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2018

The Regulation of Trading Markets: A Survey and Evaluation

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Publication Information & Recommended Citation

Paul G. Mahoney, co-author. "The Regulation of Trading Markets: A Survey and Evaluation." Gabriel Rauterberg, co-author. In Securities Market Issues for the 21st Century, edited by Merritt B. Fox et al., 221-81. New Special Study of the Securities Markets. New York: Columbia Law School, 2018.

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Chapter 5

THE REGULATION OF TRADING MARKETS

Paul G. Mahoney[547] & Gabriel V. Rauterberg[548]

1 Introduction

The U.S. equity markets have undergone profound changes in the past 15 years. The manual creation of contracts to buy and sell shares, either face to face on a trading floor or by telephone with a securities dealer, has been mostly replaced by the automated matching of buy and sell orders by electronic communications and information processing systems. Trading in listed stocks, which used to be heavily concentrated on the listing exchange, is now widely dispersed among multiple automated trading venues.[549] Exchange specialists and over-the-counter market makers have been eclipsed by proprietary traders that offer liquidity to the automated markets by executing algorithmic trading strategies. Those strategies often rely on a menu of new and complex order types that trading venues create to supplement the traditional market and limit orders.[550]

Technological advances made these developments possible. The cost of creating a trading platform has fallen as computers replace trading floors, allowing investors, exchanges, and brokers to solve old problems in new ways.[551] In place of market makers who manually update quotations to reflect information and their own inventory management needs, proprietary traders use automated systems to obtain market data and execute transactions pursuant to predetermined strategies in milliseconds or less. Rather than giving large orders to brokers who can "work" the

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[549] *See* U.S. Securities and Exchange Commission, Concept Release on Equity Market Structure 6 (January 14, 2010), https://www.sec.gov/rules/concept/2010/34-61358.pdf [hereinafter "Market Structure Release"] (NYSE's share of trading volume in its listed stocks fell from 79% in 2005 to 25% in 2009).

[550] *See* Phil Mackintosh, *Demystifying Order Types,* KCG TRADING STRATEGIES & MKT. ANALYTICS (Sept. 2014).

[551] *See* James J. Angel, Lawrence E. Harris & Chester S. Spatt, *Equity Trading in the 21st Century*, 1 Q. J. OF FIN. 1 (2011).

order, large institutional investors split up their orders into many pieces routed to different trading venues. The technologies themselves and the way market participants use them differ in detail but not in kind from past technological breakthroughs. Throughout history, securities traders have been among the earliest adopters of new communications technologies, always seeking to profit from faster execution and access to information.

The changes are also a product of Congress's and the SEC's regulatory policies.[552] Both consider technology a tool for bringing greater competition to the securities markets. Moreover, each has a vision of how that competition should operate. As we will discuss in more detail below, Congress saw the automation of securities markets as a way to promote its longstanding goal of a market in which investors would trade directly with one another without the intermediation of an exchange specialist or market maker. For its part, the SEC encouraged a structure in which markets compete for trading volume in each individual stock rather than for listings.

On objective measures, the current equity market structure is a great success. A retail investor today can trade with greater convenience and speed, and with lower commissions and spreads, than ever before.[553] Nevertheless, numerous commentators, most notably Michael Lewis, argue that the new stock market is rigged against the average investor.[554] The argument, in summary, is that exchanges and other trading centers collude with "high-frequency" proprietary traders to help those traders identify changes in market prices, order volumes, and other market information before the rest of the trading public has access to it, to the ultimate detriment of other investors.[555] Other commentators decry the growth of so-called "dark pools,"

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[552] *See* Lawrence Harris, *The Homogenization of U.S. Equity Trading 2* (2011), https://www.bankofcanada.ca/wp-content/uploads/2012/11/Larry-Harris.pdf ("decisions made by the SEC have effectively determined market structure for all US equities"). Harris is a former SEC Chief Economist.

[553] *See infra* Section 6.

[554] *See* Michael Lewis, *Flash Boys: A Wall Street Revolt* (2014); *see also* Jay Somaney, *Is Our Stock Market Rigged?*, FORBES (Aug. 24, 2015), http://www.forbes.com/sites/jaysomaney/2015/08/24/is-our-stock-market-rigged/#731a33291b15 ("Of late the most common question I get asked whether on the golf course or at dinner with friends is whether our markets are rigged?").

[555] Yesha Yadav refers to high-frequency traders as "structural insiders" and argues that their trading harms other investors similarly to traditional insider trading. *See* Yesha Yadav, *Insider Trading and Market Structure*, 63 UCLA L. REV. 968 (2016).

trading platforms that do not publicly display their quotations.[556] Commentators also criticize the fee structures that exchanges have implemented to attract order flow in a highly competitive market.

It is a safe bet that neither Congress nor the SEC foresaw how technology-based competition would unfold in practice. The number and importance of traditional intermediaries has in fact declined, but they have been replaced by high-frequency and other proprietary traders, not by a trading environment catering exclusively to long-term investors. The SEC required the traditional exchanges to open up their quotations to the public, but traders still hide their trading interest using dark trading venues and non-displayed order types. Competition among public trading markets is no longer based on different methods of bringing together buyers and sellers, like the old competition between the NYSE and Nasdaq, but on different incentive structures for attracting order flow.[557] The SEC appears to be having second thoughts about some aspects of the equity trading markets.[558]

This chapter was prepared for a conference exploring the desirability and structure of a new special study of the securities markets.[559] A companion chapter by separate authors addresses the financial economics literature, and we accordingly focus on the regulatory and legal aspects of trading markets.[560] Our objective is not to resolve all of the questions that commentators have raised about the new equity markets, but to lay the groundwork for a new

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[556] *See* Scott Patterson, DARK POOLS: THE RISE OF THE MACHINE TRADERS AND THE RIGGING OF THE U.S. STOCK MARKET (2012); Yesha Yadav, *Dark Pools and the Decline of Market Governance* (working paper, 2017).

[557] *Id*. at 2.

[558] *See* Market Structure Release, *supra* note 1; U.S. Securities and Exchange Commission, Securities Exchange Act Release No. 60997 (November 13, 2009) (hereafter "Non-Public Trading Interest Release") (proposing changes to rules regulating non-exchange trading platforms); U.S. Securities and Exchange Commission, Securities Exchange Act Release No. 60684 (September 18, 2009) (hereafter "Flash Order Release") (proposing rule changes to remove certain exemptions for orders that are canceled if not immediately executed).

[559] In 1961, Congress by joint resolution directed the SEC to "make a study and investigation of the adequacy, for the protection of investors, of the rules of national securities exchanges and national securities associations...." *See* Pub. L. No. 87-196, 75 Stat. 465 (1961). The SEC delivered its report in 1963. *See* U.S. Securities and Exchange Commission, Report of Special Study of Securities Markets, House Doc. 95, 88th Cong., 1st Sess. (1963).

[560] Ryan Davis & Erik R. Sirri, *The Economics of Trading Markets*, *supra*.

special study by surveying the state of market regulation, identifying issues, and offering preliminary evaluations.

Section 2 of the paper briefly describes existing trading markets and their functions. Sections 3, 4, and 5 survey the regulatory landscape, with Section 3 focused on the statutory scheme, Section 4 on the SEC's implementing regulations, and Section 5 on the largely judge-made regulation of fraudulent or manipulative trading. Section 6 identifies aspects of equity market structure that have generated criticism and merit further study. Section 7 discusses proposals for alternative market structures. Section 8 concludes.

2 The U.S. Equity Markets

A well-functioning secondary market for securities is essential to the health of the primary market in which businesses raise needed capital. Investors will more eagerly purchase shares in a company if they know they can sell the shares when desired on an efficient and low-cost secondary market. We describe the key operational features of the trading markets for equities, both conceptually and as they currently exist in the United States.

2.1 Nature and Functions

It is tempting to think of a stock market as a facility, physical or virtual, but it is better described as a set of rules and procedures pursuant to which investors buy and sell securities. Through those rules and procedures, the market attempts to attract enough trading interest to provide liquidity. Liquidity implies that there is only a small trade-off between speed and price. In a liquid market, someone wishing to trade can find a counterparty with minimal delay and the resulting trade will be at a price that is attractive to both parties, meaning that it reflects a consensus value of the security at the time of the trade.

A market may create the price dimension of liquidity by bringing together a sufficiently large and informed group of traders to offer both competition and effective price discovery. Alternatively, it may offer the opportunity to trade at prices derived from the primary market, meaning the market in which price discovery takes place. Trading markets typically attract both long-term investors and securities professionals who continuously gather information about traded companies and the trading interest of investors. Securities professionals may have a formal relationship with the market that imposes an obligation to quote prices or trade in order to provide liquidity to other traders. Alternatively, they may provide liquidity simply as a by-product of their attempt to earn trading profits.

Stock markets have generated liquidity in various ways at different times and places. Perhaps the easiest to understand, because it is analogous to markets in many other goods, is a dealer market. In a dealer market, intermediaries known as market makers or dealers continuously quote two-way prices—a "bid" price at which they are willing to buy, and an "ask" or offer price at which they are willing to sell. The difference, or spread, is their compensation for providing liquidity through their willingness to trade. Customers wishing to buy at the market price contact a dealer, either directly or through a broker, and purchase at the dealer's ask price or buy at its bid price. A dealer market is often referred to as "quote-driven" because the dealer's posting of bid and ask prices, or quotations, initiates the transaction process.

Virtually every dealer market throughout history, whether in grain, spices, jewels, foreign exchange, or any other tangible or intangible good, has attracted criticism because the dealers appear to make money for nothing; they neither manufacture nor improve the good being bought or sold. Stock markets are no different. As we will see, securities regulation is sometimes driven by the desire to maintain liquidity but avoid the spread.

A floor-based exchange is a different and somewhat more complex market. It is often referred to as "order-driven" because the transaction process originates with a customer's request to a broker to buy or sell, either at the market price (a "market" order) or a designated price (a "limit" order). Brokers holding buy and sell orders in a particular stock meet on the trading floor and participate in a two-way auction.

If the auction results in a price that both a buyer and seller are willing to accept, the trade can be agreed directly between the brokers acting as their agents. However, in case that does not occur, floor-based exchanges often incorporate dealers known as specialists. The specialist assigned to a stock is expected to quote two-way prices at all times to accommodate market orders that do not find a counterparty in the trading crowd.

In the continuous-auction model, limit orders supply liquidity apart from the specialist. Auctions on a stock exchange, like auctions at Sotheby's or eBay, generally follow rules of price and time priority. Imagine that since the time of the last trade in the stock of XYZ Corp. a potential trader—a broker holding a customer order, a dealer trading for its own account, or a specialist—has bid $25.00 for XYZ; no one has yet agreed to sell at that price nor bid as much. Shortly thereafter, a broker arrives at the trading post with a customer limit order to buy at $25.10. The limit order now has priority, meaning that the next market order to sell will be

matched with that limit order and execute at $25.10. Should there be multiple bids at $25.10, the one first in time will be matched with an incoming market order up to the number of shares subject to that bid.

A newer, and now dominant, form of market is an electronic limit order book, in which limit orders are entered and displayed electronically to attract trading interest. In both a traditional dealer market and a floor-based exchange, executions are done manually by telephonic or face-to-face interaction between the buying and selling broker. Electronic limit order books, by contrast, are automated. Marketable orders (market orders or limit orders that can be matched against a contra-side order at the same or a superior price) are executed electronically. These systems blur the distinction between a (professional) dealer and a (nonprofessional) investor and between an order-driven and quote-driven market. They also emphasize that ultimately a stock market is a set of rules that determine how potential buyers and sellers interact, now mostly implemented electronically by what is often called a "matching engine."

2.2 Institutions

The specific institutions that make up the current U.S. equity market fall into four broad categories, which we will describe briefly in turn.

2.2.1 Registered Exchanges

There are twelve securities exchanges registered with and regulated by the Securities and Exchange Commission (SEC) that trade common stocks and related products and seven that trade options.[561] The oldest and most prominent, the New York Stock Exchange (NYSE) was for most of its existence a traditional, floor-based exchange as described above. In response to technological, competitive, and regulatory developments, however, the NYSE now refers to itself as a "hybrid" between an automated and a manual market. It offers automated access to its publicly displayed quotations. It still, however, incorporates "designated market makers," the successors of the specialists, who trade to smooth order imbalances. Brokers overwhelmingly place orders and trade through its electronic trading system.

[561] Several of these are affiliated with other exchanges and operate under a single brand, such as the four exchanges owned by the NYSE parent company, Intercontinental Exchange (NYSE, NYSE MKT, NYSE Arca, and NSX), the 4 BATS exchanges, and the three Nasdaq exchanges.

The second most prominent exchange, Nasdaq, was not registered with the SEC as an exchange until 2006. It began as a decentralized dealer market that used computers to display quotations but not to match customer orders with those quotations. But today, Nasdaq is an entirely automated, electronic matching system.

As markets rely on software to match buy and sell orders automatically, the difference between an exchange and the other markets we will describe is increasingly a matter of the degree of organization and regulatory responsibility rather than the trading process itself.

2.2.2 Alternative Trading Systems

A significant portion of U.S. equity trading takes place through electronic limit order books owned and operated by broker-dealers. Historically, some display their limit orders publicly through a consolidated quotation system operated by the regulated exchanges. They are known formally as "electronic communication networks" or ECNs. Together with the registered securities exchanges, they make up what is popularly known as the "lit" market. Other proprietary systems do not publicly disseminate their orders and are known as "dark pools."

The distinction between lit and dark markets, however, is a matter of degree. Lit markets hold non-displayed orders. For example, a broker may hold a customer order but not make it public until it chooses to execute a trade. Lit markets also may permit non-displayed order types or display a smaller trading size than the actual order. Dark pools may communicate trading interest in the system to selected subscribers either as a formal offer or an indication of interest.

From a regulatory perspective, trading systems, whether lit or dark, that are not regulated as exchanges are known as "alternative trading systems" (ATSs). As of December 1, 2016, there are 82 ATSs registered with the SEC, although only around 30 are active in equities.[562]

2.2.3 Internalization

Broker-dealers also internalize orders. That is, they either match orders they hold as agent or take the other side of the trade as principal. A few dealers do a very large internalization business by paying retail brokers to route customer orders to the dealer. Retail orders are highly attractive because the dealer can earn a spread with little adverse selection risk. A substantial

[562] The list is available at *Alternative Trading Systems with Form ATS on File with the SEC* (November 4, 2016), https://www.sec.gov/foia/ats/atslist1116.pdf; *see also FINRA, OTC Transparency Data, ATS Data*, https://otctransparency.finra.org/TradingParticipants (ATSs reporting equity executions to FINRA).

portion of retail orders are internalized through payment for order flow arrangements.[563] Internalization is a type of dark liquidity, in the sense that broker-dealers do not publicly quote the prices and quantities at which they are willing to internalize orders.

The regulatory definition of an ATS excludes broker-dealer internalization. However, by SEC rule, dealers who execute trades must generally disclose information about execution quality.[564] At the end of 2016, 206 broker-dealers reported executions as internalizers and/or operators of ATSs.[565]

2.2.4 OTC

Equities that are not listed on a registered exchange are defined as over-the-counter (OTC) stocks. Some companies, mostly smaller and less-established ones, are not listed on an exchange. Their shares trade in a dealer market in which one or more dealers quote prices and customers or brokers bring market orders to a dealer for execution.

Dealers may also execute trades in listed stocks off the exchange. In the era of manual markets, institutional trades in listed stocks negotiated and executed with an OTC dealer were known as the "third market," while direct institution-to-institution trading was called the "fourth market." These terms have become less prevalent in the era of electronic trading.

2.3 Selection Among Trading Venues

Different markets may offer different non-price advantages or disadvantages to a would-be buyer or seller. These include commissions and fees and other transaction costs. A persistent issue for institutional investors is that their orders are relatively large and accordingly have market impact. Market (or price) impact refers to the tendency for prices to move in the direction of order flow, an effect that increases with order size.

One reason for this tendency is that large orders are more likely to be informed than small orders. Market makers and other traders move prices when attempting to protect themselves against adverse selection. Facing a potentially informed trader, they widen the spread.[566]

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[563] *See* Market Structure Release, supra note 549, at 21.

