

COMMITTEE ON CAPITAL MARKETS REGULATION

September 16, 2016

Brent Fields, Secretary
U.S. Securities and Exchange Commission
100 F Street, N.E.
Washington, D.C. 20549-1090

Re: List of Rules to be Reviewed Pursuant to the Regulatory Flexibility Act (File No. S7-21-16)

Dear Sir or Madam:

The Committee on Capital Markets Regulation (the “**Committee**”) is grateful for the opportunity to comment on the Securities and Exchange Commission’s (the “**Commission**”) list of rules to be reviewed under the Regulatory Flexibility Act (the “**Rule List**”).

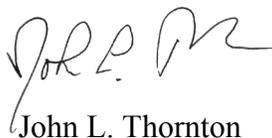
Founded in 2006, the Committee is dedicated to enhancing the competitiveness of U.S. capital markets and ensuring the stability of the U.S. financial system. Our membership includes thirty-four leaders drawn from the finance, investment, business, law, accounting and academic communities. The Committee is an independent and nonpartisan 501(c)(3) research organization, financed by contributions from individuals, foundations, and corporations.

This year’s Rule List includes Regulation NMS for review. In July 2016, the Committee published a report entitled *The U.S. Equity Markets: A Plan for Regulatory Reform* (the “**Report**”), which examines the existing structure and performance of U.S. equity markets and proposes 26 recommendations to enhance the function of our equity markets. In particular, Chapter 3 of the Report addresses four rules under Regulation NMS: the order protection rule; the access rule; the sub-penny rule; and market data rules. The Report explains the policy goals underlying each of those rules and sets forth specific recommendations about how to better achieve those goals. In response to the Commission’s request for comments on Regulation NMS to assist its review, enclosed with this letter the Committee is providing the Commission the Report for its consideration.

* * *

Thank you very much for your consideration of our views. Should you have any questions or concerns, please do not hesitate to contact the Committee’s Director, Prof. Hal S. Scott ([REDACTED]) or its Executive Director of Research, John Gulliver ([REDACTED]), at your convenience.

Respectfully submitted,



John L. Thornton
Co-CHAIR



Hal S. Scott
DIRECTOR



R. Glenn Hubbard
Co-CHAIR



COMMITTEE ON CAPITAL MARKETS REGULATION



THE U.S. EQUITY MARKETS

A Plan for Regulatory Reform

July 2016



COMMITTEE ON CAPITAL MARKETS REGULATION

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The Committee on Capital Markets Regulation is an independent and nonpartisan 501(c)(3) research organization dedicated to improving the regulation of U.S. capital markets. Thirty-four leaders from the investor community, business, finance, law, accounting, and academia comprise the Committee's membership.

The Committee Co-Chairs are R. Glenn Hubbard, Dean of Columbia Business School and John L. Thornton, Chairman of the Brookings Institution. The Committee's President and Director is Hal S. Scott, Nomura Professor and Director of the Program on International Financial Systems at Harvard Law School. The Committee's research on the regulation of U.S. capital markets provides policymakers with a nonpartisan, empirical foundation for public policy.

Unless otherwise noted, the recommendations in this Report are unanimously supported by Committee members, though some statements expressed in the body of the Report may not be shared by all members. The Report represents the work of the Committee, not the institutions of which its members are a part.

The Committee wishes to thank all of the members of the Advisory Committee for their extensive and valuable input on the critical issues examined in this Report. In addition, we wish to thank the entire staff, and in particular John Gulliver, the Research Director, who guided this project from start to finish, Megan Vasios, our current associate, who helped throughout, and Matthew Judell, a former associate, who did much of the original data analysis in Chapter 1.

A Path Forward for the U.S. Equity Market Structure

Well-functioning trading markets for stocks are critical to the U.S. economy because they promote the productive allocation of capital. They do so by establishing accurate prices for the shares of publicly traded companies and by enabling investors to efficiently enter and exit their investments. However, in recent years, a lack of understanding of our trading markets has fostered concerns that the markets are not functioning effectively for long-term investors. Some critics have even gone so far as to suggest that the equity markets are “rigged” against long-term investors.

“*The US Equity Markets: A Plan for Regulatory Reform*” (“**the Report**”) addresses these concerns in two distinct ways. First, we seek to inform the public and policymakers about the U.S. equity market structure and evaluate its performance for U.S. investors and public companies. Second, we set forth twenty-six recommendations to enhance the performance of our equity markets. We note that the Securities and Exchange Commission (“**SEC**”) has the authority to implement all of our recommendations except for three that would require legislative change. These three recommendations are noted with an asterisk in the list below.

To inform the public about our trading markets, we have conducted an empirical analysis of U.S. stock orders and executions over the past twenty years. This research allows us to reach conclusions as to how investors and public companies are faring in today’s markets. Overall, we find that our trading markets are performing very well for long-term investors. For example, we find that our markets are highly liquid and that investor transaction costs, as measured by bid-ask spreads, brokerage commissions and price impact, are at record lows. Additionally, instances of extreme volatility have been infrequent and isolated, and can be addressed by our recommendations.

We also explain high frequency trading (“**HFT**”) strategies and “dark pools” and we review the academic literature on each. With regards to HFT strategies, we believe that they are best understood as modern variants of traditional market making and arbitrage strategies that have always existed in equity markets. These

strategies can provide important benefits to markets—market making provides investors with liquidity and arbitrage improves the accuracy of stock prices. Our review of the academic literature on HFT strategies finds that they are generally associated with positive effects on market quality, particularly with respect to liquidity, price efficiency, and volatility.

With regards to orders that are executed in the “dark,” we find that dark orders are often executed at a better price than the best publicly displayed price. However, our review of the academic literature on the relationship between dark trading and market quality is inconclusive. A number of studies find positive effects from dark trading, such as lower transaction costs, while several others find that dark trading can have negative effects, including a reduction in the accuracy of stock prices.

We also explain the key rules that govern trading in the U.S. stock market and their policy goals. These rules were last comprehensively revised over a decade ago and since then, our equity markets have dramatically changed. We explain how.

Our recommendations to modernize the existing equity market structure rules are based on three underlying themes: (1) Increase transparency; (2) Strengthen resiliency; and (3) Lower transaction costs by enhancing competition. A list dividing our twenty-six recommendations into these three themes is included at the end of this statement.

We hope that dividing our recommendations into these three groups will clarify the order in which policymakers should address our recommendations. Indeed, we strongly suggest that the SEC *promptly* acts on our recommendations to: (1) Increase transparency and (2) Strengthen resiliency. We believe that the benefits of these reforms to investors and public companies are clear and significant. Furthermore, these reforms should face limited opposition, in part because they do not affect the existing competitive balance between exchanges and broker-dealers.

More specifically, the disclosure rules that apply to our equity markets are severely outdated, as they were implemented in 2000 when stocks primarily traded on the floor of an exchange. Enhanced disclosures by exchanges and “dark pools” would allow brokers to better identify the trading venues with the best prices. This will put more money in the pockets of investors, because brokers retain significant discretion about where they will send and execute a customer’s order. Brokers should also be subject to enhanced disclosure requirements so institutional and retail investors can determine whether their broker is getting the best prices for their orders.

Strengthening the resiliency of U.S. equity markets would also improve investor confidence by reducing the likelihood of events like the May 6, 2010 “flash crash” or the volatility seen on August 24, 2015 (when hundreds of stocks did not open on time, were subject to multiple trading halts after opening and traded at highly volatile prices). Indeed, most of the existing volatility controls are relatively new, and recent events have provided us with the information that we need to enhance them.

Finally, we expect that our recommendations to lower transaction costs by enhancing competition will be our most contentious recommendations. This is because certain of these recommendations are based on the view that stock exchanges have authorities that reduce competition and increase transaction costs for investors. We therefore recommend that the SEC take incremental steps when possible. The use of pilot programs and independent studies could be especially valuable to ensure that these reforms have a solid analytical basis. Such an approach would promote both the effectiveness of the reforms and the legitimacy of the SEC’s actions.

In conclusion, it is our strong view that now is the time for policymakers to act in the best interest of long-term investors and public companies by unleashing the benefits of transparent, resilient and competitive equity markets.

CCMR Specific Recommendations¹

(1) Increasing the Transparency of our Equity Markets

1. The SEC should require that disclosures on new Form ATS-N are published in a standardized format.
2. Required disclosures of registered exchanges should be revised to include trading volumes attributable to undisplayed (“dark”) order flow.
3. Retail brokerages should be required to provide disclosures regarding execution quality for their customers. Relevant disclosures should include percent of shares with price improvement, effective/quoted spread ratio, and average price improvement.
4. The SEC should require broker-dealers to provide institutional customers with standardized reports that provide order routing and execution quality statistics.
5. Trading venue disclosures should include information about execution speeds to the millisecond.
6. Statistical information for disclosures pursuant to Rule 605 and Rule 606 and disclosures regarding institutional orders should be submitted in only one format to facilitate comparison across trading venues and among broker-dealers.
7. The SEC’s cost benefit analysis for the Consolidated Audit Trail did not determine whether the \$2 billion in implementation costs and \$1.5 billion in

¹ The below list divides our recommendations into three groups. We note, however, that the Report does not present our recommendations in these same groupings. This is because the order of the report is based on our explanation of the existing rules and not the themes underlying our recommendations.

annual reporting costs for broker-dealers would be passed on to investors. Prior to finalizing the CAT, the SEC should conduct a *publicly available* analysis that evaluates the costs and benefits of the CAT, and applies the cost benefit analysis to ensure that the CAT is implemented efficiently, with costs allocated appropriately amongst the stakeholders.

8. The SEC should pass a rule applying the order protection rule to odd lot transactions above a threshold dollar amount, instead of a threshold share amount.
9. Broker-dealers should be required to disclose how access fees and liquidity rebates affect order routing practices and transaction costs for their customers.
10. The SEC should require exchanges to publicly disclose revenues from the securities information processors (“SIPs”), the allocation of market data revenues among SIP Plan Participants and revenues from proprietary data feeds.
11. The SEC should require exchanges to disclose performance data for the SIPs and proprietary data feeds to facilitate a comparison of the relative speeds with which investors can obtain actionable market data from each.

(2) Strengthening the Resiliency of our Equity Markets

1. Thresholds for market-wide circuit breakers should be adjusted so that they are triggered when a pre-determined number of stocks or percentage of an index display extreme volatility by triggering their individual trading halts.
2. The SEC and the Commodity Futures Trading Commission should work together to harmonize the thresholds for market-wide circuit breakers in the stock market with the futures market.

3. The SEC should establish uniform Limit Up-Limit Down (“LULD”) intraday price bands, instead of wider bands during the market open and close.
4. The SEC should eliminate clearly erroneous trade guidelines by aligning them with the thresholds for LULD rules.
5. The SEC should require mandatory kill switches on all exchanges for all exchange members.
6. The SEC should clarify exchange regulatory trading halt procedures in the event of specific operational failures (e.g., SIP failure).

(3) Reducing Transaction Costs by Enhancing Competition

1. The surveillance and enforcement regulatory responsibilities currently assigned to SROs should be centralized to the extent practicable. The reorganization could include centralization at either the SEC or FINRA.*
2. The NMS Plan process should be revised so that exchange SROs do not have outside influence in the rulemaking process. Representatives of exchanges, broker-dealers and investors should be permitted to vote on any NMS Plans.*
3. Once SRO surveillance and enforcement responsibilities have been centralized to the extent practicable, Congress should revisit the Exchange Act to reconsider exchange legal immunity. Exchange legal immunity should only be available for exchange regulatory functions unique to exchanges that cannot be effectively centralized.*
4. The SEC should implement a pilot program to evaluate the impact of a reduction in access fees and liquidity rebates on market quality and trading behavior. The structure of the pilot should generally conform to the

framework proposed by the Equity Market Structure Advisory Committee Regulation NMS Subcommittee and leverage existing pilots as appropriate.²

5. After concluding the access fee pilot, the SEC should conduct a pilot program for reducing the tick size for highly liquid stocks. The pilot should include a control group and should not include a trade-at rule.
6. After requiring disclosure of exchange market data revenues, the SEC should adopt a “Competing Consolidator” model for data dissemination. As a first step to implementing this framework, the SEC should promote reforms in the governance and transparency of the current SIPs.
7. The SEC should *not* implement a trade-at rule, as it could increase investor transaction costs without appreciably improving market quality.
8. ATSS should be allowed to limit access to their trading venues.³
9. ATSS should not be required to obtain pre-approval from the SEC before adopting trading rules.

² Citadel dissents from this recommendation.

³ Citadel dissents from this recommendation.

EXECUTIVE SUMMARY

This Report is divided into four chapters: Chapter 1: Market Characteristics and High Frequency Trading; Chapter 2: Trading Venues and Undisplayed Liquidity; Chapter 3: Regulation National Market System (“**Reg NMS**”); and Chapter 4: Understanding and Enhancing Market Resiliency.

Chapter 1 sets forth the findings of our empirical analysis of equity quotation and execution data over the past 20 years. The analysis considers key market performance metrics to reach empirically-based conclusions regarding the impact of the automated market structure on investor outcomes. The chapter then provides specific insight into high frequency trading (“**HFT**”) strategies, including a simple example of an HFT strategy and a review of the academic literature on HFT strategies and market quality.

Chapter 2 describes the rules applicable to the two types of trading venues: exchanges and alternative trading systems (“**ATs**”). It also describes the process of broker-dealer internalization. The chapter then sets forth proposed reforms to exchanges and ATs. Next, the chapter describes undisplayed or “dark” liquidity, including a review of the academic literature on the relationship between “dark” liquidity and market quality. The chapter then sets forth specific recommendations related to “dark” liquidity.

Chapter 3 is divided into four parts, each of which addresses a major rule from Reg NMS: the order protection rule, the access rule, the sub-penny rule and market data rules. Each part explains the policy goals underlying each rule and sets forth specific recommendations for how to better achieve those policy goals.

Chapter 4 explains the 2010 flash crash, the market break of 1987 and the disruptions experienced on August 24, 2015. The chapter then describes existing volatility controls and sets forth specific recommendations for how to strengthen the resiliency of our equity markets.

INTRODUCTION

From the 1970s until the mid-2000s, the U.S. equity markets were dominated by exchange-based floor trading. This manual market landscape had some marked differences from the modern structure. For example, trading was highly centralized and competition among trading venues was limited. At the same time, there are similarities between the manual and modern market structure, such as the existence of undisplayed or “dark” trading and broker-dealer internalization.

Once automated electronic communication systems developed in the late 1990s, broker-dealers began to use these technologies to implement trading systems that challenged the dominance of the exchange-based manual model. In 1998, the SEC adopted Regulation Alternative Trading Systems (“**Reg ATS**”), subjecting these trading venues to regulation.

Despite the advent of electronic marketplaces, certain regulations that were in place until 2006 gave a competitive advantage to slower manual markets for exchange-listed stocks. In 2006, the implementation of Regulation National Market System (“**Reg NMS**”) reshaped the equity market regulatory structure to spur the automation of equity markets and lower investor transaction costs. Shortly thereafter, competition among trading venues intensified.

According to Mary Jo White, the Chair of the SEC, “empirical evidence shows that investors are doing better in today’s algorithmic marketplace than they did in the old manual markets.” However, a number of concerns with our trading markets have emerged in recent years. For example, the proliferation of trading venues means that investor orders may be executed across multiple platforms with different rules. Thus, in certain ways, investors lack transparency regarding where and how their trades are executed, as compared to the highly centralized manual markets. The emergence of HFT strategies that are not well understood contributes to concerns that these short-term trading strategies may be profiting at the expense of long-term investors. Concerns about resiliency have also been raised in recent years, in light of several recent incidents in which technical glitches and human errors caused widespread market disruption.

As detailed throughout this report, the SEC has made considerable progress in enhancing the regulatory landscape. However, there is more work to be done. Concerns related to transparency and equity market resiliency can negatively affect investor confidence and participation in U.S. equity markets, which in turn could make it costlier for public companies to raise capital and for U.S. savers to invest.

Through this Report, the Committee seeks to contribute to the equity market reform effort in two distinct ways. First, we seek to educate the public and policymakers about the U.S. equity market structure and its performance for public companies and U.S. investors. Second, we offer twenty-six recommendations to enhance the existing regulatory framework.

CHAPTER 1: MARKET CHARACTERISTICS AND HIGH FREQUENCY TRADING

Part I: Equity Market Characteristics

A. Competition

We begin Chapter 1 with an analysis of the effect of competition on the distribution of trading volumes among different trading venues. We find evidence of increased competition in (1) the decline in trading venues' respective market shares of total trading volume and (2) the NYSE's decline in market share of trading volume in NYSE-listed stocks.

B. Automation

We then assess the changes to equity market structure that automation has facilitated and amplified. We find that automation is associated with: (1) increased NYSE execution speeds; (2) the emergence of innovative new securities products like ETFs and ETNs, (3) a growth in daily trading volume in NMS securities, and (4) the ability of market participants to update their quotes with greater frequency. We also find that increases in trading volumes and quotes per trade have plateaued or diminished slightly in recent years, which we tentatively attribute to the high degree of competition among market participants that employ HFT strategies.

C. Volatility

Volatility generally refers to the extent to which a stock's price fluctuates over a period of time. A common concern with automation is the belief that it has contributed to an increase in stock market volatility. We review long-term and intraday volatility measures since 2000. We find that the VIX, a commonly used indicator of long-term volatility, is at historically average levels. We find that the intraday volatility for the most volatile stocks and stocks of median volatility is currently lower than its level in 2000 and that the intraday volatility of the least volatile stocks has remained relatively constant since 2000.

D. Liquidity and Transaction Costs

Market liquidity measures the ease with which a security can be bought and sold. Liquidity can be evaluated along three dimensions: (1) *market depth* – the dollar amount or share volume of publicly displayed offers to buy or sell at the best available price; (2) *immediacy* – how quickly trades of a given size can be executed; and (3) *market breadth* – the transaction cost of executing a trade of a given size.

We examine market depth and also treat it as a loose proxy for immediacy, because market depth and immediacy are closely related concepts and empirical trends in market depth are likely accompanied by similar trends in immediacy. We find that the share volume of displayed quotes at the best publicly displayed price (“NBBO”) has generally increased or remained stable since 2003.

Market breadth is closely related to a stock's bid-ask spread (the difference between the market prices to buy and sell) because the spread is a component of a trade's cost. We find that in recent years, stocks' spreads at the NBBO have generally fallen for stocks. Lower spreads generally mean lower transaction costs. We also review empirical studies finding that other key components of market breadth have declined. For example, studies have documented a decline in retail and institutional brokerage commissions, and reduced costs associated with price impact for institutional investors.

E. Undisplayed or “Dark” Liquidity

Undisplayed or “dark” liquidity generally refers to trades that are executed without the public display of an order. Trading in the dark can be beneficial to investors when it results in trades being executed at better prices than the NBBO (referred to as “price improvement”). Even if a trade is executed without price improvement, trading in the “dark” can still benefit institutional investors if it helps minimize the price impact of a large order. We review trading venue Rule 605 disclosures and find that exchanges, ATSS, and broker-dealer internalizers each offer measurable price improvement for trades that are executed in the dark. Chapter 2 of this report further describes and contextualizes dark trading in today’s equity markets.

Part II: High Frequency Trading Strategies and Equity Market Quality

A. Description of High Frequency Trading Strategies

High frequency trading (“HFT”) strategies make up a significant segment of trading activity in the modern equity markets (nearly 50% of U.S. equity market trading volume, according to some estimates). However, in today’s markets, high speed execution and data services are accessible to a wide range of market participants, and many different types of institutions and traders use these services. We therefore believe that an informed analysis of the role of HFT in U.S. equity markets should focus on identifying the functional characteristics of HFT strategies, rather than classifying certain institutions that engage in such strategies as “HFT firms.” Common functional characteristics of HFT strategies include: (1) use of high speed programs to generate, route, and execute orders; (2) use of high speed execution services and proprietary data feeds offered by exchanges; and (3) short timeframes for establishing and liquidating positions.

Two common types of HFT strategies are HFT market making and HFT arbitrage strategies. Market making and arbitrage strategies are traditional trading strategies that have always existed in equities markets, and HFT strategies use automation to execute these strategies more efficiently.

B. HFT Strategies and Equity Market Quality

To conclude the chapter, we present the results of our independent review of the academic literature that has emerged in the past five years regarding the relationship between HFT strategies and market quality. We find that this literature generally highlights a positive association between HFT strategies and market quality, particularly with respect to volatility, price efficiency, liquidity, and transaction costs. We also briefly introduce certain popular criticisms of HFT strategies and relate these criticisms to illustrative empirical data, finding that there is often a disconnect.

CHAPTER 2: TRADING VENUES AND UNDISPLAYED LIQUIDITY

Part I: Regulating Different Types of Trading Venues

A. Exchanges

Twelve exchanges are currently in operation. They are estimated to collectively handle approximately 63% of the total U.S. share volume of executions in equities. In addition, the SEC approved the exchange application of Investors Exchange (“**IEX**”) in June 2016.

The key requirements that apply to exchanges are set forth in the Exchange Act and in regulations promulgated thereunder by the SEC. One requirement is that exchanges must permit any registered broker-dealer in good standing to become a member of the exchange. Exchanges must also file their proposed rules, which cover trading at the exchange and member conduct, for public comment and SEC approval before they can go into effect. In addition, exchanges are the only trading venues that are statutorily deemed “self-regulatory organizations” (“**SROs**”). As SROs, exchanges must have the capacity to carry out the purposes of the Exchange Act and to enforce compliance by their members with the Act and related exchange rules.

Exchange registration also provides trading venues with certain advantages to other trading venues. These advantages include the ability to display “protected quotes” and several benefits of SRO status (e.g., participation in market data

revenues, design of “national market system plans” (“**NMS Plans**”) that govern the development and operation of major components of the market infrastructure, and certain types of legal immunity). Each of these advantages is explained in detail in the body of the Report.

B. Alternative Trading Systems (ATs)

In 1998, the SEC passed Regulation Alternative Trading System (“**Reg ATS**”) and established a new type of trading venue, the ATS. This new type of trading venue was designed to respond to the proliferation of automated trading platforms that market participants had developed in recent years, which “furnish[ed] services traditionally provided solely by registered exchanges.” There are now roughly forty ATs that are estimated to collectively execute approximately 15% of the total U.S. share volume in equities.

Although these electronic venues meet the Exchange Act definition of exchange, Reg ATS exempts them from exchange registration if they comply with Reg ATS and their operators are regulated as broker-dealers. However, any venue registering as an ATS cannot exercise self-regulatory powers, such as making rules regarding subscriber conduct outside the platform. For example, Reg ATS requires that an ATS’s rules can only pertain to its subscribers’ trading conduct, and ATs can only discipline subscribers by excluding them from trading.

Unlike an exchange, an ATS can effect trading rules without the SEC’s pre-approval. ATs can also limit access to trading on their platform, unless their average daily trading volume in a particular stock equals or exceeds a specified threshold. If that volume is reached, then the ATS must establish written standards for granting open access to trading in that stock and not unreasonably limit anyone’s access to trading in that stock by applying those standards in an unfair or discriminatory way.

ATs are also not required to publicly display orders, unless their trading volume in a stock equals or exceeds a specified threshold *and* the ATS displays prices to more than one of its participants (i.e., it is not a “dark pool”). If an ATS is

a dark pool, then there is no regulatory threshold at which the ATS must publicly display orders. It is important to note that virtually all ATSs are dark pools.

C. Broker-Dealer Internalization

Broker-dealer internalization generally involves a broker-dealer executing customer orders against its own inventory of stocks. Broker-dealer internalizers do not meet the Exchange Act definition of an exchange, because they generally execute trades as principal rather than acting as an intermediary that connects buyers with sellers of stocks. Accordingly, they do not have to register as an exchange under the Exchange Act or an ATS under Reg ATS. Instead, broker-dealer internalizers must register as members of the Financial Industry Regulatory Authority (“**FINRA**”). FINRA membership carries with it a number of regulatory obligations, such as examination, licensing, and reporting requirements. Approximately 22% of the total U.S. share volume in equities is executed in this manner and roughly 250 broker-dealers internalize customer orders.

Nearly 100% of retail orders to buy or sell NMS stocks at the NBBO (“**marketable orders**”) are executed via “retail” broker-dealer internalization. Retail broker-dealer internalizers often have payment for order flow (“**PFOF**”) agreements with retail brokerages. Under a typical PFOF agreement, a broker-dealer internalizer pays a retail brokerage to direct marketable retail order flow to the broker-dealer internalizer for execution. PFOF agreements often guarantee a specified amount of average price improvement for executions of the retail order flow, and the cost savings are generally divided among the broker-dealer internalizer, retail brokerage, and investor. Rule 606 of Reg NMS requires retail brokerages to report information about their PFOF arrangements in quarterly public filings.

D. Different Regulatory Regimes for Exchanges and ATSs

In this section, we consider whether specific differences between the regulatory regimes for the two types of trading venues (exchanges and ATSs), remain appropriate. First, we contrast each venue’s access rules. In general, exchanges are required to provide all broker-dealers in good standing with access to trading on their platforms. In contrast, ATSs may limit access to trading on their

platforms. In our view, ATSS' ability to offer price improvement to the NBBO may relate to their ability to limit access to their platform. First, it allows them to quickly limit the access of traders who create a hostile trading environment for other subscribers. Second, certain execution strategies for investor orders may be more efficiently deployed on a trading venue that only includes a specific sub-set of market participants.

Specific Recommendation:

1. ATSS should be allowed to limit access to their trading venues.⁴

We next assess the differences in rulemaking processes and requirements for exchanges and ATSS. As SROs, exchanges have robust rulemaking and self-disciplinary authorities. Rules proposed by exchanges must generally be reviewed and approved by the SEC before they go into effect, and they must be published with an opportunity for interested parties to comment. In contrast, ATS rules are filed only as "notice" to the SEC—they do not need to be published or pre-approved—and they generally address technical aspects of the platforms' operations. We believe that each venue's respective rulemaking requirements are appropriate for two major reasons. First, the required rulemaking process for each type of venue tracks the scope of its rulemaking authority: exchanges have broad rulemaking authority over their members and must abide by stringent rulemaking requirements, while ATSS have narrower rulemaking powers and a streamlined rulemaking process. Second, ATSS' rulemaking flexibility can facilitate innovation and reduce start-up costs for new venues.

Specific Recommendation:

2. ATSS should not be required to obtain pre-approval from the SEC before adopting trading rules.

⁴ Citadel dissents from this recommendation.

E. Legal Issues regarding Exchanges and ATSS: Enhancing the Regulatory Framework

Since 2011, several enforcement actions have exposed improper trading and disclosure practices at certain ATSS. These behaviors include (i) the misuse of confidential customer information, (ii) false and/or incomplete disclosures, and (iii) pricing misconduct. We believe that the amendments to Reg ATS proposed by the SEC in November 2015 represent an important step towards improving ATS accountability through enhanced transparency. The proposed amendments would subject ATSS to enhanced reporting requirements on a new mandatory “Form ATS-N.” Required disclosures would include information regarding ATS products and services, trading activity by the operators, and procedures regarding confidential customer information. Importantly, Forms ATS-N filed by ATSS would be *publicly available*. We generally support Form ATS-N and believe that these enhanced public disclosures would improve investors’ ability to objectively compare trading venues and help reduce the behaviors that led to recent enforcement actions. In addition, we recommend that the SEC provide a mandatory standardized format for Form ATS-N disclosures, to ensure that investors can objectively compare trading venues using the information provided.

Specific Recommendation:

3. The SEC should require that disclosures on new Form ATS-N are published in a standardized format.

Exchanges and “national securities associations” are designated as SROs under the Exchange Act. The only national securities association is FINRA, an independent organization that regulates the securities industry. In practice, exchanges do not execute their SRO obligations independently. The SEC maintains a role in regulating exchanges—exchange rules and disciplinary decisions are subject to SEC review, and the SEC may “suspend, bar or otherwise censure” an SRO that fails in its self-regulatory responsibilities. The Exchange Act also allows the SEC to re-allocate regulatory responsibilities among SROs that would otherwise share those same responsibilities, so that one SRO (e.g., FINRA) can handle those responsibilities on behalf of other SROs (e.g., exchanges). In

addition, SROs have voluntarily entered into Regulatory Services Agreements (“RSAs”) with other SROs to contract out certain non-common regulatory responsibilities. The upshot of this ability to outsource SRO obligations is that FINRA now handles many of exchanges’ self-regulatory responsibilities on their behalf.

Against this backdrop, we consider the potential benefits of formally centralizing SRO surveillance and enforcement authorities with a single centralized regulator. We believe that this structure could enhance regulators’ ability to monitor trading practices across the fragmented marketplace and streamline and simplify disciplinary processes. One option is to centralize these authorities with FINRA, given its existing status as a non-exchange SRO and involvement in discharging SRO responsibilities. Another potential approach is for Congress to consolidate the relevant authorities at the SEC, but only if adequate funding is available to the agency. Competitive private sector alternatives to FINRA and the SEC are also worth evaluating. In principle, centralizing and standardizing these authorities to the extent possible is a worthwhile policy goal that warrants further study.

Specific Recommendation:

4. The surveillance and enforcement regulatory responsibilities currently assigned to SROs should be centralized to the extent practicable. The reorganization could include centralization at either the SEC or FINRA.

One consequence of exchanges’ SRO status is that they are able to exert disproportionate influence in establishing market-wide rules through NMS Plans. SROs’ authority to file NMS Plans originates in the Exchange Act, which allows the SEC to delegate the development and operation of key elements of market infrastructure to the SROs when they jointly file such plans. The Exchange Act and Reg NMS do not expressly restrict the scope or contents of NMS Plans, so they can govern a wide range of important market structure issues. As a result, their contents affect essentially every market participant, although non-exchange participants play no meaningful role in their design. For example, the consolidated audit trail (“CAT”), the tick-size pilot program, and the governance of the

consolidated market data aggregators (SIPs) are all managed according to NMS Plans.

We believe that this system is outdated and unfair in today's competitive marketplace and we agree generally with the approach recently recommended by the SEC's Equity Market Structure Advisory Committee ("EMSAC") Trading Venues Regulation Subcommittee to effect a more equitable NMS Plan process. In particular, we believe that the role of NMS Plan Advisory Committees (on which certain key groups of market participants are represented) should be enhanced and that the role of SRO-controlled Executive Sessions should be restricted. We would also go further than the EMSAC Subcommittee in recommending that Congress should revise the Exchange Act so that a representative from certain key constituent groups of Advisory Committees (e.g., broker-dealers and investors) should each be granted a formal vote on NMS Plan matters.

Specific Recommendation:

5. The NMS Plan process should be revised so that exchange SROs do not have outsize influence in the rulemaking process. Representatives of exchanges, broker-dealers and investors should be permitted to vote on any NMS Plans.

Another consequence of exchanges' SRO status is that, unlike other market participants, they are immune from certain types of legal liability. Exchange immunity originated from their adjudicatory and disciplinary responsibilities, but has expanded to encompass their regulatory functions more generally. Given that exchanges outsource many regulatory functions and are now for-profit entities that compete with other market participants, their limited legal immunity now seems an unfair and outdated competitive advantage.

Specific Recommendation:

6. Once SRO surveillance and enforcement responsibilities have been centralized to the extent practicable, Congress should revisit the Exchange Act to reconsider exchange immunity. Exchange immunity should only be

available for regulatory functions unique to exchanges that cannot be effectively centralized.

Part II: Undisplayed or “Dark” Trading

Undisplayed or “dark” trading describes trades that are executed without the use of publicly displayed orders. In contrast, a displayed quote is viewable by the public and includes: (1) the stock symbol, (2) whether the order is one to buy or to sell, (3) the number of shares, and (4) the price. It is important to note that trade *execution* data must be publicly reported regardless of whether the *quotation* data for that trade was displayed.

A. Dark Trading Across Trading Venues

Dark trading has always been a part of equity markets, but dark trading volume has increased in recent years. Although it is widely acknowledged that effectively all trading on ATSS and via broker-dealer internalization occurs in the dark, according to some estimates, a significant amount (roughly 11-14%) of trading volume on exchanges also occurs in the dark. However, it is difficult to estimate the actual amount of dark trading on exchanges with any certainty, because exchanges do not disclose their dark trading volumes. Indeed, the significant amount of dark trading on exchanges is often overlooked, and public concern regarding dark trading often focuses on ATS regulation. In our view, to produce regulations that accurately reflect and respond to the existing market landscape, transparency regarding dark trading on exchanges must be improved.

Specific Recommendation:

7. Required disclosures of registered exchanges should be revised to include trading volumes attributable to undisplayed (“dark”) order flow.

B. Dark Trading and Market Quality

This section presents (1) empirical data and (2) a literature review regarding dark trading and certain market quality metrics. First, we briefly revisit CCMR’s

empirical findings presented in Chapter 1 that relate to the impact of dark trading on market quality. The CCMR data shows that measurable price improvement to the NBBO may be obtained via dark executions. The frequency and magnitudes of such price improvement according to venue and order type (market and limit) are described as well.

Second, we present a review of the academic literature that evaluates the impact of dark trading on market quality. Studies have identified a number of potential positive effects of dark trading, including reduced volatility, increased market depth, improved liquidity, narrower spreads, and improved price discovery. However, other studies have concluded that dark trading may yield limited price improvement or may harm price discovery. Studies have also produced mixed conclusions regarding the effect of varying levels of dark trading on market quality.

We believe that the regulation of dark trading should be based in empirical findings regarding the relationship between dark trading and market quality. In general, we believe that enhanced disclosures regarding dark trading, as endorsed in Recommendations 3 and 7, can improve investor outcomes and confidence in our markets. We offer no further policy recommendations stemming from our empirical research and literature review at this time, because in our view the literature is inconclusive in informing appropriate next steps.

C. Trade-at Rule

The “trade-at” rule is a potential reform that would encourage the public display of orders. The rule would prohibit a trading venue from executing a trade at the NBBO if the trading venue had not been publicly displaying a quote at the NBBO when the order was received. In other words, to execute a trade in the dark, the trading venue could not simply match the best publicly displayed price. Instead, the trading venue could either execute the order with “significant” price improvement to the NBBO or else route the order to a trading venue that was publicly displaying the NBBO.

We have certain concerns with a trade-at rule. First, such a rule could reduce dark trading and any market quality improvements that are attributable thereto. For example, the benefits of executing in the dark are not solely from price improvement. Dark trading *at* the NBBO, which would be prohibited by the trade-at rule, can also reduce the price impact of a large institutional order. In addition, experiences abroad (in Canada and Australia) indicate that a trade-at rule may be associated with negative market quality effects.

We conclude that a broad trade-at prohibition is unlikely to be the most efficient approach to encourage the public display of orders. We believe that the factors that drive dark trading are varied, nuanced, and generally legitimate. In our view, some dark trading is likely an attempt to avoid certain costs associated with publicly displaying orders, including those caused by exchange access fees. We therefore recommend implementing reforms to reduce the cost of publicly displaying orders instead of a trade-at rule. Such reforms are introduced in Chapter 3.

Specific Recommendation:

8. The SEC should *not* implement a trade-at rule, as it could increase investor transaction costs without appreciably improving market quality.

CHAPTER 3: REGULATION NATIONAL MARKET SYSTEM

Part I: The Order Protection Rule

This section discusses the rules intended to ensure that investors receive the best prices for their orders. First, the duty of best execution requires that broker-dealers seek to obtain the best terms for customer orders. Prior to Reg NMS, orders for exchange-listed stocks were also subject to the Intermarket Trading System Plan (“**ITS Plan**”), which sought to ensure that trading venues executed orders at the best price. Reg NMS eliminated the outdated ITS Plan and replaced it with the order protection rule.

A. The Duty of Best Execution

The duty of best execution requires broker-dealers to seek to execute customer trades at the most favorable terms reasonably available under the circumstances. It derives from common law agency principles and fiduciary obligations. Broker-dealers must consider a number of factors to help them identify the best terms reasonably available, but the duty of best execution is not a guarantee that customer orders will receive the best terms in every instance.

