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## High-Speed Trading on Stock and Commodity Markets - From Courier Pigeons to Computers

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# High-Speed Trading on Stock and Commodity Markets—From Courier Pigeons to Computers

JERRY W. MARKHAM\*

The success of a speculator depends on the accuracy of his estimates, and it follows that where we find organized speculation we find the best perfected facilities for securing early and accurate information. This is one of the striking merits of the speculative system. In any business, knowledge and foresight are the chief requisites of success. Nowhere do we find such strenuous efforts in this direction as among large speculators. It may be said with scarcely an exception that every successful operator in the stock or grain market has been distinguished by his unusual success in securing accurate information in advance of his competitors.

With this body of keen experts, striving by the use of private wires, special agents and every other means, to discover and foresee every event bearing on values, speculation has been well defined as the struggle of well-equipped intelligence against the rough power of chance.

—Henry Crosby Emery, 1896<sup>1</sup>

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1. Henry Crosby Emery, *Speculation on the Stock and Produce Exchanges of the United States*, in 7 *STUDIES IN HISTORY, ECONOMICS AND PUBLIC LAW* 116–17 (Faculty of Political Sci. of Colum. Univ. eds., 1896) (footnotes omitted).

## TABLE OF CONTENTS

I.	ABSTRACT .....	556
II.	INTRODUCTION: HIGH-SPEED TRADING CONCERNS .....	557
III.	EARLY HIGH-SPEED TRADERS .....	567
	A. <i>From Telescopes to Carrier Pigeons</i> .....	567
	B. <i>Early Co-location Issues</i> .....	577
IV.	TWENTIETH CENTURY EXCHANGES—THE PRE-COMPUTER ERA .....	581
	A. <i>The NYSE</i> .....	581
	B. <i>The OTC and Nasdaq Market</i> .....	590
	C. <i>The Futures Markets</i> .....	592
	D. <i>The CBOE</i> .....	594
V.	AUTOMATION ARRIVES .....	594
	A. <i>Introduction</i> .....	594
	B. <i>The ECNS Arrive</i> .....	597
	C. <i>The SEC Responds</i> .....	600
	D. <i>Futures Markets and Electronic Trading Concerns</i> .....	605
	E. <i>Trading Abuses: “Spoofing” and “Layering”</i> .....	606
VI.	INFORMATION IS A COMMODITY .....	611
VII.	CONCLUSION .....	618

## I. ABSTRACT

A growing concern in the stock and commodity markets over the last several years has been the rise of high-frequency traders (HFTs).<sup>2</sup> Those traders employ high-speed computer technology for the algorithmic origination, transmission and execution of their orders through fiber optic cables and microwave towers. That technology allows HFT orders to be executed in times measured in fractions of a second. As a result of this technological advance, HFTs are now dominating trading volumes. This phenomenon has, on the one hand, led to claims by proponents of high-speed trading that HFTs are an important source of market liquidity and should not be subject to burdensome regulation. Critics of HFTs, on the other hand, are claiming that high-speed trading is abusive and disruptive for other traders. Those critics also claim that HFTs use their high-speed advantage to trade in advance of other customers and that HFTs should be regulated in a manner that will remove their advantages. This Article will show that concern over informational advantages of traders through “high-

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2. Although this article focuses on electronic trading in the stock and commodity markets, bond trading has also begun a migration to electronic trading platforms. See Nathaniel Popper, *Shouts on Bond-Trading Floor Yield to Robot Beeps*, N.Y. TIMES (Oct. 19, 2014), [http://dealbook.nytimes.com/2014/10/19/shouts-on-bond-trading-floor-yield-to-robot-beeps/?\\_php=true&\\_type=blogs&\\_r=0](http://dealbook.nytimes.com/2014/10/19/shouts-on-bond-trading-floor-yield-to-robot-beeps/?_php=true&_type=blogs&_r=0) [http://perma.cc/DW9S-PA49]; see also Tara Bhupathi, Comment, *Technology's Latest Market Manipulator? High Frequency Trading: The Strategies, Tools, Risks, and Response*, 11 N.C. J.L. & TECH. 377, 385–91 (2010) (discussing the modern technologies of trading markets).

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

speed” communications is not a new phenomenon. Such advantages have historically been employed through communication methods that have included fast sailing ships, courier pigeons, stagecoaches, smoke signals, semaphore flags, flashing mirrors, the telegraph, and the telephone. This article will also show how computerized high-speed trading transformed the stock and commodity markets from inefficient open outcry auctions to more efficient electronic trading platforms in which HFTs play an important role. The article concludes that HFTs are simply a continuation of market advances and that efforts to slow down HFTs are misguided.

## II. INTRODUCTION: HIGH-SPEED TRADING CONCERNS

A growing concern in the stock and commodity markets over the last several years has been the rise of high-frequency traders (HFTs).<sup>3</sup> HFTs seek advantage over other traders through the use of algorithmic trading programs that execute orders through high-speed fiber optic cables, microwaves, and even lasers.<sup>4</sup> The speed of HFT order entry and execution is further enhanced by the “co-location” of their computer servers at

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3. The Securities and Exchange Commission has noted that:

One of the most significant market structure developments in recent years is high frequency trading (HFT). The term is relatively new and is not yet clearly defined. It typically is used to refer to professional traders acting in a proprietary capacity that engage in strategies that generate a large number of trades on a daily basis. These traders could be organized in a variety of ways, including as a proprietary trading firm (which may or may not be a registered broker-dealer and member of FINRA), as the proprietary trading desk of a multi-service broker-dealer, or as a hedge fund . . . .

Concept Release on Equity Market Structure, Exchange Act Release No. 34–61358, 75 Fed. Reg. 3594, 3606 (proposed Jan. 21, 2010). *See generally e.g.*, SCOTT PATTERSON, THE QUANTS 309 (2010) (describing the development of HFTs).

4. An advisory committee created by the Commodity Futures Trading Commission identified the following as attributes of a HFT:

- (a) Algorithms for decision making, order initiation, generation, routing, or execution, for each individual transaction without human direction;
- (b) low-latency technology that is designed to minimize response times, including proximity and co-location services;
- (c) high speed connections to markets for order entry; and
- (d) recurring high message rates (orders, quotes or cancellations) determined using one or more objective forms of measurement, including (i) cancel-to-fill ratios; (ii) participant-to-market message ratios; or (iii) participant-to-market trade volume ratios.

Concept Release on Risk Controls and System Safeguards for Automated Trading Environments, 78 Fed. Reg. 56,542, 56,545 (proposed Sept. 12, 2013) (footnote omitted) [hereinafter Risk Controls and System Safeguards].

specially built exchange facilities.<sup>5</sup> These communication advantages allow HFTs to shave microseconds off trade origination and execution times, providing advantage over traders that do not have such high-speed capabilities.<sup>6</sup>

As will be described below, the quest for “high-speed” trading advantages is not a new phenomenon. High-speed traders in earlier centuries employed communication mediums that were faster than the norm at the time.<sup>7</sup> Such devices have included fast sailing ships, courier pigeons, express coaches, smoke and hand signals, semaphore flags, mirrors, the telegraph, and private telephone lines.<sup>8</sup> Those advances in communication initially benefitted individual speculators who were the first to employ them, but concerns were voiced that those “high-speed” traders were taking advantage of slower speed market participants.<sup>9</sup> There was, however, another side of

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5. Senator John McCain (R. Ariz) described co-location as follows:

Another key tactic used by high-frequency trading firms is co-location. This practice involves trading firms literally renting space for their computers in the same room as the computers that run the stock exchanges so that they can receive market information directly from the exchanges’ computers as fast as possible. The investors that don’t buy this direct connection to the exchanges receive market data via a government-established system using out-of-date technology called the Securities Information Processor that compiles market data much more slowly.

*Conflicts of Interest, Investor Loss of Confidence, and High Speed Trading in U.S. Stock Markets: Hearing Before the Subcomm. on Investigations of the S. Comm. on Homeland Sec. & Governmental Affairs*, 113th Cong. 5 (2014) [hereinafter *Hearing*] (statement of Sen. John McCain, Member, S. Comm. on Homeland Sec. & Governmental Affairs), <http://www.gpo.gov/fdsys/pkg/CHRG-113shrg89752/pdf/CHRG-113shrg89752.pdf> [<http://perma.cc/VV6D-QZKW>].

6. The Securities and Exchange Commission has noted that “[u]nlike years ago, trades today are transacted in milliseconds or faster and dispersed among many trading centers. These changes have allowed large market participants to employ sophisticated trading methods to trade electronically on multiple venues in huge volumes at very fast speeds.” Press Release, U.S. Sec. & Exch. Comm’n, SEC Adopts Large Trader Reporting Regime, No. 2011-154 (July 26, 2011), <http://www.sec.gov/news/press/2011/2011-154.htm> [<http://perma.cc/Y2N6-DPEY>]. Microwave transmissions were becoming increasingly popular in 2014 for HFTs. Jesse Westbrook et al., *High-Frequency Traders Find Microwaves Suit Their Need for Speed*, BLOOMBERG BUS. (July 24, 2014), <http://www.businessweek.com/articles/2014-07-24/high-frequency-traders-find-microwaves-suit-their-need-for-speed> [<http://perma.cc/LS4K-SZ4X>].

7. Bob Pisani, *Plundered by Harpies: An Early History of High-Speed Trading*, FIN. HIST., Fall 2014, at 21.

8. *Id.* at 21–23.

9. Scott Patterson, *SEC Chairman Targets Dark Pools, High-Speed Trading*, WALL ST. J. (June 6, 2014) <http://www.wsj.com/articles/sec-chairman-unveils-sweeping-proposals-to-improve-markets-1401986097> [<http://perma.cc/R944-9QWM>]; see also PATTERSON, *supra* note 3, at 309 (“[R]egulators were concerned. The Securities and Exchange Commission was worried about a rising trend of high-frequency trading firms that were getting so-called naked access to exchanges from brokerages that lent out their computer identification codes.”).

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

the coin that those critics largely ignored. The introduction of ever-faster communication methods transformed stock and commodity markets from local exchanges with little liquidity into international markets that dominated international finance.<sup>10</sup>

Twentieth century markets thus benefitted from ever-higher speed trading advances, but were still hampered by the slow paced “open outcry” auction markets that emerged from the nineteenth century.<sup>11</sup> The computer was only solely integrated into those markets and did not fully arrive until this century.<sup>12</sup> The modern HFT is the by-product of a much-needed shift from the inefficient and sometimes abusive open outcry trading floors of exchanges to the modern electronic trading platform.<sup>13</sup> Before the advent of electronic trading platforms, traders on the New York Stock Exchange (NYSE) would typically formulate orders in their heads based on some market signal they viewed to be favorable.<sup>14</sup> The trader would phone the order into a broker’s trading desk, usually located on or near a market center.<sup>15</sup> The broker would transmit the order to a floor broker on the trading floor by messenger, hand signals or pneumatic tubes.<sup>16</sup> The floor broker would then take the order to the NYSE specialist’s post

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10. Stijn Claessens et al., *Explaining the Migration of Stocks from Exchanges in Emerging Economies to International Centres* 2, (Ctr. for Econ. Policy Research, Discussion Paper No. 3301, 2002), [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=311119](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=311119) [<http://perma.cc/45B7-CTBJ>].

11. PAOLO PEZZUTTI, *TRADING THE US MARKETS: A COMPREHENSIVE GUIDE TO US MARKETS FOR INTERNATIONAL TRADERS AND INVESTORS* 5, 21–22, 63 (2008).

12. See Craig Pirrong, *Upstairs, Downstairs: Electronic vs. Open Outcry Exchanges* 3 (Feb. 19, 2003) (unpublished manuscript) (on file with the University of Houston Bauer College of Business), <http://www.bauer.uh.edu/spirrong/upstairs1.pdf> [<http://perma.cc/S5PX-Y2BT>]; Pisani, *supra* note 7, at 23.

13. See Tom Polansek, *Insight: Chicago Pits Going Quiet, 165 Years After Shouting Began*, REUTERS (Aug. 5, 2013, 10:47 AM), <http://www.reuters.com/article/2013/08/05/us-cme-grain-pits-insight-idUSBRE9740EC20130805> [<http://perma.cc/R4AP-7PK7>].

14. See SCOTT PATTERSON, *DARK POOLS* 273 (2012); *CFA Level 1: Derivatives—The Futures Trade Process*, INVESTOPEDIA, <http://investopedia.com/exam-guide/cfa-level-1/derivatives/futures-trade-process.asp> [<http://perma.cc/M57C-RBGG>] (last visited Sept. 12, 2015) [hereinafter *CFA Level 1: Derivatives*].

15. Asani Sarkar & Michelle Tozzi, *Electronic Trading on Futures Exchanges*, CURRENT ISSUES ECON. & FIN., Jan. 1998, at 1, 1–2.

16. See Pisani, *supra* note 7, at 23; *CFA Level 1: Derivatives*, *supra* note 14 (discussing hand signals).

where a listed stock was traded for execution.<sup>17</sup> The process would be reversed to report the execution of the order.<sup>18</sup>

This process was slow, cumbersome, and costly because commissions had to be paid to brokers.<sup>19</sup> The specialist was also paid a costly fee in the form of the spread he quoted between his bid and ask quotes.<sup>20</sup> The order execution process was similarly cumbersome in the over-the-counter (OTC) market where competing market makers had to be consulted in order to assure the best execution price for orders.<sup>21</sup> There too commissions—or markups or markdowns—and spreads had to be paid to brokers and market makers.<sup>22</sup>

The slowness of this process raised further costs concerns from “latency” and “slippage.” Latency is the period of delay that occurs between the time an order is formulated and the time that it is executed.<sup>23</sup> The slower the execution process, the greater is the latency associated with the order.<sup>24</sup> Slippage is a reference to the potential change in the price of an investment between the time a trade is contemplated or entered and its execution.<sup>25</sup> Delays in the order entry process, namely latency, exposes a trader to greater risks of slippage and lost trading opportunities.<sup>26</sup>

17. George Sofianos & Ingrid M. Werner, *The Trades of NYSE Floor Brokers*, 3 J. FIN. MARKETS 139, 140 (2000).

18. See *Understanding Order Execution*, INVESTOPEDIA, <http://www.investopedia.com/articles/01/022801.asp> [<http://perma.cc/25HF-3KU4>] (last visited Sept. 12, 2015).

19. See *Open Outcry*, INVESTOPEDIA, <http://www.investopedia.com/terms/o/openoutcry.asp> [<http://perma.cc/PYK8-NPTM>] (last visited Sept. 12, 2015); Jason Van Bergen, *Paying Your Investment Advisor—Fees or Commissions?*, <http://www.investopedia.com/articles/basics/04/022704.asp> [<http://perma.cc/L5QU-3N4E>] (last visited Sept. 12, 2015).

20. Kenneth D. Garbade & William L. Silber, *Price Dispersion in the Government Securities Market*, 84 J. POL. ECON. 721, 736 (1976).

21. See BD. OF THE INT’L ORG. OF SEC. COMM’NS, *REGULATORY ISSUES RAISED BY CHANGES IN MARKET STRUCTURE* 16–17 (2013), [http://www.csrc.gov.cn/pub/csrc\\_en/affairs/AffairsIOSCO/201402/P020140213531132659111.pdf](http://www.csrc.gov.cn/pub/csrc_en/affairs/AffairsIOSCO/201402/P020140213531132659111.pdf) [<http://perma.cc/WG2W-P2QR>]; *Understanding Order Execution*, INVESTOPEDIA, <http://www.investopedia.com/articles/01/022801.asp> [<http://perma.cc/AZT9-X9EF>] (last visited Sept. 12, 2015).

22. Sec. Inst. of Am., Inc., *Series 55: Commissions and Trade Complaints - Broker vs. Dealer*, INVESTOPEDIA, <http://www.investopedia.com/study-guide/series-55/commissions-and-trade-complaints/broker-vs-dealer/> [<http://perma.cc/UTM8-S6YC>] (last visited Sept. 12, 2015).

23. Bhupathi, *supra* note 2, at 386 n.52.

24. Michael J. McGowan, Comment, *The Rise of Computerized High Frequency Trading: Use and Controversy*, DUKE L. & TECH. REV., no. 016, 2010, at ¶ 16.

25. IRENE ALDRIDGE, *HIGH-FREQUENCY TRADING: A PRACTICAL GUIDE TO ALGORITHMIC STRATEGIES AND TRADING SYSTEMS* 43–44 (2d ed. 2013).

26. See *Goldstein v. Mortenson*, 113 S.W.3d 769, 773 (Tex. App. 2003) (“The time expended in placing phone calls allowed market positions . . . to change, often resulting in serious losses . . . . The negative effect resulting from such a delay is known in the industry as ‘slippage.’”).



[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

HFTs seek to minimize latency and slippage through the formulation and transmission of their orders by computer algorithms and high-speed data transmission devices.<sup>27</sup> One HFT group spent \$300 million to build a high-speed data line between New Jersey and Chicago in order to reduce order latency by three milliseconds.<sup>28</sup> Another fiber optic project sought to cut five milliseconds off order entry between London and New York at a cost of a projected \$500 million.<sup>29</sup> Microwave transmissions are even faster.<sup>30</sup> The most recent development in the effort to reduce latency is the use of laser communications.<sup>31</sup>

The efficiencies achieved by the high-speed transmission and execution of their orders made HFTs successful.<sup>32</sup> The specialists on the NYSE and

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27. See ALDRIDGE, *supra* note 25, at 17, 23–24; Bhupathi, *supra* note 2, at 386–87.

28. PATTERSON, *supra* note 14, at 287.

29. *Id.* at 288.

30. MICHAEL LEWIS, FLASH BOYS 267 (2014).

31. See Scott Patterson, *Traders with Need for Speed Turn to Laser Beams*, WALL ST. J., Feb. 12, 2014, at A1.

32. The prospectus of a HFT firm, which was proposing to go public before HFT trading activities were engulfed in controversy, advertised that it was:

[A] leading technology-enabled market maker and liquidity provider to the global financial markets. We stand ready, at any time, to buy or sell a broad range of securities, and we generate revenue by buying and selling large volumes of securities and other financial instruments and earning small amounts of money based on the difference between what buyers are willing to pay and what sellers are willing to accept, which we refer to as “bid/ask spreads.” We make markets by providing quotations to buyers and sellers in more than 10,000 securities and other financial instruments on more than 210 unique exchanges, markets and liquidity pools in 30 countries around the world. We believe that our broad diversification, in combination with our proprietary technology platform and low-cost structure, enables us to facilitate risk transfer between global capital markets participants by supplying liquidity and competitive pricing while at the same time earning attractive margins and returns.

We believe that market makers like us serve an important role in maintaining and improving the overall health and efficiency of the global capital markets by continuously posting bids and offers for securities and other financial instruments and thereby providing to market participants an efficient means to transfer risk. All market participants benefit from the increased liquidity, lower overall trading costs and enhanced execution certainty that we provide. While in most cases we do not have customers in a traditional sense, we make markets for global banks, brokers and other intermediaries, in addition to retail and institutional investors, including corporations, individuals, hedge funds, mutual funds, pension funds and other investors, all of whom desire to transfer risk in multiple securities and asset classes for their own accounts and/or on behalf of their customers.

market makers on Nasdaq, who traditionally filled liquidity gaps in that market, are now pretty much outdated.<sup>33</sup> Instead, HFTs are dominating markets and driving trading volumes on both the stock and commodity markets.<sup>34</sup> By 2009, some two-thirds of stock-market volume was attributable to “high-frequency traders, who can buy or sell in less than 400 microseconds, or nearly a thousand times faster than you can blink your eye.”<sup>35</sup> HFTs’ trading volume appears to have dropped in more recent years, but were still estimated to be accounting for more than half of all stock market trading volume in June 2014.<sup>36</sup> Trading volumes in the futures markets are also dominated by HFTs.<sup>37</sup> However, critics of HFTs claim that their high-speed trading is, at least in some instances, abusive and disruptive of orderly markets.<sup>38</sup> Those critics seek regulation of HFTs in order to handicap their trading advantages.<sup>39</sup> Countering those claims

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Virtu Fin., Inc., Registration Statement Under the Securities Act of 1933 (Form S-1) (Mar. 10, 2014), [https://www.sec.gov/Archives/edgar/data/1592386/000104746914002070/a2218589zs-1.htm#dm16701\\_business](https://www.sec.gov/Archives/edgar/data/1592386/000104746914002070/a2218589zs-1.htm#dm16701_business) [<https://perma.cc/7FKX-Q2BB>].

33. LEWIS, *supra* note 30, at 3.

34. Dennis K. Berman, *The Game: Saving the Stock Market Only To Destroy It*, WALL ST. J., Aug. 24, 2010, at C1.

35. Jason Zweig, *The Intelligent Investor: Staying Calm in a World of Dark Pools, Dark Doings*, WALL ST. J., Oct. 24, 2009, at B1.

36. Scott Patterson, *High-Speed Traders Face Tighter Reins*, WALL ST. J., June 6, 2014, at C1.

37. GARY SHORTER & RENA S. MILLER, CONG. RESEARCH SERV., R43608 HIGH-FREQUENCY TRADING: BACKGROUND, CONCERNS, AND REGULATORY DEVELOPMENTS 27–28 (2014), <http://fas.org/sgp/crs/misc/R43608.pdf> [<http://perma.cc/6GRJ-BDQW>]. The Commodity Futures Trading Commission has noted that:

An established body of data indicates the importance of electronic and algorithmic trading in U.S. futures markets. In 2012, approximately 91.50% of exchange trading volume in U.S. futures markets was executed electronically. Estimates indicate that algorithmic trading first accounted for at least 50% of orders in 2009, and accounted for over 40% of total trading volume in 2010 . . . . Increased automation in both order generation and matching, combined with the exponentially faster communication networks . . . has in many cases reduced the trade lifecycle to as little as a few milliseconds. As a result, high-frequency trading (“HFT”) strategies have also become an increasingly important component of automated trading environments.

Risk Controls and System Safeguards, *supra* note 4, at 56,545.