[564] *See* Rule 605 of Regulation NMS, 17 C.F.R. §242.605 (2016).

[565] The list is available at http://www.finra.org/industry/market-centers.

[566] *See* Lawrence R. Glosten & Paul R. Milgrom, *Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders*, 14 J. FIN. ECON. 71 (1985); Albert S. Kyle, *Continuous Auctions and Insider Trading*, 53 ECONOMETRICA 1315 (1985).

Empirically, however, even large uninformed trades (such as an index fund buying in response to cash inflows) produce temporary market impact. This is often described, tautologically, as a consequence of other traders buying (selling) in anticipation of the price rise (fall) created by a large order. A non-tautological explanation relies on the assumption that market makers do not like to hold large net long or short positions. If a large trader begins making purchases, the market makers who sell to it accumulate short positions. They may then increase their bid and ask prices to induce investors to sell to them and thereby get back to a neutral position. The large purchaser perceives itself being front run by the market makers, who perceive themselves as short covering.[567] However produced as a matter of theory, market impact is an important practical problem for institutional investors. Much of their trading strategy is designed to minimize it.

With this brief introduction to market structure, we turn to the regulatory system.

3. The Statutory Environment

3.1 Pre-1975

As initially enacted, the Securities Exchange Act of 1934 was concerned principally with securities exchanges, defined then and now as organizations that make available "a market place or facilities for bringing together purchasers and sellers of securities."[568] Most of its substantive provisions covered registered exchanges, their member broker-dealers, and listed securities and their issuers.

Section 12(a) of the statute bars brokers and dealers from transacting in any security on any exchange unless the security is registered on that specific exchange. In theory, this gives the listing exchange a monopoly on trading a listed stock. However, Section 12(f) originally gave the SEC the authority, upon application by an exchange, to afford unlisted trading privileges to a stock listed elsewhere. In the Unlisted Trading Privileges Act of 1994, Congress amended Section 12(f) to generally allow exchanges to trade unlisted stocks without SEC approval.[569]

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[567] *See* Phil Mackintosh, *The Need for Speed: It's Important, Even for VWAP Strategies*, KNIGHT CAPITAL GROUP NEWS & PERSPECTIVES, https://www.kcg.com/news-perspectives/article/the-need-for-speed-its-important-even-for-vwap-strategies.

[568] Securities Exchange Act 15 U.S.C. 78a-78kk (hereinafter SEA) § 3(a)(1).

[569] *See* Pub. L. No. 103-389, 108 Stat. 4081 (1994).

The Exchange Act also reflects the New Deal Congress's skepticism that specialists and other securities dealers add value.[570] Section 11 of the statute instructed the newly-created SEC to consider whether to ban principal trading by exchange members, either on or off the floor of the exchange.[571] Exercised to the fullest, the provision could have meant the end of the specialist. The SEC ultimately chose not to make such a fundamental change to the NYSE's structure.

In 1936, Congress amended Section 15 of the Exchange Act to mandate registration of broker-dealers operating in the over-the-counter (OTC) market.[572] Previously, the statute gave the SEC the authority to regulate OTC brokers if it chose. The Maloney Act of 1938 added Section 15A, authorizing any association of OTC broker-dealers to register with the SEC and gain regulatory power over its members similar to those of a registered exchange.[573] The National Association of Securities Dealers, Inc. (NASD) registered as the sole self-regulatory organization for OTC broker-dealers. In 2007, the NASD and NYSE merged their self-regulatory, enforcement, and arbitration arms to create the Financial Industry Regulatory Authority (FINRA), which regulates exchange and OTC trading markets and broker-dealers.

The Securities Acts Amendments of 1964 took a large step toward harmonizing treatment of the exchange and OTC markets by requiring large, widely-held companies whose equity securities were not traded on a regulated exchange to register those securities and become subject to periodic reporting and other requirements already imposed on exchange-traded companies.[574] The statute further required the NASD to adopt rules "governing the form and content of quotations" disseminated by its members.[575]

The timing of these amendments was significant because the development of minicomputers and related peripherals was about to make it possible for OTC market makers to disseminate quotes by screen rather than by paper and telephone. In the late 1960s, the NASD began work on an inter-dealer quotation network, Nasdaq, that began operation in 1971.

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[570] For a more thorough description of this issue, see Paul G. Mahoney, *The Stock Pools and the Securities Exchange Act*, 51 J. FIN. ECON. 343 (1999).

[571] *See* Act of June 6, 1934, § 11(a), 47 Stat. 891 (since repealed).

[572] Act of May 27, 1936, § 3, 49 Stat. 1377, codified as amended at SEA § 15.

[573] Act of June 25, 1938, 52 Stat. 1070, codified as amended at SEA § 15A.

[574] Pub. L. 88-467, § 3(c), 78 Stat. 566, codified as amended at SEA § 12(g).

[575] *Id.* at § 7(a)(7), 78 Stat. 577, codified as amended at SEA § 15A(b)(11).

3.2 Structural Change and the Paperwork Crisis

The rise of institutional investors during the 1960s put pressure on the NYSE's floor-based, continuous auction model. Institutions' share of trading volume on the NYSE nearly doubled from 28% in 1960 to 52% in 1969.[576]

Institutions typically trade in larger sizes than retail investors. The floor-based model did not entirely suit the needs of large traders, particularly their desire to minimize market impact. In the late 1960s, exchanges and their member brokers created new procedures for handling block trades, defined as trades of 10,000 shares or $200,000, whichever is less.[577]

Under those procedures, a broker holding an order of block size may solicit contra-side interest from other brokers or investors "upstairs," or off the trading floor. The broker, either acting as agent for both parties or taking the other side of the trade as principal, may then take the pre-negotiated "cross" to the floor for execution. The trade is executed under special rules of priority that generally permit the trading crowd or specialist to trade with the original order only if offering a better price than the crossed trade.[578] This block trading was accordingly a hybrid between over-the-counter and exchange trading and between dark and lit orders.

Institutions were also highly attentive to transaction costs, putting substantial pressure on the NYSE's fixed commission model. Institutions sometimes looked to the third market for less expensive execution of trades in listed stocks. They also demanded other services, including equipment and research, from their brokers. Mutual funds used brokerage commissions to reward brokers who sold the funds' products.

The NYSE, although forced to accommodate these changes, was uneasy with them. It argued that the securities laws should be amended to eliminate third-market and other off-exchange trading to prevent market fragmentation. Less sympathetic observers argued that the NYSE was simply trying to hamper competition and protect its commission structure.

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[576] Institutional Investor Study at 2168.

[577] NYSE Rule 127.10. For a description of the history of the NYSE's rules on block trading, see Division of Market Regulation, U.S. Securities and Exchange Commission, *Market 2000: An Examination of Current Equity Market Developments II-7* (1994).

[578] A detailed description of block trading and other crossed trades on the NYSE appears in Joel Hasbrouck, George Sofianos & Deborah Sosebee, *New York Stock Exchange Systems and Trading Procedures* (NYSE working paper, 1993).

A market crash at the end of the decade ensured that the NYSE would lose the argument. The Dow Jones Industrial Average fell by a third from early 1969 to mid-1970. Unprecedented trading volumes overwhelmed the cumbersome physical clearance and settlement process and caused further damage. The combination of falling prices and paperwork backlogs led to the failure of many smaller brokerage firms.

Congress responded by creating the Securities Investor Protection Corporation to protect customer accounts in the event of a broker's failure. It also began the process of amending the securities laws with the stated purpose of preventing a recurrence of the paperwork crisis. To set the stage for legislation, Congress instructed the SEC to study the role of institutional investors and report back its conclusions.

The SEC took this opportunity to pursue its own views about market structure. Contrary to the NYSE's desire to concentrate trading in listed stocks on the exchange, the SEC wanted to encourage competition among trading venues. But the mere existence of multiple trading venues was not, in the SEC's view, sufficient to produce effective competition. Each trading venue separately reported transaction prices and volumes in the stocks it traded. Dealer transactions off an organized market were not necessarily reported at all. There was even less pre-trade transparency because exchanges viewed their specialists' quotations as proprietary information. NYSE rules also limited member brokers' ability to buy or sell a listed stock off the floor of the exchange. A broker holding a customer market order and wanting to execute it at the best available price accordingly faced substantial hurdles.

In its report to Congress and a separate statement on the future of the trading markets, the SEC urged the creation of a central market, including links between venues trading listed stocks. It also raised concerns about the trading of unlisted securities in dealer markets, including the new Nasdaq market. The SEC suggested that interposing a dealer between the buyer and seller was not always necessary and might be unfair to customers. Dealer markets could be improved by introducing auction principles allowing customer orders to interact directly with one another.

Even before Congress acted, the SEC began to use its statutory authority over stock exchange rules to force changes at the NYSE. It adopted Rule 19b-3, banning fixed commissions on stock exchanges effective May 1, 1975.

3.3 The 1975 Securities Acts Amendments

Congress responded to the SEC's report with the Securities Acts Amendments of 1975.[579] They added Section 11A to the Exchange Act, giving the SEC new regulatory authority to spur the creation of a "national market system" (NMS).[580] Section 11A suggested that a broker holding a customer order to buy or sell a stock should be able to see the quotations in every market in which that stock traded and route the order to the market offering the best price.[581] It also called for SEC registration and regulation of securities information processors, or companies disseminating trade reports and quotations.[582]

Section 11A(a)(2) instructs the SEC to designate by rule the securities that will be eligible for trading in the national market system, termed "qualified securities" in the statute and "NMS securities" in the SEC's rules.[583] Congress did not, however, mandate any particular institutional structure for the trading markets but left it to the SEC to define and create the NMS.

The statute also changed the relationship between exchanges, clearing agencies, and the NASD, on the one hand, and the SEC, on the other.[584] It for the first time referred to the former entities as "self-regulatory organizations" (SROs)[585] but simultaneously inserted the SEC more deeply into their regulatory role. The SROs must submit most proposed internal rule changes to the SEC for approval after public notice and comment.[586] The SEC gained more authority to rescind or amend SRO rules.[587] The statute also codified the abolition of fixed brokerage commissions.[588]

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[579] Pub. L. 94-29, 89 Stat. 97.

[580] SEA §11A.

[581] *Id.* §11A(a)(1)(C)(iv).

[582] *Id.* §11A(b). The term "securities information processor" is defined in Section 3(a)(22).

[583] *See* Rule 600 of Regulation NMS, 17 C.F.R. §242.600.

[584] The statute also gave the SEC regulatory authority over municipal securities broker-dealers and expanded the regulation of the clearance and settlement process.

[585] *Id.* §3(6), 89 Stat. 100, codified at SEA §3(a)(26).

[586] *Id.* §16, 89 Stat. 147, codified as amended at SEA §19(b).

[587] *Id.* §16, 89 Stat. 150, codified as amended at SEA §19(c).

[588] *Id.* §4, 89 Stat. 107, codified as amended at SEA §6(e)(1).

The 1975 amendments authorized the SEC to pursue changes it had contemplated since at least the early 1970s. The next section describes how it used that authority.

4 Regulatory Implementation of the 1975 Amendments

4.1 Information Links

The SEC's early efforts to create a national market system focused on information linkages.[589] It took tentative steps in 1972 with the adoption of Rule 17a-15, which introduced consolidated reporting of transactions in listed stocks, whether taking place on the principal exchange, a regional exchange, or the third market. In particular, the rule required each securities exchange and securities association to adopt a transaction reporting plan to provide last-sale information for all transactions on its trading platform. Brokers and dealers were barred from transacting on a market unless the SEC declared its reporting plan effective. As a condition of effectiveness, the plan had to require any vendor purchasing transaction information to consolidate the information from all reporting markets into a single, real-time composite tape.

The 1975 amendments gave the SEC additional tools to require a consolidated system of transaction and quotation reporting, including direct regulatory power over securities information processors. The SEC accordingly amended and designated Rule 17a-15 as Rule 11Aa3-1 (the rules adopted under Section 11A have since been moved to Regulation NMS).[590] The amended rule continued to require effective transaction reporting plans but broadened the requirement to large-cap Nasdaq stocks as well as listed stocks. It also authorized SROs to act jointly to create transaction reporting plans.

The SEC also adopted Rule 11Ac1-1, requiring SROs to make the best bids and offers in their trading systems continuously available to quotation vendors.[591] A complementary

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[589] For further background and an insightful overview of secondary market issues at the turn of the millennium, see Laura Nyantung Beny, *U.S. Secondary Stock Markets: A Survey of Current Regulatory and Structural Issues and a Reform Proposal to Enhance Competition*, 2 COLUM. BUS. L. REV. 399 (2002).

[590] The rule is adopted under the provision of Exchange Act §11A(a)(3) authorizing the SEC to permit or require SROs to act jointly with respect to creating an NMS. The rule, as amended, has since been redesignated Rule 601 of Regulation NMS, 17 C.F.R. §242.601 (2016).

[591] Rule 11Ac1-1, as amended, has been redesignated Rule 602 of Regulation NMS, 17 C.F.R. §242.602 (2016).

provision, Rule 11Ac1-2, required that a securities information processor (SIP) display transaction and quote information on a consolidated basis.[592]

Pursuant to Rule 11Aa3-1, the NYSE, Amex, regional exchanges, and Nasdaq cooperated to create four separate transaction and quotation reporting plans: one for NYSE-listed securities, one for securities listed on other exchanges, one for Nasdaq and certain OTC securities, and one for listed options. The Consolidated Tape Association, owned by the exchanges, is the SIP for transaction and quote data for listed securities; Nasdaq is its own information processor. Brokers operating alternative trading systems report trades executed in the system to an SRO-operated market where they "print," or are publicly identified, as trades on the relevant venue. The SIP accordingly consolidates across all exchanges "core data" consisting of last-trade reports and each exchange's current highest bids and lowest offers for each security.[593] For each stock, the overall highest bid and lowest offer provided to the SIP and disseminated by it pursuant to a national market system transaction reporting plan are known as the national best bid (NBB) and national best offer (NBO), collectively called the NBBO.[594]

As the national market system developed, a broker holding a customer order had many options for executing that order. The SEC accordingly adopted rules designed to give customers information about executions and order routing that could help them monitor their brokers. Rule 11Ac1-3 required brokers opening a new customer account to give the customer information about the broker's policies regarding payment for order flow.[595] Rule 11Ac1-5 required execution venues to provide summary information about the quality of executions, including information about execution speeds, prices relative to the NBBO, and average effective and

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[592] Rule 11Ac1-2, as amended, has been redesignated Rule 603 of Regulation NMS, 17 C.F.R. §242.603 (2016).

[593] *See* 17 C.F.R. §§ 242.601, 242.602 (2015) (requiring exchanges to report last sales—price and size of the most recent trades—and current best bids and offers); NetCoalition v. SEC, 615 F.3d 525, 529 (D.C. Cir. 2010) (discussing the core data regime).

[594] *See* Rule 600(b)(42) of Regulation NMS, 17 C.F.R. §242.600(b)(42) (2016).

[595] Rule 11Ac1-3, as amended, has been redesignated Rule 607 of Regulation NMS, 17 C.F.R. §242.602 (2016).

realized spreads on orders of different sizes.[596] Rule 11Ac1-6 required broker-dealers to disclose summary information about their order routing decisions.[597]

4.2 Order Handling and Execution

4.2.1 ITS

In the 1975 amendments, Congress encouraged the SEC to remove barriers to competition between markets. The SEC interpreted the statutory language not merely to give it authority to require information linkages, but to regulate order handling and execution within each trading platform—in short, to shape the institutional structure of the markets by rule.[598]

Its first exercise of this authority came in 1978. The SEC encouraged the NYSE, Amex, and several regional exchanges to create an Intermarket Trading System (ITS).[599] The ITS created an electronic link between the exchanges allowing brokers to route market orders to the exchange offering the best price at the time of the order.

The rules of the participating exchanges were amended to discourage trade-throughs, or executions in one market at a price inferior to that available in another linked market. In general, those rules gave a broker a right of redress when an order it publicly displayed was traded through.[600] The ITS reflected the SEC's view that it could and should change the rules and procedures of individual trading venues to require member brokers to take market orders to the market offering the best price regardless of the broker's or even the customer's preferences.