B. The ITS Plan

The ITS Plan was the precursor to the order protection rule. It required orders for exchange-listed stocks to be executed at the trading venue displaying the best price. In practice however, the ITS Plan often caused orders to miss the best price, because it required broker-dealers to check quotes at both automated and slower, manual venues. An order that is executed at a worse price than the best publicly available price is known as a “trade-through.” The SEC adopted Rule 611 of Reg NMS (the “**order protection rule**”) to reduce trade-throughs by protecting only automated quotes.

C. The Order Protection Rule

The order protection rule effectively eliminated the ITS Plan. Instead, it requires trading centers (including exchanges, ATSS and broker-dealer internalizers) to establish, maintain, and enforce written policies and procedures that are reasonably designed to prevent trade-throughs of “protected quotations.” Protected quotations are the best publicly displayed bids and offers on each exchange and the ADF operated by FINRA. While the rule restricts order execution at a price worse than the NBBO, trading centers are free to execute at a price matching the NBBO, even if they were not displaying that price.

D. Achieving the Goals of the Order Protection Rule

Rule 605 and Rule 606 disclosures do not provide the information necessary for a retail investor to determine whether they are getting the best prices for their order. To address this concern, we recommend that each retail brokerage produce a

report combining order routing statistics and statistics regarding execution quality received at *each venue* to which it routes its customers' orders.

Specific Recommendation:

9. Retail brokerages should be required to provide disclosures regarding execution quality for their customers. Relevant disclosures should include percent of shares with price improvement, effective/quoted spread ratio, and average price improvement.

Another potential concern with current reporting rules is that there are no disclosure requirements specific to large institutional orders. Presently, voluntary institutional disclosure practices vary considerably among broker-dealers. We believe that broker-dealers should be required to provide standardized disclosures regarding order routing and execution quality statistics, so institutional investors can better determine whether they are getting the best prices.

Specific Recommendation:

10. The SEC should require broker-dealers to provide institutional customers with standardized reports that provide order routing and execution quality statistics.

Another problem is that Rule 605 requires trading venues to disclose executions to the tenth of a second, but prevailing order speeds are much faster (often in the microseconds (1 millionth of a second) for the most liquid stocks). In our view, trading venues should be required to disclose execution speeds to the millisecond, so customers are better able to detect and respond to inefficient routing and execution practices.

Specific Recommendation:

11. Trading venue disclosures should include information about execution speeds to the millisecond.

Additionally, Rules 605 and 606 permit the submission of statistical information in a variety of formats, hindering comparisons among venues and broker-dealers. We recommend that a standardized format for statistical information be adopted for Rule 605 and 606 disclosures and for new institutional order disclosures.

Specific Recommendation:

12. Statistical information for disclosures pursuant to Rule 605 and Rule 606 and disclosures regarding institutional orders should be submitted in only one format to facilitate comparison across trading venues and among broker-dealers.

The ability of the SEC and FINRA to determine whether investors are obtaining the best prices for their orders depends on their surveillance capabilities. In July 2012, the SEC adopted Rule 613, requiring the development of an NMS Plan to establish and implement the Consolidated Audit Trail (“CAT”). Once implemented, the CAT will be an order tracking system and information repository that allows regulators to track order and quote specifications across trading venues. However, the CAT is an extremely costly project: the SEC estimates \$2 billion in implementation costs and \$1.5 billion in annual reporting costs for broker-dealers, and the SEC’s cost benefit analysis did not determine the extent to which these significant costs would be passed on to investors. While we support the CAT, we believe that the SEC’s analysis must determine the extent to which such costs will be passed on to investors and ensure that there is a fair and balanced apportionment across both the industry and exchanges.

Specific Recommendation:

13. The SEC’s cost benefit analysis for the Consolidated Audit Trail did not determine whether the \$2 billion in implementation costs and \$1.5 billion in annual reporting costs for broker-dealers would be passed on to investors. Prior to finalizing the CAT, the SEC should conduct a *publicly available* analysis that evaluates the costs and benefits of the CAT, and applies the cost

benefit analysis to ensure that the CAT is implemented efficiently, with costs allocated appropriately amongst the stakeholders.

Odd lots are trades for less than the standard trading unit of 100 shares and are exempt from the order protection rule. Exempting these transactions from the order protection rule creates concerns that investors are missing the best prices. In addition, orders exempt from the order protection rule are not reflected in the NBBO for a stock, reducing the accuracy of publicly displayed prices. We believe that redefining odd lots based upon the dollar value of a trade would be a prudent and efficient way to expand the benefits of the order protection rule. Higher-priced stocks are already more likely to trade in odd lots, and from the perspective of an investor, dollar value is a more meaningful measure of a trade's importance than the number of shares. This reform could improve both execution quality for investors and the accuracy of key market quality metrics.

Specific Recommendation:

14. The SEC should pass a rule applying the order protection rule to odd lot transactions above a threshold dollar amount, instead of a threshold share amount.

Part II: The Access Rules

Investors would not be able to obtain the best prices for their orders if broker-dealers could not *access* trading venues for their customers in a fair and efficient manner. Rule 610 of Reg NMS sets forth the rules by which market participants may access trading venues.

A. Access Fees

Trading venues have the authority to impose “access fees” on market participants executing trades. However, access fees are not expressly reflected in a stock's publicly displayed price, so high access fees can reduce stock price accuracy and increase transaction costs for investors. To address this risk, the SEC has implemented an access fee cap of 30 cents/100 shares for publicly displayed

orders. In practice, ATSS generally charge access fees of between 5-10 cents/100 shares and broker-dealer internalizers do not charge access fees. However, exchanges often charge the regulatory maximum as part of the “maker-taker” pricing system.

B. Maker-Taker Pricing System

Maker-taker is a pricing system whereby exchanges pay a per share rebate to market participants who provide (“make”) liquidity in equities and assess a fee to the market participants that remove (“take”) liquidity. The access fees charged by exchanges are typically close to the 30 cent maximum under Rule 610 and the rebates paid to liquidity providers are close to 20 cents. Access fees are generally used to fund liquidity rebates, and exchanges earn the difference.

The underlying purpose of the maker-taker pricing system is to attract liquidity providers and increase trading volumes. Exchange reliance on rebates to attract liquidity in turn drives the fees that they charge liquidity takers up to the regulatory maximum. It is our view that exchanges maintain high access fees because they are trapped in a prisoner’s dilemma for protected quotes. If one exchange lowered its access fees, it would also have to reduce its liquidity rebates, and liquidity providers would likely migrate to other exchanges that offered higher rebates. In fact, a recent NASDAQ pilot program that reduced access fees had this very result.

In our view, the maker-taker pricing system has both positive and negative effects on market quality. The rebate establishes a financial incentive for the public display of liquidity, thereby increasing liquidity. On the other side of this coin, maker-taker pricing can also fuel market complexity, because new and complicated order types are frequently developed to navigate the landscape of fees and rebates. It can also interfere with the public display of orders by encouraging certain liquidity takers to trade off-exchange to avoid paying high exchange access fees.

C. Reducing the Access Fee Cap

One way to mitigate the market-distorting effects of maker-taker pricing is to reduce the access fee cap for highly liquid stocks. This change could reduce the

impact of fees and rebates on routing decisions and exchange revenue models without stymying the markets in the securities that rely on maker-taker for liquidity. We believe that a pilot program would be an effective way to determine the optimal parameters of a lower access fee cap and we support the recommended framework for an access fee cap pilot program that was submitted by the EMSAC Regulation NMS Subcommittee to the SEC on July 8, 2016. Although pilot programs can impose significant costs on market participants, we believe that these costs can be mitigated by the use of the infrastructure and data from pilots already planned or underway, such as the “Tick Size Pilot Program”.

Specific Recommendation:

15. The SEC should implement a pilot program to evaluate the impact of a reduction in access fees and liquidity rebates on market quality and trading behavior. The structure of the pilot should generally conform to the framework proposed by the Equity Market Structure Advisory Committee Regulation NMS Subcommittee and leverage existing pilots as appropriate.⁵

D. Aligning Maker-Taker Pricing with the Disclosure Regime

We also support reforms that would enhance broker-dealer disclosures in the context of the maker-taker system. More specifically, we recommend that broker-dealers be required to disclose how access fees and liquidity rebates affect their routing practices and whether they pass through liquidity rebates or access fees to their customers.

Specific Recommendation:

16. Broker-dealers should be required to disclose how access fees and liquidity rebates affect order routing practices and transaction costs for their customers.

⁵ Citadel dissents from this recommendation.

Part III: The Sub-Penny Rule

Tick sizes are the minimum price variation (“MPV”) for quotations for stocks. During the mid-1990s, the majority of exchanges set tick sizes at fractions (e.g., 1/8th) of a dollar. But in 2000, the SEC directed the exchanges to develop a plan to convert their quotations from fractions to decimals, primarily because fractional tick sizes were creating wide spreads and increasing transaction costs for investors. The SEC has set the current MPV at one cent for listed stocks that trade above \$1 per share. Rule 612 of Reg NMS, the “sub-penny rule,” prohibits any venue from displaying, ranking, or accepting orders in increments smaller than one penny.

The minimum tick size for a stock is important because negative consequences can result from minimum tick sizes that are either too wide or too narrow. A tick size that is too narrow (e.g. one-tenth of one penny) can (1) cause “flickering quotations,” in which a stock quote rapidly switches back and forth between prices, or (2) enable “stepping ahead,” whereby a trader uses an economically insignificant quote to “step ahead” of an existing order. Flickering quotations are problematic because they can complicate broker-dealer routing decisions and hinder their ability to get the best prices for investors. Stepping ahead is problematic because it reduces the likelihood that orders posted by fundamental investors and liquidity suppliers will be executed, which in turn can disincentivize the public display of orders and ultimately increase bid-ask spreads. A tick size that is too wide (e.g. 10 cents for liquid stocks) sets an artificial floor on permissible bids and offers, which can also increase transaction costs for investors. These costs can disincentivize the public display of liquidity as well, because executions at price variations within the minimum tick size are possible in the dark.

The appropriate minimum tick size for a stock depends on the stock’s natural spread, which is based on its fundamental supply from sellers and demand from buyers. For example, if the natural spread of a stock is 5 cents, then the ideal minimum tick size for that stock would also be 5 cents. However, determining each stock’s natural spread and using that information to set the ideal tick size for each stock is not practicable. The natural supply and demand for each stock is difficult

to identify with precision and changes over time. Because of this difficulty, the SEC takes a “one-size fits all” approach, which is not responsive to a stock’s individual liquidity characteristics.

A. Reducing Minimum Tick Sizes

We review empirical data suggesting that the penny tick size is artificially wide for certain highly liquid stocks, which may be driving up investor transaction costs. We recommend that the SEC consider lowering the MPV for these stocks, first by implementing a pilot program to test the effects of such a reduction.

Specific Recommendation:

17. After concluding the access fee pilot, the SEC should conduct a pilot program for reducing the tick size for highly liquid stocks. The pilot should include a control group and should not include a trade-at rule.

Part IV: Market Data Rules

A. Consolidated Market Data

Under the Exchange Act, the SEC must ensure that investors have access to consolidated market data at a reasonable and fair cost and in an effective and timely manner. Consolidated market data generally refers to: (1) pre-trade transparency – timely information on the best-priced displayed quotations; and (2) post-trade transparency – timely reports of trades that are executed. Trading venues and broker-dealers must have access to consolidated market data in order to comply with the order protection rule and duty of best execution.

There are two ways that market participants can obtain consolidated market data. The first is via the securities information processors (“SIPs”). Reg NMS requires trading venues to submit real-time quotation and trade information to the SIPs, which aggregate and disseminate consolidated market data. Consolidated data for each individual NMS stock must be disseminated through a single SIP and only SROs are permitted to establish SIPs. Second, market participants also have

the option to purchase market data directly from trading venues and consolidate it themselves. Reg NMS permits trading venues to sell access to their own “proprietary” data feeds, which are used for this purpose. In practice however, trading venues and broker-dealers that consolidate proprietary data feeds must still purchase access to the SIPs. It is important to note that the transmission speed of proprietary data is faster than that of the SIP. As a result, data from proprietary feeds arrive at users faster than SIP data arrives at users. Recent efforts by the SEC to reduce the speed differential have been successful, but a meaningful difference in speed persists.

B. Criticisms of the Market Data Rules

Two concerns with the SIPs are that (1) there is a speed disparity between proprietary data feeds and the SIPs; and (2) the SIPs have certain resiliency weaknesses. Broker-dealers and trading venues that rely on the SIPs for consolidated market data are thus at a disadvantage—they depend on a system with resiliency deficiencies and may be missing the best prices for their orders.

C. How to Reform the Market Data Rules

Improving the transparency of the SIPs is a first step to reform this system. More specifically, enhanced disclosures regarding SIP and proprietary data feed revenues and performance data would allow investors to objectively compare the cost and quality of these market data sources and would force SROs to accept responsibility for deficiencies in the SIPs.

Specific Recommendations:

18. The SEC should require exchanges to publicly disclose revenues from the SIPs, the allocation of market data revenues among SIP Plan Participants and revenues from proprietary data feeds.

19. The SEC should require exchanges to disclose performance data for the SIPs and proprietary data feeds to facilitate a comparison of the relative speeds with which investors can obtain actionable market data from each.

Ultimately, we believe that introducing competition among SIPs would benefit investors in four major ways. First, we believe that subjecting SIPs to competition would narrow their performance gap with proprietary data feeds. This change would level the playing field between investors who rely on the SIP with those who also use proprietary data feeds. Second, competition could encourage improvements in resiliency by forcing SIP operators to invest in SIP technology and by ensuring that alternate sources of consolidated data would be available if one were to fail. Third, faster SIPs would better equip trading venues and broker-dealers that rely on the SIP to comply with the order protection rule and their duty of best execution. Finally, competition among multiple SIPs could reduce the cost of market data. Today, many broker-dealers purchase access to proprietary data feeds *and* the SIPs, even though they provide much of the same market data. Faster SIPs could obviate the need for broker-dealers to pay for proprietary data feeds in addition to the SIP.

To implement a competing consolidators structure, the SEC should first replace the Reg NMS provision that permits only SROs to establish and operate SIPs with a rule that defines SIP operator eligibility according to functional and technical standards. Second, the SEC should enact reforms to improve the minimum performance of the SIPs. Requiring SIPs to meet objective data quality metrics would ensure the achievement of a performance baseline, and introducing a competitive framework would then provide an incentive to exceed these standards.

Specific Recommendation:

20. After requiring disclosure of exchange market data revenues, the SEC should adopt a “Competing Consolidator” model for data dissemination. As a first step to implementing this framework, the SEC should promote reforms in the governance and transparency of the current SIPs.

CHAPTER 4: ENHANCING EQUITY MARKET RESILIENCY

Part I: Examining Recent Incidences of Volatility in U.S. Equity Markets

A. The 2010 Flash Crash

On May 6, 2010, the equity markets experienced a so-called “Flash Crash” when the prices in a large number of equity-based securities abruptly fell by \$1 trillion in value and then quickly rebounded. According to a report by the SEC and CFTC, the Flash Crash was likely triggered when a mutual fund executed an algorithmic trade that entered a series of exceptionally large and aggressive sell orders. Automated market makers initially absorbed the selling pressure, but soon became unsure about the financial risk that they were taking by continuing to trade, so they widened spreads or stopped offering buy-side liquidity. Prices in the stock and futures market plunged until they triggered a trading halt on the Chicago Mercantile Exchange (a futures exchange), after which market participants slowly stepped in to purchase securities and prices largely rebounded.

B. Automated Market Makers and Manual Market Makers

Due to events like the Flash Crash, there is concern that the liquidity provided by market makers in today’s market structure is illusory because during volatile market conditions market makers will withdraw from the market, thereby exacerbating rather than relieving market stress. To evaluate these concerns, we examine the rules that applied to market makers in manual markets (“**NYSE specialists**”) and compare them to the rules that apply to market makers in today’s automated markets. We find that the primary differences are: (1) automated market makers are generally allowed to trade for their own account, whereas specialists were subject to the “negative obligation” that restricted such trading; and (2) automated market makers are not required to trade against the market trend, whereas specialists were required to trade against the market. The SEC approved these rule changes because of practical differences in market making in automated as opposed to manual markets, as we describe.

C. The Market Break of 1987

We then compare the performance of market makers during the Flash Crash with the performance of NYSE specialists during the crash of 1987 and find certain notable similarities in the actions of market makers. We therefore do not make any specific recommendations to change the rules applicable to market makers, as we do not believe the Flash Crash provides clear support for such changes.

D. The Market Events of August 24, 2015

More recently, on August 24, 2015, concerns about the health of the Chinese economy led to a dramatic (8.5%) overnight decline in the Shanghai Composite Index in China, setting the stage for a shaky open to the U.S. stock market. That morning, U.S. equity markets experienced delayed openings, severe price dislocations, extreme volatility, and an uneven and unusual level of trading halts. Turmoil in the stock market also caused disruptions in the exchange-traded fund (“ETF”) market, as ETF market makers generally provide quotes for the ETF based on the prices of the ETFs’ underlying securities. We believe that the SEC should pursue reforms that would support the efficient pricing of ETFs in the face of trading halts of the underlying securities. The NYSE has suggested that the SEC consider aligning halt procedures between individual equities and ETFs. While we do not currently have a specific recommendation on this topic, we tentatively agree that the SEC should consider rules that would halt the trading of an ETF if a sufficiently high percentage of its underlying securities are subject to a trading halt.

Part II: Enhancing Volatility Controls

A. Market-wide Circuit Breakers

Market-wide circuit breakers are designed to briefly shut down trading across all stocks and all trading venues when a reference index experiences a certain percentage decline. Shutting down trading provides market participants with time to evaluate and react to new market information. However, the efficacy of these circuit breakers depends largely on their calibration: they must be triggered during turmoil, but must not be so sensitive that they disrupt trading due to ordinary course price fluctuations. During the flash crash and events of August

24, 2015, the market-wide circuit breakers in place were not triggered, despite the extreme volatility on those days. A review of the circuit breaker activation thresholds is in order. We recommend that the thresholds are further refined to respond to volatility in a fixed number of stocks or percentage of an index. In addition, breach of “Limit Up-Limit Down” (“LULD”) thresholds (which track volatility in individual stocks, as further discussed below) should be treated as the signal of critical levels of volatility for each stock.

Specific Recommendation:

21. Thresholds for market-wide circuit breakers should be adjusted so that they are triggered when a pre-determined number of stocks or percentage of an index display extreme volatility by triggering their individual trading halts.

Both the Flash Crash and August 24 highlighted the interconnection between equity markets and futures markets—in each instance, disruptions in one market spread to the other. This connection between equity markets and the futures market also impacts the effectiveness of volatility controls like market-wide circuit breakers. Without inter-market coordination, shutting down trading in certain securities could spur extreme disruptions in markets in related securities. For market-wide circuit breakers to have their intended effect of stabilizing trading by giving market participants time to respond to information, it is important that thresholds are harmonized between the equity markets and futures market.

Specific Recommendation:

22. The SEC and the Commodity Futures Trading Commission should work together to harmonize the thresholds for market-wide circuit breakers in the stock market with the futures market.

B. Trading Halts for Individual Stocks

The SEC implemented the LULD mechanism to target anomalous price movements in individual or few securities. The LULD mechanism assigns a fixed price band to each individual security, prevents trade execution outside of that

price band, and then pauses trading in that security if price volatility is not quickly corrected. LULD thus protects market participants from trading at extreme and unintended prices and provides time for them to adjust their orders during periods of volatility. On August 24th, LULD trading pauses were triggered on a widespread but non-universal basis. One factor that drove the large number of LULD pauses was the fact that the width of LULD price bands doubles during the open and close of trading. Wider bands during the open accommodate greater volatility in stocks, and the band narrows after 15 minutes. This inconsistency can disrupt the markets—for example, volatility during the open can trigger immediate LULD halts when the narrower bands kick in. We therefore recommend that consistent LULD price bands are applied throughout the trading day.

Specific Recommendation:

23. The SEC should establish uniform LULD intraday price bands, instead of wider bands during the market open and close.

C. “Breaking” Clearly Erroneous Trades

The SROs have the authority to cancel a trade if the price at which it occurred indicates that the trade was entered into due to an obvious error. This power to nullify trades protects investors from being bound by unintentional trades at terms they clearly would not have intended to accept, thereby promoting fair and orderly markets. Rules regarding these “clearly erroneous” trades generally require SROs to cancel trades according to certain percentage deviations from a reference price. However, uncertainty regarding the application of clearly erroneous rules contributed to the market turmoil experienced during the Flash Crash and August 24th. To improve the clarity of the rules, we recommend that LULD thresholds are aligned with “clearly erroneous” thresholds.

Specific Recommendation:

24. The SEC should eliminate clearly erroneous trade guidelines by aligning them with the thresholds for LULD rules.

D. Kill Switches

Kill switches halt trading for a specific market participant on a trading venue when that entity's trading activity has breached a pre-established exposure threshold on that trading venue. They are thus intended to stop a specific market participant's erroneous orders or uncontrolled accumulation of unintended positions. Certain exchanges currently offer kill switches, but they are of limited utility because they are optional and non-uniform. To mitigate volatility caused by the unintentional actions of individual market participants, we recommend that standardized kill switches be mandatory across exchanges for all broker-dealer members. Each kill switch should have an automatic trigger at both the exchange and broker-dealer member level when the threshold is breached.

Specific Recommendation:

25. The SEC should require mandatory kill switches on all exchanges for all exchange members.

E. Regulatory Trading Halts

Exchanges have the authority to call regulatory trading halts for their listed securities under the NMS Plans that cover NYSE-listed securities and NASDAQ-listed securities. Once a listing exchange decides a regulatory halt is appropriate and institutes one, the listing exchange must notify the other SROs. Regulatory trading halts are generally effective across all trading venues. Regulatory trading halts may be called due to (i) inadequate or pending disclosure of material information to the public; or (ii) "regulatory problems relating to" a security "that should be clarified before trading therein is permitted to continue," including extraordinary market activity due to system misuse or malfunction. However, in the event of operational difficulties (e.g., a SIP outage), there are no standardized rules for when a regulatory trading halt should be implemented. This discretion leads to unpredictability, which can discourage the provision of liquidity during operational failures. To avoid such uncertainty, we believe that it is important to have clear standards in place for regulatory trading halts.

Specific Recommendation:

26. The SEC should clarify exchange regulatory halt procedures in the event of specific operational failures (e.g., SIP failure).

POLICY RECOMMENDATIONS

CHAPTER 2: TRADING VENUES AND UNDISPLAYED LIQUIDITY

1. ATSS should be allowed to limit access to their trading venues.⁶
2. ATSS should not be required to obtain pre-approval from the SEC before adopting trading rules.
3. The SEC should require that disclosures on new Form ATS-N are published in a standardized format.
4. The surveillance and enforcement regulatory responsibilities currently assigned to SROs should be centralized to the extent practicable. The reorganization could include centralization at either the SEC or FINRA.
5. The NMS Plan process should be revised so that exchange SROs do not have outside influence in the rulemaking process. Representatives of exchanges, broker-dealers and investors should be permitted to vote on any NMS Plans.
6. Once SRO surveillance and enforcement responsibilities have been centralized to the extent practicable, Congress should revisit the Exchange Act to reconsider exchange immunity. Exchange immunity should only be available for regulatory functions unique to exchanges that cannot be effectively centralized.
7. Required disclosures of registered exchanges should be revised to include trading volumes attributable to undisplayed (“dark”) order flow.
8. The SEC should *not* implement a trade-at rule, as it could increase investor transaction costs without appreciably improving market quality.

⁶ Citadel dissents from this recommendation.

CHAPTER 3: REGULATION NATIONAL MARKET SYSTEM

9. Retail brokerages should be required to provide disclosures regarding execution quality for their customers. Relevant disclosures should include percent of shares with price improvement, effective/quoted spread ratio, and average price improvement.

10. The SEC should require broker-dealers to provide institutional customers with standardized reports that provide order routing and execution quality statistics.

11. Trading venue disclosures should include information about execution speeds to the millisecond.

12. Statistical information for disclosures pursuant to Rule 605 and Rule 606 and disclosures regarding institutional orders should be submitted in only one format to facilitate comparison across trading venues and among broker-dealers.

13. The SEC's cost benefit analysis for the Consolidated Audit Trail did not determine whether the \$2 billion in implementation costs and \$1.5 billion in annual reporting costs for broker-dealers would be passed on to investors. Prior to finalizing the CAT, the SEC should conduct a *publicly available* analysis that evaluates the costs and benefits of the CAT, and applies the cost benefit analysis to ensure that the CAT is implemented efficiently, with costs allocated appropriately amongst the stakeholders.

14. The SEC should pass a rule applying the order protection rule to odd lot transactions above a threshold dollar amount, instead of a threshold share amount.

15. The SEC should implement a pilot program to evaluate the impact of a reduction in access fees and liquidity rebates on market quality and trading behavior. The structure of the pilot should generally conform to the framework

proposed by the Equity Market Structure Advisory Committee Regulation NMS Subcommittee and leverage existing pilots as appropriate.⁷

16. Broker-dealers should be required to disclose how access fees and liquidity rebates affect order routing practices and transaction costs for their customers.

17. After concluding the access fee pilot, the SEC should conduct a pilot program for reducing the tick size for highly liquid stocks. The pilot should include a control group and should not include a trade-at rule.

18. The SEC should require exchanges to publicly disclose revenues from the SIPs, the allocation of market data revenues among SIP Plan Participants and revenues from proprietary data feeds.

19. The SEC should require exchanges to disclose performance data for the SIPs and proprietary data feeds to facilitate a comparison of the relative speeds with which investors can obtain actionable market data from each.

20. After requiring disclosure of exchange market data revenues, the SEC should adopt a “Competing Consolidator” model for data dissemination. As a first step to implementing this framework, the SEC should promote reforms in the governance and transparency of the current SIPs.

CHAPTER 4: ENHANCING EQUITY MARKET RESILIENCY

21. Thresholds for market-wide circuit breakers should be adjusted so that they are triggered when a pre-determined number of stocks or percentage of an index display extreme volatility by triggering their individual trading halts.

22. The SEC and the Commodity Futures Trading Commission should work together to harmonize the thresholds for market-wide circuit breakers in the stock market with the futures market.

⁷ Citadel dissents from this recommendation.

23. The SEC should establish uniform LULD intraday price bands, instead of wider bands during the market open and close.

24. The SEC should eliminate clearly erroneous trade guidelines by aligning them with the thresholds for LULD rules.

25. The SEC should require mandatory kill switches on all exchanges for all exchange members.

26. The SEC should clarify exchange regulatory halt procedures in the event of specific operational failures (e.g., SIP failure).

THE U.S. EQUITY MARKETS

A Plan for Regulatory Reform

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INTRODUCTION

Statutory Objectives for U.S. Equity Markets

The evolution of the U.S. equity market structure into today's highly connected and automated landscape was largely initiated by the adoption of the Securities Acts Amendments of 1975 (the "**1975 Amendments**").⁸ The 1975 amendments began a significant transformation away from the historical market landscape, which was characterized by trade execution at manual venues that were generally isolated from each other.⁹ This legislation did so by amending the Securities Exchange Act of 1934 (the "**Exchange Act**") to "...foster the development of a national securities market system."¹⁰ Congressional findings that "new data processing and communications techniques create the opportunity for more efficient and effective market operations" laid the foundation for this effort.¹¹

Congress delegated the implementation of the national market system to the Securities and Exchange Commission ("**SEC**"), as the agency mandated "to protect investors, maintain, fair, orderly, and efficient markets, and promote capital formation."¹² This approach was "designed to provide maximum flexibility to the SEC and the securities industry in giving specific content to the general concept of a national market system."¹³

⁸ Pub. L. No. 94-29, 89 Stat. 97 (1975).

⁹ *Testimony Concerning Preserving and Strengthening the National Market System for Securities in the United States: Before the S. Comm. on Banking, Housing, and Urban Affairs*, 106th Cong. 2 (2000) (statement of Arthur Levitt, Chair, U.S. SEC. & EXCH. COMM'N), available at <https://www.sec.gov/news/testimony/ts082000.htm>.

¹⁰ Pub. L. No. 94-29, 89 Stat. 97 (1975).

¹¹ Pub. L. No. 94-29, 89 Stat. 97, 111 (1975).

¹² 15 U.S.C. § 78k(a)(2) (1994); *What We Do*, U.S. SEC. & EXCH. COMM'N, available at <https://www.sec.gov/about/whatwedo.shtml> (last modified Jun. 10, 2013).

¹³ H.R. Rep. No. 94-229, at 92 (1975) (Conf. Rep.).

In the 1975 Amendments, Congress presented five essential goals that should underpin the SEC rules governing the national market system. These five objectives are codified in Section 11A of the Exchange Act.

First, the SEC should seek to assure the economically efficient execution of securities transactions.¹⁴ As discussed throughout the report, measures taken to minimize transaction costs for retail and institutional investors are a key component of this effort.

Second, the SEC should seek to assure fair competition among brokers and dealers, among exchanges, and between exchanges and markets other than exchanges.¹⁵ Such competition encourages innovation in trading services that can reduce transaction costs. Having multiple trading venues can also improve market stability, because if one venue has an isolated problem, order flow can be shifted to other venues.

Third, the SEC should assure that information regarding quotations for and transactions in stocks is available to investors and broker-dealers.¹⁶ Broker-dealers need this price transparency to send investor orders to the trading venues that offer the best available prices for investors.

Fourth, the SEC is required to assure the practicability of brokers executing investors' orders in the best market.¹⁷ In other words, the SEC's rules should help broker-dealers fulfill their duty of "best execution." The duty of best execution requires brokers to seek the most favorable terms reasonably available for the execution of their customers' trades.¹⁸ Many factors may contribute to what is considered a favorable execution, such as price, speed, and likelihood of execution.¹⁹

¹⁴ Pub. L. No. 94-29, 89 Stat. 112 (1975).

¹⁵ *Id.*

¹⁶ *Id.*

¹⁷ *Id.*

¹⁸ *See, e.g., Best Execution*, U.S. SEC. & EXCH. COMM'N, available at <http://www.sec.gov/answers/bestex.htm> (last modified May 9, 2011).

¹⁹ *See id.*

Fifth, the SEC’s rules should assure the opportunity for investors’ orders to be executed without the participation of a dealer.²⁰ In the context of today’s markets, this requirement essentially means that the national market system should promote optimal “order interaction.” In other words, even though there are multiple trading venues, investor orders should be exposed to as many other orders as possible to facilitate their ability to receive best execution.

In furtherance of these five objectives, Congress found that “the linking of all markets for qualified securities through communication and data processing facilities will foster efficiency, enhance competition, increase the information available to brokers, dealers, and investors,... and contribute to best execution of such orders.”²¹ Since 1975, the SEC has therefore sought to adapt the rules governing the U.S. equity markets to technological advances in order to promote competition, efficiency, and investor outcomes.

To support the modernized national market system, the 1975 Amendments also revised the Exchange Act to establish a national system for the clearance and settlement of securities transactions.²² To this end, Congress directed the SEC “to facilitate the establishment of linked or coordinated facilities for clearance and settlement of transactions in securities.”²³ The shift towards “linked” rather than “vertically-integrated” clearing and settlement facilities helped to decentralize order flow and spread trading volume to multiple competing venues.²⁴

²⁰ Pub. L. No. 94-29, 89 Stat. 97, 112 (1975).

²¹ *Id.*

²² See 15 U.S.C. § 78q-1 (2010).

²³ 15 U.S.C. § 78q-1(a)(2)(A)(ii) (2010).

²⁴ See Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. & EXCH. COMM’N 2 (Apr. 30, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

History and Evolution of U.S. Equity Markets

Manual Markets

From the 1970s until the mid-2000s, U.S. equity markets were predominately manual markets with exchange-based floor trading. The manual market landscape had some marked differences from the modern structure.

One difference between the manual market structure and today's automated market structure is the degree of competition among trading venues. Trading in the manual markets was highly centralized and certain rules amplified this effect. For example, until 2000, the New York Stock Exchange ("NYSE") Rule 390 prohibited NYSE members from using off-exchange venues to execute trades.²⁵ During this time, trading volumes were often consolidated at a stock's listing exchange. In contrast, today's automated market structure features numerous and diverse trading venues where trades may be routed for execution. (Some refer to the decentralization and diffusion of trading volume among trading venues as "market fragmentation.") This report describes these automated trading venues and evaluates the policy implications of this structure.

On the other hand, there are also similarities between the manual market structure and today's automated markets. For example, broker-dealer internalization, whereby a broker-dealer executes trades within that firm and without using an outside trading platform, existed in manual markets.²⁶ Broker-dealer internalizers typically act as principals in each trade, instead of matching buyers and sellers, and so executing trades in this manner largely circumvents the

²⁵ *Id.*

²⁶ *See, e.g., supra* note 9. *See also* NYSE Rulemaking: Notice of Filing of Proposed Rule Change to Rescind Exchange Rule 390; Commission Request for Comment on Issues Relating to Market Fragmentation, Exchange Act Release No. 42450, File No. SR-NYSE-99-48 (Feb. 23, 2000), available at <https://www.sec.gov/rules/sro/ny9948n.htm> ("Internalization is the routing of order flow by a broker to a market maker that is an affiliate of the broker. An integrated broker-dealer, for example, internalizes orders by routing them to the firm's market-making desk for execution."); Richard Y. Roberts, Commissioner, U.S. SEC. & EXCH. COMM'N, Remarks at the Ray Garrett Jr. Corporate and Securities Law Institute, Payment for Order Flow 10 (Apr. 29, 1993), available at <https://www.sec.gov/news/speech/1993/042993roberts.pdf>.

formal regulatory structures in place at trading venues. In addition, payment for order flow arrangements also existed in the manual markets. This practice generally involves broker-dealer internalizers paying other brokers for the right to execute their customer orders internally.²⁷ Broker-dealer internalization remains an important practice in today's equity marketplace, as further discussed in this report.

Another similarity between the manual and automated market structure is the existence of undisplayed or "dark" trading. Dark trading generally refers to executions that avoid the public display of orders. There have always been reasons for market participants to want to avoid publicly displaying their orders. For example, institutional investors often seek to avoid the public display of their large orders, because doing so would move the price against the investor and make it costlier for them to trade.²⁸

Measures intended to avoid publicly displaying a large order have consistently occurred both on- and off-exchange. In manual markets, broker-dealers would execute large orders on exchanges by breaking them into smaller orders and gradually executing them, to minimize their effect on the market price.²⁹ In today's automated market structure, execution algorithms perform the same task by breaking up large orders for institutional investors and executing them on- and off-exchange. In the manual markets, broker-dealers also executed large orders in what was referred to as the "upstairs market." The upstairs market involved broker-dealers directly contacting other broker-dealers off of the trading floor and over the

²⁷ See NYSE Rulemaking: Notice of Filing of Proposed Rule Change to Rescind Exchange Rule 390; Commission Request for Comment on Issues Relating to Market Fragmentation, Exchange Act Release No. 42450, File No. SR-NYSE-99-48 (Feb. 23, 2000), available at <https://www.sec.gov/rules/sro/ny9948n.htm>; Roberts, *supra* note 26, at 2.

²⁸ See Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 18 (Jan. 14, 2010), available at <https://www.sec.gov/rules/concept/2010/34-61358.pdf>.

²⁹ See Joel Hasbrouck, et al., *New York Stock Exchange Systems and Trading Procedures* 5, 39 (NYSE Working Paper No. 93-01, 1993), available at <http://people.stern.nyu.edu/jhasbrou/Research/Working%20Papers/NYSE.PDF>; ROBERT A. SCHWARTZ & RETO FRANCONI, EQUITY MARKETS IN ACTION: THE FUNDAMENTALS OF LIQUIDITY, MARKET STRUCTURE & TRADING 73 (2004); Stavros Gadinis, *Market Structure for Institutional Investors; Comparing the U.S. and E.U. Regimes*, 3 VA. L. & BUS. REV. 311, 325 (2008), available at <http://scholarship.law.berkeley.edu/facpubs/948>.

phone, which allowed them to avoid publicly displaying their institutional customers' large orders.³⁰

Automation of Equity Markets

Once automated electronic communication systems developed in the late 1990s, broker-dealers began to implement electronic and automated trading systems that challenged the dominance of the manual model.³¹ These trading systems allowed buyers and sellers of stock to communicate directly with one another over an automated platform.

