

**HOW TO PREVENT FUTURE FLASH  
CRASHES AND RESTORE THE  
ORDINARY INVESTORS' CONFIDENCE  
IN THE FINANCIAL MARKET:  
THE IMPLEMENTATION OF CIRCUIT  
BREAKERS AND SPEED LIMITS TO  
HELP ENFORCE THE MARKET  
ACCESS RULE**

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INTRODUCTION

In the race for the newest, fastest, trading technology, Wall Street traders are quickly being replaced by lightning-quick computer algorithms, capable of executing a day's worth of stock trades with the single click of a computer mouse. As Wall Street firms invest millions of dollars in the research and development of high-frequency trading ("HFT") technology, U.S. regulators are struggling to keep pace.

The Securities and Exchange Commission ("SEC") simply does not have the financial resources to access the cutting edge trading technology responsible for the new surge of HFT technology in the financial market. The SEC's failure to keep up with these technological advances made its most dramatic display during the May 6, 2010, flash crash. On May 6, Waddell & Reed Financial Inc., a Kansas-based mutual fund manager, sold 1.6 million e-minis<sup>1</sup> over the course of twenty minutes, causing the market to suddenly drop 998.50 points.<sup>2</sup> The market was able to recover 347.8 points by the end of the day, giving the event its name: the flash crash.<sup>3</sup>

In the aftermath of the May 6 flash crash, the Canadian, German, and European Union financial markets immediately implemented preventative policies and regulations in order to avert flash crashes in

1. E-minis are stock market index futures contracts exclusively traded on the Chicago Mercantile Exchange's Globex electronic trading platform. According to Askville by Amazon, "[s]tock index futures are contracts to buy or sell the value of a specific stock index at a specific price on a specific date in the future. Mini contracts are smaller versions of regular contracts and require less money to trade." *What is E-Mini Trading?*, ASKVILLE BY AMAZON, <http://askville.amazon.com/E-mini-trading/AnswerViewer.do?requestId=13406505> (last visited Nov. 3, 2013).

2. Tom Lauricella and Peter A. McKay, *Dow Takes a Harrowing 1,010.14-Point Trip*, WALL STREET JOURNAL (last updated May 7, 2010, 12:01 AM), <http://online.wsj.com/article/SB10001424052748704370704575227754131412596.html>; COMMODITY FUTURES TRADING COMM'N & SECURITIES AND EXCHANGE COMM'N, FINDINGS REGARDING THE MARKET EVENTS OF MAY 6, 2010 10 (Sept. 30, 2010), available at <http://www.sec.gov/news/studies/2010/marketevents-report.pdf>.

3. CFTC & SEC REPORT, *supra* note 2.

their international markets. Among these preventative measures are the implementation of circuit breakers and speed limits on trade execution velocity.<sup>4</sup> In the U.S., regulators did not act as quickly. After a trial period, the SEC implemented the market access rule. The rule aims to ensure that financial firms executing high frequency technology have safety measures in place in case their HFT technology algorithms go awry. While the market access rule is certainly a step in the right direction toward protecting investors from rogue computer algorithms, regulators should additionally follow the international market and implement circuit breakers and speed limits on trade execution. These additional regulatory measures will help overcome the danger of regulators allowing the HFT industry to regulate itself.

The addition of speed limits and circuit breakers to the existing regulatory framework will have the dual effect of leveling the playing field for ordinary investors while simultaneously helping prevent future flash crashes. Speed limits level the playing field for both ordinary and sophisticated investors by ensuring that high frequency traders are not given a radical time advantage over the rest of the financial markets. Speed limits accomplish this goal by placing a time limit on how fast trades can be executed. Circuit breakers, in contrast, are the most direct way to prevent flash crashes as soon as a stock begins to exhibit flash crash symptoms. Circuit breakers stop trading in a particular stock if the price of the stock moves up or down by a certain percentage over a certain, usually short, amount of time. The effect of circuit breakers is to immediately halt the trading of a stock exhibiting flash crash symptoms.

While there are certainly benefits to using HFT technology in the financial market, such as lower trading costs and competitive time advantages, there are signs that HFT is at least partially to blame for ordinary investors' loss of confidence in today's financial market. The U.S should follow the lead of Canada, Germany, and the European Union by implementing circuit breakers and speed limits on trade execution velocity. Speed limits will create a more transparent trading

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4. See Birgit Ortkemper, BUNDESANSTALT FÜR FINANZDIENSTLEISTUNSAUFSICHT [BaFin] [Federal Financial Supervisory Authority], NEW RULES FOR HIGH FREQUENCY TRADING (Nov. 22, 2012), [http://www.bafin.de/SharedDocs/Veroeffentlichungen/EN/Fachartikel/2012/fa\\_bj\\_2012\\_11\\_hochfrequenzhandel\\_en.html](http://www.bafin.de/SharedDocs/Veroeffentlichungen/EN/Fachartikel/2012/fa_bj_2012_11_hochfrequenzhandel_en.html); Nathaniel Popper, *Beyond Wall Street, Curbs on High-Speed Trades Proceed*, N.Y. TIMES (Sept. 26, 2012), <http://www.nytimes.com/2012/09/27/business/beyond-wall-st-curbs-on-high-speed-trading-advance.html?pagewanted=all>; Barbara Schechter, *Canadian Regulator Set to Get Tough on High-Frequency Trading*, FINANCIAL POST (July 18, 2012, 10:36 AM), <http://business.financialpost.com/2012/07/18/canadian-regulator-set-to-get-tough-on-high-frequency-trading>; Derek Klobucher, *Europe Takes Control of High-Speed Trading*, FORBES (Oct. 2, 2012, 9:15 AM), <http://www.forbes.com/sites/sap/2012/10/02/europe-takes-control-of-high-speed-trading>.

environment for financial market investors and circuit breakers will help prevent future flash crashes. Both will help restore the ordinary investor's confidence in the market.

In Part I, this Note offers background information about HFT, including how the technology is used and how the technology contributed to the May 6, 2010 flash crash. This part also describes regulatory reactions to the flash crash, including descriptions of the temporary policies that were immediately implemented in the flash crash's wake. Part II explores why HFT may be bad for ordinary investors, and why HFT technology may be at least partially to blame for ordinary investors' loss of confidence in the U.S. financial market. Additionally, this part analyzes the means by which U.S. regulators can work to overcome the volatile effect of HFT technology.

Part III analyzes the international model for regulating high frequency technology including the legislation and policies implemented by Germany, Canada, and the European Parliament. Part IV asserts that adopting speed limits and circuit breakers will help enforce the market access rule, prevent future flash crashes, and restore the ordinary investor's confidence in the market.

## I. BACKGROUND

On May 6, 2010, the U.S. stock market experienced its first "flash crash." At approximately 2:32 p.m., Waddell & Reed Financial Inc., a Kansas-based mutual fund manager, sold 1.6 million e-minis<sup>5</sup> over the course of twenty minutes.<sup>6</sup> This sale saturated the market, causing the market to suddenly drop 998.50 points.<sup>7</sup> Despite the sudden drop, the algorithm continued to execute the trade "without regard to price or time."<sup>8</sup> The market was able to recover 347.8 points by the end of the day, giving the event its name: the flash crash.<sup>9</sup>

The increasing availability of fast-moving trade technology has played a direct role in the increasing prevalence of HFT. HFT is most easily described as a "lightning quick" stock market trade executed on a computer.<sup>10</sup> In its most basic use, HFT executes specialized algorithms via super-fast computers in order to detect market movements.<sup>11</sup> The

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5. See *supra* note 1 for a discussion of e-minis.

