

REGULATING HIGH-FREQUENCY TRADING: AN EXAMINATION OF U.S. EQUITY MARKET STRUCTURE IN LIGHT OF THE MAY 6, 2010 FLASH CRASH

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INTRODUCTION

The market structure for U.S. equities has changed dramatically over the past few years. A mere decade ago, the majority of stock trades were handled manually on the floor of the exchange where the stock was listed. However, advances in technology and regulatory reforms have drastically changed the landscape of trading. Today, the vast majority of stock orders are executed by highly automated trading systems that use complex algorithms to make trading

decisions at lightning speed.¹ As a result, trade execution time is now measured in fractions of a second² and share volume has ballooned.³

Most notably, the current equity market structure has given rise to a new and growing phenomenon called high-frequency trading. By some estimates, high-frequency trading now accounts more than half of total trading volume in U.S. equities.⁴ As such a significant part of the current market structure, government regulators and even members of congress have begun to question the risks posed by proprietary trading firms that engage in high-frequency trading strategies (“HFT firms”) and the need, if any, to regulate such traders.⁵ This paper will analyze this new breed of proprietary trading firm and argue that their practices are detrimental to the health of our equity markets and therefore should be regulated.

This paper is broken into several parts. Part I of this paper will provide a brief explanation of high-frequency trading and point out several firms that implement high-frequency trading strategies. Part II will discuss one popular strategy—market making/rebate trading—used by high-frequency traders to generate profits. It will also explore certain regulatory changes and services offered by trading centers that have enabled high-frequency traders to successfully engage in this strategy. Part III will argue that high-frequency traders and the services they use do in fact pose a substantial threat to long-term investors and the financial system at large. Part IV will then analyze steps regulators have taken to curb the negative effects of high-frequency trading, while Part V will suggest additional reforms regulators should

¹ See Mary L. Schapiro, Chairman, Sec. & Exch. Comm’n, Speech at the Economic Club of New York: Strengthening Our Equity Market Structure (Sept. 7, 2010), *available at* <http://www.sec.gov/news/speech/2010/spch090710mls.htm> (“Today, proprietary trading firms play a dominant role by providing liquidity through the use of highly sophisticated trading systems capable of submitting many thousands of orders in a single second. This transformation of market structure has raised serious questions and concerns.”) [hereinafter Schapiro, Strengthening Our Equity Market Structure].

² See SEC Concept Release on Equity Market Structure, 75 Fed. Reg. 3594, 3595 (Jan. 14, 2010) (“NYSE’s average speed of execution for small, immediately executable (marketable) orders was 10.1 seconds in January 2005, compared to 0.7 seconds in October 2009.”).

³ See *id.* (“Consolidated average daily share volume in NYSE-listed stocks was 2.1 billion shares in 2005, compared to 5.9 billion shares (an increase of 181%) in January through October 2009.”).

⁴ See *id.* at 3606 & n.67 (“Estimates of HFT volume in the equity markets vary widely, though they typically are 50% of total volume or higher”); IRENE ALDRIDGE, HIGH-FREQUENCY TRADING: A PRACTICAL GUIDE TO ALGORITHMIC STRATEGIES AND TRADING SYSTEMS 1 (2010) (“According to a February 2009 report from Aite Group, high-frequency trading now accounts for over 60 percent of trading volume coming through the financial exchanges.”).

⁵ See, e.g., SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3606 (discussing in detail and requesting comment on high-frequency trading); Letter from Senator Edward E. Kaufman to Mary L. Schapiro, Chairman, Sec. & Exch. Comm’n (Aug. 21, 2009) [hereinafter Kaufman Aug. 21, 2009 Letter] (on file with author) (requesting that the SEC look into high-frequency trading practices); *Sen. Ted Kaufman Addresses High-Frequency Trading*, TRADERS MAGAZINE, Mar. 24, 2010, <http://www.tradersmagazine.com/news/ted-kaufman-high-frequency-trading-105420-1.html>.

consider to adequately protect long-term investors and ensure the safety of our financial system. Part VI will conclude.

I. HIGH FREQUENCY TRADING

High-frequency trading is a form of algorithmic and quantitative trading.⁶ Although the term “high-frequency trading” does not have a settled definition, “[i]t typically is used to refer to professional traders acting in a proprietary capacity that engage in a number of strategies that generate a large number of trades on a daily basis.”⁷ Firms that engage in high-frequency trading, which may be organized as boutique proprietary trading firms, hedge funds, or proprietary trading desks at multi-service broker-dealers,⁸ are often referred to as high-frequency trading firms (“HFT firms”).

In January 2010, the U.S. Securities and Exchange Commission (“SEC”) issued a Concept Release on Equity Market Structure (“Concept Release”) requesting public comment on a number of equity market structure issues, including the sudden and rapid growth of high-frequency trading. In the Concept Release, the SEC listed five characteristics often associated with HFT firms:

- 1) “use of extraordinarily high-speed and sophisticated computer programs for generating, routing, and executing orders;”
- 2) “use of co-location services and individual data feeds offered by exchanges and others to minimize network latencies;”
- 3) “very short time-frames for establishing and liquidating positions;”
- 4) “the submission of numerous orders that are cancelled shortly after submission;”
and
- 5) “ending the trading day in as close to a flat position as possible (that is, not carrying significant, unhedged positions overnight).”⁹

High-frequency trading has quickly become a significant component of the current equity market structure. It is not unusual for a single HFT firm to execute several million trades in a

⁶ See ALDRIDGE, *supra* note 4, at 23-24. Quantitative trading “refers to making portfolio allocation decisions based on scientific principles. These principles may be fundamental or technical or can be based on simple statistical relationships.” *Id.* at 23.

⁷ SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3606.

⁸ *See id.*

⁹ *Id.*

single day.¹⁰ By some estimates, high-frequency trading now accounts for over 70% of the daily volume in U.S. equity markets.¹¹

High-frequency trading has also produced enormous profits for some trading firms and their managers. In 2008 alone, for example, high-frequency trading generated an estimated \$21 billion in profits.¹² Well-known hedge funds engaged in high-frequency trading strategies include Jim Simmon's Renaissance Technologies¹³ and Ken Griffen's Chicago-based Citadel Investments.¹⁴ In 2009, these two hedge fund managers personally took home \$2.5 billion and \$900 million, respectively, as their cut of fund profits.¹⁵

II. HIGH-FREQUENCY MARKET MAKING/REBATE TRADING

While there are numerous high-frequency trading strategies, this paper will focus on one type of strategy that poses a substantial threat to the health and viability of the equity markets. Through a strategy known as market making/rebate trading, HFT firms have largely replaced traditional liquidity providers¹⁶ in the equity markets. Advances in computing technology, regulatory reforms, and the availability of certain services offered by trading centers have enabled HFTs to successfully enter the market making business. This section will first discuss how profits are generated from a market making and rebate trading strategy. Second, this section will describe two services offered by trading centers that have given HFT firms time, place, and informational advantages historically enjoyed only by traditional liquidity providers. Finally, this section will briefly explore several regulatory changes that have enabled HFT firms to

¹⁰ See generally Charles Wallace, *What's Fueling Stocks' Late-Day Price Swings* (June 4, 2010), <http://www.dailyfinance.com/story/nyse/are-high-frequency-traders-causing-the-huge-price-swings-in-stoc/19502653/>.

¹¹ See Randall Dodd, *Opaque Trades*, FIN. & DEV., Mar. 2010, at 27, available at <http://www.imf.org/external/pubs/ft/fandd/2010/03/pdf/dodd.pdf> ("Today, [high-frequency trading] generates an estimated 73 percent of the total trading volume on U.S. stock markets and about 20 percent at options exchanges.").

¹² *Id.*

¹³ See generally, SCOTT PATTERSON, *THE QUANTS 107* (2010) ("Renaissance's flagship Medallion fund, launched in the late 1980s, is considered by many to be the most successful hedge fund in the world. Its returns, at roughly 40 percent a year over the course of three decades, are by a wide margin unmatched in the investing world. By comparison, before the recent stock market implosion, Warren Buffet's storied Berkshire Hathaway averaged an annual return of about 20 percent.")

¹⁴ See Peter Cohan, *Rigged Market: How Latency Arbitrage Picks \$3 Billion a Year From Your Pockets*, Jun. 5, 2010, <http://www.dailyfinance.com/story/investing/rigged-market-latency-arbitrage-3-billion/19503388/>. See also Michael Peltz, *Man Vs. Machine: Inside the World of High-Frequency Trading*, Sept. 13, 2010, <http://classic.cnn.com/id/39099331/page/4/>.

¹⁵ Barry Ritholtz, *Top 10 Hedge Fund Managers 2009 Salary*, Apr. 1, 2010, <http://www.ritholtz.com/blog/2010/04/top-10-hedge-fund-managers-2009-salary/>. See generally, PATTERSON, *supra* note 13, at 108-17 for a history on Jim Simons and Renaissance Technologies.

¹⁶ Traditional liquidity providers include exchange specialists and other registered market makers as well as over-the-counter (OTC) market makers.

compete with traditional liquidity providers.

A. Making Markets

Under the current market structure, market makers—whether they be HFT firms or traditional liquidity providers—generate revenue in two ways: (1) trading across the bid-ask spread and (2) earning any liquidity rebates offered by trading centers.¹⁷

1. *Capturing the Bid-Ask Spread*

The first way market makers generate revenue from their trading activities is by capturing the bid-ask spread. To capture the bid-ask spread market makers buy a stock at the bid price and sell it at the offer price. To do this, market makers typically place non-marketable resting orders¹⁸ (bids and offers) on the order book and wait for them to be executed against by incoming marketable orders.¹⁹ In the U.S. equity markets, orders are executed based on price-time priority. Under price-time priority, the national best bid or offer (NBBO) is executed before all other inferior bids and offers. When there are multiple bids or offers on the order book at the same price, the first order to have arrived on the order book—i.e. first in time—takes priority.

To illustrate how an HFT firm might profit from the bid-ask spread, consider the following example:

HFT firm “A” places a non-marketable bid on the order book to purchase 100 shares of XYZ stock at \$20.00 per share. A also places a non-marketable offer on the order book to sell 100 shares of XYZ at \$20.01 per share. Moments later, investor “B” submits a marketable order to sell 100 shares of XYZ and investor “C” submits a marketable order to buy 100 shares of XYZ. If A’s bid to buy at \$20.00 per share is the national best bid and is first in line for execution, then B’s order will execute against A’s quote and A will add B’s 100 shares to its inventory at a price of \$20.00 per share. Likewise, if A’s offer to sell at \$20.01 is the national best offer and is first in line for execution, then C’s order will execute against A’s quote and A will sell C 100 shares from its inventory (or sell short if no inventory) at a price of \$20.01 per share. Overall, from these two transactions alone, A has made a profit of \$1 (\$20.01 x 100 received from C less \$20.00 x 100 given to B). If A can replicate this strategy thousands of times per day, five days a week, 52 weeks a year, A stands to generate a large profit.