In 1998, the SEC passed Regulation Alternative Trading Systems (“**Reg ATS**”), subjecting these automated trading venues (alternative trading systems or “**ATSS**”) to certain core elements of exchange regulation.³² In today’s equity markets, the hallmark of ATSS is that they generally do not publicly display quotations. As a result, ATSS are often colloquially referred to as “dark pools.”³³ However this term is imprecise, as dark trading also occurs on exchanges, as described in Chapter 2 of this report.

ATSS operated on a for-profit basis, which is noteworthy because exchanges had traditionally operated as not-for-profit mutual organizations,³⁴ with their broker-dealer members handling exchange governance. Broker-dealer members

³⁰ See Gadinis, *supra* note 29, at 325-26. See generally Hasbrouck, *supra* note 29, at 39; Donald Keim & Ananth Madhavan, *The Upstairs Market for Large-Block Transactions: Analysis and Measurement of Price Effects*, 9 THE REVIEW OF FINANCIAL STUDIES 1 (1996), available at http://www.business.unr.edu/faculty/liuc/files/RUC/topic_upstairsmarket/Keim_Madhavan_1996.pdf.

³¹ Michael A. Perino, *Securities Law for the Next Millennium: A Forward-Looking Statement*, in FACULTY PUBLICATIONS, ST JOHN’S L. SCHOLARSHIP REPOSITORY Paper 77,7-8 (2001), available at http://scholarship.law.stjohns.edu/faculty_publications/77.

³² Annette L. Nazareth, *Remarks*, 75 ST. JOHN’S L. REV. 15, 18 (2012), available at <http://scholarship.law.stjohns.edu/cgi/viewcontent.cgi?article=1378&context=lawreview>.

³³ As discussed in detail throughout this report, dark trading occurs on other venues as well, including via non-displayed orders on exchanges.

³⁴ Roberta S. Karmel, *Turning Seats Into Shares: Implications of Demutualization for the Regulation of Stock Exchanges*, 53 HASTINGS L.J. 367, 369 (2001-2002), available at <http://ssrn.com/abstract=256867>.

were motivated to manage the exchange because they used the venue to execute trades.³⁵ However, the proliferation of automated trading venues put competitive pressure on this structure, in part because many of the broker-dealer members of exchanges had begun to operate competing trading venues. In order to remain competitive, the major stock exchanges converted to for-profit entities between 2000 and 2005 and shortly thereafter converted to public companies with dispersed ownership.³⁶

Despite the advent of electronic marketplaces in the early 2000s, the regulations that were in place until 2006 provided slower manual markets with a competitive advantage.³⁷ Specifically, the Intermarket Trading System (“ITS”) Plan effectively imposed a thirty-second execution delay for automated marketable orders in exchange-listed stocks.³⁸ The ITS Plan gave manual exchanges little incentive to update and automate their trading processes, so their dominant market shares in exchange-listed stocks persisted.³⁹

Where regulations did not artificially hinder the impact of automation, its effects on the markets were immediate and extensive. Trading in NASDAQ stocks is illustrative, because the ITS Plan applied only to exchanges, and NASDAQ had not yet registered as an exchange when the ITS Plan was in place.⁴⁰ Automation spurred a rapid increase in competition and fragmentation among venues trading in NASDAQ stocks.⁴¹ Other innovations that characterize modern automated trading also gained traction at an earlier point in the NASDAQ markets. These include the

³⁵ *See id.*

³⁶ Reena Aggarwal, *Demutualization and Corporate Governance of Stock Exchanges*, J. APPLIED CORPORATE FINANCE 105, 108-109 (2002), *available at* https://www.set.or.th/setresearch/files/demutualization/ResearchPaper_2002_Reena.pdf.

³⁷ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37501 (Jun. 29, 2005), *available at* <https://www.sec.gov/rules/final/34-51808fr.pdf>.

³⁸ *Id.*

³⁹ *See* Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 4-5 (Jan. 14, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358.pdf>.

⁴⁰ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. & EXCH. COMM’N 7 (Apr. 30, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

⁴¹ *See id.*

use of (1) proprietary data feeds to transmit market data and (2) high frequency trading (“HFT”) strategies.⁴² These innovations will be described later in this report.

In 2006, the implementation of Regulation National Market System (“Reg NMS”) reshaped the equity market regulatory structure to spur the automation of equity markets and lower investor transaction costs.⁴³ Reg NMS has four pillars: (1) the “order protection rule,” which, among other things, removed the competitive advantage that the ITS Plan had previously provided manual markets; (2) rules regarding the accessibility of trading venues; (3) rules setting a minimum pricing increment for orders for stock; and (4) rules for the public display of quotes for stocks and trade executions. The details of each of the four pillars of Reg NMS will be set forth in Chapter 3.

Following the implementation of Reg NMS, competition among trading venues in NYSE-listed stocks intensified. For example, the NYSE executed approximately 79% of the share volume in NYSE-listed stocks in 2005; four years later, NYSE’s market share in those stocks had dropped to roughly 25%.⁴⁴ Chapter 2 will describe the current competitive landscape among trading venues in greater detail.

Concerns with Today’s Equity Market Structure

According to Mary Jo White, the Chair of the SEC, “empirical evidence shows that investors are doing better in today’s algorithmic marketplace than they

⁴² *Id.*

⁴³ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37501 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>.

⁴⁴ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 8 6 (Jan. 14, 2010), available at <https://www.sec.gov/rules/concept/2010/34-61358.pdf> (citing *NYSE Euronext Announces Trading Volumes for October 2009*, NYSE EURONEXT (Nov. 6, 2009), available at <https://www.nyse.com/press/125741917814.html> and Self-Regulatory Organizations; NYSE Arca, Inc.; Order Setting Aside Action by Delegated Authority and Approving Proposed Rule Change Relating to NYSE Arca Data, Exchange Act Release No. 59039, File No. SRNYSEArca-2006-21 (Dec. 2, 2008), available at <https://www.sec.gov/rules/sro/nysearca/2008/34-59039.pdf>).

did in the old manual markets.”⁴⁵ Thus, the SEC should “not roll back the technology clock or prohibit algorithmic trading.”⁴⁶

However, a number of concerns with the U.S. equity market structure have emerged in recent years. The fragmented nature of the markets drives certain of these concerns. For example, a recent analysis of one firm’s trading showed that a 1,000 share order was sent to 18 separate trading venues before it was completely executed.⁴⁷ Routing orders across multiple venues naturally involves different types of platforms with different trading rules. Thus, in certain ways, investors lack transparency regarding where and how their trades are executed, as compared to the highly centralized manual markets. The emergence of HFT strategies that are not well understood and yet account for 50% of all trades, according to some estimates,⁴⁸ also contributes to concerns that firms executing these short-term trading strategies may be profiting at the expense of long-term investors. Some have also suggested that the fragmented and high speed U.S. equity market structure may lack resiliency. Resiliency concerns are fueled by several recent incidents in which technical glitches and human errors caused widespread market disruption.

As detailed throughout this report, the SEC has made considerable progress in enhancing the regulatory landscape. However, there is more work to be done. Concerns related to transparency and equity market resiliency can negatively affect investor confidence and participation in U.S. equity markets, which in turn could make it costlier for U.S. companies to raise capital and for U.S. savers to invest.

⁴⁵ Mary Jo White, Chair, U.S. SEC. & EXCH. COMM’N, Speech at the Sandler O’Neill & Partners, L.P. Global Exchange and Brokerage Conference, Enhancing Our Equity Market Structure (Jun. 5, 2014), *available at* <https://www.sec.gov/News/Speech/Detail/Speech/1370542004312>.

⁴⁶ *Id.*

⁴⁷ Jacob Bunge, *A Suspect Emerges in Stock-Trade Hiccups: Regulation NMS*, WALL ST. J. (Jan. 27, 2014), *available at* <http://www.wsj.com/articles/SB10001424052702303281504579219962494432336>.

⁴⁸ *See, e.g.*, World Federation of Exchanges, *Understanding High Frequency Trading 2* (May 2013) (“HFT was estimated in 2012 by consultancy Tabb Group to make up 51% of equity trades in the US...”), *available at* http://modernmarketsinitiative.org/wp-content/uploads/2013/10/WFE_Understanding-HFT_May-2013.pdf.

Through this Report, the Committee seeks to contribute to the equity market reform effort in two distinct ways. First, we seek to educate the public and policymakers about the U.S. equity market structure and its performance for U.S. investors and public companies. Second, we offer twenty-six recommendations to enhance the existing regulatory framework.

CHAPTER 1: MARKET CHARACTERISTICS AND HIGH FREQUENCY TRADING

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CHAPTER 1: MARKET CHARACTERISTICS AND HIGH FREQUENCY TRADING

Chapter 1 sets forth the findings of our empirical analysis of stock quotation and execution data over the past 20 years. Part I considers key metrics of market performance to reach empirically-based conclusions regarding the impact of the automated market structure on investor outcomes.⁴⁹ Part II then provides specific insight into HFT strategies. It includes a simple example of an HFT strategy and a review of the academic literature on HFT strategies and equity market quality.

Part I: Equity Market Characteristics

A. Competition

Reg NMS and advancements in technology have helped the U.S. equity market evolve from an exchange-dominated, largely floor-based trading system into a diffuse ecosystem of automated trading venues that engage in vigorous competition for order flow. Trade execution is now divided among twelve exchanges and approximately forty ATSS.⁵⁰ The competitive landscape also

⁴⁹ Many results presented in this section are consistent with those initially set forth in Angel (2013), but are extended by using a longer period of time. James J. Angel et al., *Equity Trading in the 21st Century: An Update*, Q GROUP (Jun. 21, 2013), available at <http://www.q-group.org/wp-content/uploads/2014/01/Equity-Trading-in-the-21st-Century-An-Update-FINAL1.pdf>.

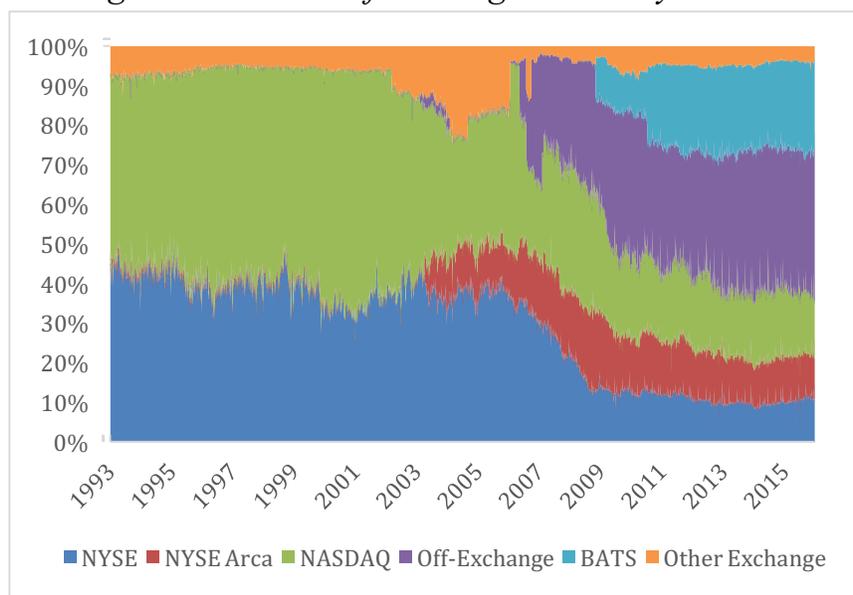
⁵⁰ Laura Tuttle, U.S. SEC. & EXCH. COMM’N, *Alternative Trading Systems: Description of ATS Trading in National Market System Stocks* (Oct. 2013), available at https://www.sec.gov/marketstructure/research/ats_data_paper_october_2013.pdf; Laura Tuttle, U.S. SEC. & EXCH. COMM’N, *OTC Trading: Description of Non-ATS OTC Trading in National Market System Stocks* (Mar. 2014), available at https://www.sec.gov/marketstructure/research/otc_trading_march_2014.pdf. See also Mary Jo White, Chair, U.S. SEC. & EXCH. COMM’N, Speech at the Sandler O’Neill & Partners, L.P. Global Exchange and Brokerage Conference, Enhancing Our Equity Market Structure (Jun. 5, 2014), available at <https://www.sec.gov/News/Speech/Detail/Speech/1370542004312>; Luis A. Aguilar, Commissioner, U.S. SEC. & EXCH. COMM’N, Public Statement, U.S. Equity Market Structure: Making Our Markets Work Better for Investors (May 11, 2015), available at <https://www.sec.gov/news/statement/us-equity-market-structure.html>.

includes approximately 250 broker-dealer internalizers that execute trades within their firm or with an affiliate rather than via an outside trading venue.⁵¹

1) Reg NMS and Trading Venue Market Share

Figure 1.1 documents the remarkable effect that Reg NMS had on the market share of various trading venues. After 2005, a number of exchanges emerged to challenge the dominance of NYSE and NASDAQ. Off-exchange executions also increased, representing another dimension of competition. Off-exchange execution includes broker-dealer internalization and executions on ATSS; approximately 37.4% of trading now occurs off-exchange.⁵²

Figure 1.1: Share of Trading Volume by Venue⁵³



⁵¹ White, *supra* note 50.

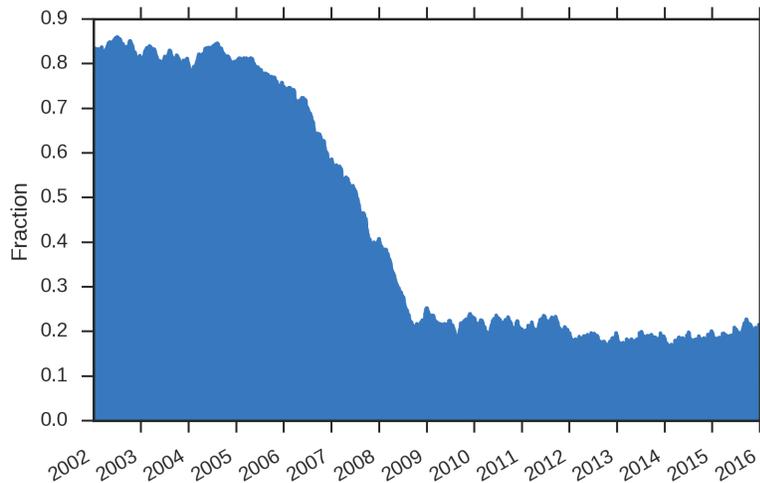
⁵² TABB Group, Equities LiquidityMatrix April 2016, 3, available at http://mm.tabbforum.com/liquidity_matrices/186/documents/original_2016-04_Equities_Liquidity_Matrix_April_2016.pdf.

⁵³ Source: Trade and Quote (“TAQ”) database. Daily aggregate trading volume by venue code.

2) Reg NMS and NYSE Market Share

Figure 1.2 shows the effect of competition on NYSE's market share of trading volume in NYSE-listed stocks. As shown in Figure 1.2, NYSE's share of such trading volume has declined from the pre-NMS level of close to 80% to a post-NMS level near 20%.

Figure 1.2: NYSE Share of Trading Volume in NYSE-Listed Stocks⁵⁴



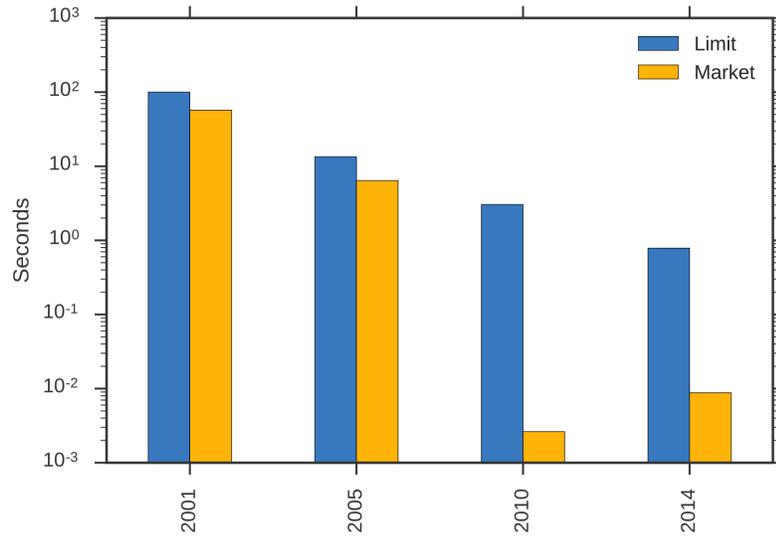
B. Automation

1) Automation and NYSE Execution Speed

As illustrated in Figure 1.3, the time required for NYSE to execute a market order was nearly 100 seconds in 2001. By autumn 2014, NYSE had become roughly 10,000 times faster, executing market orders in less than .01 seconds. Figure 1.3 shows how NYSE execution speed has evolved over time. The vertical axis is shown on a log scale so that recent speeds are visible.

⁵⁴ Source: Center for Research in Security Prices (“CRSP”) and TAQ databases. Data reflects a 5-day moving average for smoothness.

Figure 1.3: NYSE Execution Speed (Log Scale)⁵⁵

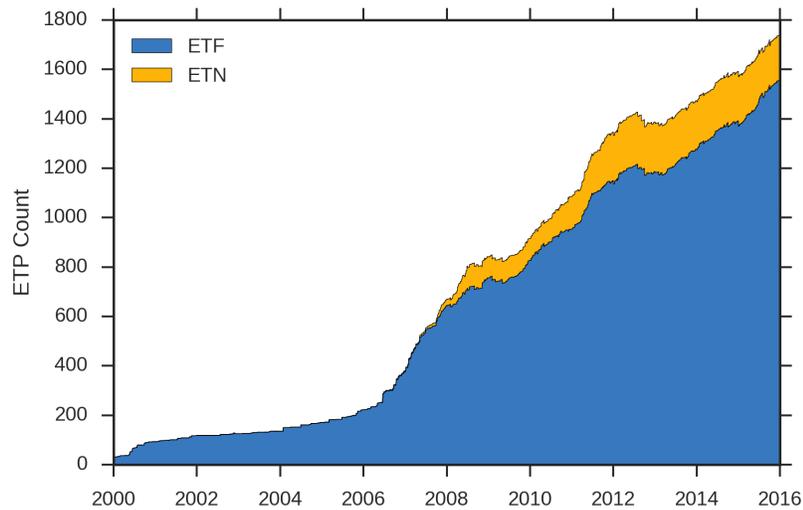


2) Automation and New Securities Products

Automation has coincided with the emergence of innovative new products like exchange traded funds (“**ETFs**”) and exchange traded notes (“**ETNs**”). The rapid proliferation of ETFs and ETNs is illustrated in Figure 1.4.

⁵⁵ Source: NYSE Rule 605 disclosures.

Figure 1.4: Exchange Traded Funds and Exchange Traded Notes⁵⁶



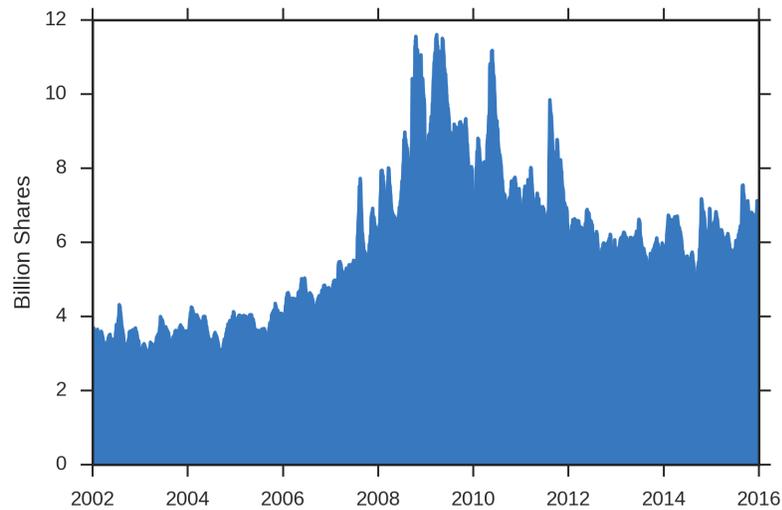
3) Automation and Aggregate Daily Trading Volume

As shown in Figure 1.5, trading volume in securities that are subject to NMS transaction reporting plans (“NMS securities”) grew rapidly as the markets became increasingly automated during the 1990s and 2000s. This trading volume then peaked at the end of 2008. Angel (2013) attributes this peak to post-2008 attrition of firms that employ HFT strategies, due to the high degree of competition among such firms.⁵⁷ Since its 2008 peak, trading volume in NMS securities has stabilized around 7 billion shares per day.

⁵⁶ Source: CRSP Mutual Fund Database.

⁵⁷ Angel et al., *supra* note 49; see also Matthew Baron et al., *Risk and Return in High Frequency Trading*, U.S. COMMODITY FUTURES TRADING COMM’N (Apr. 2014), available at http://www.cftc.gov/idc/groups/public/@economicanalysis/documents/file/oc_e_riskandreturn0414.pdf.

Figure 1.5: Total Daily Trading Volume in NMS Securities⁵⁸



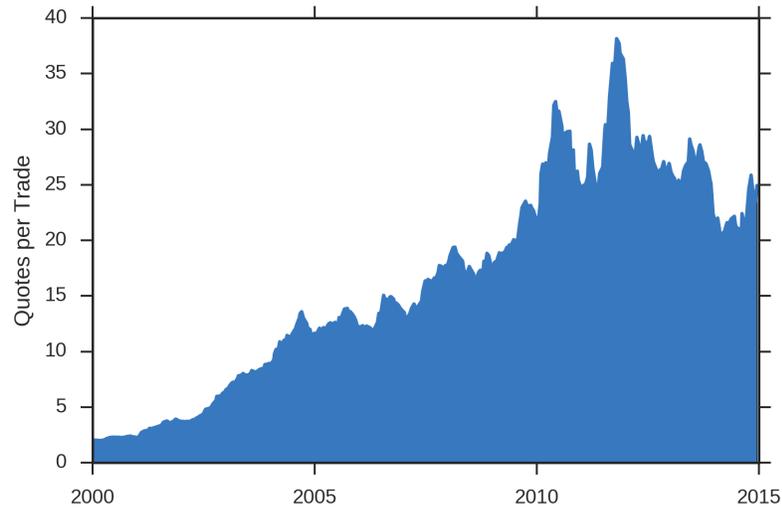
4) Automation and Quotes per Trade

Automation has enabled market participants to update their positions with greater frequency. Automated trading strategies continuously update quotes to avoid adverse selection and to incorporate information much faster than they could in the manual era. As a result, the number of quotes per trade increased during the transition to automation. This trend can be seen in Figure 1.6, which highlights the large increase in quotes per trade over the past decade. Figure 1.6 also shows that quotes per trade have declined from their peak. Similar to the trading volume trend illustrated in Figure 1.5, this decline may be attributable to competition putting downward pressure on the number of economically viable HFT strategies.⁵⁹

⁵⁸ Source: TAQ database. Data reflects a 10-day moving average for smoothness.

⁵⁹ See Angel et al., *supra* note 49; Baron, *supra* note 57.

Figure 1.6: Median Intraday Quotes per Trade⁶⁰



C. Volatility

Volatility generally refers to the extent to which a stock's price fluctuates over a period of time. High volatility is considered unfavorable, because it indicates a high level of uncertainty about a stock's value. A common concern with automation is the belief that it has contributed to an increase in stock market volatility. We explore this issue below.

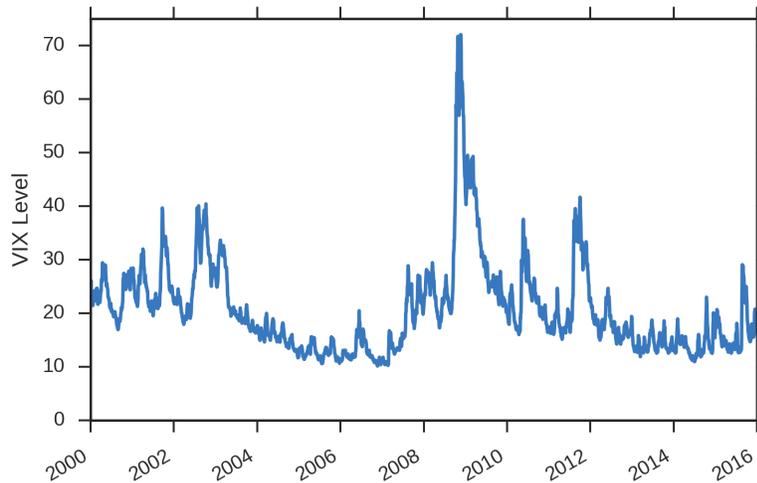
1) Long-term Volatility Measures

The Chicago Board Options Exchange Volatility Index (“VIX”) is a commonly used indicator of long-term volatility, expressing the expected volatility of the S&P 500 index over the next month. The VIX, often called “the investor fear index,”⁶¹ increases during periods of market stress. Figure 1.7 shows the level of the VIX over time. As evident in this figure, VIX levels are at historically average levels.

⁶⁰ Source: TAQ database. Data reflects a 2-day moving average for smoothness.

⁶¹ Sam Bourgi, *What Volatility is Saying about US Stocks*, EconomicCalendar.com (Mar. 19, 2016), available at <http://www.economiccalendar.com/2016/03/19/what-volatility-is-saying-about-us-stocks/>.

Figure 1.7: Market Volatility (level of VIX)⁶²



2) Intraday Volatility

Intraday volatility is a measure of how much stock prices change during a trading day, as opposed to other volatility measures that focus only on closing prices. This is the measure most likely to be “felt” by investors, as it measures how much the value of their investment fluctuates throughout the trading day.

Figure 1.8 shows intraday volatility of stocks at the 90th, 50th, and 10th percentiles for such volatility. These groups are intended to represent the most volatile stocks (90th percentile), stocks of median volatility (50th percentile), and the least volatile stocks (10th percentile).

The blue line shows stocks at the 90th percentile of volatility, which means that 90% of stocks have a lower intraday volatility than these stocks, and 10% have higher volatility. The 90th percentile thus gives an indication of the intraday volatility for the most volatile stocks. The intraday volatility of these stocks has

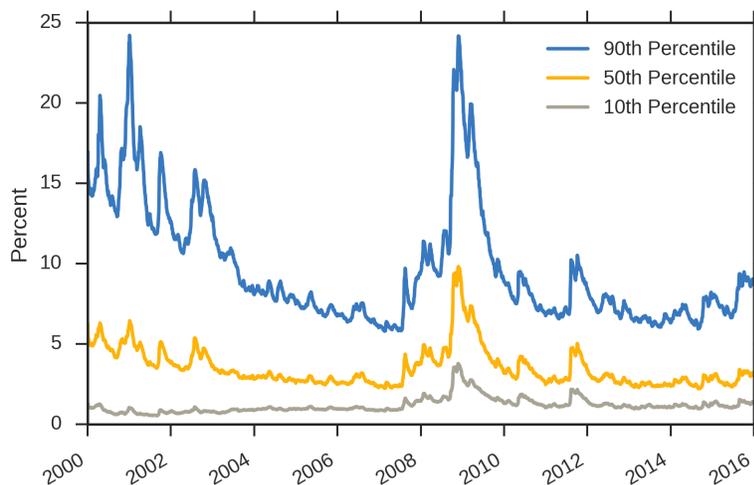
⁶² Source: Yahoo! Finance data for Chicago Board Options Exchange Volatility Index (“VIX”). Data reflects a 2-day moving average for smoothness.

dropped from roughly 20% in 2001, and a more recent peak of almost 25% during the financial crisis, to less than 10% as of 2016.

The yellow line shows stocks with median volatility, giving an indication of intraday volatility for a typical stock. As shown in the figure, these stocks experienced intraday volatility of approximately 3% as of 2016, down from roughly 5% in 2000.

Finally, the grey line shows the least volatile stocks, for which volatility has remained at a consistently low level of roughly 2% or less since 2000, except for a spike in volatility during the financial crisis.

*Figure 1.8: Intraday Volatility*⁶³



D. Liquidity and Transaction Costs

Market liquidity is a multi-faceted concept that measures the ease with which a security can be bought and sold. Liquidity can be evaluated along three dimensions: (1) *market depth* – the amount of publicly displayed offers to buy or

⁶³ Source: CRSP database. Intraday volatility is defined as (high minus low) / low. Data reflects a 10-day moving average for smoothness.

sell at the best available price; (2) *immediacy* – how quickly trades of a given size can be arranged at a given cost;⁶⁴ and (3) *market breadth* – the transaction cost of executing a trade of a given size.

For a retail investor, the transaction cost of buying or selling stock largely depends on the bid-ask spread and the commissions charged by the broker-dealer to execute a trade. For an institutional investor, transaction costs also depend on the broker-dealer’s ability to execute large orders without prices moving against the order (“**price impact**”).

1) Market Depth and Immediacy

Market depth and immediacy are closely related concepts and are often directly correlated. Empirical trends in market depth are thus likely accompanied by similar trends in immediacy. We examine market depth below.

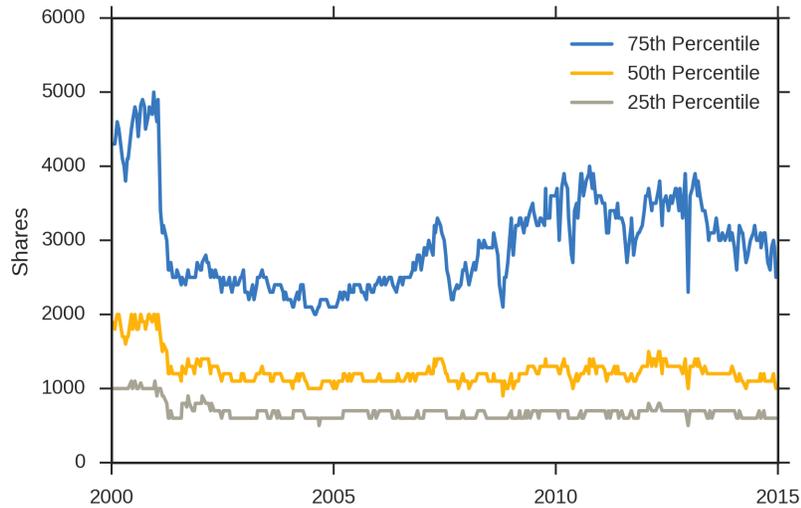
The total share volume of the displayed quotes to buy or sell at the national best bid and offer (“**NBBO**”) is referred to as the “NBBO volume depth”. In theory, NBBO volume depth reflects the amount of stock that an investor can trade immediately at the best prevailing price. As shown in Figure 1.9, NBBO volume depth has generally increased or remained stable since 2003.

The blue line in Figure 1.9 shows the change over time in stocks with an NBBO volume depth in the 75th percentile. These are stocks with a high degree of depth, as 75% of stocks have less depth at the NBBO. Our findings demonstrate that NBBO volume depth for these stocks has increased since 2005.

The yellow line shows the change over time in stocks with the median NBBO volume depth and the grey line shows the change over time in stocks with NBBO volume depth at the 25th percentile. The levels of depth for these stocks has remained relatively constant since 2002.

⁶⁴ See LARRY HARRIS, TRADING AND EXCHANGES 73 (2003).

Figure 1.9: Volume Depth Available at NBBO⁶⁵



2) Market Breadth

a) Spreads at the NBBO

Figure 1.10 shows the evolution of bid-ask spreads over time. Spreads declined dramatically following decimalization in the early 2000s (when minimum quoting increments were lowered from 1/8ths and 1/16ths of one dollar to one cent).⁶⁶

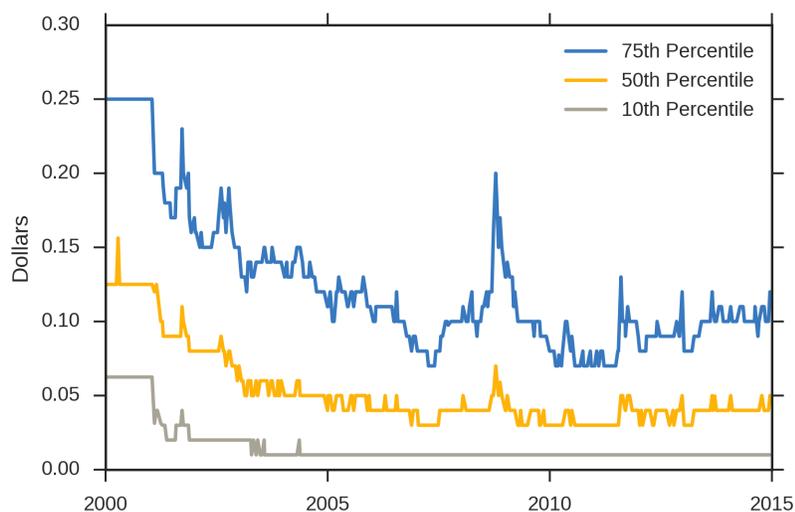
The blue line in Figure 1.10 represents stocks with bid-ask spreads in the 75th percentile. Stocks with spreads in the 75th percentile have wider spreads than most stocks, as only 25% of stocks have a wider spread and 75% of stocks have a narrower spread. We find that these stocks now have spreads of approximately 10 cents as compared to 25 cents in 2000.

⁶⁵ Source: TAQ database.

⁶⁶ See *Testimony Concerning The Effects of Decimalization on the Securities Markets: Before the S. Comm. on Banking, Housing, and Urban Affairs, 107th Cong. (2001)* (statement of Laura S. Unger, Acting Chair, U.S. SEC. & EXCH. COMM'N), available at <https://www.sec.gov/news/testimony/052401tslu.htm>.

The yellow line in Figure 1.10 represents stocks with the median bid-ask spreads. We find that these stocks now trade at spreads of less than 5 cents as compared to spreads of over 10 cents in 2000. Finally, the grey line shows stocks with spreads in the 10th percentile. This means that 90% of stocks have wider spreads than these stocks. As demonstrated in Figure 1.10, these 10th percentile stocks have traded at penny spreads since 2004.

*Figure 1.10 Quantiles of NBBO Spread over Time*⁶⁷



b) Other Measures of Market Breadth

Empirical studies have found that other key components of market breadth have declined in recent years. Angel et al. (2013) document a decline in both retail brokerage commissions and institutional brokerage commissions. For example, Angel et al. show that the average commission charged by the three major retail brokers is approximately \$10 per trade;⁶⁸ in contrast, full-service broker commissions ranged from \$75 to \$150 per trade-through the mid-1990s.⁶⁹ Other

⁶⁷ Source: TAQ database.

⁶⁸ Angel et al., *supra* note 49.

⁶⁹ Yannis Bakos et al., *The Impact of E-Commerce on Competition in the Retail Brokerage Industry*, INFORMATION SYSTEMS RESEARCH 4 (2005), available at <http://pages.stern.nyu.edu/~bakos/ebrokers.pdf>.

estimates find that as recently as 2001, brokers charged institutional investors about 5 cents/share to execute a large order, while brokers now charge only 1.5 cents/share.⁷⁰

Angel et al. also find that institutional investors are able to execute their large orders with record low price impact. For example, they find that a hypothetical \$30 million institutional order today would only cost roughly \$120,000 in price impact, whereas in 2000 it would have cost three times as much.⁷¹ Greenwich Associates estimates that U.S. annual institutional equity trading costs have decreased more than 30% from their peak in 2009, to \$9.65 billion in 2016.⁷² Another study similarly estimates that the institutional trading costs for U.S. large cap stocks have declined by more than 19% since 2010.⁷³

A reduction in transaction costs can have a significant impact on long-term returns for investors. For example, a 2010 letter by Vanguard cited estimates that transaction costs for investors had been reduced by at least 35% since 2000, with some estimating a reduction of more than 60%.⁷⁴ They quantified the impact of reduced transaction costs on long-term investors, finding that \$10,000 invested in a mutual fund over 30 years would (as of 2010) yield a long-term investor \$132,000

⁷⁰ Andre Cappon, *The Brokerage World is Changing, Who Will Survive?*, FORBES (Apr. 16, 2014), available at <http://www.forbes.com/sites/advisor/2014/04/16/the-brokerage-world-is-changing-who-will-survive/>.

⁷¹ Angel et al., *supra* note 49.