6. Lauricella & McKay, *supra* note 2; CFTC & SEC REPORT, *supra* note 2, at 2.

7. Lauricella & McKay, *supra* note 2.

8. Graham Bowley, *Lone \$4.1 Billion Sale Led to 'Flash Crash' in May*, N.Y. TIMES (Oct. 1, 2010), <http://www.nytimes.com/2010/10/02/business/02flash.html>.

9. CFTC & SEC REPORT, *supra* note 2, at 2.

10. *HFT*, N.Y. TIMES (updated Dec. 20, 2012), [http://topics.nytimes.com/topics/reference/timestopics/subjects/h/high\\_frequency\\_algorithmic\\_trading/index.html](http://topics.nytimes.com/topics/reference/timestopics/subjects/h/high_frequency_algorithmic_trading/index.html).

11. *Rise of the Machines*, THE ECONOMIST (July 30, 2009),

computers then execute those algorithms again to exploit the market movements for the trader's or firm's advantage.<sup>12</sup> There are several ways for HFT to exploit the market movements. One strategy involves sending out "a stream of probing quotes" to trade large orders in blocks of 100 to 500 shares.<sup>13</sup> If the quotes go unanswered (with no willing buyers), the quotes are quickly cancelled.<sup>14</sup> The quotes continue to be cancelled until a buyer is found.<sup>15</sup> Once the trader finds a buyer, "the traders then buy or short the targeted stock ahead of the investor, offering it to them a fraction of a second later for a tiny profit."<sup>16</sup> This quick quoting and cancelling of the order helps the HFTers determine how much a buyer (investor) is willing to pay for the block of shares.<sup>17</sup>

Cisco, Tradeworx, and Thesys are at the forefront of leading HFT technology. Cisco recently released new technology that feeds market data into computers in just 50 nanoseconds.<sup>18</sup> Cisco's Series 3548 model line simultaneously supplies "high-speed switches" to trading firms while providing analytical information about changes in the market.<sup>19</sup> Operating in "normal mode," the 3548 takes in, processes, and forwards trading information in 250 nanoseconds.<sup>20</sup> The 3548 features a "warp span" with the capacity of replicating market data in just 50 nanoseconds and taking in, processing, and forwarding trade information in just 190 nanoseconds.<sup>21</sup>

Tradeworx has teamed up with Thesys technologies to create their own comprehensive HFT technology. The Tradeworx/Thesys technologies feature "hyper-efficient algorithms for block and basket-order execution, hosted on the fastest trading infrastructure anywhere."<sup>22</sup> The technology also creates a paper trail of "real-time and historical surveillance, compliance, and monitoring tools" and features "ultra-fast direct or aggregated feeds and order books, realistic exchange simulators for back testing of active and passive strategies, [and] historical data and visualization tools" to ensure safe trading activity and monitor risk.<sup>23</sup>

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<http://www.economist.com/node/14133802>.

12. *Id.*

13. *Id.*

14. *Id.*

15. *Id.*

16. *Id.*

17. *Id.*

18. Tom Steinert-Threlkeld, *Cisco Hits 'Warp' Speed, Replicates Feeds in 50 Nanoseconds*, TRADERS MAGAZINE (Sept. 19, 2012), <http://www.tradersmagazine.com/news/cisco-50-nanosecond-data-replication-110311-1.html>.

19. *Id.*

20. *Id.*

21. *Id.*

22. *See generally* TRADEWORX, <http://mail.tradeworx.com> (last visited Jan. 16, 2014).

23. *Id.*

After the flash crash, the SEC identified HFT technology, similar to that of Cisco, Tradeworx, and Thesys, as the igniting catalyst to the May 6, 2010 flash crash. An official SEC report found that the flash crash began when the sale of 75,000 E-Mini Standard & Poor's 500 future contracts was executed because of the manipulation of an algorithm over the short time span of just twenty minutes.<sup>24</sup> The report explains that normally, without HFT technology, a comparable sale of this size would take place over five hours.<sup>25</sup> However, the algorithm executed this particular trade "without regard to price or time," and "continued to sell even as prices dropped sharply."<sup>26</sup> As the trades were sold, high frequency traders began to aggressively resell those same trades, causing Waddell's algorithm to accelerate its selling.<sup>27</sup> The report describes what happened next as a "hot potato effect": contracts changed hands between the Waddell traders and the high frequency traders "27,000 times in 14 seconds, but with eventually only 200 actually being bought or sold."<sup>28</sup> The effects of this hot potato trading trickled down from the futures market to the stock market when arbitrageurs began buying the cheap futures contracts, and reselling the cash shares "on markets like the New York Stock Exchange."<sup>29</sup> Other automatic computerized traders on the stock market detected the radical rises in buying and selling, and shut down.<sup>30</sup> This shut down, in turn, led to steep drops in prices of individual stocks.<sup>31</sup> For example, on May 6, 2010, shares of Procter & Gamble were trading at a low price of just one cent, and a high price of \$100,000.<sup>32</sup>

#### *A. Symptoms of a Flash Crash*

In the SEC's Findings Regarding the Market Events of May 6, 2010, the SEC identified five phases leading up to the flash crash.<sup>33</sup> In the first phase, from the time the market opened to the time Waddell began trading the large block trade, "prices were broadly declining across markets."<sup>34</sup> In the second phase, during the time period the SEC identifies as 2:32 p.m. to approximately 2:41 p.m., the broadly declining

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24. Bowley, *supra* note 8.

25. *Id.*

26. *Id.*

27. *Id.*

28. *Id.*

29. *Id.*

30. *Id.*

31. *Id.*

32. *Id.*

33. CFTC & SEC REPORT, *supra* note 2, at 9.

34. *Id.*

markets continued to lose ground, "declining another 1-2%."<sup>35</sup> In the third phase, covering the time between 2:41 p.m. and 2:45:28 p.m., "volume spiked upwards and the broad markets plummeted a further 5-6%."<sup>36</sup> In phase four, from 2:45 p.m. to approximately 3:00 p.m., "broad market indices recovered while at the same time many individual securities and ETFs experienced extreme price fluctuations and traded in a disorderly fashion at prices as low as one penny or as high as \$100,000."<sup>37</sup> In the fifth and final phase, beginning at about 3:00 p.m., "prices of most individual securities significantly recovered and trading resumed in a more orderly fashion."<sup>38</sup> These five phases can be more broadly described as: (1) an already volatile market (2) experiences dramatic price fluctuations across the market, then (3) individual securities begin to experience extraordinary price movements, and (4) trading suddenly resumes to a more "orderly fashion."<sup>39</sup>

### *B. Subsequent flash crashes and related technological glitches*

Since the May 6 flash crash, technological glitches and misfires have continued to contribute to an unstable, volatile market. On August 1, 2012, a rogue algorithm caused Knight Capital to flood the market with millions of unintentional orders over a period of just 45 minutes.<sup>40</sup> Subsequently, the firm was forced to accept \$400 million in rescue financing (in exchange for more than a 70% stake in the company) and is rumored to be in talks to settle with the SEC for approximately \$12 million.<sup>41</sup>

The 2012 Facebook IPO fell victim to technological malfunction when trading was delayed on NASDAQ for 30 minutes after the exchange "had trouble matching buy and sell orders."<sup>42</sup> The pause caused a delay in the confirmation for millions of shares, arguably causing some investors to halt trading in the IPO, consequently hindering Facebook's first-day performance.<sup>43</sup>

On August 22, 2013, an electronic malfunction in a computer system froze trading in Nasdaq-listed stocks, like Apple and Facebook,

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35. *Id.*

36. *Id.*

37. *Id.*

38. *Id.*

39. *Id.*

40. John D'Anotona, Jr., *KCG Close to \$12M Settlement for 2012 Trading Glitch*, TRADERS MAGAZINE ONLINE NEWS (Sept. 27, 2013), <http://www.tradersmagazine.com/news/kcg-knight-close-to-settlement-2012-trading-glitch-111571-1.html>.