38. See, e.g., LEWIS, *supra* note 30.

39. Sam Mamudi & Nick Baker, *Mary Jo White Gets High-Frequency Embrace with SEC Plan*, BLOOMBERG BUS. (June 5, 2014, 9:00 PM), <http://www.bloomberg.com/news/articles/2014-06-06/mary-jo-white-gets-high-frequency-embrace-with-sec-plan> [<http://perma.cc/L59B-ZX63>]. Hearings were held in Congress in 2014 that considered the need for such regulation. See *Hearing*, *supra* note 5.

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

are studies that show that HFTs provide liquidity and actually stabilize markets.<sup>40</sup>

The related development of unregulated “dark pools,” that is, non-public markets where orders are executed without the public scrutiny available for regulated exchange trading, has aroused further concerns.<sup>41</sup> Dark pools are anonymous trading platforms for trading stock listed on public markets.<sup>42</sup> Orders placed through an exchange are visible to the public and all other market participants, but an order or an indication of interest entered on a dark pool is revealed only to other dark pool participants.<sup>43</sup> This gives dark pool participants access to information unavailable to the public.<sup>44</sup>

A popular book has condemned HFTs and essentially charged those traders with improperly front running orders of other traders through their advanced trading techniques.<sup>45</sup> Especially criticized were trading programs that took advantage of SEC regulations that had tried to equalize trading opportunities.<sup>46</sup> HFTs were using the requirement that investors receive

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40. See, e.g., *HFT Stabilises Modern Markets—Academic Research*, AUTOMATED TRADER (Dec. 1, 2014), <http://www.automatedtrader.net/news/at/152493/hft-stabilises-modern-markets—academic-research> [<http://perma.cc/YJ6T-YCAS>].

41. See PATTERSON, *supra* note 3, at 311 (2010); Patterson, *supra* note 9. It was estimated in June 2014 that forty percent of U.S. stock trades were occurring on dark pools. Cameron Smith, *Stock Investors Can Handle the Truth*, WALL ST. J., June 3, 2014, at A11. The SEC has noted that unreported trades are not unique only to dark pools:

In general, dark liquidity (that is, trading interest that is not included in the consolidated quotation data) is not a new phenomenon. Market participants that need to trade in large size, such as institutional investors, always have sought ways to minimize their transaction costs by completing their trades without prematurely revealing the full extent of their trading interest to the broader market . . . . In addition, broker-dealers acting as over-the-counter (“OTC”) market makers and block positioners long have provided liquidity directly to their customers that is not reflected in the consolidated quotation data.

Regulation of Non-Public Trading Interest, Exchange Act Release No. 34-60997, 74 Fed. Reg. 61,208–09 (proposed Nov. 23, 2009).

42. Austin J. Sandler, *The Invisible Power of Machines: Revisiting the Proposed Flash Order Ban in the Wake of the Flash Crash*, 2011 DUKE L. & TECH. REV. 003, ¶ 7 n.18., <http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1217&context=dltr> [<http://perma.cc/J2SW-WZJC>].

43. *Id.* ¶ 6, 7.

44. See *id.*

45. LEWIS, *supra* note 30.

46. SHORTER & MILLER, *supra* note 37, at 19.

the best price available anywhere on public markets to anticipate trades on multiple markets and profit from that opportunity.<sup>47</sup>

Exposure of this practice set off a public outcry in the press.<sup>48</sup> Regulators and politicians saw an opportunity to grab headlines by targeting those traders for prosecutions and new rules. The New York Attorney General launched a broad scale investigation into the trading practices of HFTs in April 2014.<sup>49</sup> That probe was later expanded into the dark pools operated by Goldman Sachs Group, Inc., and other large banks.<sup>50</sup> The New York Attorney General, shortly afterwards, charged Barclays PLC for misrepresenting the access it provided to its dark pool by HFTs.<sup>51</sup>

The SEC responded with its own investigation of dark pools in order to determine whether they were undermining the integrity of U.S. markets.<sup>52</sup> The SEC also proposed rules that would attempt to move trading from dark pools to the public exchanges and subject HFTs to regulation by requiring them to register with the agency as broker-dealers.<sup>53</sup> FINRA began an investigation of customer order routing practices by broker-dealers to determine if orders were being sent to execution centers on the basis of payments for that order flow rather than the best execution price.<sup>54</sup>

47. See *Hearing supra* note 6, at 5 (describing that concern).

48. See, e.g., Jacob Goldstein, *Trading Places*, N.Y. TIMES ABSTRACTS, Oct. 13, 2013, at 14 (“high-frequency traders often can foil long-term investors by trading ahead of slower players”); Jacob Goldstein, *Putting a Speed Limit on the Stock Market*, N.Y. TIMES (Oct. 8, 2013), <http://www.nytimes.com/2013/10/13/magazine/high-frequency-traders.html> [<http://perma.cc/92VG-2VUD>]; Eric Levenson & Dashiell Bennett, *Is High-Frequency Trading as Bad as Michael Lewis Wants You to Think?*, THE WIRE (Apr. 1, 2014, 6:28 PM), <http://www.thewire.com/business/2014/04/is-high-frequency-trading-as-bad-as-michael-lewis-wants-you-to-think/359903/> [<http://perma.cc/89WS-2B95>]; Sam Mamudi, *Charlie Munger: HFT is Legalized Front-Running*, BARRON’S (May 3, 2013, 1:25 PM), <http://blogs.barrons.com/stockstowatchtoday/2013/05/03/charlie-munger-hft-is-legalized-front-running/> [<http://perma.cc/NGZ6-EUJ9>].

49. Scott Patterson, *Subpoenas Are Sent to Fast-Trading Firms*, WALL ST. J., Apr. 17, 2014, at C2.

50. Justin Baer & Scott Patterson, *Banks Draw Trading Scrutiny*, WALL ST. J., May 10, 2014, at B2.

51. Scott Patterson & Andrew R. Johnson, *Barclays Sued Over ‘Dark Pool,’* WALL ST. J., June 26, 2014, at C1.

52. Scott Patterson, Jean Eaglesham & Bradley Hope, *‘Dark Pools’ Face New SEC Probe*, WALL ST. J., June 10, 2014, at C1.

53. Andrew Ackerman & Bradley Hope, *SEC Set to Spur Exchange Trading*, WALL ST. J., May 27, 2014, at C1; Patterson, *supra* note 36; William Alden, *S.E.C. Chief Offers Rules to Govern Fast Trading*, N.Y. TIMES, June 6, 2014, at B1. The SEC appeared to be following Germany’s lead, which enacted legislation in 2013 that requires high-frequency traders (HFTs) to register with the government and subjects those traders to special organizational requirements. Tim Cave, *German Firm Quits Over Tough High-Frequency Trading Rules*, WALL ST. J. (June 5, 2013, 12:30 PM), <http://blogs.wsj.com/moneybeat/2013/06/05/german-firm-quits-over-tough-high-frequency-trading-rules/>.

54. Scott Patterson, *FINRA Opens Broker-Routing Inquiry*, WALL ST. J., July 9, 2014, at C3.

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

The Commodity Futures Trading Commission (CFTC) launched a separate investigation of incentive arrangements that sought to attract HFTs to particular trading platforms.<sup>55</sup>

Congress also could not resist the publicity over HFTs. The Senate Permanent Subcommittee on Investigations scheduled hearings in June 2014 on HFTs to determine whether their trading was injurious to the markets and whether trading incentives used to attract orders to particular trading platforms were appropriate.<sup>56</sup> Those trading incentives involve “payment for order flow” from market makers to brokers as an incentive to route customer orders to the payer for execution.<sup>57</sup> Another practice of concern are “maker-taker” payments, in which an electronic trading platform charges fees or pays incentives for order depending on whether the parties to an executed order initiated the trade or whether they accepted the initiating order.<sup>58</sup>

Regulators and industry participants have raised further concerns over the fragmentation of trading among electronic trading platforms and traditional trading venues. As 2014 began, there were thirteen public exchanges and some fifty “Alternative Trading Systems,” namely, non-exchange electronic trading platforms, that were open to HFTs.<sup>59</sup> Compounding that complex array of markets, SEC “Regulation NMS (National Market System) requires brokers to route their customer orders to the exchange displaying the best available public price at any given time.”<sup>60</sup> This requirement has been used by HFTs to anticipate orders

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55. Scott Patterson & Jenny Strasburg, *High-Speed Trading Firms Face New U.S. Scrutiny*, WALL ST. J. (Mar. 18, 2014), <http://online.wsj.com/news/articles/SB10001424052702303287804579447610625554506> [<http://perma.cc/DY3C-KXZU>].

56. Sarah N. Lynch, *Senate Panel to Probe High-Speed Trading, Broker Conflicts*, REUTERS (June 9, 2014, 5:46PM), <http://www.reuters.com/article/2014/06/09/us-senate-markets-idUSKBN0EK20K20140609> [<http://perma.cc/3G2J-HHX4>].

57. Robert Battalio, Andriya Shikilko & Robert Van Ness, *To Pay or be Paid? The Impact of Taker Fees and Order Flow Inducements on Trading Costs in U.S. Options Markets*, 1 (Nov. 3, 2011).

58. William Alden, *Senate Hearing on Fairness of High-Speed Stock Trading Could Get Heated*, N.Y. TIMES, June 17, 2014, at B5; Scott Patterson, *Senate Turns Gaze to Superfast Trading*, WALL ST. J., June 17, 2014, at C3. The Congressional Research Service also did an extensive report on HFTs. SHORTER & MILLER, *supra* note 37, at 34–36.

59. Gary Cohn, *The Responsible Way to Rein in Super-Fast Trading*, WALL ST. J. (Mar. 20, 2014), <http://www.wsj.com/articles/SB10001424052702303563304579447692855042948> [<http://perma.cc/U3HY-4EDJ>].

60. *Id.*

complying with that requirement and to trade in front of those orders.<sup>61</sup> Another concern is that the high message traffic generated by HFTs is overwhelming the ability of markets and traders to deal with that volume, and a number of computer glitches on exchanges have resulted in trading halts and alarming market crashes.<sup>62</sup>

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61. LEWIS, *supra* note 30. As was noted in Senate hearings on this issue: One of the most predatory high-frequency trading practices depends on the unintended consequences of the SEC's Regulation National Market System, or Reg NMS. That regulation essentially mandated that investment firms must buy or sell stocks at the best price available. While that might sound like a reasonable requirement, hi-frequency trading firms can take advantage of the rule by putting out offers to buy or sell small amounts of stock at attractive prices. When a large investor, seeking to make a big order, accepts the high-frequency trading firm's offer because it is the best price available, the high-frequency trader can predict that the large investor will have to go to another exchange to purchase the rest of his order. The high-frequency trader can then race ahead of that investor to the other exchange, buy up all available shares, and sell them to the large investor at a higher price.

*Hearing, supra* note 6.

62. Concept Release on Risk Controls and System Safeguards for Automated Trading Environments, 78 Fed. Reg. 56542, 56549, 56551 (Sept. 12, 2013) (footnotes omitted); see LEWIS, *supra* note 31, at 200, 202; Andrew Smith, *Fast Money: The Battle Against the High Frequency Traders*, THE GUARDIAN (June 7, 2014), <http://www.theguardian.com/business/2014/jun/07/inside-murky-world-high-frequency-trading> [<http://perma.cc/42CM-N4C8>]. The Commodity Futures Trading Commission has noted that errors in order transmissions have sometimes disrupted markets:

Increased interconnectedness encourages price efficiencies when economically identical or related contracts are traded on multiple exchanges. However, it also increases the speed with which a disruption on one trading platform, or within one ATS or algorithm, can impact related markets. For example, a trading platform may experience changes in the prices, spreads or volatility of one or more of its products due to errors in an ATS or algorithm active in its markets. Even if this algorithm does not trade elsewhere, such changes are likely to quickly impact the prices, spreads, and volatility of related products on other platforms, as automated systems attempt to arbitrage price differences. The potential result is a cascading series of market disruptions, brought about by the malfunction of a single ATS or algorithm trading on a single platform.

Transmission effects such as this are illustrated by events like the May 6, 2010 "Flash Crash." On that day, major equity indices in both the futures and securities markets fell over 5% in minutes before recovering almost as quickly. After investigation by both the Commission and the SEC, it was found that a fundamental seller utilized an automated execution algorithm to sell 75,000 E-mini contracts (valued at approximately \$4.1 billion) over an abbreviated time interval. The algorithm placed orders based on recent trading volume but was not programmed to take price or time into account; because of this lapse, a feedback loop triggered continued orders from the algorithm even as prices moved far beyond traditional daily ranges. Like the hypothetical example provided above, these declines in the derivatives market quickly filtered over to different, but closely related, products on many other exchanges. Soon after the initial moves in the E-mini contract, similar extreme volatility was experienced by the S&P

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

Part III of this article will describe early high-speed trading techniques and the concerns they raised. Part IV will describe twentieth century stock and commodity markets and the inefficiencies they engendered from their lack of automation. Part V will show how those markets were automated and fostered HFTs. Part VI describes the concerns raised by HFTs and current efforts to regulate their activities.

### III. EARLY HIGH-SPEED TRADERS

#### A. *From Telescopes to Carrier Pigeons*

A Japanese document written in 1706 recounts the tale of a merchant who obtained considerable market advantage by having messengers use hand signals to forewarn him of rice price changes at the Osaka rice market. The merchant was able to observe those signals from several miles away in Koriyama through a telescope. This information gave the merchant an advantage over other merchants, and he was able to profit greatly from that information. That merchant's scheme, however, received a setback after a drunken messenger was late and became confused over

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500 SPDR exchange traded fund and by many of the 500 underlying securities which make up the index itself.

Risk Controls and System Safeguards, *supra* note 5, at 56547. Later, the CFTC and the Department of Justice brought civil and criminal charges against a trader charging that an algorithm he used had also contributed to the May 6, 2010 Flash Crash. See Peter J. Henning, *The Fine Line Between Smart and Illegal*, N.Y. TIMES (Apr. 27, 2015), <http://www.nytimes.com/2015/04/28/business/dealbook/the-fine-line-between-smart-and-illegal.html> [<http://perma.cc/7TTD-353J>] (describing those charges). The Senior Supervisors Group, an international body for coordinating international supervision of financial markets) has recommended stronger internal supervision and risk controls for HFTs. John McCrank, *Global Bank Regulators Call for More Risk Controls Around Algo Trading*, REUTERS (Apr. 30, 2015, 3:42 PM), <http://www.reuters.com/article/2015/04/30/us-banks-regulator-algotrading-idUSKBN0NL2I320150430> [<http://perma.cc/NWB4-JM72>]. The SEC, by consent sanctioned Knight Capital for failing to maintain adequate safeguards to prevent the entry of millions of erroneous orders that disrupted the stock markets on August 1, 2012. Knight Capital Americas LLC, Exchange Act Release No. 70694, 2 (2013). The errors occurred as a result of a programming error in allowing customer access to a NYSE Retail Liquidity Program. Knight Capital Americas LLC, Exchange Act Release No. 70694, 5–6 (2013). This conduct was found to have violated SEC Rule 15c3-5, [17 C.F.R. § 15c3-5], which requires broker-dealers to implement controls to guard against risks posed by the direct market access of broker-dealers and their customers. Knight Capital Americas LLC, Exchange Act Release No. 70694, 4 (2013). This rule requires broker-dealers to prevent automated system errors, outages and other failures and to mitigate the effects of such problems when they do occur. *Id.*

the proper hand signals. The merchant suffered large losses when he acted on an erroneous signal sent by the messenger.<sup>63</sup>

Rice futures trading in Japan during that era were also using other high-speed communications to foster trading and obtain market advantage. By 1716, rice traders were employing “elaborate communications systems based on smoke signals, flag signals, and carrier pigeons” that enabled traders and brokers to transmit information between Japanese cities at a distance of 350 miles with “great speed.”<sup>64</sup>

Fast sailing ships were long used in Europe for obtaining information that could be used to profit from price changes in securities<sup>65</sup> In the eighteenth century, Sir Henry Furnese, “throughout Holland, Flanders, France and Germany, . . . maintained a complete and perfect train of intelligence . . . the fall of Namur added to his profits, owing to his early intelligence.”<sup>66</sup>

Traders were able to profit handsomely by short selling the stock of the East India Company in 1773, after receiving advance knowledge of the Boston Tea Party.<sup>67</sup> The tea destroyed in that affair was shipped from the East India Company on consignment to colonial merchants.<sup>68</sup> The East India Company was in financial trouble at the time and was being bailed out by the British government.<sup>69</sup> A part of that effort was legislation that granted the company a monopoly on tea shipped to the American colonies.<sup>70</sup> However, the Crown refused to remove a tax on that tea that was abhorrent to many in the colonies.<sup>71</sup> The Boston Tea Party was a protest against such taxation without representation.<sup>72</sup> The loss of the tea destroyed in that raid caused a sharp drop in the price of the East India Company’s

63. David Moss & Eugene Kintgen, *The Dojima Rice Market and the Origins of Futures Trading*, HARV. BUS. SCH., Case Study No. 9-709-044 (Nov. 10, 2010) (Appendix), [http://disciplinas.stoa.usp.br/pluginfile.php/69204/mod\\_resource/content/4/CHY%20GE\\_D\\_LS-%23795938-v1-Dojima\\_Rice\\_Market\\_Case.pdf](http://disciplinas.stoa.usp.br/pluginfile.php/69204/mod_resource/content/4/CHY%20GE_D_LS-%23795938-v1-Dojima_Rice_Market_Case.pdf) [<http://perma.cc/VY7U-F8NP>].

64. *Id.* See also Mark D. West, *Private Ordering at the World’s First Futures Exchange*, 98 MICH. L. REV. 2574, 2586–87 (2000) (noting the use of this communication method to transmit messages on rice prices between Tokyo and Dojima).

65. See generally Stuart Banner, *What Causes New Securities Regulation?* 300 *Years of Evidence*, 75 WASHINGTON UNIV. L.Q. 849, 850 (1997).

66. Emery, *supra* note 2, at 116 n.3 (citations omitted).

67. NICK BUNKER, *EMPIRE ON EDGE* 239 (2014).

68. *Significance of the Tea Act, 1773*, BOSTON TEA PARTY HISTORICAL SOCIETY, <http://www.boston-tea-party.org/tea-act.html> [<http://perma.cc/6HQD-EFLP>] (last visited Sept. 12, 2015).

69. *The Tea Act: The Catalyst of the Boston Tea Party*, BOSTON TEA PARTY, <http://www.bostonteapartyship.com/the-tea-act> [<http://perma.cc/57RZ-RJXR>] (last visited Sept. 12, 2015).

70. *Id.*

71. *Id.*

72. *Id.*



[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

stock.<sup>73</sup> Traders receiving advance information of that destruction from fast sailing ships anticipated that decline and were able to reap profits from those less informed.<sup>74</sup> This information disparity was due in part to the fact that the British navy, which carried the Royal mails, used a slower route to travel back from America than did commercial vessels.<sup>75</sup>

After the Revolution, fast coaches drawn by horses and sailing ships were used to speed market information in the United States.<sup>76</sup> Within a year of the founding of the Philadelphia Stock Exchange in 1790, express coaches were speeding to Philadelphia from New York.<sup>77</sup> Those coaches carried news from ships docking in New York that could affect security prices on the Philadelphia exchange.<sup>78</sup> “Philadelphia brokers learned to dread the sudden appearance of a stagecoach full of Wall Streeters because it meant that they were in exclusive possession of important news from London that might make them a small fortune.”<sup>79</sup>

Express coaches played a similar role after the approval by Congress in 1790 of Alexander Hamilton’s plan to refund the Revolutionary War debt.<sup>80</sup> That debt was virtually worthless before that funding scheme was approved, but became quite valuable when Congress agreed to refund it at par.<sup>81</sup> Those receiving advance news of that plan quickly hired express coaches and fast sailing ships, directing them to various cities and locals to purchase the old debt at steep discounts for redemption at par.<sup>82</sup> There was much criticism of members of Congress who participated in these

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73. BUNKER, *supra* note 67, at 239.

74. *Id.*

75. *Id.* at 320.

76. *Philadelphia Stock Exchange Papers*, THE HIST. SOC. OF PENN., Collection 3070, 1, 1, [http://hsp.org/sites/default/files/legacy\\_files/migrated/findingaid3070phlx.pdf](http://hsp.org/sites/default/files/legacy_files/migrated/findingaid3070phlx.pdf) [<http://perma.cc/K27S-BVWQ>].

77. *Id.*

78. As the Philadelphia Stock Exchange later noted:  
[t]he speeding coaches that clattered from New York to Philadelphia carried speculators and stockjobbers, agents of foreign investors, and inside traders with privileged information that could move the market, and make their fortune at the expense of the Philadelphia merchants.

*Philadelphia Stock Exchange*, THE HISTORICAL SOCIETY OF PENNSYLVANIA 1 (2006).

79. JOHN STEELE GORDON, *THE GREAT GAME: THE EMERGENCE OF WALL STREET AS A WORLD OF POWER 1653-2000*, at 78 (1999).

80. ROBERT IRVING WARSHOW, *ALEXANDER HAMILTON* 123 (1931). *See also* RON CHERNOW, *ALEXANDER HAMILTON* 297–306 (2004) (describing the political fights over this refunding measure).