⁷² See *Broker Commissions on Institutional U.S. Equity Trades Flat at \$9.65 Billion*, GREENWICH ASSOCIATES (Jul. 13, 2016), available at <https://www.greenwich.com/press-release/broker-commissions-institutional-us-equity-trades-flat-965-billion>.

⁷³ Aguilar, *supra* note 50; *Global Cost Review 2014/Q3*, INVESTMENT TECHNOLOGY GROUP 8 (Jan. 14, 2015), available at http://www.itg.com/marketing/ITG_GlobalCostReview_Q3_2014_20150205.pdf; *Global Cost Review 2010/Q2*, INVESTMENT TECHNOLOGY GROUP 6 (Oct. 27, 2010), available at http://www.itg.com/wp-content/uploads/2009/12/ITGGlobalCostReview_2010Q2_Final.pdf.

⁷⁴ The Vanguard Group, SEC Comment Letter, Re: Concept Release on Equity Market Structure File Number S7-02-10 2 (Apr. 21, 2010), available at <https://www.sec.gov/comments/s7-02-10/s70210-122.pdf>.

instead of \$100,000.⁷⁵ More recent data demonstrates that total transaction costs have continued to decline and are down an additional 16% since 2009.⁷⁶

E. Undisplayed or “Dark” Liquidity

Undisplayed or “dark” liquidity generally refers to trades that are executed without the public display of an order. In contrast, visible or “lit” liquidity generally refers to trades that are executed by posting certain information about an order (e.g. size and price) that can be viewed by all other market participants. Chapter 2 of this report further describes and contextualizes dark liquidity in today’s equity markets.

Trading in the “dark” can be beneficial to investors when it results in trades being executed at better prices than the NBBO (referred to as “price improvement”). However, critics of dark trading often claim that dark transactions offer trivial price improvements, if any, to investors.⁷⁷ It is also important to note that even if a trade is executed without price improvement, trading in the “dark” can be beneficial to institutional investors if it helps minimize the price impact of a large order. We discuss this issue further in Chapter 2.

To assess whether trading in the “dark” provides investors with price improvement, we review Rule 605 disclosures by trading venues.⁷⁸

⁷⁵ *Id.* at 2-3.

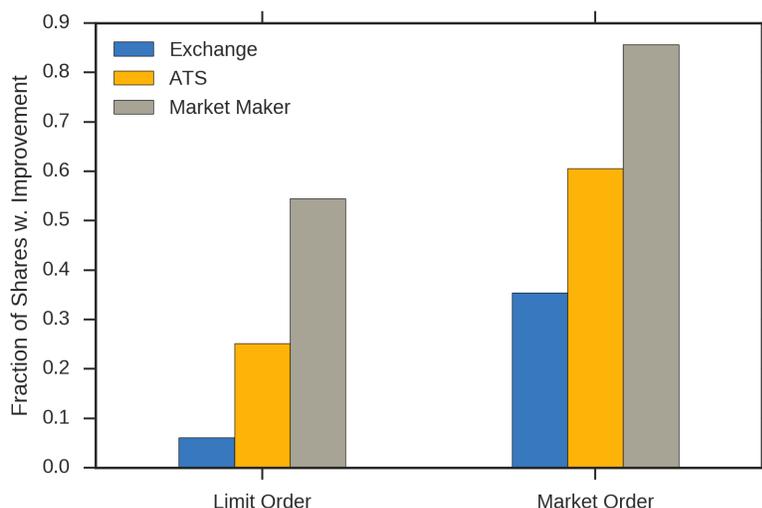
⁷⁶ *Global Cost Review Q1/2016*, INVESTMENT TECHNOLOGY GROUP 4 (Apr. 27, 2016) (ITG estimates that transaction costs decreased from 54.6 basis points in the third quarter of 2009 to 45.8 basis points in the first quarter of 2016), *available at* <http://analyticsincubator.itginc.com/tasks/render/file/?fileID=E438E97A-7B0B-445D-8DF6A122F60E086D>.

⁷⁷ See Sviatoslav Rosov, *HFT, Price Improvement, Adverse Selection: An Expensive Way to Get Tighter Spreads?*, CFA INST. (Dec. 18, 2014), *available at* <https://blogs.cfainstitute.org/marketintegrity/2014/12/18/hft-price-improvement-adverse-selection-an-expensive-way-to-get-tighter-spreads/>.

⁷⁸ 17 C.F.R. § 242.605 (2005); Rule 605 requires trading venues to prepare monthly reports that publicly disclose basic, standardized information about the execution quality that they achieve for retail-size customer orders.

Figure 1.11 shows that exchanges, ATs, and broker-dealer internalizers (referred to below as market makers) each offer price improvement for limit orders (orders to execute at a pre-determined price) and market orders (orders to execute at the NBBO) that are executed in the dark. For example, Figure 1.11 shows that more than 80% of market orders that are internalized and approximately 60% of market orders that are executed at an ATs receive price improvement.

Figure 1.11: Frequency of Price Improvement by Venue Type⁷⁹



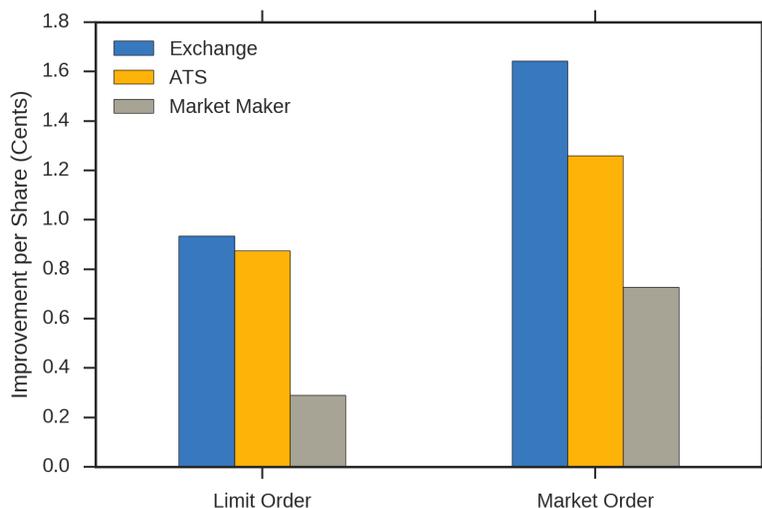
Moreover, our review of Rule 605 disclosures also indicates that dark trading offers *measurable* price improvement. As demonstrated in Figure 1.12, we find that the average per share price improvement provided to limit and market orders on exchanges and ATs is over 0.8 cents when executed in the dark.⁸⁰ Our

⁷⁹ Source: Rule 605 filings for March, April, and May 2016. Market maker data gathered for top 9 venues for non-ATs OTC transactions in Reg NMS stocks (Citadel Securities LLC, KCG Americas LLC, G1 Execution Services LLC, Goldman Sachs & Co, UBS Securities LLC, Two Sigma Securities LLC, Deutsche Bank Securities, Morgan Stanley & Co LLC, and Citigroup Global Markets Inc.). ATs data gathered for 5 of the top 10 ATs for transactions in Reg NMS stocks (UBS ATs, IEX, JPM-X, Level ATs, and Barclays LX ATs).

⁸⁰ See Figure 1.12. Our analysis focused on undisplayed market orders and marketable limit orders at exchanges, broker-dealer internalizers, and ATs.

data also shows that dark market orders that are internalized receive an average price improvement of over 0.7 cents per share.⁸¹

Figure 1.12: Magnitude of Price Improvement by Venue Type⁸²



Part II: High Frequency Trading Strategies and Equity Market Quality

High frequency trading strategies make up a significant segment of trading activity in the modern equity markets. According to some estimates, nearly 50% of U.S. equity market trading volume is attributable to HFT strategies.⁸³ However,

⁸¹ *Id.*

⁸² Source: Rule 605 filings for March, April, and May 2016. Market maker data gathered for top 9 venues for non-ATS OTC transactions in Reg NMS stocks (Citadel Securities LLC, KCG Americas LLC, G1 Execution Services LLC, Goldman Sachs & Co, UBS Securities LLC, Two Sigma Securities LLC, Deutsche Bank Securities, Morgan Stanley & Co LLC, and Citigroup Global Markets Inc.). ATS data gathered for 5 of the top 10 ATSs for transactions in Reg NMS stocks (UBS ATS, IEX, JPM-X, Level ATS, and Barclays LX ATS).

⁸³ See, e.g., Gregory Meyer et al., *Casualties Mount in High-Speed Trading Arms Race*, THE FINANCIAL TIMES (Jan. 22, 2015), available at <http://www.ft.com/intl/cms/s/0/38a1437e-a1eb-11e4-bd03-00144feab7de.html> (citing data from TABB Group).

despite their crucial role in today's equity markets, there is still limited public understanding of how HFT strategies work in practice.⁸⁴

The first section of this part describes HFT strategies generally, with a brief explanation of the types of activities commonly labeled HFT strategies. It also summarizes two broad types of HFT strategies: (1) market making and (2) arbitrage strategies. The section follows with an example of a high frequency arbitrage strategy, which is simulated using historical market data. This simulation illustrates the role that speed plays in the equity markets and provides tentative evidence of the effect of competition on HFT strategies.

The second section of this part provides a review of the academic literature regarding the relationship between HFT strategies and market quality. The literature review generally supports the conclusion that HFT strategies are positively associated with market quality. This section also evaluates certain popular criticisms of HFT strategies in the context of empirical research.

A. Description of High Frequency Trading Strategies

In today's markets, high speed execution and data services are accessible to a wide range of market participants, and many different types of institutions and traders use these services.⁸⁵ Indeed, retail and institutional investors often have access to some of the highest speed execution services through their broker-dealers. We therefore believe that an informed analysis of the role of HFT in U.S. equity markets should focus on identifying the functional characteristics of HFT strategies, rather than classifying institutions that engage in such strategies as "HFT firms."

⁸⁴ The Committee on Capital Markets Regulation has contributed to the improvement of public understanding through its December 2014 fact statement on high frequency trading, *available at* http://capmktreg.org/app/uploads/2014/12/2014-12-29_CCMR_-_What_Is_High_-_Frequency_Trading.pdf.

⁸⁵ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 45 (Jan. 14, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358.pdf>.

Common functional characteristics of HFT strategies include: (1) use of high speed and sophisticated programs for generating, routing, and executing orders; (2) use of execution services and proprietary data feeds offered by exchanges to minimize network and other latencies; (3) very short timeframes for establishing and liquidating positions; (4) submission of numerous orders that are cancelled shortly after submission; and (5) ending the trading day in as close to a flat position as possible (that is, not carrying significant, unhedged positions overnight).⁸⁶ HFT strategies are also often characterized by extremely low average profits per trade⁸⁷ and as having little or no correlation with traditional long-term buy and hold strategies.⁸⁸

One way to understand HFT strategies is as a variant of traditional market making and/or arbitrage strategies that have always existed in equities markets. We explain these strategies below and how automation has allowed market participants to execute them more efficiently.

1) Automated Market Making

The U.S. equity markets have always relied on certain market participants acting as market makers. These market makers perform the essential function of meeting the liquidity demands of fundamental investors who cannot efficiently trade with each other.⁸⁹ For example, an investor wishing to buy 100 shares of XYZ may not immediately find another investor wishing to sell 100 shares of XYZ, because these investors may disagree on price and/or come to the market at different times. To facilitate executions, a market maker intermediates the trade. Market makers do so by displaying quotes for a given set of stocks. They display a “bid” price to buy a stock from investors and an “ask” or “offer” price to sell a stock to investors. The liquidity provided by market makers therefore helps investors enter or exit positions. In order to determine their quotes, market makers

⁸⁶ *Id.*

⁸⁷ IRENE ALDRIDGE, HIGH-FREQUENCY TRADING: A PRACTICAL GUIDE TO ALGORITHMIC STRATEGIES AND TRADING SYSTEMS 1 (Apr. 22, 2013).

⁸⁸ *Id.*

⁸⁹ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 49-50 (Jan. 14, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358.pdf>.

use available market data to reach the best determination of the immediate supply and demand for a stock.

The most straightforward way for a market maker to earn a profit is to capture the spread, or the difference between the bid and the ask price of a stock. For example, a market maker would seek to buy at a bid of \$10.00 and sell at a higher ask price of \$10.01, earning the penny spread. Of course, market makers risk losing on trades if they buy at a bid of \$10.00 and have to sell at a lower ask price of say \$9.99. This can occur when they misjudge the short-term supply and demand for a stock.

Given the constant fluctuation of supply and demand for stocks and the fact that market maker quotes are not executed immediately, market makers must constantly update their bid and ask quotes based on new market data. Updating their quotes often requires them to cancel unfilled orders and post new quotes based on changes in the market price for a stock.⁹⁰ Market makers' ability to perform their trading strategies has been enhanced by (1) access to high speed execution and data services from exchanges; and (2) the proprietary technology necessary to quickly assess the supply and demand for that security and rapidly update their quotes.

2) Arbitrage Strategies

Arbitrage strategies are a fundamental component of trading in securities markets. Arbitrage opportunities arise when the same asset trades on multiple markets at different prices, or when two related assets trade at divergent prices. Such price divergences can occur for various reasons. For example, market participants may be trading more actively in one market versus another market. When prices between the same or related assets diverge, arbitrageurs can profit by simultaneously buying the lower priced asset and selling the higher priced asset, until prices converge.

⁹⁰ See Matt Levine, *Why Do High-Frequency Traders Cancel So Many Orders?*, BLOOMBERG (Oct. 8, 2015), available at <https://www.bloomberg.com/view/articles/2015-10-08/why-do-high-frequency-traders-cancel-so-many-orders->.

Statistical arbitrageurs identify related securities that have historically traded within a certain price range. When the prices of these securities diverge from their historical and fundamental trading patterns, statistical arbitrageurs assess whether the divergence is temporary or whether it is permanent.⁹¹ For example, a *temporary* price change could be due to market-wide volatility, rather than a change in the expected future cash flows of the security itself. Statistical arbitrageurs then trade against temporary price changes seeking to realign the security with its previous price range.⁹²

Arbitrage strategies can improve the accuracy of publicly displayed prices, because statistical arbitrageurs expend resources to seek out additional information and analyze its meaning for the price of the security. They then incorporate this information and analysis into the effective price of a security by buying or selling that security. As a result, the price of the security reflects more information.⁹³ This result is beneficial for the real economy, because more informative stock prices promote better resource allocation.⁹⁴

HFT arbitrageurs are able to identify and trade against mispricings faster than ever before, which reduces the length of time that such mispricings exist. Investors can benefit from this result because they are able to enter and exit positions at prices that better reflect the fundamental value of a security.

3) Example of a High Frequency Trading Strategy

We simulate an HFT statistical arbitrage strategy on tick-level trade data for S&P Composite 1500 index constituents from (1) 6/2/2009 and (2)

⁹¹ See Jonathan Brogaard et al., *High Frequency Trading and Price Discovery* 5 (European Central Bank Working Paper No. 1602, 2013), available at <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1602.pdf>.

⁹² See *id.*

⁹³ See Andre Shleifer & Robert Vishny, *The Limits of Arbitrage*, 52 THE JOURNAL OF FINANCE 1 (Mar. 1997).

⁹⁴ See Brogaard et al., *supra* note 91, at 31.

6/2/2014. The strategy is very simple and was used in Khadani and Lo (2007).⁹⁵ The procedure for our simulation was the following: over the course of the trading day, at every 1-minute interval (i.e. a 1-minute rebalancing frequency) we buy the 150 stocks that had the lowest return over the previous minute and we sell short the 150 stocks that had the highest return over the previous minute. From a functional perspective, the strategy used in our simulation is very similar to “mean reversion statistical arbitrage” strategies that preserve cross-correlation relationships between stocks over short time scales.⁹⁶

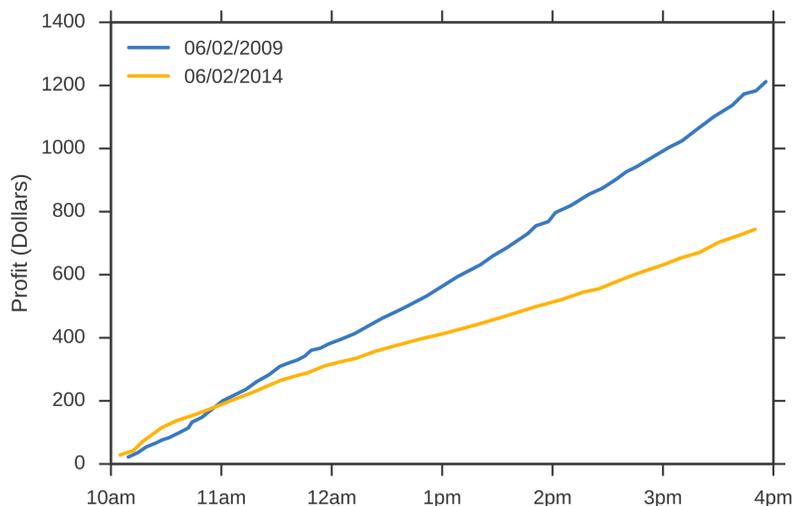
Excluding transaction costs, this strategy earns a steady return and almost never loses money. However, we note that this simulation does not mean that a trader could employ this strategy and turn a profit. This is because there would be many expenses associated with executing this strategy. For example, market participants employing HFT arbitrage strategies must pay transaction fees and make substantial investments in technology and top-tier staff. Additionally, an HFT arbitrageur does not successfully complete every trade it hopes to execute. They must compete with other market participants, including other traders with access to similar technologies. These realities put a natural cap on the profitability of HFT arbitrage strategies.

Figure 1.13 illustrates the results of our simulations using 2009 data (in blue) and 2014 data (in gold). As the figure shows, the strategy’s profitability declined markedly between 2009 and 2014. This trend provides tentative evidence that competition between HFTs has constrained the profitability of their strategies.

⁹⁵ Amir E. Khandani & Andrew W. Lo, *What Happened to the Quants in August 2007* (MIT Working Paper, 2007), available at <http://web.mit.edu/Alo/www/Papers/august07.pdf>.

⁹⁶ Andrew W. Lo & Craig MacKinlay, *When Are Contrarian Profits Due to Stock Market Overreaction?* (NBER Working Paper No. 2977, 1989), available at <http://www.nber.org/papers/w2977>.

Figure 1.13: Gross Profits from an HFT Statistical Arbitrage Strategy with \$10,000 Invested (Excluding Implicit and Explicit Transaction Costs)⁹⁷

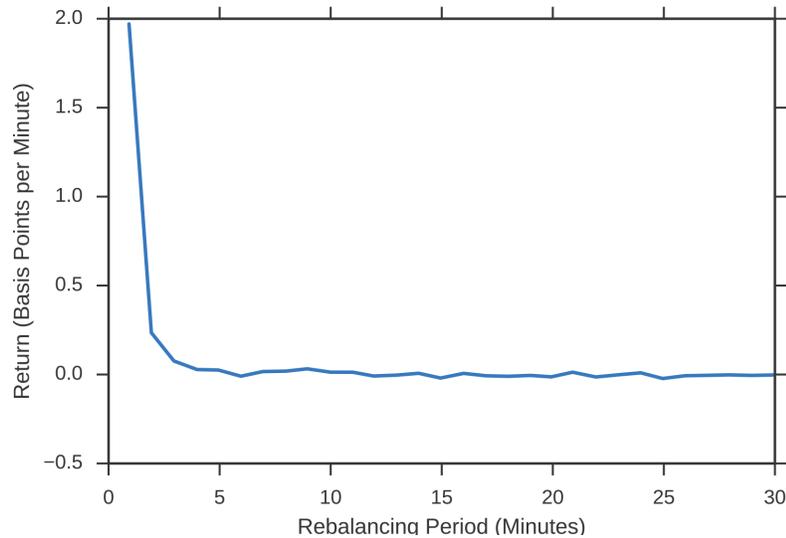


Using a proprietary data set that identifies individual traders, Brogaard (2010) concludes that many HFT algorithms follow price reversal strategies that are similar to our example, although they are likely more sophisticated.⁹⁸ As Figure 1.14 shows, the quicker an algorithm rebalances the portfolio of stocks, the higher the returns of the strategy. A correlation between speed and profitability is therefore not evidence that abusive or manipulative trading tactics are at play. Instead, the ability to react to market data at higher frequencies likely improves the efficiency of price discovery.

⁹⁷ Basis for statistical arbitrage strategy outlined in Amir E. Khandani & Andrew W. Lo, *What Happened to the Quants in August 2007?: Evidence from Factors and Transactions Data* (NBER Working Paper No. 14465, 2008), available at <http://www.nber.org/papers/w14465.pdf>.

⁹⁸ Jonathan A. Brogaard, *High Frequency Trading and Its Impact on Market Quality* 14 (2010), available at http://www.futuresindustry.org/ptg/downloads/HFT_Trading.pdf (finding that HFT algorithms “tend to buy stocks at short-term troughs and tend to sell stocks at short-term peaks”).

Figure 1.14: Profitability of HFT Statistical Arbitrage Strategy as a Function of Trade Frequency (Smaller Rebalancing Period Implies Higher Frequency)⁹⁹



B. HFT Strategies and Equity Market Quality

Despite the widespread use of HFT strategies in modern equity markets, public understanding of these strategies and their impact on markets remains limited. Certain depictions of HFT strategies in popular culture, such as those presented in Michael Lewis’s book “Flash Boys,” have fueled public skepticism about HFT strategies.¹⁰⁰ In this section, we address that public skepticism through an objective summary of the academic literature on HFT strategies as related to equity market quality.

A large body of empirical academic research regarding the relationship between HFT strategies and market quality has emerged over the past five years. This section describes the major findings and conclusions presented in the

⁹⁹ Basis for statistical arbitrage strategy outlined in Amir E. Khandani & Andrew W. Lo, *What Happened to the Quants in August 2007?: Evidence from Factors and Transactions Data* (NBER Working Paper No. 14465, 2008), available at <http://www.nber.org/papers/w14465.pdf>.

¹⁰⁰ See Eric Levenson & Dashiell Bennett, *Is High-Frequency Trading as Bad as Michael Lewis Wants You to Think?*, THE ATLANTIC (Apr. 1, 2014), available at <http://www.thewire.com/business/2014/04/is-high-frequency-trading-as-bad-as-michael-lewis-wants-you-to-think/359903/>; Michael Lewis, *Flash Boys: A Wall Street Revolt* (Norton 2014).

empirical academic literature. We find that this literature generally highlights a positive association between HFT strategies and market quality, particularly with respect to volatility, price efficiency, liquidity, and transaction costs.

Throughout the summary, we also briefly introduce certain popular criticisms of HFT strategies and relate these criticisms to illustrative empirical data. These criticisms are that HFT strategies: (i) increase the volatility of stock prices; (ii) create the illusion of liquidity, which vanishes during periods of market distress; (iii) are engaged in a so-called “arms race” that does not improve market quality; and (iv) earn outsize profits that represent economic “rents” from long-term investors.¹⁰¹ We find that the disconnect between these criticisms and the empirical data suggests that there is a broader distrust of HFT strategies underlying the beliefs.

1) HFT Impact on Overall Market Quality

In a review of empirical academic research on HFT strategies, Jones (2013) finds that the studies evaluating a causal link between HFT activity and market quality generally conclude that HFT strategies improve market quality.¹⁰² Gomber et al. (2011) conclude that “the majority [of academic literature] argues that HFT [strategies] generally contribute] to market quality and price formation and finds positive effects on liquidity and short-term volatility.”¹⁰³ And a 2015 SEC paper found that HFT strategies can reduce transaction costs and improve pricing

¹⁰¹ See, e.g., *High Frequency Trading’s Impact on The Economy: Hearing Before the S. Subcomm. on Securities, Insurance and Investment*, 113th Cong. 2 (2014) (comments by Sen. Elizabeth Warren, Chairman, on the testimony of Hal S. Scott, Nomura Professor and Director of the Program on International Financial Systems, Harvard Law School); Gary Shorter & Rena S. Miller, Cong. Research Serv., R43608, *High-Frequency Trading: Background, Concerns and Regulatory Developments* (2014), available at <http://fas.org/sgp/crs/misc/R43608.pdf>.

¹⁰² Charles M. Jones, *What do we know about high-frequency trading?* (Columbia Business School Research Paper No. 13-11, 2013), available at <https://securitytraders.org/wp-content/uploads/2013/04/HFT0324.pdf>.

¹⁰³ Peter Gomber et al., *High-Frequency Trading* (Goethe-Universitat Working Paper, 2011), available at <http://www.asktheu.org/en/request/425/response/2986/attach/3/HFT%20Study%20Goethe%20University%20Frankfurt.pdf>.

efficiency.¹⁰⁴ Additionally, Hasbrouck and Saar (2012) found evidence that “[HFT] activity improves traditional market quality measures.”¹⁰⁵

2) HFT Impact on Volatility

An initial review of illustrative empirical findings suggests that concerns that HFT strategies increase stock price volatility are misplaced. For example, Figure 1.8 above illustrates that intraday volatility, i.e. percent change between daily low and daily high, is below its historical average.¹⁰⁶ These results suggest that HFT strategies are not appreciably increasing intraday volatility, although they do not necessarily mean that HFT strategies reduce volatility. In addition, Gao and Mizrach (2013) found that the frequency of “market quality breakdowns,” defined as a decline of 10% or more below the 9:35am price, followed by a reversion to within 2.5% of that price, have declined over time.¹⁰⁷ Indeed, academics generally agree that during normal periods of market activity, HFT strategies dampen volatility in the equity markets (see, e.g., Gomber et al. (2011), Jones (2013) and Angel et al. (2011, 2013)).

Despite the majority view regarding HFT’s positive impact on volatility, the academic literature includes some dissenters. Zhang (2010) and Cartea and Penalva (2012) conclude that HFT strategies are associated with increases in volatility.¹⁰⁸ It should be noted, however, that those conclusions are based on a theoretical approach. Those negative theoretical assertions are countered by the empirical

¹⁰⁴ Austin Gerig, *High-Frequency Trading Synchronizes Prices in Financial Markets* (DERA Working Paper, 2015), available at <http://www.sec.gov/dera/staff-papers/working-papers/dera-wp-hft-synchronizes.pdf>.

¹⁰⁵ Joel Hasbrouck & Gideon Saar, *Low-Latency Trading* (Johnson School Research Paper Series No. 35-2010, 2013), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1695460.

¹⁰⁶ See *supra* Figure 1.8.

¹⁰⁷ Cheng Gao & Bruce Mizrach, *Market Quality Breakdowns in Equities* (2015), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2153909.

¹⁰⁸ See Frank Zhang, *The Effect of High-Frequency Trading on Stock Volatility and Price Discovery* (2010), available at <http://mitsloan.mit.edu/groups/template/pdf/Zhang.pdf>; Alvaro Cartea & Joe Penalva, *Where is the Value in High Frequency Trading?* (2010), available at http://www.cftc.gov/idx/groups/public/@swaps/documents/dfsubmission/tacpresentation030111_acjp.pdf.

work of Brogaard (2010), Angel et al. (2013) and Jones (2013), each finding that HFT dampens volatility based on empirical results.

Indeed, no empirical evidence supports the claim that HFT strategies increase the volatility of equity prices during periods of normal market activity, although certain studies have found that HFT strategies may increase the volatility of equity prices during extreme market events (see, e.g., Kirilenko et al. (2014) and Angel et al. (2013)).¹⁰⁹

A related criticism of HFT strategies is that they can create extreme price swings through “fleeting liquidity,” in which high speed order updates can cause “a false sense of overpriced supply and demand for a stock.”¹¹⁰ As a result, market participants may act under the impression that liquidity exists, when it actually does not. Fleeting liquidity is said to cause “mini crashes,” in which stock prices undergo dramatic price swings followed by corrections within a short period of time.¹¹¹

Empirical studies of this phenomenon do not demonstrate a clear connection between HFT strategies and “fleeting liquidity.” For example, Golub et al. (2012) conclude that frequent quote updating can produce fleeting liquidity, which in turn creates large, rapid fluctuations in price.¹¹² However, Golub’s analysis focuses on a standard data set that does not distinguish between HFT and non-HFT trading strategies. Brogaard et al. (2015), who analyze a proprietary data set that *does* differentiate between HFT strategies and non-HFT strategies, obtain different results. They find that traders using HFT strategies are net liquidity providers in

¹⁰⁹ See Andrei Kirilenko et al., *The Flash Crash: The Impact of High Frequency Trading on an Electronic Market* (2014), available at http://www.cftc.gov/idc/groups/public/@economicanalysis/documents/file/oc_flashcrash0314.pdf.

¹¹⁰ See, e.g., Anton Golub et al., *High Frequency Trading and Mini Flash Crashes* 16 (Working Paper, 2012), available at <http://arxiv.org/pdf/1211.6667.pdf>.

¹¹¹ See *id.*; see also Michael Kling, *A Dozen Mini Flash Crashes Hit Stock Market Daily*, CNNMONEY (Mar. 21, 2013), available at <http://www.newsmax.com/finance/InvestingAnalysis/flash-crash-stocks-mini-SEC/2013/03/21/id/495652/?s=al>.

¹¹² See Golub et al., *supra* note 110.

the immediate aftermath of an extreme price movement, and that they are *not* net liquidity demanders preceding an extreme price movement. In other words, those using HFT strategies do not trigger extreme price movements by entering aggressive liquidity-demanding orders, and do not—as a group—withdraw liquidity immediately after extreme price movements.¹¹³

3) HFT Impact on Liquidity

In general, the academic literature on HFT strategies finds that they contribute positively to the liquidity of equity markets. Jones (2013) notes that the vast majority of empirical work on HFT strategies shows that they improve market liquidity. Other research has found that HFT strategies generally contribute liquidity to the market when liquidity is in short supply and consume liquidity from the market when there is an over-supply, thus smoothing equity market liquidity overall (see e.g. Carrion (2013)). Brogaard et al. (2014) further confirm that market participants using HFT strategies “supply liquidity in stressful times such as the most volatile days and around macroeconomic news announcements.”¹¹⁴ Overall, the majority of the academic literature support the view that HFT strategies have a positive impact on market liquidity in a number of respects.

4) HFT Impact on Price Discovery

Improvement in the efficiency of price discovery is another positive impact of HFT strategies generally supported by the empirical literature. Brogaard et al. (2014) found that “overall HFT strategies facilitate price efficiency by trading in the direction of permanent price changes and in the opposite direction of transitory pricing errors.”¹¹⁵ A review of the academic literature by Gomber et al. (2011) also found that the vast majority of papers on HFT strategies conclude that HFT strategies improve price formation.¹¹⁶ The conclusion is supported by Carrion (2013), who determines that “[p]rices incorporate information flow from order

¹¹³ Jonathan Brogaard et al., *High-Frequency Trading and Extreme Price Movements* (2015), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2531122.

¹¹⁴ Jonathan Brogaard et al., *High-Frequency Trading and Price Discovery*, 27 REVIEW OF FINANCIAL STUDIES 2267 (2014), available at <http://faculty.haas.berkeley.edu/hender/hft-pd.pdf>.

¹¹⁵ *Id.*

¹¹⁶ Gomber et al., *supra* note 103.

flow and market-wide returns more efficiently on days when HFT participation is high,”¹¹⁷ and by Biais and Wooley (2011), who find that “HFT [activity] improves informational efficiency...[and] enhances price discovery.”¹¹⁸

5) HFT Strategies and the “Arms Race”

Another concern about HFT strategies involves the so-called arms race among firms that use HFT strategies, whereby competitors engage in an escalating rivalry to trade faster than other market participants.

The underlying concern is that the arms race would reduce competition among liquidity providers (see, e.g., Angel et al. (2013), Budish et al. (2015), Biais et al. (2011), Harris (2013), Chordia et al. (2013)).¹¹⁹ Harris (2013) notes that “[m]arkets need to be slowed, but not because HFT [activity] is dangerous. Markets need to be slowed slightly to wisely stop an arms race that will eventually decrease competition...and thereby increase investor transaction costs.”¹²⁰ Angel et al. (2013) also express a concern that the expense for technologies necessary to compete at high speeds could become a significant barrier to entry that will reduce competition and potentially increase transaction costs.

However, despite the concerns about the arms race, there is no empirical evidence that the proposed consequences have materialized. Given that competition has not clearly been reduced to deleterious levels, it is important not to introduce proactive measures that may have unintended consequences on an otherwise well-performing market (see Harris (2013), noting that imposing

¹¹⁷ Allen Carrion, *Very Fast Money: High-Frequency Trading on the NASDAQ*, 16 J. FINANCIAL MARKETS 680, 710 (2013), available at http://www.business.unr.edu/faculty/liuc/files/RUC/topic_limitorderbook/Carrion_2013.pdf.

¹¹⁸ Bruno Biais & Paul Woolley, *High Frequency Trading*, 14 (2011) (unpublished manuscript), available at <http://www.eifr.eu/files/file2220879.pdf>.

¹¹⁹ Eric Budish et al., *The High Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response* (2015), available at <https://faculty.chicagobooth.edu/eric.budish/research/HFT-FrequentBatchAuctions.pdf>; Tarun Chordia et al., *High Frequency Trading*, 16 THE JOURNAL OF FINANCIAL MARKETS 637 (2013).

¹²⁰ Larry Harris, *What to Do about High-Frequency Trading*, CFA INST. (Apr. 24 2013), available at <https://blogs.cfainstitute.org/investor/2013/04/24/what-to-do-about-high-frequency-trading/>.

minimum standing times for orders would “have the unintended effect of increasing transaction costs for public investors”).¹²¹

6) HFT Strategies and “Rent-Seeking” Behavior

Some commenters have expressed concern that HFT strategies can yield outsize profits, and that these profits represent rent-seeking behavior that extracts value from other market participants without improving market quality.¹²²

Again, a preliminary investigation of empirical findings suggests that this criticism is not well-founded. For example, Figures 1.9 and 1.10 above show that increases in depth and declines in bid-ask spreads have accompanied the rise of automated trading—these results provide tentative evidence of improvements in market quality. Data regarding the profits attributable to HFT strategies also appear to undermine the “rent-seeking” theory. For example, the TABB Group estimates that the aggregate profits earned by firms employing HFT strategies declined from around \$7.2 billion in 2009 to \$1.3 billion in 2014.¹²³ More recent data show that the average profit per traded share earned by firms using HFT strategies has halved in recent years, from a tenth of a penny in 2009 to a twentieth of a penny in 2015.¹²⁴

¹²¹ *Id.*

¹²² See, e.g., PETER SWANN, COMMON INNOVATION: HOW WE CREATE THE WEALTH OF NATIONS 121 (Dec. 17, 2014); Mark Hutchinson, *High Frequency Trading: Wall Street’s New Rent-Seeking Trick*, MONEY MORNING, (Aug. 14, 2009), available at <http://www.moneymorning.com/2009/08/14/high-frequency-trading/>.

¹²³ Larry Tabb, *No, Michael Lewis, the US Equities Market Is Not Rigged*, TABB GROUP (Mar. 31, 2014), available at http://tabbforum.com/opinions/no-michael-lewis-the-us-equities-market-is-not-rigged?print_preview=true&single=%20true.

¹²⁴ Orcun Kaya, *High-frequency Trading*, Deutsche Bank, 3 (May 24, 2016) (citing Rosenblatt Securities), available at [https://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD000000000406105/High-frequency trading%3A Reaching the limits.pdf](https://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD000000000406105/High-frequency%20trading%3A%20Reaching%20the%20limits.pdf).

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CHAPTER 2: TRADING VENUES AND UNDISPLAYED LIQUIDITY

Part I describes the rules applicable to the two types of trading venues: exchanges and ATSS. It also describes the process of broker-dealer internalization. Part I then sets forth proposed reforms to exchanges and ATSS. Part II describes undisplayed or “dark” liquidity, including a review of the academic literature on the relationship between “dark” liquidity and market quality. Part II then sets forth specific recommendations related to “dark” liquidity.

Part I: Regulating Different Types of Trading Venues

A. Exchanges

The Exchange Act defines an exchange as “any organization, association, or group of persons, whether incorporated or unincorporated, which constitutes, maintains, or provides a market place or facilities for bringing together purchasers and sellers of securities.”¹²⁵ The Exchange Act provides that an exchange may seek to register as a “national securities exchange” by publicly filing an application with the SEC.¹²⁶ Throughout this report we use the term “exchange” to refer to a trading venue that has registered as a national securities exchange with the SEC.