4.2.2 NYSE Rule 390

The ITS integrated the regional exchanges with the principal exchanges. Bringing the third market fully into the ITS took another two decades. The NYSE's Rule 390, which (with

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[596] Rule 11Ac1-5, as amended, has been redesignated Rule 605 of Regulation NMS, 17 C.F.R. §242.605 (2016).

[597] Rule 11Ac1-6, as amended, has been redesignated Rule 606 of Regulation NMS, 17 C.F.R. §242.606 (2016).

[598] This was not an uncontroversial reading of the statute. *See* Dale A. Oesterle, *Congress's 1975 Directions to the SEC for the Creation of a National Market System: Is the SEC Operating Outside the Mandate?* AMERICAN ENTERPRISE INSTITUTE MONOGRAPH (May 2003).

[599] *See* Securities Exchange Act Release No. 14416, 43 Fed. Reg. 4354, 4357 (1978).

[600] *See* Order Approving Proposed Rule Changes, Midwest Stock Exchange, Inc., *et al.*, Exchange Act Release No. 17704, 46 Fed. Reg. 22520 (1981).

some exceptions) required that any NYSE member firm's principal trades in listed stocks take place on the exchange, stood in the way of complete integration.

In 1980, the SEC adopted Rule 19c-3, which made Rule 390 inapplicable to any stock listed after April 26, 1979. In 1982, the SEC required the exchanges and the NASD to extend the ITS to third market makers with respect to "Rule 19c-3" stocks not grandfathered into Rule 390. It was not until the end of 1999, however, that the NYSE, under SEC pressure, proposed to eliminate Rule 390 altogether.[601]

4.2.3 The Order Handling Rules

In the early 1990s, an academic study of the Nasdaq market created momentum for new and consequential market structure regulations. The study found that Nasdaq market makers rarely quoted prices in odd eighths.[602] In other words, the typical spread was at least 25 cents even though the minimum price increment at the time was 12.5 cents. Although there were potentially innocent explanations for the practice, the SEC concluded that Nasdaq's rules and procedures did not provide competitive pricing to retail investors.

Market makers at that time were under no obligation to display customer limit orders. A market maker might accordingly quote $20 bid, $20.25 ask and receive a customer limit order to sell at $20.125. The market maker might or might not choose to "price improve" and fill the customer order at the limit price. If it chose not to do so, the order remained on its books, to be executed only when the market maker's bid price reached $20.125. In the meantime, incoming market orders to buy would execute at the market maker's $20.25 ask rather than at the customer limit price.

From Nasdaq's perspective, this was a fundamental design feature of the competing market-maker model. The NYSE assigns a single specialist to a stock, but that specialist maintains a central limit order book containing limit orders that brokers have left with the specialist. Orders on the book are executed under auction principles offering price/time priority. Customer orders on an exchange accordingly interact with one another and thereby compete with the specialist's quotations. In a market-maker system, the market maker internalizes orders,

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[601] *See* Securities Exchange Act Release No. 42758, https://www.sec.gov/rules/sro/ny9948o.htm.

[602] *See* William G. Christie & Paul H. Schultz, *Why do NASDAQ Market Makers Avoid Odd-Eighth Quotes?*, 49 J. FIN. 1813 (1994). Specifically, Christie and Schultz studied 100 actively traded Nasdaq-listed stocks and found that 70 almost never traded at an odd eighth. For the remaining stocks, odd eighth quotes were observed, although even eighths were more common.

executing them against its own public quotes rather than against limit orders it or another dealer holds. It therefore captures the spread on most or all trades. Competition comes from the existence of multiple market makers in a stock, not from direct interaction of customer orders.

The SEC, however, concluded that requiring market makers to display price-improving customer limit orders would reduce spreads, reviving a concept it had first floated in the 1970s. It accordingly adopted the so-called Order Handling Rules in 1996 to take effect in 1997.[603] New rule 11Ac1-4 required a market maker, with certain exceptions, to publish the price and size of any customer limit order that either improved the market maker's quotation or increased size at the quoted price.[604]

The Order Handling Rules also included an amendment to Rule 11Ac1-1 requiring a market maker that posts a quotation in an electronic communications network to make the same price available, in at least the minimum quote size, in the primary market. The ECN itself may meet the market maker's obligation by including its best bid and offer in the consolidated quotation system and providing all broker-dealers the ability to execute a trade against its public quote.

The number and trading volumes of ECNs increased after adoption of the Order Handling Rules. There is ample reason to think there is a causal link. Rule 11Ac1-4 ensured that orders submitted to an ECN could appear on Nasdaq screens in direct competition with market maker quotes. While prior rules mandating communication linkages indirectly affected market structure, the Order Handling Rules directly mandated a new type of competition among trading platforms.

It is also worth noting that the Order Handling Rules did *not* require that public orders take priority over securities professionals trading for their own account, a policy goal the SEC suggested as far back as 1973.[605] For a time, the Nasdaq market remained a decentralized dealer market based principally on internalization of customer orders. A dealer willing to match the best

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[603] *See* Order Execution Obligations (Rules 11Ac1-4 and 11Ac1-1), Securities Exchange Act Release No. 37619A, https://www.sec.gov/rules/final/37619a.txt.

[604] Rule 11Ac1-4, as amended, has been redesignated as Rule 604 of Regulation NMS, 17 C.F.R. § 242.604.

[605] *See* Securities and Exchange Commission, *Policy Statement on the Structure of a Central Market System* (1973).

bid or offer in the system could execute a customer market order as principal even though another dealer held a customer limit order at the same price.

4.3 Regulations ATS and NMS

After adoption of the Order Handling Rules, the SEC accelerated the pace of regulating market structure. In addition to the final abolition of NYSE Rule 390, discussed above, the most important developments were the adoption of Regulations ATS and NMS, which together exert a substantial influence on how equity markets operate today.

4.3.1 Regulation ATS

In 1969, Institutional Networks Corp. (later Instinet) began operation as an electronic trading system. Unlike Nasdaq, which gave dealers the opportunity to update and display their quotations on-screen, Instinet catered to institutional investors, allowing them to trade directly with one another without a dealer. Investors could enter limit orders and indications of interest into the system. Initially handling listed stocks in competition with the third market, Instinet and other proprietary trading systems would later become a major presence in Nasdaq stocks.

The question naturally arose whether these systems are exchanges. Both Nasdaq and Instinet operate facilities for bringing together buyers and sellers and therefore meet the statutory definition of an exchange. But the definition itself is overbroad. A telephone system brings together buyers and sellers of securities, but it was never thought necessary to register AT&T as a securities exchange. The SEC did not push the regulatory definition to its limit, but applied the term only to organizations that centralized quotations on a continuous basis and executed trades.[606]

It was not terribly consequential whether Nasdaq was required to register as an exchange. The market was operated by the NASD, an organization with regulatory powers similar to those of an exchange and subject to similar SEC oversight. Soon the SEC would begin adding the term "or interdealer quotation system" alongside the term "exchange" in many of its regulations.

Instinet, however, was not initially a regulated entity. In 1969, the SEC accordingly proposed a rule regulating "automated trading information systems," defined as automated systems for communicating indications of interest or offers to buy or sell securities.[607] The proposed regulation, Rule 15c2-10, would have required such systems to file and have the SEC

[606] *See* Securities Exchange Act Release No. 27611, 55 Fed. Reg. 1890, 1900 (1990).

[607] *See* Securities Exchange Act Release No. 8661, 34 Fed. Reg. 12952 (1969).

declare effective a plan describing the system and its rules and agreeing to maintain certain records.

As the SEC considered the proposed rule, however, Instinet sought to register as a broker-dealer, offering a different solution to the regulatory gap. As a registered broker-dealer, Instinet would be subject to SEC and NASD oversight. Moreover, by becoming a member of one or more exchanges, Instinet could access the order book of those exchanges. Eventually, it would offer its institutional subscribers "direct market access," or the ability to look through the broker-dealer and interact directly with the exchange's order book.

Instinet registered as a broker-dealer and became a member of several regional exchanges, and the SEC did not adopt proposed rule 15c2-10. Instinet and other proprietary computer-based trading systems expanded and competed with the primary markets—the NYSE, Amex, and Nasdaq—for institutional and broker-dealer order flow. They offered investors the opportunity to enter orders and have them matched automatically and rapidly by computer algorithm.

Although initially conceived as a way to facilitate block-size trades in listed stocks, this did not become the mainstay of the ECNs' business. When limit orders did not match internally, the ECNs needed a way to access other sources of liquidity. Accessing manual orders on the floor of an exchange was cumbersome compared to accessing market maker quotations through a Nasdaq terminal. The ECNs therefore came to specialize in trading Nasdaq stocks until the NYSE's transformation into a largely electronic market.

As ECNs grew, they became unwilling to rely solely on informal guidance from the SEC staff and sought formal assurance that the Division of Market Regulation would not recommend enforcement action should a system not register as an exchange. In the mid-1980s, the Division issued several no-action letters to electronic trading systems conditioned on their providing various ongoing data to the SEC.[608] The SEC would later formalize the reporting conditions in these no-action letters by adopting Rule 17a-23.[609] The rule required any registered broker-dealer operating an automated trading system to report information about participants, orders, trades, and other data to the SEC on a quarterly basis.

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[608] A list of no-action letters appears in Securities Exchange Act Release No. 26708, 54 Fed. Reg. 15429, 15430 n. 3 (1989).

[609] Rule 17a-23 was repealed by the Regulation ATS adopting release cited *infra* note 613.

Traditional stock exchanges complained that the SEC's use of the no-action approach rather than formal rulemaking kept the exchanges from participating in the regulatory process. They argued, moreover, that the proprietary networks would likely be fair-weather markets. During times of substantial volatility, liquidity might disappear on the electronic markets, leaving the slack to be picked up by stock exchange specialists, who are required to maintain orderly markets, and Nasdaq market makers, who are required to quote continuous two-way prices.

At the same time, the SEC became concerned about market fragmentation. In particular, it worried that orders in the public markets did not necessarily interact with those in the proprietary systems. Retail investors might therefore receive inferior prices to those available to institutions trading in the automated systems. The concern was not hypothetical; the SEC found that some Nasdaq market makers quoted prices on Instinet that were better than their quotes in the Nasdaq system.[610]

Ironically, however, the 1975 National Market System amendments complicated the SEC's attempts to bring proprietary trading systems into the national market system. The amendments were drafted under the assumption that a stock exchange would be a membership organization and that its members would all be registered broker-dealers.[611] ECNs operated on a different business model; they were proprietary and allowed direct access to institutional investors. They could not maintain that business model and comply with the Exchange Act's requirements for registered exchanges. Any integration of those systems into the national market system, accordingly, would have to take place under the rubric of broker-dealer regulation.

In 1996, as part of the Order Handling Rules, the SEC required stock exchange specialists and Nasdaq market makers to make publicly available any price quoted on a proprietary system representing an improvement on their displayed prices.[612] Shortly thereafter, Congress gave the SEC general exemptive authority, making it possible for the SEC to expand its interpretation of

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[610] *See* Securities Exchange Act Release No. 38672, 62 Fed. Reg. 30485, 30492 (1997).

[611] *See, e.g.*, Securities Exchange Act §6(b) (regulating the relationship between an exchange and its members); §6(c) (requiring that members be registered broker-dealers).

[612] *See* Securities Exchange Act Release No. 37619A, 61 Fed. Reg. 48290 (1996) (adopting the so-called "Order Handling Rules").

the term "exchange" while applying different regulatory standards to different types of exchanges.

The SEC accordingly overhauled its rules relating to exchanges and other markets in 1998.[613] The new rules define an "exchange" to include any organization that brings together the orders of multiple buyers and sellers and uses non-discretionary rules or processes to execute trades.[614] The definition excludes broker-dealer internalization. In the adopting release, the SEC also declared that it had no objection to a registered exchange demutualizing and operating as a for-profit organization, which the registered exchanges have subsequently done.[615]

Not every entity meeting the broad definition of "exchange" must register as such. An "alternative trading system" (ATS), defined as an exchange that does not operate as a self-regulatory body (that is, does not seek to regulate the conduct of its subscribers apart from their use of the system) may instead operate under Regulation ATS.[616]

Regulation ATS keeps in place the longstanding practice under which ATSs register as broker-dealers. As the adopting release summarizes, any ATS handling less than five percent of the aggregate trading volume in each security it trades need only "(1) file with the Commission a notice of operation and quarterly reports; (2) maintain records, including an audit trail of transactions; and (3) refrain from using the words 'exchange', 'stock market', or similar terms in its name."[617]

However, any ATS that handles at least 5% of the trading volume in any national market system security is potentially subject to two forms of integration into the national market system under the "order display" rule and the "fair access" rule of Regulation ATS. The order display rule requires an ATS that displays subscriber orders to potential counterparties to create a link to an exchange or securities association to display the best bid and offer in its system for any such security. It must also allow any member broker-dealer of the linked exchange or association to execute trades using the same rules of priority as the linked exchange or association.

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[613] *See Regulation of Exchanges and Alternative Trading Systems*, Securities Exchange Act Release No. 40760, 63 Fed. Reg. 70844 (1998) ("ATS adopting release").

[614] 17 C.F.R. § 242.3b-16(a) (2016).

[615] *See* ATS adopting release, *supra* note 613, at 70848.

[616] 17 C.F.R. §§ 242.300 – 303 (2016).

[617] ATS adopting release, *supra* note 613, at 70847.

The "fair access" rule applies at the same volume threshold but does not apply to an ATS that uses strictly passive pricing (that is, pricing derived from public last-sale prices) and that does not display orders. It requires an ATS to establish written standards for subscriber access and permit any person meeting those standards to subscribe.

In principle, then, Regulation ATS inaugurated a process of bringing ATSs into the national market system by bringing their best bids and offers into the public quote stream and giving the public the ability to execute against them. But the regulation has not been the primary driver of integration. Individual ATSs have generally not accounted for a sufficient portion of trading in individual stocks to trigger the order display and fair access requirements.[618] Individual ATSs choose to be a "lit" ECN or a dark pool for reasons of business strategy rather than regulatory requirement. Moreover, even a large dark pool could avoid triggering the order display rule by not displaying system orders to other subscribers, but instead communicating only indications of interest.

In 2009, the SEC proposed to amend Regulation ATS to broaden application of the order display rule. The proposed amendments would lower the threshold for public display of ATS best bid and offer quotations dramatically, to 0.25% of trading volume.[619] They would also define certain indications of interest as orders. Operators of ATSs argued that the existence of non-displayed pools of liquidity was not a new phenomenon and was not detrimental to public investors.[620] At the time of this writing, the amendments have not been adopted.

4.3.2 Regulation NMS

In 2005, the SEC reorganized existing regulations adopted pursuant to the 1975 national market system amendments and added significant new regulations. Rules previously adopted under Section 11A and described above were moved to a new Regulation NMS.

The most notable and controversial of the new rules was the so-called trade-through rule, or in the SEC's terminology the order protection rule, Rule 611.[621] Recall that the ITS Plan

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[618] *See Regulation of Non-Public Trading Interest*, Securities Exchange Act Release No. 60997, at 24 ("Few if any dark pool ATSs exceed the 5% threshold for any NMS stocks…").

[619] *Id.*

[620] *See* Goldman Sachs Group, *Market Structure Overview* (Sept. 2009), https://www.sec.gov/comments/s7-21-09/s72109-53.pdf.

[621] Rule 611 of Regulation NMS, 17 C.F.R. §242.611.

requires the participating exchanges to take certain steps to discourage trade-throughs in listed stocks. By contrast, the order protection rule imposes a mandatory requirement that every exchange, securities association, and ATS adopt rules reasonably designed to prevent trade-throughs of "protected quotations" in NMS stocks.[622] Protected quotations are the best publicly displayed bid and offer on the exchanges or OTC market, but only to the extent those quotations can be automatically accessed. An order on a floor-based exchange that would require manual execution is not a protected quotation.

Rule 611 is designed in part to protect investors entering market orders from receiving inferior prices. This is not, however, the principal objective. A broker acting as the customer's agent owes a duty of best execution that would usually (although not always) lead the broker to route the order to the trading venue offering the best price even without a trade-through rule. Exceptions would occur when the customer instructs the broker to trade in a particular venue or when the customer or broker believes trading through the best bid or offer could reduce market impact. In short, trade-through protection is not principally for the benefit of market orders.