81. WARSHOW, *supra* note 80, at 123.

82. *Id.* at 123–24.

purchases or tipped others.<sup>83</sup> Thomas Jefferson called that effort a “base scramble.”<sup>84</sup> However, it was not until some 220 years later that Congress passed the STOCK Act of 2012, which now prohibits such insider trading by members of Congress.<sup>85</sup>

Advance information, received from a British sailing ship, of the signing of the Treaty of Ghent that ended the War of 1812 led to large profits by a speculator in New Orleans that resulted in a famous Supreme Court case.<sup>86</sup> It appeared that, on the night of February 18, 1815, certain merchants received word from the British fleet that the treaty of Ghent had been signed by the American and British commissioners—an event that had already been published in the British press.<sup>87</sup> This news was made public in New Orleans through a handbill distributed at 8:00 a.m. on Sunday morning, February 19, 1815.<sup>88</sup> A merchant in the house Peter Laidlaw & Co., who had earlier received that information, arranged to purchase 111 hogsheads of tobacco soon after sunrise on that same Sunday morning from another merchant who was unaware of the treaty.<sup>89</sup> The value of the tobacco sold in that transaction increased from thirty to fifty percent once information about the treaty became widely known.<sup>90</sup> That increase in value was due to the effect that the treaty would have on the reopening European markets to American tobacco.<sup>91</sup> The selling merchant reclaimed the tobacco after learning of the treaty and the issue made its way to the Supreme Court, where Justice John Marshall ruled that the purchaser had no duty to disclose that information to the seller.<sup>92</sup>

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83. See 1 JERRY W. MARKHAM, *A FINANCIAL HISTORY OF THE UNITED STATES: FROM CHRISTOPHER COLUMBUS TO THE ROBBER BARONS (1492-1900)* 80 (2002) (describing that scandal).

84. WARSHOW, *supra* note 80, at 123. Jefferson was appalled at this activity and charged that:

[c]ouriers and relay-horses by land, and swift sailing boats by sea, were flying in all directions. Active partners and agents were associated and employed in every state, town and country neighborhood; and this paper was bought for five shillings, and even as low as two shillings, in the pound, before the holder knew that Congress had already provided for its redemption at par. Immense sums were thus filched from the poor and ignorant, and fortunes accumulated by those who had themselves been poor enough before.

*Id.* at 123–24.

85. Stop Trading on Congressional Knowledge (STOCK) Act of 2012, Pub. L. No. 112–105; 126 Stat. 292.

86. *Laidlaw v. Organ*, 15 U.S. 178 (1817).

87. *Id.* at 182–83.

88. *Id.* at 183.

89. *Id.* at 181, 183.

90. *Id.* at 183.

91. Nicola W. Palmieri, *Good Faith Disclosures Required During Precontractual Negotiations*, 24 SETON HALL L. REV. 70, 122 (1993) (citation omitted).

92. *Laidlaw*, 15 U.S. at 181.

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

The House of Rothschild regularly employed human couriers to provide advance news of market moving events in the nineteenth century.<sup>93</sup> Nathan Rothschild famously acted on advance news of Wellington's victory at Waterloo in 1815 that was supplied by an agent who had sped to England aboard a fast ship after the battle.<sup>94</sup> Rothschild used that information to purchase British government bonds that rose in value when knowledge of the victory became generally known.<sup>95</sup> "Unfortunately—as with every innovation in communications—it was not long before the Rothschilds' rivals were sending just as many couriers of their own."<sup>96</sup> To regain advantage, Rothschild turned to carrier pigeons to send market information from European cities to London. Using a crude code, messages sent by this method would advise whether to buy or sell securities.<sup>97</sup>

An increase in cotton prices in Liverpool, England in 1824 provided a profit opportunity for U.S. speculators.<sup>98</sup> When that news arrived in New York, special packets were sent south directing cotton purchases, and other methods were used to obtain advantage through special expresses that were much faster than those available through the U.S. mail system, which was then the normal method for transmitting and making public news reports of market moving events.<sup>99</sup> As one author noted:

[S]peculators sent packets to Southern cotton markets. The messenger who arrived first made substantial profits for his employer by purchasing cotton at normal prices. This was hardly an isolated occurrence. Speculators in Eastern ports, especially New York, sought advance information about fluctuations in distant

93. John Maxwell Hamilton & Eric Jenner, Essay, *The New Foreign Correspondence*, FOR. AFF. 131, 133 (Sept.–Oct. 2003).

94. Joseph Mandel, *The Richest Dynasty in History?*, BUSINESSWEEK (Dec. 1998), <http://www.businessweek.com/1998/49/b3607071.htm> [<http://perma.cc/2H6A-6UYR>].

95. *Nathan Mayer Rothschild and 'Waterloo'* ROTHSCHILD ARCHIVE, [https://www.rothschildarchive.org/contact/faqs/nathan\\_mayer\\_rothschild\\_and\\_waterloo](https://www.rothschildarchive.org/contact/faqs/nathan_mayer_rothschild_and_waterloo) [<https://perma.cc/5LRA-9P6F>] (last visited Sept. 12, 2015).

96. NIALL FERGUSON, *THE HOUSE OF ROTHSCHILD: MONEY PROPHETS (1798-1848)* 234 (1998).

97. *Id.* Ironically, notice of Nathan Rothschild's death in Europe in 1836 was sent to London by courier pigeon. "[A] sportsman, looking for birds in the neighborhood of Brighton, on the English coast, shot a pigeon which, when picked up, proved to be one of the well-known carrier-pigeons of the Rothschilds. Under its wings was a small piece of paper, bearing the words: 'Il est mort.'" *A Tale of Great Fortunes*, 5 THE ILLUSTRATED AM. 421 (Jan. 21, 1891).

98. Richard B. Kielbowicz, *Speeding the News: Postal Express, 1825-1861: The Public Policy of Privileges for the Press*, 22 SOC. SCI. J. 49, 50 (Jan. 1985) (citation omitted).

99. *Id.* at 50–51 (citation omitted).

markets. Ships from Europe would sometimes dawdle along the coast while a courier carried market intelligence ashore. Messengers then hurried the information south. It was even charged that public mail carriers were bribed or delayed while private messengers dashed ahead to convert their exclusive market information into profits.<sup>100</sup>

In response to concerns over cotton speculations, the Postmaster General proposed an express service between Boston, Massachusetts and Augusta, Georgia in 1825 that would travel at the rate of eleven miles per hour.<sup>101</sup> That service “would convey information about ‘any sudden and important change in the price of the principal staples of our Country.’”<sup>102</sup> It was believed, that this service would “put a stop to the system of speculation which has lately been so extensively practised by individuals of one commercial town on those of another who were not possessed of the same means of information.”<sup>103</sup> Needless to say, cotton speculations continued through other means. The Post Master tried again to forestall speculators between 1836 and 1839 by creating a rapid horse express that operated between New York and New Orleans.<sup>104</sup> However, it too did not stop traders seeking trading advantages.<sup>105</sup>

A signal system between the New York and Philadelphia stock exchanges using telescopes, semaphore flags, mirrors during the day and lanterns at night was created in the 1830s.<sup>106</sup> The operator of that then high-speed communications system, William C. Briggs, a Philadelphia stock broker, could flash information between those two exchanges within minutes, allowing him to arbitrage stocks that were traded in both Philadelphia and New York.<sup>107</sup> D.H. Craig was also using courier pigeons to send information to Boston from Halifax, Nova Scotia where ships first landed with news from Europe.<sup>108</sup>

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100. *Id.* at 50 (citation omitted).

101. *Id.* at 50–51 (citation omitted).

102. *Id.* (footnote omitted).

103. *Id.* at 50–51 (footnote omitted).

104. *Id.*

105. Pisani, *supra* note 7, at 21.

106. As one financial historian has noted:

Timely information is so important to securities markets that, in the 1830s, a semaphore line sprang up between Wall Street and Philadelphia. Men were stationed on tall buildings and hills every six or eight miles, armed with flags and telescopes. The man on the top of the Merchants' Exchange on Wall Street, where the Stock Exchange was then located, would signal opening prices to a man in Jersey City across the Hudson, and the information could get to Philadelphia in about thirty minutes.

GORDON, *supra* note 79, at 79.

107. DAVID HOCHFELDER, *THE TELEGRAPH IN AMERICA, 1832-1920*, at 101 (2012).

108. MARKHAM, *supra* note 83, at 163; JAMES D. REID, *THE TELEGRAPH IN AMERICA: ITS FOUNDERS, PROMOTERS, AND NOTED MEN* 609 (1879).

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

A way to speed orders on Wall Street was through the use of “pad-shovers,” who acted as messengers between brokers. They were “walking tickers” that would shove their messages right under the broker’s noses to make sure they were read immediately.<sup>109</sup> “Rushing the Pad, they used to call the process.”<sup>110</sup> William Heath, the fleetest of these pad-shovers, was so fast that he was called the “American Deer.”<sup>111</sup> The pad-shovers were eventually replaced by faster communication systems, but messenger boys continued to be “an important link in Wall Street’s flow of information.”<sup>112</sup>

The introduction of the telegraph in 1844 changed the speed of communications by magnitudes and soon led to its use by speculators. “The telegraph would have a profound impact upon the financial services business and helped put an entire generation of carrier pigeons out of work.”<sup>113</sup> In 1846, a telegraph line between Philadelphia and New York also replaced Briggs’s once high-speed mirrors and flags.<sup>114</sup> It was soon reported that “certain parties in New York and Philadelphia were employing the telegraph for speculating in stocks.”<sup>115</sup>

The telegraph was also used to trade on advance information about Civil War battles, allowing speculators to profit in the gold markets in New York that were sensitive to such news.<sup>116</sup> “Anson Stager, serving as both U.S. Military Telegraph Corps (USMT) superintendent and Western Union superintendent, and George Ladd, Western Union’s California superintendent, both made fortunes leveraging their advance knowledge of war news to speculate in gold.”<sup>117</sup>

This high-speed information advantage also induced “some crafty manipulators” to profit from such information in advance of other traders.<sup>118</sup> “A favorite ploy was to bribe a telegraph operator or war office clerk” in

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109. EDWIN LEFEVRE, *THE MAKING OF A STOCKBROKER* 160 (1924).

110. *Id.*

111. MARKHAM, *supra* note 83, at 245; *A Shock to Wall-Street: Henry N. Smith and William Heath & Co. Fail. The Culmination of Dealings That Began Before Black Friday—A Blow From Vanderbilt’s Axe*, N.Y. TIMES, Oct. 3, 1885, at 1.

112. THE NEW YORK STOCK EXCHANGE 82 (James E. Buck ed., 1999).

113. CHARLES R. GEISST, *WALL STREET: A HISTORY* 46 (2004).

114. HOCHFELDER, *supra* note 107, at 101.

115. OFFICE OF TECH. ASSESSMENT, OTA-CIT-469, *ELECTRONIC BULLS AND BEARS: U.S. SECURITIES MARKETS AND INFORMATION TECHNOLOGY* 129 (1990).

116. “Gold prices would ‘gyrate with each new victory or defeat for the Union army.’” RON CHERNOW, *THE HOUSE OF MORGAN: AN AMERICAN BANKING DYNASTY AND THE RISE OF MODERN FINANCE* 22 (1990).

117. HOCHFELDER, *supra* note 107, at 104.

118. MAURY KLEIN, *THE LIFE AND LEGEND OF JAY GOULD* 69 (1986).

order to obtain advance knowledge of military developments.<sup>119</sup> “The Lees, Grants, and Shermans had their counterparts in the great stock operators who bribed soldiers, sutlers, politicians, and telegraph operators in order to get the latest information from the front.”<sup>120</sup>

“The so-called Bogus Proclamation incident in May 1864 demonstrated the power of telegraphic information (even false information) to influence the gold market.”<sup>121</sup> That incident involved the planting of a false claim supposedly issued in Washington by President Lincoln and telegraphed late at night by the Associated Press to newspaper editors in New York. This bogus message stated that, because of war reverses, the President was announcing the draft of 400,000 additional men into the Union army. This caused stock prices to plunge on Wall Street and gold prices to soar. Joseph Howard, city editor of the Brooklyn Eagle, carried out this scheme and made a large profit from the hoax. Howard was sent to jail for this fraud, but served less than three months. President Lincoln granted that early release after announcing, only a few months after the hoax, that the government would actually be drafting 500,000 additional men.<sup>122</sup>

In another trading coup, Robber Baron Jay Gould used fast ships to trade in London on advance news that the Confederacy had capitulated. Gould sold confederate bonds short in the London market, and those bonds became worthless once news of the Union victory reached England.<sup>123</sup>

“The new technology of the post-Civil War years, the perfection of the telegraph, telephone and ticker systems, drastically affected managing the ‘business’ of the [Chicago] board of trade” and the stock exchanges.<sup>124</sup> The Atlantic cable was used to send quotes after it became fully operational in 1866. “From the stock broker’s standpoint its prime value was in transmitting instantaneous quotations, and orders to buy and sell securities, between the continents.”<sup>125</sup> As a result of that new high-speed communication device, “financiers such as Peabody and Morgan could

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119. *Id.*

120. EDWARD CHANCELLOR, *DEVIL TAKE THE HINDMOST: A HISTORY OF FINANCIAL SPECULATION* 160 (1999).

121. HOCHFELDER, *supra* note 107, at 104.

122. *The Civil War Gold Hoax*, MUSEUM HOAXES, [http://www.museumofhoaxes.com/hoax/archive/permalink/the\\_civil\\_war\\_gold\\_hoax](http://www.museumofhoaxes.com/hoax/archive/permalink/the_civil_war_gold_hoax) [<http://perma.cc/FP74-LYTJ>] (last visited July 28, 2015).

123. Pisani, *supra* note 8, at 23.

124. JONATHAN LURIE, *THE CHICAGO BOARD OF TRADE, 1874-1905: THE DYNAMICS OF SELF-REGULATION* 8 (1979).

125. EDMUND C. STEDMAN, *THE NEW YORK STOCK EXCHANGE 195* (1905). The Atlantic cable created an “arbitrage business, in which stock houses with foreign connections learned to profit by the price differences between the New York and London markets for American shares.” *Id.*

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

move quickly in and out of markets, easily trade in foreign currencies, and anticipate the effects of international news.”<sup>126</sup>

The stock ticker, which was invented in 1867, was an advance in high-speed trading technology, which “broadcast real-time financial information from exchange floors to anyone subscribing to the service.”<sup>127</sup> “Taking the information supplied by the trading-floor reporters, telegraph operators entered transaction data onto a circular push-button keyboard, activating the print wheels of tickers in subscriber’s offices.”<sup>128</sup>

The telegraph remained the key to high-speed trading on Wall Street. “Then, as now, traders believed they could make money if they knew about trades before their competitors did.”<sup>129</sup> A *Harpers Weekly* illustration from 1873 shows a maze of wires “running from buildings around the stock exchange, with Western Union promoting ‘direct wires.’”<sup>130</sup> One broker described the layers of telegraph wires used by brokers on Wall Street and its environs as being so dense that, “[n]o bird could fly through their network, a man could almost walk upon them; in fact, they darkened the street and the windows below their level.”<sup>131</sup> This network of wires became such a nuisance that the City of New York required them to be buried beneath the streets.<sup>132</sup>

“Thomas Edison’s quadruplex, a device that allowed four messages to be sent simultaneously over one telegraph wire” was invented in 1874 and further speeded Wall Street communications.<sup>133</sup> The invention of the telephone was another communications advance. In 1878, two years after

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126. JEAN STROUSE, MORGAN, AMERICAN FINANCIER 65 (1999).

127. HOCHFELDER, *supra* note 107, at 102.

128. THE NEW YORK STOCK EXCHANGE, *supra* note 112, at 116.

129. Floyd Norris, *Sacrificing Sense for Speed in Markets*, N.Y. TIMES (Apr. 10, 2014), [http://www.nytimes.com/2014/04/11/business/sacrificing-sense-for-speed-in-markets.html?\\_r=0](http://www.nytimes.com/2014/04/11/business/sacrificing-sense-for-speed-in-markets.html?_r=0) [<http://perma.cc/556S-S29M>].

130. *Id.* The first edition of the *Wall Street Journal* that was printed on July 8, 1896 contained front-page advertisements from brokers and bankers promoting their “Direct Wire” connections. *The Wall Street Journal’s First Edition*, WSJ 125, <http://wsj.com/125/wsj-first-edition/#!/#8> [<http://perma.cc/58GS-HUTZ>] (last visited Aug. 3, 2015). For example, Spencer Trask & Co., advertised its direct wire connections among its offices in New York, Albany and Providence R.I. and to markets in Philadelphia, Boston, and Chicago. *Id.*

131. HOCHFELDER, *supra* note 107, at 101.

132. RUSSELL O. WRIGHT, CHRONOLOGY OF THE STOCK MARKET 19 (2002).

133. HOCHFELDER, *supra* note 107, at 23; *Quadruplex Telegraph*, ENGINEERING & TECH. HIST. WIKI, [http://ethw.org/Quadruplex\\_Telegraph](http://ethw.org/Quadruplex_Telegraph) [<http://perma.cc/KT5V-XPNY>] (last modified Feb. 13, 2012).

its invention, the NYSE installed the first telephones on its floor.<sup>134</sup> By 1880, most brokers had telephone lines connected directly to the exchanges.<sup>135</sup>

It was thought by some that the telegraph and telephone limited speculation by making important market moving information generally available. In 1890, however, the president of Western Union testified before Congress that forty six percent of that company's "message traffic was 'purely speculative,' including 'stock-jobbing, wheat deals in futures, cotton deals in futures' and horse racing odds, while only thirty four percent pertained to what he considered 'legitimate trade.'"<sup>136</sup> The telegraph, in all events, dramatically affected development of the markets. Some 250 exchanges had operated at various periods during the nineteenth century, but many of them were put out of business as a result of the telegraph.<sup>137</sup>

Large brokerage firms earned the sobriquet of "wire houses" by reason of their high-speed telegraph and telephone connections with branch offices and the exchanges.<sup>138</sup> By 1905, a San Francisco broker was executing orders within five minutes of their receipt on stock and commodity exchanges in New York and Chicago. Another San Francisco broker had a private wire to the Boston Copper Market.<sup>139</sup> Jones & Baker was the country's largest stockbroker in 1917 and ran private wires to the homes of favored clients.<sup>140</sup> As trading surged in the markets during the 1920s, commission brokers had in place some 500,000 miles of private wires to transmit customer orders and information, including over 100 private wires stretched between New York and Chicago.<sup>141</sup>

In 1924, the NYSE added ticker tape enlarging machines that allowed the display of ticker tape information on large overhead screens on the floor.<sup>142</sup> By 1925, the NYSE also installed some thirty miles of copper pneumatic tubes to connect its specialists' trading booths with broker telephone booths on the NYSE floor. Order execution instructions from broker desks on the NYSE floor were placed in those pneumatic tubes by "tube men." In an effort that would presage efforts to slow HFT's, "[t]he pneumatic tube system was constructed so that a message traveling a long

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134. WRIGHT, *supra* note 133, at 18.

135. OFFICE OF TECH. ASSESSMENT, *supra* note 115, at 129.

136. HOCHFELDER, *supra* note 107, at 103.

137. MARKHAM, *supra* note 83, at 334.

138. 2 JERRY W. MARKHAM, A FINANCIAL HISTORY OF THE UNITED STATES: FROM J.P. MORGAN TO THE INSTITUTIONAL INVESTOR (1900-1970) 8 (2002); J. Peter Ferderer, *Advances in Communication Technology and Growth of the American Over-the-Counter Markets, 1876-1929*, 68 J. ECON. HIST. 1, 13 (2008).

139. MARKHAM, *supra* note 138, at 9.

140. *Id.* at 86.

141. *Id.* at 129.

142. THE NEW YORK STOCK EXCHANGE, *supra* note 112, at 143.



[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

distance would arrive at the same time as one sent by a shorter route, in this way not giving anyone an unfair advantage.”<sup>143</sup>

In 1930, the NYSE introduced a new high-speed ticker that could report trading activity at 500 characters per minute, nearly double the speed of prior tickers.<sup>144</sup> Stock market quotes were then sent from the exchanges to a Western Union office in New York and punched onto a perforated tape by clerks. “The tape was then fed through the telex machine, which sent out electrical impulses that became the prices on the ticker seen in brokerage offices around the country.”<sup>145</sup>

Many brokers had a “board room” for customers to observe a ticker tape of trading activity on the NYSE.<sup>146</sup> In the mid-1930s, there were over 9,000 tickers in the U. S. and Canada.<sup>147</sup> Additional information shown on the “board” might include current information on commodity prices, foreign currencies, the number of shares sold each hour on the New York Stock Exchange, and the Dow-Jones average might be posted periodically.<sup>148</sup> In addition, earlier in the 1930s, the industry developed a mechanism for projecting the ticker tape onto a screen by a trans-lux machine, which made for easy viewing and was popular with customers.<sup>149</sup>

*B. Early Co-location Issues*

An issue of considerable concern with high-speed trading by HFTs has been their efforts to locate, actually “co-locate,” their computer servers in or near an exchange facility so that they can receive market data more quickly and respond accordingly.<sup>150</sup> Co-location, or other efforts to obtain close proximity to an exchange, reduces latency.<sup>151</sup> Co-location seeks the

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143. *Id.* at 142.

144. MARKHAM, *supra* note 138, at 226; RICHARD J. TEWELES & EDWARD S. BRADLEY, *THE STOCK MARKET* 149 (1998).

145. CHARLES R. GEISST, *100 YEARS OF WALL STREET* 65 (2000).

146. TWENTIETH CENTURY FUND, INC., *THE SECURITY MARKETS* 230 (Alfred L. Bernheim & Margaret Grant Schneider eds., 1935).

147. *Id.* at 252.

148. *Id.* at 230–31.

149. *Id.* at 230, 251–52.

150. *Hearing*, *supra* note 6.

151. As the CFTC has noted:

Two common methods for reducing latency are co-location and proximity hosting, defined as the placement of a firm’s trading technology in close proximity to the trading platform. They may be offered directly by an exchange or by a third-party service provider. Co-location denotes those connectivity solutions

same time and place advantage that exchange floor members have sought and enjoyed over the centuries—a principal attraction for membership zealously guarded then and now that usually comes with a steep price for a seat on the exchange.

The informational advantages of a central exchange and co-location have long been known. In Rome, over 1,600 years ago, one “way for merchants to more efficiently spread information was to work physically near each other. Knowing each other, seeing each other each day, and gossiping together would undoubtedly increase the information flow between the merchants.”<sup>152</sup>

The so-called Buttonwood Agreement, which laid the groundwork for the NYSE in 1792, stated that the signers would sell “Public Stock” at a fixed rate of commission and that members “will give preference to each other in our Negotiations.”<sup>153</sup> The Buttonwood Agreement effectively limited membership of its members to the wealthier financiers in New York, providing an exclusive society for stock trading at collusive rates of commission. “Before long, the Buttonwood Agreement lapsed, but its exclusionary principle served as the foundation of the New York Stock & Exchange Board,” the predecessor to the NYSE.<sup>154</sup> By 1819, the members of that exchange reached a “mutual understanding ‘not to inform outsiders of the bids, offers or transactions of any particular members.’”<sup>155</sup> The exchange floor then became a central source of valuable information on the most current value of stocks traded through its facilities.