Twelve exchanges are currently in operation. They are estimated to collectively handle approximately 63% of the total share volume of executions in equities in the United States.¹²⁷ ICE/NYSE, NASDAQ OMX, and BATS are the three exchange groups that execute the vast majority of this trading volume.¹²⁸ These three groups collectively control ten of the twelve exchanges; CHX and

¹²⁵ 15 U.S.C. § 78c(a)(1) (2012).

¹²⁶ 15 U.S.C. § 78f (2010).

¹²⁷ See TABB Group, Equities LiquidityMatrix May 2016, *available at* http://mm.tabbforum.com/liquidity_matrices/187/documents/original_2016-05_Equities_Liquidity_Matrix_May_2016.pdf.

¹²⁸ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. & EXCH. COMM’N 16 (Apr. 30, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

NSX constitute the remaining two as “non-group” exchanges.¹²⁹ In addition, the SEC approved the exchange application of Investors Exchange (“**IEX**”), currently an ATS, in June 2016.¹³⁰

The requirements that apply to exchanges are set forth in the Exchange Act and in regulations promulgated thereunder by the SEC. The Exchange Act requires that exchanges permit any registered broker-dealer (or individual associated with a broker-dealer) in good standing to become a member of the exchange.¹³¹ The Exchange Act also requires that each exchange have the capacity to carry out the purposes of the Exchange Act and to enforce compliance by its members with the Act and its related rules.¹³² Such enforcement is generally achieved through disciplinary proceedings and membership restrictions, for which the Exchange Act also sets forth guidelines.¹³³ In furtherance of their enforcement responsibilities, exchanges are statutorily deemed to be “self-regulatory organizations” (“**SROs**”). They are the only type of trading venue so designated.¹³⁴

Of course, exchanges also have their own rules that apply to their broker-dealer members. Exchange rules govern a wide range of details about their operations, from the types of trading services that they provide to the fees that they charge their broker-dealer members.¹³⁵ The Exchange Act sets forth specific parameters for the contents of exchange rules. These include the requirement that the rules “are designed to... remove impediments to and perfect the mechanism of a free and open market and a national market system...to protect investors and the

¹²⁹ *Id.*; *Market Value Summary*, BATS TRADING, available at http://www.batstrading.com/market_summary.

¹³⁰ See In the Matter of the Application of Investors’ Exchange, LLC for Registration as a National Securities Exchange, Exchange Act Release No. 78101, File No. 10-222 (Jun. 17, 2016), available at <https://www.sec.gov/rules/other/2016/34-78101.pdf>.

¹³¹ 15 U.S.C. § 78f(b)(2) (2010).

¹³² 15 U.S.C. § 78f(b)(1) (2010).

¹³³ 15 U.S.C. § 78f(c),(d) (2010).

¹³⁴ 15 U.S.C. § 78s(a) (2010). See *infra* note 220 . As discussed in greater detail below, “national securities associations” (i.e., FINRA) may also be self-regulatory organizations.

¹³⁵ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 16 (Jan. 14, 2010), available at <https://www.sec.gov/rules/concept/2010/34-61358.pdf>.

public interest; and are not designed to permit unfair discrimination between customers, issuers, brokers, or dealers....”¹³⁶

The Exchange Act also determines the process by which an exchange may change its trading rules. First, exchange rules are generally subject to the SEC’s review and approval before they go into effect.¹³⁷ Second, a proposed rule change must be publicly filed on a Form 19b-4 “in a clear and comprehensible manner, to enable the public to provide meaningful comment on the proposal...”¹³⁸ Third, exchanges are required to post a current and complete list of their rules on their own websites.¹³⁹

Importantly, exchange registration provides certain regulatory advantages. For example, exchanges are exempt from paying clearing fees for executing a trade whereas ATs and broker-dealer internalizers must pay such fees. Additionally, Rule 611 of Reg NMS (also referred to as the “order protection rule” and discussed further in Chapter 3) encourages the public display of orders on exchanges, because the rule provides publicly displayed orders on exchanges with “price protection.” This means that a broker-dealer is required to send orders for a stock to an exchange with the best publicly displayed price for that stock if the broker-dealer cannot otherwise match or improve on that price.¹⁴⁰

Exchanges also derive certain benefits from their status as SROs. For example, exchanges receive certain types of legal immunity as SROs. SROs are also the only types of entities that may control and operate the Securities Information Processors (“SIPs”), from which other market participants are required to purchase market data. Although the SEC reviews the fees charged by

¹³⁶ 15 U.S.C. 78f(b)(5) (2010).

¹³⁷ 15 U.S.C. § 78s(b) (2010). The SEC generally has 45 days to approve, disapprove, or institute proceedings to determine whether the rule change should be approved, subject to a potential 45 day extension.

¹³⁸ SEC Form 19b-4, *available at* <https://www.sec.gov/about/forms/form19b-4.pdf>.

¹³⁹ 17 C.F.R. §§ 240.19b-4(l) and (m) (2013).

¹⁴⁰ Rule 611 of Reg NMS; Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data Dissemination, U.S. SEC. & EXCH. COMM’N 5 (Oct. 20, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>.

the SIPs, the exchanges are still able to charge broker-dealers high fees for accessing market data.¹⁴¹

Exchanges' status as SROs also allows them to establish market-wide rules through the use of national market system plans or "NMS Plans." For example, SROs are designing and will implement the Consolidated Audit Trail ("CAT") via an NMS Plan.¹⁴² The CAT will allow regulators to more easily and accurately survey quoting and trading activity across the marketplace. However, the implementation and reporting requirements for the CAT will require operational changes not only by exchanges, but will also impose significant regulatory burdens on broker-dealers. However, due to their influence over NMS Plans, exchanges have disproportionate input into and oversight of the CAT planning process. These and other legal and practical implications of SRO status will be addressed in further detail later in this Chapter.

It is important to note that certain aspects of Reg NMS may have lowered the barriers to entry for new and smaller exchanges.¹⁴³ For example, because the order protection rule protects the publicly displayed quotes of any exchange (regardless of its trading volume), the rule helps to ensure that even small exchanges can attract order flow by displaying the best prices.¹⁴⁴ For example,¹⁴⁵ as of June 2016, CHX had a market share of only 0.34% of the trading volume in NASDAQ stocks and 0.25% of the trading volume in NYSE stocks.¹⁴⁶

¹⁴¹ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data Dissemination, U.S. SEC. & EXCH. COMM'N 6 (Oct. 20, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>.

¹⁴² Chapter 3 of this Report addresses the CAT in further detail.

¹⁴³ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. & EXCH. COMM'N 16 (Apr. 30, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

¹⁴⁴ *Id.* at 16 n.27, citing to Regulation NMS Adoption Release, 70 FR at 37607. The Order Protection Rule is described in greater detail in Chapter 3.

¹⁴⁵ *See also id.* at 16.

¹⁴⁶ Data *available at* https://batstrading.com/market_summary/. *See also id.* at 10-11.

B. Alternative Trading Systems (ATSs)

In 1998, the SEC passed Regulation Alternative Trading System (“**Reg ATS**”) and established a new type of trading venue, the ATS. This new type of trading venue was created to respond to the proliferation of automated trading platforms that market participants had developed in recent years. In particular, market participants had successfully applied technological advancements to build electronic platforms that “furnish[ed] services traditionally provided solely by registered exchanges.”¹⁴⁷ At the time of Reg ATS’s adoption, ATSs had a market share of over 20% of the order volume in NASDAQ-listed securities (NASDAQ was not an exchange at that time) and 4% of order volume in exchange-listed securities.¹⁴⁸

Importantly, Reg ATS established that trading venues could be exempt from exchange registration, if they complied with Reg ATS and were regulated as broker-dealers. However, any venue registering as an ATS could *not* exercise self-regulatory powers, such as making rules regarding subscriber conduct outside the platform. Thus, in adopting Reg ATS, the SEC presented trading venues with two regulatory options: (1) register as a national securities exchange; or (2) register as broker-dealers, and comply with the requirements of ATSs, as described below.¹⁴⁹

Today, there are roughly 40 ATSs that are estimated to collectively execute approximately 15% of the total U.S. share volume in equities.¹⁵⁰

1) Key Provisions of Reg ATS

An ATS must file with the SEC an initial operation report on a Form ATS, which it must later amend whenever there is a material change to the operation of

¹⁴⁷ Regulation of Exchanges and Alternative Trading Systems, Exchange Act Release No. 40760, File No. S7-12-98 (Dec. 8, 1998), *available at* <https://www.sec.gov/rules/final/34-40760.txt>.

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ See TABB Group, Equities LiquidityMatrix May 2016, *available at* http://mm.tabbforum.com/liquidity_matrices/187/documents/original_2016-05_Equities_Liquidity_Matrix_May_2016.pdf.

the ATS.¹⁵¹ The Form ATS includes information regarding the details of how the ATS operates, its subscribers, the types of securities it trades, and its procedures for reviewing systems capacity.¹⁵² Importantly, “Form ATS is not an application and the [SEC] would not ‘approve’ an ATS before it began to operate. Form ATS is, instead, a notice to the [SEC].”¹⁵³ ATSs are therefore able to effect trading rules without the SEC’s pre-approval. Form ATSs and amendments thereto are also “deemed confidential when filed.”¹⁵⁴ The rules an ATS establishes must pertain solely to the trading conduct of the users of its platform¹⁵⁵ and ATSs can only discipline subscribers by excluding them from trading.¹⁵⁶

The operators of ATSs must be registered as broker-dealers under Section 15 of the Exchange Act.¹⁵⁷ Broker-dealers must also be members of FINRA, subject to few exceptions.¹⁵⁸ In practice, a broker-dealer that operates an active ATS cannot qualify for these exceptions, so all ATS operators are members of FINRA.¹⁵⁹ ATS operators are subject to regular audits and examinations by FINRA.

¹⁵¹ 17 C.F.R. § 242.301(b)(2) (2009).

¹⁵² Regulation of Exchanges and Alternative Trading Systems, 63 Fed. Reg. 70844, 70863-864 (Dec. 22, 1998), available at <https://www.gpo.gov/fdsys/pkg/FR-1998-12-22/pdf/98-33299.pdf>.

¹⁵³ *Id.* at 70864.

¹⁵⁴ 17 C.F.R. § 242.301(b)(2)(vii) (2009).

¹⁵⁵ 17 C.F.R. § 242.300 (2009).

¹⁵⁶ *Id.*

¹⁵⁷ 17 C.F.R. § 242.301(b)(1) (2009).

¹⁵⁸ See, e.g., *Brokers*, FINRA, available at <http://www.finra.org/investors/brokers>. Exchange Act Sec. 15(b)(8) provides “It shall be unlawful for any registered broker or dealer to effect any transaction in, or induce or attempt to induce the purchase or sale of, any security (other than or commercial paper, bankers’ acceptances, or commercial bills), unless such broker or dealer is a member of a securities association registered pursuant to section 15A of this title or effects transactions in securities solely on a national securities exchange of which it is a member.

¹⁵⁹ Pursuant to Exchange Act Sec. 15(b)(8), ATS operators must register as members of a national securities association, i.e. FINRA, because they do not effect transactions solely over an exchange. There is also a limited exemption from registration under Rule 15b9-1, whereby broker-dealers may avoid registration if it (1) is a member of a national securities exchange, (2) carries no customer accounts, and (3) has annual gross income derived from purchases and sales of securities otherwise than on a national securities exchange of which it is a member in an amount no greater than \$1,000. An active ATS would not satisfy prongs (2) and/or (3) of the exemption.

ATs are not required to publicly display orders, unless their trading volume exceeds a specified threshold *and* the ATS displays prices to more than one of its participants (i.e., it is not a “dark pool”).¹⁶⁰ If an ATS is a dark pool, then there is no regulatory threshold at which the ATS must publicly display orders. It is important to note that virtually all ATs are dark pools.

If the ATS is not a dark pool, then it must publicly display orders in an NMS stock¹⁶¹ (and report them for inclusion in the SIP) “if during four or more of the preceding six months the ATS had an average daily trading volume of 5% or more of the average daily share volume” for that stock.¹⁶² For trades that fall below this volume threshold, ATs do not need to report their quotations for inclusion in consolidated market data.¹⁶³

Unlike exchanges, ATs are not required to provide all broker-dealers in good standing with access to trade on their platform. However, there is a limitation on an ATS’s ability to restrict access to their platform. More specifically, an ATS must provide “fair access” to trade in a stock on its system to any market participant if, during four or more of the preceding six months, the ATS had an average daily trading volume of 5% or more of the average daily share volume for

¹⁶⁰ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data Dissemination, U.S. SEC. & EXCH. COMM’N 4 (Oct. 20, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>.

¹⁶¹ Rule 600(b)(46) of Reg NMS defines NMS security as “any security or class of securities for which transaction reports are collected, processed, and made available pursuant to an effective transaction reporting plan...” and Rule 600(b)(47) defines NMS stock as an NMS security other than an option. 17 C.F.R. § 242.600 (2005). *See also* Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. & EXCH. COMM’N 3 (Apr. 30, 2015) (“An NMS stock generally means any exchange-listed security (other than listed options) for which consolidated market data is disseminated.”).

¹⁶² 17 C.F.R. §§ 242.301(b)(3) and (5) (2009).

¹⁶³ 17 C.F.R. § 242.301(b)(3) (2009). Pursuant to sub-section (A), the ATS must “display subscriber orders to any person (other than ATS employees)” in order for this obligation to be triggered. Qualifying broker-dealers must also have access to the exchange to which the data is reported.

that stock.¹⁶⁴ Providing fair access requires that the ATS: (1) establish written standards for granting access to trading; and (2) not unreasonably limit anyone's access to trading by applying those standards in an unfair or discriminatory way.¹⁶⁵

Importantly, quotes displayed solely at ATSs are not subject to price protection under the order protection rule. As discussed in Chapter 3, “protected quotations” are defined in Reg NMS as the best bid or offer on an exchange or FINRA.¹⁶⁶ As a result, quotes on ATSs only become “protected quotations” if an ATS reports them to the Alternative Display Facility (“ADF”) operated by FINRA.¹⁶⁷ The ADF is a “display only facility and does not provide automated order routing functionality, execution facilities, or linkages between ADF trading centers.”¹⁶⁸

C. Broker-Dealer Internalization

A substantial volume of trade executions take place via broker-dealer internalization, not on an exchange or ATS. This trading activity generally involves a broker-dealer systematically executing customer orders as a principal, against the broker-dealer's own inventory of stocks. Today, approximately 22% of the total U.S. share volume in equities is estimated to be executed in this manner.¹⁶⁹ And according to Chair White, approximately 250 broker-dealers

¹⁶⁴ 17 C.F.R. § 242.301(b)(5) (2009). The Fair Access Rule applies on a “security-by security basis.” See Regulation of Exchanges and Alternative Trading Systems, 63 Fed. Reg. 70844, 70873 (Dec. 22, 1998), available at <https://www.gpo.gov/fdsys/pkg/FR-1998-12-22/pdf/98-33299.pdf>.

¹⁶⁵ 17 C.F.R. § 242.301(b)(5)(ii)(C) and (d) also establish related record-keeping and reporting requirements.

¹⁶⁶ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data Dissemination, U.S. SEC. & EXCH. COMM’N 5 (Oct. 20, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>.

Regulation NMS defines “protected quotation” to be the best bid or offer at an exchange or national securities association (i.e., FINRA).

¹⁶⁷ *Id.*

¹⁶⁸ *Id.* (citing to *Alternative Display Facility (ADF)*, FINRA, available at <http://www.finra.org/industry/adf>).

¹⁶⁹ See TABB Group, Equities LiquidityMatrix May 2016, available at http://mm.tabbforum.com/liquidity_matrices/187/documents/original_2016-

internalize customer orders.¹⁷⁰ Indeed, broker-dealer internalization is common across securities markets and existed in the manual market era.

Importantly, broker-dealer internalizers do not meet the Exchange Act definition of an “exchange,” because they generally execute trades as principal rather than acting as a liaison that connects buyers with sellers of stocks. However, broker-dealer internalizers are, of course, required to register as members of FINRA.¹⁷¹ FINRA membership carries with it a number of regulatory obligations, such as examination, licensing, and reporting requirements.¹⁷² Many broker-dealer internalizers are also subject to regulation as “OTC market makers.”¹⁷³ OTC market makers must file Rule 605 execution quality reports, like trading venues.¹⁷⁴ Other broker-dealers are not required to file this type of report. In addition, all broker-dealer internalizers are subject to the order protection rule, which requires execution of customer orders only at the NBBO or better.¹⁷⁵

1) Broker-Dealer Internalization of Retail Orders and Payment for Order Flow

Nearly 100% of retail orders to buy or sell NMS stocks at the best publicly available price (“marketable orders”) are executed via “retail” broker-dealer internalization.¹⁷⁶ Retail broker-dealer internalizers typically have payment for

05 Equities Liquidity Matrix May 2016.pdf; CCMR staff analysis of FINRA OTC (Non-ATS) Transparency Data, *available at* <https://otctransparency.finra.org/>.

¹⁷⁰ Mary Jo White, Chair, U.S. SEC. & EXCH. COMM’N, Speech at the Sandler O’Neill & Partners, L.P. Global Exchange and Brokerage Conference, Enhancing Our Equity Market Structure (Jun. 5, 2014), *available at* <https://www.sec.gov/News/Speech/Detail/Speech/1370542004312..>

¹⁷¹ *See, e.g., Brokers*, FINRA, *available at* <http://www.finra.org/investors/brokers>.

¹⁷² *Id.*

¹⁷³ 17 C.F.R. § 242.600(b)(52) (2005).

¹⁷⁴ OTC market makers are considered “market centers” under Regulation NMS. *See* 17 C.F.R. § 242.600(b) (38),(52) (2005). Market centers are required to produce Rule 605 reports. *See* 17 C.F.R. § 242.605 (2005).

¹⁷⁵ 17 C.F.R. § 242.611(a) (2005).

¹⁷⁶ Memorandum from SEC Division of Trading and Markets to SEC Equity Market Structure Advisory Committee, Certain Issues Affecting Customers in the Current Equity Market Structure, U.S. SEC. & EXCH. COMM’N 2 (Jan. 26, 2016), *available at* <https://www.sec.gov/spotlight/equity-market-structure/issues-affecting-customers-emsac-012616.pdf> (referring to Concept Release on Equity Market Structure, Exchange Act Release

order flow (“PFOF”) agreements with retail brokerages. Under a typical PFOF agreement, a broker-dealer internalizer pays a retail brokerage to direct marketable order flow to the broker-dealer internalizer.¹⁷⁷ Broker-dealer internalizers enter into such agreements to attract customer order flow that might otherwise be routed elsewhere for execution. For example, a broker-dealer internalizer might pay a retail brokerage (such as E*TRADE, TD Ameritrade or Charles Schwab) roughly 0.1 cent per share or less in exchange for that brokerage’s retail orders.¹⁷⁸ Pursuant to Rule 606 of Reg NMS, retail brokerages must publicly disclose information about their PFOF arrangements in quarterly public filings.¹⁷⁹ In Chapter 3, we describe these and other Reg NMS disclosure obligations in greater detail.

Retail broker-dealer internalizers are often able to provide retail orders with immediate execution at a price better than the NBBO. Indeed, PFOF agreements often guarantee a specified amount of average price improvement for executions of the retail order flow.¹⁸⁰ PFOF agreements generally allocate the cost savings

No. 61358, File No. S7-12-98 20 (Jan. 14, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358.pdf>. A marketable order is an order to buy or sell a stock at the best publicly displayed price. *See also* Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-02-10, 75 Fed. Reg. 3594, 3600 (proposed Jan. 21, 2010).

¹⁷⁷ *See, e.g.*, Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Certain Issues Affecting Customers in the Current Equity Market Structure, U.S. SEC. & EXCH. COMM’N 5 (Jan. 26, 2015), *available at* <https://www.sec.gov/spotlight/equity-market-structure/issues-affecting-customers-emsac-012616.pdf>.

¹⁷⁸ *See, e.g.*, E*TRADE, *SEC Rule 606 Disclosure* (2016), *available at* <https://content.etrade.com/etrade/powerpage/pdf/OrderRouting11AC6.pdf>; TD Ameritrade Clearing, Inc., *SEC Rule 606 Report* (2016), *available at* https://www.tdameritrade.com/retail-en_us/resources/pdf/AMTD2054.pdf; Charles Schwab Corporation, *Report on Routing Customer Orders for Quarter Ending March 31, 2016* (2016), *available at* http://www.schwab.com/public/schwab/nn/legal_compliance/important_notices/order_routing.html.

¹⁷⁹ 17 C.F.R. § 242.606(a)(1)(iii) (2005).

¹⁸⁰ *See* Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Certain Issues Affecting Customers in the Current Equity Market Structure, U.S. SEC. & EXCH. COMM’N 6 (Jan. 26, 2015), *available at* <https://www.sec.gov/spotlight/equity-market-structure/issues-affecting-customers-emsac-012616.pdf>.

attributable to price improvement among the broker-dealer internalizer, retail brokerage, and retail investor.¹⁸¹

As discussed in Chapter 1, our empirical analysis finds that internalized customer orders do in fact receive price improvement.¹⁸² Another empirical study shows that the execution quality provided by OTC market makers was recently at an “all-time high.”¹⁸³ Therefore, we generally believe that broker-dealer internalization of customer orders is a form of order execution that should be preserved. However, in Chapter 3 we recommend certain reforms applicable to all broker-dealers, including those that internalize order flow. In particular, we support enhancements to broker-dealer disclosures regarding retail and institutional orders that would enhance customers’ ability to monitor and respond to their broker-dealers’ performance.

D. Different Regulatory Regimes for Exchanges and ATSS

The U.S. equity markets’ competitive landscape is in many ways driven by the SEC’s bifurcation of trading venues into two distinct regulatory regimes: exchanges and ATSS. In this section, we evaluate this structure and do not treat the regulatory segregation of exchanges and ATSS as a foregone conclusion. To assess whether the current regime is appropriate, we focus on differences between exchanges and ATSS. First, we consider the ability of ATSS to limit access to trading on their platforms. Second, we evaluate the ability of ATSS to enact trading rules without the SEC’s prior review and approval.

¹⁸¹ See generally Robert H. Battalio & Tim Loughran, *Does Payment For Order Flow To Your Broker Help Or Hurt You?*, 80 T. J BUS ETHICS 37 (2008).

¹⁸² See *supra* Figure 1.11 and surrounding discussion.

¹⁸³ Luis A. Aguilar, Commissioner, U.S. SEC. & EXCH. COMM’N, Public Statement, U.S. Equity Market Structure: Making Our Markets Work Better for Investors (May 11, 2015), available at <https://www.sec.gov/news/statement/us-equity-market-structure.html> (quoting *U.S. Equity Market Structure: Q4-2014 TABB Equity Digest* (Apr. 7, 2015), available at <http://www.tabbgroup.com/PublicationDetail.aspx?PublicationID=1662>).

1) Trading Venues' Access Rules

One basic difference between exchanges and ATSS is each venue's access rules. As described above, exchanges are generally required to provide fair access to all broker-dealers seeking to trade on their platform.¹⁸⁴ In contrast, ATSS may select which market participants may access their platforms. In our view, ATSS' ability to offer price improvement to the best publicly displayed price may relate to their ability to limit access to their platform.

First, ATSS are able to quickly limit the access of traders who create a hostile trading environment for other subscribers. For example, some market participants may employ trading strategies that are aggressive or potentially adverse to other subscribers, but their behavior may not rise to the level of abuse or manipulation that could disqualify them from exchange membership. ATSS have broad discretion to deny access to any participants, so they can quickly exclude these market participants from their venue.¹⁸⁵

Second, certain execution strategies for investor orders may be more efficiently deployed on a trading venue that only includes a specific sub-set of market participants. For example, large institutional investors may benefit from having their orders executed on a venue that only includes other large institutional investors. Therefore, ATSS' ability to exercise discretion as to who may gain

¹⁸⁴ It is important to reiterate that "fair" access nevertheless permits exchanges to reasonably exclude certain market participants under specific circumstances, such as the loss of good standing due to misconduct.

¹⁸⁵ Exchanges are required by the Exchange Act to provide substantial due process to members when prohibiting or limiting access. This requirement mandates notice, a hearing, a supporting statement prepared by the exchange, and also provides some SEC oversight. 15 U.S. Code § 78f(d) (2010). Additionally, exchanges' rules can provide significantly greater process, including the filing of complaints, answers, and various motions, as well as appeal processes. *See, e.g.*, NYSE Rules 9000-9870 *available at* <http://nyserules.nyse.com/NYSE/Rules/>. Conversely, ATSS are capable of summarily prohibiting or limiting subscriber access. *See, e.g.*, Barclays Capital Inc., Form ATS Barclays DirectEx (Jun. 30, 2015) ("Barclays retains the discretion to remove, revoke or limit a subscriber's access at any time without notice."), *available at* <http://www.investmentbank.barclays.com/content/dam/barclayspublic/docs/investment-bank/equities/barclays-directex-form-ats-july-2015.pdf>.

access to their platforms allows them to offer unique trading venues that cater to specific trading needs.

Although this report finds that ATSS in their current form can provide investors with measurable price improvement to the NBBO, our findings do not provide direct causal support between limited access and price improvement. If it were empirically demonstrated that limited access does *not* contribute to the reduction in investor transaction costs or otherwise improve investor outcomes, then we would support requiring ATSS to provide fair access.

Specific Recommendation:

1. ATSS should be allowed to limit access to their trading venues.¹⁸⁶

2) Rulemaking Flexibility for ATSS

The requirements and processes associated with rulemaking at exchanges and ATSS diverge significantly. As SROs, exchanges have robust rulemaking and self-disciplinary authorities. These heightened regulatory authorities are associated with stringent requirements for the SEC review and approval of exchange rules. Exchanges must file proposed rule changes with the SEC for their review and approval before the rules are effective.¹⁸⁷ The SEC review process includes publication of the proposed rule with an opportunity for interested parties to comment on its contents.¹⁸⁸ In contrast, the rulemaking authorities of ATSS are narrowly circumscribed, and the processes associated with their rulemakings are limited. ATSS are not required to publicly release their Forms ATS and they are not required to obtain the approval of the SEC before enacting new trading rules.

ATS trading rules generally address technical details of the platform's operation and use. For example, they might establish order types or set forth the

¹⁸⁶ Citadel dissents from this recommendation.

¹⁸⁷ See Section 19(b)(1) of the Exchange Act.

¹⁸⁸ *Id.*

procedures that a subscriber would use to enter an order at the ATS.¹⁸⁹ If they regulate the conduct of members, they may only regulate behaviors pertaining to the use of the platform. For example, an ATS might establish a rule that subscribers can enter only bona fide bids or offers and may not engage in any deceptive acts on the platform.¹⁹⁰ In contrast, exchanges can regulate the off-exchange conduct of their members—for example, NYSE Rule 2210 establishes certain parameters for written communications between exchange members and institutional and retail investors.¹⁹¹

We believe that the existing rulemaking requirements that respectively apply to exchanges and ATSS remain appropriate and should not be changed. In particular, ATSS should not be required to obtain SEC pre-approval before they adopt trading rules. SEC review does not provide particular value in the design of technical and operational trading rules. Limited SEC resources should not be expended on an exacting review process of rules that are limited in scope and generally technical in nature.

In addition, investors can benefit from ATSS' rulemaking flexibility. The streamlined process allows ATSS to update their rules quickly and frequently. A simplified rulemaking procedure for smaller venues reduces start-up costs and facilitates innovation. As a result, smaller ATSS are better equipped to compete with large and incumbent exchanges. Investors can benefit from this increased competition: for example, it can drive the improvement of trading services offered to investors over time, consistent with the original policy behind the introduction of ATSS.¹⁹² Furthermore, the relatively small market share of all ATSS and low

¹⁸⁹ See generally IEX ATS Subscriber Manual Version 2.7, Updated: January 27, 2016; <https://www.iextrading.com/docs/IEX+Subscriber+Manual.pdf>.

¹⁹⁰ See *id.* at 25.

¹⁹¹ NYSE Rule 2210, available at http://nyserules.nyse.com/nysetools/PlatformViewer.asp?SelectedNode=chp_1_20&manual=/nyse/rules/nyse-rules/.

¹⁹² See generally Regulation of Exchanges and Alternative Trading Systems, Exchange Act Release No. 40760, File No. S7-12-98 (Dec. 8, 1998), available at <https://www.sec.gov/rules/final/34-40760.txt>.

trading volume of individual ATSS limits the risk of adverse effects from their trading rules.

Specific Recommendation:

2. ATSS should not be required to obtain pre-approval from the SEC before adopting trading rules.

E. Legal Issues regarding Exchanges and ATSS: Enhancing the Regulatory Framework

In this section, we consider instances of improper or illegal practices at certain ATSS and reforms that could help prevent such violations in the future. We then assess the status of exchanges as SROs and its implications, with related policy recommendations.

1) Enhancing the ATSS Regulatory Structure: Measures to Improve ATSS Transparency and Accountability

a) Concerns regarding Improper Activity by ATSS

As detailed in Part II of this Chapter, dark trading is often subject to public scrutiny because it is associated with a general lack of transparency. ATSS, which many know simply as “dark pools,” are particular targets of such scrutiny. In some cases, these concerns appear to be well-founded—since 2011, several enforcement actions have exposed improper trading and disclosure practices at certain ATSS.¹⁹³

¹⁹³ See, e.g., *In the Matter of ITG Inc. and Altnet Securities Inc.*, Securities Exchange Act Release No. 75672 (Aug. 12, 2015), available at <https://www.sec.gov/litigation/admin/2015/33-9887.pdf>; *In the Matter of UBS Securities LLC*, Securities Exchange Act Release No. 74060 (Jan. 15, 2015), available at <http://www.sec.gov/litigation/admin/2015/33-9697.pdf>; *In the Matter of LavaFlow, Inc.*, Securities Exchange Act Release No. 72673 (Jul. 25, 2014), available at <http://www.sec.gov/litigation/admin/2014/34-72673.pdf>; *In the Matter of Liquidnet, Inc.*, Securities Exchange Act Release No. 72339 (Jun. 6, 2014), available at <http://www.sec.gov/litigation/admin/2014/33-9596.pdf>; *In the Matter of eBX, LLC*, Securities Exchange Act Release No. 67969 (Oct. 3, 2012), available at <http://www.sec.gov/litigation/admin/2012/34-67969.pdf>; *In the Matter of Pipeline Trading*

These behaviors include: (i) the misuse of confidential customer information; (ii) false and/or incomplete disclosures; and (iii) pricing misconduct. In this section, we review the facts and legal bases of these enforcement actions, focusing on two recent actions by the SEC and the New York Attorney General (“NYAG”) against Credit Suisse (USA) LLC (“Credit Suisse”) and Barclays Capital Inc. (“Barclays”).¹⁹⁴

i. *Misuse of Confidential Customer Information*

Reg ATS requires that ATSs establish “adequate safeguards and procedures to protect subscribers’ confidential trading information.”¹⁹⁵ Required safeguards include limiting access to customer information to ATS employees “who are operating the system or [are] responsible for its compliance with . . . applicable rules”¹⁹⁶ and “[i]mplementing standards controlling employees of the [ATS] trading for their own accounts.”¹⁹⁷

Two of the largest and most recent ATS settlements both involved claims relating to the misuse of confidential customer data, among other violations.¹⁹⁸ On January 31, 2016, Credit Suisse and Barclays each settled actions with the SEC and

Systems LLC et al., Securities Exchange Act Release No. 65609, 10 (Oct. 24, 2011), *available at* <https://www.sec.gov/litigation/admin/2011/33-9271.pdf>.

¹⁹⁴ See Settlement Order, Credit Suisse Sec., LLC, Securities Act Release No. 10013, Exchange Act Release No. 77002, File No. 3-17078 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10013.pdf>; Settlement Order, Barclays Capital, Inc., Securities Act Release No. 10010, Exchange Act Release No. 77001, File No. 3-17077 6 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10010.pdf>.

¹⁹⁵ 17 C.F.R. § 242.301(b)(10)(i) (2009).

¹⁹⁶ 17 C.F.R. § 242.301(b)(10)(i)(A) (2009).

¹⁹⁷ 17 C.F.R. § 242.301(b)(10)(i)(B) (2009). Although the rule does not specifically reference the possibility that employees trading for their own account will misuse confidential information, the SEC’s commentary on the rule notes that Rule 301(b)(10) requires ATSs to ensure that “procedures exist to ensure that employees of the alternative trading system cannot use such information for trading in their own accounts.” Regulation of Exchanges and Alternative Trading Systems, 63 Fed. Reg. 70844, 70879 (Dec. 22, 1998).

¹⁹⁸ See Bradley Hope & Jenny Strasburg, *Credit Suisse, Barclays to Pay \$154.3 Million to Settle ‘Dark Pool’ Investigations*, WALL ST. J. (Jan. 31, 2016), *available at* <http://www.wsj.com/articles/credit-suisse-barclays-to-pay-about-150-million-to-settle-dark-pool-investigations-1454256877>.

NYAG regarding these and other acts of misconduct at their respective ATSs. According to the SEC settlement order, Barclays allowed certain non-compliance employees to access confidential subscriber trading information on its ATS, Barclays LX.¹⁹⁹ At Credit Suisse, similar claims focused on the transfer of confidential subscriber information outside the ATS to other Credit Suisse systems.²⁰⁰

ii. *False Disclosures and Undisclosed Proprietary Trading Activity*

ATSs have also incurred liability for making false statements to investors and regulators, and for concealing the role of proprietary trading desks or other entities affiliated with the ATS. Such actions could constitute: (1) a failure to report material information in filings under Reg ATS²⁰¹ and (2) fraud under § 17(a) of the Securities Act.²⁰² Such actions could also violate New York's blue sky law, the Martin Act, under the premise that such actions misrepresent the character and safety of an ATS.²⁰³

The January 2016 settlements by Barclays and Credit Suisse each resolved alleged violations of Reg ATS, Section 17(a)(2) of the Securities Act, and New York's Martin Act.²⁰⁴ According to the SEC, Credit Suisse failed to disclose or

¹⁹⁹ Barclays Capital, Inc., Securities Act Release No. 10010, Exchange Act Release No. 77001, File No. 3-17077 3, 6, 12 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10010.pdf>.

²⁰⁰ Credit Suisse Sec., LLC, Securities Act Release No. 10013, Exchange Act Release No. 77002, File No. 3-17078 3 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10013.pdf>.

²⁰¹ 17 C.F.R. § 242.301(b)(2) (2009).

²⁰² 15 U.S.C. § 77q (2010). This section governs the “[u]se of interstate commerce for [the] purpose of fraud or deceit.”

²⁰³ *People ex rel. Schneiderman v. Barclays Capital*, 1 N.Y.S.3d 910, 912 (2015).

²⁰⁴ Settlement Agreement, Barclays PLC & Barclays Capital Inc. (Jan. 29, 2016), *available at* http://www.ag.ny.gov/pdfs/2016.2.1_Final_Signed_Barclays_Settlement_Agreement.pdf; Settlement Agreement, Credit Suisse Sec. (USA) LLC (Sept. 28, 2015), *available at* http://www.ag.ny.gov/pdfs/20160201_Fully_Executed_Settlement_Agreement_AES.PDF; Settlement Order, Credit Suisse Sec., LLC, Securities Act Release No. 10013, Exchange Act Release No. 77002, File No. 3-17078 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10013.pdf>; Settlement Order, Barclays Capital,

misrepresented to its ATS subscribers key information about their orders, including their categorization and where confidential information was transmitted.²⁰⁵ The Barclays settlement similarly resolved charges relating to a number of material misrepresentations or omissions in violation of Section 17(a)(2).²⁰⁶ For example, the SEC order states that Barclays failed to accurately inform subscribers of their likelihood of interacting with “aggressive” traders in the Barclays ATS and misrepresented the type of data feeds used to determine the NBBO in the ATS.²⁰⁷ The order also states that Barclays violated Reg ATS by failing to disclose material changes to its ATS processes on Form ATS.²⁰⁸

iii. *Pricing Misconduct*

Enforcement actions against ATSs can also involve violations of Reg NMS Rule 612, which prohibits the “display, rank, or accept[ance]” of sub-penny orders,²⁰⁹ and is described in detail in Chapter 3. For example, Credit Suisse was found to have violated Rule 612 in the SEC’s January 2016 order instituting settlement proceedings.²¹⁰ According to the SEC, Credit Suisse “accepted, ranked and executed over 117 million illegal sub-penny orders” in its ATS.²¹¹

Inc., Securities Act Release No. 10010, Exchange Act Release No. 77001, File No. 3-17077 6 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10010.pdf>.