41. *Id.*

42. Christopher Matthews, *Wall Street's Worst Computer Glitches*, TIME (Sept. 20, 2013, 2:00 PM), <http://business.time.com/2013/09/20/wall-streets-worst-computer-glitches>.

43. *Id.*

for three hours.<sup>44</sup> That same month, a computer technical error at Goldman Sachs caused the company "to accidentally send trade orders to the U.S. options exchanges."<sup>45</sup> Though the exchanges were able to cancel the trades, thereby causing no trading loss to the company, the cancellation outraged exchange members who stood to profit from the trades.<sup>46</sup>

The Knight Capital flash crash, Facebook IPO, and the computer glitches in the summer of 2013 were all the result of deviant computer technology. While these technological glitches cannot solely be attributed to HFT technology, the accumulation of events offer proof that operational risk will persistently plague Wall Street with the continued use of advanced trading technology. The sustained use of similar programs will continue to contribute to an unstable, volatile market.

### C. REGULATORY REACTIONS TO THE FLASH CRASH AND CRITICISM OF HOW U.S. REGULATORS REACTED

In an effort to prevent flash crashes in the days and months immediately following the 2010 flash crash, the SEC immediately implemented temporary regulations aimed at curbing short-term volatility of the market. These temporary regulations included circuit breakers, "limit up-limit down" rules, and the market access rule. From these temporary regulations, the SEC permanently adopted the market access rule. Additionally, the SEC launched a website that offers information on every quarter's various HFT quotes, cancellations and executed trades.<sup>47</sup>

#### 1. Circuit Breakers

In the immediate aftermath of the flash crash, the SEC temporarily adopted single stock circuit breakers. Single stock circuit breakers stop trading in a particular stock if the price of the stock moves up or down by 10% over the span of five minutes.<sup>48</sup> According to the SEC, the purpose

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44. Kevin McCoy, *S&P: Exchanges' Glitches Put Ratings at Risk*, USA TODAY (Sept. 20, 2013, 2:24 PM), <http://www.usatoday.com/story/money/markets/2013/09/20/exchange-glitches-and-downgrades/2842259>.

45. *Exchanges' Technical Glitches Reveal Growing Operational Risk—And Could Trigger Downgrades*, STANDARD & POOR'S (Sept. 19, 2013, 1:06 PM), <http://www.standardandpoors.com/ratings/articles/en/us/?articleType=HTML&cassetID=1245357558044>.

46. *Id.*

47. Sarah N. Lynch, *SEC Website Will Shed Light on High-Speed Trading*, REUTERS (Oct. 2, 2013, 6:22 PM), <http://www.reuters.com/article/2013/10/02/us-sec-market-data-idUSBRE9910ZE20131002>.

48. Bowley, *supra* note 8.



of circuit breakers is to "ensure that market participants have an opportunity to become aware of and respond to significant price movements."<sup>49</sup> The temporary regulation takes form through proposed changes to rule 11.14, and pilot testing began in April of 2013.<sup>50</sup> In broad form, rule 11.14 provides a methodology to determine when to "halt trading in all stocks due to extraordinary market volatility."<sup>51</sup> The rule also provides for trading halts characterized by certain market decline percentages.<sup>52</sup> Decline percentages are divided into three categories: levels 1, 2, and 3.<sup>53</sup> Under the temporary regulation, a level 1 halt indicates a 7% decline, level 2 indicates a 13% decline, and level 3 indicates a 20% decline.<sup>54</sup> The proposed changes also modify how the level trigger point is determined: under the temporary regulation, the level trigger point is calculated by the S&P 500 on a daily basis, rather than by the Dow Jones Industrial Average on a quarterly basis.<sup>55</sup> The changes to rule 11.14 began pilot testing in conjunction with the limit up, limit down rule.<sup>56</sup>

## 2. Limit Up, Limit Down

This regulation, formally known as Rule 608, provides "for market-wide limit up-limit down requirements that prevent trades in individual NMS Stocks from occurring outside of specified price bands."<sup>57</sup> According to the SEC, Rule 608 flags a trade as non-executable when "one side of the market for an individual security is outside the applicable price band."<sup>58</sup> The SEC explains,

When the other side of the market reaches the applicable Price Band, the market for an individual security will enter a limit state. Trading for that security will exit the limit state if, within 15 seconds of entering the limit state, all limit state quotations were executed or cancelled. If the market does not exit a limit state within 15 seconds,

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49. Self-Regulatory Organizations; EDGX Exchange, Inc.; Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Delay the Operative Date of Changes to the Rule for Halting Trading in All Stocks Due to Extraordinary Market Volatility, Exchange Act Release No. 34-68805, 78 Fed. Reg. 8648, 8649 (Feb. 6, 2013).

50. *Id.* at 8648-49.

51. *Id.* at 8648.

52. *Id.* at 8648-49.

53. *Id.*

54. *Id.* at 8649.

55. *Id.*

56. *Id.*

57. Self-Regulatory Organizations; C2 Options Exchange, Incorporated; Notice of Filing of Proposed Rule Change Relating to the Regulation NMS Plan to Address Extraordinary Market Volatility, Exchange Act Release No. 34-69083, 78 Fed. Reg. 1630, 1631 (Mar. 14, 2013).

58. *Id.*

then the primary listing exchange will declare a five-minute trading pause, which will be applicable to all markets trading the security.<sup>59</sup>

The crucial difference between circuit breakers and the limit up, limit down rule, is that circuit breakers "would be used to stop trading across the whole exchange—while limit up, limit down are confined to futures contracts."<sup>60</sup> As explained by CNBC, circuit breakers are more expansive in that they are "a market safety feature [that] temporarily stop[s] trading when there is a computer-induced plummet in prices."<sup>61</sup> To date, the limit up, limit down rule has not been permanently adopted.

### 3. Market Access Rule

The market access rule is the only official rule adopted by the SEC in the wake of the flash crash. Officially codified as 17 C.F.R. § 242.613, the market access rule mandates that commodity and security exchanges create, implement, and maintain a consolidated audit trail while providing the exchange with flexibility "in how they choose to meet the requirements of the Rule. . ."<sup>62</sup>

The SEC requires that the consolidated audit trail "capture customer and order event information for orders in NMS [National Market Systems] securities, across all markets, from the time of order inception through routing, cancellation, modification, or execution."<sup>63</sup> The SEC explains, "[t]hese requirements are intended to ensure that the Commission and the public have sufficiently detailed information to carefully consider all aspects of the NMS plan ultimately submitted by the SROs, facilitating an analysis of how well the NMS plan would allow regulators to effectively and efficiently carry out their responsibilities."<sup>64</sup> Specifically, the market access rule says that firms executing trades via HFT must:

- Report data by 8 a.m. of the next trading day,<sup>65</sup>
- Transmit all orders to a central repository and "the repository must be able to efficiently and accurately link together all lifecycle events for the same order, and make

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59. *Id.*

60. Mark Koba, *Limit Up, Limit Down: CNBC Explains*, CNBC (Mar. 7, 2012, 12:17 PM), <http://www.cnbc.com/id/46644158>.

61. *Id.*

62. Consolidated Audit Trail, Exchange Act Release No. 34-67457, 77 Fed. Reg. 45,722, 45,738 (18 Aug., 2012).

63. *Id.* at 45,722.