Thus, because order execution is based on price-time priority, HFT firms engaged in market making strategies compete with traditional liquidity providers, and each other, in being

¹⁷ See SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3607.

¹⁸ Non-marketable orders are limit orders to buy at a price lower than the current offer, or limit orders to sell at a price higher than the current bid.

¹⁹ A marketable order is either (1) a market order or (2) a limit order at a price equivalent to the current bid (if a sell order) or offer (if a buy order).

first to quote the NBBO. Therefore, the ability to place orders quickly (at least quicker than competitors) at the best price is essential to the operation of a successful market making strategy.

2. Earning Liquidity Rebates

A second way market makers generate revenue is by earning liquidity rebates offered by many trading centers.²⁰ Most exchanges and some electronic communications networks (ECNs)²¹ operate what is called a “make-or-take” pricing model.²² Under the make-or-take model, trading centers charge “liquidity takers” an access fee (typically three-tenths of a penny per share) and give “liquidity makers” a rebate (typically two-tenths of a penny per share).²³ Liquidity takers are those who submit marketable orders that fill against resting limit orders. Liquidity makers are those who submit resting limit orders to be executed against by liquidity takers. Trading centers profit from the difference between the access fees charged to liquidity takers and the liquidity rebates given to liquidity makers, typically one-tenth of a penny per share.²⁴ Trading centers use the make-or-take pricing model to incentivize liquidity providing firms to post additional liquidity on their respective order books which, in turn, attracts additional order flow. To illustrate how an HFT firm might profit from liquidity rebates, consider the following example:

Assuming the same facts as the previous example, further assume that the transactions occurred over a trading center that uses the make-or-take pricing model. Under such a scenario, HFT firm “A” will receive a liquidity rebate for any of its non-marketable bids or offers that are executed against by incoming marketable orders. Thus, based on a liquidity rebate of two-tenths of a penny per share, A will receive a rebate of 20 cents for the 100 shares of liquidity it provided to B and 20 cents for the 100 shares of liquidity it provided to C, for a total rebate of 40 cents. B and C will each be charged an access fee of 30 cents (based on an access fee of three-tenths of a cent per share), for a total of 60 cents. The trading center that facilitated the trade will keep the difference between the access fees received from B and C and the liquidity rebate paid to A—in this case, 20 cents.

Theoretically, if transaction costs are low enough, HFT firms engaged in rebate trading can generate a profit by buying and selling at the same price, as long as their limit orders were

²⁰ HFT firms generated an estimated \$3.7 billion from liquidity rebates in 2008. *See* Dodd, *supra* note 11, at 27.

²¹ *See generally*, SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3599 (stating “ECNs are regulated as alternative trading systems” and providing additional information on ECNs).

²² *See* JAMES J. ANGEL ET AL., EQUITY TRADING IN THE 21ST CENTURY 42 (Feb. 23, 2010), *available at* <http://www.sec.gov/comments/s7-02-10/s70210-54.pdf>.

²³ *See generally* Letter from Senator Edward E. Kaufman to Mary L. Schapiro, Chairman, Sec. & Exch. Comm’n (Aug. 5, 2010), at 5-6 (on file with author).

²⁴ *See* ANGEL ET AL., *supra* note 22, at 42

non-marketable at the time they were placed. Because liquidity providers only earn liquidity rebates if their resting limit orders are executed against, they strive to be the first to provide liquidity at the NBBO.²⁵

B. Use of Speed Enhancing Services

Speed is at the heart of every high-frequency trading strategy, including market making/rebate trading strategies.²⁶ Being faster than traditional liquidity providers and other HFT Firms is the key to unlocking virtually riskless profits. Under current order execution rules (price-time priority), the fastest trader willing to quote at the NBBO can all but ensure that his bids and offers are first in line for execution to capture the spread and any liquidity rebates offered. This section will discuss two services widely used by HFT firms to obtain, process, and trade on information faster than competitors—co-location services and direct trading center data feeds.²⁷ However, this section will first discuss the importance of network speed to HFT firms. The following section will discuss concerns some market participants have with the use of these services.

1. *The Need for Speed*

As a market maker, it is always good to be the first in line to receive information. This is because, “given the very small bid-ask spreads that characterize most markets, dealing [i.e. market making] is only profitable to the extent that dealers [i.e. market makers] can anticipate future price changes.”²⁸ Market makers who receive certain information before others have the ability to anticipate future price changes. They can engage in what is called latency arbitrage—“the buying and selling of equities based on small price changes that have not yet been broadly

²⁵ Recall that under price-time priority, the order of execution is first arranged by price (best to worst) and then by time (first to last).

²⁶ As explained in the SEC’s Concept Release, HFT Firms depend on speed in several different areas: (1) “speed of market data delivery from trading center servers to the servers of the proprietary firm,” (2) “speed of decision processing of trading engines of the proprietary firm,” (3) “speed of access to trading center servers by servers of the proprietary firm,” and (4) “speed of order execution and response by trading centers.” SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3610.

²⁷ Another service commonly used by HFT firms to trade faster is known as “direct market access,” “sponsored access,” or “naked access.” For more information on direct market access see SEC Proposal for Risk Management Controls for Brokers or Dealers with Market Access, 75 Fed. Reg. 4007 (Jan. 26, 2010). The SEC implemented rules regulating direct market access on November 15, 2010. *See* Risk Management Controls for Brokers or Dealers with Market Access, 75 Fed. Reg. 69792 (Nov. 15, 2010).

²⁸ ANGEL ET AL., *supra* note 22, at 48. Historically, exchange specialists were given a first “look” at incoming orders which enabled them to somewhat predict the direction of the market and adjust their bid and ask quotes accordingly. *See* Order Granting Accelerated Approval to a Proposed NYSE Rule Change Creating a Designated Market Maker, Exchange Act Release No. 58845 (Oct. 24, 2008), *available at* <http://www.sec.gov/rules/sro/nyse/2008/34-58845.pdf> [hereinafter Designated Market Maker Release].

recognized due to the varying speeds of market data delivery systems.”²⁹

Latency arbitrage is not anything new. After the American Revolutionary War, for instance, bonds that had been used to fund the war were trading at very low prices because many expected that the government would default on the bonds. However, after the federal government passed the Funding Act of 1790, which guaranteed all debts of the federal government and the states, these bonds became valuable again. George Washington instructed sailors to sail down the coast to inform bondholders of the good news. However, several New Yorkers learned of Washington’s plans to notify bondholders and quickly jumped on their horses to run ahead of the sail boats. Because the New Yorkers were faster than Washington’s messengers, they were able to buy the valuable bonds from many uninformed investors for pennies on the dollar shortly before the messengers arrived.³⁰

Like in the example above, in the current equity market structure, liquidity providers that can receive, process, and trade on information faster than their competitors will be better able to anticipate and act on imminent price changes and therefore generate greater profits. In fact, trading speed has become so important to profits that some traders have gone to great lengths to shave milliseconds of network latency. For instance, high-frequency trader, Daniel Spivey, and legendary Netscape founder, Jim Barksdale, have created a company called Spread Networks to build an estimated \$300 million dollar high-speed fiber cable between Chicago and New York.³¹ To maximize transmission speed, the company is attempting to lay the fiber cable in a straight line (as the crow flies) between the two cities—even burrowing through granite rock where necessary. The company plans to lease the cable to traders that can profit from the latency reduction that the cable provides—approximately 3 milliseconds.

2. Co-location Services

As indicated above, speed is important to HFT firms, “both in the absolute sense of achieving very small latencies and in the relative sense of being faster than competitors, even if only by a microsecond.”³² One factor that determines the amount of latency in receiving and transmitting information is distance. Because electronic messages can only travel as fast as the speed of light (186,282 miles per second), the laws of physics dictate that the further an

²⁹ Ralph Frankel, *The Un(?)Fair Advantage of Latency Arbitrage*, July 24, 2009, http://www.securitiestechologymonitor.com/issues/19_100/-23732-1.html.

³⁰ See DAVID J. LEINWEBER, *NERDS ON WALL STREET: MATH, MACHINES, AND WIRED MARKETS* 51 (2009).

³¹ Christopher Steiner, *Wall Street’s Speed War*, *FORBES*, Sept. 27, 2010, at 24.

³² SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3610.

electronic message must travel, the longer it will take. Hence, a trader in San Francisco will receive the latest market information from the New York Stock Exchange (NYSE), located 2,563 miles away, approximately 14 milliseconds (fourteen-thousandths of a second) later than a trader in New York. In a world where HFT firms have begun to measure latency in microseconds (one-millionth of a second), this is practically an eternity.

To reduce latency resulting from sheer distance, many HFT firms purchase co-location services offered by many trading centers. Co-location enables market participants to place their servers in close proximity to a trading center's own servers.³³ As explained in the Concept Release, this “helps minimize network and other types of latencies between the matching engine of trading centers and the servers of market participants.”³⁴

With the rise of high-frequency trading, co-location has become a large revenue producer for exchanges and other trading centers. Trading centers that offer co-location services now include, among others, the NYSE, NASDAQ, CME, London Euronext, Tokyo Stock Exchange, and Globex.³⁵ The NYSE is currently constructing a 400,000-square-foot building in Mahwah, New Jersey that is “expected to house several football fields of cutting-edge computing equipment for hedge funds and other firms that engage in high-frequency trading.”³⁶ It is also building a similar facility near London that will serve traders wanting quick access to overseas markets.³⁷

Those who oppose co-location services claim that they give the privileged few—those with deep pockets—an advantage over the general investing public. These critics argue that co-location services are unfair and create a two-tiered market system where those in the first-tier—those with access to co-location services—are able to receive and trade on public information first. This controversy is discussed in greater detail below.

3. *Direct Trading Center Data Feeds*

Another way HFT firms reduce latency is by subscribing to direct data feeds offered by

³³ See SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3610. See also, LEINWEBER, *supra* note 30, at 72 (stating “You can rent a parking space for your execution computer right next to the market center computers, eliminating communication latency.”).

³⁴ SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3610.

³⁵ See LEINWEBER, *supra* note 30, at 72.

³⁶ Scott Patterson & Serena Ng, *NYSE's Fast-Trade Hub Rises Up in New Jersey—Big Board Points to Its Future as Critics See Systemic Risk*, THE WALL STREET JOURNAL, July 30, 2009, at C1.

³⁷ See *id.*

many trading centers.³⁸ Direct data feeds communicate important information about a particular trading center, such as its best-priced quotations and trades as well as the presence and size of inferior-priced orders on its order book (depth-of-book information).³⁹ To subscribe to these direct data feeds, market participants must pay a fee to trading centers, which can be quite costly.