Traders on exchange floors could generate orders and respond to events much faster than those removed from the floor.<sup>156</sup> Even with the development of the telegraph and telephone, floor traders retained a decided time and place advantage over traders without such access. Exchange membership “exclusivity allowed members to use the information obtained at the Board for their own advantage in trades with nonmembers.”<sup>157</sup> This informational advantage did not pass unnoticed by politicians. The New York Senate passed a bill in 1836 that would have prohibited the NYSE from closing its trading sessions to non-member traders, but that bill was

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hosted by the exchange itself, while proximity hosting indicates services offered by third parties.

Risk Controls and System Safeguards, *supra* note 5, at 56,546.

152. David Kessler & Peter Temin, *The Organization of the Grain Trade in the Early Roman Empire*, 60 *ECON. HIST. REV.*, 313, 329 (2007).

153. STEDMAN, *supra* note 126, at 36.

154. STUART BRUCHEY, *MODERNIZATION OF THE AMERICAN STOCK EXCHANGE* (1971-1989) 8 (1991).

155. STEDMAN, *supra* note 126, at 70.

156. WALTER WERNER & STEVEN SMITH, *WALL STREET* 29 (1991).

157. *Id.*

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

defeated.<sup>158</sup> Stymied speculators on the curb market drilled a hole through a wall on the NYSE trading floor in 1837 in order to hear quotations.<sup>159</sup> That practice was stopped, but during the Civil War, brokers paid \$100 to listen through a keyhole so that they could follow stock quotations on the floor of the NYSE.<sup>160</sup>

The NYSE also sought to preserve its time and place location advantage for floor members by restricting access to the floor by telephone and telegraph devices. As Henry Emery noted in 1896, private wires between Boston and New York were in popular use. “A change in price in either place was known by the broker on the floor of the other within less than thirty seconds. This was trade reduced to its finest point. It is not necessary to point out how completely such dealings bring about a uniformity of price.”<sup>161</sup> In 1894, however, the NYSE required communications from the floor to the telephone to be sent by a messenger. “This action was taken solely for the practical purpose of bringing the business of other centres to the New York market, and to more strictly maintain commission rates.”<sup>162</sup> This “was a backward step from the economic point of view, and, on the practical side as well, the opinion is not uncommon that it diminished rather than increased business.”<sup>163</sup>

Information from the trading floor proved its value in other ways. The NYSE and the commodity exchanges sought to gain control over their quotations by restricting and selling the right to receive that data through telegraph lines.<sup>164</sup> That information was deemed valuable and could be sold to traders seeking high-speed access to exchange trading data.<sup>165</sup> The exchanges also recognized that they could shut down competitors by denying access to their quotes.<sup>166</sup> Some of those competitors were the unsavory bucket shops that were essentially betting operations on grain and stock prices:

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158. MARKHAM, *supra* note 83, at 159.

159. Robert Steiner, *The Big Board's Bicentennial, 200 Years Later, Small Investors Find Clout at America's Premier Exchange*, WALL ST. J., May 13, 1992, at C1.

160. STEDMAN, *supra* note 126, at 146; MARKHAM, *supra* note 83, at 242.

161. Emery, *supra* note 2, at 139.

162. *Id.*

163. *Id.*

164. HOCHFELDER, *supra* note 107, at 101.

165. *Id.*

166. *Id.*

As financial markets increasingly became markets in information, control of and access to the flows of quotations became a major source of conflict between exchanges, telegraph companies, brokers, and bucket shops. By broadcasting quotations to a wider and wider audience, the ticker and telegraph network enabled the dramatic growth in stock trading and ownership in the twentieth century.<sup>167</sup>

The battle with the bucket shops over exchange quotations was all about the trading advantages of such information. In 1905, the Supreme Court strongly protected the exchanges' power to sell and distribute that data selectively in *Board of Trade v. Christie*.<sup>168</sup> There, the Court recognized the property right of an exchange in its trading data and the corresponding right to control its use.<sup>169</sup> The Court further rejected a claim that the information should be made freely available because it was being used by exchanges to encourage speculation.<sup>170</sup>

Exchanges have thus long employed the practice of selling market information at the highest price the market will bear.<sup>171</sup> The Supreme Court did later place some limits under the antitrust laws on the exchanges' ability to use their market power to punish others by arbitrarily denying access to their trading data. In *Silver v. New York Stock Exchange*, the Supreme Court held that the NYSE could not order its members to remove private direct telephone wire connections with a nonmember without giving the nonmember due process in the form of notice of the

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167. HOCHFELDER, *supra* note 107, at 102–03.

168. *Board of Trade v. Christie Grain & Stock Co.*, 198 U.S. 236 (1905).

169. *Id.* at 245, 253.

170. *Id.* Justice Holmes thus stated that the Chicago Board of Trade was:  
[A] great market, where, through its eighteen hundred members, is transacted a large part of the grain and provision business of the world. Of course, in a modern market contracts are not confined to sales for immediate delivery. People will endeavor to forecast the future and to make agreements according to their prophecy. Speculation of this kind by competent men is the self-adjustment of society to the probable. Its value is well known as a means of avoiding or mitigating catastrophes, equalizing prices and providing for periods of want. It is true that the success of the strong induces imitation by the weak, and that incompetent persons bring themselves to ruin by undertaking to speculate in their turn. But legislatures and courts generally have recognized that the natural evolutions of a complex society are to be touched only with a very cautious hand, and that such coarse attempts at a remedy for the waste incident to every social function as a simple prohibition and laws to stop its being are harmful and vain.  
*Id.* at 247–48.

171. After the author joined the CBOE as an executive in 1974, he was given the unenviable task of informing the quote vendors that the exchange would no longer pay them to publish the exchange's price information. Instead, the vendors would have to pay the exchange for that data. One vendor smashed his quote machine in front of me upon being informed of this change, but the firm still paid.

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

intention to sever those connections, a statement of the reasons for the action, and an opportunity to be heard on the matter.<sup>172</sup>

In 1918, the NYSE prohibited specialists on its floor from disclosing customer stop orders to others, namely, customer orders directing the buying or selling of a stock when it reached a particular price. Traders had been using that information to profit from those orders as market prices changed.<sup>173</sup> However, information in the specialists' book of limit and stop orders remained available to the specialists, providing them with "special knowledge."<sup>174</sup> This allowed the specialists to have "a tremendous advantage over the general public" when trading for the specialists' own account.<sup>175</sup> The specialists claimed that this advantage was justified because their trading provided stability and liquidity to the market and more efficient pricing because they were making continuous two-sided markets for customer orders. The floor traders on the NYSE could make no such claims because their training was purely opportunistic. Those floor traders did not make continuous markets and tended to accentuate price trends and volatility.<sup>176</sup>

#### IV. TWENTIETH CENTURY EXCHANGES—THE PRE-COMPUTER ERA

##### A. *The NYSE*

The time and place advantage of floor traders on the NYSE over other traders was well in place when the federal securities laws were enacted to regulate their activities in the 1930s. As the SEC noted, during that period, the exchanges operated as auction markets through a labyrinth of brokers and specialists who provided liquidity for the stocks traded through their facilities. The SEC has thus noted that:

[I]n the mid-1930s, the predominant markets for the trading of securities in the United States were the organized stock exchanges. Predominant among these were exchanges such as the NYSE and New York Curb Exchange (. . . [renamed] the American Stock Exchange ('Amex'), which operated as centralized, continuous auction markets for the trading of listed securities. Those auction markets offered liquidity, continuity, and depth to investors through the services of several categories of member brokers and dealers: (1) commission brokers (who traded primarily for the accounts of public customers); (2) floor brokers (who traded primarily for

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172. *Silver v. N.Y. Stock Exch.*, 373 U.S. 341, 365 (1963).

173. MARKHAM, *supra* note 138, at 86.

174. S. REP. NO. 1455 at 25 (2d Sess. 1934).

175. *Id.*

176. MARKHAM, *supra* note 138, at 125.

the accounts of other exchange members); (3) floor traders (who traded primarily for their own accounts); and, most importantly, (4) 'specialists.' Exchange specialists, trading issues assigned to them at particular floor locations called 'posts', performed the dual functions of effecting transactions in securities allocated to them both for their own accounts (as dealers) and for the accounts of others (as brokers). As dealers, the specialists assumed "affirmative" obligations to trade for their own accounts in order to maintain market continuity and depth, and were subject to statutorily imposed "negative" obligations to abstain from trading for their own accounts unless such trading was necessary for the maintenance of a fair and orderly market. As brokers, the specialists were required to execute not only market orders (to buy or sell at the best current market price), but also limit orders (orders to buy or sell at a specific price or better) and "stop" orders (orders requiring the specialist to execute the order when a transaction in the security occurs at or above the 'stop' price in the order).<sup>177</sup>

The process for executing a customer order was a laborious one that involved transmitting the order by wire or telephone and then to a floor broker for manual execution at a specialist's post.<sup>178</sup> Floor traders on these exchanges still had a decided time and place advantage that gave them an edge over "outside operators," namely, traders entering orders from outside the exchange, who also had to pay higher commission rates than exchange members.<sup>179</sup> Criticism of NYSE floor traders led that exchange to prohibit them from trading for their own account unless their bid or offer was at least one eighth of a dollar better than customer orders.<sup>180</sup>

The Securities Exchange Act of 1934 (34 Act) imposed statutory duties of self-regulation on the exchanges. This required the exchanges to enforce their rules against members through disciplinary actions.<sup>181</sup> The

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177. SEC, Self-Regulatory Organizations; Delta Government Options Corp.; Order Granting Temporary Registration as a Clearing Agency, Exchange Act Release No. 34-27611, 55 Fed. Reg. 1890, 1895-96 (1990) (footnotes omitted).

178. The SEC observed that:

The exchanges of the 1930s were designed, through the interaction of specialists and floor brokers, to accommodate trading by retail investors as well as institutions. Typically, a customer's market order, placed initially with a branch office of a member firm, would be routed by telephone or wire to the trading floor of the broker's firm, usually in New York City; there, it would be taken by a floor broker. The floor broker would then carry the order to the specialist's post, where the floor broker would either: (1) Match the order against a reciprocal order represented in the crowd or left with the specialists, to be recorded in the specialist's "book." When buy and sell orders could not be matched, the specialists would function as dealer, buying or selling a sufficient amount of stocks to ensure a continuous, orderly market.

*Id.* at 1896.

179. MARKHAM, *supra* note 138, at 4.

180. *Id.* at 60.

181. As one court noted:

As national securities exchanges, the intervenors are self-regulatory organizations (SROs). They therefore "have 'a duty to promulgate and enforce rules governing the conduct of [their] members,' under the oversight of the SEC." Exchanges

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

34 Act directed the SEC to consider the complete separation of the roles of “brokers” who execute orders for customers and “dealers” that trade for their own account as principal with their customers.<sup>182</sup>

The SEC’s report on that issue focused on the roles of the specialists and floor traders on the stock exchanges. The SEC noted the time and place advantage of floor traders and specialists, which was especially valuable when the NYSE ticker tape was running late because of heavy trading in volatile markets.<sup>183</sup> A late tape was not uncommon on heavy trading volume days. The NYSE even had a “Ticker Tape Delay” indicator that showed how long the tape was running behind the reporting of trades.<sup>184</sup>

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must file their rules with the SEC and ensure compliance therewith. Section 6 of the Exchange Act requires that the rules of national securities exchanges, *inter alia*, “provide for the equitable allocation of reasonable dues, fees, and other charges among its members and issuers and other persons using its facilities”; “promote just and equitable principles of trade”; and do not “permit unfair discrimination between customers, issuers, brokers, or dealers” or “impose any burden on competition that is not necessary or appropriate in furtherance of the purposes of” the Exchange Act.

NetCoalition v. SEC, 715 F.3d 342, 344–45 (D.C. Cir. 2013) (citations omitted).

182. SEC. & EXCH. COMM’N, REPORT ON THE FEASIBILITY AND ADVISABILITY OF THE COMPLETE SEGREGATION OF THE FUNCTIONS OF DEALER AND BROKER, at xiii (1936). The SEC defined the role of a broker as someone who is acting as an agent of his customer in the purchase or sale of securities:

He does not undertake to sell to or buy from his customer but rather to negotiate a contract of purchase or sale between the customer and a third party. The transaction is solely for the account of the customer who becomes the owner of securities purchased by the broker on his behalf, is entitled to the profits realized and is liable for the losses incurred. The broker has no beneficial interest in the transaction except the commission or other remuneration which he receives for his services.

*Id.* at xiv. The SEC defined the role of a dealer as being:

[S]imilar to those of a dealer or jobber in merchandise. The dealer sells securities to his customer which he has purchased or intends to purchase elsewhere or buys securities from his customer with a view to disposing of them elsewhere. In any such transaction he acts for his own account and not as agent for the customer. He receives no brokerage commission but relies for his compensation upon a favorable difference or spread between the price at which he buys and the amount for which he sells. The risk of loss is entirely his own.

*Id.*

183. MARKHAM, *supra* note 138, at 209.

184. THE NEW YORK STOCK EXCHANGE, *supra* note 112, at 161.

The SEC's report was critical of the role of floor traders because they had no obligation to maintain a fair and orderly market.<sup>185</sup> However, it was not until the 1960s that the SEC effectively excluded such traders from exchange floors.<sup>186</sup> Even then, the specialists continued to enjoy their time and place advantage. To be sure, that advantage was tempered by a requirement that they maintain a continuous two-sided "fair and orderly" market.<sup>187</sup> This required specialists to quote a "spread" between the price at which what it was willing to sell shares and the price at which it stood ready to buy share.<sup>188</sup> This was no penalty, however, because the specialist captured the "spread" as a profit.<sup>189</sup> All things being equal, the specialist would profit on the difference in prices between his buy and sell orders.<sup>190</sup> This advantage of the specialist was thought justifiable because the presence of the specialist gave assurance of liquidity for investors seeking to buy and sell NYSE listed securities.<sup>191</sup>

NYSE rules continued to seek to protect the specialists' monopoly over NYSE listed stocks.<sup>192</sup> Since 1863, the NYSE prohibited its members from dealing in NYSE listed stocks outside the exchange's floor.<sup>193</sup> The SEC, however, acted to stop the NYSE from enforcing that restriction where its stocks traded on regional exchanges.<sup>194</sup> In 1940, there were seventeen such exchanges, but their volume was comparatively small, and the NYSE's restriction, found in NYSE Rule 390, on off-exchange trading continued to apply to the larger OTC market.<sup>195</sup>

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185. MARKHAM, *supra* note 138, at 209.

186. 17 C.F.R. § 240.11a-1 (2014).

187. *Id.*

188. Andy Kessler, *High-Frequency Trading Needs One Quick Fix*, WALL ST. J., June 16, 2004, at A15.

189. *Id.*

190. *Id.*

191. That advantage was also subject to criticism. As one commentator has noted:

Being a New York Stock Exchange specialist—each stock had one—was a lucrative business because there is information in every trade. Like Nasdaq market makers, they didn't charge commissions but instead would keep the spread, or the difference between the bid and the ask price, measured in quarters (25 cents) and eighths (12.5 cents). And specialists were notorious for front running customers. Simply put, if they didn't like the spread on a buy order, they would buy shares themselves and then raise the price of the shares they had to offer, knowing there was a buyer in the market. At a cocktail party many years ago, I asked a specialist about this and he told me, 'You big investment banking guys shouldn't worry about it, we need to get paid too.'

*Id.*

192. MARKHAM, *supra* note 138, at 244.

193. *Id.*

194. *Id.*

195. MARKHAM, *supra* note 138, at 244.



[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

Rule 390 posed a serious problem for the execution of large institutional orders because the specialists did not have sufficient capital to execute large block trades at a competitive price.<sup>196</sup> This was important because trading in the stock markets was being driven, beginning in the 1950s, by institutional traders, rather than by retail traders who had historically driven trading volumes.<sup>197</sup>

The growth of institutional size orders caused substantial conflict between the exchanges and those institutions. The NYSE wanted to milk those orders by requiring the institutions to pay the specialists' spreads, and the NYSE required those institutions to pay a large commission to the NYSE member firm executing their trades. The institutions wanted neither to pay the spread nor the commission. The institutions were particularly galled that their large block trades, which required the same paperwork as a small order, were forced to pay a commission magnitudes greater than small trades.<sup>198</sup>

The lack of capital on the part of specialists to execute large block orders led, in the 1950s, to block trading arrangements in which broker-dealers, like Goldman Sachs, assembled large institutional trades "upstairs" and then reported them to the NYSE floor for execution.<sup>199</sup> Broker-dealers arranged block trades upstairs by contacting known active and

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196. See LISA ENDLICH, *GOLDMAN SACHS: THE CULTURE OF SUCCESS* 66 (1999) (describing this inability).

197. As one source notes:

[I]n the 1950s, the stockbrokers' world began to change. The profile of the "typical" investor was changing, from the moderately affluent individual investor occasionally buying or selling a few shares through his retail stockbroker to the continuously active, professional institutional investor who was active in the market all the time, buying and selling positions in dozens of different stocks everyday.

CHARLES D. ELLIS, *THE PARTNERSHIP: THE MAKING OF GOLDMAN SACHS* 135 (2008). This growth of institutional trading led to an extensive five-volume study by the Commission in 1973 on the identity of institutional traders and their role in the marketplace. 1-5 INSTITUTIONAL INVESTOR STUDY REPORT OF THE SECURITIES AND EXCHANGE COMMISSION, H.R. DOC. NO. 92-64, pt. 6 (1st Sess. 1971). The *Institutional Investor Study* was conducted pursuant to a joint resolution of Congress, which directed the SEC to determine the effect of institutional trading "upon . . . the maintenance of fair and orderly securities markets . . . the stability of such markets . . . the interest of the issuers . . . and upon the interests of the public . . ." S. JOURNAL, 90th Cong., 82 Stat. 453 (1968).

198. This was an enormous expense for active institutional traders. For example, the commission on a 100,000-share transaction was 1,000 times higher than the commission on a 100-share transaction even though the costs of executing larger trades were not nearly as disproportionate. Utilization of Membership on National Securities Exchanges for Public Purposes, 38 Fed. Reg. 3902, 3915 (Feb. 8, 1973).

199. ELLIS, *supra* note 197, at 134-35.

wealthy traders and institutional traders, such as pension funds, endowments and other trusts, and insurance companies. The arranging broker-dealer exposed the order in whole or in part to other institutional clients and solicited those traders to take all or a portion of the block. Through this process, the broker-dealer was able to obtain a better price on the block than would be available if the block were simply dumped on the NYSE floor.<sup>200</sup> This provided some relief to those institutional traders, but they were still suffering from the requirement that they pay retail commission rates on their trades until the SEC began the process of eliminating that restriction in the 1970s.

Before lifting that restriction, the SEC sought to block institutional traders from becoming registered as broker-dealers. Before fixed commissions were eliminated in the 1970s, many actively trading institutions had sought to register with the SEC as broker-dealers in order to become members of the stock exchanges. Such membership would have allowed those institutions to avoid the exchanges' fixed minimum commissions that exchange members' firms were required to charge to their non-member customers, no matter what the size of their trades.<sup>201</sup> The NYSE sought to block that effort,<sup>202</sup> with the aid of the SEC, which was concerned that large institutional traders might come to dominate the markets if they were allowed to register as broker-dealers and become exchange members.<sup>203</sup>

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200. ELLIS, *supra* note 197, at 135–37. By 1986, institutional block sales constituted almost fifty percent of volume on the New York Stock Exchange, up from fifteen percent in 1970. Report of the Presidential Task Force on Market Mechanisms II-16 (1988). Although NYSE Rule 390 has since been repealed, block trading continues. In 2012, monthly block trading volume on the NYSE was usually over \$120 billion and was exceeding \$140 billion per month in 2013. See *Factbook: NYSE Group Block Volume in NYSE Listed*, NYXDATA.COM, [http://www.nyxdata.com/nyxdata/asp/factbook/viewer\\_edition.asp?mode=table&key=3140&category=3](http://www.nyxdata.com/nyxdata/asp/factbook/viewer_edition.asp?mode=table&key=3140&category=3) [<http://perma.cc/J4DG-E8JT>] (last visited Sept. 12, 2015).

201. The Commission banned exchange fixed commission schedules on May 1, 1975. See 3 MARKHAM, A FINANCIAL HISTORY OF THE UNITED STATES: FROM THE AGE OF DERIVATIVES TO THE NEW MILLENNIUM (1970-2001) 29–30 (2002) (describing these developments).

202. See S. REP. NO. 94-75, at 60–61 (1st Sess. 1975) (describing that resistance).

203. The SEC, therefore, allowed institutional traders to become broker-dealers only if eighty percent of their trading was with the public, which effectively blocked most institutional traders from becoming broker-dealer members. See Cliff Friskis & William J. Hunter, *Securities and Exchange Commission: Coping With Institutional Membership and Anticompetitive Practices*, 41 GEO. WASH. L. REV. 841, 858–59 (1973) (discussing this controversy). Legislation enacted in 1975 also prohibited money managers from creating affiliated broker-dealers in order to qualify as an exchange member unless they did most of their business with the public. See MARKHAM, *supra* note 138, at 359 (describing that controversy). Congress was concerned with conflicts of interests between institutions that combine the role of an unregistered customer and that of a broker. As stated in a 1975 Senate report:

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

In the meantime, NYSE Rule 390 gave rise to the so-called “third” and “fourth” markets in NYSE listed stocks.<sup>204</sup> The third market involved transactions in NYSE stock executed for institutional customers by broker-dealers that were not NYSE members and, therefore, not subject to the requirements of Rule 390 or exchange minimum commissions.<sup>205</sup> The fourth market involved transactions between two institutional investors directly, without exchange or broker-dealer intermediation, and it was these systems that led to the development of electronic communications networks that match customer orders.<sup>206</sup> In 1969, the Institutional Network Corporation sought to develop an electronic network that would allow institutions to trade large blocks of stock.<sup>207</sup> This was significant because the institutions were doing almost fifty percent of the stock

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Until very recently . . . fixed commission rates have provided artificial incentives for the combination of money management and brokerage. This combination could distort the natural evolution of the markets. Where functions are separated, institutions are customers for securities market services. As such, they will seek the most efficient and flexible market relationships, and thus help to sharpen price and service competition in the securities business. If the institutional money managers are also the brokers, however, they will lose a good deal of their incentive to bargain with the brokers on behalf of their beneficiaries, thus sacrificing an important instrument of protection for the millions of Americans whose securities investments are made through the medium of institutions.

