'*, CNBC (Apr. 3, 2014), <http://www.cnbc.com/id/101553264>.

advantage that HFTs gain through colocation and other informational and speed advantages. In fact, a few unofficial exchanges and dark pools have already been implementing some type of speed bump to curb HFT activity.¹¹⁴

One of the more successful dark pools, known as IEX, has used a slightly different strategy to create a speed bump. Instead of creating a randomized delay, IEX elected to eliminate the speed and information advantage HFT firms get from being physically close to the exchange servers. To do so IEX wrapped 32 miles of fiber optic cable and placed it in a box right outside the exchange.¹¹⁵ To connect to IEX, traders have to travel through these miles of cable, which creates a delay of roughly 350 microseconds.¹¹⁶ This delay gives IEX enough time to process and route trades to any exchange in the country before high-frequency traders have time to receive and act on that information.

Currently IEX operates as a dark pool, but it has plans to eventually become a registered exchange.¹¹⁷ However, there is some question about whether IEX's signature speed bump would be allowed to remain in place should it become registered.¹¹⁸ Regulation NMS, which governs the registered exchanges, contains some language that may be in conflict with an intentional speed bump. Specifically, regarding the immediate fulfillment of orders, Regulation NMS states that 'immediate,' "precludes any coding of automated systems or other type of intentional device that would delay the action taken with respect to a quotation."¹¹⁹ Despite this language, there is some speculation that the SEC will revisit that provision if IEX applies to become an official exchange, given its rising popularity as a dark pool.¹²⁰

Additionally, various countries outside of the United States have implemented speed bumps in an effort to combat predatory trading by

¹¹⁴ Barbara Shecter, *TMX Group to Install Speed Bump' to Slow HFT Traffic, Ahead of Aequitas Launch*, FINANCIAL POST (Oct. 23, 2014), <http://business.financialpost.com/2014/10/23/tmx-group-to-install-speed-bump-to-slow-hft-traffic-ahead-of-aequitas-launch/>.

¹¹⁵ LEWIS, *supra* note 13, at 178.

¹¹⁶ *Id.*

¹¹⁷ *See About IEX*, IEX, <http://www.iextrading.com/about/> (last visited Jan. 14, 2016) (IEX is an exchange aimed at preventing front-running, and is the focus of Michael Lewis's book).

¹¹⁸ John McCrank, *Exclusive: Upstart Trading Venue IEX May Prompt US Market Rule Change*, REUTERS (July 30, 2014), <http://www.reuters.com/article/2014/07/30/us-markets-regulations-iexgroup-idUSKBN0FZ09J20140730>.

¹¹⁹ Regulation NMS Release No. 34,51808, 70 Fed. Reg. 37,496, 37,534 (June 29, 2005).

¹²⁰ McCrank, *supra* note 118.

high-frequency traders. The most successful of these speed bumps has been the one implemented by the E.U. The European Parliament unanimously voted in 2012 to impose a half-second speed limit on traders using computer algorithms to execute trades.¹²¹ This limit remains in effect today, and has evidently been successful in curbing some predatory trading.

4. Order Randomization

Order randomization is an idea that has been advanced along with speed bumps. Order randomization functions by grouping orders into batches as they arrive at an exchange. Once the orders are split into smaller lots, they are randomized before being executed. The underlying logic is that the first order to arrive will not necessarily be the first one executed. While this sounds great at first glance, it does not eliminate the HFT advantage. To overcome order randomization, high-frequency traders need only submit a huge amount of orders, even more than they do currently.¹²² The orders coming in to an exchange using order randomization are broken into smaller batches that make it possible to randomize them without an impact processing speed. In other words, all orders inside a very small time window are randomized. To overcome this, high-frequency traders need only send hundreds and hundreds of orders all at the same time. The more HFT orders that get submitted, the more HFT orders make it into each batch. The law of large numbers tells us that the probability of an HFT order being executed first will eventually rise to a near certainty.

Nevertheless, order randomization still has its merits. This strategy can be effectively used in conjunction with a speed bump or other randomized delay.¹²³ This combination has shown some limited success thus far.¹²⁴

¹²¹ See Derek Klobucher, *Europe Takes Control of High-Speed Trading*, FORBES (Oct. 2, 2012), <http://www.forbes.com/sites/sap/2012/10/02/europe-takes-control-of-high-speed-trading/>.