²⁰⁵ Settlement Order, Credit Suisse Sec., LLC, Securities Act Release No. 10013, Exchange Act Release No. 77002, File No. 3-17078 4 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10013.pdf>.

²⁰⁶ Settlement Order, Barclays Capital, Inc., Securities Act Release No. 10010, Exchange Act Release No. 77001, File No. 3-17077 6 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10010.pdf>.

²⁰⁷ Press Release, U.S. SEC. & EXCH. COMM’N, Barclays, Credit Suisse Charged with Dark Pool Violations (Jan. 31, 2016), *available at* <https://www.sec.gov/news/pressrelease/2016-16.html>.

²⁰⁸ Settlement Order, Barclays Capital, Inc., Securities Act Release No. 10010, Exchange Act Release No. 77001, File No. 3-17077 6 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10010.pdf>.

²⁰⁹ *Id.*; Rule 612 of Regulation NMS.

²¹⁰ Settlement Order, Credit Suisse Sec., LLC, Securities Act Release No. 10013, Exchange Act Release No. 77002, File No. 3-17078 6 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10013.pdf>.

²¹¹ Press Release, U.S. SEC. & EXCH. COMM’N, Barclays, Credit Suisse Charged with Dark Pool Violations (Jan. 31, 2016), *available at* <https://www.sec.gov/news/pressrelease/2016-16.html>; Settlement Order, Credit Suisse Sec., LLC, Securities Act Release No. 10013, Exchange Act

b) Proposed Amendments to Reg ATS and “Form ATS-N”

In November 2015, the SEC proposed amendments to Reg ATS that would subject ATSs to enhanced reporting requirements on a new mandatory “Form ATS-N” that would be publicly available.²¹² We believe that Form ATS-N represents an important step towards improving ATS accountability through enhanced transparency.

Required disclosures on Form ATS-N would include information regarding: (1) products and services offered to subscribers; (2) differences in the availability of services; (3) trading activities by the operator or its affiliates on the venue; (4) arrangements with unaffiliated trading centers; and (5) written standards and procedures associated with access to and protection of confidential customer information.²¹³ Form ATS-N would also contain detailed information about the ATS’s manner of operations, including types of orders, subscriber types, fees, market data, opening and closing, outbound routing, and display and segmentation of order flow.²¹⁴ Importantly, disclosures on Form ATS-N would be publicly available, via both the SEC website and a link posted to the ATS’s website.²¹⁵

We generally support Form ATS-N and believe that these enhanced public disclosures would facilitate efforts to hold the broker-dealer operators of ATSs accountable for improper trading and disclosure practices. However, we support certain clarifications to the proposed Form ATS-N to make the disclosures as helpful as possible. Specifically, the final Form ATS-N should request information that is in a consistent format wherever possible. We also believe that Form ATS-N responses should be standardized across ATSs to make them as accessible for

Release No. 77002, File No. 3-17078 6 (Jan. 31, 2016), *available at* <https://www.sec.gov/litigation/admin/2016/33-10013.pdf>.

²¹² See Regulation of NMS Stock Alternative Trading Systems, Exchange Act Release No. 76474, File No. S7-23-15 (Nov. 18, 2015), *available at* <https://www.sec.gov/rules/proposed/2015/34-76474.pdf>.

²¹³ *Id.* at 152-53.

²¹⁴ *See id.*

²¹⁵ *See id.*

regulators and investors as possible. These changes would improve the Form's usefulness to investors as a resource for objective comparisons of trading venues.

To standardize Form ATS-N reports, we recommend certain revisions to Parts III and IV of the proposed Form. Parts III and IV contain itemized requests for information regarding the ATS broker-dealer operator's other activities and the manner of operation of the ATS, respectively.²¹⁶ Responses to these items would often require narrative disclosures that are attached as exhibits to the filing. For example, Item 10 of Part III requests a description of safeguards and procedures relating to the confidential treatment of trading information.²¹⁷ Responses to Part IV are likely to be difficult to compare across venues, although Part IV's stated purpose is to allow market participants to compare and evaluate ATSs vis-à-vis other trading venues.²¹⁸ Part IV requests descriptions of 16 separate elements of the ATS's operations. Unless an item is not applicable, each will require a narrative response that addresses certain enumerated points. Rather than requesting specific details via a narrative description, we would encourage the SEC to request information in a yes-no or multiple choice format, wherever possible. Similarly, we would ask that the Form ATS-N and disclosures thereunder use plain language when practicable, to maximize their helpfulness to investors and regulators.

Specific Recommendation:

3. The SEC should require that disclosures on new Form ATS-N are published in a standardized format.

²¹⁶ *See id.*

²¹⁷ *See id.*

²¹⁸ *See id.*

2) Enhancing the Exchange Regulatory Structure: SRO Status and Legal Immunity

a) Exchanges as Self-Regulatory Organizations (“SROs”)

Exchanges and “national securities associations” are among the entities designated as “self-regulatory organizations” or “SROs” under the Exchange Act.²¹⁹ The only national securities association is FINRA,²²⁰ which is an independent organization that acts as a regulator for the securities industry. The organization was formed in 2007, when the National Association of Securities Dealers (“NASD”) was combined with the regulatory arm of the NYSE.²²¹ FINRA makes and enforces rules for 3,917 securities firms and 639,680 brokers as of July 2016.²²² FINRA also performs a wide range of regulatory tasks: for example, it writes rules that apply to its members (including best execution standards), handles the examination and licensing of broker-dealers, offers investor education services, provides a dispute resolution forum for securities industry matters, and institutes disciplinary actions against members that violate its rules.²²³

As self-regulatory entities, registered exchanges are required to carry out the purposes of the Exchange Act and enforce compliance with exchange rules and the Act itself.²²⁴ Exchanges must also use a “fair procedure” to discipline their members for violating either the exchange rules or the Exchange Act. They can

²¹⁹ 15 U.S.C. § 78(c)(a)(26) (2012). The other two SRO entities are registered clearing agencies and, in limited circumstances, the Municipal Securities Rulemaking Board.

²²⁰ See, e.g., SEC Division of Trading and Markets, Jumpstart Our Business Startups Act Frequently Asked Questions About Crowdfunding Intermediaries, U.S. SEC. & EXCH. COMM’N (May 7, 2012), available at <https://www.sec.gov/divisions/marketreg/tmjjobsact-crowdfundingintermediariesfaq.htm>.

²²¹ See Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data Dissemination, U.S. SEC. & EXCH. COMM’N 12 (Oct. 20, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>.

²²² See, e.g., *About FINRA*, FINRA, available at <http://www.finra.org/about>.

²²³ FINRA Rulemaking Process, FINRA, available at <http://www.finra.org/industry/finra-rulemaking-process>; FINRA Rule 5310 (amended 2014), available at http://finra.complinet.com/en/display/display_main.html?rbid=2403&element_id=10455. *What We Do*, FINRA, available at <http://www.finra.org/about/what-we-do>.

²²⁴ 15 U.S.C. § 78f(b)(1) (2010).

discipline their members “by expulsion, suspension, limitation of activities, functions, and operations, fine, censure, being suspended or barred from being associated with a member, or any other fitting sanction.”²²⁵ Disciplinary proceedings have certain basic due process requirements, including notice, an opportunity to be heard, and a supporting statement accompanying any penalty.²²⁶

However, the Exchange Act does not contemplate exchanges conducting their regulatory operations entirely independently. As discussed above, exchange rules are subject to the review and approval of the SEC, and punishments resulting from their disciplinary hearings are also subject to SEC review.²²⁷ The SEC may also suspend, bar or otherwise censure an SRO for failing to enforce compliance with the Exchange Act or its own rules by its members or a person associated with a member (as well as for being unable or unwilling to comply with these rules itself).²²⁸

In addition, the SEC may allocate regulatory responsibilities among SROs that would otherwise share such regulatory authority.²²⁹ Section 17(d) of the Exchange Act authorizes the SEC to, “by rule or order”: (1) relieve an SRO of certain regulatory responsibilities with respect to a member or participant of more than one SRO; and (2) allocate among SROs the authority to adopt rules with respect to matters for which the SROs would otherwise share authority.²³⁰ Under this provision, the SEC promulgated Rule 17d-2 to provide a process for the re-allocation of SRO responsibilities: SROs file a “17d-2” plan with the SEC that sets forth the proposed regulatory re-allocation for SEC review, including a notice and comment period.²³¹ The SEC may allocate SRO responsibilities as it deems necessary or appropriate in the discharge of its Exchange Act duties, but must take

²²⁵ 15 U.S.C. §§ 78f(b)(6) and (7) (2010).

²²⁶ 15 U.S.C. §§ 78f(d)(1) and (2) (2010). Section 78(d)(3) provides for summary proceedings, but anyone aggrieved by such an action is entitled to a hearing in accordance with the provisions of 78(d)(1) and (2).

²²⁷ 15 U.S.C. §§ 78s(b) and (d)-(f) (2010).

²²⁸ 15 U.S.C. § 78s(h)(1) (2010).

²²⁹ 15 U.S.C. § 78(q)(d) (2010); 17 C.F.R. § 240.17d-2 (1976).

²³⁰ 15 U.S.C. § 78(q)(d) (2010); 17 C.F.R. § 240.17d-2 (1976).

²³¹ 17 C.F.R. § 240.17d-2 (1976).

into consideration factors such as the SROs' location, staff, regulatory capabilities, and "unnecessary regulatory duplication."²³²

SROs have also voluntarily entered into Regulatory Services Agreements ("RSAs") with other SROs to contract out *non-common* regulatory responsibilities.²³³ The upshot of this ability to outsource SRO obligations is that FINRA now handles many of exchanges' self-regulatory responsibilities on their behalf.²³⁴ For example, under the current RSA between NASDAQ and FINRA, FINRA is responsible for a range of NASDAQ's regulatory duties. These duties include reviewing and approving applications for new members of the exchange, monitoring and reviewing member compliance, and initiating disciplinary proceedings.²³⁵ However, NASDAQ retains its regulatory responsibilities for certain real-time market monitoring, most rulemaking, and some membership functions that were not delegated to FINRA.²³⁶ Similarly, BATS has entered an RSA with FINRA, pursuant to which FINRA provides cross market

²³² 15 U.S.C. § 78(q)(d) (2010); 17 C.F.R. § 240.17d-2 (1976).

²³³ See, e.g., Self-Regulatory Organizations; EDGX Exchange, Inc.; Notice of Filing and Immediate Effectiveness of Proposed Rule Change to Amend Chapter IX of its Rulebook, Exchange Act Release No. 71445, File No. SR-EDGX-2014-01 2 (Jan. 30, 2014), *available at* <https://www.sec.gov/rules/sro/edgx/2014/34-71445.pdf>; Self-Regulatory Organizations; New York Stock Exchange LLC; Notice of Filing and Immediate Effectiveness of Proposed Rule Change Amending Rules 9268, 9559, and 9620, Exchange Act Release No. 71986, File No. SR-NYSE-2014-20 2 (Apr. 22, 2014), *available at* <https://www.sec.gov/rules/sro/nyse/2014/34-71986.pdf>; Program for Allocation of Regulatory Responsibilities Pursuant to Rule 17d-2, Exchange Act Release No. 58350, File No. 4-566 5 (Aug. 13, 2008), *available at* <https://www.sec.gov/rules/other/2008/34-58350.pdf>. The SEC has considered whether it should limit SROs from contracting with others. See Daniel M. Gallagher, U.S. SEC. & EXCH. COMM'N, Remarks at the SRO Outreach Conference (Jan. 12, 2012), *available at* <https://www.sec.gov/News/Speech/Detail/Speech/1365171489690#.VI58F0sUybl>.

²³⁴ Gallagher, *supra* note 233; Letter from SIFMA to SEC, Self-Regulatory Structure of the Securities Market 4 (Jul. 31, 2013).

²³⁵ Nasdaq, Inc., 2015 Annual Report (10-K), 11 (Feb. 26, 2016), *available at* <http://www.sec.gov/Archives/edgar/data/1120193/000112019316000020/ndaq-20151231x10k.htm>; The Nasdaq Stock Market, Inc., 2007 Annual Report (10-K), 11-12 (Feb. 25, 2008), *available at* <http://www.sec.gov/Archives/edgar/data/1120193/000119312508037364/d10k.htm>.

²³⁶ Nasdaq, Inc., 2015 Annual Report (10-K), 11 (Feb. 26, 2016), *available at* <http://www.sec.gov/Archives/edgar/data/1120193/000112019316000020/ndaq-20151231x10k.htm>.

surveillance.²³⁷ BATS remains responsible for surveillance and enforcement with respect to trading activities or practices involving their own market.²³⁸

It is worth noting that exchanges have recently acted to reassume certain of their regulatory responsibilities from FINRA. For instance, NYSE recently allowed its RSA with FINRA to expire, effectively taking back its responsibility to monitor and enforce member conduct, including by instituting disciplinary proceedings.²³⁹ However, FINRA continues to perform certain of NYSE's regulatory responsibilities, including cross-market surveillance and investigation, as well as the registration, testing, and examination of NYSE broker-dealers.²⁴⁰

b) *Centralizing SRO Authorities*

We believe that the SRO system should be restructured in order to promote the efficient and impartial regulation of trading. Although exchanges already delegate many of their regulatory functions to FINRA, the nature and extent of each exchange's outsourcing practices vary.²⁴¹ Such inconsistency can hinder the development of best practices. We therefore recommend that policymakers consider formally transferring certain SRO responsibilities to a centralized authority.

²³⁷ Press Release, FINRA, BATS Global Markets, FINRA Enter Regulatory Service Agreement (Feb. 6, 2014), *available at* <https://www.finra.org/newsroom/2014/bats-global-markets-finra-enter-regulatory-service-agreement>.

²³⁸ Bats Global Markets, Inc., Prospectus (424B4), 147 (Apr. 14, 2016), *available at* <https://www.sec.gov/Archives/edgar/data/1659228/000104746916012249/a2228288z424b4.htm>.

²³⁹ See Jeff Kern and Christopher Bosch, *NYSE Returns to the Regulatory Beat*, New York Law Journal (Feb. 8, 2016), *available at* <http://www.newyorklawjournal.com/id=1202748819238/NYSE>Returns-to-the-Regulatory-Beat>.

²⁴⁰ *Id.* See also Order Approving and Declaring Effective a Proposed Plan for the Allocation of Regulatory Responsibilities, Exchange Act Release No. 76311, File No. 4-618 (Oct. 29, 2015), *available at* <https://www.sec.gov/rules/sro/17d-2/2015/34-76311.pdf>.

²⁴¹ See, e.g., Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data Dissemination, U.S. SEC. & EXCH. COMM'N 12 (Oct. 20, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>.

i. *SRO Functions: Rulemaking, Surveillance, and Enforcement*

In our view, there are three basic SRO functions: (1) rulemaking, (2) surveillance, and (3) enforcement. These terms are not formally defined by statute or regulation, but they most commonly describe: (1) developing and implementing an exchange’s required policies and practices; (2) overseeing trading activity and member behavior; and (3) ensuring member compliance with laws and exchange rules.

We generally recommend that exchanges retain their rulemaking authorities, but that their surveillance and enforcement authorities be shifted to a centralized regulator to the extent possible. However, we note that although the three categories should guide the division of tasks, there will be exceptions. For example, the SEC’s Equity Market Structure Advisory Committee (“EMSAC”) Trading Venues Regulation Subcommittee recently noted that exchanges may be best equipped to perform certain real-time surveillance responsibilities, such as monitoring activities on exchange floors or activities relating to an initial public offering.²⁴²

ii. *Benefits of Centralization*

In the rulemaking context, we believe that there is value in exchanges and ATSS asserting their authority to issue different rules. The cultivation of different trading rules can promote competition among venues, leading to improvements in their processes and rules over time.²⁴³ In addition, the familiarity of SRO staff with member operations and the technicalities of trading on their venue positions them well to develop related rules.²⁴⁴ However, for purposes of *surveillance* and

²⁴² See Memorandum from EMSAC Trading Venues Regulation Subcommittee to Equity Market Structure Advisory Committee (EMSAC), Recommendations Relating to Trading Venues Regulation, U.S. SEC. & EXCH. COMM’N (Apr. 19, 2016), *available at* <https://www.sec.gov/spotlight/emsac/emsac-trading-venues-subcommittee-recommendations-041916.pdf>.

²⁴³ Gallagher, *supra* note 233.

²⁴⁴ See, e.g., Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data

enforcement of these rules, the potential benefits of centralizing these responsibilities with a single authority are substantial.

First, trading activity in the equity markets is highly dispersed, so a comprehensive view of trading venues is indispensable for effective enforcement efforts. For example, manipulative or disruptive trading practices generally take place over multiple trading venues (and even across different asset classes). However, if trading surveillance and enforcement is divided among several exchanges, it is more difficult to identify abusive trading. Doing so requires effective collaboration, which can be difficult. Assigning enforcement authority to one entity would also simplify regulation from the perspective of market participants.²⁴⁵ Oversight of these procedures would naturally be streamlined and simplified as well. We also note that the consolidated audit trail (“CAT”) will provide a single comprehensive source of order and trade information that would facilitate the centralization of surveillance and enforcement authorities. The details and implementation of the CAT are described further in Chapter 3.

Historically, the SRO enforcement system complemented and reinforced the ownership structure of exchanges. Exchanges were member-owned, mutual organizations,²⁴⁶ so self-regulation was consistent with their general governance structures. However, U.S. exchanges demutualized over time, and today exchanges resemble conventional shareholder-owned for-profit companies.²⁴⁷ In fact, today’s three dominant exchange groups (NYSE, NASDAQ and BATS) are publicly-owned companies that are accountable to a broad and diverse ownership base, which is often far removed from day-to-day realities of exchange operations. Despite this structural transformation, exchanges retain the same SRO powers that

Dissemination, U.S. SEC. & EXCH. COMM’N 7 (Oct. 20, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>.

²⁴⁵ Gallagher, *supra* note 233.

²⁴⁶ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data Dissemination, U.S. SEC. & EXCH. COMM’N 10 (Oct. 20, 2015), *available at*

<https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>.

²⁴⁷ *Id.*

they had as mutual organizations. As a result, today's exchanges play the dual role of regulator and for-profit enterprise.

Today, there is often a tension between these two functions. For example, exchanges may face conflicts in executing their SRO duties when they regulate broker-dealers that operate ATSS, because ATSS are their competitors.²⁴⁸ Commercial pressures may also lead exchanges to *underenforce* in order to cultivate important relationships or appease their members. For instance, they might be reluctant to bring enforcement actions against their broker-dealer customers that are responsible for the most trade executions or otherwise favor select customers based on their profit motive.²⁴⁹ In the past, the SEC has indeed brought enforcement actions against exchanges that fell short in administering their regulatory responsibilities. For example, in 1999 and again in 2005, the SEC brought actions against the NYSE for failing to detect and stop unlawful proprietary trading on the exchange floor;²⁵⁰ in 2007, the SEC sued the American Stock Exchange for non-compliance with recordkeeping responsibilities and for not enforcing order-handling rules.²⁵¹ Thus, to improve both the efficiency and fairness of exchange regulation, centralizing SRO tasks with a separate regulator represents a compelling option.

²⁴⁸ *See id.*

²⁴⁹ Luis A. Aguilar, Commissioner, U.S. SEC. & EXCH. COMM'N, Public Statement, The Need for Robust SEC Oversight of SROs (May 8, 2013), *available at* <https://www.sec.gov/News/PublicStmt/Detail/PublicStmt/1365171515546>. *See also* Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data Dissemination, U.S. SEC. & EXCH. COMM'N 10 (Oct. 20, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>.

²⁵⁰ Press Release, U.S. SEC. & EXCH. COMM'N, SEC Charges the New York Stock Exchange with Failing to Police Specialists (Apr. 12, 2005), *available at* <https://www.sec.gov/news/press/2005-53.htm>.

²⁵¹ N.Y. Stock Exch., Exchange Act Release No. 51524, File No. 3-11892 (Apr. 12, 2005), *available at* <https://www.sec.gov/litigation/admin/34-51524.pdf>.

iii. *The Regulator: Alternative Centralization Models*

The SEC has considered alternative SRO models in the past.²⁵² In its 1994 “Market 2000 Report,” the SEC first addressed the possibility of restructuring SRO responsibilities and considered whether the SEC should assume certain of these functions.²⁵³ In 2004, the SEC again focused on this regulatory model in an SRO Concept Release.²⁵⁴ They acknowledged that the existing system bred certain inefficiencies and conflicts among participants and considered alternative models.²⁵⁵ These alternatives included: (a) a universal industry self-regulator model, whereby one industry regulator would handle rulemaking, oversight and enforcement; and (b) direct regulation by the SEC.²⁵⁶ However, the SEC has not acted on either of these alternative models.²⁵⁷ We consider each of the SEC alternatives separately and find that FINRA is the entity that is likely best positioned to serve as a centralized SRO regulator.

We believe that centralizing SRO authorities at FINRA is a compelling option for several reasons. First, FINRA presently handles a number of exchange regulatory tasks and regulates the broker-dealer operators of ATSS. Consolidating and standardizing certain regulatory responsibilities for exchanges and ATSS would therefore be both efficient and equalizing. Leveling the playing field among trading venues in this way could improve investor outcomes by enhancing the competitive landscape.

²⁵² Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Current Regulatory Model for Trading Venues and for Market Data Dissemination, U.S. SEC. & EXCH. COMM’N 10 (Oct. 20, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-regulatory-model-for-trading-venues.pdf>, citing to 2004 SRO Concept Release at 71259.

²⁵³ *Id.* at 8, citing Market 2000: An Examination of Current Equity Market Developments (1994), *available at* <https://www.sec.gov/divisions/marketreg/market2000.pdf>.

²⁵⁴ *Id.* at 8-9, citing to Exchange Act Release No. 50700 (Nov. 18, 2004), 69 FR 71256 (Dec. 8, 2004).

²⁵⁵ *Id.*

²⁵⁶ *Id.*

²⁵⁷ *Id.*

The regulatory process of formally transferring exchange SRO functions to FINRA would likely be relatively easy. Because FINRA is an SRO, the existing infrastructure for FINRA to perform the relevant functions is in place. Exchanges would simply register with FINRA, as broker-dealers do now.²⁵⁸ In addition, it is possible that the SEC could use its authority under Section 17(d) of the Exchange Act to centralize SRO responsibilities at FINRA.

However, there are certain difficulties to this approach. Most notably, it is unclear how effective centralizing at FINRA would be to mitigate regulatory conflicts of interest. In particular, FINRA's funding model would need to be re-evaluated. Funding by broker-dealer and exchange members could influence its regulatory priorities, particularly if fees were assessed unequally based on member size or capitalization. It would also be necessary to clearly delineate the respective responsibilities of FINRA and the SEC, as this approach could introduce greater potential for overlap or redundancy.

SRO authorities could alternatively be centralized at the SEC. The most effective way to implement this structure would likely be via direct registration by exchanges and ATSS with the SEC. FINRA could take on a more targeted role in the regulation of broker-dealers. The feasibility of this approach would largely turn on the SEC's access to the necessary funding to perform exchange SRO tasks in-house. Centralizing SRO authorities at the SEC would likely require Congressional action to amend or clarify certain provisions of the Exchange Act.

The SEC's relative distance from the technical elements of trading at exchange markets is one major disadvantage of such a structure. Centralizing SRO responsibilities at the SEC would require a particularly slow and considered approach. However, the adoption of new technologies like the Consolidated Audit Trail increases the likelihood that the SEC could effectively regulate technical elements of trading in the equity markets.

²⁵⁸ See, e.g., SRO Structure Release, Exchange Act Release No. 50700 (Nov. 18, 2004), 69 Fed. Reg. 71256, 71280 (Dec. 8, 2004).

We believe that an independent research organization should be retained by the SEC to conduct a technical study on how centralization could be achieved. Competitive private sector alternatives to FINRA and the SEC are also worth evaluating. In principle, we believe that centralizing and standardizing SRO surveillance and enforcement authorities to the extent possible is a worthwhile policy goal and that further research into its logistics is warranted.

Specific Recommendation:

4. The surveillance and enforcement regulatory responsibilities currently assigned to SROs should be centralized to the extent practicable. The reorganization could include centralization at either the SEC or FINRA.

c) Consequence of Exchange SRO Status: Design of NMS Plans

One consequence of exchanges' SRO status is that they have disproportionate influence in establishing market-wide rules through "national market system plans" ("**NMS Plans**"). SROs' authority to file NMS Plans originates in the 1975 Amendments to the Exchange Act, which allow the SEC to delegate the development and operation of key elements of market infrastructure to the SROs when they jointly file such plans.²⁵⁹ Reg NMS defines an NMS Plan as any joint SRO plan in connection with (1) the "planning, development, operation or regulation" of a national market system, sub-system or facility thereof; or (2) the "development and implementation of procedures... designed to achieve compliance by SROs and their members" with Reg NMS.²⁶⁰

The Exchange Act and Reg NMS do not expressly restrict the scope or contents of NMS Plans, so they can govern a wide range of important market structure issues and their contents can affect essentially every market participant. Indeed, it is within the SEC's discretion which market-wide rules they choose to implement via an NMS Plan. Recent examples include the consolidated audit trail

²⁵⁹ See 15 U.S.C. § 78k-1(a)(3)(B) (2012).

²⁶⁰ 17 C.F.R. § 242.600(43) (2006).

(CAT), the tick size pilot program, and the governance of the SIPs, which are the consolidated source of market data.

Rule 608 of Reg NMS describes the process whereby SROs may jointly file NMS Plans and amendments thereto with the SEC. NMS Plans are subject to SEC review and approval, as well as a notice and comment period.²⁶¹ In general however, NMS Plans are subject to fewer procedural requirements than SEC rules—for example, unlike SEC rules, NMS Plans do not require a cost-benefit analysis. The process to *amend* an NMS Plan is even simpler than the initial filing process, and amendments can be deemed effective when filed. Not only do SROs implement NMS Plans, but they also administer and operate them.²⁶²

As SROs, exchanges are the key architects of NMS Plans. Other market participants, including ATs, broker-dealers and investors, have a much more limited role in their design. We believe that this consequence of exchanges' SRO status is outdated and unfair in today's competitive marketplace. For example, broker-dealers must pay for access to the SIPs to ensure that they are getting the best prices for investors. However, the fees for SIP access are determined through NMS Plans, implemented by exchanges that can profit from these fees. Presently, SIP fees are costing investors close to \$400 million a year and how these fees are allocated among the SROs is subject to limited disclosure.²⁶³ The CAT NMS Plan is also illustrative of potential unfairness, as the exchanges have proposed a CAT design that leaves broker-dealers incurring approximately \$2 billion in implementation costs and \$1.5 billion in ongoing annual costs.²⁶⁴ Meanwhile, the exchanges' costs are expected to be less than 1/10th of broker-dealers' costs.²⁶⁵

We encourage Congress and the SEC to reform the limited role that broker-dealers and investors currently have in shaping NMS Plans. We believe that the

²⁶¹ 17 C.F.R. § 242.608 (2006).

²⁶² 17 C.F.R. § 242.608 (2006).

²⁶³ J.P. Morgan Securities LLC, U.S. Equity Market Structure Update (May 16, 2016).

²⁶⁴ Notice of Filing of the National Market System Plan Governing the Consolidated Audit Trail, Exchange Act Release No. 77724, 470 (Apr. 27, 2016), *available at* <https://www.sec.gov/rules/sro/nms/2016/34-77724.pdf>.

²⁶⁵ *See id.*

role of NMS Plan Advisory Committees should be enhanced. NMS Plan Advisory Committees are not required by statute and their existence and composition are generally at the discretion of the SROs.²⁶⁶ However, NMS Plans do typically have an Advisory Committee, on which certain key groups of market participants are represented.²⁶⁷ Examples of such groups are investors, retail broker-dealers, institutional broker-dealers, data vendors, ATSS, and, in the case of the CAT NMS Plan, an academic and a clearing firm representative.²⁶⁸

Advisory Committees have limited and informal rights regarding NMS Plans. They may submit their views on NMS Plan matters, but their views are not binding.²⁶⁹ Advisory Committees may also be restricted from attending NMS Plan meetings if the SROs determine that a meeting warrants confidentiality.²⁷⁰ In practice, SROs have broad discretion to exclude the Advisory Committee from meetings and are rarely obligated to formally respond to Advisory Committee positions. We believe that the dynamic between SROs and Advisory Committee members is outdated and unfair. Opening up the design and implementation of NMS Plans to non-SROs could benefit the market in many regards: access fees and market data fees would likely be reduced, the costs of the CAT could be more equitably reallocated, and investment in SIP technology could yield faster and more resilient SIPs.

²⁶⁶ One notable exception is Rule 613, requiring the Consolidated Audit Trail NMS Plan to have an Advisory Committee and dictating aspects of its composition.

²⁶⁷ See, e.g., Joint Self-Regulatory Organization Plan Governing The Collection, Consolidation And Dissemination Of Quotation And Transaction Information For Nasdaq-Listed Securities Traded On Exchanges On An Unlisted Trading Privilege Basis, 9, available at <http://www.utpplan.com/DOC/Nasdaq-UTP%20Plan%20after%2035th%20Amendment%20-%20Excluding%201st%20Amendment%20-%20i.e.%20Effective%20Plan%20as%20of%209-151.pdf>; Second Restatement Of Plan Submitted To The Securities And Exchange Commission Pursuant To Rule 11aa3-1 Under The Securities Exchange Act Of 1934, 14-15, available at https://www.nyse.com/publicdocs/ctaplan/notifications/trader-update/CTA_Plan_Composite_as_of_September_1_2015.pdf.

²⁶⁸ Notice of Filing of the National Market System Plan Governing the Consolidated Audit Trail, Exchange Act Release No. 77724, 799 (Apr. 27, 2016), available at <https://www.sec.gov/rules/sro/nms/2016/34-77724.pdf>.

²⁶⁹ See, e.g., *supra* note 267.

²⁷⁰ *Id.*

We agree generally with the approach recently recommended by the EMSAC Trading Venues Regulation Subcommittee to effect a more equitable NMS Plan process.²⁷¹ More specifically, on July 8, 2016, the Trading Venues Subcommittee recommended that the SEC take measures to expand and formalize the role of Advisory Committees, in part by enabling the Advisory Committee to hold their own vote on NMS Plan matters.²⁷² We agree with the spirit of this recommendation and would go one step further, by amending the Exchange Act to grant a representative from key constituent groups of Advisory Committees a separate formal vote on NMS Plans. This would include representatives of broker-dealers and investors, among others.

Second, greater restrictions should be placed on the use and decision-making capabilities of “Executive Sessions,” which lack transparency and are controlled only by SROs. Executive Sessions generally refer to the private meetings held by SROs in developing and executing NMS Plans. To call an Executive Session, the SROs must typically comply with only perfunctory procedural requirements, such as a majority vote among themselves and a determination that a matter requires confidentiality.²⁷³ However, SRO Executive Sessions can be used to make important NMS Plan decisions—for example, data access fees can be set via Executive Session.²⁷⁴ Accordingly, we would accompany the expansion of

²⁷¹ See Memorandum from EMSAC Trading Venues Regulation Subcommittee to Equity Market Structure Advisory Committee (EMSAC), Recommendations Relating to Trading Venues Regulation, U.S. SEC. & EXCH. COMM’N (Apr. 19, 2016), *available at* <https://www.sec.gov/spotlight/emsac/emsac-trading-venues-subcommittee-recommendations-041916.pdf>; Equity Market Structure Advisory Committee (EMSAC), Recommendations Regarding Enhanced Industry Participation in Certain SRO Regulatory Matters, U.S. SEC. & EXCH. COMM’N (Jun. 10, 2016), *available at* <https://www.sec.gov/spotlight/emsac/emsac-trading-venues-regulation-subcommittee-recomendation-61016.pdf>; Andrew Ackerman, *SEC Urged to Launch Pilot Program for Curbing Maker-Taker Fee Plans*, WALL ST. J. (Jul. 8, 2016), *available at* <http://www.wsj.com/articles/sec-urged-to-launch-pilot-program-for-curbing-maker-taker-fee-plans-1468015388>.

²⁷² Equity Market Structure Advisory Committee (EMSAC), Recommendations Regarding Enhanced Industry Participation in Certain SRO Regulatory Matters, U.S. SEC. & EXCH. COMM’N 2 (Jun. 10, 2016), *available at* <https://www.sec.gov/spotlight/emsac/emsac-trading-venues-regulation-subcommittee-recomendation-61016.pdf>; Ackerman, *supra* note 271.

²⁷³ See, e.g., *supra* note 267.

²⁷⁴ See Letter from Ira D. Hammerman, General Counsel, SIFMA, to John Ramsay, Acting Director, Division of Trading and Markets, SEC (Mar. 28 Letter, 2013) (objecting to the UTP

Advisory Committees' role in NMS Plans with greater restrictions on the use of Executive Sessions.

Specific Recommendation:

5. The NMS Plan process should be revised so that exchange SROs do not have outside influence in the rulemaking process. Representatives of exchanges, broker-dealers and investors should be permitted to vote on any NMS Plans.

d) Consequence of Exchange SRO Status: Legal Immunity

Another consequence of exchanges' SRO status is that they are immune from certain types of legal liability, whereas ATs and other market participants do not have similar immunity.

Exchange legal immunity originated from the quasi-judicial adjudicatory and disciplinary authorities incident to exchange SRO status.²⁷⁵ Absolute legal immunity has been granted to judges to protect the judicial decision-making process for centuries.²⁷⁶ In the 1970s, the Supreme Court extended legal immunity to government agency officials due to the "functional comparability" between the decisions in a government agency's administrative proceedings and traditional court proceedings.²⁷⁷ Similar reasoning was later used to grant some types of legal immunity to SROs, to protect them from perpetual lawsuits over decisions from their adjudications.²⁷⁸

NMS Plan OC's adoption of a fee increase during an executive session excluding the advisory committee,) available at <http://www.sec.gov/comments/s7-24-89/s72489-31.pdf>; Joint Industry Plan, Exchange Act Release No. 69587, File No. S7-24-89 (May 15, 2013), available at <https://www.sec.gov/rules/sro/nms/2013/34-69587.pdf>.

²⁷⁵ Rohit A. Nafday, Comment, *From Sense to Nonsense and Back Again: SRO Immunity, Doctrinal Bait-and-Switch, and a Call for Coherence*, 77 U. CHI. L. REV. 847, 854 (2010), available at <https://lawreview.uchicago.edu/sites/lawreview.uchicago.edu/files/uploads/77.2/77-2-SRO%20Immunity-Nafday.pdf>.

²⁷⁶ *Id.* at 855.

²⁷⁷ *Id.* at 857-858.

²⁷⁸ *Id.* at 854-855, 859.

SRO legal immunity is generally interpreted to apply only to an exchange's regulatory actions.²⁷⁹ Nevertheless, exchanges have still attempted to use the broadest legal immunity possible during legal proceedings. For example, NASDAQ tried unsuccessfully to invoke its legal immunity to shield itself from claims stemming from its technological failures during the Facebook IPO.²⁸⁰ Although the court rejected this argument because the claims did not arise out of NASDAQ's regulatory duties, it is notable that the immunity question remained the subject of litigation and appeals for years after the IPO.²⁸¹

SRO legal immunity was established before exchanges became for-profit entities, and it has perpetuated despite the conflicts associated with their profit motive. The effect is that exchanges have a competitive advantage over other trading venues, because they are not exposed to comparable liability.²⁸² As detailed above, exchanges currently outsource many of their regulatory functions, further bringing the justification for this immunity into question.