Instead, the rule was justified as an attempt to reward and thereby encourage the provision of liquidity through limit orders. If a trader knows that any limit order he or she enters will be protected against a trade-through when it is the best-priced bid or offer, traders will be more likely to enter limit orders, all other things equal.

There is room for debate, however, about whether the order protection rule was necessary for this purpose. The two dissenting commissioners argued that there was little evidence that trade-throughs were a problem on Nasdaq (which was not subject to the ITS trade-through rules) or that traders were discouraged from entering limit orders there. Some commentators had argued in favor of an opt-out provision that would have permitted the trader entering a market order to ignore the best-priced order, presumably pursuant to a trading strategy designed to reduce market impact. The final rule did not include an opt-out, consistent with the view that the principal beneficiaries of trade-through protection are those who enter limit orders.

A related provision, Rule 610(d), requires SROs to prohibit a trading venue from displaying quotations that lock or cross protected quotations. A bid price in one market that equals the (previously entered) ask price in another "locks" that quotation, while a bid price that

[622] At the time of Regulation NMS's adoption, Nasdaq was not yet a registered exchange. Rule 611 accordingly extended trade-through protection for the first time to Nasdaq NMS stocks.

exceeds that ask price "crosses" the quotation. Similarly, an ask price that is the same or less than a previously entered bid locks or crosses that quote, respectively.

The logic behind the rule is that submitting a locking or crossing quotation is a way to avoid trading with the best bid or offer without violating the trade-through rule. Imagine, for example, that a trader prefers to trade in Venue A rather than Venue B, perhaps because the former typically has better depth, resulting in less price impact. At some point in time, Venue B displays an ask price of $20.01 for a particular stock, while Venue A displays an ask price of $20.02. Absent the trade-through rule, the trader would simply ignore the quote in Venue B and purchase the shares offered at $20.02 in Venue A. But the trade-through rule prohibits this.

An alternative strategy to execute the trade in Venue A is to post a bid at $20.01 there in hopes that the bid will attract trading interest. Note that this strategy locks the ask price in Venue B and is inconsistent with the spirit of the trade-through rule, which aims to reward the person posting the best ask. Rule 610(d) comes to the rescue of Venue B by forbidding Venue A to display the $20.01 bid.

Regulation NMS also regulates execution access to quotations displayed by various markets. Effective trade-through protection requires that brokers be able to route customer orders quickly to the venue providing the best price. As described above, the SEC spurred the creation of the ITS that facilitated routing among exchanges. However, Regulation NMS does not mandate the use of the ITS or any other specific link between trading centers. In practice, exchanges and ATSs typically offer brokers private links to their systems, giving those willing to pay for such links rapid execution access to displayed quotations. Rule 610(a) prohibits SROs from imposing unfairly discriminatory terms that inhibit customer access, through member brokers, to trading facilities regulated by the SRO.

Rule 610(c) caps fees for access to quotations. In particular, no trading center can charge more than $0.003/share for execution access to a protected quotation or to certain other displayed quotations. The rule effectively limits the amount of the "take" fee imposed pursuant to a maker-taker fee structure, described in more detail in Section 6.2.2 below.

Finally, Regulation NMS added a new "sub-penny" provision, Rule 612, restricting trading venues from quoting or accepting quotations in increments of less than one penny so long as the stock price is at least $1.00. The rule was designed to prevent traders from stepping ahead, or making an economically inconsequential improvement to the best quotation in order to obtain

priority over it. In effect, the practice of stepping ahead is inconsistent with the spirit of the price/time priority system, which gives priority to the first-in-time order at a given price until an economically superior price is quoted. Rule 612 does not, however, forbid executing trades in sub-penny increments. A crossing network that executes trades at the midpoint of the quoted spread can execute in a half-penny increment. Similarly, a broker-dealer internalizing an order can price improve by less than a penny.

Adoption of Regulation NMS, like adoption of the order handling rules, was followed by significant changes in market structure that are likely due, at least in part, to the regulatory change. Shortly before the final adoption of the rule, both the NYSE and Nasdaq acquired ECNs and prepared to transform themselves into mostly electronic markets allowing for automated execution against publicly displayed quotations. New exchanges and ATSs quickly began operation. In particular, the number of ATSs operating as dark pools increased from 10 in 2002 to 29 in 2009.[623]

5 The Regulation of Trading Practices

The centerpiece of the Securities Exchange Act, for the purposes of regulating misconduct by traders, is § 10(b) and Rule 10b-5 promulgated thereunder. Section 10(b) broadly prohibits any "manipulative or deceptive device[s] or contrivance[s] in contravention of" rules and regulations prescribed by the SEC "as necessary or appropriate in the public interest or for the protection of investors."[624] Rule 10b-5, adopted without fanfare in 1943, has served for more than eighty years as the workhorse of federal securities enforcement.[625] It prohibits, *inter alia*, "in connection with the purchase or sale of any security," employing "any device, scheme, or artifice to defraud" and engaging "in any act, practice, or course of business which operates or would operate as a fraud or deceit upon any person." The most important forms of trader misconduct proscribed under § 10(b) are insider trading and manipulation.

5.1 Insider Trading

Alongside the rise of high-frequency trading, perhaps no aspect of securities law has ignited the popular imagination as much as insider trading law, which generally prohibits

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[623] *See Regulation of non-public trading interest*, *supra* note 618, at 6 (increase from 2002 to 2009).

[624] 15 U.S.C. § 78j(b).

[625] 17 C.F.R. § 240.10b-5.

individuals from trading while in possession of material nonpublic information in violation of a duty owed to their employer. The modern story of insider trading law begins with the Supreme Court's decision in *Chiarella v. United States*,[626] which held that an insider has no duty to disclose material, nonpublic information or abstain from trading under § 10(b) based on "the mere possession of nonpublic information."[627] *Chiarella* articulated the "classical" theory of insider trading that a trade based on material nonpublic information violates Rule 10b-5 if alongside possession of material nonpublic information there was "a relationship of trust and confidence between the parties to a transaction."[628] The Supreme Court subsequently supplemented it with the "misappropriation" theory of insider trading in the *O'Hagan* case,[629] which held that transactions based on material nonpublic information violate Rule 10b-5 when the trade "was in breach of a duty [of loyalty and confidentiality] owed to the source of the information."[630] While the classical theory would only seem to reach corporate insiders of an issuer of securities, who plausibly owe a duty to all the shareholders of that firm who own its securities, the misappropriation theory reaches beyond insiders of the issuer to insiders within other institutions who possess material nonpublic information about the issuer, and may owe their own institution a duty of loyalty. In other words, the "relationship of trust and confidence" need no longer exist "between the parties to a transaction" for the purposes of insider trading law.

The source of additional complications—and an issue recently ruled upon by the U.S. Supreme Court—is the applicability of Rule 10b-5 to persons who directly or indirectly learn of (and trade on) material nonpublic information ("tippees") from a person who, if he traded on that

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[626] 445 U.S. 222, 235 (1980). The origins of federal insider trading law begin with the SEC's opinion in *Cady, Roberts & Co*., 40 S.E.C. 907 (1961), finding that a person with a special relationship with a company violates Rule 10b-5 if that person trades the company's stock while in possession of material nonpublic information without first disclosing it. The Second Circuit, in *SEC v. Texas Gulf Sulphur Co*., 401 F.2d 833 (2d. Cir. 1968), radicalized *Cady, Roberts* by dispensing with the special relationship requirement and holding that "*anyone* in possession of material inside information must either disclose it to the investing public or . . . must abstain from trading . . . while such inside information remains undisclosed." *Id.* at 848.

[627] 445 U.S. 222, 235 (1980).

[628] *Id.* at 230.

[629] United States v. O'Hagan, 521 U.S. 642 (1997).

[630] *Id. at 652.*

information himself, would be acting unlawfully ("tippers").[631] Tippees will often owe no duty of loyalty or confidence to either an issuer or an institution holding material information about the issuer, but the Supreme Court inventively found a way to apply insider trading laws to both tippers and tippees. In *Dirks v. SEC,* the Court held that "a tippee assumes a fiduciary duty to the shareholders of a corporation not to trade on material nonpublic information [] when the insider has breached his fiduciary duty to the shareholders by disclosing his information to the tippee and the tippee knows or should know that there has been a breach,"[632] and, in addition, for the tipper to breach her duty to the shareholders, the source must "personally . . . benefit, directly or indirectly, from [her] disclosure."[633] A tippee, effectively, is deemed to have become a "participant after the fact" in the tipper's breach of her relationship of trust and confidence to an issuer when the tipper provided information to someone likely to trade on it. Further downstream tippees, who receive information from a predecessor tippee, can also violate Rule 10b-5, either through awareness of the breach by the original source, including her personal benefit,[634] or where the downstream tippee is breaching her own duty of confidentiality to the person providing her with the information.[635]

The issue of tipper liability recently returned to the Supreme Court in *United States v. Salman*,[636] where the Court analyzed the gift prong of the personal benefit test as applied to a remote tippee. In *Salman*, the tipper and initial tippee had clearly violated Rule 10b-5. The

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[631] For a fuller discussion of these issues, see Merritt B. Fox, Lawrence R. Glosten & Gabriel V. Rauterberg, *Informed Trading and its Regulation*, J. CORP. L. (forthcoming 2018), and the literature discussed there.

[632] 463 U.S. 646, 660 (1983) (citation omitted).

[633] *Id.* at 662. Where an insider provides a gift of information to a relative or friend, the personal benefit requirement is also satisfied. *Dirks*, 463 U.S. at 664. *See also* Adam C. Pritchard, *Dirks and the Genesis of Personal Benefit*, 68 SMU L. REV. 857 (2015) (discussing the origins of the personal benefit test).

[634] *See, e.g.*, SEC v. Musella, 678 F.Supp. 1060, 1062-64 (S.D.N.Y. 1988) (defendants "should have known that fiduciary duties were being breached with respect to confidential, non-public information"); *In re* Motel 6 Sec. Litig., 161 F. Supp. 2d 227, 242 (S.D.N.Y. 2001) ("a defendant's subjective belief that information received 'was obtained in breach of a fiduciary duty . . . may . . . be shown by circumstantial evidence'").

[635] In each of these two cases, if someone who himself is prohibited from trading instead, or in addition, tips someone else, he would violate Rule 10b-5 as a tipper.

[636] Salman v. United States, 580 U.S. __ (2016).

dispute concerned the defendant, who had received information from the initial tippee and knew the improper origin of the information, but argued that there was no evidence that the tippee had received a personal benefit from communicating the information, as the Second Circuit's decision in *United States v. Newman*,[637] supposedly required. The Court clarified that the tipper need not receive a pecuniary benefit, and that a close familial relationship or friendship was sufficient to infer that the defendant receiver a personal benefit from making a gift.

The tipping situations above involved information originating within an issuer. The law differs for information originating within an institution other than the issuer and importantly discriminates between two distinct scenarios. In the first, a source with a duty of confidentiality to an institution willingly provides material nonpublic information to a tippee who has no duty to that institution. The tipper had no authorization to disclose the information, and the tippee trades based on it. Here, the tipper violates Rule 10b-5 under the misappropriation theory by breaching a duty of confidentiality in providing information to an individual likely to trade based on it.[638] The tippee violates Rule 10b-5 if he was aware of the breach by the source when trading due to the information.[639] In the second scenario, a tippee owes a duty of confidentiality to the tipper and/or her employer institution and does not know the tip to be authorized. Here, the tippee violates the misappropriation theory quite clearly. Further downstream tippees can also violate Rule 10b-5 under applicable versions of the "participant after the fact" and misappropriation theories.

While the academic debate regarding the desirability of insider trading law continues,[640] the law remains politically popular and vigorously enforced. In light of this reality, practically

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[637] 773 F.3d 438 (2d Cir. 2014).

[638] *See, e.g.*, SEC v. Yun, 327 F.3d 1263, 1274-75 (11th Cir. 2003); SEC v. Gansman, 657 F.3d 85, 92 (2d Cir. 2011); 18 DONALD C. LANGEVOORT, INSIDER TRADING REGULATION, ENFORCEMENT AND PREVENTION § 6:13 (2015).

[639] *See, e.g.*, United States v. Falcone, 257 F.3d 226, 234 (2d Cir. 2001) ("the government was simply required to prove a breach by Salvage, the tipper, of a duty owed to the owner of the misappropriated information, and defendant's knowledge that the tipper had breached the duty").

[640] The range of classic papers on insider trading is far too vast to summarize, but for two recent analyses reflecting the current state of debate, *see, e.g.*, Stephen Bainbridge, An Overview of Insider Trading Law and Policy, *in* RESEARCH HANDBOOK ON INSIDER TRADING 1 (Stephen M. Bainbridge ed. 2013), and Laura Nyantung Beny, *Insider Trading Laws and Stock Markets Around the World: An Empirical Contribution to the Theoretical Law and Economics Debate*, 32

open questions largely concern how an optimal anti-insider trading regime should work. Here, a series of separate issues appear, including whether we should replace our current common law approach with a statutory one, and how to resolve ongoing debates regarding the scope of tippee liability. In particular, *Salman* fails to provide precise answers regarding fact patterns in which material nonpublic information is provided as a gift among acquaintances in social contexts in the financial world. Careful analysis could provide clarity for courts in this regard.

5.2 Manipulation

Securities manipulation is expressly prohibited by statute, but notoriously difficult to define, analyze, or prosecute. There are two express prohibitions. Section 10(b) prohibits the use of "any manipulative or deceptive device" in connection with trading a security in contravention of rules promulgated by the SEC.[641] Section 9(a)(2) proscribes effecting "a series of transactions" in a security (i) that "creat[e] actual or apparent active trading" or affect its price, (ii) "for the purpose of inducing the purchase or sale of such security by others."[642] While § 9(a)(2)'s language may seem clearly applicable to manipulation, its jurisprudence has failed to robustly develop for a number of reasons,[643] leaving § 10(b) as the basis of most manipulation enforcement.

Scholarship has identified three principal forms of manipulative activity: manipulations involving misrepresentations, such as driving up a stock's price by making false statements about its value, which is ambiguously similar to fraud; transaction-based manipulations, based on trading a security to affect its price, where the manipulation's profitability arises from a distinct

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J. CORP. L. 237 (2007) (hereinafter Beny, *Insider Trading Laws*), and the sources cited therein. *See, e.g.*, Beny, *Insider Trading Laws* at 239-244, n.1-3, 6-13, 32, and elsewhere.

[641] *See* 15 U.S.C. § 78j(b). Neither the statute, nor subsequent rulemaking has further defined "manipulative," however. Further, despite the explicit reference to manipulation, rules promulgated pursuant to Section 10(b) have made no mention of manipulation except for Rule 10b-1, which simply refers back to Section 9 to the effect that an act or omission that would violate Section 9 if made in connection with an exchange-listed security is a violation of Section 10(b) whether registered or not.

[642] *See* 15 U.S.C. § 78i(a)(2).

[643] Perhaps foremost among these is that until 2010, § 9(a)(2) could only apply to securities traded on exchanges, which due to their volume and liquidity are less likely to be manipulated than OTC securities. Indeed, until 2006, NASDAQ was not even an exchange. Some courts have also interpreted § 9(a)'s scienter requirement to be more demanding than Rule 10b-5. *See, e.g.*, Chemetron Corp. v. Bus. Funds, Inc., 682 F.2d 1149, 1162 (5th Cir. 1982).

transaction referring to that price; and market manipulation (also known as "trade-based" manipulation),[644] where the manipulation consists solely of a trading strategy in the securities markets.[645]

The law applying § 10(b) to the various types of manipulation is significantly confused with a split among the federal circuit courts as to central questions in manipulation jurisprudence.[646] The circuit split involves whether market manipulation, without an additional act that is itself unlawful, can be proscribed by § 10(b).[647] The Third and Seventh Circuit hold that a manipulation cannot consist of actual trades without some further improper act, i.e., that market manipulation is *not* unlawful under Rule 10b-5.[648]

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[644] See Franklin Allen & Douglas Gale, *Stock Price Manipulation*, 5 REV. FIN. STUD. 503 (1992) (providing seminal model of manipulation executed exclusively through actual transactions).