64. *Id.* at 45,725.

65. *Id.* at 45,724.

available to regulators this linked order data";<sup>66</sup>

- Permit small broker-dealers three years to "provide the required data to the consolidated audit trail";<sup>67</sup>
- Require that the selected "plan describe and discuss any reasonable alternative approaches to the creation of the consolidated audit trail that were considered by the SROs and why the approach set forth" was selected;<sup>68</sup>
- "Provide a plan to eliminate existing rules and systems (or components thereof) that are rendered duplicative by the consolidated audit trail, including identification of such rules and systems (or components thereof)";<sup>69</sup>
- Provide a "plan to address the process by which the plan sponsors solicited views of their members and other appropriate parties regarding the creation, implementation, and maintenance of the consolidated audit trail, provide a summary of the views of such members and other parties, and describe how the plan sponsors took such views into account in preparing" the plan;<sup>70</sup>
- "Require the central repository's Chief Compliance Officer to regularly review the operations of the consolidated audit trail, and, in light of market and technological developments, make appropriate recommendations for enhancements to the consolidated audit trail";<sup>71</sup> and
- Provide "detailed information regarding anticipated error rates as well as the plan's proposed error connection process,"<sup>72</sup> including "additional policies and procedures that are designed to ensure the rigorous protection of confidential information collected by the central repository."<sup>73</sup>

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66. *Id.*

67. *Id.*

68. *Id.*

69. *Id.*

70. *Id.*

71. *Id.* at 45,724-25.

72. *Id.* at 45,725.

73. *Id.*

In addition to these requirements, the SEC asks that the firms address the following considerations in their plan:

- (1) The specific features and details of the NMS plan (e.g. how data will be transmitted to the central repository, when linked data will be available to regulators);
- (2) the SRO's analysis of NMS plan costs and impact on competition, efficiency, and capital formation;
- (3) the process followed by the SROs in developing the NMS plan (e.g. the requirement to solicit input from members of the SROs and other appropriate parties); and
- (4) information about the implementation plan and milestones for the creation of the consolidated audit trail.<sup>74</sup>

The rule encourages "risk targeted exams," designed to help the SEC better understand how HFT firms implement any technological changes, prevent problems or the algorithm from running amok, and how the firm recovers from technological glitches.<sup>75</sup>

#### 4. SEC Website

The SEC launched the *Market Structure* website in October of 2013 in an effort to make information about HFT technology, data, and tracking more easily accessible to the public.<sup>76</sup> The website shows how quickly orders are filled, compares how often orders that entered the market were actually executed, and how many HFT orders were canceled.<sup>77</sup> The website invites investors to "review current staff market structure research, use interactive data visualization tools to explore a variety of advanced market metrics produced from the Commission's Market Information Data and Analytics System (MIDAS), download dozens of datasets to perform your own analyses," and further the dialogue on HFT through a public feedback feature.<sup>78</sup> According to SEC Chair Mary Jo White, "we expect this new tool to transform the debate on market structure by focusing as never before on data, not anecdote."<sup>79</sup> The SEC updates the website on a quarterly basis, but hopes to make more frequent updates in the future.<sup>80</sup>

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74. *Id.*

75. Sarah N. Lynch, *SEC reviewing technology at brokerages following glitches*, REUTERS, (Sept. 26, 2012, 5:15 PM), <http://www.reuters.com/article/2012/09/26/sec-technology-review-idUSL1E8KQFE020120926>.

76. *Market Structure*, SEC.GOV, <http://www.sec.gov/marketstructure/#.UnlUJpNetgJ> (last modified Oct. 9, 2013).

77. Lynch, *supra* note 47.

78. *Overview, Market Structure*, SEC.GOV, *supra* note 76.

79. Lynch, *supra* note 75.

80. *Id.*

## 5. Criticism of the U.S. Regulators' Reaction

Critics of the SEC's hesitance to regulate in the aftermath of the 2010 flash crash stand in opposition to advocates against regulation. Critics in favor of regulation argue that a lack of SEC intervention will give rise to "dark pools" of secret trading, and unstable markets. Critics against regulation insist that the market is better off without government intervention. Advocates of self-regulation propose that any legislation of HFT should be left to technical experts in the field.<sup>81</sup>

Critics in favor of government regulation suggest that a lack of regulation contributes to an unstable market.<sup>82</sup> According to this school of thought, volume in the market is not equal with liquidity.<sup>83</sup> Even though HFT technology undeniably inserts volume into the market (by executing large numbers of trades at once), since those trades are not held overnight (they are quickly dropped), the unheld trades do not actually represent a liquid commodity.<sup>84</sup>

Those in favor of government regulation also argue that regulators are responsible for increasing transparency on HFTs.<sup>85</sup> "Dark pools" have surfaced as a safe haven for institutional investors to execute large volume trades in a location that is not available to the public's eye.<sup>86</sup> In the regular, public exchange, when traders detect a large order coming to the market, they run up the stock price.<sup>87</sup> However, in a "dark pool," operated on private platforms instead of the public exchange, "identities and total order sizes are kept hidden until the trade is executed."<sup>88</sup> A key feature of a "dark pool" is that the pool does not identify the

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81. See *High Frequency Trading Debate*, THE ECONOMIST, <http://www.economist.com/debate/days/view/818>; Corey E. Costa, *Is HFT the Problem with the Financial Markets?*, 3 STEVENSON U. FORENSICS J., 18, 2012, [http://gps.stevenson.edu/site/wp-content/uploads/2012/04/Forensic\\_Journal\\_2012.pdf#page=20](http://gps.stevenson.edu/site/wp-content/uploads/2012/04/Forensic_Journal_2012.pdf#page=20); Letter from James D. Angel, PhD, CFA, to the SEC, *RE: Comments on market technology and issues and market stability*, Sept. 5, 2012, <http://www.sec.gov/comments/4-652/4652-5.pdf>; James Angel, Lawrence Harris, and Chester S. Spatt, Working Paper, *Equity Trading in the 21<sup>st</sup> Century*, USC MARSHALL SCHOOL OF BUSINESS, Feb. 23, 2010, <http://www.scribd.com/doc/93399318/Angel-Harris-Spatt-Equity-Trading-in-the-21st-Century>.

82. Seth Merrin, *The Opposition's Closing Remarks*, THE ECONOMIST (Mar. 14, 2012), <http://www.economist.com/debate/days/view/818>.

83. *Id.*

84. Sal Arnuk, Joseph Saluzzi and R. T. Leuchtkafer, *What's Changed Since the Flash Crash?*, ADVANCED TRADING (May 6, 2011), <http://www.advancedtrading.com/algorithms/whats-changed-since-the-flash-crash/229402968>.

85. Costa, *supra* note 81.

86. *Id.*

87. Allen Wastler, *Dark Pools: Letting in Some Light Now?*, CNBC (Jan. 28, 2013, 12:18 PM) <http://www.cnbc.com/id/100409045>.