¹²² LEWIS, *supra* note 13, at 174.

¹²³ Wanfeng Zhou & Nick Olivari, *Exclusive: EBS Take New Step to Rein in High-Frequency Traders*, REUTERS (Aug. 23, 2013), <http://www.reuters.com/article/2013/08/23/us-markets-forex-hft-idUSBRE97M0YJ20130823>.

¹²⁴ Joel Clark, *Thomson Reuters to Trial Randomization on FX Matching Platform*, EuroMoney (Mar. 25, 2014), <http://www.euromoney.com/Article/3323308/Thomson-Reuters-to-trial-randomization-on-FX-matching-platform.html> (explaining Thomson Reuters is implementing the system pioneered by EBS, who has recently rolled it out to all of their products offerings after a 6 month trial period).

5. *Order Taxation*

Order taxation is a response aimed at HFT as a whole, not specifically front-running. While such a tax could take many iterations, the general idea is that a very small tax would be placed on all trades. This tax would not have a noticeable effect on those taking long positions, but would be devastating to HFT firms who operate on very thin spreads. Order taxation has seen mixed reception, but has garnered some notable supporters in recent months, including Nobel laureate Joseph Stiglitz.¹²⁵

Despite the increased support, a flat tax on all trades is a heavy-handed approach that may even incentivize more predatory trading as legitimate HFT firms have their profit margins regulated away. In fact, some of the negative effects of a broad tax can be seen in France and Italy, who in 2012 both instituted a tax on all trades occurring in 0.5 seconds or faster.¹²⁶ While European trading volume as a whole was up 14% from 2012 to 2013, the volumes in Italy and France both fell over 10%.¹²⁷ Whether this will have a long-term impact on those markets remains to be seen.

Nevertheless, a trade tax may still prove useful. A tax designed to target only predatory trading strategies, for instance, could be useful in curbing such activity. For example, a tax that applies only on trades made above a certain order-to-trade ratio may deter activities such as quote stuffing, which have no place in a legitimate trading strategy. A tax alone, however, is unlikely to solve the issue at hand, but it could be a valuable tool in conjunction with other potential SEC responses.

B. Equities Market and Regulatory Review

1. Regulation NMS Review

Regulation NMS was intended to increase competition among the exchanges, and in doing so has resulted in a highly fragmented marketplace.¹²⁸ This fragmentation and other key provisions of Regulation NMS have created an environment rife with predatory trading

¹²⁵ See Steve Matthews, *Stiglitz Calls High-Speed Trading "Front Running," Suggests Tax*, BLOOMBERG (Apr. 15, 2014), www.bloomberg.com/news/2014-04-15/stiglitz-calls-high-speed-trading-front-running-suggests-tax.html; Nelson D. Schwartz, *'Flash Boys' Fuels More Calls for a Tax on Trading*, NY TIMES (Apr. 7, 2014), www.nytimes.com/2014/04/08/business/argument-for-financial-transaction-tax-regains-footing.html.

¹²⁶ Matt Clinch, *Italy Launches Tax on High-Frequency Trading Transactions*, CNBC (Sept. 2, 2013), <http://www.cnbc.com/id/101002422>.

¹²⁷ *Id.*

¹²⁸ See Korsmo, *supra* note 4.

activity.¹²⁹ The intention behind Regulation NMS was sound, but as the market has evolved, so must its regulations. Many market participants, including institutional investors, exchanges, and SEC officials, have called for a review of Regulation NMS.¹³⁰ Echoing the thoughts of many, SEC member Luis Aguilar has called for regulators to review “whether Regulation NMS has created too much fragmentation and fostered an unreliable complexity in markets.”¹³¹