[645] On transaction-based manipulation, see Steve Thel, *$850,000 in Six Minutes – The Mechanics of Securities Manipulation*, 79 CORNELL L. REV. 219, 251-55 (1994). On market manipulation, there is a large literature, but some prominent sources include Albert S. Kyle & S. Viswanathan, *How to Define Illegal Price Manipulation*, 98 AM. ECON. REV. PAP. & PROC. 274, 274 (2008), and the well-known critique of the possibility of profitable market manipulation, Daniel R. Fischel & David Ross, *Should the Law Prohibit "Manipulation" in Financial Markets?*, 105 HARV. L. REV. 503 (1991).

[646] This confusion as to what manipulation is and when it might be unlawful is at least in part a legacy of the Supreme Court's repeated emphasis on fraud and deceit in interpreting § 10(b). *See, e.g.*, Ernst & Ernst v. Hochfelder, 425 U.S. 185, 198 (1976) ("the word 'manipulative' . . . is and was virtually a term of art when used in connection with securities markets. It connotes intentional or willful conduct designed to deceive or defraud investors by controlling or artificially affecting the price of securities.") (citations omitted); Santa Fe Industries, Inc. v. Green, 430 U.S. 462, 476 (1977) (manipulation "refers generally to practices, such as wash sales, matched orders, or rigged prices, that are intended to mislead investors by artificially affecting market activity."); Schreiber v. Burlington Northern, Inc., 472 U.S. 1, 8 n.6 (1985); Chiarella v. United States, 445 U.S. 222, 234-35 (1980).

[647] Louisiana Corp. v. Merrill Lynch & Co., 571 F. App'x 8, 10 (2d Cir. 2014) (discussing the general elements of an open market manipulation claim), *citing* ATSI Commc'ns, Inc. v. Shaar Fund, Ltd., 493 F.3d 87, 101 (2d Cir. 2007).

[648] GFL Advantage Fund, Ltd. v. Colkitt, 272 F.3d 189, 205 (3d Cir. 2001) ("the essential element of the [market manipulation] claim is that *inaccurate* information is being injected into the marketplace."); Foss v. Bear, Stearns & Co., 394 F.3d 540, 541 (7th Cir. 2005) ("There is no violation of Section 10(b) without fraud").

On the other side, are the D.C. Circuit,[649] and as of 2015, the Second Circuit,[650] holding that lawful trading alone, when done with the wrong intent, can be a form of market manipulation prohibited by § 10(b). This split was the subject of a petition to the Supreme Court in 2016.[651] More scholarly attention is merited in assessing how the law should address manipulation.

5.3 Short Selling

Short selling is a trading practice in which a trader borrows a security from a third party, sells that security, and later "covers" by acquiring an identical security and returning it to the third party.[652] While short selling has been intermittently controversial, especially during times of financial crisis, it is generally permitted, although scrutinized, by current regulation, and there appears to be widespread academic support for this position.[653]

6 Current Issues in Equity Market Structure

On high-level measures of liquidity and transaction costs, the U.S. equity markets are remarkably healthy. Commissions and spreads have dropped dramatically in the past two decades.[654] Retail investors can trade conveniently online for commissions of $10 per trade (10 cents per share for a round lot) or less.

At a more detailed level, however, several recent equity market developments have generated criticism and concern. The number of trading venues has proliferated. The structural

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[649] Markowski v. S.E.C., 274 F.3d 525, 528-29 (D.C. Cir. 2001) (interpreting Congress, through Section 9(a)(2) of the Securities Exchange Act, to have proscribed manipulations exclusively involving trades based "solely because of the actor's purpose" when that purpose was improper, without necessitating any further unlawful act).

[650] Fezzani v. Bear, Stearns & Co. Inc., 777 F.3d 566, 571 (2d Cir. 2015) (Section 10(b) does *not* require "reliance by a victim on direct oral or written communications by a defendant.").

[651] Koch v. SEC, No. 15-781 (S. Ct. Mar. 28, 2016).

[652] There are a number of short selling structures, not all of which involve borrowing a security.

[653] Regulation SHO and Rule 10a-1, Securities Exchange Act Release No. 34-55970, 72 Fed. Reg. 36,348 (July 3, 2007) (codified at 17 C.F.R. pts. 240, 242); *see also* Exchange Act Release No. 50103 (July 28, 2004), 69 Fed. Reg. 48008, 48011 (Aug. 6, 2004); *see also* Exchange Act Release No. 48795 (Nov. 17, 2003), 68 Fed. Reg. 65820 (Nov. 21, 2003).

[654] *See* James J. Angel, Lawrence E. Harris & Chester S. Spatt, *Equity Trading in the 21st Century: An Update*, 5 Q. J. FIN. 1 (2015) (documenting improvements in speed of execution, bid-ask spread, commissions, and number of quotes per minute); *see also* Angel, Harris & Spatt, *supra* note 370.

and functional differences among them have diminished, but the regulatory system continues to treat exchanges, ATSs, and broker-dealer internalization differently. Registered exchanges and ATSs both operate automated matching systems. Competition among trading venues has led most to adopt pricing structures designed to attract order flow. It does not make obvious sense for trading platforms offering similar services using similar technologies and matching procedures to fit into different regulatory boxes.

Another important question is whether trading venues' pricing structures lead brokers to provide less than optimal executions for their customers. There are two dominant pricing models, described in more detail below, that provide brokers a financial incentive to execute orders in a particular market.

The trading practices of securities professionals are another source of concern. The replacement of traditional manual markets by automated matching engines has, as commentators expected, reduced the number and importance of traditional specialists and market makers. But contrary to some expectations, it has not resulted in a market in which long-term investors' trades are mostly made directly with one another. Instead, so-called high-frequency traders (HFTs) have stepped in as an important category of liquidity provider.

In this section, we explore each of these structural issues.

6.1 Venue Types

6.1.1 Regulatory Categories

All exchanges and most other organized trading venues now operate electronic limit order books that automatically match marketable and nonmarketable order flow. However, for regulatory purposes, these trading venues are put into separate buckets labeled "exchange," "ATS," or "broker-dealer internalization." These distinctions were initially driven by the need to accommodate new electronic trading venues that neither maintained the volume, nor regulated their members in a manner reminiscent of, a traditional exchange. The technological differences, however, have largely disappeared and the operational differences are becoming blurred. Broker-dealer trading platforms may mimic the exchanges' matching procedures. Exchanges offer a variety of order types that can mimic the way a broker-dealer traditionally "works" a large order.

As a result of these technological and operational developments, the governing regulatory regime is largely a choice variable for the trading venue. BATS began operation as an ATS but converted to a registered exchange. Citadel Execution Services, an automated trading system that

is one of the largest trading venues for retail orders, has chosen to be regulated as a broker-dealer that internalizes order flow and not as an ATS.

The choice whether to be an exchange, an ATS, or a broker-dealer has a number of consequences:

- exchanges engage in market surveillance and otherwise regulate their members; ATSs do not[655]
- unlike an ATS, the rules of an exchange must meet a public interest standard and changes to those rules are subject to SEC approval[656]
- exchanges must make membership available to any registered broker-dealer; ATSs are subject to the fair access requirement only if they exceed the 5% trading volume threshold; broker-dealers may offer to internalize an order or not at their discretion
- exchange quotations are included in the consolidated quotation system, whereas ATSs may choose to include their quotations or not unless they exceed the 5% trading volume threshold and broker-dealers need not publicly display the prices at which they intend to internalize orders.

The difference between an exchange, an ATS, and a broker-dealer is in part a difference in the rules of internal governance that provide the terms of explicit and implicit contracts between the trading venue and its members or customers. In that respect, the choice to be one type of regulated entity or another is analogous to a business's choice to be a corporation, a partnership, or an LLC. While legislators or regulators provide the menu of options, they have little reason to care which one a particular trading venue selects.

However, the choice of regulatory type has external effects as well. Most notably, it affects other market participants' access to quotations. While insisting on linked markets, Congress and the SEC have permitted a degree of competition among different trading platforms with respect to transparency and order types. An important question for a new special study is whether to rethink the regulatory categories.

6.1.2 Liability Rules

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[655] *See* 15 U.S.C. §§ 78f(a), 78c(a)(26); Lanier v. Bats Exch., Inc., 838 F.3d 139 (2d Cir. 2016).

[656] 15 U.S.C. § 78f(b).

Distinctive liability rules currently apply to different kinds of trading venues. Broker-dealers, whether internalizers or ATSs, are subject to the same liability rules as any other private financial institution. In contrast, exchanges and their officers enjoy "absolute immunity" from suits for monetary damages when they are acting pursuant to their regulatory and oversight functions as self-regulatory organizations.[657] The policy and legal foundation for this immunity is that as SROs, the exchanges perform regulatory functions that would otherwise be performed by the SEC—an agency afforded sovereign immunity from any monetary liability.[658] As a result, an exchange is immune to suits for fraud, incompetence, or other forms of misconduct when engaged in interpretation, discipline, or enforcement, or other activities necessary or critical to its quasi-governmental regulatory functions.[659]

The sharp discontinuity between the regulatory burdens and immunity benefits of exchange status and the burdens and liabilities of ATSs highlights the importance of revisiting whether the current structure for categorizing trading venues makes sense. Does immunity from liability still make sense for SROs, at least when read as broadly as it is by, for example, the Second Circuit? Does the lack of regulatory scrutiny applied to internalizers, like Citadel, make sense given that their share of equity market volume exceeds that of many exchanges and any ATS?

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[657] A "self-regulatory organization 'when acting in its capacity as a SRO, is entitled to immunity from suit when it engages in conduct consistent with the quasi-governmental powers delegated to it pursuant to the Exchange Act and the regulations and rules promulgated thereunder.'" DL Capital Grp., LLC v. Nasdaq Stock Mkt., Inc., 409 F.3d 93, 97 (2d Cir. 2005) (citations omitted), citing D'Alessio v. N.Y. Stock Exch., Inc., 258 F.3d 93, 106 (2d Cir. 2001); Barbara v. N.Y. Stock Exch., Inc., 99 F.3d 49, 59 (2d Cir. 1996) abrogated on other grounds by Merrill Lynch, Pierce, Fenner & Smith Inc. v. Manning, 136 S. Ct. 1562 (2016); Weissman v. Nat'l Ass'n of Sec. Dealers, Inc., 500 F.3d 1293, 1296 (11th Cir. 2007) ("SROs are protected by absolute immunity when they perform their statutorily delegated adjudicatory, regulatory, and prosecutorial functions"); Sparta Surgical Corp. v. Nat'l Ass'n of Sec. Dealers, Inc., 159 F.3d 1209, 1214 (9th Cir. 1998); Austin Mun. Sec., Inc. v. Nat'l Ass'n of Sec. Dealers, Inc., 757 F.2d 676, 692 (5th Cir. 1985) ("the NASD . . . requires absolute immunity from civil liability for actions connected with the disciplining of its members.") (citations omitted).

[658] DL Capital, 409 F.3d at 97; *id*. ("the NYSE should, in light of its 'special status and connection to the SEC,' out of fairness be accorded full immunity from suits for money damages, as well."); *id*. (when "alleged misconduct falls within the scope of quasi-governmental powers delegated to the NYSE pursuant to the Exchange Act . . . absolute immunity precludes [any plaintiff] from recovering money damages in connection with his claims.").

[659] *Id.* at 98-99.

6.2 Broker-Dealer Routing Decisions

Broker-dealers are pivotal actors in the equity marketplace. The term "broker-dealer" is a regulatory status created pursuant to the Exchange Act. The SEC mandates that any individual or institution that acts as either a broker or dealer register as a "broker-dealer" with Form BD.[660] A broker is defined as "any person engaged in the business of effecting transactions in securities for the account of others," and a dealer as "any person engaged in the business of buying and selling securities . . . for such person's own account through a broker or otherwise."[661] While capacious, these definitions are expressly crafted to exclude investors who simply actively trade equities, while capturing those participants whose business is intermediating trade, whether as principal or agent.

6.2.1 The Duty of Best Execution

The main legal framework relevant for assessing agency functions of broker-dealers, such as handling the execution of customer orders, is the duty of best execution. Brokers owe customers a duty of best execution as a matter of state common law, self-regulatory organization rules, and arguably federal securities law. The seminal discussion of best execution is *Newton v. Merrill Lynch*,[662] a class action stemming from the Nasdaq odd-eighths scandal. As defined by the *Newton* court, the duty of best execution "requires a broker-dealer to 'use reasonable efforts to maximize the economic benefit to the client in each transaction.'"[663] This duty is multi-dimensional, requiring a broker to take into account best price, but also "order size, trading characteristics of the security, speed of execution, clearing costs, and the cost and difficulty of executing an order in a particular market."[664]

FINRA Rule 5310 similarly defines a broad standard, requiring a broker to use *reasonable diligence* to ascertain the best market for a security in any transaction for or with a

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[660] *See* Securities Exchange Act of 1934 § 15(b); 15 U.S.C. § 78o(b).

[661] *See* Securities Exchange Act of 1934 §§ 3(4)(A), 3(5)(A), 15 U.S.C. § 78c.

[662] Newton v. Merrill Lynch, Pierce, Fenner & Smith, Inc., 259 F.3d 154, 162 (3d Cir. 2001) (hereinafter *Newton II*), *as amended* (Oct. 16, 2001); Newton v. Merrill, Lynch, Pierce, Fenner & Smith, Inc., 135 F.3d 266, 271 (3d Cir. 1998) (hereinafter *Newton I*).

[663] *Newton II* at 173.

[664] *Newton I* at 271. For a more recent opinion fundamentally applying the analysis of *Newton*, see Gurfein v. Ameritrade, Inc., No. 04 CIV. 9526(LLS), 2007 WL 2049771, at *3 (S.D.N.Y. July 17, 2007), *aff'd*, 312 F. App'x 410 (2d Cir. 2009).

customer, and to provide an execution such that the resultant price for the customer is "as favorable as possible under prevailing market conditions."[665] Reasonable diligence includes considering: "the character of the market for the security (e.g., price, volatility, relative liquidity, and pressure on available communications)"; "the size and type of transaction"; "the number of markets checked"; the "accessibility of the quotation"; and "the terms and conditions of the order which result in the transaction."[666]

Perhaps because of the standard's complexity, the SEC has opted for a combined "rules and standards" approach. As described above, the best execution standard applicable to brokerage executions is supplemented by Rule 611 of Regulation NMS, the trade-through rule, which is in part designed to provide a minimum floor for "best price" execution for small orders.[667] The broader "best execution" standard does most of the work regulating the execution of larger and more complicated orders and strategies.

Although Rule 611 forces brokers to recognize price priority across markets, it does not recognize time (or any other non-price) priority across markets. Thus, when multiple markets display the same best bid or offer, a broker can route a customer order to any one of those venues. It can also route the order to a venue that does not display quotations, so long as that venue executes the trade at the NBBO or better. Trading venues attempt to influence this exercise of discretion through their pricing systems. There are two common pricing practices: "maker-taker" fees and "payment for order flow." From the perspective of a retail investor, the first is relevant primarily to non-marketable limit orders and the second to marketable orders, as will be explained below.

6.2.2 Maker-Taker Fees

In a maker-taker model, a trading venue pays a rebate for each non-marketable limit order posted to it that executes on the venue. The theory is that the trader who submitted a resting limit order added liquidity to the trading venue. The subsequent trader who "takes" that liquidity by submitting a contra-side marketable order pays a fee that is typically slightly larger than the liquidity rebate, with the difference representing revenue to the exchange. This is a common fee structure on ATSs and exchanges, although some have experimented with an

[665] FINRA Rule 5310 "Best Execution and Interpositioning." (emphasis added).

[666] *Id*. at Rule 5310(a)(1)(A)-(E).

[667] *See infra* subsection 4.3.2.

inverted "taker-maker" fee structure.[668] Rule 610(c) of Regulation NMS caps the "take" fee at $0.003/share to the extent the resting order is a protected order or the best bid or offer in a displayed market.