88. *Id.*

participating broker or institution, or the information about the broker or institution's order.<sup>89</sup> Since the identities of both the buyer and the seller can be concealed in a dark pool, brokers can avoid the fees charged by the public exchanges.<sup>90</sup> Traders who want to make a large trade are enticed to execute in the "dark pool" so that competing traders can't watch the activity.<sup>91</sup> By staying in the "dark," competing traders cannot manipulate prices by driving them up or down, because competing traders can't see the activity.<sup>92</sup> This makes the use of dark pools very attractive for executers of HFT, who primarily execute large volume trade orders.<sup>93</sup>

Critics opposed to government intervention suggest that technical experts are in a better position than SEC attorneys to determine how to regulate the HFT industry.<sup>94</sup> In his comments to the SEC on market technology issues and market stability, James Angel PhD remarked, "the SEC should approach system technology the way the [Federal Aviation Administration] and [National Transportation Safety Board] approach transportation safety by relying primarily on experienced technical experts, not attorneys."<sup>95</sup> Angel advocates against approaching the HFT problems from a legalistic standpoint. He urges:

It is tempting for the SEC (to) follow its usual custom and to pass a rule which says that market participants must have policies and procedures in place to have good technology and to document those procedures, and then send enforcement people in to inspect the paperwork. However, approaching the problem legalistically sets up an adversarial and thus unproductive atmosphere from the start.<sup>96</sup>

Angel insists that the SEC's effort to regulate through the market access rule is unproductive and more appropriately dealt with by industry experts with technical expertise in HFT.<sup>97</sup>

Other critics of HFT regulation disparage the dangers of the market

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89. Nina Mehta, *Dark Pool Disclosures to Users are Subject of Review by Finra*, BLOOMBERG, (Jan. 18, 2013, 5:07 PM), <http://www.bloomberg.com/news/2013-01-19/dark-pool-disclosures-to-users-are-subject-of-review-by-finra.html>.

90. *Id.*

91. Wastler, *supra* note 87.

92. *Id.*

93. *Id.*

94. James Angel, PhD, CFA, to the SEC, *RE: Comments on market technology and issues and market stability*, Sept. 5, 2012, available at <http://www.sec.gov/comments/4-652/4652-5.pdf>; James Angel, Lawrence Harris & Chester S. Spatt, Working Paper, *Equity Trading in the 21<sup>st</sup> Century*, USC MARSHALL SCHOOL OF BUSINESS, Feb. 23, 2010, <http://www.scribd.com/doc/93399318/Angel-Harris-Spatt-Equity-Trading-in-the-21st-Century>.

95. Angel, *supra* note 94, at 2.

96. *Id.*

97. *Id.*

access rule's policy of self-regulation. After delivering his testimony to the Committee on Banking, Housing, and Urban Affairs Subcommittee on Securities, Insurance, and Investment, David Lauer told interviewers, "You don't rely on the subject of your study to build the device you are going to be studying them with."<sup>98</sup> The SEC's decision to permit HFT firms to regulate themselves is akin to "the fox guarding the hen house."<sup>99</sup> HFT firms cannot be trusted to regulate themselves because the temptation to take advantage of their position of power will be too great. HFT traders will continue to exploit the advantages of HFT to the detriment of the ordinary investor.

## II. HFT'S AFFECT ON THE ORDINARY INVESTOR

### *A. How HFT can be Both Good and Bad for the Market and Ordinary Investors*<sup>100</sup>

Ordinary investors should be attracted to all of the advantages of trading with HFT technology. HFT lowers the cost of trading, adds liquidity to the market by reducing the bid-ask spreads, and gives investors a valuable time advantage over investors who do not possess HFT technology.<sup>101</sup> All of these HFT characteristics should attract, and not deter, ordinary investors from investing their money in the market.

First, it costs less to execute a trade via high frequency technology. Because the trade is executed using computer technology, the investor pays less for the broker's labor. Lightning quick computer technology also makes it possible for firms to make small profits per trade on high volume orders.<sup>102</sup>

98. Nathaniel Popper and Ben Protess, *To Regulate Rapid Traders, S.E.C. Turns to One of Them*, N.Y. TIMES, Oct. 7, 2012, <http://www.nytimes.com/2012/10/08/business/sec-regulators-turn-to-high-speed-trading-firm.html?pagewanted=all>.

99. *Computerized Trading: What Should the Rules of the Road Be?* Hearing Before the Subcomm. on Sec., Ins. and Inv. of the S. Comm. on Banking and Urban Affairs, 112th Cong. 20 (2012) (statement of David Lauer, Market Structure and HFT Consultant, Better Markets, Inc.) available at [http://banking.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore\\_id=56ef1df0-6c9a-4c53-99e8-2ad7a614afe2](http://banking.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=56ef1df0-6c9a-4c53-99e8-2ad7a614afe2).

100. For the purpose of this paper, an ordinary investor is defined as someone who "buys stocks in companies whose profits they expect to rise." Peter Morici, *Are stocks a sucker's bet?*, UPI (Jan. 28, 2013 at 7:25 AM), [http://www.upi.com/Top\\_News/Analysis/Outside-View/2013/01/28/Outside-View-Are-stocks-a-suckers-bet/UPI-31721359375904](http://www.upi.com/Top_News/Analysis/Outside-View/2013/01/28/Outside-View-Are-stocks-a-suckers-bet/UPI-31721359375904).

101. Frank J. Fabozzi, Sergio M. Focardi, and Caroline Jonas, *High-Frequency Trading: Methodologies and Market Impact*, 19 REV. OF FUTURE MARKETS, no. 1, 2011 at 7, 24-27, available at <http://www.conatum.com/presscites/HFTMMI.pdf>; James Angel, Lawrence Harris, & Chester S. Spatt, *Equity Trading in the 21st Century* (USC Marshall School of Business Working Paper FBE No. 9-10, 2010) available at <http://www.knight.com/newsroom/pdfs/EquityTradinginthe21stCentury.pdf>.

102. Jacob Bunge, *Does High-Speed Trading Hurt the Small Investor?*, WALL STREET

Second, HFT adds liquidity to the market by reducing the bid-ask spread. The bid-ask spread is the price difference between the highest price the buyer is willing to pay and the lowest price the seller is willing to give up.<sup>103</sup> When the bid-ask spread is reduced, the highest price the buyer is willing to pay is close to the lowest price the seller is willing to sell at. When this gap is small, investors are buying and selling at a price they are willing to pay, which makes investors more apt to invest.<sup>104</sup> With a smaller bid-ask spread, investors do not have to worry about bargaining for prices on the market, and they are more likely to invest their cash, which adds liquidity to the market.

Finally, HFT grants a valuable time advantage: the first to make the trade is the first to make money on the trade. HFT executes trades much more quickly than a human trader ever could.<sup>105</sup> Accordingly, ordinary investors and brokers employing HFT are rewarded by executing the best trades on the best prices at the highest speed.<sup>106</sup>

While HFT provides several advantages, HFT still comes with many disadvantages for the market and for ordinary investors. HFT allows those who have access to the technology the advantage of "flash orders" that are generally unavailable to the public.<sup>107</sup> Giving an advantage to the few at the cost of the many diminishes retail investors' confidence in the U.S. market and economy.