Similar information (excluding depth-of-book information) is widely available to the public at low or zero cost via consolidated market data feeds, as required by Regulation NMS.⁴⁰ However, the information contained in direct data feeds generally reaches market participants faster than the same information in consolidated data feeds.⁴¹ This is due to the extra step required to route the information contained in direct data feeds to a central processor for consolidation before it distributed to the public.⁴² This consolidation process, on average, adds nearly 10 milliseconds of latency to consolidated data feeds.⁴³

The controversy surrounding the use of direct data feeds stems from this latency difference. HFTs that can afford to purchase direct data feeds, and who generally have the sophisticated equipment to take advantage of this latency, can effectively front-run traders who rely on the consolidated data feeds—much like those with horses outpaced George Washington’s messengers to purchase war bonds on the cheap. While it is illegal for registered market makers, which have certain structural time and place advantages, to front-run customer orders, HFTs are effectively allowed to do so. As one observer explained:

To ensure fairness, all trades are to be based on the pricing of the National Best Bid and Offer (NBBO). But the exchanges publish NBBO separately (and more slowly) than raw price feeds. Technology has gotten so good that by aggregating raw prices it’s possible to come up with your own proprietary “best bid and offer” figure before the NBBO itself comes in. These differences in price represent an arbitrage opportunity.⁴⁴

C. Regulatory Reforms: Making Way for High-Frequency Market Makers

Regulatory reforms over the past thirty years have created the ideal market structure for HFT Firms. This section will give a brief history of several important regulatory changes and will provide a brief overview of the regulatory landscape in which HFT firms operate. Specifically, this section will attempt to illustrate how these changes have allowed HFT firms to

³⁸ Direct data feeds are also often referred to as “raw data feeds” or “individual data feeds.”

³⁹ See SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3611.

⁴⁰ See Rule 602 of Regulation NMS, 17 CFR 242.611.

⁴¹ See SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3611.

⁴² See *id.*

⁴³ See *id.*

⁴⁴ Frankel, *supra* note 29.

successfully compete with traditional liquidity providers.

In 1975, Congress added Section 11A to the Securities Exchange Act of 1934 which directed the SEC to establish a national market system for securities in accordance with specified findings and objectives.⁴⁵ Congress envisioned the establishment of a fragmented national market system composed of multiple competing markets linked through technology—as opposed to a centralized market system where all securities would be traded on a single exchange. It “determined that promoting competition among trading venues and giving as many market makers as possible an opportunity to provide liquidity in stocks would promote greater liquidity and price continuity than a single dominant trading venue.”⁴⁶

In an effort to establish the national market system envisioned by Congress, the SEC has adopted several rules over the past few years. Many of these rules have greatly diminished the role of traditional liquidity providers while paving the way for HFT firms. In 1996, for example, the SEC adopted order handling rules which included a “Display Rule” requiring traditional liquidity providers “to display the price and full size of customer limit orders when these orders represent buying and selling interest that is at a better price than a specialist's or OTC market maker's public quote.”⁴⁷ This rule effectively enabled the general public to take part in setting bid-ask quotes and therefore provide improved pricing and narrower spreads. In short, it afforded all market participants an opportunity to be first in line for execution on a particular exchange by submitting a limit order that was priced better than a traditional liquidity provider's quote. It gave unregulated traders a way to compete with the quasi-monopolistic traditional liquidity providers in providing the best-priced liquidity to investors in a given trading venue.

Almost a decade later, in 2005, the SEC adopted Regulation NMS. Among other things, Regulation NMS included a “Trade-through Rule” which currently “prevents the execution of

⁴⁵ The objectives set forth in Section 11A to guide the SEC in establishing a national market system are: (1) economically efficient execution of transactions; (2) fair competition among broker-dealers, among exchanges, and between exchanges and other markets; (3) ready availability of quotation and transaction information to broker-dealers and investors; (4) the ability of broker-dealers to execute orders in the best market; and (5) an opportunity, consistent with the other goals, for investors to execute orders without the participation of a dealer. *See* Section 11A of the Sec. Exch. Act of 1934.

⁴⁶ U.S. COMMODITY FUTURES TRADING COMM'N & U.S. SEC. & EXCH. COMM'N, PRELIMINARY FINDINGS REGARDING THE MARKET EVENTS OF MAY 6, 2010, at app. A – 1 (May 18, 2010), *available at* <http://www.sec.gov/sec-cftc-prelimreport.pdf> [hereinafter PRELIMINARY FINDINGS].

⁴⁷ Order Execution Obligations, Exchange Act Release No. 34-37619A, at 5 (Sept. 6, 1996), *available at* <http://www.sec.gov/rules/final/37619a.txt>. *See also* Mark Borrelli, Market Making in the Electronic Age, 32 LOY. U. CHI. L.J. 815, 849 (2001).

trades at prices that are inferior to a displayed and immediately accessible quotation on another trading venue.”⁴⁸ The Trade-through Rule has had a significant impact on the equities markets. It has had the effect of linking all trading centers together into a national market system by providing the assurance that “quotations that are displayed at one trading center will not be bypassed by trades with inferior prices at any trading center in the national market system.”⁴⁹ Furthermore, because the Trade-through Rule requires trading centers to either cancel or route inferior priced orders to venues with better prices, it has resulted in a highly competitive marketplace where trading centers vigorously compete with one another for order flow. Trading centers do this by offering services and rebates that will encourage traders to provide added liquidity and therefore attract additional order flow to their venues. In short, the Trade-through Rule allows HFT firms to effectively compete with other market participants, including traditional liquidity providers, in providing liquidity to investors.

In summary, nowadays, “[l]iquidity on equities exchanges and ECNs is derived from orders to buy or sell securities as well as quotations submitted by members of an exchange that are registered as market makers.”⁵⁰ Thus, to ensure priority of execution, HFT firms need only be first to quote at the NBBO.

III. RISKS POSED BY HFT FIRMS

As such a significant and growing part of the U.S. equity market structure, high-frequency trading has recently captured the attention of regulators and even several members of Congress. As mentioned above, in January 2010, the Securities and Exchange Commission issued a Concept Release on Equity Market Structure (“Concept Release”).⁵¹ The Concept Release was issued after the SEC received several letters from Senator Ted Kaufman of

⁴⁸ PRELIMINARY FINDINGS, *supra* note 46, at app. A – 1. Specifically, the “trade-through” rule, or Rule 611 of Regulation NMS, requires that trading centers “establish, maintain, and enforce written policies and procedures that are reasonably designed to prevent trade-throughs on that trading center of protected quotations in NMS stocks.” 17 CFR 242.611. A “trade-through” is “the purchase or sale of an NMS stock during regular trading hours, either as principal or agent, at a price that is lower than a protected bid or higher than a protected offer.” 17 CFR 242.600(b)(77). For a bid or offer to be protected, it “must be “displayed by an automated trading center, must be disseminated in the consolidated quotation data, and must be “displayed by an automated trading center that is the best bid or best offer of a national securities exchange or FINRA.” PRELIMINARY FINDINGS, *supra* note 46, at app. A – 6. In practice, the best protected bid and best protected offer (i.e. the best bid and offer of all the stock exchanges and FINRA) is the national best bid and national best offer (“NBBO”). *Id.*

⁴⁹ PRELIMINARY FINDINGS, *supra* note 46, at app. A – 7. Rule 600(b)(78) of Regulation NMS defines “trading center” quite broadly. It includes, among other venues, exchanges, ATSS (ECNs and dark pools), OTC market makers, and any other broker-dealer that executes orders internally by trading as principal or agent. *Id.* at app. A – 6.

⁵⁰ PRELIMINARY FINDINGS, *supra* note 46, at app. A – 8.

⁵¹ See generally SEC Concept Release on Equity Market Structure, 75 Fed. Reg. 3594.

Delaware expressing his concerns with the growing practice of high-frequency trading in the U.S. equity markets.⁵² The Concept Release invited the public to comment on several market structure issues in light of recent technological and regulatory changes. One of the primary issues discussed in the Concept Release was the increasing dominance of high-frequency trading in the U.S. equity markets.⁵³ In particular, the SEC expressed its concern over the possible negative impact high-frequency trading may have on long-term investors. Furthermore, the Concept Release reiterated the SEC’s long-held predisposition to protect the interests of long-term investors over those of short-term traders, stating: “Where the interests of long-term investors and short-term professional traders diverge, the Commission repeatedly has emphasized that its duty is uphold the interests of long-term investors.”⁵⁴

This section will discuss two primary concerns some market participants—particularly long-term investors—have expressed toward HFT firms operating market making strategies. First, they argue that HFT firms and their business models place the broader financial system at risk during times of market stress. Second, they argue that HFT firms and the services they use threaten to undermine the fair and level playing field essential to capital formation.

A. Risk to the Overall Financial System: Phantom Liquidity

As HFT firms have become a significant part of the current market structure and have largely replaced Traditional Market Makers, their ability to selectively provide liquidity to the markets poses a substantial risk to the overall financial system. This risk became more evident after the market events of May 6, 2010. This portion of the paper will first describe the trading obligations imposed on exchange specialists and other registered market makers. It will then explore the market events of May 6, 2010 and its adverse impact on many long-term investors.

1. Background: Trading Obligations of Traditional Market Makers

Exchange specialists and other registered market makers (“Traditional Market Makers”) are governed by certain trading obligations. For instance, Traditional Market Makers have an affirmative obligation to “maintain fair and orderly markets.”⁵⁵ To fulfill this obligation,

⁵² See, e.g., Kaufman Aug. 21, 2009 Letter, *supra* note 5 (requesting that the SEC look into high-frequency trading practices); Letter from Senator Edward E. Kaufman to Mary L. Schapiro, Chairman, Sec. & Exch. Comm’n (Nov. 20, 2009) (touching upon a number of high-frequency trading concerns).

⁵³ SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3606-12.

⁵⁴ *Id.* at 3603.

⁵⁵ Nasdaq Stock Market Rule 4613, for example, states, “A member registered as a Nasdaq Market Maker shall engage in a course of dealings for its own account to assist in the maintenance, insofar as reasonably practicable, of fair and orderly markets in accordance with this Rule.” Nasdaq Stock Market Rule 4613 available at

Traditional Market Makers “try to ensure that changes in stock prices are small from one trade to the next, even if the price is moving dramatically overall.”⁵⁶ Dramatic price moves are usually the result of temporary imbalances between buy and sell orders.⁵⁷ Thus, when large imbalances exist, Traditional Market Makers buy or sell for their own account to maintain order in the market.⁵⁸

Traditional Market Makers also have an affirmative obligation to maintain continuous two-sided quotations for securities in which they are registered as a market maker.⁵⁹ Exchange rules, however, generally do not specify the prices at which Traditional Market Makers must quote.⁶⁰ Therefore, “when a [Traditional Market Maker’s] liquidity has been exhausted, or if it is unwilling to provide liquidity, it may at that time submit what is called a stub quote . . . to comply with its obligation to maintain a continuous two-sided quotation.”⁶¹ A stub quote is a quotation that is far away from the prevailing price of a stock—for example, a two sided stub quote could consist of an offer to buy a \$50 stock at a penny and sell at \$100,000.⁶²

In addition, Traditional Market Makers are generally governed by negative trading obligations. For example, exchange specialists are not permitted to deal for their own account except at times when it was reasonably necessary to maintain fair and orderly markets and to act as an odd-lot dealer.⁶³ That is to say, they are prohibited from trading for their own accounts

http://nasdaq.cchwallstreet.com/NASDAQTools/PlatformViewer.asp?selectednode=chp_1_1_2_1&manual=%2Fnasdaq%2Fmain%2Fnasdaq-equityrules%2F. See also NYSE Acra Equities Rule 7.23 and BATS Exchange Rule 11.8.