Brokers do not typically pass along the liquidity rebate directly to retail customers who submit non-marketable limit orders.[669] There is evidence that the rebates lead brokers to send those orders to venues that may be inferior with respect to fill rates and other indicia of execution quality.[670] It is more difficult to determine whether competition leads brokers to pass on the resulting revenue to customers in the form of lower commissions. In any event, the SEC's position is clear that these maker-taker fee structures are legally permissible and that broker-dealers do not necessarily violate their fiduciary duties simply by directing orders to such venues.

A separate concern with this fee structure is that it adds a layer of complexity for traders attempting to determine the best available price.[671] Displayed prices do not reflect the actual price paid or received net of the rebate or fee. Regulation NMS defines the "best" bid or offer without reference to the actual cost of accessing that bid or offer.

6.2.3 Payment for Order Flow

Dealers who internalize orders often pay third party brokers to direct orders to them for execution rather than to an exchange or ATS, a practice known as "payment for order flow" (PFOF).[672] As part of the arrangement, the internalizer typically commits to execute trades at a

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[668] Inverted "taker-maker" fee arrangements impose the opposite fee structure on incoming orders. Typically, maker-taker arrangements award $.0020-$.0025 per share for executed nonmarketable orders and charge $.0025-$.0030 per share for executed marketable orders. These arrangements must be publicly available on an exchange's website. *See* Securities Exchange Act of 1934 § 19(b)(3)(A)(ii)(4), 15 U.S.C. § 78s(b)(3)(A)(ii) (2012); 17 C.F.R. § 240.19b-4(f)(2) (2013).

[669] *See* Larry E. Harris, *Maker-Taker Pricing Effects on Market Quotations* (working paper 2013).

[670] *See* Robert Battalio, Shane A. Corwin & Robert Jennings, *Can Brokers Have It All? On the Relation Between Make-Take Fees and Limit Order Execution Quality*, 71 J. FIN. 2193 (2016).

[671] *See* SEC Market Structure Advisory Committee, *Maker-Taker Fees on Equities Exchanges*, https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf.

[672] SEC, *Certain Issues Affecting Customers in the Current Equity Market Structure*, Jan. 26, 2016.

price that is at least a slight improvement over the NBBO.[673] The broker can therefore argue that it has met its best execution obligation to the customer while pocketing the incentive payment from the dealer, an argument the SEC has accepted.[674]

Retail customer orders are extremely desirable because they are assumed to be uninformed and therefore to create no adverse selection risk for the dealer. Accordingly, retail brokers route nearly all of their customer market orders to internalizers pursuant to PFOF arrangements.[675] Payments to large retail brokerages for order flow in 2014 ranged from $92 million to $304 million, with the rate per share ranging from $0.0010 to $0.0031.[676]

A small number of firms dominate internalization, with Citadel, KCG Americas, and G1 accounting for around 28%, 20%, and 10% of non-ATS OTC volume and the ten largest non-ATS venues accounting for over 80% of volume.[677] This means that by parent company, Citadel and KCG are some of the largest execution forums for U.S. equities, after the NYSE, BATS, and Nasdaq exchange groups.[678]

Although brokers receive the PFOF, competition among brokers should lead them to reduce retail commissions to attract more customers in order to have more retail orders to sell. Certainly the level of retail commissions has declined in recent years. At least one online broker

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[673] *Id.* at 6.

[674] *See* Payment for Order Flow Proposing Release, Securities Exchange Act Release No. 33026 (Oct. 7, 1993) 58 Fed. Reg. 52934, 52936 (Oct. 13, 1993) ("Payment for Order Flow Proposing Release"). The principal regulatory strategy toward PFOF has been disclosure. *Id*. at 59 FR 55006. For an overview of the relevant distinct disclosure requirements, *see* 17 CFR 240.10b-10; 17 CFR 240.606; and 17 CFR 240.607(a)(1)-(2).

[675] SEC, *Certain Issues Affecting Customers in the Current Equity Market Structure*, Jan. 26, 2016, at 2 n.2 ("Internalization is believed to account for almost 100% of all retail marketable order flow.")

[676] *Id*. at 6.

[677] All statistics are derived from data from FINRA's OTC Transparency Data facility. *See OTC Transparency Data*, https://otctransparency.finra.org/ (calculations for the months of September 2016 and April 2017).

[678] Data on exchange volume in U.S. equities is available on BATS's website. *See U.S. Equities Market Volume Summary*, http://www.bats.com/us/equities/market_statistics/current_most_active/.

has taken advantage of PFOF (among other revenue sources) to offer commission-free trading.[679] Empirically, the effects of PFOF, like maker-taker fees, on customer welfare is a topic for further study.

Internalization is controversial apart from concerns about retail brokerage customers.[680] Dealers' willingness to internalize is another form of non-displayed liquidity that has attracted the same criticism as dark pools and non-displayed order types. A separate criticism is that internalizers "skim" the uninformed (usually retail) order flow. Thus, the relative proportion of informed order flow arriving at the primary exchanges, where price discovery takes place, is necessarily greater than would be the case absent internalization and PFOF.[681]

Because market makers respond to adverse selection risk by increasing the bid-ask spread, PFOF might cause an increase in market-wide spreads. The counterargument is that the aggregate amount of adverse selection risk that liquidity providers face should not depend on how it is distributed. It is always in the best interests of retail investors to have a separating equilibrium where the lit markets have all the informed traders and wider spreads to compensate, while retail investors trade exclusively OTC with dealers inside the spread. Thus, it is again an empirical question whether concentrating adverse selection risk in the lit markets has adverse welfare consequences.

The SEC has suggested that it might consider a "trade at" rule that would prohibit a trading center from executing an order at the NBBO unless it was already displaying that price when the order arrived.[682] The rule would reduce broker discretion over order routing, particularly to internalizers. But it would also have significant distributional consequences for trading venues. The requirement that the venue "display" the NBBO would mean that dark ATSs and internalizers would always have to price improve in order to execute a trade. The rule would

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[679] *See, e.g.*, http://www.robinhood.com; *see also* Jane Morrissey, *With No Frills and No Commissions, Robinhood App Takes On Big Brokerages*, N.Y. TIMES, Feb. 18, 2017, https://www.nytimes.com/2017/02/18/business/robinhood-stock-trading-app.html.

[680] For a sample of important analyses, *see, e.g.*, Allen Ferrell, *A Proposal for Solving the "Payment for Order Flow" Problem*, 74 S. CAL. L. REV. 1027 (2001); John C. Coffee, Jr., *Order-Flow Payments Get New Scrutiny*, NAT'L L.J., July 19, 1993.

[681] *See* Beny, *supra* note 589, at 432-33 (discussing empirical evidence addressing whether internalization has actually increased the proportion of informed trade on exchanges).

[682] *See* Market Structure Release, *supra* note 549, at 70.

accordingly have to define a "meaningful" price improvement in order to prevent internalizers from "stepping ahead" of the NBBO by trivial amounts. Not surprisingly, the concept of a trade at rule is popular among lit venues and unpopular among dark venues. It is also unpopular among large traders, who fear that being forced into lit venues would increase the price impact of their trades.

An alternative approach to addressing PFOF is for regulators to clarify the requirements of best execution. FINRA's recent best execution guidance provides that the duty applies to a FINRA member executing transactions as principal where the member accepts order flow "for the purpose of facilitating the handling and execution of such orders," but not where "the member is acting solely as the buyer or seller in connection with orders presented by a broker-dealer against the member's quote."[683] This guidance plausibly requires that broker-dealers paying for order flow are under a duty of best execution when transacting with that order flow.[684] The SEC and/or FINRA may wish to provide further guidance as to how that duty of best execution applies to an internalizer's order routing decisions.

6.2.4 Dark Pool Agency Problems

A significant portion of executed volume involves non-displayed orders. Dark pools, like broker-dealer internalization, raise concerns about whether uninformed order flow is overwhelmingly being executed off-exchange, resulting in higher spreads on exchanges due to correspondingly greater adverse selection concerns. Dark pools raise other concerns as well.

Large broker-dealer firms run many of the high-volume dark pools, creating a potential agency problem. The broker has an interest in routing orders to its own dark pool, both because it receives execution fees and because it may offer its own trading desk or other favored traders opportunities to transact with its customer orders. These interests may conflict with the customer's interest in best execution. At least one recent settlement suggests that these conflicts of interest may have led a dark pool operator to put its own interests ahead of its customers. Two

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[683] FINRA Rule 5310 Supplementary Material .04.

[684] *See also* FINRA Regulatory Notice 15-46 *Best Execution: Guidance on Best Execution Obligations in Equity, Options and Fixed Income Markets 3* (2015) (firms "cannot transfer to another person their obligations to provide best execution to their customers' orders, although other firms may also acquire that best execution obligation.... [A] broker-dealer that routes all of its order flow to another broker-dealer without conducting an independent review of execution quality would violate the duty of best execution.").

other settlements involve dark pools that made material misrepresentations to customers in marketing materials. In aggregate, Credit Suisse, Barclays Capital, and Deutsche Bank were fined over $200 million for violations of the Exchange Act in connection with their dark pools. At various times, these firms operated the first, second, and fourth largest equity ATSs, respectively.[685]

Credit Suisse owns and operates the dark pool Crossfinder. The Commission found that Crossfinder communicated confidential subscriber trading information to affiliated entities.[686] This violated Rule 301(b)(10) of Reg. ATS, which requires protection of confidential trading information. The ATS adopting release also stated that brokers should separate their ATS and brokerage functions.[687] More importantly, the Commission found that Credit Suisse misrepresented to clients that its smart order router did not preference Crossfinder (or any other venue) although the router systematically privileged Crossfinder.[688] In particular, certain router default settings automatically routed orders to Crossfinder.

Barclays admitted making material misrepresentations in marketing and operating its dark pool, Barclays LX ("LX").[689] In particular, Barclays misrepresented LX's Liquidity Profiling function and its related surveillance tools for policing LX trading activity.[690] Liquidity Profiling was a program designed to categorize LX users as more or less aggressive depending on particular aspects of their order flow and then to allow users generally to block the most

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[685] In the Matter of Barclays Capital Inc., Securities Exchange Act Release No. 77001, https://www.sec.gov/-litigation/admin/2016/33-10010.pdf (hereinafter Barclays Order); In the Matter of Credit Suisse Securities (USA) LLC, Securities Exchange Act Release No. 77002, https://www.sec.gov/litigation/admin/2016/33-10013.pdf (hereinafter Credit Suisse Order); In the Matter of Deutsche Bank Securities Inc., Securities Exchange Act Release No. 79576, https://www.sec.gov/litigation/-admin/2016/33-10272.pdf (hereinafter Deutsche Bank Order).

[686] Credit Suisse Order, *supra* note 504. Credit Suisse neither admitted nor denied the findings in the Commission's Order. *Id*. at 1. Crossfinder also violated the subpenny quote prohibition, *see infra* subsection 4.3.2, by permitting customers to submit almost 500 million orders at subpenny prices.

[687] 17 C.F.R. § 242.301(b)(10); ATS Adopting Release at 70879.

[688] Credit Suisse Order, *supra* note 685, at 11.

[689] Barclays Order, *supra* note 685.

[690] *Id*. at 3-5. Barclays also misrepresented to customers that it relied on market data feeds generally to calculate its internal NBBO, while it relied on a combination of the SIP and direct feeds from some exchanges, but not NYSE.

aggressive traders from interacting with them. In fact, Barclays conducted very little surveillance of LX trading activity and would sometimes override the Liquidity Profiling tool's categorization of participants, including manually moving users from the most to the least aggressive categories. This resulted in other users trading with them after having opted to block such trades.

The action against Deutsche Bank ("DB")involves a possibly inadvertent failure to operate its order router in the manner it represented to customers.[691] DB developed an order router, SuperX+, primarily for routing equity orders to dark pools. DB marketed SuperX+ as based on a routing algorithm called the "Dark Pool Ranking Model" ("DPRM"), which was described as SuperX+'s "quantitative core." DPRM was designed to rank venues based on execution quality, and then to route orders to eligible venues that historically had offered the best liquidity. However, SuperX+ largely failed to update DPRM due to a coding error, and DB's personnel sometimes supplemented DPRM with their subjective assessments. DB's marketing materials accordingly failed to reflect the actual operation of SuperX+.

6.3 High-Frequency Trading

HFTs are proprietary trading firms or desks that enter and cancel orders and make trades in high volume and at great speed.[692] Like traditional market makers, they seek to earn a spread on their trades, but not to establish large long or short positions. Unlike traditional market makers, they need have no formal connection to the market and no corresponding obligation to quote continuous prices or smooth order imbalances. However, many HFTs have taken on institutional market making roles at exchanges. For instance, prominent HFTs, such as Virtu,

[691] Deutsche Bank Order, *supra* note 685. That DB's errors were largely inadvertent is underlined by the fact that due to a coding error, its own dark pool was erroneously placed among the worst venues by its algorithm, which rendered the venue incapable of receiving almost any orders. *Id*. at 4. Subsequently, Deutsche Bank manually overrode the ranking and placed its dark pool in the highest ranking.

[692] For a review of recent academic research on high-frequency trading, see Charles M. Jones, *What Do We Know About High-Frequency Trading* 10, 26 (Columbia Business School Research Paper, Paper No. 13-11, 2013).

Citadel, and GTS are among the few Designated Market Makers (DMM) at NYSE.[693] HFTs have become an important class of market professional.[694]

Although there is no single accepted definition of HFTs, they are typically described as using high-speed communications, private data feeds from trading venues, and algorithmic trading strategies to rapidly and frequently enter, cancel, and update quotations at trading venues.[695] As a result, they play substantial roles in both market making and arbitrage activities. Research indicates that they supply a majority of the limit orders against which marketable orders transact.[696]

HFTs argue that they face the same challenges as traditional market makers—to earn a spread on as many trades as possible while managing adverse selection and inventory risk. Because they do so in a highly dispersed electronic market, they necessarily use algorithms rather than the continuous manual updating of quotations that characterized traditional market makers. Critics claim that they exploit their speed advantage over other traders to earn nearly riskless profits through superior access to information about transactions and quotations. We will examine some of the practices that have generated criticism.

6.3.1 Latency Arbitrage

Media commentators, industry insiders, and academics all worry about the prevalence of "latency arbitrage" by HFTs. The term refers to a family of trading practices that can differ considerably in their economics, riskiness, and desirability from a welfare standpoint, but all use

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[693] NYSE Membership, NYSE Designated Market Maker Firms, https://www.nyse.com/markets/nyse/membership.

[694] Another fact suggestive of HFTs' increasing prominence is GTS's purchase of Barclay's DMM business at NYSE. With this development, all NYSE DMMs are now operated by automated, algorithmic trading firms, which have crowded out all of the traditional brokerages that were once common market makers. *See* NYSE Membership, *Designated Market Makers*, https://www.nyse.com/markets/nyse/membership; *see also* Annie Massa, *High-Speed Firms Now Oversee Almost All Stocks at NYSE Floor*, BLOOMBERG, Jan. 26, 2016.

[695] *See* Charles R. Korsmo, *High-Frequency Trading: A Regulatory Strategy*, 48 U. RICH. L. REV. 523, 540 (2014) (defining attributes of HFTs).

[696] Jonathan A. Brogaard, *High Frequency Trading and its Impact on Market Quality* 2, 11 (July 16, 2010) (unpublished manuscript), http://www.futuresindustry.org/ptg/downloads/HFT_Trading.pdf (finding HFTs supply limit orders for 51% of trades and provide market quotes 50% of the time, based on NASDAQ data set); *see generally* Albert J. Menkveld, *High Frequency Trading and the* New Market *Makers*, 16 J. FIN. MKTS. 712 (2013).

information asymmetries generated by speed differences to exploit potential profit-making opportunities.[697] We will briefly consider three different types.

The first is inter-venue order cancellation, or simply "order cancellation" as we will refer to it.[698] The term refers to a liquidity provider cancelling quotes for a given security at one or more venues on which it has posted orders after detecting trading activity at another venue or venues. In a highly competitive market, inter-venue order cancellation is to be expected and is unlikely to be problematic.[699] Quote removal often represents defensive risk management by liquidity providers. They may be concerned that large transactions on one venue are informationally motivated and that current orders posted on other venues thus face a significant adverse selection risk.[700] Alternatively, they may accumulate positions in one market and therefore need to quote less aggressively in another.