The key Regulation NMS provision under fire is the Trade Through Rule. As mentioned above, this rule requires brokers to accept the lowest (or highest) price available when purchasing (or selling) a stock, regardless of the exchange it is on.¹³² It does not allow them to “trade through” on a single marketplace at an inferior price.¹³³ These rules were designed to protect investors from brokers making unsavory deals not in their best interest, but in reality, they have forced brokers to split up orders and route them to multiple exchanges, which has made it easier for HFT firms to front-run their trades.¹³⁴ Many have called for a review of the current trade through rule, most notably among them SEC Commissioner Dan Gallagher,¹³⁵ who has said, “I believe the trade-through rule is a prime example of regulatory distortion of market competition.”¹³⁶ A reconsideration of this rule may allow investors to consider when the costs of taking an inferior price outweigh the risks of being front-run by high-frequency traders. Overall, a comprehensive review of Regulation NMS would go a long way in repairing the current market environment that allows predatory traders to thrive.

¹²⁹ See LEWIS, *supra* note 13.

¹³⁰ See Stephanie Russell-Kraft, *Futures Industry Group Calls On SEC To Simplify Reg NMS*, LAW360 (Jan. 28, 2015), <http://www.law360.com/articles/615995/futures-industry-group-calls-on-sec-to-simplify-reg-nms>; Sarah N. Lynch, *SEC Official Calls for Review of 'Reg NMS' Equity Market Rules*, REUTERS (Dec. 5, 2013), <http://www.reuters.com/article/2013/12/05/sec-aguilar-regnms-idUSL2N0JK1IW20131205>; Stephanie Russell-Kraft, *BATS Exchange Calls On SEC, Industry To Reform Markets*, LAW360 (Jan. 6, 2015), <http://www.law360.com/articles/608827/bats-exchange-calls-on-sec-industry-to-reform-markets>.

¹³¹ Lynch, *supra* note 130.

¹³² SEC Concept Release, *supra* note 1, at 3601.

¹³³ *Id.*

¹³⁴ Matt Levine, *SEC Will Keep Thinking About High Frequency Trading*, BLOOMBERGVIEW (June 5, 2014), <http://www.bloombergtview.com/articles/2014-06-05/sec-will-keep-thinking-about-high-frequency-trading>.

¹³⁵ Ivy Schmerken, *SEC Commissioner Urges Agency to Reform Equities & Fixed Income Markets*, INFORMATIONWEEK (Sept. 18, 2014), <http://www.wallstreetandtech.com/compliance/sec-commissioner-urges-agency-to-reform-equities-and-fixed-income-markets/d/d-id/1315855>.

¹³⁶ *Id.*

2. Structural Reform

While the responses above have shown some limited success, the best way for the SEC to curb front-running and other predatory trading practices by high-frequency traders is to implement broad reforms to the current market structure. While a Band-Aid fix may temporarily resolve the problem, the best practice would be to revisit the regulations and market evolutions that allowed these activities to arise in the first place. The first, most troublesome issue that the SEC should consider is that regulated exchanges are catering to HFT firms at the expense of every other investor.¹³⁷ The exchanges are selling faster access to information in the form of direct data feeds and colocation services. Allowing some users to pay for faster access to information has resulted in a textbook two-tiered marketplace, with HFT firms at the top and everyone else at the bottom.¹³⁸

The biggest divide between high-frequency traders and traditional investors is the use of direct versus consolidated data feeds. Direct data feeds provide a picture of the current market several times faster than the consolidated feed, which in the era of lightning fast electronic trading, may as well be an eternity.¹³⁹ SEC Chairwoman Mary Jo White recognizes the disparity between the consolidated feed, or SIP, and direct feeds, and plans to “continue efforts to minimize latency.”¹⁴⁰ She also plans to ask the exchanges to include a timestamp on consolidated trade data, which will allow investors using the SIP to judge exactly how delayed that data is, and to determine if the SIP fits their informational needs.¹⁴¹ While more transparency is always good, making the shortcomings of the SIP more identifiable does not change the fact that investors either have to settle for slow information or else pay tens of thousands of dollars per month for faster access. The only real solution to the problem is for the SEC to either spend the substantial amount of money it would take to eliminate the sizeable gap between the SIP and direct feeds, or to prohibit exchanges from selling raw data entirely.

¹³⁷ Email from Sal L. Arnuk and Joseph Saluzzi, Themis Trading, to Ms. Elizabeth M. Murphy, Secretary, Sec. and Exch. Comm’n. (Apr. 21, 2010) (on file with author).