⁵⁶ Borrelli, *supra* note 47, at 824.

⁵⁷ For example, after a negative news announcement, there may be more sell orders than buy orders for a particular stock. Ordinarily, such an imbalance would cause the price of the stock to drop to a point where excess sell orders have been entirely consumed by several tiers of buy orders—in other words, to a level where the number of buy and sell orders is roughly equal. When such an imbalance arises, specialists should provide added liquidity for sellers by buying shares to ease the imbalance.

⁵⁸ See Borrelli, *supra* note 47, at 824.

⁵⁹ See e.g., Nasdaq Stock Market Rule 4613(a)(1) (stating “For each security in which a member is registered as a Nasdaq Market Maker, the member shall be willing to buy and sell such security for its own account on a continuous basis and shall enter and maintain a two-sided quotation.”).

⁶⁰ See PRELIMINARY FINDINGS, *supra* note 46, at app. A – 9.

⁶¹ *Id.*

⁶² Older rules governing Traditional Market Makers required quotations to be “reasonably related to the prevailing market.” See *id.*

⁶³ For instance, Rule 11b-1 of the Exchange Act outlines the negative and affirmative obligations of exchange specialists. The negative obligations of that rule require specialists to restrict their dealings to only those “reasonably necessary to permit him to maintain a fair and orderly market or necessary to permit him to act as an odd-lot dealer.” The affirmative obligations of that rule require specialists to “engage in a course of dealings for his own account to assist in the maintenance, so far as practicable, of a fair and orderly market.”

during times when there are enough matching customer orders to ensure a two-sided market.⁶⁴ It effectively prevents exchange specialists from trading ahead of their customers' orders that are already on the order book. Over the years, however, most exchanges have done away with this negative trading obligation. In 2008, for example, the NYSE did away with its exchange specialist model and instituted a new type of market maker called Designated Market Makers ("DMMs").⁶⁵ Although DMMs are bound by the same basic affirmative obligations as exchange specialists, they are free to trade for their own accounts at anytime.⁶⁶

Historically, Traditional Market Makers were provided certain privileges as consideration for these important affirmative and sometimes negative obligations. For example, besides gaining a monopoly over certain stocks at their trading center, Traditional Market Makers who were subject to these trading obligations were given favorable time and place advantages.⁶⁷ They were given a first "look" at all incoming orders which enabled them to somewhat predict the general direction of the market and adjust their bid and ask spreads accordingly.⁶⁸

Surprisingly, under the current market and regulatory structure, HFT firms have obtained the same favorable time and place advantages as Traditional Market Makers, but without the ensuing negative and affirmative obligations.⁶⁹ This is concerning to many, including SEC Chairman Mary Schapiro.⁷⁰ In a speech before the Economic Club of New York, Chairman Schapiro shared the following thoughts regarding HFT firms:

In the old manual market structure, the market participants with the best access to the markets — the specialists on the dominant exchanges — were subject to significant trading obligations that were designed to promote fair and orderly markets and fair treatment of investors. These included affirmative obligations to provide liquidity and to

⁶⁴ Put another way, this negative trading obligation prohibits exchange specialists from trading for their own account when investors do not need them to provide liquidity to the market.

⁶⁵ See Designated Market Maker Release, *supra* note 28.

⁶⁶ See *id.* at 35 ("[T]he negative obligation and the requirement to yield to public customer orders on the Display Book, imposed on specialists under NYSE's current market model, would be eliminated.").

⁶⁷ See Letter from R. T. Leuchtkafer to Rule-Comments, Sec. & Exch. Comm'n, (Apr. 16, 2010), available at <http://www.sec.gov/comments/s7-02-10/s70210-107.htm> [hereinafter Leuchtkafer Comment].

⁶⁸ See *id.* at 36-37 ("NYSE Specialists, by virtue of their advance 'look' at incoming orders and their position on the trading floor, also have an informational advantage over other market participants which, if unchecked, could permit them to adjust their trading interest to the disadvantage of orders residing on the book.").

⁶⁹ Advances in technology and certain aspects of the current market structure—such as co-location, direct data feeds, and direct market access—have enabled HFT firms to derive nearly the same time and place advantages enjoyed by specialists and market makers, but without incurring the same affirmative and negative trading obligations.

⁷⁰ See Schapiro, Strengthening Our Equity Market Structure, *supra* note 1 ("Today, proprietary trading firms play a dominant role by providing liquidity through the use of highly sophisticated trading systems capable of submitting many thousands of orders in a single second. This transformation of market structure has raised serious questions and concerns.")

promote price continuity, as well as negative obligations to forego trading in ways that would exacerbate price moves — such as aggressively taking out bids during a price decline and thereby driving prices even lower.

These traditional obligations have fallen by the wayside as the market structure evolved and the traditional specialist role became obsolete. Today, in contrast, the obligations that apply to most registered market makers are minimal. In fact, many very active liquidity providing firms are not registered as market makers, and some active firms are not even registered as broker-dealers and thereby fall entirely outside the regime for regulated entities.

We should consider the relevance today of a basic premise of the old specialist obligations — that the professional trading firms with the best access to the markets (and therefore the greatest capacity to affect trading for good or for ill) should be subject to obligations to trade in ways that support the stability and fairness of the markets.⁷¹

As Chairman Schapiro explained, without certain trading obligations, HFT firms can provide liquidity to the market on a selective basis, whenever it suits them best. When times are good, HFT firms can use their time and place advantages—obtained through technology, co-location, and direct trading center data feeds—to operate profitable market making strategies. However, when times are bad, HFT firms can simply turn off their computers and stop providing liquidity. Moreover, unlike Traditional Market Makers who would face severe consequences for such behavior, HFT firms do not face any regulatory consequences⁷² nor do they do they “have ongoing relationships with customers that can pressure [them] to provide liquidity in tough trading conditions.”⁷³

For these reasons, many have characterized the liquidity provided by HFT firms as “phantom liquidity,” or “liquidity that disappears when most needed by long-term investors and other market participants.”⁷⁴ Although HFT firms have vigorously disputed this characterization,

⁷¹ *Id.*

⁷² Many HFT Firms are not even registered as broker-dealers and therefore incur very little regulatory oversight. *See id.*

⁷³ SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3608. *See also Adventures in Algorithmic Trading*, Aug. 5, 2010, http://www.assetinternational.com/ai5000/channel/TECHNOLOGY_PRODUCTS/Adventures_in_Algorithmic_Trading.html (“The old system of manual traders and specialists was, of course, much slower, more expensive, and more prone to mistakes and corruption than the new automated system. Yet, traders generally were required to function as a liquidity source of last resort, were capable of taking on a large share of daily volume themselves, and helped out trading partners in dire straits in order to maintain the business relationship. In today’s Wall Street, automated traders simply can turn off their machines if they don’t like what’s happening in the market, as many firms did during the recent “Flash Crash.”).

⁷⁴ SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3608. *See also* Letter from Dr. Harald Malmgren, Chief Executive Officer, Malmgren Global & Mark Stys, Chief Investment Officer, Bluemont Capital

the market events of May 6, 2010 seem to suggest otherwise. Indeed, the events of May 6 have made it apparent that the activities of HFT firms do in fact pose a substantial threat to the overall financial system and to the millions of Americans that rely on its viability.

2. *The May 6, 2010 “Flash Crash”*

On May 6, 2010, the U.S. equity markets experienced an extremely rapid and harrowing decline. The crash—dubbed the “Flash Crash” by the media—erased nearly \$1 trillion dollars in market capitalization in a matter of minutes before miraculously rebounding moments later.⁷⁵ Several months after the Flash Crash, the SEC and the Commodity Futures Trading Commission (CFTC) released a joint report entitled, “Findings Regarding the Market Events of May 6, 2010” (the “Joint Report”).⁷⁶

The Joint Report indicated that “May 6 started as an unusually turbulent day for the markets.”⁷⁷ The markets opened down over 4% in early trading and the S&P 500 volatility index (“VIX”) turned up 31.7 percent⁷⁸ based on news of the European debt crisis and fears that

Advisers, to Asymmetric Threats Contingency Alliance (ATCA) & The Philanthropia (June 2, 2010), *available at* <http://www.mi2g.com/cgi/mi2g/frameset.php?pageid=http%3A//www.mi2g.com/cgi/mi2g/press/020610.php> (“Broker-dealers who are designated ‘market makers’ are constrained by regulatory requirements that they must stay active and provide a bid when requested. In effect, [high-frequency] traders also function as market makers but have no comparable obligations. If they sense an aberration in trading activity, particularly an abrupt downward movement in prices, they are free to withdraw from trading. In a rapid market decline, their absence is likely to amplify the rate of descent. When active, their voluminous transactions create an illusion of ample liquidity and balance between sellers and buyers. When they step away, this illusion is instantly dispelled. Thus, [high-frequency] traders may often help moderate or smooth market volatility, but since they retain freedom of action to withdraw at their own discretion, they pose systemic risk.”); Letter from O. Mason Hawkins et al., Southeastern Asset Management, Inc. (SAMI), to Elizabeth M. Murphy, Secretary, Sec. & Exch. Comm’n, (Apr. 28, 2010), at 5, *available at* <http://www.sec.gov/comments/s7-02-10/s70210-164.pdf> [hereinafter SAMI Letter] (stating that “inaccessible liquidity is not real liquidity” and that “HFT firms swapping 100 shares of the same stock between one another 1000 times a day provides no use to the long-term investor, despite reporting an additional 100,000 shares to the tape”); *Adventures in Algorithmic Trading*, *supra* note 73 (“The argument that these [high-frequency market making] strategies provide liquidity is a red herring,” says longtime quant (and quant skeptic) Dr. Paul Wilmott. ‘It’s a “liquidity card,” like the “race card,” people just play it to end arguments. All these people supposedly providing liquidity, if some of them decide to step back, they’ve got you by the *cojones*, haven’t they?’”).