Lewis identifies two other forms of latency arbitrage and argues that they are ethically similar to front-running, or the improper use of information about another trader's intentions. In traditional forms of front-running, the use is improper because the trader owes a duty to the source of the information, as when a broker or investment advisor trades ahead of a large customer order. That is not the case with latency arbitrage. Instead, the use is argued to be improper because the HFT obtains information about changes in quotations or last-transaction prices through a private data feed more rapidly than other traders.

"Slow market arbitrage" involves an HFT with a limit order at the NBB or NBO on one exchange which then learns of a new quote at another venue that improves on that quote. If a

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[697] Robert P. Bartlett, III & Justin McCrary, *How Rigged Are Stock Markets? Evidence from Microsecond Timestamps* (working paper, Aug. 5, 2016).

[698] *See* Vincent van Kervel, *Liquidity: What You See Is What You Get?*, 2–6 (May 2012) (unpublished Ph.D. thesis, Tilburg University), http://www.rsm.nl/fileadmin/home/Department_of_Finance__VG5_/LQ5/VanKervel.pdf. Michael Lewis refers to inter-venue order cancelation as "electronic front-running" in Flash Boys. *See* Lewis, *supra* note 373. The nomenclature of "slow market arbitrage" and "midpoint order exploitation" are similarly taken from Lewis's book.

[699] *See* van Kervel, *supra* note 698 (showing that trades on venues are followed by cancellations of limit orders on competing venues and would be expected based on adverse selection dynamics).

[700] Under non-competitive market dynamics, the possibility of a liquidity provider canceling its quotes and replacing them with quotes providing marketable orders with inferior executions may represent a socially undesirable increase in transaction costs for traders.

marketable order then arrives at the first venue and transacts against the HFT's now-stale quote, that HFT could make a riskless profit by transacting against the improved quote standing on the alternative venue (if it is still there).

"Midpoint order exploitation" involves a "midpoint" limit order resting on a dark pool that will transact against the next incoming marketable contra-side order at the current midpoint of the NBBO. An HFT could potentially detect a quote improving on the current NBB or NBO at a lit venue and then rapidly transact with that improving quote, while sending an opposite order to a dark pool with a contra-side midpoint limit order still based on the stale NBB/NBO, resulting in riskless profit (if there was such an order). So-called slow market arbitrage and midpoint order exploitation both depend on the same reality, which is an order transacting against (or being based on) a kind of "stale quote" – a quote that was, but no longer is, the best bid or offer.

6.3.2 Latency Arbitrage and Regulation NMS

The NBBO as defined for regulatory purposes consists of the best quotations disseminated by the SIP. Trading venues provide their quotations to the SIP pursuant to a national market system plan. At the same time, they offer private feeds of the same data to market participants willing to pay for the private link. Co-location, or putting the market professional's servers in close physical proximity to the exchange's servers, assures the minimum possible delay in receipt of the data. Traders can use this data to privately construct the NBBO some milliseconds before the NBBO is available from the SIP.[701]

A trader can exploit the resulting time difference because of the SEC's interpretation of Rule 603(a)(2) of Regulation NMS. The rule prohibits exchanges from "unreasonably discriminatory" distribution of market data.[702] The SEC's interpretation of the provision has been that "distributed data could not be made available on a more timely basis [to private clients] than core data is made available to a Network processor [the SIP]."[703] Thus, "Rule 603(a) prohibits an

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[701] *See* Market Structure Release, supra note 549.

[702] *See* 17 C.F.R. § 242.603(a)(2) (2015). Section 11A(c)(1) of the Exchange Act authorizes the Commission to regulate market data. 15 U.S.C. § 78k-1(b) (2012).

[703] *See* Regulation NMS, 70 Fed. Reg. 37,496, 37,567 & 37,569 (June 29, 2005) (adopting release for Regulation NMS).

SRO or broker-dealer from transmitting data to a vendor or user any sooner than it transmits the data to a Network processor."[704]

In short, the SEC's interpretation of "unreasonably discriminatory" is based on when the market center sends a signal, not when traders actually receive it. Traders who get core data from the SIP will generally receive it with a slight delay compared to those who get it directly from the trading center even though the trading center sends them to private clients and the SIP simultaneously. The usefulness of private data feeds and co-location is partly predicated on this interpretation.[705]

Critics dispute the SEC's interpretation of Rule 603(a)(2), arguing that the simultaneous distribution of information to private data feeds and the SIP—knowing private data feeds will arrive before the SIP's data—is "unreasonably discriminatory."[706] They offer an alternative interpretation under which it would be "unreasonably discriminatory" to send a signal that will reach private customers before the SIP core data are publicly available.[707] The SEC has adopted analogous interpretations, emphasizing when information reaches end users rather than the time it is sent, in other contexts, including for when information is no longer nonpublic for insider trading purposes.[708]

There is a tension with the principle behind the trade-through rule when a trader can execute a trade at a particular price knowing that in a millisecond or so the SIP may show that it is no longer the best available price. However, Rule 611(b)(8) of Regulation NMS permits a trade-through when "[t]he trading center displaying the protected quotation that was traded through had displayed, within one second prior to execution of the transaction that constituted

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[704] *Id*.

[705] In fact, the Market Structure Release, supra note 549, at 3601, confirmed this interpretation by acknowledging these arrangements. *Id.* (consolidation processing time of the SIP "means that [private] data feeds can reach end-users faster than the consolidated data feeds.").

[706] *See Direct vs. SIP Data Feed*, Nanex (Apr. 4, 2014), http://www.nanex.net/aqck2/4599.html.

[707] For instance, the market research firm Nanex views exchange private data feeds as violating Regulation NMS. *See HFT Front Running, All The Time*, Nanex (Sept. 30, 2013), http://www.nanex.net/aqck2/4442.html.

[708] *See, e.g.*, SEC v. Texas Gulf Sulphur, 401 F.2d 833, 854 (2d Cir. 1968); Investors Mgmt. Co., Exchange Act Release No. 9207, 1971 WL 120502, at *8 (July 29, 1971).

the trade-through, a best bid or best offer, as applicable, for the NMS stock with a price that was equal or inferior to the price of the trade-through transaction."[709]

Put simply, a trading venue may permit an order to transact against a quote that is no longer best if the now-best quote is on a venue which, within one second prior, had displayed as its best bid or offer a price equal or inferior to the price of the transaction.[710] A new, price-improving quote thus only becomes protected after being in force for one second, far more time than trading venues generally need to register a new quote at another venue and update their own systems accordingly.

From a customer welfare perspective, the question is whether venues deliberately use the one-second exception to attract HFTs with risk-free profits at the cost of providing customers inferior executions. This is in principle subject to empirical testing. If trading venues allow HFTs to use the one second exception to execute trades at stale prices, there should be many transactions occurring "outside the quote," or inferior to the best available prices in the market. To gain a sense of their magnitude, one would analyze how often trades occur on trading venues at prices that were outside the best quote for that security at the time of trade.[711] A breakdown of

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[709] 17 C.F.R. § 242.611(b)(8).

[710] *See also* Regulation NMS, 70 Fed. Reg. 37,496, 37,522 (June 29, 2005) (adopting release for Reg. NMS) ("pursuant to Rule 611(b)(8) trading centers would be entitled to trade at any price equal to or better than the least aggressive best bid or best offer, as applicable, displayed by the other trading center during that one-second window. For example, if the best bid price displayed by another trading center has flickered between $10.00 and $10.01 during the one-second window, the trading center that received the order could execute a trade at $10.00 without violating Rule 611."). The SEC's motivation for adopting this exception was a concern that rapid changes in trading center quotes would "create the impression that a quotation was traded-through, when in fact the trade was effected nearly simultaneously with display of the quotation," and that the SEC did "not believe that the benefits would justify the costs imposed on trading centers of attempting to implement an intermarket price priority rule at the level of sub-second time increments." *Id*. at 37,523. However, even at the time of the exception's adoption, critical commentators alleged that its use would "create arbitrage opportunities for computerized market participants." *See* Letter from Meyer S. Frucher, Chairman and Chief Executive Officer, Philadelphia Stock Exchange, Inc., to Jonathan G. Katz, Secretary, Commission, dated January 31, 2005 at 3, *cited by* Regulation NMS, 70 Fed. Reg. 37,496, 37,522 (June 29, 2005).

[711] Intermarket sweet orders are another source of outside the quote transactions, but should not be included in any estimate of the possibilities of latency arbitrage, given that they are deliberately ordered by investors.

this data by venue would be vital as certain ATSs are likely to be the principal suspects, if the one second rule is in fact exploited.

7 Alternative Market Structures

Several of the issues identified above arise from differences in the speed with which various market participants receive updated core data. A number of commentators have proposed changes to market structure to reduce the advantages associated with speed. We survey the most prominent ones in this section.

7.1 Batched Auctions

One of the best developed ideas for major market structure reform is Budish, Cramton, and Shim's proposal to replace the current structure of continuous trading on exchanges with frequent batched auctions.[712] All thirteen active stock exchanges presently share the same structure, in which displayed orders receive execution priority based on time of arrival within a continuous sequence. Orders are processed serially, however small the difference in their arrival times.

This structure, Budish *et al.* suggest, bakes in opportunities for latency arbitrage. New information results in frequent revaluation of individual securities resulting from the revaluation of other instruments with which those securities' prices are correlated. Under current market structure, each of these changes triggers a race to react, whether to withdraw now-stale quotes by liquidity providers or to "pick off" stale quotes in order to make a profit. Because the liquidity provider is just one among a large *N* of traders, and orders are processed serially in continuous time based on order of arrival, getting picked off becomes a pervasive fact of liquidity providers' lives.[713] This pervasive phenomenon has at least two pernicious consequences. First, it makes liquidity costlier because losses to speedier snipers acts as a kind of tax on the business of

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[712] *See* Eric Budish, Peter Cramton & John Shim, *The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response*, 130 Q.J. ECON. 1547, 1548 (2015) (hereinafter Budish *et al.*, High-Frequency Trading Arms Race); *see also* Michael S. Barr, Howell E. Jackson & Margaret E. Tahyar, FINANCIAL REGULATION: LAW AND POLICY 547 (2016) (discussing various proposed responses to the rise of high-frequency trading).

[713] Eric Budish, Peter Cramton & John Shim, *Implementation Details for Frequent Batch Auctions: Slowing Down Markets to the Blink of an Eye*, 104 AM. ECON. REV. 418 (2015) (a liquidity provider's "request to adjust their stale quotes would have to reach the exchange before *all* of the requests to pick off their stale quotes."). Importantly, the proposed auction involves "sealed-bids," so none of the orders submitted are displayed until the auction outcome is reported. *Id.* at 419.

liquidity provision. Second, it triggers an arms race for speed that consumes resources in the real economy but has no tangible welfare consequences given the near-zero time differences at which modern trading occurs.[714]

Their proposal is to replace continuous time trading with discrete but frequently repeated batched auctions, say every one millisecond. Rather than processing orders serially as they arrive, incoming orders would be aggregated in a uniform-price double auction. As a result, minute differences in speed would cease to confer a competitive advantage, heightening incentives for price competition.[715] Essentially, they propose a "tick for time," analogous to the "tick" or minimum price variation in which quoting is permitted in equity markets.

7.2 Speed Bumps: IEX

Perhaps the most important, and certainly the most controversial, market structure development of 2016 was the application of the ATS IEX to become a stock exchange. The application generated extensive comments, but the SEC ultimately approved it.[716] While providing a familiar electronic limit order book structure, IEX adopted a series of innovative practices, some of which it will continue as an exchange.

Most famously, as an ATS, IEX imposed a "speed bump," largely intended to address the perceived problem of inter-exchange order cancelation, noted above. The speed bump applies to communications arriving at and departing the IEX matching engine, and it means that when an order arrives at IEX, IEX's systems will wait 350 microseconds to post and/or execute it, and that when an execution occurs on IEX, the counterparties are only notified after a 350 microsecond delay. Because those involved in an order do not find out about the execution for a delayed period of time, a large trader has sufficient time for its orders to arrive at other exchanges or for IEX to route the remainder of an order to other exchanges, before other market participants discover the IEX execution and can react. During its exchange application process, IEX adjusted its structure so that IEX's own order routing technology was also subject to the 350

[714] Budish *et al.*, *High-Frequency Trading Arms Race*, *supra* note 712, at 1576-1608.

[715] *See also* SEC, Letter from Eric Budish to Brent J. Fields, Secretary (Feb. 5, 2016), https://www.sec.gov/comments/10-222/10222-371.pdf.

[716] SEC, In the Matter of the Application of Investors' Exchange, LLC for Registration as a National Securities Exchange Findings, Opinion, and Order of the Commission, June 17, 2016, Release No. 34-78101, https://www.sec.gov/rules/other/2016/34-78101.pdf.

microsecond speed bump after the router's exemption from the speed bump came under fierce attack.[717]

7.3 Eliminating the NMS

IEX's application to become a registered exchange raised an interpretive issue under Regulation NMS. To qualify as a "protected" quotation that may not be traded through, the quotation has to be "immediately" executable.[718] An essential design principle behind IEX was the "speed bump," or physical delay of approximately 350 microseconds between receipt of a message at the point of connection and delivery to the matching engine.[719] Approval of the application therefore required that the SEC conclude that access to IEX's quotations is "immediate" despite the delay. Ultimately, it issued interpretive guidance permitting an intentional *de minimis* delay but did not provide a bright-line rule for what is *de minimis*.[720]

Any attempt to create a new exchange based on batched auction principles would also require interpretive or exemptive relief. The point of a batched auction is to do away with time priority within the time frame of each auction, thus avoiding a microsecond-scale race to get in line at a particular price. The batch auction would be permissible only if the entrepreneur could persuade the SEC that the interval between auctions is *de minimis*.

These examples illustrate a fundamental point: although the national market system was intended to permit competition among trading venues, Regulation NMS channels that competition into particular, and arguably narrow, forms. The SEC has concluded that the only permissible market structure (1) permits any stock to trade on any venue that wishes to trade it, and (2) requires that brokers route marketable orders to a venue offering the best price.

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[717] Letter from Sophia Lee, General Counsel, IEX to Brent Fields, Secretary, SEC, Re: Investors' Exchange LLC Form 1 Application, Release No. 34-75925, https://www.sec.gov/comments/10-222/10222-421.pdf ("The Router will interact with the IEX matching system over a 350 microsecond speed-bump in the same way an independent third party broker would be subject to a speed bump.").

[718] 17 C.F.R. §600(b)(3), (57).

[719] *See* U.S. Securities and Exchange Commission, In the Matter of the Application of Investors' Exchange, LLC for Registration as a National Securities Exchange, Exchange Act Rel. No. 78101, at 47-52 (June 17, 2016)

[720] The SEC staff did offer guidance that an intentional delay of one millisecond or less is acceptable. Staff Guidance on Automated Quotations under Regulation NMS, June 2016, https://www.sec.gov/divisions/marketreg/automated-quotations-under-regulation-nms.htm.

Regulation NMS rules out any form of competition among exchanges that would concentrate trading in listed stocks on the listing exchange.[721] Such a system could conceivably result in competition among entirely different types of trading platforms—some manual, some electronic, some continuous, some batched, some trading 24 hours a day and others during limited periods, and so on. It is not obvious how or why that form of competition would be less desirable than the current competition among fairly homogeneous linked electronic limit order books.

A bit of history helps to explain the SEC's adherence to its position. Prior to the 1975 National Market System amendments, the NYSE was unapologetic in contending that the market functioned best when all liquidity in a particular stock was consolidated in a single location, and for NYSE-listed stocks that single location should be the NYSE. Its rules and procedures attempted to maintain its market share in trading of listed stocks. Rule 390 limited brokers' ability to trade off the exchange. Specialists' quotations and limit order books were not publicly disseminated.

The SEC and Congress were united in their disagreement with the NYSE's view. In particular, they were concerned that allowing the NYSE to continue doing business in the traditional way would impede the growth of electronic markets that could match buyers and sellers more rapidly and at lower cost. In their view, the markets had to be forced into a world of high-tech trading and competition.