S. REP. NO. 94-75, at 62–65. Institutions already holding regional exchange memberships were allowed to keep them for a period of three years. “But it would be inappropriate and inconsistent with the Congressional purposes, for an institution to acquire an exchange membership during this period solely for the purpose of using that membership to effect transactions for its own account.” H.R. REP. NO. 94-229, at 107 (1st Sess. 1975).

204. The first market is a reference to the distribution of shares to the public under the Securities Act of 1933 and the second (secondary) market is the exchanges, NASDAQ, and now other trading centers where already issued shares are traded.

205. As one standard text book has noted:

The *third market* is a market for large blocks of listed shares that operates outside the confines of the organized exchanges. In the third market, blocks of stock (units of 10,000 shares) are traded OTC. The participants in the third market are large institutions (such as mutual funds, insurance companies, and pension funds) that often need to trade large blocks of shares. Brokers assist the institutions in the third market by bringing buyers and sellers together and, in return, receive a fee.

RONALD W. MELICHER & EDGAR A. NORTON, INTRODUCTION TO FINANCE 298 (2011).

206. In the fourth market, “[c]ertain large institutional investors arrange purchases and sales of securities among themselves without the benefit of a broker or dealer.” *Id.*

207. SID MITTRA, INSIDE WALL STREET 224 (1971).

business at that time and were excluded from membership on the NYSE.<sup>208</sup>

The NYSE and other stock exchanges otherwise traded pretty much in the same manner as they did in the nineteenth century, but with some marginal increases in communications technology. For example, the speed of the ticker increased in the 1960s to 900 characters per minute.<sup>209</sup> The NYSE also experimented with “optical reader cards” that were filled out by reporters at the trading posts on the floor that could be read by a computer and transmitted over the ticker.<sup>210</sup>

By the 1960s, the NYSE Quotation Department also supplied quotes to telephone callers by voice recordings. “Quote boys” phoned in the bid and asked quotes for some 300 stocks. The voice recording was then played back to subscribers to the service, which they could access by dialing a three-digit code. At any one time, up to thirty-seven subscribers could access the recorded quote for any one stock.<sup>211</sup> By 1966, the American Stock Exchange was using computers to input trading information from the floor into its ticker system.<sup>212</sup>

Technology had not added much to order execution times on the exchanges, and trading remained a cumbersome process in the 1960s. Orders were phoned or sent by teletype to the floor operations of a broker-dealer, which sent them to a floor broker—by hand signal, pneumatic tube or mechanical conveyor belt—who then conveyed the order to the specialist for execution or placement in the specialist’s book of limit orders. The process repeated to confirm the order on execution. As a SEC study of the securities markets noted in 1963:

In spite of its importance, the floor of the NYSE has been untouched by most of the technological developments of the 20th century. A critic of the NYSE’s progress in technological innovation has said that the basic organization of the Exchange’s floor has not changed since the ‘period in which the institution solidified—slightly before the telephone.’ While the Special Study should not be understood as espousing the proposals made by this commentator, there is undoubtedly some merit in his analysis. Aside from recent developments in methods of transmitting orders to the floor . . . and various innovations and proposed innovations with respect to the reporting of transactions . . . there has been no

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208. *See id.* It was noted in 1992 “[T]raders are shifting waves of business in NYSE listed securities to the Fourth Market, in which large institutional investors trade directly among themselves in informal groups, and to foreign exchanges, most of which are completely automated.” Dale Arthur Oesterle et al., *The New York Stock Exchange and Its Out Moded Specialist System: Can the Exchange Innovate To Survive?*, 17 J. CORP. L. 223, 227–28 (1992).

209. MITTRA, *supra* note 207, at 22; THE NEW YORK STOCK EXCHANGE, *supra* note 112, at 192.

210. THE NEW YORK STOCK EXCHANGE, *supra* note 112, at 192.

211. *Id.* at 185.

212. BRUCHEY, *supra* note 154, at 41.

[VOL. 52: 555, 2015]

*High-Speed Trading*

SAN DIEGO LAW REVIEW

basic change in the methods of executing orders since the NYSE floor took its present form. Except for firms utilizing teletype devices, orders reach the Exchange by telephone and are written down on slips by clerks. From that point, orders are transmitted manually by brokers, or through tubes, to the trading post. Orders given to specialists are again transcribed by hand onto the specialists' books. At present there is no internal means of assuring that quotations announced on the floor of the Exchange are the same as those disseminated to the public. Even after the Exchange automates its off-floor quotation service such assurance will not be provided.<sup>213</sup>

The NYSE faced a near total collapse at the end of the 1960s, when increased trading volumes resulted in a "paperwork crisis."<sup>214</sup> NYSE members were unable to deal with the avalanche of documents required to document and clear this increased trading volume.<sup>215</sup> Between 1968

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213. SEC. & EXCH. COMM'N, STUDY OF UNSAFE AND UNSOUND PRACTICES OF BROKERS AND DEALERS, H.R. DOC. NO. 231, at 323 (2d Sess. 1971) (footnotes omitted). The order execution process on the American Stock Exchange in the early 1960s was described as follows:

The member firm's booth clerk receives a sell order either from the firm's order room or branch office via telephone or teletype. The clerk relays the customer's limit order . . . from the booth to the floor broker. To do so he uses a hand signal or writes the order . . . on an order slip and places it on a conveyor belt that carries it to the edge of the trading floor. The floor broker acknowledges the order and walks to the post where [the stock] is traded and hands it to the specialist. The specialist stamps the order with date and time and files it in the trading post rack until ready for execution. He executes the order when the market price . . . [reaches the limit order price] and records the volume, price, and clearing name . . . of the contra broker on the order slip. (If the specialist executes the order for his own account he enters the sale and his trading book). The specialist's clerk then reports the execution of the order to the member firm booth clerk via a pneumatic tube system. And in the meantime the data clerk at the trading post has checked the accuracy of the stock symbol and sales price on the sales slip. The sale is then entered into a key set, the data clerk verifies entry, and the sale . . . appears on the ticker.

BRUCHEY, *supra* note 154, at 40.

214. See SEC. & EXCH. COMM'N, *supra* note 213 (describing that crisis and its causes).

215. As the SEC later found:

The operations crisis in the securities industry first reached major dimensions in August of 1967. Newspaper reports of that period recall the feverish efforts of the Wall Street community to keep up with each day's business: Stock certificates and related documents were piled 'halfway to the ceiling' in some offices; clerical personnel were working overtime, six and seven days a week, with some firms using a second or even a third shift to process each day's transactions. Hours of trading on the exchanges and over the counter were curtailed to give back offices additional time after the closing bell. Deliveries to customers and similar activities dropped seriously behind, and the number of

and 1970, over 100 NYSE firms failed, including several large ones, as a result of their inability to document customer trades properly and in a timely manner. This crisis resulted in an industry wide effort to computerize and streamline clearing and settlement practices and paperwork. As a result, by the turn of this century, the stock markets could execute and clear trading volumes in the billions of shares, whereas before it had choked on average trading volumes of 16 million shares per day.<sup>216</sup>

The floor trading operations of the exchanges were also subject to abuse. Two specialists on the floor of the Amex were found to have been engaged in the sale of unregistered securities and a massive stock price manipulation scheme.<sup>217</sup> A series of scandals erupted on the NYSE in this century, as trading there was migrating to electronic trading platforms. The Justice Department brought criminal charges against various specialists for “interpositioning” their trades between customer orders. However, those prosecutions failed. The SEC did obtain settlements from specialist firms totaling some \$240 million, over charges that those firms were trading ahead of customer orders and for taking orders into their own accounts that could have been matched against other customer orders. Another SEC settlement involved fourteen specialists on other exchanges that were alleged to trading ahead of customer orders.<sup>218</sup>

### *B. The OTC and Nasdaq Market*

The over-the-counter (OTC) market traces its origins to the curb market that began in the nineteenth century. In the OTC, or “curb” market as it was initially called, trading took place in the streets of New York. Brokers used messengers to send hand signals from their offices to the curb traders in order to expedite orders. “Fingers were used to spell out the identity of the security and the number of shares to be purchased or sold. To make it easier for a clerk to pick out his broker in the milling crowd below each broker wore some distinctive article of clothing—a colorful jacket or an unusual hat.”<sup>219</sup> However, the curb traders moved their operations indoors

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errors in brokers’ records, as well as the time required to trace and correct these errors, exacerbated the crisis.

*Id.*

216. See JERRY W. MARKHAM & THOMAS L. HAZEN, 23A BROKER-DEALER OPERATIONS AND REGULATION UNDER SECURITIES AND COMMODITIES LAW, § 13:3 (2013) (describing those improvements).

217. ROBERT SOBEL, AMEX: A HISTORY OF THE AMERICAN STOCK EXCHANGE (1921-1971) 260-66 (1972).

218. See JERRY W. MARKHAM, A FINANCIAL HISTORY OF THE UNITED STATES, FROM ENRON-ERA SCANDALS TO THE SUBPRIME CRISIS (2004-2009) 143-44 (2011) (describing those scandals).

219. BRUCHEY, *supra* note 154, at 17.

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

in 1921 to the Curb Exchange that later became the American Stock Exchange.<sup>220</sup>

Nevertheless, a network of brokers continued to operate an informal, but significant, OTC market. This market became more formalized with the founding of the National Association of Securities Dealers, Inc., (now FINRA), which became formally recognized as an industry self-regulatory body by the after passage of legislation in 1938 authorizing that role under the federal securities laws.<sup>221</sup>

Rather than employing a specialist's post on an exchange floor, OTC trading was conducted by telephone and telegraph during much of the twentieth century.<sup>222</sup> By the 1930s, some OTC broker-dealers specialized in particular OTC securities and, like a specialist, provided "broad and continuous" markets in those securities.<sup>223</sup> Quotations for OTC securities were published in the "pink sheets" starting in 1911, so named because the quotations were printed on pink paper.<sup>224</sup> The quotes in the pink sheets were not firm. They were merely a "guide" as to what the securities could have been bought or sold for at the time the quotes were compiled.<sup>225</sup> This meant that a broker posting quotations in the pink sheets had to be contacted by telephone. A firm order price could then be negotiated that might vary from the quote in the pink sheets based on order size or changes in market conditions.

In 1963, the SEC completed a massive study of the securities markets.<sup>226</sup> Among other things, it found abuses by brokers using the pink sheets to

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220. See SOBEL, *supra* note 217, at 1–2, 21.

221. See MARK INGEBRETSEN, NASDAQ 41–43 (2002) (describing this history).

222. THE SECURITY MARKETS: FINDINGS AND RECOMMENDATIONS OF A SPECIAL STAFF OF THE TWENTIETH CENTURY FUND 265–66 (Alfred L. Bernheim & Margaret Grant eds., 1935).

223. *Id.* at 265.

224. MARKHAM, *supra* note 138, at 60.

225. SEC. & EXCH. COMM'N, REPORT OF SPECIAL STUDY OF SECURITIES MARKETS OF THE SECURITIES AND EXCHANGE COMMISSION, H.R. DOC. NO. 88-95, at 635 (1st Sess. 1963).

226. The SEC Special Study described the OTC market as follows:

Transactions in securities outside the organized securities exchanges are described as taking place in the over-the-counter market. The over-the-counter market is actually a group of markets, in which broker-dealers transact business with the public as principals or agents, dealing for the most part in securities not listed on any exchanges. Some dealers may maintain inventories in one or more over-the-counter securities and be willing to both buy and sell them to other broker-dealers, in which case they are known as "market makers" in those securities.

*Id.* at 13.

engage in manipulative activity. The SEC's Special Study suggested using computers to report broker-dealer OTC stock quotations.<sup>227</sup> The suggestion in the Special Study gave rise to the creation of the Nasdaq market in 1968.<sup>228</sup> That market allowed broker-dealer quotes to be posted on a computer network that could be accessed by other broker-dealers, and it allowed more rapid updating of quotes. Still, orders had to be negotiated orally over the telephone.<sup>229</sup>

Unlike the specialists on the NYSE, Nasdaq market makers competed with each other for stocks traded on Nasdaq.<sup>230</sup> Multiple market makers might compete with each other for a single Nasdaq stock.<sup>231</sup> The Nasdaq market makers, nevertheless, had market making obligations that required them to quote a continuous two-sided market that was fair and orderly.<sup>232</sup> This meant, however, that customers had to pay the spread between the bid and ask prices of those market makers, plus a brokerage commission or a mark up or mark down when the broker-dealer was selling for its own account.<sup>233</sup>

### C. The Futures Markets

The futures markets are regulated separately from the securities markets and by an independent regulator, the Commodity Futures Trading

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227. The Special Study stated that:

Apart from the possible utilization of a computer for the crossing of orders, the information supplied by a computer system could be expected to confer important benefits on broker-dealers and on the public. It would permit the immediate identification of the highest bid and lowest offer, and thus facilitate the task of a broker-dealer in obtaining the best market for his customer. Another advantage would be the compilation of complete data relating to quotations and transactions, so that actual price and volume data could be made public as in the case of listed securities, thus improving the ability of investors, lending institutions, and other interested persons to evaluate over-the-counter securities and markets. The data could also be speedily and comprehensively retrieved for surveillance or study purposes by the Commission and other regulatory bodies to which access would be granted.

*Id.*

228. MARKHAM, *supra* note 138, at 347. Nasdaq is an acronym for National Association of Securities Dealers Automated Quotation system. INGEBRETSEN, *supra* note 221, at 18.

229. MARKHAM, *supra* note 138, at 247. The pink sheets continued to publish quotes for stocks not actively traded or quoted on Nasdaq. MARKHAM, *supra* note 201, at 18.

230. *What's the Difference Between a Nasdaq Market Maker and a NYSE Specialist?*, INVESTOPEDIA, <http://www.investopedia.com/ask/answers/128.asp> [<http://perma.cc/2QPS-MMEG>] (last visited Sept. 12, 2015).

231. *Id.*

232. *Id.*

233. See Certain Market Making Activities on Nasdaq, Exchange Act Release No. 34-40900, 1998 WL 919673 (Jan. 11, 1999) (describing role of Nasdaq market makers).



[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

Commission (CFTC).<sup>234</sup> The futures markets historically operated as a public open outcry market carried out on commodity exchange floors.<sup>235</sup> However, those floor operations varied materially from those on the securities markets, and no OTC trading was allowed for futures.<sup>236</sup>

Starting in the nineteenth century and still in practice today for non-electronic executions, orders to the floor of a commodity futures exchange were transmitted to an order desk operated by a futures commission merchant (FCM) on the floor.<sup>237</sup> The order was then taken manually to the pit by a runner, or the order might be flashed by the runner through hand signals to a floor broker located in the trading pit.<sup>238</sup> The floor broker would then execute the order by public outcry in the pit against other customer orders represented by floor brokers or with floor traders trading for their own accounts.<sup>239</sup> The floor traders had the time and place advantages of the specialists on the stock exchanges but had no obligation to maintain fair and orderly or continuous market.<sup>240</sup>

The execution of customer orders in commodity futures trading pits were often chaotic in actively traded contracts during volatile markets. “Trade throughs” of customer limit orders were common in “fast” markets because floor brokers could not react in time to sharp market movements. The popular movie *Trading Places* that was released in 1983 paints a realistic picture of some of the more active pits.

The commodity futures exchanges were regulated by the Commodity Exchange Act of 1936.<sup>241</sup>

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234. That regulation is carried out under the Commodity Exchange Act of 1936, 7 U.S.C. §§ 1–9097 (2012).

235. See JERRY W. MARKHAM, *THE HISTORY OF COMMODITY FUTURES TRADING AND ITS REGULATION* 40 (1986).

236. *Open Outcry*, WIKIPEDIA, [https://en.wikipedia.org/wiki/Open\\_outcry#cite\\_note-hand-signals-2](https://en.wikipedia.org/wiki/Open_outcry#cite_note-hand-signals-2) [https://perma.cc/V7Q7-3JEN] (last modified May 25, 2015).

237. *Futures Commission Merchant (FCM)*, NAT’L FUTURES ASS’N, <https://www.nfa.futures.org/nfa-registration/fcm/index.HTML> [https://perma.cc/T64P-M9FU] (last visited Sept. 12, 2015).

238. *How Open Outcry Works in American Futures Trading*, FOR DUMMIES, <http://www.dummies.com/how-to/content/how-open-outcry-works-in-american-futures-trading.html> [http://perma.cc/UFN6-WPZS] (last visited Sept. 12, 2015).

239. *Id.*

240. See MARKHAM, *supra* note 235, at 51 (describing the development and trading on the futures exchanges).

241. 7 U.S.C. §§ 1–9097 (2012).

#### D. The CBOE

Another model of the open outcry exchange was the Chicago Board Options Exchange, Inc. (CBOE), which had elements of both a stock and a commodity futures exchange. The CBOE, which was created in 1973, used a futures style trading pit for trading in its standardized option contracts. Floor brokers held and executed customer market orders, but customer limit orders were held and executed through a separate book managed by a “board broker.” The board broker was initially an exchange member but later was replaced by exchange employees. The effect of this arrangement was to separate the role of a specialist from the book of limit orders.<sup>242</sup>

Market making functions on the CBOE were carried out by floor traders trading for their own accounts.<sup>243</sup> However, unlike the floor traders on commodity futures exchanges, but like market makers and specialists in the stock markets, CBOE floor traders had affirmative obligations to trade for their own accounts in order to maintain a continuous and orderly two-sided market.<sup>244</sup> The stock exchanges attempted to compete with the CBOE using those exchanges’ traditional specialists as market makers.<sup>245</sup> However, the CBOE dominated options trading until the advent of electronic trading.

### V. AUTOMATION ARRIVES

#### A. Introduction

Automation began arriving on the stock exchanges in the 1970s in the form of automated executions for small traders. The NYSE implemented a Designated Order Turnaround (DOT) system in 1976—and in 1984, the Super DOT system—that provided for the automated execution of small customer orders, namely, orders of 2,000 shares or less, at the bid and ask prices posted by the specialist.<sup>246</sup> This advanced the speed execution of those customer orders, but the specialist was still compensated by the spread between those bid and ask prices.<sup>247</sup>

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242. See Jerry W. Markham & David J. Gilberg, *Stock and Commodity Options – Two Regulatory Approaches and Their Conflicts*, 47 ALB. L. REV. 741, 744–45 (1983) (describing this process).

243. See *id.* at 745.

244. *Id.*

245. *Id.* at 746.

246. Jerry W. Markham & Daniel J. Harty, *For Whom the Bell Tolls: The Demise of Exchange Trading Floors and the Growth of ECNs*, 33 IOWA J. CORP. L. 865, 897 (2008).

247. See MARKHAM, *supra* note 201, at 102–03.

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

In 1978, the SEC authorized the Cincinnati Stock Exchange to operate an electronic trading system in which agency and principal limit orders would be matched by computer. However, it had a very low volume exchange with only limited participation by a few large broker-dealers.<sup>248</sup> However, other traders were discovering that the computer could be used as a tool for trading. The advent of algorithmic trading brought numerous active traders into the markets. For example, so-called “program trading” appeared in the 1970s, which employed computer software programs to generate automated orders through algorithms cued to react to market events.<sup>249</sup> “Index arbitrage” traders also appeared. These were traders who tried to take advantage of small differences in the prices between a basket of stocks traded on NYSE and a parallel commodity futures index covering that basket.<sup>250</sup>

In response to program trading and arbitrage trading of index products, NYSE specialists began to offer “baskets” of securities that allowed institutional investors to trade all 500 stocks in the Standard & Poor’s Index in a single trade of a minimum of \$5 million. Customized baskets of fewer stocks were also permitted.<sup>251</sup> This allowed program traders and Index arbitrage traders to hedge and trade positions in both the derivative and equity markets.

Concern arose that these computer driven traders were adding volatility to the market.<sup>252</sup> Critics also warned that a “cascade” scenario could result from algorithmic trades that would automatically generate sell orders in a declining market and push prices lower, thereby generating more sell orders and so on until the market crashed.<sup>253</sup> Those concerns seemed to have been justified by the Stock Market Crash of 1987, which witnessed

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248. BRUCHEY, *supra* note 154, at 63. One of the leaders in that experiment was Bernie Madoff, who later became the world’s largest crook through a massive Ponzi scheme that was exposed in the market downturn during the Financial Crisis in 2008. See DIANA B. HENRIQUES, *THE WIZARD OF LIES: BERNIE MADOFF AND THE DEATH OF TRUST* 68 (2011) (describing that involvement).

249. See Jerry W. Markham & Rita McCloy Stephanz, *The Stock Market Crash of 1987—The United States Looks at New Recommendations*, 76 GEO. L. J. 1993, 2000 (1988) (describing program trading).

250. *Id.* at 2001.

251. William Power, *Big Board To Launch ‘Basket’ Trades Today*, WALL ST. J., Oct. 26, 1989, at C1.

252. SENIOR SUPERVISORS GRP., ALGORITHMIC TRADING BRIEFING NOTE (2015), <http://www.newyorkfed.org/newsevents/news/banking/2015/SSG-algorithmic-trading-2015.pdf> [<http://perma.cc/367C-USG4>].