As stated in Recommendation 4, we support a reorganization of the SRO system that would centralize SRO regulatory functions to the extent practicable. One significant consequence of such a structure is that the regulatory responsibilities of exchanges and ATSS would increasingly converge. The more similar the trading venues' regulatory responsibilities become, the less justification exists for a unique legal immunity applied to exchange regulatory action. As a centralized structure is implemented, we invite Congress to revisit the Exchange Act to clarify the nature of "SRO" obligations and status, as well as any legal immunity incident thereto.

²⁷⁹ Carmen Germaine, *NASDAQ Can't Shake Immunity Decision in Facebook IPO Suit*, LAW 360 (Nov. 25, 2015), available at <http://www.law360.com/articles/731829/NASDAQ-can-t-shake-immunity-decision-in-facebook-ipo-suit>.

²⁸⁰ *Id.*

²⁸¹ *Id.* More than three years after Facebook's May 2012 IPO, U.S. District Judge Robert W. Sweet denied Nasdaq OMX Group Inc.'s motion to vacate a December 2013 decision that found that the immunity protecting the exchange did not apply.

²⁸² SIFMA, SEC Comment Letter, Re: Self-Regulatory Structure of the Securities Markets, 9 (Jul. 31, 2013).

Specific Recommendation:

6. Once SRO surveillance and enforcement responsibilities have been centralized to the extent practicable, Congress should revisit the Exchange Act to reconsider exchange legal immunity. Exchange legal immunity should only be available for exchange regulatory functions unique to exchanges that cannot be effectively centralized.

Part II: Undisplayed or “Dark” Trading

Undisplayed or “dark” trading describes trades that are executed without the use of publicly displayed orders.²⁸³ In contrast, a displayed quote is viewable by the public and includes: (1) a stock symbol, (2) whether the order is one to buy or to sell, (3) the number of shares, and (4) the price.²⁸⁴ A dark trade may therefore be said to lack “pre-trade transparency.” It is important to clarify that even trades that are executed in the dark are subject to “post-trade transparency.” This is because the NMS Plans governing the SIPs require the exchanges and FINRA to report all trade execution information to the SIPs.²⁸⁵

Dark trading has always been a part of equity markets. In manual markets, institutional investors used dark trading to execute large orders with minimal price impact. For example, broker-dealers executed orders in what was referred to as the

²⁸³ See, e.g., Aguilar, *supra* note 183; Robert Bloomfield et al., *Hidden Liquidity: Some New Light on Dark Trading*, 70 JOURNAL OF FINANCE 2227-74 (Oct. 2015).

²⁸⁴ *SIFMA Paper on Displayed and Non-Displayed Liquidity*, SEC. INDUS. & FIN. MKT. ASS’N 3 (Aug. 31, 2009).

²⁸⁵ Joint Self-Regulatory Organization Plan Governing The Collection, Consolidation And Dissemination Of Quotation And Transaction Information For Nasdaq-Listed Securities Traded On Exchanges On An Unlisted Trading Privilege Basis, 14-15, *available at* <http://www.utpplan.com/DOC/Nasdaq-UTP%20Plan%20after%2035th%20Amendment%20-%20Excluding%201st%20Amendment%20-%20i.e.%20Effective%20Plan%20as%20of%209-151.pdf>; Second Restatement Of Plan Submitted To The Securities And Exchange Commission Pursuant To Rule 11aa3-1 Under The Securities Exchange Act Of 1934, 39-40, *available at* https://www.nyse.com/publicdocs/ctaplan/notifications/trader-update/CTA_Plan_Composite_as_of_September_1_2015.pdf.

“upstairs market.” The upstairs market involved broker-dealers directly contacting other broker-dealers off the trading floor and over the phone, which allowed them to avoid publicly displaying their trading interest.²⁸⁶ Investors used this pre-automation form of dark trading to minimize price impact and transaction costs—the same considerations that drive much of today’s dark trading.

However, the volume of trades that are executed in the dark has increased in recent years. For example, dark ATs and broker-dealer internalizers executed approximately 29.4% of the trading volume in NASDAQ stocks in 2005; by 2014, this proxy for dark trading volume had increased to 38.6%.²⁸⁷ Recent changes in the dark trading of NYSE stocks is even more significant. In 2005, the volume of NYSE stocks executed by dark ATs and broker-dealer internalizers was just 13%.²⁸⁸ By 2014, this dark NYSE stock volume had increased to 34.6%.²⁸⁹ Today, approximately 37% of U.S. share volume in equities is executed by ATs and broker-dealer internalizers.²⁹⁰

²⁸⁶ See Stavros Gadinis, *Market Structure for Institutional Investors; Comparing the U.S. and E.U. Regimes*, 3 VA. L. & BUS. REV. 311, 325-26 (2008), available at <http://scholarship.law.berkeley.edu/facpubs/948>. See generally Joel Hasbrouck, et al., *New York Stock Exchange Systems and Trading Procedures* (NYSE Working Paper No. 93-01, 1993), available at <http://people.stern.nyu.edu/jhasbrou/Research/Working%20Papers/NYSE.PDF>; Donald Keim & Ananth Madhavan, *The Upstairs Market for Large-Block Transactions: Analysis and Measurement of Price Effects*, 9 THE REVIEW OF FINANCIAL STUDIES 1 (1996), available at http://www.business.unr.edu/faculty/liuc/files/RUC/topic_upstairsmarket/Keim_Madhavan_1996.pdf.

²⁸⁷ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. & EXCH. COMM’N 11-12 (Apr. 30, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

²⁸⁸ *Id.*

²⁸⁹ *Id.*

²⁹⁰ See TABB Group, *Equities LiquidityMatrix May 2016*, available at http://mm.tabbforum.com/liquidity_matrices/187/documents/original_2016-05_Equities_Liquidity_Matrix_May_2016.pdf.

A. Dark Trading Across Trading Venues

As discussed earlier in this chapter, it is widely acknowledged that effectively all trading on ATSS and via broker-dealer internalization occurs in the dark. However, according to some estimates a significant amount (roughly 11-14%) of trading volume on exchanges also occurs in the dark.²⁹¹ It is difficult to estimate the exact amount of dark trading that occurs on exchanges with any certainty, because exchanges do not disclose their trading volumes that are executed in the dark. In fact, if 11-14% of trading volume on exchanges is dark, then roughly an additional 8% of U.S. share volume is executed in the dark, bringing the total of dark trading to an estimated 45% of U.S. share volume.²⁹²

Dark trading occurs on exchanges through the use of non-displayed or “hidden” order types. According to one study, these hidden order types are the most frequently used types of orders on exchanges.²⁹³ The existence and popularity of these order types on exchanges is an important consideration in formulating policy recommendations relating to dark trading. For example, one former SEC Commissioner has recommended that “the [SEC] should...study how the use of non-displayed order types by exchanges may affect the price discovery process.”²⁹⁴

The significant amount of dark trading that occurs on exchanges is often overlooked in policy discussions surrounding dark trading. Instead, the regulation of dark trading is often conflated with the regulation of ATSS. Concerns related to dark trading should not be directed only at certain venues, as dark trading occurs across the market. To produce regulations that accurately reflect the existing market landscape, we believe it is important to improve the transparency

²⁹¹ *U.S. Equity Market Structure: An Investor Perspective*, BLACKROCK 3 (Apr. 2014), available at <https://www.blackrock.com/corporate/en-au/literature/whitepaper/viewpoint-us-equity-market-structure-april-2014.pdf>; In 2013, the SEC estimated approximately 11%-14% of exchange volume to involve non-displayed orders. *Hidden Volume Ratios, Data Highlight 2013-02*, U.S. SEC. & EXCH. COMM’N (Oct. 9, 2013), available at <https://www.sec.gov/marketstructure/research/highlight-2013-02.html#.Vzsv0JEtLIU>.

²⁹² See *supra* notes 127, 150, 169 and related text.

²⁹³ Phil Mackintosh, *Demystifying Order Types*, KCG 10 (Sept. 2014), available at https://www.kcg.com/uploads/documents/KCG_Demystifying-Order-Types_092414.pdf.

²⁹⁴ See Aguilar, *supra* note 183.

surrounding the substantial yet largely unacknowledged volume of dark trading that occurs at exchanges. We therefore recommend that the SEC require exchanges to publicly report their undisplayed trading volumes.²⁹⁵

Specific Recommendation:

7. Required disclosures of registered exchanges should be revised to include trading volumes attributable to undisplayed (“dark”) order flow.

B. Dark Trading and Market Quality

The principal concern with dark trading is that a sufficiently high level of such trading can negatively impact price formation, based on the notion that the fundamental supply and demand for a stock will not be reflected in a stock’s publicly displayed price. Inefficiencies in price formation are considered problematic because less informative stock prices can negatively impact efficient capital allocation for investors.

A normative evaluation of the role of dark trading in today’s equity markets should be based in empirical findings regarding the relationship between dark trading and market quality. The first part of this section presents empirical data regarding undisplayed liquidity and price improvement. The second part provides a literature review of dark trading and market quality.

1) CCMR Data

Chapter 1 of this report presents the results of empirical analyses regarding the characteristics of today’s automated equity markets conducted by the Committee on Capital Markets Regulation (the “**CCMR data**”). In this section, we briefly summarize our findings that relate specifically to the impact of dark trading on market quality.

²⁹⁵ Committee member Kenneth Bentzen, Jr. with co-author Curt Bradbury made this recommendation in their New York Times Dealbook article “How to Improve Market Structure” (Jul. 14, 2014) *available at* <http://dealbook.nytimes.com/2014/07/14/how-to-improve-market-structure/>.

One market quality metric evaluated in the CCMR study is the frequency of price improvement for dark orders, or the percentage of dark orders that are executed at a price better than the best publicly available price (the NBBO). The CCMR data shows that there are dark trades executed on (1) exchanges, (2) ATSS and (3) via broker-dealer internalization that receive price improvement to the NBBO. In addition, the CCMR data shows that both (a) market orders and (b) marketable limit orders that are executed in the dark often receive price improvement.²⁹⁶

The percentage of dark orders that receive price improvement varies according to the order type and venue. Figure 1.11 in Chapter 1 (renamed Figure 2.1 below), shows that market orders are more likely to receive price improvement than limit orders.²⁹⁷ In general, internalized orders and dark orders executed on ATSS are also more likely to receive price improvement than dark orders executed on exchanges.²⁹⁸ For example, the CCMR data shows that over 80% of market orders that are executed by broker-dealer internalizers receive price improvement and approximately 60% of market orders that are executed on ATSS receive price improvement.²⁹⁹

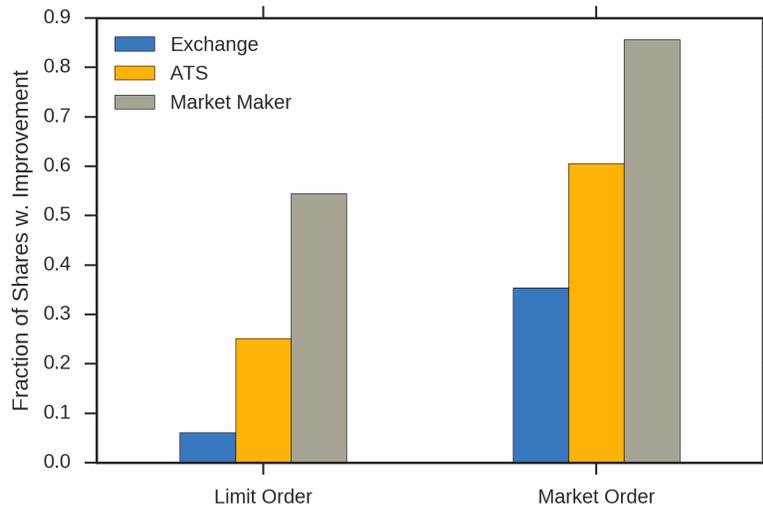
²⁹⁶ Market orders are orders to execute at the best publicly available price and limit orders are orders to execute at a pre-determined price.

²⁹⁷ *See supra* Figure 1.11.

²⁹⁸ *Id.*

²⁹⁹ *Id.*

Figure 2.1: Frequency of Price Improvement by Venue Type³⁰⁰



Another market quality metric analyzed in the CCMR study is the magnitude of price improvement obtained for dark orders. Figure 1.12 in Chapter 1 (renamed Figure 2.2 below), shows that there is measurable average per share price improvement for dark orders across venues and order types.³⁰¹ For example, the CCMR data shows that the average per share price improvement provided to limit and market orders on exchanges and ATSs is at least 0.8 cents when executed in the dark.³⁰² Our data also shows that dark market orders that are executed by broker-dealer internalizers receive an average price improvement of over 0.7 cents per share.³⁰³

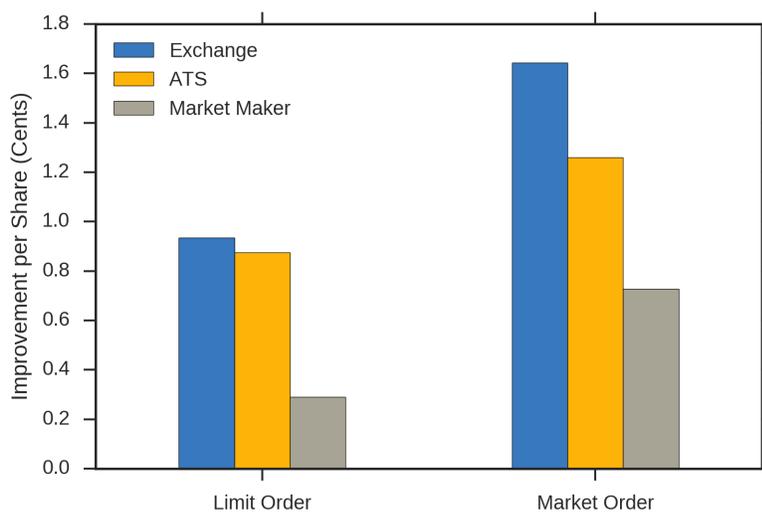
³⁰⁰ Source: Rule 605 filings for March, April, and May 2016. Market maker data gathered for top 9 venues for non-ATS OTC transactions in Reg NMS stocks (Citadel Securities LLC, KCG Americas LLC, G1 Execution Services LLC, Goldman Sachs & Co, UBS Securities LLC, Two Sigma Securities LLC, Deutsche Bank Securities, Morgan Stanley & Co LLC, and Citigroup Global Markets Inc.). ATS data gathered for 5 of the top 10 ATSs for transactions in Reg NMS stocks (UBS ATS, IEX, JPM-X, Level ATS, and Barclays LX ATS).

³⁰¹ See *supra* Figure 1.12.

³⁰² *Id.*

³⁰³ *Id.*

Figure 2.2: Magnitude of Price Improvement by Venue Type³⁰⁴



2) Literature Review regarding Dark Trading and Market Quality

There is a substantial body of literature that finds that dark trading can enhance market quality. For example, in an analysis of dark ATSS, Buti, Rindi and Werner (2011) conclude that such trading improves important measures of market quality, including a narrowing of spreads, increase in market depth, and reduction of short-term volatility.³⁰⁵ Focusing on liquidity, Hendershott, Jones and Menkveld (2011) show that dark trading helps to provide liquidity to the market.³⁰⁶ In a theoretical paper on dark trading, Zhu (2014) also finds that dark trading has a

³⁰⁴ Source: Rule 605 filings for March, April, and May 2016. Market maker data gathered for top 9 venues for non-ATS OTC transactions in Reg NMS stocks (Citadel Securities LLC, KCG Americas LLC, G1 Execution Services LLC, Goldman Sachs & Co, UBS Securities LLC, Two Sigma Securities LLC, Deutsche Bank Securities, Morgan Stanley & Co LLC, and Citigroup Global Markets Inc.). ATS data gathered for 5 of the top 10 ATSS for transactions in Reg NMS stocks (UBS ATS, IEX, JPM-X, Level ATS, and Barclays LX ATS).

³⁰⁵ See Sabrina Buti et al., *Diving into Dark Pools* (Charles A. Dice Center Working Paper 2010-10, 2011), available at http://www.irim.eur.nl/fileadmin/irim_content/documents/Werner_April3.pdf.

³⁰⁶ See Terence Hendershott et al., *Does Algorithmic Trading Improve Liquidity?*, 66 THE JOURNAL OF FINANCE 1 (2011).

positive effect on liquidity.³⁰⁷ Boni, Brown, and Leach (2013) find that dark ATSs designed specifically for buy-side traders exhibit increased execution quality for block trades, suggesting a positive effect for institutional traders.³⁰⁸

However, not all academic literature paints a positive picture. Hatheway, Kwan & Zheng (2013) find that nearly half of trades executed in the dark are executed without price improvement over the NBBO.³⁰⁹ However, their findings have important limitations. First, the authors use off-exchange trading volumes to estimate dark volumes, so their sample is both over- and under-inclusive.³¹⁰ This approach contrasts markedly with the approach in the CCMR study, which includes dark trading on exchanges. A second limitation of the Hatheway et al. findings is that dark orders may receive quantifiable cost savings that are not reflected as price improvement to the NBBO.³¹¹ Indeed, a more useful measure of price improvement would be a comparison to the price that would have been obtained if the order had been executed in the lit markets. This is relevant because institutional investors may benefit from reduced price impact from dark trading.

The academic literature to date has provided mixed results regarding the relationship between dark trading and price discovery (the determination of a stock's fundamental price based on its supply, demand, and other market factors). Two theoretical papers that model the impact of dark trading on price discovery reach conflicting conclusions. Ye (2012) predicts that increased dark trading harms

³⁰⁷ See Haoxiang Zhu, *Do Dark Pools Harm Price Discovery?*, 27 REVIEW OF FINANCIAL STUDIES 747 (2014).

³⁰⁸ See Boni, Brown and Leach, *Dark Pool Exclusivity Matters*, Working Paper (2013).

³⁰⁹ See Frank Hatheway et al., *An Empirical Analysis of Market Segmentation on U.S. Equities Markets* (Working Paper, 2013), available at

https://www.rhsmith.umd.edu/files/Documents/Centers/CFP/research/hatheway_kwan_zheng.pdf.

³¹⁰ *Id.* The sample is over-inclusive because off-exchange trading volumes include lit or partially lit transactions. The sample is under-inclusive because a significant volume of dark trades occurs on exchanges.

³¹¹ *Id.* For example, dark trading can minimize the price impact of a large order. In this case, the NBBO *itself* is more favorable due to dark trading, but this quantifiable benefit is not reflected as a rate of improvement to a set NBBO.

price discovery,³¹² while Zhu (2014) comes to the opposite conclusion.³¹³ Zhu (2014) finds that the addition of dark pool trading introduces an element of self-selection among traders, whereby relatively more informed traders transact on lit exchanges and uninformed traders benefit from price improvement provided by dark ATSs or broker-dealer internalizers. The net effect is an overall improvement in price discovery, benefitting the entire market. The theoretical work of Boulatov and George (2013) corroborates the Zhu (2014) results by finding that the provision of liquidity in dark ATSs or by broker-dealer internalizers leads to more competition among informed traders, thereby improving price discovery.³¹⁴ However, while Zhu (2014) and Boulatov and George (2013) provide theoretical support that such dark activity improves price discovery, the studies lack empirical backing.

Comerton-Forde and Putnins (2015) filled the empirical void by conducting an empirical study of the effects of dark trading on price discovery.³¹⁵ The study confirms the prediction of Zhu (2014) that self-selection occurs in the dark and lit markets by informed and uninformed traders. Overall, the authors find that dark pool activity has a positive impact on price discovery and that “[f]or a typical stock, the level of dark trading is below harmful levels.”³¹⁶

Other studies have also considered the effect of varying levels of dark trading on market quality. Some have found that the current level of dark trading is below its optimal level.³¹⁷ In other words, more dark trading would be beneficial

³¹² See Mao Ye, *Price Manipulation, Price Discovery and Transaction Costs in the Crossing Network* (Working Paper, 2012), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2024057.

³¹³ See Zhu, *supra* note 307.

³¹⁴ See Alex Boulatov & Thomas J. George, Hidden and Displayed Liquidity in Securities Markets with Informed Liquidity Providers, 26 THE REVIEW OF FINANCIAL STUDIES 2095 (2013).

³¹⁵ See Carole Comerton-Forde & Talis J. Putnins, *Dark Trading and Price Discovery*, 118 JOURNAL OF FINANCIAL ECONOMICS 70 (2015).

³¹⁶ *Id.*

³¹⁷ Rhodri Preece, *Dark Pools, Internalization, and Equity Market Quality*, CFA INST. (Oct. 2012) (finding that quoted spreads decline as dark pool share approaches 63.9%, but increase from there); Maureen O’Hara & Mao Ye, *Is Market Fragmentation Harming Market Quality?*, 100 JOURNAL OF FINANCIAL ECONOMICS 459 (June 2011) (finding that higher levels of dark execution improve effective spreads).

for market quality. However, others have found that dark trading is harming price efficiency and measures of market quality like effective spread.³¹⁸ One study estimated the tipping point at which dark trading begins to potentially harm market quality is 46.7% for all stocks.³¹⁹ Up until that threshold, increased dark pool trading leads to narrower spreads and increased depth for best prices. However, after the threshold tipping point is crossed, dark trading becomes harmful. The study also attempted to track the variation in these market quality effects across stocks of different market capitalizations and at broker-dealer internalizers or ATSS. They generally found the threshold tipping point to be higher at ATSS than at internalizers across all ranges of market capitalization. In addition, they found that as market cap increases, the threshold tipping point decreases. For example, if the threshold tipping point were 50% for stocks with a \$1 billion market cap, then the tipping point would be lower, say 35%, for stocks with a \$5 billion market cap.³²⁰

We conclude this section by reminding policy makers to review our empirical findings in the course of considering the future regulation of dark trading. We offer no specific policy recommendations stemming from our empirical research and literature review at this time, as in our view the literature is inconclusive in informing appropriate next steps.

C. Trade-At Rule

The “trade-at” rule is a potential reform that would encourage the public display of orders. A trade-at rule would prohibit a trading venue from executing a trade at the NBBO if that trading venue had not been publicly displaying a quote at the NBBO when the order was received. This means that an ATS or broker-dealer internalizer could *not* execute a trade in the dark if it simply matched the best publicly displayed price for a stock. Such trading venues could either (1) execute

³¹⁸ Hatheway et al., *supra* note 309 (finding that price efficiency, as measured by variance ratio, declines as the level of dark execution increases).

³¹⁹ Preece, *supra* note 317, at 5-59.

³²⁰ *Id.*

the order with “significant” price improvement to the NBBO or (2) route the order to a venue that was displaying the NBBO.³²¹

1) Concerns with a Trade-At Rule

One direct consequence of a trade-at prohibition would be the discouragement of dark trading. It is important to note that this is not necessarily a good thing, as reducing dark trading volume could stymie market quality improvements attributable to undisplayed liquidity. As stated above, certain empirical studies suggest that dark trading has positive effects on market quality, e.g., by finding that dark trading promotes price discovery and liquidity. A rule that would artificially redirect order flow away from dark venues could undermine these market quality improvements.

A trade-at prohibition could also directly increase investor transaction costs. For example, it is generally understood that a trade-at rule would require ATSS or broker-dealer internalizers to achieve a pre-determined minimum amount of price improvement to the NBBO in order to execute a stock. However, this presents the obvious risk that this pre-determined minimum would be set too high (e.g. half a penny) and that, as a result, investors would miss out on slightly better prices that might seem trivial individually but could be very significant in the aggregate and over time.

In addition, dark trading at the NBBO (i.e., not at a price improvement) can reduce the price impact of large institutional orders, which also reduces transactions costs for investors. A trade-at rule could make it harder for institutional investors to minimize price impact. This is true even if the SEC were to include a carve-out for large institutional block orders from the trade-at rule. This is because these large orders are often broken up into many small orders prior to being routed across markets and it is possible that the trade-at rule would fail to properly account for this routing strategy.

³²¹ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 70-71 (Jan. 14, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358.pdf>.

Canada and Australia recently implemented “trade-at” rules, and in both cases bid-ask spreads increased and the dollar amount of offers to buy and sell at the NBBO decreased. In Canada, overall trading volume declined 20%, investors did not display more liquidity on exchanges, and quoted and effective spreads increased.³²² The Canadian pilot has also produced support for the notion that a trade-at rule interferes with retail investors’ price improvement. In Canada, retail investors’ average price improvement dropped 70% after the rule was enacted.³²³ In Australia, quoted and effective spreads increased as well, with quoted spreads widening by almost 20%.³²⁴

Market participants and commentators have raised concerns with a potential trade-at prohibition. For example, BATS has warned that a trade-at rule could lead to “potentially wider spreads as well as fewer and inferior execution choices resulting from restrictions on competition.”³²⁵ Market structure expert Larry Tabb has predicted that a trade-at prohibition would “force market center consolidation,” to the benefit of large exchanges.³²⁶

Tabb’s prediction seems plausible for several reasons. First, a trade-at prohibition would severely restrict the circumstances under which dark executions would be permissible. As a result, dark ATSS would lose order flow and potentially go out of business. These dark venues’ current order flow would likely be redirected to exchanges, where the vast majority of displayed executions occur. In addition, as Tabb explains, the current system of broker-dealer internalization of

³²² Sviatoslav Rosov, *What Early Results on Australian and Canadian Trade-at Rules Mean for Regulation*, CFA INST. (Jan. 7, 2015), available at <http://blogs.cfainstitute.org/marketintegrity/2015/01/07/what-early-results-on-australian-and-canadian-trade-at-rules-mean-for-regulation/>.

³²³ Sherree DeCovny, *Rulers of Darkness*, CFA INST. MAGAZINE (Jan./Feb. 2015), available at <http://www.cfapubs.org/doi/pdf/10.2469/cfm.v26.n1.10>.

³²⁴ Rosov, *supra* note 322.

³²⁵ Joe Ratterman & Chris Concannon, Open Letter to U.S. Securities Industry Participants, Re: Market Structure Reform Discussion, BATS TRADING 3 (Jan. 6, 2015), available at <http://cdn.batstrading.com/resources/newsletters/OpenLetter010615.pdf>.

³²⁶ Larry Tabb, *The Grand Bargain: A Great Start, But Don’t Hold Your Breath*, TABB GROUP (Jan. 6, 2015), available at <http://tabbforum.com/opinions/the-grand-bargain-a-great-start-but-don't-hold-your-breath>.

retail orders does not always provide mid-point price improvement, which could be mandatory under a trade-at rule.³²⁷ Because a trade-at rule would weaken the competitive position of both ATs and broker-dealer internalizers relative to exchanges, it would likely mitigate the ability of ATs and broker-dealer internalizers to continue to provide investors with the benefits described throughout Chapter 1 and Chapter 2.

2) Alternatives to a Trade-At Rule

A broad trade-at prohibition is unlikely to be the most efficient approach to encourage the public display of orders. We believe that the factors that drive dark trading are varied, nuanced, and generally legitimate. For example, as stated earlier, dark trading in order to minimize the price impact of large orders can improve institutional investor outcomes. Additionally, broker-dealer internalization that leads to significant price improvement for retail orders in the aggregate is a beneficial use of dark trading as well (even if the price improvement for those trades is very small for each individual trade).

Market participants may also choose to execute trades in the dark in order to avoid certain costs associated with publicly displaying orders. For example, participants may trade in the dark to avoid exchange access fees. As described in Chapter 3, a liquidity-demanding investor is often required to pay 30¢ per 100 shares to execute against standing limit orders on an exchange. ATs fees can be substantially lower and broker-dealer internalizers generally do not charge fees, increasing incentives to execute in the dark on these venues. Several prominent market participants have identified this possibility.³²⁸

³²⁷ *Id.*

³²⁸ SIFMA, SEC Comment Letter, Re: Recommendations for Equity Market Structure Reforms 2-4 (Oct. 24, 2014), *available at* <https://www.sec.gov/comments/s7-02-10/s70210-422.pdf>; Citigroup Global Markets Inc., SEC Comment Letter, Re: Concept Release on Equity Market Structure (Release No. 34-61358; File No. S7-02-10) 5-7 (Aug. 7, 2014), *available at* <https://www.sec.gov/comments/s7-02-10/s70210-416.pdf>; BlackRock, SEC Comment Letter, RE: Equity Market Structure Recommendations; Concept Release on Equity Market Structure, File No. S7-02-10; Regulation Systems Compliance and Integrity, File No. S7-01-13; and Equity Market Structure Review 2 (Sept. 12, 2014), *available at* <http://www.sec.gov/comments/s7-02-10/s70210-419.pdf>.

Instead of implementing a trade-at rule that could increase transaction costs, we recommend reforming certain regulations that may be increasing the cost of publicly displaying orders. We believe that such an approach is less likely than a trade-at prohibition to have an adverse effect on competition. In addition, this approach would not interfere with broker-dealer and investor discretion. Chapter 3 includes proposed reforms to existing regulations that are designed in part to reduce the transaction costs associated with the public display of orders. This includes pilot programs to reduce exchange access fees and lower the minimum pricing increment for the most liquid stocks.

Specific Recommendation:

8. The SEC should *not* implement a trade-at rule, as it could increase investor transaction costs without appreciably improving market quality.

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CHAPTER 3: REGULATION NATIONAL MARKET SYSTEM

This Chapter is divided into four parts--the order protection rule, access rule, sub-penny rule and market data rules. Each part explains the policy goals underlying each rule and sets forth specific recommendations for how to better achieve those policy goals.

Part I: The Order Protection Rule

Two of the five objectives of the national market system—(1) fostering competition among trading venues and (2) promoting order interaction³²⁹—can often be at odds with one another. The difficulty is that if orders on one trading venue are not exposed to orders on another trading venue, then investors may not receive the best prices for their orders.

Rules designed to address this conflict are a key feature of the national market system. First, the duty of best execution seeks to ensure that broker-dealers obtain the best terms for customer orders.³³⁰ Prior to Reg NMS, orders for exchange-listed stocks were also subject to the Intermarket Trading System Plan³³¹ (“ITS Plan”), which also sought to ensure that investors would get the best prices for their orders. Reg NMS eliminated the outdated ITS Plan and replaced it with the order protection rule. All three are described below.

A. The Duty of Best Execution

The duty of best execution requires broker-dealers to seek to execute customer trades at the most favorable terms reasonably available under the circumstances. It derives from common law agency principles and fiduciary

³²⁹ See 15 U.S.C. § 78k-1(a)(1)(C) (2012).

³³⁰ See, e.g., NORMAN POSER, BROKER-DEALER LAW & REGULATION, § 2.03(B), at 2-58 (3d ed. 2001).

³³¹ Plan for the Purpose of Creating and Operating an Intermarket Communications Linkage Pursuant to Section 11A(c)(3)(B) of the Securities Exchange Act of 1934, Exchange Act Release No. 14661 (Apr. 14, 1978), 43 Fed. Reg. 17,419 (Apr. 24, 1978).

obligations.³³² Although the duty of best execution predates the federal securities laws, it has been incorporated into the antifraud provisions of federal securities laws through judicial decisions.³³³

FINRA has codified the duty of best execution in its rulebook in FINRA Rule 5310 and enforces it. Rule 5310 identifies five factors that must be considered in carrying out the duty of best execution, in addition to price. These are: (1) the character of the market for the security; (2) the size and type of transaction; (3) the number of markets checked; (4) the accessibility of the quotation; and (5) the terms and conditions of the order as communicated to the firm.³³⁴

In practice, fulfilling the duty of best execution is markedly different for retail orders than for institutional orders. Due to their small size, retail orders can typically be filled immediately at prices better than or equal to the NBBO.³³⁵ In contrast, due to the size of institutional orders, broker-dealers will often use complex order routing and execution strategies to minimize the price impact of the order. A broker-dealer executing an institutional order must therefore consider numerous factors in addition to the NBBO in carrying out the duty of best execution. In particular, a broker-dealer executing an institutional order is likely to consider the order size, trading venue, and timing for execution that would best minimize the price impact of the order.

The duty of best execution includes several affirmative obligations. For example, broker-dealers must periodically assess the quality of competing markets to ensure that order flow is directed to the markets providing the most beneficial terms for their customer orders.³³⁶ Broker-dealers must also regularly examine their

³³² FINRA, Regulatory Notice No. 15-46, Best Execution 6 (Nov. 2015), *available at* http://www.finra.org/sites/default/files/notice_doc_file_ref/Notice_Regulatory_15-46.pdf.

³³³ *See, e.g.*, *Newton v. Merrill, Lynch, Pierce, Fenner & Smith*, 135 F.3d 266, 270 (3d Cir. 1998).

³³⁴ FINRA Rule 5310 (amended 2014), *available at* http://finra.complinet.com/en/display/display_main.html?rbid=2403&element_id=10455.

³³⁵ *See* Reproposing Release, Exchange Act Release No. 50870 (Dec. 16, 2004), 69 Fed. Reg. 77424, 77447 (Dec. 27, 2004).

³³⁶ Order Execution Obligations, 61 Fed. Reg. 48290, 48323.

best execution procedures in light of market and technology changes, and modify those practices if necessary to provide their customers with the best reasonably available terms.³³⁷ In doing so, broker-dealers must take into account price improvement opportunities, and whether different markets may be more suitable for different types of orders or particular securities.³³⁸

Despite this guidance, the best execution requirement cannot practically ensure that a customer will receive the best terms for their order in every instance; it requires only that a broker-dealer seek to do so in a reasonable manner and then sets forth specific obligations that are intended to assist with this goal.

B. The ITS Plan

The ITS Plan, designed in the 1970s, required orders for exchange-listed stocks to be executed at the trading venue displaying the best price.³³⁹ The ITS Plan was an NMS Plan,³⁴⁰ so SROs, not the SEC, devised its rules.³⁴¹ It is important to note that NASDAQ stocks were not subject to the ITS Plan, because the ITS Plan only applied to exchange-listed stocks and NASDAQ did not register as an exchange until 2006.³⁴² Before then, NASDAQ operated as an electronic stock market, or “automated inter-dealer quotation system.”³⁴³

³³⁷ *Id.*

³³⁸ *Id.*

³³⁹ See Plan for the Purpose of Creating and Operating an Intermarket Communications Linkage Pursuant to Section 11A(c)(3)(B) of the Securities Exchange Act of 1934, Exchange Act Release No. 14661 (Apr. 14, 1978), 43 Fed. Reg. 17419 (Apr. 24, 1978).

³⁴⁰ For a detailed discussion of NMS Plans and the problems with implementing market-wide rules using them, see Chapter 2.

³⁴¹ *Id.*; see also, Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37501 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>.

³⁴² See, e.g., NASDAQ Press Release, Nasdaq Becomes Operational as a National Securities Exchange (Aug. 1, 2006), available at <http://ir.nasdaq.com/releasedetail.cfm?releaseid=205921>; Morrison & Foerster LLP, Impact of Recent NASDAQ Changes on Listed Companies (Jul. 12, 2006), available at <http://www.mofo.com/resources/publications/2006/07/impact-of-recent-nasdaq-changes-on-listed-compan>.

³⁴³ Morrison & Foerster LLP, *supra* note 342. Before 2006, NASDAQ was an automated inter-dealer quotation system of a national securities association registered under Section 15A of the Exchange Act.

The key shortcoming of the ITS Plan was that it did not distinguish between automated orders and manual orders on an exchange floor.³⁴⁴ For that reason, broker-dealers were required to check the exchange floor before executing an automated order.³⁴⁵ This was a time-consuming process and often resulted in trading delays of up to 30 seconds.³⁴⁶ It also provided floor-based manual markets with a structural trading advantage to automated markets. As a result, in 2005 almost 80% of NYSE stocks still traded manually on the floor of the NYSE.³⁴⁷ In contrast, NASDAQ stocks had already been trading in a highly automated fashion and across many ATSS since the mid-1990s.³⁴⁸

Eventually the SEC learned that requiring broker-dealers to wait for a response from the floor meant that investors could wind up missing both the best price of a manual quotation and prices at automated markets that would have been immediately accessible.³⁴⁹ Executing an order at a worse price than the best publicly available price is often referred to as a “trade-through”.³⁵⁰ Although the

³⁴⁴ See Plan for the Purpose of Creating and Operating an Intermarket Communications Linkage Pursuant to Section 11A(c)(3)(B) of the Securities Exchange Act of 1934, Exchange Act Release No. 14661 (Apr. 14, 1978), 43 Fed. Reg. 17419 (Apr. 24, 1978); Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496 (Jun. 29, 2005), *available at* <https://www.sec.gov/rules/final/34-51808fr.pdf>.