But this belief at least requires some explanation. We ordinarily assume that when the cost of entry into a business falls, the number of competitors will increase. In the business of operating trading markets, technology substantially reduced the non-regulatory costs of entry. The result should have been more trading platforms and more competition without the need for regulatory encouragement. Although the NYSE can write a rule requiring its member brokers to trade listed stocks exclusively on the exchange, it cannot force companies to list there if competing markets are better.

The current regulatory design may lack a compelling account of the externality being solved. Without it, it is not clear why competition for liquidity provision in each traded stock is good and competition for (exclusive) listings is bad. Because liquidity attracts liquidity, one

[721] Beny, *supra* note 589, at 465, argues for a listings-focused approach. Beny's argument is to prohibit transactions in a firm's shares on any venue on which that issuer has chosen not to list, with the ambition of moving market centers away from competition for order flow and toward competition for corporate listings.

might argue that securities trading is subject to network externalities. But while this is true of the trading in any given stock, there is little reason to think that it is true of listings. Technology has dramatically decreased the cost of creating a new electronic market, meaning that companies would have substantial choice among listing venues.

The strongest argument in favor of the SEC's stance may be empirical, not theoretical. The period since the implementation of the Order Handling Rules in 1997 has seen continuous improvement in basic measures of market quality. The U.S. equity markets perform well in comparison both to equity markets in other countries and in comparison to the fixed income markets, which are not subject to the same regulatory regime. This makes a powerful case for the current structure.

A speculative counterargument is that in the 20th century, for a variety of historical reasons, the NYSE obtained a dominant market position. Once Congress and the SEC had achieved the stock market equivalent of the AT&T breakup, competition flourished and the need to oversee that competition at such a detailed level vanished along with the NYSE's dominant position. A key question for a new special study is whether less intrusive regulations could provide the same competitive benefits.

7.4 Venue Innovation

Provided there is sufficient regulatory flexibility, innovation by trading venues is likely to also mean that market structure continues to evolve in sometimes dramatic ways. IEX's exchange application seems to have ignited a spate of new proposals.

For instance, Nasdaq has proposed an innovative new order type.[722] Named the "Extended Life Priority Order Attribute," this change would give displayed orders that commit to remaining on the order book for one second or more a higher priority than other displayed orders on Nasdaq's limit order book.[723] While not framed by Nasdaq in this way, the rule seems designed to address a widely shared concern about today's market structure, which is that it features an excessive amount of intermediation. The worry is that professional dealers' market making capabilities have in some way "crowded out" liquidity provision by "natural" end-users or investors interested in actually owning firms' stock. More straightforwardly, the order type

[722] Notice of Filing of Proposed Rule Change to Adopt a New Extended Life Priority Order Attribute under Rule 4703, Nov. 30, 2016, Release No. 34-79428, SR-NASDAQ-2016-161.

[723] *Id*. at 40.

would also serve to provide incentives for non-fading liquidity. Whether changes to intellectual property law are necessary to promote the emergence of further innovations is an open question worth consideration by legal scholars.

New types of exchanges may emerge to supplement innovation at existing stock exchanges. For instance, there have been recent calls for something like a venture exchange in which listed firms could have their stock traded among a limited set of investors, free of the disclosure requirements federal securities law currently imposes on public corporations.[724] In a somewhat similar vein, the exchange operator BATS has called for the concentration of liquidity for thinly-traded securities at the primary listing exchange for that security.[725] As part of that ambition, BATS expressed interest in no longer offering trading on BATS in illiquid securities listed on other exchanges.[726] Increasing pressure on how securities law currently conceives of the "public" corporation could have other implications for equity market structure.[727]

7.5 EMSAC's Proposed Reforms

In early 2015, the SEC formed an Equity Market Structure Advisory Committee (EMSAC). Its members are tasked with studying the structure and functioning of the U.S. equity markets and providing advice and recommendations for market reform. The EMSAC has made a number of notable recommendations:

- An Access Fee Pilot proposal that would study the effects of altering access fee caps on rebates, order routing, liquidity, and other market quality outcomes[728]
- Reforms to liability limits of SROs, whereby rule-based liability limits are increased and regulatory capital potentially required. EMSAC also suggested

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[724] *See* A. C. Pritchard, *Revisiting "Truth in Securities" Revisited: Abolishing IPOs and Harnessing Private Markets in the Public Good*, 36 SEATTLE U. L. REV. 999 (2013).

[725] Chris Concannon, *Letter to BATS Customers and Trading Community*, http://cdn.batstrading.com/resources/newsletters/CEO-Newsletter-April-2015.pdf.

[726] *Id.* (arguing that "concentrating displayed liquidity in thinly-traded stocks at a single venue will enable market participants to more efficiently form prices, and that one venue also will be better able to innovate their markets specifically for thinly traded stocks (i.e., tick size, auctions, etc.).").

[727] *See* Donald C. Langevoort & Robert B. Thompson, *"Publicness" in Contemporary Securities Regulation After the Jobs Act*, 101 GEO. L.J. 337, 339 (2013).

[728] EMSAC, *Regulation NMS Subcommittee Recommendation for an Access Fee Pilot*, June 10, 2016, https://www.sec.gov/spotlight/emsac/emsac-regulation-nms-recommendation-61016.pdf.

reforms to the governance structure of NMS plans, involving a greater role for non-exchange constituents[729]

- Recommendations involving volatility, including price band mechanisms to address flaws regarding re-openings auctions after volatility halts[730]

All of these efforts would produce highly valuable data, particularly concerning the interaction between access fee caps, maker-taker fees, and off-exchange trade, but some may also increase market complexity.

7.6 The Tick Size Pilot

Beginning in October 2016, the SEC implemented a pilot project to adjust the tick size or minimum increment in which a displayed order can price a bid or ask quote for a stock.[731] In the early 2000s, the U.S. stock market went through decimalization, or the process of reducing the tick size to one cent.[732] Since then, some have argued that this reduced tick size has had adverse effects on market quality. The essential argument is that a large tick size rewards liquidity provision, and that because IPO underwriters often make markets in the company's stock, increasing market makers' return on liquidity provision can arguably make investment banks more eager to underwrite IPOs, with positive effects for capital formation and job creation.[733] This argument was influential in initiating the tick size pilot.

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[729] EMSAC, *Recommendations Regarding Enhanced Industry Participation in SRO Regulatory Matters* (2016),

https://www.sec.gov/spotlight/emsac/emsac-trading-venues-regulation-subcommittee-recomendation-61016.pdf.

[730] EMSAC, *Recommendations for Rule-Making on Issues of Market Quality*, Nov. 16, 2016, https://www.sec.gov/spotlight/emsac/emsac-market-quality-subcommittee-final-recommendations-1116.pdf.

[731] FINRA, *Tick Size Pilot Program*, http://www.finra.org/industry/tick-size-pilot-program (providing extensive details on rationale and function of pilot).

[732] Decimalization was codified in Rule 612 of Reg. NMS. *See* 17 C.F.R. §242.612 ("No national securities exchange, national securities association, alternative trading system, vendor, or broker or dealer shall display, rank, or accept from any person a bid or offer, an order, or an indication of interest in any NMS stock priced in an increment smaller than $0.01 if that bid or offer, order, or indication of interest is priced equal to or greater than $1.00 per share.").

[733] *See, e.g.*, David Weild, Edward Kim & Lisa Newport, *The Trouble with Small Tick Sizes: Larger Tick Sizes will Bring Back Capital Formation, Jobs and Investor Confidence*, Grant Thorton Capital Markets Series (Sept. 2012).

The pilot program, which spans two years, involves a control group and three test groups, each consisting of around 400 small capitalization issuers, and will allow for a five-cent tick size for those issuers' securities. During the pilot, the SEC will gather and make available market quality data in order to test whether a widening tick size for small capitalization companies improves or harms liquidity, volume, and market quality. While the tick size will produce market data for research purposes, various critics, including the SEC's Investor Advisory Committee, argue that increasing the tick size will harm investors.[734] They contend that in the past, market making has increased even as the tick size decreased; a larger tick size means costlier liquidity for the smallest investors for whom the spread is a good measure of liquidity; and the current spread represents the efficient equilibrium of a competitive market.[735] Indeed, one might argue that the tick size should be made *smaller* for actively-traded, large capitalization stocks that typically trade with a one-penny spread. Critics also point out that underwriters are typically no longer actively involved in market making.

8 Conclusion and Implications for Future Research

Equity trading markets changed dramatically in the past two decades, while the regulatory architecture has undergone far less updating. Considering which aspects of that architecture should be revised, and if so how, constitutes the foundation of a future research agenda for those invested in the regulation of trading markets. As a starting point for this research, we conclude by summarizing major pressure points placed on the current regulatory system.

First, there are a series of overlapping concerns about the current categorization system for trading venues as well as the structure of SROs and status of exchanges. Should there be multiple different regulatory statuses for trading venues that are becoming increasingly functionally similar? Should exchanges remain individual SROs with the absolute immunity from private suit that accompanies that status? Should the exchanges retain their low rule-book liability limits?

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[734] *Recommendation of the Investor Advisory Committee Decimalization and Tick Sizes*, https://www.sec.gov/-spotlight/investor-advisory-committee-2012/investment-adviser-decimilization-recommendation.pdf.

[735] *Id*. at 7-9.

Second, the current system relies heavily on broker-dealers as gatekeepers. Accordingly, the regulatory system should be attentive to whether competition sufficiently mediates the conflicting interests of broker-dealers and their customers. Areas for particular study include monetary inducements in the form of maker/taker fees or payment for order flow.

Third, there are significant drawbacks to the predominantly common law approach to trader misconduct on which the SEC and Department of Justice currently rely. Insider trading law may have more coherency than some commentators appreciate, but significant uncertainties remain under current law regarding important issues. Manipulation law is the subject of considerable disagreement among the federal circuit courts on foundational questions. Section 9(a)(2) of the Exchange Act, because of the very limited case law addressing it, may offer courts and regulators a fresh start for conceptualizing and prosecuting manipulation. Both the law of insider trading and of manipulation might also benefit from well-crafted statutory enactments defining their precise contours.

Fourth, important open empirical questions could have a significant impact on policy if answered in specific ways. For instance, the conceptual case for the negative externality imposed on lit liquidity by dark liquidity is plausible, but its actual economic significance is unknown. Using data from IEX's transition to an exchange, or from an SEC-mandated experiment, empiricists should study whether increased dark liquidity has a negative effect on the lit market and market quality overall.

Table 1: U.S. Holdings of Equities ($ Billions, Market Value)

Year	Value	%	Value	%	Total Value
2001	$6,704.4	43.1	$8,840.3	56.9	$15,544.7
2002	$5,072.6	41.0	$7,314.6	59.0	$12,387.2
2003	$6,662.9	40.2	$9,924.5	59.8	$16,587.4
2004	$7,352.8	38.9	$11,527.5	61.1	$18,880.3
2005	$8,014.0	38.9	$12,586.7	61.1	$20,600.6
2006	$9,931.2	41.2	$14,162.0	58.8	$24,093.2
2007	$9,726.1	38.4	$15,602.9	61.6	$25,329.0
2008	$5,406.9	35.5	$9,830.5	64.5	$15,237.4
2009	$7,034.3	35.5	$12,767.5	64.5	$19,801.8
2010	$8,450.7	36.4	$14,791.7	63.6	$23,242.4
2011	$8,069.9	36.0	$14,376.3	64.0	$22,446.2
2012	$9,401.4	36.4	$16,452.4	63.6	$25,853.8
2013	$12,545.3	37.4	$21,001.3	62.6	$33,546.6
2014	$13,883.1	37.8	$22,887.9	62.2	$36,771.0
2015	$13,310.9	37.3	$22,376.3	62.7	$35,687.2

Source: SIFMA Fact Book, 2016

Table 2: Average Daily Equity Trading Volumes (Matched Volume for 5 days ended March 14, 2017)

Panel A: Exchange Volume (shares)

Exchange	Tape A	Tape B	Tape C	Total Market	% Market
IEX	82,120,148	20,238,082	39,812,731	142,170,961	2.10%
CHX	12,428,436	12,428,436	4,698,218	29,012,382	0.43%
NYSE (N)	828,539,051			828,539,051	12.23%
NYSE Arca (P)	227,228,365	290,102,387	130,203,073	647,533,825	9.56%
NYSE MKT (A)		13,064,685		13,064,685	0.19%
EDGX (K)	187,149,315	97,019,632	153,584,295	437,753,242	6.46%
BATS BZX (Z)	211,968,076	89,546,514	106,248,730	407,763,320	6.02%
BATS BYX (Y)	161,487,158	67,687,777	81,979,228	311,154,164	4.59%
EDGA (J)	81,714,899	39,020,576	38,513,757	159,249,232	2.35%
Nasdaq (Q)	363,754,710	120,616,142	449,915,452	934,286,303	13.79%
Nasdaq BX	100,673,993	31,452,682	55,690,142	187,816,818	2.77%
Nasdaq PSX	21,771,133	21,101,586	19,606,067	62,478,786	0.92%

P anel B: Trade Reporting Facilty (TRF) Volume (shares)

Facility	Tape A	Tape B	Tape C	Total Market	% Market
Nasdaq TRF	1,148,611,147	526,907,736	718,242,565	2,393,761,448	35.33%
NYSE TRF	104,533,901	46,432,750	68,965,564	219,932,215	3.25%

Source: BATS Global Markets, http://www.bats.com/us/equities/market_share/

Table 3: Weekly trading volume of 31 ATS reporting to FINRA (for week ended February 20, 2017)

ATS Name	Total share volume	Total number of trades
QUA AQUA	260,800	43
BCDX BARCLAYS DIRECTEX	24,000	1
BIDS BIDS TRADING	93,169,106	117,574
BLKX BLOCKCROSS	11,436,732	1,065
CBLC CITIBLOC	3,740,544	191
CROS CROSSFINDER	285,513,409	1,602,153
CXCX CITI CROSS	22,061,154	90,803
DBAX SUPERX	201,627,980	1,097,385
DLTA DEALERWEB	26,421,232	81
EBXL LEVEL ATS	115,950,700	595,467
IATS IBKR ATS	22,874,024	76,419
ICBX INSTINET CONTINUOUS BLOCK CROSSING SYSTEM	81,773,936	368,331
ITGP POSIT	75,242,400	273,823
JPMX JPM-X	156,304,206	718,785
KCGM KCG MATCHIT	85,096,689	482,795
LATS BARCLAYS ATS ("LX")	107,455,347	552,078
LMNX LUMINEX TRADING & ANALYTICS LLC	5,269,324	152
LQNA LIQUIDNET H2O	12,315,900	1,196
LQNT LIQUIDNET ATS	22,557,100	567
MLIX INSTINCT X	95,361,619	461,797
MSPL MS POOL (ATS-4)	152,590,410	622,063
MSRP MS RETAIL POOL (ATS-6)	4,810,500	24,949
MSTX MS TRAJECTORY CROSS (ATS-1)	50,942,000	283,909
NYFX MILLENNIUM	29,374,620	90,706
PDQX CODA MARKETS, INC.	14,955,671	75,334
SGMA SIGMA X	85,087,955	439,786
UBSA UBS ATS	458,740,223	2,721,500
USTK USTOCKTRADE SECURITIES, INC.	2,905	66
WDNX XE	2,119,846	1,701
XIST INSTINET CROSSING	13,725,139	2,849
XSTM CROSSSTREAM	52,606,856	149,673

Source: FINRA Alternative Trading System Transparency Data.

Table 4: Routing venues and routing decisions for an introducing broker for NYSE-listed stocks

Route Venue	Total %	Market %	Limit %	Other %
Citadel Execution Services	28.19	35.87	9.12	32.71
KCG Americas LLC	20.79	30.46	5.47	22.79
NASDAQ	15.89	0.00	47.66	9.81
G1 Execution Services	11.07	15.99	2.90	12.26
BATS (EDGX)	11.02	0.00	31.69	7.38
Two Sigma Securities	7.33	4.64	0.88	11.31
UBS Securities LLC	3.74	6.50	1.16	3.55
Total %	100.00	24.58	22.45	52.97

Source: Scottrade, Inc., SEC Rule 606 Report, 1st Quarter 2017.