⁷⁵ See Agustino Fontevicchia, *No Morals and Extreme Speed Created Flash Crash*, *Forbes.com*, Oct. 22, 2010, <http://www.forbes.com/2010/10/20/flash-crash-mackenzie-equities-markets-sociology.html?boxes=Homepagechannels>. At its lowest point, the Dow Jones Industrial Average was down nearly 1,000 points, but “closed the frenetic trading day down only 348 points.” John D’antona Jr. & Peter Chapman, *So Not Fast!*, *TRADERS MAGAZINE*, Aug. 2010, at 28; *Spread betting: High-frequency traders*, *THE ECONOMIST*, Aug. 14, 2010, *Fin & Econ. Sec.*

⁷⁶ U.S. COMMODITY FUTURES TRADING COMM’N & U.S. SEC. & EXCH. COMM’N, FINDINGS REGARDING THE MARKET EVENTS OF MAY 6, 2010 (Sept. 30, 2010), *available at* <http://www.sec.gov/news/studies/2010/marketevents-report.pdf> [hereinafter JOINT REPORT].

⁷⁷ *Id.* at 1.

⁷⁸ *Id.* at 9.

Greece might default on its sovereign debt.⁷⁹ By about 2:30 p.m., buy-side liquidity had dropped significantly in two of the most actively traded stock index instruments—the E-Mini S&P 500 futures contract (the “E-Mini”) and the S&P 500 SPDR exchange traded fund (“SPY”).⁸⁰

In the face of this heightened volatility and reduced liquidity, a large mutual fund, Waddell & Reed Financial of Overland Park, Kansas,⁸¹ initiated an order execution algorithm at 2:32 p.m. to sell 75,000 June 2010 E-Mini contracts (“June E-Mini”) worth approximately \$4.1 billion to hedge an existing equity position.⁸² The algorithm was programmed to feed the orders into the market at a rate equal to 9% of the June E-Mini’s trading volume over the course of the previous minute and, surprisingly, was not programmed to take into account price or time to determine the appropriate order execution rate.⁸³

As the algorithm began flooding the futures market with sell orders, the price of the E-Mini began to decline. The sell pressure was initially absorbed by several types of market participants who stepped in to buy the E-Mini as it fell. For example, cross-market arbitrageurs⁸⁴ stepped in and bought the E-Mini while simultaneously selling equivalent amounts of stock in the equities markets. This cross-market arbitrage trading worked to transfer the sell pressure in the futures markets to the equities markets. Meanwhile, high-frequency futures traders (“HFFTs”) began buying and reselling the E-Mini to each other, “generating a ‘hot potato’ volume effect as the same positions were rapidly passed back and forth.”⁸⁵ Because order execution rate was tied to volume, the increase in trade volume due to the back-and-forth buying and selling of HFFTs dramatically increased the rate at which the algorithm fed sell orders into the market. As a result, all 75,000 June E-Mini contracts (\$4.1 billion dollars worth) were sold into the market in a period of only 20 minutes.⁸⁶

⁷⁹ As a result of these fears, the cost of credit default swaps against Greek sovereign debt rose substantially that morning. *See id.* at 1.

⁸⁰ *See id.* at 10.

⁸¹ *See* Graham Bowley, *Lone \$4.1 Billion Sale Led to ‘Flash Crash’ in May*, NYTimes.com, Oct. 1, 2010, <http://www.nytimes.com/2010/10/02/business/02flash.html>.

⁸² JOINT REPORT, *supra* note 76, at 2.

⁸³ *Id.*

⁸⁴ Cross-market arbitrageurs are opportunistic traders who capitalize on temporary, though often small, price differences between related products by purchasing the cheaper product and selling the more expensive product. *See id.* at 3 n.9.

⁸⁵ *Id.* at 3. However, once HFFTs accumulated temporary net long positions, they became net sellers of the E-Mini since HFFTs, like HFT firms, generally like to end the day flat to reduce risks associated with carrying a net long or short position.

⁸⁶ *See id.* at 2. Earlier in the year, the same mutual fund sold a similar amount of E-Mini contracts into the market. However, on that occasion, it spread the sales out over a 5 hour period. *Id.*

The rapid decline in the E-Mini as well as declines in individual stocks translated into a liquidity crisis in the stock market at approximately 2:45 p.m. The declines triggered internal risk parameters at many HFT firms causing their automated trading systems to either drastically scale back trading or stop providing liquidity altogether.⁸⁷ As the Joint Report explained, “[t]hese built-in pauses are designed to prevent automated systems from trading when prices move beyond predefined thresholds in order to allow traders and risk managers to fully assess market conditions before trading is resumed.”⁸⁸ At the same time HFT market making firms pulled back, many Traditional Market Makers widened their bid-ask spreads and reduced the number of shares they were willing to buy and sell.⁸⁹ Some Traditional Market Makers even entered stub quotes⁹⁰—e.g., a bid to buy at a penny and an offer to sell at \$100,000—which allowed them to effectively pull out of the market while adhering to their obligation to maintain two-sided quotations.⁹¹ Moreover, many over-the-counter (“OTC”) market makers—broker-dealers who typically execute a substantial percentage of their retail customers’ orders internally—began routing most of their customers’ orders “directly to the public exchanges where they competed with other orders for immediately available, but dwindling liquidity.”⁹²

As HFT firms, Traditional Market Makers, and OTC market makers dropped out of the market, buy-side liquidity plummeted. In some securities, the stub quotes of Traditional Market Makers were actually hit as liquidity in those securities dried up completely and as market orders⁹³ and automatic stop-loss orders⁹⁴ flooded the system.⁹⁵ This resulted in trades being executed at absurd and irrational prices. For instance, market orders to buy shares of Apple were executed at prices as high as \$100,000 while market orders to sell shares of Accenture were

⁸⁷ See *id.* at 4, 45.

⁸⁸ JOINT REPORT, *supra* note 76, at 4.

⁸⁹ See *id.* at 38.

⁹⁰ As explained in the Joint Report, “[s]tub quotes are quotes at unrealistically low or high prices that fulfill a market maker’s obligation to provide continuous bids and offers, but at levels that the market maker does not expect to be reached under ordinary market conditions.” *Id.* at 38 n.34.

⁹¹ *Id.* at 38.

⁹² *Id.* at 5.

⁹³ A Market Order is “an order to buy or sell a stock at the current market price.” If the trader does not specify otherwise, his broker will enter the trader’s order as a market order. Market Order, <http://www.sec.gov/answers/mktord.htm> (last visited Nov. 27, 2010).

⁹⁴ Stop-loss order, or stop order, “is an order to buy or sell a stock once the price of the stock reaches a specified price, known as the stop price. When the specified price is reached, [the] stop order becomes a market order.” Stop Order, <http://www.sec.gov/answers/stopord.htm> (last visited Nov. 27, 2010).

⁹⁵ See JOINT REPORT, *supra* note 76, at 5.

executed at prices as low as one penny from \$40.⁹⁶

To make matters worse, as liquidity evaporated between 2:45 and 3:00 p.m., HFT firms started becoming liquidity takers rather than liquidity providers, exasperating the downward price movement.⁹⁷ In fact, the SEC and CFTC analyzed data for 17 HFT firms and concluded that “the 17 HFT firms traded with the price trend on May 6 and, on both an absolute and net basis, removed significant buy liquidity from the public quoting markets during the downturn.”⁹⁸ One commentator recently explained why and how HFT firms conducting market making activities can quickly switch from being liquidity provider to liquidity demanders during market downturns:

Imagine a stock under stress from sellers such was the case in the fall of 2008. There is a sell imbalance unfolding over some period of time. Any HFT market making firm is being hit repeatedly and ends up long the stock and wants to readjust its position. The firm times its entrance into the market as an aggressive seller and then cancels its bid and starts selling its inventory, exacerbating the stock's decline. Unrestrained by affirmative responsibilities, the firm adjusts its risk model to rebalance as often as it wants and can easily dump its inventory into an already declining market. A HFT market making firm can easily demand as much or more liquidity throughout the day than it supplies. Crucially, its liquidity supply is generally spread over time during the trading day but its liquidity demands are highly concentrated to when its risk models tell it to rebalance. Unfortunately regulators do not know what these risk models are. So in exchange for the short-term liquidity HFT firms provide, and provide only when they are in equilibrium (however they define it), the public pays the price of the volatility they create and the illiquidity they cause while they rebalance. For these firms to say they add liquidity and beg to be left alone because of the good they do is chutzpah.⁹⁹

During the twenty-minute period between 2:40 p.m. and 3:00 p.m., approximately 2 billion shares changed hands.¹⁰⁰ The vast majority of these shares were “executed at prices within 10% of their 2:40 p.m. value.”¹⁰¹ However, the shares of over 300 securities, including many ETFs, “were executed at prices 60% or more away from their 2:40 p.m. prices” before miraculously recovering to normal levels around 3:00 p.m.¹⁰² Although the exchanges and FINRA agreed to cancel (or break) all trades executed at prices 60% or more away from their

⁹⁶ See Tom Lauricella and Scott Patterson, *Legacy of the ‘Flash Crash’: Enduring Worries Repeat*, THE WALL STREET JOURNAL, Aug. 6, 2020, at A1.

⁹⁷ See JOINT REPORT, *supra* note 76, at 48.

⁹⁸ *Id.*

⁹⁹ Leuchtkafer Comment, *supra* note 67.

¹⁰⁰ See JOINT REPORT, *supra* note 76, at 48 Report at 5.

¹⁰¹ *Id.*

¹⁰² *Id.* at 6.

2:40 p.m. prices under their “clearly erroneous” trade rules,¹⁰³ many who suffered less severe but still very substantial losses had no such recourse.¹⁰⁴ They were forced to eat their losses, which had nothing to do with the underlying fundamentals of the securities that were sold at unreasonable prices.

3. *Systemic Risk*

Many fear that the next “Flash Crash” could be much worse. Breaking trades could be much more complicated and could have much more severe consequences.¹⁰⁵ As explained by three university professors, “losses from broken trades arise when traders arrange related trades before learning that the broken trades will be broken.”¹⁰⁶ This may result in a situation where traders are financially unable to settle their trades. For example, a trader might sell short a security that is falling in price during a crash similar to the one on May 6th and use the proceeds to simultaneously purchase a correlated security.¹⁰⁷ If the trade in the first security is broken, he will be expected to make good on the trade in the second security. If the trader is financially unable to settle the trade in the second security, the trader’s broker is obligated to settle the trade.¹⁰⁸ If the broker has multiple traders who are financially unable to settle their trades and if “the broker lacks the capital to settle [these] trades, the trades must be settled by the clearing member through whom the broker clears trades.”¹⁰⁹ Moreover, “[i]f the clearing member lacks the capital to settle the trades, the clearinghouse must settle the trade.”¹¹⁰ Nevertheless, if the trades that must be settled by brokers, clearing members, and clearinghouses are large enough in quantity and size that these entities are financially unable to settle the trades—perhaps because of a similar but more severe crash than the Flash Crash—these entities could go bankrupt causing other entities to go bankrupt “as these entities are all bound together through various contractual

¹⁰³ *See id.*

¹⁰⁴ *See id.* at 7.