¹³⁸ *Id.*

¹³⁹ *HFT Front Running, All The Time*, NANEX RESEARCH (Sept. 30, 2013), <http://www.nanex.net/aqck2/4442.html>.

¹⁴⁰ Mary Jo White, Chairwoman, U.S. Sec. Exch. Comm’n., Enhancing our Equity Market Structure, Address to Sandler O’Neill & Partners, L.P. Global Exchange and Brokerage Conference (July 5, 2014).

¹⁴¹ *Id.*

Colocation, while a part of the same issue, is a slightly more difficult problem to solve. If you cease to allow HFT firms to locate their servers inside the exchange building, they will just move them across the street to a private location as close to the exchange as possible. The only way to prevent the inevitable battle for real estate is to mandate that anyone who wants to connect to these exchanges must do so from a specified point of contact. While this idea may seem outlandish, it is not entirely without precedent. The SEC allowed the NYSE to force anyone who did not want to pay for colocation to connect at a specified location. The SEC could solve the colocation problem by instituting a similar requirement, just in reverse. Anyone who wants access to these exchanges must connect from this place. That would effectively eliminate the problem of colocation.

The last potential reform to be considered is one that would limit the ability of high-frequency traders to use predatory trading practices. This is known as a negative trading obligation. Negative trading obligations are nothing new, and have been a requirement for various classes of traders in the past.¹⁴² The most practical of these proposed obligations is a maximum order-to-trade ratio. As discussed before, one way HFT firms detect a large incoming trade is by submitting massive amounts of orders, in the hope that one of these collides with a hidden order. A maximum order-to-trade ratio would curb this practice by forcing HFT firms to maintain a certain amount of executed trades per order, and barring them from submitting hundreds of orders which they never intend to fill. Of course, this limit could have the potential side effect of “reducing market participants' ability to react to market exogenous events, but there is always a trade off between tighter regulation and market efficiency.”¹⁴³

In January 2015, the SEC announced the creation of a “new Equity Market Structure Advisory Committee, which will focus on the structure and operations of the U.S. equities markets.”¹⁴⁴ This committee is comprised of experts from different areas of the financial services industry, but there have been some questions about the impartiality of their selection. Most notably, Nobel laureate Joseph Stiglitz had his nomination blocked after making public his views on HFTs.¹⁴⁵ Despite

¹⁴² *Id.* (discussing negative trading obligations on market-makers in the manual trading day).

¹⁴³ Leis, *supra* note 15, at 75.

¹⁴⁴ Press Release, Sec. Exch. Comm'n., SEC Announces Members of New Equity Market Structure Advisory Committee (Jan. 13, 2015), http://www.sec.gov/news/pressrelease/2015-5.html#.VOzILLPF_t9.

¹⁴⁵ Dave Michaels, *Stiglitz Blocked from SEC Panel After Faulting Speed Traders*, BLOOMBERG (Jan. 5, 2015), <http://www.bloomberg.com/news>

the concerns about its composition, this committee is a promising first step toward a reevaluation of the current equities market structure that has resulted in a harmful two-tiered marketplace.

CONCLUSION

In the past decade the U.S. securities market has undergone drastic changes due to the exponential growth of technology. These technological advances have enabled us to trade more quickly and efficiently than ever before. However, some high-frequency traders are leveraging the technological and informational advantages created by a two-tiered marketplace to prey on other investors. These high-frequency traders are paying for expensive services like colocation and direct data feeds that give them an information and speed advantage that can be used to front-run the trades of institutional investors. This informational asymmetry has resulted in a two-tiered system in which the privileged class is receiving market information before everyone else. High-frequency traders are using this premier access to information to prey on institutional investors. By jumping in front of these orders, high-frequency traders enact a pseudo-tax on other investors without providing any benefit in return. The SEC has acknowledged the need to curtail predatory trading such as front-running and has multiple options to consider. A band-aid fix aimed exclusively at front-running, such as a speed bump or order randomization, could be very effective in the short term. However, the U.S. equities market would be much better served if the SEC committed itself to a structural reform and examined the regulations and market structure that have created an environment that is so hospitable to predatory trading.