Additionally, HFT perpetuates the inherent unfairness of the financial markets.<sup>108</sup> The financial market has always offered advantages to those who could afford the advice of financial brokers and consultants. Now, this inherent unfairness is additionally exacerbated by the high cost of firms who can afford to use HFT over those firms who cannot. The unfairness is exacerbated even further because the SEC does not have the funding to invest the same amount of money financial brokers invest into HFT for monitoring and regulating this new technology.<sup>109</sup> This imbalance of funding provides an even larger advantage to the firms

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JOURNAL (Oct. 10, 2011)  
<http://online.wsj.com/article/SB10001424052970204226204576600980170960802.html>.

103. *Bid-Ask Spread*, INVESTOPEDIA, <http://www.investopedia.com/terms/b/bid-askspread.asp#axzz2HVRiYihg> (last visited Nov. 29, 2013).

104. *Id.*

105. Linette Lopez, *A High Frequency Trader Explains his Three Basic Advantages*, BUSINESS INSIDER (Sept. 20, 2012, 5:00 PM), <http://www.businessinsider.com/3-advantages-of-high-frequency-trading-2012-9>.

106. *Id.*

107. Eric Philo, *High-Frequency Trading: A Grave Threat to the Markets and the Economy*, 24/7 WALL ST. (Dec. 4, 2012, 5:39 PM), <http://247wallst.com/2012/12/04/high-frequency-trading-a-grave-threat-to-the-markets-and-the-economy>.

108. See James J. Angel & Douglas M. McCabe, *Fairness in Financial Markets: The Case of High Frequency Trading* (Dec. 21, 2010), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1737887](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1737887).

109. Bunge, *supra* note 102.



employing HFT.

Finally, HFT is especially vulnerable to operational risk. According to Standard & Poor's, the "spate of technical snafus at exchanges around the world in the past 18 months reveal exchanges' vulnerability to high operational risk."<sup>110</sup> The rating agency attributes the increase in technical glitches in part to advances in trading technology.<sup>111</sup> The rating agency explains that the rise of high-frequency traders and "the exchanges' heavy reliance on these order flows to generate revenues have led them to spend millions of dollars to reduce trade latency and build colocation services to attract high-frequency traders to their marketplace."<sup>112</sup> According to the report, "while technology is becoming more sophisticated and trade execution more efficient, this also increases the complexity of exchange operations."<sup>113</sup> The agency declares, "in our opinion, faster trade speed and greater interconnectivity are amplifying the impact of operational glitches when they occur."<sup>114</sup> Thus, according to the agency, regulators should be more than wary of the demonstrated risk of operational glitches of high frequency trading technology.

*B. HFT May be to Blame for the Ordinary Investors' Loss of Faith in the U.S. Stock Market*

Empirical studies suggest that investor confidence in the U.S. market has plummeted.<sup>115</sup> The decreased number of individuals and corporate investors in the market is an indication of the ordinary investor's lessening confidence in the market. According to the latest Chicago Booth/Kellogg School Financial Trust Index, only 15% of the public expresses trust in the stock market.<sup>116</sup> This figure is 8% lower than the public's expressed trust in banks.<sup>117</sup> Further proof of the loss of investors' confidence can be found in the massive loss of retail investors during a period where Americans are experiencing notably high stock market returns.<sup>118</sup> As David Lauer, in his testimony to the Committee on Banking, Housing, and Urban Affairs Subcommittee on Securities, Insurance, and Investment, said, "the flight of the retail investor during a period of incredible stock market returns is a sure sign that this exodus is a result of mistrust rather than economic conditions."<sup>119</sup>

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110. *Exchanges' Technical Glitches*, *supra* note 45.

111. *Id.*

112. *Id.*

113. *Id.*

114. *Id.*

115. Lauer, *supra* note 99, at 4-5.

116. *Id.*

117. *Id.*

118. *Id.* at 4.

119. *Id.*

A decreased number of companies going public is another indicator that ordinary investors have lost confidence in today's market. Lauer's testimony explains that from 1990-2000, approximately 530 firms went public each year.<sup>120</sup> Since 2001, approximately 125 firms have gone public each year.<sup>121</sup> Lauer's report speculates that companies are experiencing an inability to grow, expand, or hire because of the increased costs of going public.<sup>122</sup> Lauer suggests that companies are encouraged to go public when they have access to a large amount of capital.<sup>123</sup> Accordingly, when ordinary investors are hesitant to invest their money in the stock market, companies have less access to cash and a decreased ability to go public.

Ordinary investors are further discouraged from participating in the market because of their inability to monitor the lightning quick rise and fall of stock prices. Andrew Brooks<sup>124</sup> describes the volatile effects of HFT on investor confidence as a kin to an unfair race where traders have the opportunity to bet on the winning horse while the public is forced to watch from the sidelines. Brooks explains:

[HFT] generates a huge amount of market data in terms of price quotes—but most of the quotes are inaccessible and unactionable because the high-frequency firms cancel them so quickly. In a simplified form, their game is to initiate an action with the sole purpose of observing a reaction, and then quickly change strategy to profit from that reaction. The traders get to watch the finish of the horse race, then bet on the winning horse.<sup>125</sup>

Brooks' analogy demonstrates that the ordinary investor suffers even more because they are not given the opportunity to watch the race. The ordinary investor does not get the same opportunity to see the lightning quick rise and fall of prices, and may be forced to pay a higher price on a trade that would have cost a lower price just milliseconds before.

In addition to the ordinary investor's inability to monitor the lightning quick rise and fall of prices, ordinary investors are further discouraged from investing in the market because of their inability to compete with the resources available to HFT firms. Wealth management powerhouse Merrill Lynch explains that the ordinary investor does not

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120. *Id.* at 5.

121. *Id.*

122. *Id.*

123. *Id.*

124. Brooks is a 33-year veteran on the T. Rowe Price trading desk, and head of T. Rowe Price's Equity Trading.

125. Anne Kates Smith, *High-Frequency Trading Kills Market Confidence*, KIPLINGER (Dec. 2012), <http://www.kiplinger.com/magazine/archives/high-frequency-trading-kills-market-confidence.html>.

have the resources or the patience to compete with HFT technology.<sup>126</sup> Its Private Banking and Investment Group says that the normal Joe investing from his laptop cannot process, "let alone act on, data fast enough to anticipate a price change before the high-frequency traders close the spread, and even day traders who employ fundamental analysis can find themselves caught up in the backdraft of major HFT moves that have nothing to do with earnings estimates or interest rate swings."<sup>127</sup> It is undeniable that ordinary investors recognize that they're at a competitive disadvantage compared to firms that employ HFT technology, and this discourages ordinary investors from investing in the market.

### *C. How to Overcome the Volatile Effects of HFT*

To overcome the volatile effects of HFT, U.S. Regulators should implement circuit breakers and place speed limits on trade execution velocity. These measures will help prevent future flash crashes and restore ordinary investors' confidence in the stock market. Circuit breakers will have the effect of immediately pausing trading activity in stocks exhibiting the symptoms of a flash crash, and executing speed limits on execution velocity will act as a confidence building device to overcome the volatile effects of HFT algorithms.

## III. THE INTERNATIONAL MODEL FOR REGULATING HIGH FREQUENCY TRADES: CIRCUIT BREAKERS AND SPEED LIMITS ON TRADE EXECUTION VELOCITY

Germany, Canada, and the European Parliament have all implemented safety measures to help prevent future flash crashes. The safety measures implement circuit breakers or place speed limits on trade execution velocity. These measures have the effect of increasing ordinary investor's confidence while helping prevent future flash crashes from disrupting foreign markets.