¹⁰⁵ See, e.g., Letter from James J. Angel, Associate Professor of Fin., Georgetown University, to Sec. & Exch. Comm’n (Apr. 30, 2010), at 5, available at <http://www.sec.gov/comments/s7-02-10/s70210-172.pdf> [hereinafter Angel Apr. 30, 2010 Letter] (stating, “With the global linkage of cash and derivative markets around the world, it would be extremely difficult to go back after the fact and bust the appropriate trades, leading to years of litigation” and “It is extremely messy to attempt to bust erroneous trades after the fact, especially if multiple instruments in multiple asset classes traded on multiple exchanges in multiple countries are involved.”).

¹⁰⁶ ANGEL ET AL., *supra* note 20, at 45.

¹⁰⁷ Similarly, “an investor may sell stock that was purchased during [a] malfunction only to find that the purchase was busted but not the later sale, leading to an inadvertently naked short position.” Angel Apr. 30, 2010 Letter, *supra* note 105, at 5.

¹⁰⁸ *See* ANGEL ET AL., *supra* note 22, at 46.

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

relationships that may fail in the event of bankruptcy”¹¹¹ Such a scenario could create a financial crisis similar to the one experienced between 2007 and 2009 where financial institutions such as Bear Sterns and Lehman Brothers failed while many others would have failed were it not for government intervention. Professor Angel of Georgetown University touched upon the possibility of such a scenario in a comment letter to the SEC on short selling in September 2009:

The big picture is that today’s warp speed computerized markets contain the potential for another financial catastrophe at warp speed. If an algorithm at a large financial institution misfires, whether because of an honest malfunction or sabotage, it could create an enormous critical chain reaction that would cause a tsunami of economic destruction within milliseconds. Yet we currently rely on slow humans at our exchanges to make decisions. We need automated circuit breakers that function on a stock by stock basis that will kick in instantly when something goes haywire. To date, the SEC has taken the same approach to such warnings as FEMA took to warnings that New Orleans was vulnerable to a Category 5 hurricane. Do we need a Category 5 meltdown in the equity market before the SEC moves to take action to prevent such a preventable calamity? The individual exchanges cannot act on their own because of the competitive fragmented nature of our modern markets. If a single exchange halts trading, it stands at a competitive disadvantage to its competitors. Dealing with this threat requires intelligent coordinated action by the SEC.¹¹²

Five days after the market events of May 6, 2010, Professor Angel submitted an additional comment to the SEC wherein he stated, “We didn’t have a Category 5 hurricane on May 6, 2010; we only had a Category 1. A Category 5 is still a distinct possibility if we do not make the right reforms.”¹¹³

As discussed below, the SEC has taken several steps to avoid another Flash Crash scenario caused in part and exasperated by HFT firms engaged in market making strategies. However, additional steps must be taken to remedy the problems associated with “phantom liquidity.” The steps that the SEC has taken as well as additional steps that are needed will be discussed below, but first this paper will explore the threat HFT firms pose to investor confidence and therefore capital formation.

B. Risk to the Capital Formation Process: The Unlevel Playing Field

1. *The Importance of a Fair and Level Playing Field*

¹¹¹ *Id.*

¹¹² Letter from James J. Angel, Associate Professor of Fin., Georgetown University, to Sec. & Exch. Comm’n (Sept. 21, 2009), at 1-2, available at <http://www.sec.gov/comments/s7-08-09/s70809-4658.pdf> [hereinafter Angel Sept. 21, 2009 Letter].

¹¹³ Letter from James J. Angel, Associate Professor of Fin., Georgetown University, to Sec. & Exch. Comm’n (May 11, 2010), at 4, available at <http://www.sec.gov/comments/s7-02-10/s70210-181.pdf> [hereinafter Angel May 11, 2010 Letter].

The preamble to the Securities Exchange Act of 1934, among other things, provides that regulation of the securities market is necessary to “insure the maintenance of fair and honest markets.”¹¹⁴ Fair and honest markets are vitally important because they encourage investors to participate in the markets by allocating capital to businesses in need.¹¹⁵ This efficient transfer of capital from investors to businesses is necessary for a healthy economy. Capital enables businesses to expand operations, hire additional employees, and create desirable products and services. Furthermore, it enables long-term investors to reap a return on their investment in the form of dividends and capital gains as these businesses become successful. In fact, millions of Americans rely on the equity markets to save for important future events, such as college and retirement.¹¹⁶ Most Americans participate in the equity markets and thereby allocate capital to businesses through mutual funds, pension plans, and other retirement vehicles.

However, as SEC Chairman Mary Schapiro recently pointed out during a speech to the Economic Club of New York, “if the equity market structure breaks down—if it fails to provide the necessary and expected fairness, stability, and efficiency—investors and companies pull back, raising costs and reducing growth.”¹¹⁷ In other words, if investors feel that the equity market structure¹¹⁸ is rigged—if they feel that the market is a Casino where the chips are constantly stacked against them—they will not keep playing. They will withdrawal their participation in the markets, making it more difficult and expensive for businesses to raise money. This, in turn, would affect the rate at which our economy is able to grow and create jobs and therefore would diminish the quality of life for millions of Americans. Therefore, “[e]nsuring the quality of equity market structure is an essential part of the SEC’s investor protection and capital formation mission.”¹¹⁹

HFT firms and the services they use have created an unfair market environment. Because co-location and direct data feed services give HFT firms a first look at (and response to) market information, they “undermine the fair and level playing field essential to investor protection,

¹¹⁴ Section 2 of the Sec. Exch. Act of 1934 (emphasis added).

¹¹⁵ See Schapiro, Strengthening Our Equity Market Structure, *supra* note 1 (explaining that “[t]hose who purchase stock in an initial public offering . . . can have confidence that they will be able to sell that stock at a fair and efficient price in the secondary market when they need or want to,” and that “the values assigned to stocks in the secondary market play an important role in the ability of companies to raise additional funding.”).

¹¹⁶ See Schapiro, Strengthening Our Equity Market Structure, *supra* note 1; SAMI Letter, *supra* note 74, at 3.

¹¹⁷ Schapiro, Strengthening Our Equity Market Structure, *supra* note 1.

¹¹⁸ The term “market structure” refers to “everything from the number and types of venues that trade a financial product to the rules by which they operate.” *Id.*

¹¹⁹ *Id.*

capital formation and vibrant capital markets generally.”¹²⁰ These services have “created a two-tiered marketplace based on latency that results in an almost risk-free trading environment for the preferred group.”¹²¹ Those without access to these services—primarily long-term investors—“must engage HFTs and pay a ‘tax’ or risk never allocating their capital to worthy enterprises.”¹²² “This forced interaction penalizes long-term investors, undermines the underlying intent of the marketplace, and diminishes the public good arising from the prudent allocation of capital in the economy.”¹²³

HFT firms have created a market structure where trading is an “end unto itself” rather than a means of allocating capital to worthy enterprises.¹²⁴ Professor Michael Goldstein of Babson College in Boston recently stated, “Trading happening at one millisecond or faster isn’t the purpose of the stock market . . . It’s to allocate capital, and I believe it hasn’t been doing that since 2007.”¹²⁵ If the market structure continues to favor HFT firms by giving them unwarranted structural time and place advantages, long-term investors will be dissuaded from offering their capital to worthy enterprises through the traditional equity markets at current prices. In other words, if investors lose confidence in the fairness and honesty of the equity markets and withdrawal as a result, businesses seeking to raise capital through a public offering will have to offer shares at a discount to induce long-term investors to part with their hard-earned dollars. If the price of capital becomes too expensive for some business operations, those operations may cease to exist or may never be created in the first place.

Investor confidence in the markets has already been severely hampered by the financial crisis of 2007 to 2009. In fact, investors—no longer viewing the equity markets as a safe place to invest their hard-earned dollars—have begun to place their savings into safer, lower-yielding U.S. Treasury bonds, pushing yields down to historically low levels. Furthermore, Chairman Mary Schapiro acknowledged in a recent address that the Flash Crash of May 6, 2010 (discussed

¹²⁰ *Id.*

¹²¹ SAMI Letter, *supra* note 74, at 3-4.

¹²² *Id.* at 3 (also stating that “While this ‘tax’ may not be discernable on any given trade, it represents an enormous transfer of wealth from investors to HFTs in aggregate. This is no different from how a casino maintains a house edge in blackjack or roulette.”).

¹²³ *Id.*

¹²⁴ See, e.g., D’antona Jr. & Chapman, *supra* note 75 (“While the increased speed of trading is cited as a natural outgrowth of the drive toward efficiency and firms engaged in high-frequency trading are generally praised for providing liquidity, there are many who believe trading at warp speed is going too far. They contend that the stock market exists to match long-term investors with businesses seeking to raise capital, and that hyper-fast trading conditions breed speculators who only make raising capital more costly for corporations.”).

¹²⁵ D’antona Jr. & Chapman, *supra* note 75.

above) has diminished individual investors' confidence in the equity markets even further:

Retail broker-dealers have told us that their customers—individual investors—have pulled back from participating in the equity market since May 6. Indeed, according to mutual fund data, every single week since May 6 has seen an outflow of funds from equity mutual funds.¹²⁶

To ensure that the efficient transfer of capital continues to flow from investors to businesses, the SEC must address the adverse impact HFT firms are having on investor confidence and therefore capital formation. The section below will address several steps the SEC and other regulatory bodies have recently taken to address the risks posed by HFT firms to the financial system at large and to the capital formation process.

IV. PROPOSED RULES & REGULATIONS

The SEC and the exchanges have proposed rules addressing the Flash Crash as well as capital formation concerns associated with diminishing investor confidence. However, as explained below, these rules do not squarely address the systemic and capital formation risks posed by HFT firms engaged in market making activities (“HFT market making firms”). This section will briefly discuss several of these recently proposed rules and the extent to which they alleviate these risks. The following section will discuss additional rules that could be put in place to better regulate HFT market making firms.

A. Circuit Breaker Rules

In response to the May 6, 2010 Flash Crash, FINRA and the exchanges¹²⁷ proposed rules that would “provide for trading pauses in individual stocks when the price moves ten percent or more in the preceding five minute period.”¹²⁸ Specifically, these rules would require the exchange that is the primary listing market for an individual security to implement the trading

¹²⁶ Schapiro, Strengthening Our Equity Market Structure, *supra* note 1.

¹²⁷ The exchanges include: BATS Exchange, Inc., EDGX Exchange, Inc., NASDAQ OMX BX, Inc., International Securities Exchange LLC, New York Stock Exchange LLC, NYSE Amex LLC, NYSE Arca, Inc., The NASDAQ Stock Market LLC, National Stock Exchange, Inc., and Chicago Board Options Exchange, Incorporated.