253. See Markham & Stephanz, *supra* note 249, at 2001 (describing those studies).

a stock market decline in excess of the crash in 1929. NYSE stocks lost \$1 trillion in value during the 1987 crash and the Dow Jones Industrial Average dropped 508 points on a single day.<sup>254</sup> Studies by the SEC, the CFTC and others of the Stock Market Crash of 1987 concluded that computerized trading had played a large role in adding volatility to the market.<sup>255</sup> A Presidential Commission also studied the trading of those institutional traders and suggested reforms, hardly any of which were implemented.<sup>256</sup> Instead, the markets quickly recovered and computer trading became an accepted part of trading in both the futures and stock markets.

The causes of the Stock Market Crash of 1987 were much debated, but the inability of the NYSE and Nasdaq markets to handle the execution of large volumes of orders in a volatile market was disturbingly clear. A report by the Government Accounting Office found that thousands of customers had complained about the October crash and that most of those complaints related to difficulties in trade executions. An investor hotline received some 6,700 calls from investors who lost \$450 million in the market, an average of \$172,000 per caller.<sup>257</sup> It was also determined that specialists on the NYSE had been unable to cope with the trading volumes during the October 1987 crisis and that many Nasdaq market makers had fled from the market, abandoning their market making obligations in the process.<sup>258</sup>

Like the NYSE, Nasdaq developed an automated “Small Order Execution System” (SOES) that executed smaller orders automatically at bid and ask prices set by Nasdaq market makers.<sup>259</sup> That SOES system became a target of the so-called “SOES Bandits” who traded for their own account and used computerized access to the SOES to take advantage of the failure by Nasdaq market makers to keep their electronic quotes updated to reflect current events.<sup>260</sup> The SOES bandits traded often and broker-dealers gave them office space as well as training programs on how to trade frequently and at high speed.<sup>261</sup> The NASDAQ market makers responded to those attacks by widening their spreads and engaging in prohibited collusive

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254. PRESIDENTIAL TASK FORCE ON MKT. MECHANISMS, 88-32-P, REPORT OF THE PRESIDENTIAL TASK FORCE ON MARKET MECHANISMS 1 (1988).

255. See Markham & Stephanz, *supra* note 249, at 1993–2043 (describing those studies).

256. PRESIDENTIAL TASK FORCE ON MARKET MECHANISMS, *supra* note 254, at 2.

257. U.S. GEN. ACCOUNTING OFFICE, GAO/GGD-88-38, FINANCIAL MARKETS: PRELIMINARY OBSERVATIONS ON THE OCTOBER 1987 CRASH 50 (1987).

258. MARKHAM, *supra* note 201, at 219–20.

259. *Id.* at 219.

260. *Id.* at 219–20.

261. *Id.* (describing the trading of SOES Bandits).

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

activities.<sup>262</sup> After those practices were exposed, the SEC assessed NASD with a large penalty for failing to supervise the market makers and the Nasdaq market was required to reorganize its self-regulatory operations.<sup>263</sup>

*B. The ECNS Arrive*

Order matching services outside the confines of exchange floors were appearing before the beginning of the twenty-first century.<sup>264</sup> These services were called “electronic communications networks” (ECNs) and later “alternative trading systems” (ATS). In the beginning, the ECNs were mostly order matching services that paired offsetting buy and sell orders from different traders. Trading on those ECNs was, therefore, order driven. There was initially no market maker or specialist that maintained a continuous two-sided market on the newly arrived ECNs, which caused liquidity concerns.<sup>265</sup> This process also meant that the traders did not have

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262. Report Pursuant to Section 21 (a) of the Securities Exchange Act of 1934 Regarding the NASD and the NASDAQ Market, Securities Exchange Act Release No. 37542 (Aug. 8, 1996). The SEC had approved a rule proposed by the National Association of Securities Dealers, Inc. (NASD) that had sought to exclude “professional traders” from using SOES. That rule was remanded by the District Columbia Court of Appeals to the SEC for further action because its definition of what is a professional trader was vague and unjustified. *Timpinaro v. SEC*, 2 F.3d 453, 455, 461 (D.C. Cir. 1993). The SOES bandits and other day traders did raise concerns because they were not required to post margin on their trades unless the position was carried overnight. See MARKHAM & HAZEN, *supra* note 216, § 8:11 (describing this concern). FINRA required “pattern day traders” to maintain minimum equity of \$25,000 on any day that the customer day trades, and it imposed other leverage restrictions, none of which involved registration as a broker-dealer. See *id.* (describing these restrictions).

263. See Certain Market Making Activities on Nasdaq, Exchange Act Release No. 34-40900, 1998 WL 919673 (Jan. 11, 1999) at 7–8 (describing the misconduct of Nasdaq market makers and imposing sanctions on the NASD and Nasdaq).

264. Technology was also affecting the market in other ways. For example in 1981, commodity market data vendors began to broadcast data through satellites. FM sideband was another way to speed such data. OFFICE OF TECH. ASSESSMENT, *supra* note 115, at 219–20.

265. The critical role of exchanges has historically been to provide liquidity so that owners of stock can sell or liquidate their ownership interest in exchange for cash. “A market with liquidity is one in which the investor can really convert his securities into cash at a price close to the last sale.” WILLIAM MCCHESENEY MARTIN, JR., *THE SECURITIES MARKETS: A REPORT, WITH RECOMMENDATIONS* 10 (1971) (submitted to the Board of Governors of the New York Stock Exchange). One measure of liquidity is how rapid a stock can be bought or sold and another is the width of the spread between bids and offers in the market. The debate over the “black box” exchange of fully automated trading by the matching of orders to computers with met by the concern that order matching alone would not make an effective market:

to pay the specialist or market makers the spreads demanded where the orders were executed on the NYSE or Nasdaq.<sup>266</sup> Consequently, liquidity on these ECNs depended on the presence of a buyer and seller entering opposing matching orders or by acceptance of a quoted bid or offer posted by another trader who might be quoting only one side of the market.<sup>267</sup> Nevertheless, ECNs were soon changing the markets.<sup>268</sup>

By the end of the twentieth century, ECNs and other non-traditional trading venues executed more than twenty percent of volume in Nasdaq listed shares.<sup>269</sup> However, only four percent of exchange listed shares were traded on ECNs at that time because NYSE Rule 390 still applied to most of the more actively traded shares listed on that exchange.<sup>270</sup> The growth of ECNs exploded as the twenty-first century began, aided by the repeal of NYSE Rule 390 in 2000.<sup>271</sup>

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In the overwhelming majority of stocks, public buying and selling is often insufficient to ensure that the order of a willing buyer can always be matched with that of a willing seller. For that reason, markets are created or their quality is improved by professional traders (specialists or market makers) who put their own capital at risk and thereby supply liquidity to the markets.

BRUCHEY, *supra* note 154, at 63 (quoting Norman Poser).

266. Cory Mitchell, *ECN Credits: Let Your Broker Pay Your Trading Fees*, INVESTOPEDIA (Sept. 17, 2009), <http://www.investopedia.com/articles/trading/09/ecn-credits.asp> [<http://perma.cc/P5GH-B2EE>].

267. *Id.*

268. The SEC observed in 1991 that:

[I]n today's securities market many small individual investors have relinquished direct management of their investments to professional investment managers. Accordingly, large institutional investors such as public and private pension or retirement funds, mutual funds, insurance companies, foundations, hedge funds and investment managers have grown extraordinarily in number and size, and have become a predominant type of market participant. Investor demands for returns greater than market averages have caused institutional investors and investment managers to develop complex and innovative relationships, products, and trading strategies. These new investment relationships, products and strategies have led to increased specialization in investment management and linked capital markets around the world. These developments enable institutional investors to trade large amounts of securities and commodities with stunning swiftness to minimize risk or to profit from small differences in valuation.

Large Trader Reporting System, Exchange Act Release No. 29593, 56 Fed. Reg. 42,550 (Aug. 22, 1991).

269. Thousands of traders were using electronic trading systems as the twentieth century closed to engage in HFTs. One discount electronic trading firm discounted commissions and its clientele trading some 95 million shares per day, which was then about ten percent of Nasdaq trading volumes. MARKHAM & HAZEN, *supra* note 216, § 2:39.

270. MARKHAM, *supra* note 201, at 31; James McAndrews & Chris Stefanadis, *The Emergence of Electronic Communications Networks in the U.S. Equity Markets*, CURRENT ISSUES ECON. & FIN., Oct. 2000, at 4, [http://www.newyorkfed.org/research/current\\_issues/ci6-12.pdf](http://www.newyorkfed.org/research/current_issues/ci6-12.pdf) [<http://perma.cc/DE2Y-GKAL>].

271. The growth of HFTs has been described by one author as flowing from the development of ECNs regulated as ATS by the SEC:

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

Both Nasdaq and the NYSE gradually introduced electronic trading into their operations until the old school NYSE specialists and Nasdaq market makers were pretty much sidelined.<sup>272</sup> Indeed, the NYSE specialists changed their identity and began calling themselves “liquidity providers.”<sup>273</sup> HFTs are now dominating trading volumes and providing market liquidity as a substitute for the traditional specialist and Nasdaq market maker.<sup>274</sup> Today, floor trading operations are only a ghost of what had once been a colorful spectacle often portrayed in news reports as the essence of the stock and commodity exchanges.<sup>275</sup>

This shift did not escape the SEC’s notice. In 2010, the SEC noted that HFTs and other proprietary trading firms “largely have replaced more traditional types of liquidity providers in the equity markets.”<sup>276</sup> As the

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Individual investors subscribing to ECNs can enter orders electronically into the network via a custom computer terminal, and the ECN will then automatically match and execute contra-side orders. If no match is identified, then an ECN order can be posted externally on NASDAQ as soon as it becomes the best price. This arrangement allows ECNs to ‘function as a hybrid between a broker for counterparties, a broker-dealer or market-maker, and an exchange, and their gain has been at the expense of NASDAQ.’ The early ECNs provided many benefits over past trading venues—including the reduction in costs and trading errors, enhancement of operational efficiencies, and other benefits associated with risk management. Eventually, day-trading firms who originally sought greater market access to NASDAQ, as well as brokerage firms, began hustling to set up ECNs; and the growth rate of ECNs has skyrocketed since 1997. The growth of these ECNs in the late 1990’s led to the wider use of algorithmic trading and eventually the rise of independent high frequency trading firms.

McGowan, *supra* note 24, ¶11 (footnotes omitted).

272. The growth of the ECNS and the demise of the traditional commodity and stock exchange floor operations is described in Markham & Harty, *supra* note 246, at 865, 897.

273. The NYSE has dropped its role of specialists and supplanted them with “designated Market Makers” and “Liquidity Providers,” the latter not having market making obligations. See *NYSE Membership*, N.Y. STOCK EXCH., <https://www.nyse.com/markets/nyse/membership> [<https://perma.cc/LQA5-F3VY>] (last visited Sept. 12, 2015).

274. See Wallace Turbeville, *Reign of the High-Frequency Trading Robots*, U.S. NEWS & WORLD REP. (Oct. 18, 2013, 8:00 AM), <http://www.usnews.com/opinion/blogs/economic-intelligence/2013/10/18/how-high-frequency-trading-is-taking-over-markets> [<http://perma.cc/2ERS-RXE3>].

275. Floor trading has not ceased entirely and at least one exchange, the London Metals Exchange, continues to operate as it has in the past. In 2014, that exchange fined some members for failing to stay seated in their assigned seats during trading session, blocking the views of other traders. See Francesca Freeman, *LME Fines Nine Traders . . . For Standing Up*, WALL ST. J. (July 21, 2014, 8:48AM), <http://blogs.wsj.com/moneybeat/2014/07/21/lme-fines-nine-dealers-for-standing-up/> [<http://perma.cc/E3W9-D6YA>].

276. Concept Release on Equity Market Structure, Exchange Act Release No. 34–61358, 75 Fed. Reg. 3594, 3607 (proposed Jan. 21, 2010).

SEC found: “[t]he use of certain strategies by some proprietary firms has, in many trading centers, largely replaced the role of specialists and market makers with affirmative and negative [market making] obligations.”<sup>277</sup> The SEC noted, however, that those traders did seek to earn “profits . . . from . . . the spread by buying at the bid and selling at the offer.”<sup>278</sup> As the SEC further noted:

Highly automated exchange systems and liquidity rebates have helped establish a business model for a new type of professional liquidity provider that is distinct from the more traditional exchange specialist and over-the-counter (‘OTC’) market maker. In particular, proprietary trading firms and the proprietary trading desks of multi-service broker-dealers now take advantage of low-latency systems and liquidity rebates by submitting large numbers of non-marketable orders (often cancelling a very high percentage of them), which provide liquidity to the market electronically.<sup>279</sup>

### C. The SEC Responds

The SEC regulated ECNs under its Regulation ATS (Automated Trading Systems), which was adopted in 1998 and required such trading platforms to register with the agency as broker-dealers.<sup>280</sup> However, traders on such platforms were not required to so register unless they were making a market in the securities they were trading.<sup>281</sup>

SEC Chairman Arthur Levitt, Jr. also contended that electronic trading should be centralized in a manner that would allow the public display of

277. *Id.* See also, Scott S. Powell & Rui Gong, *Wall Street’s New Race Toward Danger*, BARRON’S (Mar. 8, 2010, 12:01 AM), <http://online.barrons.com/articles/SB126783128753256821> [<http://perma.cc/6Y56-RLY5>] (“[U]nlike registered broker-dealers, many HFT players aren’t regulated or committed to the capital requirements toward market making in particular stocks.”).

278. Concept Release on Equity Market Structure, 75 Fed. Reg. at 3607.

279. *Id.* at 3599.

280. 17 C.F.R. §§ 242.300–303. See Markham & Harty, *supra* note 246, at 911–12 (describing the scope and background of Regulation ATS).

281. Broker-dealer registration has not been required for “traders” and “investors” who are trading for their own accounts even though their trading is a part of their regular business and even if their trading is a highly active and for speculative purposes. See generally 6 LOUIS LOSS, ET AL., *SECURITIES REGULATION* 514 (4th ed. 2011) (describing the distinction between a dealer that is required to register as a dealer and a trader). Among the HFTs not required to register were hedge funds and proprietary trading operations dealing for the trader’s own account. See Concept Release on Equity Market Structure, 75 Fed. Reg. at 3606; *Hedge Funds*, U.S. SEC. & EXCHANGE COMMISSION, <http://www.sec.gov/answers/hedge.htm> [<http://perma.cc/Z9S5-5EHK>] (last modified Dec. 4, 2012). However, in *In OX Trading, LLC*, [2013–2014 Transfer Binder] Fed. Sec. L. Rep. (CCH) ¶¶ 80,405–80,406 (Oct. 22, 2013), the SEC found by consent that a firm was required to be registered as a dealer under the Securities Exchange Act of 1934 because it was acting as a “liquidity provider” on the Chicago Board Options Exchange, Inc. (CBOE).



[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

orders to all market participants.<sup>282</sup> Concerns were also raised over the fragmentation of the marketplace due to the numerous ECNs then operating. Those concerns led to new regulations that were promulgated under authority included in the Securities Exchange Act of 1934 in 1975, which authorized the SEC to work toward a single marketplace for trading securities, that is, a “National Market System” (NMS).<sup>283</sup> Before the growth of electronic trading, the SEC had taken some timid steps toward such a system.<sup>284</sup> However, concerns over electronic trading set the SEC on a course that set the stage for the now ongoing concerns over HFTs.

In 2005, the SEC adopted Regulation NMS that created a complex set of order priority and disclosure rules that were intended to level the electronic trading playing field.<sup>285</sup> As one source notes:

The SEC adopted a system that put the premium on speed in execution at a specific price, without considering the effect it would have upon the balance between market professionals’ duties and responsibilities to customers and the effects on the market in general. Regulation NMS essentially shifted the duties

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282. See *SEC Takes Aim at Nasdaq Trading: Rules Are Proposed To End Practices by Some Dealers that Are Unfair to Small Investors*, L.A. TIMES (Oct. 1, 1995), [http://articles.latimes.com/1995-10-01/opinion/op-54424\\_1\\_small-investor](http://articles.latimes.com/1995-10-01/opinion/op-54424_1_small-investor) [<http://perma.cc/74Z6-UXN7>].

283. The concept of a central market system began with a letter from the SEC to Congress in 1971, in which the SEC stated that “a major goal and ideal of the securities markets” was the “creation of a strong central market system for securities of national importance in which all buying and selling interest in these securities could participate and be represented under a competitive regime.” INSTITUTIONAL INVESTORS STUDY, REPORT OF THE SECURITIES AND EXCHANGE COMMISSION, H.R. DOC. NO. 64, at xxiv (1st Sess. 1971). The 1971 Report by William Martin, *supra* note 260. A SEC Statement in 1972 on the future structure of the securities markets, and a SEC statement in 1973 on the structure of a central market system laid the groundwork for legislation enacted in 1975 that directed the SEC to work toward a “national market system.” See MARKHAM & HAZEN, *supra* note 216, § 2:16 (describing that legislation). The statutory language chose to term this new market structure as a national market system instead of a central market system. See BRUCHEY, *supra* note 154, at 61–62. It may have been that the lack of success with a central market system in the Soviet Union rendered that term politically suspect.

284. For a long time, a centerpiece of this new national market system was the Consolidated Last-Sale Reporting System, a.k.a., known as the “Consolidated Tape,” that began in 1975. BRUCHEY, *supra* note 154, at 65. It reported all last sales on the NYSE, the American Stock Exchange and various regional exchanges. *Id.* The SEC also required the development of an Intermarket Trading System (ITS) that linked exchanges trading the same stocks and required those stocks to be executed at the best price available on any exchange within the ITS. WRIGHT, *supra* note 133, at 61.

285. *SEC Adopts Regulation NMS and Provisions Regarding Investment Advisers Act of 1940*, U.S. SEC. & EXCHANGE COMMISSION (Apr. 7, 2005), <https://www.sec.gov/news/press/2005-48.htm> [<https://perma.cc/LU2V-CBJN>].

from the specialists and market makers to the traders themselves by imposing rules that required brokers to execute orders in the fastest manner possible, prompting brokerage firms and exchanges to interconnect and develop sophisticated computer systems to route trades in a maze-like fashion.<sup>286</sup>

Regulation NMS sought to assure that customers trading on exchanges and other market centers received the best available price for their securities on any market where the securities are traded.<sup>287</sup> Regulation NMS required broker-dealers to execute customer orders at the “national best bid or offer” (NBBO).<sup>288</sup> Another “improvement” in the NMS envisioned by the SEC was the “decimalization” of stock market quotes. This meant that stocks could be traded by using quotations with a spread as small as a penny versus the historical minimum of minimum quote size of one-eighth of a dollar.<sup>289</sup> This change initially had the effect of allowing specialists and markets to widen their spreads. However, as electronic competition grew spreads were narrowed by amounts lower than the traditional eighths. This had the effect of undercutting market maker profits and discouraging them from making commitments for two sided continuous markets.

As the SEC noted in 2008, electronic trading “has reduced the advantages once enjoyed by Floor brokers and specialists.” The NYSE also claimed that “the informational advantage has shifted ‘upstairs’ where orders are now first ‘shopped’ within a firm and then to others before being sent to the floor for execution . . . .”<sup>290</sup>

286. Bradley J. Bondi, *Memo to Michael Lewis: The Excesses of High-Speed Trading Are a Direct Result of SEC Micromanagement*, FORBES (Apr. 29, 2014, 7:46 AM), <http://www.forbes.com/sites/realspin/2014/04/29/memo-to-michael-lewis-the-excesses-of-high-speed-trading-are-a-direct-result-of-sec-micromanagement/> [<http://perma.cc/SBY5-Q3MA>].

287. See *Background on Larger Tick Sizes for Mid Cap Stocks*, MOD. MKT. INITIATIVE (Feb. 3, 2014), <http://modernmarketsinitiative.org/background-larger-tick-sizes-mid-cap-stocks/> [<http://perma.cc/9SA4-LR4U>].

288. See SEC, Regulation NMS, Release No. 34-51808, 298–99 (June 9, 2005), <https://www.sec.gov/rules/final/34-51808.pdf> [<https://perma.cc/Q794-8HRX>] (adopting Regulation NMS).

289. Trading in “eighths” was a historical carryover of the peso that was widely circulated in America before the Civil War. That coinage was broken down into eights, and gave rise to the term two bits which was equal to a quarter. *Spanish Dollar*, [http://en.wikipedia.org/wiki/Spanish\\_dollar](http://en.wikipedia.org/wiki/Spanish_dollar) [<http://perma.cc/6B4Y-6G8R>] (last modified Aug. 14, 2015).

290. Self-Regulatory Organizations; New York Stock Exchange LLC; Notice of Filing of Amendment Nos. 2 and 3 and Order Granting Accelerated Approval to a Proposed Rule Change, as Modified by Amendment Nos. 1, 2, and 3, To Create a New NYSE Market Model, with Certain Components to Operate as a One-Year Pilot, That Would Alter NYSE’s Priority and Parity Rules, Phase Out Specialists by Creating a Designated Market Maker, and Provide Market Participants with Additional Abilities to Post Hidden Liquidity, Exchange Act Release No. 34-58845, 73 Fed. Reg. 64,379–80 (proposed Oct. 24, 2008) (footnote omitted).

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

In response to concerns over HFTs, the SEC issued a market a concept release (Market Concept Release) in January 2010.<sup>291</sup> It sought comment on whether and how HFTs should be defined and regulated.<sup>292</sup> The SEC noted that HFTs were interacting with other investors in various ways, but deferred action on regulating any particular type of trade.<sup>293</sup> Instead, the Market Concept Release launched a broad based review by the SEC of the current equity market structure.<sup>294</sup> The SEC sought to determine whether its rules had kept pace with the growth of electronic trading, including the role of flash orders and other HFT practices.<sup>295</sup> That review is still underway as of the date of this writing.