### *A. Germany's Plan*

Germany's regulators implemented legislation limiting the abilities of HFT firms from taking advantage of small changes in the price of stocks. The legislation was officially implemented through the Act for the Prevention of Risks and the Abuse of High Frequency Trading (the

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126. *Man. Vs. Machine: Investing in the age of HFT*, MERRILL LYNCH: PRIVATE BANKING AND INVESTMENT GROUP (June 2012), <http://www.pb主g.ml.com/pwa/pages/man-vs-machine.aspx>.

127. *Id.*

"HFT Act").<sup>128</sup> The HFT Act specifically implements speed limits on trade execution velocity by limiting firms' ability to rapidly place and cancel orders.<sup>129</sup> The speed limit prevents the transmission of erroneous trade orders, ensuring that the HFT does not create or contribute to a disorderly market.<sup>130</sup>

Similar to America's market access rule, the HFT Act requires HFT firms to have effective system and risk controls in place.<sup>131</sup> Specifically, the legislation requires firms engaging in HFT to demonstrate that their trading systems have appropriate trading capacity and limits, and that the system is not capable of executing "erroneous trades."<sup>132</sup> The HFT firms are also required to show that the firm's system does not encourage a disorderly market or violate official regulations.<sup>133</sup> Placing speed limits on trade velocity enforces the German regulators' policy of ensuring that HFT firms have effective safety measures in place that will help prevent future flash crashes.

### B. Canada's Plan

Canadian regulators have taken the extra measure of imposing a mandatory fee for large orders executed via HFT technology in addition to the implementation of single stock circuit breakers. The Investment Industry Regulatory Organization of Canada (IIROC) implemented a single stock circuit breaker policy in the immediate wake of the 2010 flash crash.<sup>134</sup> Beginning in the spring of 2012, the IIROC also began increasing the fees charged to firms with HFT strategies.<sup>135</sup> Specifically, the fee structure applies to large order volumes, which forces large volume orders executed via HFT technology to be susceptible to a mandatory fee.<sup>136</sup> Results of the implementation have already proven to make trading more efficient because the fees have reduced the "the crush of data burdening the market's computer systems."<sup>137</sup>

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128. Torsten Schwarze, *Germany Enacts High-Frequency Trading Act*, MORGAN LEWIS (Mar. 08, 2013), [http://www.morganlewis.com/pubs/IM\\_LF\\_GermanEnactsHigh-FrequencyTradingAct\\_08mar13](http://www.morganlewis.com/pubs/IM_LF_GermanEnactsHigh-FrequencyTradingAct_08mar13).

129. Nathaniel Popper, *Beyond Wall St., Curbs on High-Speed Trades Proceed*, N.Y. TIMES, (Sept. 26, 2012), <http://www.nytimes.com/2012/09/27/business/beyond-wall-st-curbs-on-high-speed-trading-advance.html>.

130. Ortkemper, *supra* note 4.

131. *Id.*

132. *Id.*

133. *Id.*

134. *Canada Imposes High-Frequency Trading Obligations*, MARKETS MEDIA (July 11, 2012), <http://marketsmedia.com/canada-imposes-high-frequency-trading-obligations>.

135. Popper, *supra* note 4.

136. Schechter, *supra* note 4.

137. Popper, *supra* note 4.

### *C. European Parliament's Plan*

Though the European Parliament has taken longer to take any action against HFT, the Economic and Monetary Affairs Committee recently passed, by unanimous vote, a half-second speed limit on firms using HFT to execute "lightning-fast" stock deals.<sup>138</sup> The proposed rules would also require firms implementing HFT to honor the quotes they submit for at least 500 thousandths of a second.<sup>139</sup> In addition to the speed limits on trade execution velocity, the new legislation also requires firms to "have 'circuit breakers' in place to suspend trading if necessary."<sup>140</sup> According to the European Parliament, all of these policies are aimed at implementing transparent rules and procedures with the goal of efficiently executing orders.<sup>141</sup>

The European Parliament's policies will help prevent flash crashes as well as help efficiently execute large volume orders (such as those placed with high frequency technology). The European Parliament's policy for ensuring "that trading venues are able to cope with sudden surges in orders or market stresses," will be reinforced by circuit breakers and speed limits.<sup>142</sup> Circuit breakers will stop the stock from trading as soon as it exhibits flash crash symptoms, and speed limits will ensure that trading systems don't get overloaded with too many simultaneous lightning quick trades at once.

## IV. ADOPTING SPEED LIMITS AND CIRCUIT BREAKERS TO HELP ENFORCE THE MARKET ACCESS RULE

### *A. Policy Arguments Against Adopting Speed Limits and Circuit Breakers*

Opponents of the implementation of speed limits and circuit breakers suggest that the implementation will not have the desirable effect of stabilizing America's volatile financial market. Critics suggest that speed limits and circuit breakers will exacerbate inefficiency in the markets. Some critics suggest that the cost of regulation will have the undesirable effect of increasing HFT costs to the ordinary investor.

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138. Derek Klobucher, *Europe Takes Control of High Speed Trading*, FORBES (Oct. 10, 2012, 9:15 AM), <http://www.forbes.com/sites/sap/2012/10/02/europe-takes-control-of-high-speed-trading/>.

139. Popper, *supra* note 4.

140. Press Release, European Parliament-Plenary Session, Tougher rules to protect investors and curb high-frequency trading, (Oct. 26, 2012), *available at* <http://www.europarl.europa.eu/news/en/pressroom/content/20121024IPR54367/html/Tougher-rules-to-protect-investors-and-curb-high-frequency-trading>.

141. *Id.*

142. *Id.*

Others suggest that circuit breakers will suffer the same technological glitches that currently plague HFT technology. These proponents contend that an increase in trading cost combined with exacerbated technological glitches will contribute to, instead of alleviate, market volatility.

A prominent argument against adopting speed limits on the execution velocity of high frequency trades is that speed limits will jeopardize the lower trading costs that accompany HFT.<sup>143</sup> Kay Swinburne, one of six committee members involved in drafting the European Parliament rules, fears that "her fellow committee members may go too far and end up choking off trading, making buying and selling stocks more expensive for more traditional investors."<sup>144</sup> The reason why HFT should be so attractive to traditional mom and pop investors is that it costs significantly less. The industry fears that taking any regulatory action will interfere with an obvious benefit of the technology, lower trading costs on trading for the average investor.

Opponents of circuit breakers warn that circuit breaker software is equally susceptible to the glitches that plague HFT technology.<sup>145</sup> For example, in March of 2012, the Better Alternative Trading System (BATS) exchange operator "botched the listing of its own initial public offering, momentarily rattling shares of Apple, one of the most widely held stocks," in an event industry insiders describe as resembling a smaller version of the May 2010 flash crash.<sup>146</sup> Once the BATS system showed symptoms of failing, the circuit breakers paused trading in Apple shares. However, the BATS system misread the movement in stock as a symptom of failing. Consequently, a "software bug" prevented orders for BATS' own stock from being filled.<sup>147</sup> The BATS glitch caused the company's shares to be pushed down to just a fraction of a penny.<sup>148</sup> When the circuit breaker kicked in to suspend trading, Apple stock trading came to a halt.<sup>149</sup>

Speed limits may also have the adverse effect of restricting liquidity on the market. The United Kingdom commissioned the Foresight Project to assemble, study, and analyze the effect of high frequency technology on the financial market.<sup>150</sup> The recently published report

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143. Popper, *supra* note 4.