¹²⁸ Order Granting Accelerated Approval to Proposed Rule Changes to Trading Pauses Due to Extraordinary Market Volatility, Exchange Act Release No. 62252 (June 10, 2010), at 1, *available at* <http://www.sec.gov/rules/sro/bats/2010/34-62252.pdf> [hereinafter Exchange Circuit Breaker Release]; Order Granting Accelerated Approval to Proposed Rule Change to Amend FINRA Rule 6121 (Trading Halts Due to Extraordinary Market Volatility) to Permit FINRA to Halt Trading by FINRA Members Otherwise Than on an Exchange Where a Primary Listing Market has Issued a Trading Pause due to Extraordinary Market Conditions, Exchange Act Release No. 62251 (June 10, 2010), at 4, *available at* <http://www.sec.gov/rules/sro/finra/2010/34-62251.pdf> [hereinafter FINRA Circuit Breaker Release].

pause “by immediately disseminating a special indicator over the consolidated tape.”¹²⁹ All other exchanges would then be required to pause trading in that security in their respective venues.¹³⁰ Likewise, upon receiving notice, FINRA would be required to pause trading in the over-the-counter markets, i.e. ECNs, and among OTC market makers.¹³¹

The SEC approved the rules on June 10, 2010 on a pilot basis until December 10, 2010. Initially, the rules were applicable only to stocks in the S&P 500 Index.¹³² On September 10, 2010, however, the SEC expanded the pilot program to include stocks in the Russell 1000 Index as well as certain exchange-traded funds.¹³³

These rules are intended to operate as circuit breakers in the event of severe market dislocations due to rapid-fire selling and the sudden withdrawal of liquidity by automated market makers such as HFT firms. The pause will give market participants like HFT firms a chance to reassess the markets and determine whether there is any rational reason not to continue providing liquidity. One institutional investor commenting¹³⁴ on the rules stated that “on very rare occasions like May 6th a pause in trading is necessary to give market participants a chance to ‘reset’ and react appropriately to periods of dislocation. A reasonable trading halt will provide investors time to rationally assess the market events and commit liquidity at appropriate price levels.”¹³⁵

While these circuit breaker rules will help to alleviate systemic risk, they do not go to the root of the problem. They do not address the reason why flash crashes are occurring in the first place. Instead, the circuit breaker rules merely contain the damage caused by future flash crashes. Even with these rules in place, in any given flash crash, investors could still lose 10% in a given circuit breaker stock before trading is halted and could lose even more if the five minute period is too short for HFT firms to reassess and reenter the market. Nevertheless, these circuit breaker rules are a positive step toward preventing a system wide meltdown and to that extent do

¹²⁹ Exchange Circuit Breaker Release, *supra* note 128, at 4-5.

¹³⁰ *See id.* at 5.

¹³¹ *See* FINRA Circuit Breaker Release, *supra* note 128, at 4.

¹³² *See* Exchange Circuit Breaker Release, *supra* note 128, at 5-6.

¹³³ *See* Press Release, Sec. & Exch. Comm’n, SEC Approves Rules Expanding Stock-by-Stock Circuit Breakers and Clarifying Process for Breaking Erroneous Trades (Sept. 10, 2010), *available at* <http://www.sec.gov/news/press/2010/2010-167.htm>.

¹³⁴ The SEC received 26 comments to the proposed circuit breaker rules, most of which were supportive. *See* Exchange Circuit Breaker Release, *supra* note 128, at 6.

¹³⁵ Letter from George U. Sauter, The Vanguard Group, Inc., to Elizabeth M. Murphy, Secretary, Sec. & Exch. Comm’n (June 3, 2010), at 1, *available at* <http://www.sec.gov/comments/sr-bats-2010-014/bats2010014-8.pdf>.

offer long-term investors substantial protection from the illusive or “phantom” liquidity provided by HFT firms.

B. Enhanced Quotation Requirements for Registered Market Makers

In the wake of the May 6, 2010 Flash Crash, several exchanges have also proposed rules that would enhance quotation requirements for their registered market makers.¹³⁶ The rules would “require registered market makers for each stock in which they are registered to continuously maintain a two-sided quotation within a designated percentage of the National Best Bid and National Best Offer as appropriate.”¹³⁷ These enhanced quoting rules are designed to prevent registered market makers from placing “stub quotes” during difficult market conditions, as discussed above.¹³⁸

These enhanced quotation rules are intended to augment and coincide with the circuit breaker rules discussed above. The rules provide that market makers in securities subject to the circuit breaker rules are required to maintain a quote that is at least within the circuit breaker trigger percentage less two percent. Thus, because the circuit breaker trigger percentage for applicable securities is 10% from the NBBO, “a market maker’s quote in such a security may not be more than 8% away from the national best bid or best offer.”¹³⁹ Market makers in securities not subject to the circuit breaker rules, however, must “maintain quotes not more than 30% away from the national best [bid] [sic] and national best offer.”¹⁴⁰

Although these enhanced quotation rules will increase the amount of liquidity provided by registered market makers in times of crisis, they do not apply to unregistered HFT market making firms. Therefore, they do not prevent HFT market making firms, who now provide the majority of liquidity to the markets, from withdrawing liquidity during times of stress by simply turning off their computers or becoming aggressive liquidity takers through the submission of marketable orders that execute against the resting quotes of registered market makers. Instead, these enhanced quotation requirements would place registered market makers at a competitive

¹³⁶ See, e.g., NASDAQ Stock Market LLC Notice of Filing of a Proposed Rule Change to Enhance Quotation Requirements for Market Makers, Exchange Act Release No. 62950 (Sept. 20, 2010), available at <http://www.sec.gov/rules/sro/nasdaq/2010/34-62950.pdf> (pending SEC approval) [hereinafter NASDAQ Notice of Filing]; New York Stock Exchange LLC Notice of Filing of a Proposed Rule Change Amending Rule 104 to Adopt Pricing Obligations for Designated Market Makers, Exchange Act Release No. 62950 (Sept. 20, 2010), available at <http://www.sec.gov/rules/sro/nyse/2010/34-62948.pdf> (pending SEC approval) [hereinafter NYSE Notice of Filing].

¹³⁷ NASDAQ Notice of Filing, *supra* note 136, at 9.

¹³⁸ See *id.*

¹³⁹ *Id.*

¹⁴⁰ *Id.*

disadvantage to HFT firms who have the freedom to selectively provide liquidity. Rather than impose enhanced quotation requirements on registered market makers, the SEC should consider imposing quoting obligations on HFT firms engaged in market making activities. This possible solution to the HFT market making problem will be discussed in greater detail below.

C. Large Trader Reporting

On April 23, 2010, the SEC proposed a new rule (Rule 13h-1) and form (Form 13H) that would establish a large trader reporting system.¹⁴¹ The proposed rule “is designed to facilitate the [SEC’s] ability to assess the impact of large trader activity on the securities market, to reconstruct trading activity following periods of unusual market volatility, and to analyze significant market events for regulatory purposes.”¹⁴² Furthermore, it is intended to “enhance the Commission’s ability to detect and deter fraudulent and manipulative activity and other trading abuses” and “provide the [SEC] with a valuable source of useful data to study markets and market activity.”¹⁴³

In its proposal, the SEC explained that it “believes a proposal for a large trader reporting system is necessary because . . . large traders appear to be playing an increasingly prominent role in the securities markets. For example, market observers have offered a wide range of estimates for the percent of overall volume attributable to one potential subcategory of large trader—the high frequency traders—which are typically estimated at 50% of total volume or higher.”¹⁴⁴ The proposal defines a large trader as “a person who, in exercising investment discretion, effects transactions in NMS securities in an amount equal to or greater than (1) during a calendar day, either 2 million shares or shares with a fair market value of \$20 million; or (2) during a calendar month, either 20 million shares or shares with a fair market value of \$200 million.”¹⁴⁵ Since many HFT firms are known to trade millions of shares per day when conducting their market making activities, it is very likely that many HFT firms will fall under the definition of a “large trader.” Under the proposal, each large trader would be assigned a unique Large Trader Identification Number (“LTID”), which would allow the SEC and other regulators to monitor his trading activities.

The proposed large trader reporting system gives the SEC a better way to gather

¹⁴¹ See Large Trader Reporting System, 75 Fed. Reg. 21456 (Apr. 23, 2010).

¹⁴² *Id.* at 21456.

¹⁴³ *Id.*

¹⁴⁴ *Id.* at 21459.

¹⁴⁵ *Id.*

important market information and will likely assist regulators in combating the systemic and capital formation risks discussed above. The rule will have a monitoring effect on all HFT firms who engage in unfair or manipulative practices and that may pose a risk to the overall system. Had the large trader reporting system been in place before May 6, 2010, it may have prevented some HFT firms from aggravating the downward momentum that day. In other words, if HFT firms knew that the SEC was reasonably able to uncover their trading behavior through a large trader reporting system, they would have probably been more reluctant to suddenly switch from being liquidity providers to liquidity takers on May 6. The proposed rule is likely to instill greater confidence in the markets. It will give investors the knowledge that the SEC is capable of discovering, monitoring, and regulating the unfair and harmful practices of HFT firms. To that extent, it will likely bolster the capital formation process.

While the regulatory measures discussed above are a step in the right direction, more must be done to ensure the safety and vibrancy of our equity markets. The following section will discuss market innovations that the SEC could implement to better regulate HFT firms and alleviate the risks their market making activities pose to the financial system and the capital formation process.

V. POSSIBLE SOLUTIONS

To adequately eliminate the risks HFT firms pose to the financial system (through future flash crashes) and the capital formation process (through diminished investor confidence), the SEC must level both the structural and the regulatory playing field. As illustrated above, HFT firms have obtained certain structural advantages through the use of co-location and direct data feed services, which enable them to see and act on market information faster than most market participants. This has allowed HFT firms to operate successful market making strategies, often at the expense of long-term investors. At the same time, these HFT firms have not been subject to regulatory restraints like those imposed on Traditional Market Makers. These regulatory restraints include “affirmative obligations to provide liquidity and to promote price continuity, as well as negative obligations to forego trading in ways that would exacerbate price moves—such as aggressively taking out bids during a price decline and thereby driving prices even lower.”¹⁴⁶ This section will first discuss what can be done to level the structural playing field and thereby bolster investor confidence and the capital formation process. Second, this section will discuss

¹⁴⁶ Schapiro, Strengthening Our Equity Market Structure, *supra* note 1.

what can be done to level the regulatory playing field and thereby reduce the possibility of another flash crash where HFT firms suddenly withdrawal liquidity and exacerbate price moves.