HFTs were allowed for a time to have “naked” or “sponsored” access to market centers, allowing them direct access to those markets where they interfaced with customer orders. This naked access allowed unregistered high-frequency traders to access an exchange’s trading facilities without broker-dealer intermediation or supervision.<sup>296</sup> The SEC imposed risk

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291. Concept Release on Equity Market Structure, Exchange Act Release No. 34-61358, 75 Fed. Reg. 3594, 3606 (proposed Jan. 21, 2010).

292. *Id.* at 3594.

293. *Id.*

294. *Id.*

295. *Id.*

296. As the SEC noted:

Over the past decade, the proliferation of sophisticated, high-speed trading technology has changed the way broker-dealers trade for their own accounts and as agent for their customers. In addition, customers—particularly sophisticated institutions—have themselves begun using technological tools to place orders and trade on markets with little or no substantive intermediation by their broker-dealers. This, in turn, has given rise to the increased use and reliance on ‘direct market access’ or ‘sponsored access’ arrangements. Under these arrangements, the broker-dealer allows its customer—whether an institution such as a hedge fund, mutual fund, bank or insurance company, an individual, or another broker-dealer—to use the broker-dealer’s market participant identifier (‘MPID’) or other mechanism for the purposes of electronically accessing the exchange or ATS. With ‘direct market access,’ as commonly understood, the customer’s orders flow through the broker-dealer’s systems before passing into the markets, while with ‘sponsored access’ the customer’s orders flow directly into the markets without first passing through the broker-dealer’s systems. In all cases, however, whether the broker-dealer is trading for its own account, is trading for customers through more traditionally intermediated brokerage arrangements, or is allowing customers direct market access or sponsored access, the broker-dealer with market access is legally responsible for all trading activity that occurs under its MPID.

Risk Management Controls for Brokers or Dealers with Market Access, Exchange Act Release No. 34-61379, 75 Fed. Reg. 4007, 4008 (Jan. 26, 2010) (footnotes omitted).

supervision requirements on the broker-dealers that had offered naked access.<sup>297</sup> That rule effectively curbed naked access.

The SEC Market Concept Release also considered concerns over dark pools. The SEC noted that, “[i]n general, dark pools offer trading services to institutional investors and others that seek to execute large trading interest in a manner that will minimize the movement of prices against the trading interest and thereby reduce trading costs.”<sup>298</sup> There were, however, inequities that resulted from these competing trading venues. For example, traders may be able to have their orders filled on a dark pool, “while those on publicly displayed markets go unfilled, even though dark pools use the information from publicly displayed markets to price the dark pool transactions.”<sup>299</sup>

This disparity is compounded when dark pools share trading information with other dark pools, allowing them to “function like private networks that exclude the public investor.”<sup>300</sup> The SEC proposed rules to limit such exclusions by dark pools but has not acted to date on those proposals.<sup>301</sup> The SEC created a large trader reporting system that required large traders to register with the SEC.<sup>302</sup> It also began enforcing its trade reporting requirements for HFTs.<sup>303</sup>

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297. See 17 C.F.R. § 240.15c3-5 (2014).

298. Concept Release on Equity Market Structure, 75 Fed. Reg. at 3599.

299. *Fact Sheet: Strengthening the Regulation of Dark Pools*, U.S. SEC. & EXCHANGE COMMISSION, <http://www.sec.gov/news/press/2009/2009-223-fs.htm> [<http://perma.cc/K2K8-YSVR>] (last modified Oct. 23, 2009).

300. *Id.*

301. *Id.*

302. *Id.* FINRA has proposed a rule that would require developers of computer algorithms for HFTs to register with FINRA. The SEC then proposed removing an exemption from broker-dealer registration for HFTs, which will require them to register with FINRA. Press Release, U.S. Sec. & Exch. Comm’n SEC Proposes Rule to Require Broker-Dealers Active in Off-Exchange Market to Become Members of National Securities Association (Mar. 25, 2015), <http://www.sec.gov/news/pressrelease/2015-48.html> [<http://perma.cc/YJ5Q-FUKD>]. FINRA also proposed additional trade reporting requirements for dark pools. Sarah N. Lynch, *Wall Street Regulator Unveils Proposals for Dark Pools, Bond Markets*, REUTERS (Sept. 19, 2014), <http://www.reuters.com/article/2014/09/19/us-financial-regulations-finrarules-idUSKBN0HE25G20140919> [<http://perma.cc/Z4SJ-FRUT>]. FINRA has additionally provided guidance on the supervision of HFTs to assure their integrity and compliance with trading abuses such as spoofing and “momentum-ignition” strategies. Phyllis Diamond, *FINRA to Provide Guidance on Supervising Algo Strategies, Systems*, 46 Sec. Reg. & L. Rep. (BNA) 2068 (Oct. 27, 2014).

303. Scottrade, Inc., [2014-2014 Transfer Binder] Fed. Sec. L. Rep. (CCH) ¶ 80,468 (S.E.C. 2014), the SEC found by consent that the respondent had failed to file accurate blue sheet information. The SEC noted that:

Section 17 of the Exchange Act imposes on broker-dealers recordkeeping requirements that are essential to the Commission’s ability to enforce the federal securities laws and to protect investors. To ensure the continued effectiveness of the Commission’s enforcement and regulatory programs, broker-dealers must

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

The SEC additionally proposed and adopted a new Regulation SCI (Systems Compliance and Integrity) to force electronic trading platforms to enhance their programs for preventing system crashes.<sup>304</sup> The SEC also began more closely monitoring electronic trading platforms.<sup>305</sup>

#### *D. Futures Markets and Electronic Trading Concerns*

Like the stock markets, the futures markets had resisted automation, but automation soon superseded traditional floor operations and introduced the HFT to those markets.<sup>306</sup> Like the SEC, the CFTC issued a broad concept release seeking comment on regulations needed to prevent market disruptions by automated trading systems as the result of order errors or computer glitches.<sup>307</sup> The CFTC concept release also sought to create a regulatory structure for electronic trading platforms and HFTs.<sup>308</sup> Among

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comply with, among other things: Rule 17a-25, requiring that broker-dealers submit electronically securities transaction information upon request by the Commission's staff; Rule 17a-4(j), requiring broker-dealers to furnish promptly true, complete, and current copies of those records upon request by the Commission's staff; and Rule 17a-4(f)(3)(v), requiring broker-dealers to have an audit system that provides for accountability regarding the inputting of records required to be maintained and preserved.

*Id.* at 81,307.

304. See Scott Patterson, *SEC Delays Action on Wall Street Safeguards*, WALL ST. J., Oct. 8, 2014 (describing this proposed regulation); Scott Patterson, *SEC Approves New Rule to Address Computer Risks*, WALL ST. J., Nov. 19, 2014 (describing adoption of rule). The industry was also stepping up its monitoring of HFT trading. JPMorgan Chase announced on July 21, 2014 that it was creating a unit of some 150 employees to monitor electronic trading that might affect its business and to advise clients trading on electronic trading platforms. Emily Glazer, *Global Finance: J.P. Morgan Puts Electronic Trading in the Spotlight*, WALL ST. J., July 22, 2014, at C3.

305. For example, in New York Stock Exchange LLC, [2014 Transfer Binder] Fed. Sec. L. Rep. (CCH) ¶ 80,615 (2014), the SEC found by consent that an exchange and its affiliates had implemented rules that created a new or modified business practice without approval by the SEC. This included providing co-location services, failing to execute mid-point passive liquidity orders in an approved manner, and improperly distributing closing order imbalance information. *Id.* ¶¶ 81,886–88.

306. See Markham & Harty, *supra* note 246, at 865 (describing that resistance and transformation).

307. Risk Controls and System Safeguards, *supra* note 5, at 56,542.

308. The CFTC has described the interrelated roles of electronic trading platforms and automated trading systems as follows:

Automated trading environments have developed in tandem with automated systems for both the generation and execution of orders. Systems related to the generation of orders (automated trading systems or ATSSs) operate at the beginning of the order and trade lifecycle; they reflect a set of rules or instructions (an algorithm)

other things, the CFTC concept release noted, with respect to the development of automated trading systems (ATS), that:

In addition to greater automation and decreased latency, derivatives markets are increasingly characterized by a high degree of interconnection. ATSs and algorithms deployed to trade particular products often interact directly and indirectly with ATSs and algorithms active in other markets and jurisdictions. Increased interconnectedness is facilitated by electronic access to real-time pricing information, automated order execution, and some standardization in communication protocols at various trading platforms. ATSs can quickly execute strategies across multiple markets within very short periods of time. Often, cross-market activity is driven by latent arbitrage opportunities and faster access to multiple markets has led to a proliferation of strategies that seek to identify and trade on the basis of these relationships.<sup>309</sup>

The CFTC adopted some regulations to deal with the risks posed by this new trading environment. It required futures commission merchants (FCMs), swap dealers, and major swap participants that are clearing members of an exchange to establish automated pre-order risk-based limits on position and order size and margin requirements for all proprietary and customer accounts.<sup>310</sup> Among other things, the CFTC also considered whether to require registration of HFTs and identification of their algorithms so that the agency could monitor them for possible disruptive practices or market threats.<sup>311</sup>

#### *E. Trading Abuses: “Spoofing” and “Layering”*

A by-product of HFTs is a number of trading abuses, such as “spoofing,” that seek to mislead other traders by posting orders that are not intended

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and related computer systems used to automate the execution of a trading strategy. ATSs may operate as automated execution programs designed to minimize the price impact of large orders; achieve a benchmarked price (*e.g.*, volume-weighted average price and time-weighted average price algorithms); or otherwise execute instructions traditionally provided by a human agent. They may be employed by a range of market participants, with varying degrees of sophistication, for both proprietary and customer trading. For example, buy-side firms (such as mutual funds and pension funds) may use automated systems and execution algorithms to “shred” one or more large orders (called parent order) into a series of smaller trades (child orders) to be executed over time. Such systems can include additional algorithms to micro-manage the size, frequency and timing (often randomized) of child orders. In addition to automated execution, ATSs may also operate market-making programs; opportunistic, cross-asset and cross-market arbitrage programs; and a number of other strategies.

*Id.* at 56,544.

309. *Id.* at 56,546–47 (footnotes omitted).

310. 17 C.F.R. §§ 1.73, 23.609 (2014).

311. Risk Controls and System Safeguards, *supra* note 5, at 56,559–61.

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

to be executed.<sup>312</sup> This is not a new practice. In addition to using courier pigeons to gain advance information, Nathan Rothschild first entered sell orders when he wanted to purchase a large quantity of stock. The sell orders gave rise to rumors that he was selling and Rothschild would then acquire his long position at cheaper prices.<sup>313</sup> Before the Civil War, speculators engaged in what was then called a “scoop” game or “partridge” scheme in which they enter orders that made it appear that the market was weakening. Those orders would lure short sellers into the market and they would be trapped by orders that were executed at increasing prices.<sup>314</sup> During that era, Jacob Little was able to deceive other traders by announcing it would he would not sell a certain stock below \$90.<sup>315</sup> He then began selling the stock secretly at a lower price.<sup>316</sup> Such practices carried over into this century.<sup>317</sup>

Electronic spoofing may take several forms. Initially, it was a fraud scheme that falsified the source of emails in order to give the appearance that a company had announced news that would affect its stock price. This allowed the perpetrator of the scheme to trade in advance of that movement.<sup>318</sup> This term later also applied to trading schemes in which HFT place orders that they intended to cancel before execution in order to entice other traders into the market.<sup>319</sup>

Spoofing as a trading technique also has some regulatory history. Previously called “flash” trades, such orders were cancelled immediately upon communication or withdrawn if not executed immediately after

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312. Bradley Hope, *As ‘Spoof’ Trading Persists, Regulators Clamp Down*, WALL ST. J. (Feb. 22, 2015), <http://www.wsj.com/articles/how-spoofing-traders-dupe-markets-1424662202> [<http://perma.cc/4UYC-RZNF>].

313. See JOHN FRANCIS, *CHRONICLES AND CHARACTERS OF THE STOCK EXCHANGE* 303–04 (1844).

314. 1 MARKHAM, *supra* note 83, at 162 (describing these schemes).

315. *Id.* at 161.

316. *Id.*

317. See TOM BARBASH, *ON TOP OF THE WORLD: CANTOR FITZGERALD, HOWARD LUTNICK & 9/11*, at 92–93 (2003) (describing such practices by Merrill Lynch in the U.S. Treasury market). See also JERRY W. MARKHAM, *LAW ENFORCEMENT AND THE HISTORY OF FINANCIAL MARKET MANIPULATION*, 388–89 (2014) (describing other such trading practices).

318. See SEC v. Dorozkho, 574 F.3d 42 (2d Cir. 2009) (addressing such a scheme). See also MARKHAM, *supra* note 317, at 334–35 (further describing such schemes).

319. See MARKHAM, *supra* note 317, at 334–35 (describing the background of spoofing concerns).

communication.<sup>320</sup> Many criticized flash trades.<sup>321</sup> However, one of the SEC National Market System (NMS) rules, which allowed exchanges to exclude flash orders from consolidated quotation data disclosures, specifically authorized such practices.<sup>322</sup> The SEC found that, “[f]or those seeking liquidity, the flash mechanism may attract additional liquidity from market participants who are not willing to display their trading interest publicly.”<sup>323</sup> The SEC did express concern that such trading could be abusive and provide an advantage to professional traders over smaller traders, but deferred a decision to ban such orders entirely because of their potential value to the market.<sup>324</sup>

The SEC’s concerns over the value of flash orders was justified. For example, traders might enter orders to “ping” the market like a submarine seeking out possible dangers or target opportunities. Pinging appears to be a legitimate practice that should be allowed for traders, but should flash orders so large in volume as to overload competing platforms be allowed?<sup>325</sup> Instead of trying to define the difference between good and bad flash trades, the SEC began to regulate such trading through enforcement actions. Those actions attacked spoofing trades designed to increase the national best and offer (NBBO) by not displaying customer orders at prices that were better than a market maker’s NBBO posts. This practice was charged as being in violation of SEC rules on limit order displays.<sup>326</sup>

The SEC also began charging “layering” as an improper trading practice. Layering appears to be simply a more robust form of flash trades, but which the SEC views to be fraudulent. The SEC has stated that:

In general, layering occurs when a trader creates a false appearance of market activity by entering multiple non-*bona fide* orders on one side of the market, at generally increasing (or decreasing) prices, in order to move that stock’s price in

320. Elimination of Flash Order Exception from Rule 602 of Regulation NMS, Exchange Act Release No. 34-60684, 74 Fed. Reg. 48,632 (Sept. 23, 2009).

321. See “Flash” Trading Controversy in U.S. Raises Issue of Front-Running, REUTERS (Aug. 7, 2009), <http://blogs.reuters.com/financial-regulatory-forum/2009/08/07/flash-trading-controversy-in-us-raises-issue-of-front-running/> [<http://perma.cc/WQ2P-CH42>] (describing this controversy).

322. 17 C.F.R. § 242.602(a)(1)(i)(A) (2014).

323. Elimination of Flash Order Exception from Rule 602 of Regulation NMS, 74 Fed. Reg. at 48638.

324. Concept Release on Equity Market Structure, *supra* note 3, at 3594.

325. See Gregory Scopino, *The Questionable Legality of High-Speed “Pinging” and “Front Running” in the Futures Markets*, 47 CONN. L. REV. 609 (2015) (questioning the role of pinging).

326. *In re Frazee*, Exchange Act Release No. 33-8209, 2003 WL 1222734 (S.E.C. Mar. 18, 2003).



[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

a direction where the trader intends to induce others to buy (or sell) at a price altered by the non-*bona fide* orders.<sup>327</sup>

HFTs were also criticized for using complex orders to game other aspects of the SEC's NMS. One particularly unwieldy aspect of SEC Regulation NMS is its prohibition against quoting a "locked" market in which the buy and sell quotes are the same. In theory, the trades should cross and execute but do not because one or the other party may not want to pay the exchange fee associated with the execution.<sup>328</sup> That prohibition gave rise to various trading strategies to avoid the effect of that locked market prohibition, including complex "hide not slide" orders that were criticized in the press.<sup>329</sup> The hide-not-slide orders were designed to give priority to undisplayed orders when the market unlocked.<sup>330</sup> The SEC has also sought sanctions where a trading platform uses customer information for its own trading advantage.<sup>331</sup>

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327. *In re Biremis Corp.*, Exchange Act Release No. 34-68456, 2012 WL 6587520 (S.E.C. Dec. 18, 2012). The SEC has also described layering as follows:

Layering concerns the use of non-*bona fide* orders, or orders that the trader does not intend to have executed, to induce others to buy or sell the security at a price not representative of actual supply and demand. More specifically, a trader places a buy (or sell) order that is intended to be executed, and then immediately enters numerous non-*bona fide* sell (or buy) orders for the purpose of attracting interest to the *bona fide* order. These non-*bona fide* orders are not intended to be executed. The nature of these orders is to induce, or trick, other market participants to execute against the initial, *bona fide* order. Immediately after the execution against the *bona fide* order, the trader cancels the open, non-*bona fide* orders, and repeats this strategy on the opposite side of the market to close out the position.

Hold Brothers On-Line Investment Services, LLC, 2012 LEXIS 3029 (S.E.C. Sept. 25, 2012).

328. Cameron Smith, *Stock Investors Can Handle the Truth*, WALL ST. J., June 3, 2014, at A11.

329. See Scott Patterson & Jenny Strasburg, *For Superfast Stock Traders, A Way to Jump Ahead in Line*, WALL ST. J., Sept. 19, 2012, at A1 (describing these orders).

330. See *id.* (describing this practice).

331. A Citigroup, Inc. affiliate agreed to pay \$5 million to settle SEC charges that it failed to protect the confidential information of customers trading on its ECN, LavaFlow Inc. That information involved non-displayed orders and was given to a Citigroup affiliate for its trading. Michael Calia, *Citigroup Unit Pays Record Fine Over Alternative Trading System*, WALL ST. J., July 25, 2014, at B5. See also LavaFlow, Inc., [2014 Transfer Binder] Fed. Sec. L. Rep. (CCH) ¶ 80,652 (2014). In Liquidnet, Inc., [2014 Transfer Binder] Fed. Sec. L. Rep. (CCH) ¶ 80,626 (2014), the SEC by consent sanctioned a dark pool that was registered as an ATS for sharing confidential information about customer trading with a business unit outside the dark pool.

Mary Jo White, the SEC Chair, announced in June 2014 that she had directed the SEC staff to formulate rules that would identify and prohibit disruptive HFT trading strategies during volatile market conditions. She stated that the SEC “should not roll back the technology clock or prohibit algorithmic trading,” but that it had to assess “the extent to which specific elements of the computer-driven trading environment may be working against investors rather than for them.”<sup>332</sup> White also questioned, “whether the increasingly expensive search for speed has passed the point of diminishing returns.”<sup>333</sup> She stated that the SEC would also be examining “mechanisms designed to minimize speed advantages.”<sup>334</sup> White further indicated the SEC might impose affirmative market making obligations on HFTs, as had been done in the past to offset the time and place advantages of market makers and specialists on the NYSE and Nasdaq.<sup>335</sup>

Like the SEC, the CFTC encountered concerns over HFT trading practices. Section 747 of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank) allowed the CFTC to attack “spoofing”—bidding or offering with the intent to cancel the bid or offer before execution.<sup>336</sup> Section 747 also allowed the CFTC to attack other “disruptive” trading practices, such as violating the bids and offers of other traders and “banging the close.”<sup>337</sup>

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332. Mary Jo White, Enhancing Our Equity Market Structure, Address Before Sandler O’Neill & Partners, L.P. Global Exchange and Brokerage Conference New York, N.Y. (June 5, 2014), [http://www.sec.gov/News/Speech/Detail/Speech/1370542004312#VD\\_QakvP4pE](http://www.sec.gov/News/Speech/Detail/Speech/1370542004312#VD_QakvP4pE) [<http://perma.cc/6JMD-CH6N>].

333. *Id.*

334. *Id.*

335. *Id.*

336. 7 U.S.C. § 6(c) (2012) (which amended Section 4c of the Commodity Exchange Act of 1936 (CEA)). Section 4c had previously prohibited certain improper trading practices such as “wash” sales, “accommodation” trades and “fictitious” trades. *See* 13 JERRY W. MARKHAM, COMMODITIES REGULATION: FRAUD, MANIPULATION & OTHER CLAIMS, ch. 14 (2014) (describing those practices). *See also* MARKHAM & HAZEN, *supra* note 216, § 9:17.80 (describing spoofing).

337. 7 U.S.C. § 6(c). Banging the close involves manipulating the closing price of a futures or options contract in order to reduce margin requirements or to affect the price of a cash market position. *See* DiPlacido v. Commodity Futures Trading Comm’n, 364 F. App’x. 657 (2d Cir. 2009) (a pre-Dodd-Frank case attacking such practices as manipulation). The SEC and the Justice Department have also brought cases charging violations in connection with efforts to manipulate closing prices. *See* MARKHAM, *supra* note 317, at 333–34 (describing those cases). *See also, e.g.*, Athena Capital Research, LLC, Exchange Act Release No. 34-73369, 2014 WL 5282074 (Oct. 16, 2014) (settlement of banging the close case); Sarah N. Lynch, *New York High-Speed Trading Firm Settles SEC Charges Over Manipulation*, REUTERS (Oct. 16, 2014, 4:46PM), <http://www.reuters.com/article/2014/10/16/us-sec-highspeed-idUSKCN0I52E620141016> [<http://perma.cc/PH4E-Z75W>] (describing how a HFT trader settled with the SEC over alleged manipulation involving closing prices).

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

The CFTC subsequently issued an interpretation of the scope of the prohibition in Section 747 of Dodd-Frank. Among other things, that interpretation stated its prohibitions apply to any trading that involves buying at a price higher than the lowest available price or selling at a price lower than the highest available price.<sup>338</sup> The CFTC also brought spoofing charges against traders and one trader was indicted for such activity after settling with the CFTC.<sup>339</sup>

## VI. INFORMATION IS A COMMODITY

There has been much argument over whether HFTs add value to the market by enhancing liquidity.<sup>340</sup> However, that debate seems bit pointless

338. Antidisruptive Practices Authority, 78 Fed. Reg. 31,890 (May 28, 2013). The CME Group also adopted a rule prohibiting disruptive trading practices such as quote stuffing that seeks to overwhelm the quotations of another market participant, disorderly trading during closing periods, and spoofing. *CME Group Files Rule to Prohibit Disruptive Practices*, 46 Sec. Reg. & L. Rep. (BNA) 1797 (Sept. 15, 2014).