144. *Id.*

145. Michael J. De La Merced and Ben Protess, *BATS Trading Error Bolsters Case for Curbs*, N.Y. TIMES DEALBOOK (Mar. 25, 2012, 8:58 PM), <http://dealbook.nytimes.com/2012/03/25/little-fallout-expected-from-bats-trading-error/>.

146. *Id.*

147. *Id.*

148. *Id.*

149. *Id.*

150. GOV. FORESIGHT: THE FUTURE OF COMPUTER TRADING IN FINANCIAL MARKETS (2012), FINAL PROJECT REPORT, THE GOVERNMENT OFFICE FOR SCIENCE,

mostly rejects proposals implemented in the European Union to curb high-frequency trading.<sup>151</sup> While the two-year study endorses the use of circuit breakers as a policy measure that could be effective, the study advises that imposing minimum resting times (aka speed limits) on orders as a policy measure is likely to prove problematic.<sup>152</sup>

The results of the two-year study, headed by Professor Sir John Beddington, revealed that imposing speed limits on execution trade velocities would actually "expose liquidity providers to increased 'pick-off risk' due to the inability to cancel stale orders."<sup>153</sup> The Foresight Project reports that imposing minimum resting times are counterintuitive to HFT strategies that rest on the ability to quickly cancel orders. Speed limits would have the adverse effect of restricting liquidity on the market, instead of improving liquidity on the market.<sup>154</sup>

*B. The Implementation of Circuit Breakers and Speed Limits in the U.S. Market Will Help Reinforce the Market Access Rule and Prevent Future Flash Crashes*

While the implementation of circuit breakers and speed limits does not come without costs, implementation will have the dual effect of supporting the policies behind the market access rule and preventing future flash crashes. While regulators should be aware of the costs of implementation, the benefits of implementation far outweigh the risks. Circuit breakers and speed limits are the most cost-efficient tools for the SEC to use to enforce the market access rule.

Among the largest obstacles faced by regulators with the advent of HFT is the SEC's lack of financial resources to keep up with HFT's technological innovations. The SEC cannot effectively police HFT technology when they cannot access it. A lack of access to the technology means the SEC cannot gain a comprehensive understanding of how the technology works, where the advantages are gained, or how to effectively regulate.

Another obstacle to the SEC's ability to implement new regulations is that it takes the SEC weeks to process the amount of information that more current HFT can process in just one day.<sup>155</sup> In an effort to reduce the advantages of high frequency technology traders the SEC recently

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LONDON (U.K.), available at <http://www.bis.gov.uk/assets/foresight/docs/computer-trading/12-1086-future-of-computer-trading-in-financial-markets-report.pdf>.

151. Elliot Holleys, *UK Foresight Project rejects European Commission HFT proposals*, BANKING TECHNOLOGY (Oct. 24, 2012), <http://www.bankingtech.com/50178/uk-foresight-project-rejects-european-commission-hft-proposals/>.

152. The Government Office for Science, London, *supra* note 150, at 7.

153. *Id.* at 12.

154. *Id.* at 9.

155. Popper, *supra* note 98.

implemented the "Midas" program, which includes the Tradeworx program. Tradeworx is a highly technical computer program that will give the SEC "the ability to spot trading patterns in an individual stock, or to rewind and watch what happened in the trading of all stocks during previous crises."<sup>156</sup> Currently, it takes the SEC weeks to process an amount of data that would only take the Tradeworx system one day to process.<sup>157</sup>

The implementation of systems such as Tradeworx will have the effect of creating a "paper trail" which will help the SEC ensure that firms have safety measures in place to prevent any future flash crashes. If ordinary investors are assured that regulators have taken positive steps to prevent flash crashes, they will be more apt to invest in the market. However, a major concern is whether the industry is capable of providing unbiased information about the market to a regulatory agency.<sup>158</sup> While the implementation of such programs may add transparency to the financial market, regulators in the U.S. should take one step further and implement speed limits on the trade velocity of HFT, to help overcome the dangers of self-regulation.

The Foresight Project advocates the use of circuit breakers as an effective policy measurement to help control the adverse effects of HFT. The report states that benefits to circuit breakers include a cooling off period, uncertainty resolution, and investor protection.<sup>159</sup> The report says that circuit breakers allow for a "cooling period" that "prevents mechanical selling at any price, allows the market to understand what is happening and gives counterparties time to enter, thereby reducing the order imbalance."<sup>160</sup> The report adds that a long enough pause in trading will help traders identify the cause of large shifts of movement in the market.<sup>161</sup> Finally, circuit breakers protect investors because the trading halts offered by circuit breakers provide an avenue for ordinary retail investors to not lose out to professional traders who have the advantage of continuously monitoring the markets.<sup>162</sup> The Foresight Project reports that circuit breakers "remove or ameliorate concerns that small investors can be taken advantage of by manipulative trend-generating strategies."<sup>163</sup>

The launch of the new website by the SEC will not suffice to ameliorate the concerns of the ordinary investor. The public release of

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156. *Id.*

157. *Id.*

158. *Id.*

159. The Government Office for Science, London, *supra* note 150, at 101.

160. *Id.* at 103.

161. *Id.*

162. *Id.* at 104.

163. *Id.*



HFT information on a quarterly basis is not frequent enough for the ordinary investor to make meaningful investment decisions based on the SEC data. While the public availability of HFT data creates a more transparent trading environment, it will not help prevent future flash crashes or give ordinary investors equal access to the advantages of HFT technology.

Speed limits are a necessary policy in the U.S. because, like in Canada, Germany, and the European Union speed limits will have the effect of leveling the playing field for the ordinary investor, adding transparency to the financial market and increasing the ordinary investor's confidence in the financial market. So long as HFT firms are permitted to have a competitive time advantage over ordinary investors, it is unlikely that ordinary investors will feel like they are investing in a fair financial market. If ordinary investors are made to feel like they're given the same competitive advantages as sophisticated professionals, they will be more likely to invest their money in the financial market.

The use of circuit breakers is just one policy U.S. regulators should adopt to help enforce the market access rule. While the results of the Foresight Project indicate that circuit breakers may be helpful for the early detection of flash crash like symptoms, regulators should additionally focus on increasing the transparency of the financial market through the implementation of speed limits. Because the ordinary investor does not have access to the same analytical tools as a professional HFT strategist, the ordinary investor's confidence in the market will be restored if she knows she is investing her money in a transparent market.

## V. CONCLUSION

To help enforce the market access rule and prevent any future flash crashes, U.S. regulators should follow the international model and implement circuit breakers and speed limits on HFT. In the aftermath of the May 6, 2010 flash crash, international markets like Canada, Germany, and the European Union immediately implemented policies and regulations to prevent the occurrence of a flash crash in their markets. Speed limits and circuit breakers will not completely remove the competitive time advantage gained from using lightning quick trading technology, but they do create more transparency in the market and help to prevent the occurrence of future flash crashes.

While there are certainly benefits to using HFT technology in the financial market, such as lower trading costs and competitive time advantages, there are signs that HFT is at least partially to blame for ordinary investors' loss of confidence in today's financial market. The U.S should follow the lead of Canada, Germany, and the European Union and implement circuit breakers and limits on trade execution

velocity. Circuit breakers and speed limits will create a more transparent trading environment for financial market investors and also have the residual effect of helping enforce the safety measures behind the market access rule's policy.