A. Leveling the Structural Playing Field

To level the structural playing field, the SEC must eliminate co-location and direct data feed services. These services allow subscribers, such as HFT firms, to “virtually predict the future.”¹⁴⁷ Some have proposed implementing a “fair access” rule to such services, rather than an outright ban. The SEC touched upon a “fair access” approach to regulating co-location services in its recent Concept Release. The SEC stated that it “believes that the co-location services offered by registered exchanges are subject to the Exchange Act,” and that, in its opinion, “[e]xchanges that intend to offer co-location services must file proposed rule changes and receive approval of such rule changes in advance of offering the services to customers.”¹⁴⁸ The SEC also noted that “[t]he terms of co-location services must not be unfairly discriminatory, and the fees must be equitably allocated and reasonable.”¹⁴⁹

However, given that there is a finite amount of rack space available next to the exchanges or other trading centers, it would be difficult to ensure that everyone is given fair access to co-location services at a nondiscriminatory price. Sal Arnuk, a trader at Themis Trading,¹⁵⁰ recently explained the absurd notion of “fair access” to co-location services in an interview with *Trader’s Magazine*:

The exchanges will always retort that co-location is available to all, and so it is fair. . . . Of course it is available to all, as is a \$1.7 million Bugatti Veyron, which does zero to 60 in 2.6 seconds. But should that class of car be the minimum required to play? If I only need a Civic, or more realistically the V6 Camaro, should I be forced to buy the Bugatti to drive on the freeway?¹⁵¹

Similarly, it would be difficult to ensure that everyone is given “fair access” to direct data feeds at a nondiscriminatory price. As explained by one institutional investor, “‘Fair pricing’ of advantageous data feeds is an oxymoron with regard to public markets. Fairness would dictate that public price information be released to **all** market participants simultaneously.”¹⁵²

Therefore, because “fair access” to co-location and direct data feed services might be a

¹⁴⁷ SAMI Letter, *supra* note 74, at 4.

¹⁴⁸ SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3610.

¹⁴⁹ *Id.*

¹⁵⁰ Themis Trading is an independent broker specializing in trading securities for institutional investors.

¹⁵¹ D’antona Jr. & Chapman, *supra* note 75 (internal quotation marks omitted).

¹⁵² SAMI Letter, *supra* note 74, at 4 (emphasis in original).

near impossibility, the SEC should consider eliminating co-location and direct data feed services altogether. Eliminating direct data feeds would likely be simple. The SEC need only implement a rule prohibiting the exchanges and other trading centers from offering such services.¹⁵³

Eliminating co-location services, however, would not be as simple. Prohibiting the exchanges and trading centers from offering co-location services would merely shift the co-location business to private parties outside of the SEC's regulatory purview. For instance, those who own real estate in the near vicinity of an exchange or other trading center could set up their own co-location businesses. These private parties would be free to rent out server space to the highest bidder or on any other discriminatory basis. Thus, the only way to eliminate co-location services completely may be to eliminate the incentive to co-locate in the first place. In other words, eliminate the need for speed.

The only reason HFT firms co-locate their servers is to trade microseconds faster than other market participants. In a recent comment to the Concept Release, Southeastern Asset Management, Inc.¹⁵⁴ ("SAMI") recognized the importance of advancements in trading technology, but questioned the need to trade at ultra fast speeds:

Most investors have benefited from technology that is far superior to that of 2000, yet still inferior to that possessed by [HFT firms]. That said, execution speed has reached a point of negative marginal returns. **Whether execution turnaround is ten milliseconds or one second does not factor into the capital allocation consideration of the majority of market participants, particularly the favored long-term investor.** Execution turnaround of less than one second only helps the short-term professional trader use structural advantages to the detriment of the long-term investor.¹⁵⁵

One way to eliminate the incentive to co-locate, i.e. the need to trade at microsecond speeds, is to batch process orders. The SEC alluded to this mechanism in its Concept Release wherein it asked, "[C]ould exchanges and other trading centers batch process all orders each second and, if so, what would be the effect of such a policy on market equality?"¹⁵⁶ Batch processing of orders involves the bringing together of buy and sell orders within a predefined

¹⁵³ In comment to the SEC's Concept Release, Southeastern Asset Management, Inc. suggested that the SEC "ban individual data feeds altogether and require public venues to supply additional information (e.g. depth-of-book, odd-lot transactions) to the consolidated data feed." *Id.*

¹⁵⁴ Southeastern Asset Management, Inc. is an employee-owned investment advisor to the Longleaf Partners mutual funds representing thousands of individual investors. *See id.* at 1

¹⁵⁵ *Id.* at 6 (emphasis in original).

¹⁵⁶ SEC Concept Release on Equity Market Structure, 75 Fed. Reg. at 3610.

period of time and then conducting a call auction¹⁵⁷ at the end of that period.¹⁵⁸ Thus, batch processing of orders over one-second intervals would create “a trading day made up of thousands of one second auctions.”¹⁵⁹

Batch processing of orders “solves the co-location dilemma elegantly.”¹⁶⁰ Because virtually all investors—including long-term investors—now have the ability to trade at speeds of at least one second, “[i]f batches or auctions occur at one second intervals, **all** market participants will have fair electronic access without significant, if any, additional cost or constraints.”¹⁶¹ In other words, when the lowest common denominator is one second, there is no need to employ co-location services to squeeze out a few microseconds of latency. Therefore, because batch processing is possibly the only way to eliminate co-location and thereby ensure a level structural playing field, the SEC should strongly consider transforming the equity markets from a continuous trading model¹⁶² to a batch trading call auction model.

By eliminating co-location and direct data feed services, HFT firms will be placed significantly on par with long-term investors. They will no longer be able to front-run long-term investor’s orders and receive information not publically available through the consolidated data feeds. This is likely to boost investor confidence in the equity markets and encourage individuals to contribute more of their capital to worthy enterprises. This, in turn, will promote economic growth and improve quality of life metrics for millions of individuals who depend on the U.S. equity market to build savings for significant life events, such as college and retirement.

B. Leveling the Regulatory Playing Field

To level the regulatory playing field, the SEC should impose basic trading obligations¹⁶³

¹⁵⁷ Simply explained, “[a] call auction is an alternative to the continuous matching of orders usual in securities markets. Limit orders are collected over a (fixed) period. At the end of this time the orders are processed in the auction. The price that enables the largest number of orders to be executed is chosen: if the price were higher the trade volume would fall through lack of buys, if the price were lower the trade volume would fall through lack of sells.” Call Auction, <http://moneyterms.co.uk/call-auction/>.

¹⁵⁸ For an in-depth discussion of batch processing see Robert A. Schwartz, *Building a Better Stock Market: New Solutions to Old Problems* (AEI-Brookings Joint Ctr. for Regulatory Studies, Working Paper No. 00-3, 2000), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=243536.

¹⁵⁹ SAMI Letter, *supra* note 74, at 4.

¹⁶⁰ *Id.*

¹⁶¹ *Id.* (emphasis in original).

¹⁶² See generally Continuous Trading, <http://www.investopedia.com/terms/c/continuous trading.asp> (“Unlike batch trading, which collects similar orders and executes them all at once, continuous trading entails the immediate placement of orders to market. In the U.S., all trades occur on a continuous basis except at opening.”)

¹⁶³ See generally SAMI Letter, *supra* note 74, at 6 (“HFT firms now provide “liquidity” openly on the exchange (not ‘upstairs’) and have no obligations or even client pressures to keep them ‘honest.’ If a stock is in free-fall, nothing forces a HFT firm to provide stabilizing buying interest. At the least, if HFTs want to continue being the ‘new

on HFT firms and require them to register as broker-dealer with the SEC and become a member of a self-regulatory organization, or SRO, such as FINRA or one of the national securities exchanges.¹⁶⁴ These trading obligations should be similar those imposed on Traditional Market Makers, which include the obligation to maintain fair and orderly markets and to post continuous two-sided quotations. The obligation to maintain fair and orderly markets should itself necessitate that HFT firms are not justified in becoming liquidity takers during sharp downward slides.

Additionally, HFT firms should be subject to the enhanced quotation requirements proposed by several exchanges and currently under consideration by the SEC.¹⁶⁵ This would prevent them from entering stub quotes to effectively drop out of the market during tough trading conditions.¹⁶⁶ However, the SEC should allow HFT firms, like NYSE DMMs, to trade freely for their own account, even when not reasonably necessary to maintain fair and orderly markets or act as an odd-lot dealer. This will enable HFT firms to conduct highly profitable market making activities during good times to offset the costs of providing stabilizing buying interest during bad times, thereby giving HFT firms the ability and incentive to provide liquidity at all times.

However, it is important to note that if the SEC successfully eliminates co-location and direct data feed services, there may not be a need to force trading obligations upon HFT firms. With their structural advantages taken away, HFT firms may not be able to conduct market making strategies, at least profitably. As such, HFT firms engaged in market making strategies will face one of two choices: either go out of business or elect to become registered market makers. Becoming a registered market maker will necessitate registering as a broker-dealer with the SEC and becoming a member of a national exchange or FINRA.¹⁶⁷ As registered market makers, the SEC should allow HFT firms to retain somewhat favorable time and place advantages in exchange for a promise to adhere to the trading obligations mentioned above.

Although imposing trading obligations on HFT firms would reduce competition among liquidity providers and therefore widen spreads, long-term investors would likely favor such a

market makers', they should be subject to basic obligations, both affirmative (e.g. make reasonable two-sided markets all the time) and negative (e.g. do not cross the spread and cause price changes).").

¹⁶⁴ For an overview of Broker-Dealer registration, see Sec. & Exch. Comm'n, Guide to Broker Dealer Registration, <http://www.sec.gov/divisions/marketreg/bdguide.htm> [hereinafter Guide to Broker Dealer Registration].

¹⁶⁵ See, e.g., NASDAQ Notice of Filing, *supra* note 136; NYSE Notice of Filing, *supra* note 136.

¹⁶⁶ For more on stub quotes, see *supra* p. 15 and note 90.

¹⁶⁷ See generally Guide to Broker Dealer Registration, *supra* note 164. <http://www.sec.gov/divisions/marketreg/bdguide.htm>.

regulatory change. Indeed, long-term investors would probably rather pay a wider spread upfront than lose everything later on during a liquidity crisis like the one experienced in the equity markets on May 6, 2010.

VI. CONCLUSION

Over the past decade, HFT firms have become a significant part of the equity market structure. As such, regulators must thoroughly and consistently examine their activities to determine whether their activities are having an adverse impact on long-term investors and whether they pose a viable threat to the overall financial system. Because recent events and investor commentary reveal that HFT firms are hindering the capital formation process and making the equity markets more prone to liquidity crises, regulators should quickly take action to correct these weaknesses in the financial system.

Failure to adequately regulate HFT firms could prove to be a disastrous mistake with severe consequences. In discussing HFT firms, Senator Ted Kaufman recently reminded Congress members of the severe consequences resulting from past regulatory failings and urged them to equip regulators with the tools necessary to adequately police the markets:

“In years past, without a sufficient regulatory presence, an aura of invincibility developed at many financial institutions. We failed to ask questions, we failed to ensure regulators were on the field with the tools they need to do their jobs, and the results are clear: Millions of Americans have lost their jobs, their homes, and their savings. We must not repeat that mistake. We must be sure that when financial markets push the envelope, take on more and more risk, and exploit any crack in the wall, they are monitored and regulated to assure it is in the public good.”¹⁶⁸

Indeed, the financial crisis of the past two years should remind us all of the importance of evaluating, monitoring, and regulating sophisticated, self-interested parties engaged in complex, non-transparent activities when large sums of money are at stake—as is precisely the case with HFT firms.

¹⁶⁸ Senator Edward E. Kaufman, Address before Congress (Sept. 23, 2009), at 5(on file with author).