339. Kara Scannell & Gregory Meyer, *Trader Faces Criminal Spoofing Charges*, FIN. TIMES (London), Oct. 2, 2014. Questions have been raised over whether that spoofing actually injured anyone other than other HFTs. Matt Levine, *Prosecutors Catch a Spoofing Panther*, BLOOMBERG VIEW (Oct. 2, 2014, 5:15PM), <http://www.bloombergview.com/articles/2014-10-02/prosecutors-catch-a-spoofing-panther> [<http://perma.cc/E88V-YBD9>]. Another trader settled a CFTC manipulation case for \$1.56 million, which charged that the trader repeatedly entered and cancelled orders that he did not plan to have executed in order to provide the false appearance of liquidity in wheat futures contracts. *Broker Agrees to Pay \$1.56M in Manipulation Case*, 46 Sec. Reg. & L. Rep. (BNA) 1969 (Oct. 6, 2014). The commodity exchanges were also bringing numerous spoofing claims against traders. Gregory Meyer & Kara Scannell, *Chicago Prosecutor Gets Tough on 'Spoofing'*, FIN. TIMES (London), Oct. 8, 2014. Still another trader was charged in April 2015 by the CFTC and the Justice Department with spoofing that contributed to the Flash Crash in May 2010. Press Release, U.S. Commodity Future Trading Comm'n, CFTC Charges U.K. Resident Navinder Singh Sarao and His Company Nav Sarao Futures Limited PLC with Price Manipulation and Spoofing (Apr. 21, 2015), <http://www.cftc.gov/PressRoom/PressReleases/pr7156-15> [<http://perma.cc/BKF6-Z6YC>].

340. For example, the CBOE has claimed that: "Generally speaking, the evolution of high frequency trading has helped limit spreads and increase market liquidity—efficiencies that benefit all market participants." *High Frequency Trading: Progress or Problem?*, CBOE, <http://www.cboe.com/AboutCBOE/MediaHub/high-frequency-trading/views.aspx> [<http://perma.cc/DTC6-BYPG>] (last visited Sept. 12, 2015). See, e.g., Markus Baldauf & Joshua Mollner, *The Private Value of Speed: Systematic Advantages of Fast Liquidity Providers*, STANFORD UNIV. ECON. DEP'T, May 29, 2014; Bradley Hope, *A High-Speed Trader Looks To Slow Down Critics*, WALL ST. J. (Oct. 15, 2014), [http://online.wsj.com/articles/a-high-speed-trader-looks-to-slow-down-critics-1413318872?mod=dist\\_smartbrief](http://online.wsj.com/articles/a-high-speed-trader-looks-to-slow-down-critics-1413318872?mod=dist_smartbrief) [<http://perma.cc/5VU7-EXGC>]; Matthew O'Brien, *Everything You Need To Know About High Frequency Trading*, THE ATLANTIC (Apr. 11, 2014), <http://www>.

because, as volume figures indicate,<sup>341</sup> HFTs are supplanting the traditional market makers on both the stock and futures exchanges. Criticism of HFT trading practices that may be abusive are a matter of appropriate regulatory concern, but that begs the questions of what is abusive and how such practices should be regulated.

Identification of an abuse is itself problematic, since not every advantage or stratagem is abusive even if it provides advantage to its user at the expense of others. Pinging, for example, seems legitimate because it is merely seeking out trading interest, but when does pinging become illegal spoofing? Once identified as abusive, prohibited practices could be spotted by regulatory authorities through their own algorithms.<sup>342</sup> That would add certainty to the market and free traders of guessing what is or is not permitted.<sup>343</sup> In the meantime, the regulators are bringing cases on an *ad hoc* basis that adds little to the debate over the proper role and regulation of HFTs.<sup>344</sup>

This focus on trading abuses actually masks the real concern of regulators—HFTs take advantage of asymmetrical access to information gained by their high-speed trading abilities. This concern has even spawned proposals to slow down the HFTs and thereby remove their high-speed advantages. One proposal would label HFTs as “e-specialist brokers” and handicap those registrants by preventing them from using exchange data feeds. This would prevent the HFTs from getting a jump on other traders.<sup>345</sup>

Another approach is to slow everyone down to the same speed. For example, IEX is a dark pool that uses a 350 micro-second delay for orders

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theatlantic.com/business/archive/2014/04/everything-you-need-to-know-about-high-frequency-trading/360411/ [http://perma.cc/ZB9X-NYUL]; Lauren Oppenheimer & John Vahey, *The Need For Speed*, CAPITAL Mkts. INITIATIVE, 1, 1 (July 2013), [http://content.thirdway.org/publications/722/Third\\_Way\\_Report\\_-\\_The\\_Need\\_For\\_Speed.pdf](http://content.thirdway.org/publications/722/Third_Way_Report_-_The_Need_For_Speed.pdf) [http://perma.cc/8T3J-BWZN]; Matthew Philips, *How The Robots Lost: High Frequency Trading's Rise and Fall*, BLOOMBERG (June 6, 2013), <http://www.bloomberg.com/bw/articles/2013-06-06/how-the-robots-lost-high-frequency-tradings-rise-and-fall> [http://perma.cc/BA3Z-7F4N].

341. See *supra* notes 14–16.

342. FINRA seems to be moving in this direction. *FINRA Board OK's Proposals on Dark Pools, Algorithmic Trading, Fixed Income Markets*, 46 Sec. Reg. & L. Rep. 1825 (Sept. 22, 2014).

343. See MARKHAM, LAW ENFORCEMENT, *supra* note 310, at 334–35 (describing such an approach). See also Gregory Scopino, *Do Automated Trading Systems Dream of Manipulating the Price of Futures Contracts? Policing Markets for Improper Trading Practices by Algorithmic Robots*, 66 FLA. L. REV. 221, 283–84 (2015) (advocating a supervisory requirement for firms with HFTs).

344. For example, the SEC trumpeted its prosecution of an HFT over a net capital violation. See *HFT Firm Agrees to Record SEC Fine For Alleged Violations of Net Capital Rule*, 46 Sec. Reg. & L. Rep. (BNA) 1824 (Sept. 22, 2014).

345. *Report: “E-Specialist” Label Can Reduce HFT Issues*, 46 Sec. Reg. & L. Rep. (BNA) 1775 (Sept. 15, 2014).

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

entered into its system for execution in order. That delay seeks to equalize trading opportunities and preclude the front running of customer orders.<sup>346</sup> IEX was also seeking to compete with the dark pools by allowing trading for free where buy and sell orders match. Other trades on IEX were assessed a fee of nine cents per 100 shares and there were no maker/taker payments to encourage liquidity by HFT orders. Broker-dealers would be given priority over other traders, including HFTs.<sup>347</sup>

A number of other fixes for HFT trading have been proposed, including a widening of tick sizes for market quotes. That would be a reversal of a prior SEC action that reduced tick sizes to a penny from the traditional 1/16 and 1/8 of a dollar. Moreover, wider spreads are an indication of an illiquid and inefficient market, so why require inefficiency? The SEC also considered a requirement that trades be conducted on dark pools only at prices better than those available on public markets.<sup>348</sup>

Again, these efforts are directed toward the creation of a level playing field for all traders. However, as history has shown, traders have always sought information advantages that will allow them to profit at the expense of slower competitors. It would seem strange to historians if governments had prohibited the use of mirrors, smoke signals, or courier pigeons in trading securities. Similarly, banning fast ships and express coaches would also be laughable to us today if such action had been taken in order to curb the advantages of speculators.

This misguided attack on informational advantages is fueled by the SEC's fixation on insider trading, which it initially based on a theory that

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346. Scott Patterson, *Regulator Hired by Upstart Firm*, WALL ST. J., June 17, 2014, at C5. Other proposals for slowing HFTs include minimum order exposure time, batch auctions in which the exchange will periodically execute orders at price where most bids and offers match, and a transaction tax that would penalize rapid trading. See SHORTER & MILLER, *supra* note 37, at 34–36.

347. Bradley Hope, *IEX Plan Aims to Drain 'Dark Pools'*, WALL ST. J., July 7, 2014, at C1.

348. Andrew Ackerman & Bradley Hope, *SEC Set to Spur Exchange Trading*, WALL ST. J., May 27, 2014, at C1. See also Andy Kessler, *High-Frequency Trading Needs One Quick Fix*, WALL ST. J., June 16, 2014, at A15 (reporting that one fix for NMS was suggested as requiring best execution, rather than best price and by increasing decimalization to minimum five cent spreads). See JEFF CASTURA ET AL., MARKET EFFICIENCY AND MICROSTRUCTURE EVOLUTION IN U.S. EQUITY MARKETS: A HIGH-FREQUENCY PERSPECTIVE (2010), [http://finlin.wharton.upenn.edu/departments/Seminar/micro/Litzenberger\\_transient\\_vol5\\_2010.pdf](http://finlin.wharton.upenn.edu/departments/Seminar/micro/Litzenberger_transient_vol5_2010.pdf) [<http://perma.cc/GH8B-UZYU>] (discussing role of HFTs in narrowing spreads).

unequal access to information that is used to trade stocks is fraudulent.<sup>349</sup> However, an insider trading charge requires proof of some misappropriation of information or obtaining or using information in breach of a fiduciary duty.<sup>350</sup> However, HFTs are neither misappropriating information nor breaching any fiduciary duty. Moreover, the Supreme Court has rejected the SEC's claims for equal access to information even in insider trading cases. The Supreme Court held in *Chiarella v. United States*<sup>351</sup> that "[a] duty to disclose . . . does not arise from the mere possession of nonpublic market information."<sup>352</sup> "Moreover, neither the Congress nor the [Securities and Exchange] Commission ever has adopted a parity-of-information rule. Instead, the problems caused by misuse of market information have been addressed by detailed and sophisticated regulation that recognizes when use of market information may not harm operation of the securities markets."<sup>353</sup> This should signal a focus on rules that attack particular trades that are fraudulent and not on the facts that one trader is faster than another is or has better information.

The equal access to information theory has also been solidly rejected in the futures markets beginning early in the country's history. In an 1817 decision written by Justice John Marshall in *Laidlaw v. Organ*, the

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349. The equal access to information insider trading theory had been created out of whole cloth by the SEC in a 1961 consent order. *Cady, Roberts & Co.*, 40 S.E.C. 907 (1961). Such a doctrine had been rejected at common law. *See Goodwin v. Agassiz*, 186 N.E. 659, 611 (Sup. Mass. 1933). The SEC had not posited such a theory until the 1961 consent decree. *See MARKHAM, supra* note 317, at 138 (describing this development). The SEC then began using insider trading cases as the centerpiece of its enforcement efforts. *See, e.g., SEC v. Texas Gulf Sulphur Co.*, 401 F.2d 833, 839–41 (2d Cir. 1968), *cert. denied sub nom.*, *Coates v. SEC*, 394 U.S. 976 (1969).

350. *United States v. O'Hagan*, 521 U.S. 642, 667 (1987).

351. *Chiarella v. United States*, 445 U.S. 222, 223 (1980).

352. *Id.* at 235.

353. *Id.* at 233. *See also, Dirks v. SEC*, 463 U.S. 646, 651, 659–60 (1983) (further circumscribing the SEC's equal access to information theory). In *United States v. Finnerty*, 533 F.3d 143 (2d Cir. 2008), the Second Circuit affirmed the dismissal of the defendant's convictions for interpositioning or front running of customer trades because there was "no evidence that Finnerty conveyed an impression that was misleading, whether or not it could have a bearing on a victim's investment decision in connection with a security." *Id.* at 149. The Court further stated that:

It may be that Finnerty unfairly profited from superior information. But "not every instance of financial unfairness constitutes fraudulent activity under § 10(b)." *Chiarella v. United States*, 445 U.S. 222, 232, 100 S. Ct. 1108, 63 L. Ed. 2d 348 (1980). And characterizing Finnerty's conduct as "self-evidently deceptive" is conclusory; there must be some proof of manipulation or a false statement, breach of a duty to disclose, or deceptive communicative conduct. "Section 10(b) is aptly described as a catchall provision, but what it catches must be fraud."

*Id.* at 234–35.

353. *Id.* at 150.

[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

Supreme Court held that a purchaser of tobacco had no duty to disclose to the seller the buyer's prior non-public knowledge of the signing of the Treaty of Ghent.<sup>354</sup> Tobacco prices increased substantially when the existence of the treaty became publicly known.<sup>355</sup>

Congress amended the CEA in 2008 to adopt the approach taken in *Laidlaw v. Organ*.<sup>356</sup> Congress then added a proviso to the anti-fraud provisions of Section 4b of the CEA<sup>357</sup> that states its prohibitions do not require disclosure of:

nonpublic information that may be material to the market price, rate, or level of the commodity or transaction, except as necessary to make any statement made to the other person in or in connection with the transaction not misleading in any material respect.<sup>358</sup>

Section 753 of the Dodd-Frank Act added language to the CEA that is modeled after Section 10(b) of the Securities Exchange Act of 1934<sup>359</sup> and used by the SEC for its insider trader cases.<sup>360</sup> However, Section 753 of Dodd-Frank also adopted the language from the 2008 legislation that proscribes the CFTC from adopting regulations that would include insider trading concepts such as those advocated by the SEC.<sup>361</sup>

Section 753 of Dodd-Frank prohibits any "manipulative or deceptive device or contrivance" in violation of CFTC rules adopted within one year of the enactment of Dodd-Frank.<sup>362</sup> The CFTC promulgated Rule 180.1

354. *Laidlaw v. Organ*, 15 U.S. 178, 195 (1817).

355. In rejecting that claim, Justice Marshall's opinion tracked that of the proviso added to Section 4b of the CEA. He stated:

The question in this case is, whether the intelligence of extrinsic circumstances, which might influence the price of the commodity, and which was exclusively within the knowledge of the vendee, ought to have been communicated by him to the vendor? The court is of the opinion that he was not bound to communicate it. It would be difficult to circumscribe the contrary doctrine within proper limits, where the means of intelligence are equally accessible to both parties. But at the same time, each party must take care not to say or do anything tending to impose upon the other.

*Id.* at 195.

356. *Id.*; 7 U.S.C. § 6b(b) (2012).

357. 7 U.S.C. § 6b (2012).

358. 7 U.S.C. § 6b(b) (2012).

359. 15 U.S.C. § 78j(b) (2012).

360. Section 753 of Dodd-Frank also added a new special provision price manipulations through "false reporting." Dodd-Frank Wall Street Reform and Consumer Protection Act § 753.

361. *Id.*

362. *Id.*

to implement that provision.<sup>363</sup> In doing so, the CFTC refused to adopt a broad SEC insider trading prohibition because of the *Laidlaw* like language in Section 753 of the Dodd-Frank Act. The CFTC stated that it is not a violation Rule 180.1 “to withhold information that a market participant lawfully possesses about market conditions . . . either in an anonymous market setting or in bilateral negotiations . . . .”<sup>364</sup> The CFTC thus recognized “that unlike securities markets, derivatives markets have long operated in a way that allows for market participants to trade on the basis of lawfully obtained material nonpublic information.”<sup>365</sup> The CEA’s approach to asymmetrical access to information should apply equally to informational advantages from high-speed trading.

There are sound reasons why information should not be regulated in the absence of fraud. Information is a commodity that has value and for which its holder deserves payment. This simple and basic concept is found everywhere in markets and in daily commerce. Consider the purchase of a newspaper bought by a reader to obtain the information it contains. We all happily pay our doctor bills to obtain the information provided by the doctor’s diagnosis. Teachers are paid to disseminate information, as are store clerks, computer programmers and preachers. So why should special knowledge obtained by a trader be any different? Traders holding asymmetrical information or speed advantages should be rewarded for their effort and not punished.

In any event, there is the practical problem that possession of information is by its very nature asymmetrical. It is not possible for everyone to be informed of everything all the time. Some traders will always have a possession or speed advantage over other traders. Some traders will gain access to market moving information before others. Indeed, and not a little ironically, HFTs were using their ability to access the SEC’s public company filings faster than other traders through direct feeds sold by the SEC and then trade on that information before others receiving the information on the Internet could act.<sup>366</sup> This gave HFTs an advantage of as much as ten seconds.<sup>367</sup>

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363. 17 C.F.R. § 180.1 (2014).

364. CFTC, Prohibition on Manipulative and Deceptive Devices, 76 Fed. Reg. 41,398, 41,402 (July 14, 2011).

365. *Id.* at 41,403.

366. Ryan Tracey & Scott Patterson, *Fast Traders are Getting Data from SEC Seconds Early*, WALL ST. J., (Oct. 29, 2014), <http://www.wsj.com/articles/fast-traders-are-getting-data-from-sec-seconds-early-1414539997> [<http://perma.cc/675T-4N34>].

367. *Id.* Dave Michaels, *Senators Urge SEC to Fix Unequal Access to Market Data*, BLOOMBERG (Nov. 3, 2014), <http://www.bloomberg.com/news/2014-11-03/senators-urge-sec-s-white-to-fix-unequal-access-to-market-data.html> [<http://perma.cc/ZT5H-LF65>].



[VOL. 52: 555, 2015]

*High-Speed Trading*  
SAN DIEGO LAW REVIEW

Market moving information should be given equal dignity with any other article of commerce. This means, for example, that exchanges should be able to charge access fees for the information they provide without regulation by a fee setting agency like the SEC.<sup>368</sup> If exchanges want to charge higher fees for better access, then they should be allowed to do so. Exchanges exist because of the information they disseminate, and they should be compensated for that service. That same logic applies to exchange co-location services for which the exchanges charge fees.<sup>369</sup>

Similarly, exchange incentive fees that vary for “makers” of orders and those charged to “takers” of orders, which have engendered much criticism, should also be left to the trading platforms to set. Those incentives are intended to encourage liquidity and are desirable and provide information that is valuable to the market. After all, the specialists and Nasdaq market makers had long profited from the spread between purchase and sale orders. They were applauded for doing so because of the liquidity they provided to the market. HFTs are no less entitled to rewards for providing liquidity.

Further, as the SEC has noted, “[i]nvestors need not . . . always be price-takers and accept whatever prices the other side of the market is offering at the moment. They can participate in price competition by

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368. In *NetCoalition v. SEC*, 715 F.3d 342 344, 354 (D.C. Cir. 2013), the D.C. Circuit dismissed a case seeking to require the SEC to suspend the fee setting rules of exchanges for the acquisition of proprietary market data. The court noted that in an earlier decision it had set aside the SEC’s approval of an exchange rule because of faulty reasoning. *Id.* However, the Dodd-Frank Act subsequently removed the requirement that the SEC approve such fees.

369. Interestingly, the Securities Industry and Financial Markets Association (SIFMA), the primary trade organization representing the broker-dealer community is advocating the elimination or sharp reduction of exchange access fees. SIFMA is also urging the imposition of a requirement that all users of market data have access to data at the same time. See *SIFMA Publishes Recommendations for Enhancing Fairness, Stability, and Transparency in US Equity Markets*, SIFMA (July 14, 2014), <http://www.sifma.org/newsroom/2014/sifma-publishes-recommendations-for-enhancing-fairness-stability-and-transparency-in-us-equity-markets/> [<http://perma.cc/F3AT-NUGP>]. However, a district court dismissed state law claims by a subscriber to an exchange information feed that received information only after the preferred access given to HFTs. The court held that the state law claims were preempted because the SEC had examined this area and concluded that such preference was permissible. The court further held that, even if not preempted, there was no justiciable claim under state law. *Lanier v. BATS Exchange, Inc.*, 2015 WL 191446 (S.D.N.Y.).

submitting limit orders to obtain *better* prices than the market is offering.”<sup>370</sup> Ironically, the SEC further observed that:

Whatever their particular trading strategy, investors that participate in price competition by offering immediate liquidity in a security are seeking primarily to interact with investor order flow on the other side of the market. Assuring an opportunity for this type of direct interaction between investors without the intervention of a dealer is one of the principal objectives of the national market system.<sup>371</sup>

The HFTs in all events do not need to be slowed down. This is an era of computers and advocating a return to ink quills and foolscap is nonsense. The HFT is simply another step that began with courier pigeons and smoke signals and now is progressing to microwaves. One can only wonder what the next generation will bring to the long running effort to gain trading advantage by faster information media.

## VII. CONCLUSION

The use of high-speed methods for the transmittal of information in order to obtain an edge on trading over other traders is a practice that is as old as the markets themselves. From carrier pigeons to laser technology, time has shown that information is a valuable commodity that traders naturally use to seek a profit. By doing so, they are transmitting that information to the market through their trading and provide market liquidity and better market efficiency.

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370. Commission’s Request for Comment on Market Fragmentation Release No. 34-42450 65 Fed. Reg. 10577, 10581 (Feb. 28, 2000). The SEC also noted that:

Another type of implicit transaction cost reflected in the price of a security is short-term price volatility caused by temporary imbalances in trading interest. For example, a significant implicit cost for large investors (who often represent the consolidated investments of many individuals) is the price impact that their large trades can have on the market. Indeed, disclosure of these large orders can reduce the likelihood of their being filled. Consequently, large investors often seek ways to interact with order flow and participate in price competition without submitting a limit order that would display the full extent of their trading interest to the market. Among the ways large investors can achieve this objective are: (1) To have their orders represented on the floor of an exchange market; (2) to submit their orders to a market center that offers a limit order book with a reserve size feature; or (3) to use a trading mechanism that permits some form of “hidden” interest to interact with the other side of the market. A market structure that facilitates maximum interaction of trading interest can produce price competition *within* displayed prices by providing a forum for the representation of undisclosed orders.

*Id.* (emphasis in original) (footnotes omitted).

371. *Id.* at 10581 (footnote omitted).