³⁴⁵ See Joel Hasbrouck, et al., *New York Stock Exchange Systems and Trading Procedures* 26-29 (NYSE Working Paper No. 93-01, 1993), *available at* <http://people.stern.nyu.edu/jhasbrou/Research/Working%20Papers/NYSE.PDF>.

³⁴⁶ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. & EXCH. COMM’N 7-8 (Apr. 30, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>. See also Plan for the Purpose of Creating and Operating an Intermarket Communications Linkage Pursuant to Section 11A(c)(3)(B) of the Securities Exchange Act of 1934, Exchange Act Release No. 14661 (Apr. 14, 1978), 43 Fed. Reg. 17419 (Apr. 24, 1978).

³⁴⁷ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 5 (Jan. 14, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358.pdf>; see also Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37505 n.55 (Jun. 29, 2005).

³⁴⁸ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 5 (Jan. 14, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358.pdf>.

³⁴⁹ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496 (Jun. 29, 2005), *available at* <https://www.sec.gov/rules/final/34-51808fr.pdf>.

³⁵⁰ See, generally, Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. AND EXCH. COMM’N 2

ITS Plan stated that markets “should avoid” trade-throughs and provided a post hoc grievance process for those whose order had been traded through,³⁵¹ an SEC staff study found that, under the ITS Plan, an estimated 1 in 40 trades for NYSE stocks were executed at prices inferior to the best displayed quotations.³⁵² The same study also found that the duty of best execution alone was insufficient to ensure that investor orders in NASDAQ stocks obtained the best available prices.³⁵³ Investors in NASDAQ stocks missed the best available price with a similar degree of frequency as investors in NYSE stocks.³⁵⁴

The SEC estimated that the *annual cost* to investors of trade-throughs was over \$320 million.³⁵⁵ In response to these findings, the SEC implemented Rule 611 of Reg NMS,³⁵⁶ the order protection rule, to lower investor transaction costs by reducing the frequency of trade-throughs.³⁵⁷

C. The Order Protection Rule

The order protection rule requires “trading centers,” including exchanges, ATSS and broker-dealer internalizers,³⁵⁸ to establish, maintain, and enforce written

(Apr. 30, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

³⁵¹ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37501 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>.

³⁵² Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37507 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>. It found that the overall trade-through rates for NASDAQ stocks and NYSE stocks were, respectively, 7.9% and 7.2% of the total volume of traded shares. In addition, the staff study found that the amount of the trade-throughs was significant – 2.3 cents per share on average for NASDAQ stocks and 2.2 cents per share for NYSE stocks.

³⁵³ See *id.* at 37508.

³⁵⁴ *Id.* at 37507.

³⁵⁵ *Id.*

³⁵⁶ 17 C.F.R. § 242.611 (2015).

³⁵⁷ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37510 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>.

³⁵⁸ 17 C.F.R. § 242.600(b)(78) (2005) (“Trading center means a national securities exchange or national securities association that operates an SRO trading facility, an alternative trading system, an exchange market maker, an OTC market maker, or any other broker or dealer that executes orders internally by trading as principal or crossing orders as agent.”).

policies and procedures that are reasonably designed to prevent trade-throughs of “protected quotations.”³⁵⁹

Protected quotations are the best publicly displayed automated quotations on each exchange and the ADF (the display only facility operated by FINRA for the rare occasion when ATSS publicly display quotes).³⁶⁰ The best protected quotations for a stock across all exchanges and the ADF are often referred to as the “national best bid and offer” (“**NBBO**”). While the order protection rule restricts order execution at a price worse than the NBBO, trading centers are free to execute orders at a price matching the NBBO even if they were not displaying that price.³⁶¹

Importantly, the order protection rule only protects quotes that are *immediately* accessible through automatic execution so automated orders do not have to wait for slower manual markets.³⁶² However, the SEC did not define “immediate” in absolute terms. Instead, the SEC required that an exchange provide “the fastest response possible without any programmed delay.”³⁶³ This requirement relates to a particularly contentious aspect of the recent exchange application filed by IEX, which the SEC approved in June 2016.³⁶⁴ Some argue that quotes on IEX

³⁵⁹ See 17 C.F.R. § 242.611 (2005).

³⁶⁰ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. AND EXCH. COMM’N 3 (Apr. 30, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>; As discussed in Chapter 2, the ADF is facility run by FINRA that displays quotations and trade reports, but which cannot be used as an execution platform. Quotes displayed on the ATS are included in consolidated market data. ATSS display quotes on the ADF either by choice (which is extremely rare) or when required to do so pursuant to Reg ATS. See *Alternative Display Facility (ADF)*, FINRA, available at <http://www.finra.org/industry/adf>.

³⁶¹ *Id.* at 4. This contrasts with the potential “trade-at” prohibition described earlier, which would require that orders are routed for execution against displayed quotations before they could be executed at matching prices.

³⁶² See *id.* at 3 n.5.

³⁶³ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37534 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>.

³⁶⁴ See In the Matter of the Application of Investors’ Exchange, LLC for Registration as a National Securities Exchange, Exchange Act Release No. 78101, File No. 10-222 (Jun. 17, 2016), available at <https://www.sec.gov/rules/other/2016/34-78101.pdf>.

are not “immediate” and thus should not be protected quotations,³⁶⁵ because IEX has implemented a programmed 350-microsecond access delay for stock quotes on its venue.³⁶⁶

In considering IEX’s application, the SEC revisited its guidance on protected quotations, and interpreted “immediate” to permit “a de minimis intentional delay—i.e., a delay so short as to not frustrate the purposes of Rule 611 by impairing fair and efficient access to an exchange’s quotations.”³⁶⁷ The SEC found that IEX’s programmed delay is “well within geographic and technological latencies experienced today that do not impair fair and efficient access to an exchange’s quotations...”³⁶⁸ Accordingly, the SEC concluded that IEX’s delay is de minimis and that IEX can maintain protected quotations.³⁶⁹ As indicated in our March 2016 letter to the SEC, we believe that such intentional delays should require SEC approval.³⁷⁰ The SEC adopted this approach in approving IEX.

The order protection rule also includes a “self-help” remedy, which allows trading centers to bypass the quotations of an exchange that is experiencing a failure, material delay, or malfunction of its systems or equipment and does not respond within one second.³⁷¹ Without the self-help rule, if an exchange displaying

³⁶⁵ See, e.g., N.Y. Stock Exch., SEC Comment Letter, Re: Investors’ Exchange LLC Form 1 Application (Release No. 34-75925, File No. 10-222) (Nov. 12, 2015), *available at* <http://www.sec.gov/comments/10-222/10222-19.pdf>.

³⁶⁶ See *id.*

³⁶⁷ Commission Interpretation Regarding Automated Quotations Under Regulation NMS, Exchange Act Release No. 78102, File No. S7-03-16 2-3 (Jun. 17, 2016), *available at* <https://www.sec.gov/rules/interp/2016/34-78102.pdf>.

³⁶⁸ In the Matter of the Application of Investors’ Exchange, LLC for Registration as a National Securities Exchange, Exchange Act Release No. 78101, File No. 10-222 77 (Jun. 17, 2016), *available at* <https://www.sec.gov/rules/other/2016/34-78101.pdf>.

³⁶⁹ *Id.*

³⁷⁰ See Letter from the Committee on Capital Markets Regulation to U.S. Securities and Exchange Commission Re: Notice of Proposed Interpretation Regarding Automated Quotations Under Regulation National Market System, dated as of April 14, 2016, *available at* <https://www.sec.gov/comments/s7-03-16/s70316-8.pdf>.

³⁷¹ See 17 C.F.R. § 242.611 (2005).

the NBBO were to malfunction, then the order protection rule could require a trading halt across all markets.³⁷²

1) Benefits of the Order Protection Rule

According to the SEC, the order protection rule has successfully reduced the frequency with which investors miss the best available prices.³⁷³ In February 2014, the trade-through rates for both NASDAQ and NYSE stocks were approximately 0.1% for number of trades and 0.2% for share volume.³⁷⁴ These figures reflect a more than 95% decline from pre-NMS trade-through rates,³⁷⁵ or a decline from \$320 million in annual costs from trade-throughs to just \$16 million.³⁷⁶ As described in detail in Chapter 1, liquidity has also increased since the order protection rule was implemented, as measured by lower spreads and more depth at the NBBO.³⁷⁷

2) Criticisms of the Order Protection Rule

Some critics have suggested that the order protection rule has contributed to the fragmentation of trading across many trading venues. These critics argue that the order protection rule does so by requiring market participants to route orders to

³⁷² See NYSE Rule 51(c); NASDAQ Rule 4120(a)(6); CTA Plan, Second Restatement of Plan Submitted to the Securities and Exchange Commission Pursuant to Rule 11Aa3-1 Under the Securities Exchange Act of 1934, 48 (Sept. 1, 2015), *available at* https://www.nyse.com/publicdocs/ctaplan/notifications/trader-update/CTA_Plan_Composite_as_of_September_1_2015.pdf; Joint Self-Regulatory Organization Plan Governing the Collection, Consolidation and Dissemination of Quotation and Transaction Information for NASDAQ-Listed Securities Traded on Exchanges on an Unlisted Trading Privileges Basis 5, *available at* http://www.utpplan.com/DOC/UTP_Plan.pdf.

³⁷³ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. AND EXCH. COMM'N 3 (Apr. 30, 2015) at 13-14, *available at* <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

³⁷⁴ *Id.*

³⁷⁵ *See id.*

³⁷⁶ *See id.*

³⁷⁷ *See supra* Chapter 1.

certain exchanges that they might otherwise choose to avoid.³⁷⁸ They also argue that the order protection rule may have done so by making it easier for new exchanges to enter the market and attract order flow.³⁷⁹ In particular, they suggest that the order protection rule may lower barriers to entry by allowing any exchange to display a protected quotation, regardless of its trading volume.³⁸⁰ In their view, fragmentation can be bad for investors because it enhances market complexity and therefore the opacity of today's markets.³⁸¹ Lastly, they argue that the costs of maintaining connectivity to exchanges with very little trading volume are significant and ultimately borne by investors.³⁸²

These critics also suggest that the fragmentation of the marketplace has contributed to the prevalence of HFT strategies, because market participants can use HFT strategies to engage in latency arbitrage across multiple trading venues.³⁸³ They argue that these HFT strategies profit at the expense of long-term investors. However, this criticism fails to note that HFT strategies are just as prevalent in markets that have a highly centralized structure. For example, approximately 50% of the trading volume in the highly centralized futures market also comes from HFT strategies.³⁸⁴

Furthermore, the contention that the order protection rule has caused market fragmentation is not well supported by the evidence. It is true that trading in NYSE stocks became increasingly fragmented after the introduction of the order protection rule.³⁸⁵ However, trading in NASDAQ stocks was highly fragmented before it was subject to the order protection rule and fragmentation in trading of

³⁷⁸ See Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. AND EXCH. COMM'N 15 (Apr. 30, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

³⁷⁹ *Id.* at 16.

³⁸⁰ *Id.*

³⁸¹ *Id.* at 15-17.

³⁸² *Id.*

³⁸³ See, e.g., Ananth Madhavan, Exchange-Traded Funds, Market Structure and the Flash Crash (BlackRock Working Paper, 2012).

³⁸⁴ See *id.*

³⁸⁵ See *supra* Chapter 1.

NASDAQ stocks did not materially increase after the rule was implemented.³⁸⁶ It is therefore more likely that the significant increase in fragmentation in trading of NYSE stocks has more to do with the elimination of the ITS Plan, which provided the NYSE floor traders with a structural trading advantage, than with the order protection rule encouraging fragmentation itself.

Other critics have suggested that the order protection rule places too heavy an emphasis on speed to the exclusion of other important factors, such as the *size* of a publicly displayed order.³⁸⁷ An emphasis on speed is indeed evident in the market structure—for example, exchanges currently implement a “price-time” priority, where the order that arrives first gets execution priority over other orders.³⁸⁸

However, the order protection rule does *not* require that exchanges prioritize speed over all other considerations. For example, suppose an exchange receives two orders at the NBBO. Order 1 arrives first in time, but Order 2 is much larger. The exchange may implement a system whereby Order 2 receives execution priority over Order 1. Indeed, NASDAQ has implemented such a trading system in the past.³⁸⁹ Therefore, concerns that the order protection rule has mandated competition by speed are unfounded. It is further notable that exchanges for futures, currencies, foreign stocks and other asset classes also choose to prioritize speed, despite the fact that these markets do not have an order protection rule.³⁹⁰

Finally, certain critics of the order protection rule have highlighted potential negative consequences of the rule’s strict price requirement. In particular, they argue that the goal of minimizing trading costs can actually be undermined by

³⁸⁶ See Concept Release on Equity Market Structure, Exchange Act Release No. 61358, 75 Fed. Reg. 3594, 3594 n.5 (proposed Jan. 21, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358fr.pdf>.

³⁸⁷ See, e.g., Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496 (Jun. 29, 2005), *available at* <https://www.sec.gov/rules/final/34-51808fr.pdf>.

³⁸⁸ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Rule 611 of Regulation NMS, U.S. SEC. AND EXCH. COMM’N 17-18 (Apr. 30, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

³⁸⁹ See *id.* at 18.

³⁹⁰ See *id.* at 18-19.

requiring execution at prices equal to or better than the NBBO. The theory behind this criticism is that a rule that mandates execution at the NBBO may be forcing investors to trade at exchanges that charge high fees. For example, exchanges charge access fees and market data fees, both of which are described in detail later in this Chapter. The costs of these fees are not reflected in a stock's price. As a result, although the order protection rule requires that investor orders be executed at the exchange with the best publicly displayed price, investors may actually receive a worse effective price once these fees are taken into account. These critics argue that eliminating the order protection rule would allow broker-dealers to avoid exchanges that charge high fees. The obvious counterargument to this position is that, without price protection, trade-through rates could increase and the increased cost associated with trade-throughs would more than offset any potential savings from avoiding exchange fees.

D. Achieving the Goals of the Order Protection Rule

The policy goals of the order protection rule could be better achieved through reforms to Reg NMS in three important respects. First, disclosure from broker-dealers and trading venues regarding execution quality and order routing should be improved. This will enhance competition among broker-dealers and trading venues, which should lower transaction costs for investors. Second, the SEC should implement the consolidated audit trail, so that regulators are better positioned to assess whether investors are receiving the best prices for their orders. Third, odd lot trades should be subject to the order protection rule. This could provide retail investors with better prices for their orders.

1) Broker-dealer and Trading Venue Disclosures

As described throughout this report, broker-dealers have a number of options for where to execute a customer's order. For this reason, and because neither the order protection rule nor the duty of best execution *guarantee* that an order will be executed at the venue with the best effective price, transparency and disclosure are critical to broker-dealer routing strategies.

For example, the order protection rule does not prevent a broker-dealer from routing an order to a trading center offering a quarter-cent of price improvement to

the NBBO instead of to another trading center that would have offered a half-cent of price improvement to the NBBO. While the duty of best execution would require broker-dealers to use best efforts to identify the trading center with the half-cent of price improvement, today's markets are highly complex and often opaque, and so broker-dealers would not always know that another venue could have offered more price improvement to the NBBO. It is therefore critical that the market be as transparent as possible, so broker-dealers can find the venues that would offer the most price improvement for their customers.

The SEC adopted the current disclosure regime for broker-dealers and trading venues in 2000. These requirements were then incorporated into Reg NMS as: (1) Rule 605,³⁹¹ which requires trading venues to make disclosures about execution quality; and (2) Rule 606,³⁹² which requires broker-dealers to make disclosures regarding their order handling practices. Neither Rule 605 nor Rule 606 currently requires routine order-by-order or customer-by-customer disclosures.

Rule 605 requires trading venues to prepare monthly reports that publicly disclose standardized information about the execution quality that they achieve for retail-size customer orders.³⁹³ Rule 606 requires broker-dealers to publicly disclose, on a quarterly basis, the identity of each trading venue to which they

³⁹¹ 17 C.F.R. § 242.605 (2005).

³⁹² 17 C.F.R. § 242.606 (2005).

³⁹³ 17 C.F.R. § 242.605 (2005). Execution quality reported under Rule 605 is supposed to be measured using the NBBO as disseminated by the SIP feeds. In emphasizing the required use of SIP-based NBBOs, the SEC staff has explained that benchmarking executions across market centers to the same reference points would further the important objective of generating “execution quality statistics that are comparable among different market centers.” A “national best bid and offer” or “NBBO” is specifically defined under Regulation NMS as the best bid and offer for an NMS security disseminated by a SIP pursuant to an NMS Plan. 17 C.F.R. § 242.600(b)(42) (2005). In a bulletin addressing FAQs concerning Rule 11Ac1-5 (the rule redesignated as Rule 605 by Regulation NMS), SEC staff emphasized that Rule 11Ac1-5 required the use of SIP-based NBBOs. SEC Division of Market Regulation, Staff Legal Bulletin No. 12R (Revised), *Frequently Asked Questions About Rule 11Ac1-5* Q. 21 (Jun. 22, 2001), available at <http://www.sec.gov/interps/legal/slbim12a.htm>. That bulletin continues to be operative for Rule 605. See SEC Division of Market Regulation, *Responses to Frequently Asked Questions Concerning Rule 605 of Regulation NMS* (Feb. 22, 2013), available at <http://www.sec.gov/divisions/marketreg/nmsfaq605.htm>.

route a significant percentage of retail-size customer orders, as well as the nature of their relationship with each trading venue (including any payment for order flow arrangements).³⁹⁴ Under Rule 606, broker-dealers must also disclose, at the request of a customer, the identities of each trading venue to which the broker routed that particular customer's order during the preceding six-month period.³⁹⁵ Figure 3.1 below summarizes the requirements of Rule 605 and Rule 606.

As described in Chapter 1, the equity market structure has become much faster and more complex in recent years. Broker-dealers have developed new and innovative order routing and execution strategies, and trading venue fragmentation has increased. However, the SEC's disclosure regime for broker-dealers and trading venues has remained largely unchanged. We believe that the disclosure regime should be modernized by, among other things, requiring retail brokerages to provide disclosure on execution quality for their customers and requiring broker-dealers to provide institutional customers with standardized reports that provide routing and execution quality statistics. We describe our recommended changes to the existing disclosure regime below.

Figure 3.1 Summary of SEC Rules 605 & 606³⁹⁶
See next pages.

³⁹⁴ 17 C.F.R. § 242.606 (2005).

³⁹⁵ *Id.*

³⁹⁶ *See* Disclosure of Order Execution and Routing Practices, 65 Fed. Reg. 75413, 75414 (Dec. 1, 2000).

Rule 605	
Entities Required to Submit	Exchanges, ATSS and broker-dealer internalizers.
Disclosure Requirements	<ul style="list-style-type: none"> • Requires monthly electronic report categorized by individual security, order type, and order size for securities that the trading venue executes. • Orders must be sub-categorized by type of order (including market, marketable limit, inside-the-quote limit, at-the-quote limit, and near-the-quote limit). The four required buckets for order size are 100-499, 500-1999, 2000-4999, and 5000 or more shares. • For each subcategory, 11 columns of information must be provided. First, the number of all orders received. The next four columns show the cumulative number of shares of (i) covered orders, (ii) covered orders canceled prior to execution, (iii) covered orders executed at the receiving market center, and (iv) covered orders executed at any other venue. In calculating these statistics, the time is defined as the time (to the second) an order was received by a market center for execution. The next five columns ask for the number of shares that were executed within specified periods of time after order receipt. The final column required for all types of orders is the average realized spread. The average realized spread is defined as the share-weighted average of realized spreads for executed orders and is calculated as double the difference between the execution price and the midpoint of the consolidated best bid and offer five minutes after the time of order execution. • An additional nine columns of information are required for subcategories of market orders and marketable limit orders. The first of these columns is the average effective spread (in contrast to the average "realized" spread discussed above). The average realized spread differs in timing from the average effective spread. The average realized spread is calculated five minutes after an order was received by a market center for execution while the average effective spread is calculated at the time (to the second) that an order was received for execution. • The final eight columns of information required for market and marketable limit orders divide the major determinants of execution quality that are summarized in the average effective spread. These orders are classified based on whether they were executed with price improvement, executed at the quote, or executed outside the quote.

Rule 606	
Entities Required to Submit	Broker-dealers that route orders on behalf of customers must release quarterly reports detailing their order routing practices. They are not required to do so for each institutional or retail customer.
Disclosure Requirements	<ul style="list-style-type: none"> • Requires quarterly reports divided into four sections for four different types of covered securities: (1) equity securities listed on the NYSE; (2) equity securities qualified for listing on NASDAQ; (3) equity securities listed on the Amex or any other national securities exchange; and (4) options. • For each of these four sections, requires broker-dealers to give a “quantitative description” of the aggregate nature of their order flow, which must include the percentage of total customer orders for a particular section that were non-directed orders, and the percentages of total non-directed orders for a section that were market orders, limit orders, and other orders. A non-directed order is defined as any order in which the customer did not specifically select a particular venue for execution. • Quantitative description must include the identity of the top ten trading venues used by the broker-dealer for execution. It must also include any venue to which 5% or more of non-directed orders were routed and executed. The broker-dealer must also disclose the percentage of total non-directed orders for the section routed to the venue, and the percentages of total non-directed market orders, non-directed limit orders, and non-directed other orders for the section that were routed to the venue. • A broker-dealer is also required to describe any payment for order flow arrangements.

a) *Disclosure Requirements for Retail Orders*

It is difficult for retail investors to determine the execution quality achieved by their retail brokerages. This is because Rule 605 execution quality statistics and Rule 606 order routing statistics appear in separate reports. We describe this problem with an example.

Suppose Retail Brokerage A routes all customer orders to Broker-dealer Internalizer 1. Retail Brokerage A's Rule 606 disclosures would tell the retail customer the percentage of the broker's total order flow sent to Broker-dealer Internalizer 1 and whether any payment for order flow arrangements exist. If a retail investor wanted to then determine the execution quality that his orders received, he would need to separately review the Rule 605 execution quality statistics of Broker-dealer Internalizer 1. However, Rule 605 does not require Broker-dealer Internalizer 1 to disclose execution quality metrics for *each* retail brokerage that routes orders to it. As a result, if Broker-dealer Internalizer 1 executes orders for multiple retail brokerages (which is very common),³⁹⁷ then the Rule 605 disclosures would not indicate the execution quality that applies specifically to the orders received from Retail Brokerage A. Therefore, under the current disclosure regime, it is difficult for a retail investor to determine the execution quality that his retail brokerage obtains for his orders.

To address this concern, we believe that each retail brokerage should produce a report that allows retail investors to determine the execution quality of their orders. This would require combining the retail brokerage's order routing statistics with the relevant measures of execution quality received at each venue to which the retail brokerage routes orders. It is important to note that, although the SEC recently proposed rule changes that would enhance retail order disclosures,

³⁹⁷ Memorandum from SEC Division of Trading and Markets to SEC Equity Market Structure Advisory Committee, Certain Issues Affecting Customers in the Current Equity Market Structure, U.S. SEC. & EXCH. COMM'N 6 (Jan. 26, 2016), *available at* <https://www.sec.gov/spotlight/equity-market-structure/issues-affecting-customers-emsac-012616.pdf>.

their proposal would not include this requirement.³⁹⁸ However, we believe that combining the reports in this manner is an important measure to provide retail investors with the information that they need to evaluate broker performance and the impact of payment for order flow arrangements. Such disclosures would likely enhance competition among retail brokerages over execution quality and even brokerage commissions. In addition, implementation costs for this change would be minor; retail brokerages would simply need to develop a uniform template that would be provided to all retail investors.

Specific Recommendation:

9. Retail brokerages should be required to provide disclosures regarding execution quality for their customers. Relevant disclosures should include percent of shares with price improvement, effective/quoted spread ratio, and average price improvement.

b) Disclosure Requirements for Institutional Orders

Currently, broker-dealers that route large institutional orders are not required to make routing or execution quality disclosures for these orders. This is because in 2000, when the disclosure regime was last overhauled, institutional order routing practices were highly idiosyncratic and statistical disclosures would not have been useful for understanding their effectiveness.³⁹⁹ Since 2000, the routing of institutional orders has dramatically changed. Today, institutional orders are executed by broker-dealer execution algorithms in a much more standardized process. These algorithms divide large institutional orders into many smaller orders and execute them across multiple venues, in an effort to minimize price impact and

³⁹⁸ See Disclosure of Order Handling Information, Exchange Act Release No. 78309, File No. S7-14-16 (Jul. 13, 2016), available at <https://www.sec.gov/rules/proposed/2016/34-78309.pdf>. See also Press Release, U.S. SEC. & EXCH. COMM'N, SEC Proposes Rules to Enhance Order Handling Information Available to Investors (Jul. 13, 2016), available at <https://www.sec.gov/news/pressrelease/2016-140.html>.

³⁹⁹ See SEC Division of Market Regulation, Market 2000: An Examination of Current Equity Market Developments, U.S. SEC. & EXCH. COMM'N II-14 (Jan. 1994), available at <https://www.sec.gov/divisions/marketreg/market2000.pdf>.

ultimately transaction costs for institutional investors.⁴⁰⁰ However, without access to execution quality statistics, it remains difficult for institutional investors to assess the effectiveness of their broker-dealers. Fortunately, modern institutional order routing practices make standardized execution quality disclosures easier to provide to investors. Indeed, many broker-dealers voluntarily provide institutional customers with execution quality statistics.⁴⁰¹ However, the nature and extent of the information provided varies among broker-dealers.⁴⁰²

To improve transparency and broker-dealer accountability with respect to the routing and execution of institutional orders, we recommend that the SEC require standardized disclosures regarding execution quality statistics, such as price improvement and price impact. These reports should include robust and comprehensible information regarding execution quality in a uniform format. Such disclosures should improve institutional investors' ability to assess and compare broker-dealers' performance in handling orders and achieving best execution. For example, an awareness of order routing practices can help investors evaluate the potential for harmful information leakage or conflicts of interest that their broker-dealers might face in handling orders. However, determining the appropriate amount of disclosure is a careful balancing act, because the broker-dealer order routing strategies themselves are proprietary. Excessive disclosures could hinder

⁴⁰⁰ SEC Division of Trading and Markets, Equity Market Structure Literature Review Part II: High Frequency Trading, U.S. SEC. & EXCH. COMM'N 5 (Mar. 18, 2014), *available at* https://www.sec.gov/marketstructure/research/hft_lit_review_march_2014.pdf.

⁴⁰¹ See FIF Voluntary Execution Quality Reporting, REGONE SOLUTIONS (Jun. 25, 2015), *available at* http://www.regonesolutions.com/regone/web/localdata/WEB/DATA/WEBSECTIONS\MATTA\CHMENT\SITE_947\FIF-Voluntary-Execution-eversion.pdf (noting “best practices initiative involving the industry” for providing execution quality data and providing a free template for the provision of such information); *see generally* Concept Release on Equity Market Structure, Exchange Act Release No. 61358, 75 Fed. Reg. 3594, 3599 (Jan. 21, 2010).

⁴⁰² BlackRock, SEC Comment Letter, RE: Equity Market Structure Recommendations; Concept Release on Equity Market Structure, File No. S7-02-10; Regulation Systems Compliance and Integrity, File No. S7-01-13; and Equity Market Structure Review (Sept. 12, 2014), *available at* <https://www.sec.gov/comments/s7-02-10/s70210-419.pdf> (discussing order routing and execution metrics and stating that “market participants are still capable of monitoring execution quality”).

broker-dealers' ability to offer the best strategies and compete with other brokers. Excessive disclosures could also be difficult for customers to interpret.

We therefore recommend that the SEC require broker-dealers to provide institutional customers with standardized reports that provide order routing and execution quality statistics, without disclosing specific order routing strategies. We note that representatives of buy-side and sell-side institutions have suggested a standardized template for institutional order routing disclosures by broker-dealers, and we support this template.⁴⁰³ We also note that the SEC proposed a rule on July 13, 2016 that, if adopted, would provide for substantial disclosure of routing and execution quality statistics, including midpoint price improvement data related to institutional orders, and we commend the SEC for its efforts to augment investors' access to this important information.⁴⁰⁴ However, the SEC proposal would not require the disclosure of measures of price impact, therefore our recommendation would go one step further than the SEC's proposal.

Specific Recommendation:

10. The SEC should require broker-dealers to provide institutional customers with standardized reports that provide order routing and execution quality statistics.

⁴⁰³ See Inv. Company Inst. et al., SEC Comment Letter, Re: Customer-Specific Order Routing Disclosures for Institutional Investors (Oct. 23, 2014), *available at* <https://www.sec.gov/comments/s7-02-10/s70210-428.pdf>.

⁴⁰⁴ See Disclosure of Order Handling Information, Exchange Act Release No. 78309, File No. S7-14-16 (Jul. 13, 2016), *available at* <https://www.sec.gov/rules/proposed/2016/34-78309.pdf>. See also Press Release, U.S. SEC. & EXCH. COMM'N, SEC Proposes Rules to Enhance Order Handling Information Available to Investors (Jul. 13, 2016), *available at* <https://www.sec.gov/news/pressrelease/2016-140.html>.

c) *Update and Standardize Execution Quality Statistics*

Rule 605 currently requires trading venues to disclose the speed of execution to the tenth of a second.⁴⁰⁵ This time increment is very slow relative to current prevailing order execution speeds, which are often in the microseconds (1 millionth of a second) for the most liquid stocks.⁴⁰⁶ The current increment therefore does not allow for meaningful speed comparison among trading venues. The speed of a trading venue is relevant to an investor's overall costs, because a slow trading venue could take so long to execute an order that investors could miss better priced limit orders sent to another trading venue during this delay. In this regard, faster execution speeds generally benefit investors.⁴⁰⁷

Disclosures that accurately reflect relative trading venue speeds would provide investors with a crucial piece of execution quality data, allowing them to better assess their broker-dealers' performance. In particular, investors would be better equipped to identify and hold their broker-dealers accountable for costly or inefficient routing practices. This information would also be directly valuable to broker-dealers, who would benefit from greater awareness of slow trading venues. Therefore, to enhance trading venue reporting, we recommend that the time increment used for their execution speed disclosures be changed to milliseconds. We note that our recommendation is consistent with but goes further than the SEC's July 13, 2016 proposal to require disclosure of the average time, in milliseconds, between order entry and execution or cancellation for liquidity providing institutional orders.⁴⁰⁸

⁴⁰⁵ 17 C.F.R. § 242.605 (2005); Plan Submitted To The Securities And Exchange Commission Pursuant To Rule 11ac1-5 Under The Securities Exchange Act Of 1934, 9, *available at* <https://www.nyse.com/publicdocs/nyse/regulation/nyse/Rule605Plan.pdf>.

⁴⁰⁶ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, 75 Fed. Reg. 3594, 3599 (proposed Jan. 21, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358fr.pdf>.

⁴⁰⁷ Of course, it should also be noted that the IEX trading platform is premised on a theory that intentionally slowing execution speeds can be beneficial to investors.

⁴⁰⁸ *See* Disclosure of Order Handling Information, Exchange Act Release No. 78309, File No. S7-14-16 (Jul. 13, 2016), *available at* <https://www.sec.gov/rules/proposed/2016/34-78309.pdf>. *See also* Press Release, U.S. SEC. & EXCH. COMM'N, SEC Proposes Rules to Enhance Order

Specific Recommendation:

11. Trading venue disclosures should include information about execution speeds to the millisecond.

Another issue with Rule 605 and Rule 606 is the lack of uniformity with which statistical information is presented. Although the rules identify specific data points that must be included in the reports, they provide some flexibility with respect to the *format* in which the data is presented. As a result, the presentation of the reports varies among broker-dealers and trading venues. For example, the tables showing statistical information on the Rule 606 reports filed by Vanguard and E*TRADE are different.⁴⁰⁹ If the SEC provided a template for the table into which brokerages could simply insert their data, customers would be better equipped to undertake a straightforward data comparison across firms and use these reports to understand and compare the performance of trading venues and broker-dealers.

We recommend that a standardized format for statistical information be adopted for Rule 605 and 606 reports, and for our other recommendations for new retail and institutional order disclosures. We expect that implementation and compliance costs to simply re-format reports that are already produced would be marginal. We note that, on July 13, 2016, the SEC proposed a rule that would subject disclosures regarding retail and institutional orders to certain standardized formatting requirements. The spirit of this proposal is generally consistent with our recommendation and we appreciate the SEC's work to improve and standardize investor disclosures.⁴¹⁰

Handling Information Available to Investors (Jul. 13, 2016), *available at* <https://www.sec.gov/news/pressrelease/2016-140.html>; 17 C.F.R. § 242.606(b)(iii)(C).

⁴⁰⁹ See Vanguard, *SEC Rule 606 Reports - Vanguard Brokerage Services* (2016), *available at* <https://vrs.vista-one-solutions.com/sec606rule.aspx>; E*TRADE, *E*TRADE Disclosure: 1Q2016* (2016), *available at* <https://content.etrade.com/etrade/powerpage/pdf/OrderRouting11AC6.pdf>.

⁴¹⁰ See Disclosure of Order Handling Information, Exchange Act Release No. 78309, File No. S7-14-16 (Jul. 13, 2016), *available at* <https://www.sec.gov/rules/proposed/2016/34-78309.pdf>. See also Press Release, U.S. SEC. & EXCH. COMM'N, SEC Proposes Rules to Enhance Order

Specific Recommendation:

12. Statistical information for disclosures pursuant to Rule 605 and Rule 606 and disclosures regarding institutional orders should be submitted in only one format to facilitate comparison across trading venues and among broker-dealers.

2) Market Surveillance

The ability of the SEC and FINRA to determine whether investors are obtaining the best prices for their orders is limited by their own surveillance capabilities. In particular, regulators could better perform a number of their key responsibilities if they were able to accurately track investor orders from their inception at a broker-dealer to execution on a trading venue. Enhanced surveillance capabilities would also help regulators to identify and prevent market manipulation or identify the causes of “flash crashes,” as described further in Chapter 4. Investors could in turn benefit from this improved regulatory efficiency via reduced transaction costs and the more general assurance that the equity markets are working in their favor. In this section, we will describe recent efforts to enhance those capabilities.

a) *Consolidated Audit Trail*

In July 2012, the SEC adopted Rule 613,⁴¹¹ which requires the exchanges and FINRA (i.e., the SROs) to develop an NMS Plan⁴¹² to formally establish and implement the Consolidated Audit Trail (“CAT”).⁴¹³ The NMS Plan was initially

Handling Information Available to Investors (Jul. 13, 2016), *available at* <https://www.sec.gov/news/pressrelease/2016-140.html>.

⁴¹¹ Consolidated Audit Trail, 77 Fed. Reg. 45722 (Aug. 1, 2012).

⁴¹² For a detailed explanation of SROs and national market system (“NMS”) plans, *see supra* Chapter 2.

⁴¹³ Cat NMS, LLC, Limited Liability Company Agreement (Draft) 1 (Sept. 30, 2014), *available at* <http://www.sec.gov/divisions/marketreg/cat-nms-agreement.pdf>.

submitted to the SEC on September 30, 2014.⁴¹⁴ On April 27, 2016, the SEC voted to publish an amended version of the plan for public comment; the comment period expired 60 days thereafter.⁴¹⁵

The CAT is intended to serve as both a consolidated order tracking system and an information repository for the SEC, allowing regulators to track a trade's order and quote specifications across trading venues, including the identities of the involved broker-dealers and customer account holders.⁴¹⁶ Orders and trades on exchanges and ATSS, as well orders executed via broker-dealer internalization, will be subject to the CAT data collection process, with an estimated 2,000 firms and 19 SROs reporting to the CAT.⁴¹⁷ The CAT will provide the full routing history for all orders, including cancelled orders.

The SEC has stated that it will use the CAT data for investigations of securities law violations; to “inform its priorities” when examining exchanges, ATSS, broker-dealers and investment advisers; to supplement data obtained during those examinations; to determine the scope and nature of any potential misconduct the examinations identify; to identify patterns of trading that could pose risks to the securities market; to perform market reconstructions; and to inform regulatory initiatives.⁴¹⁸ The SEC has also stated that this capability is important for evaluating whether broker-dealer best execution practices were followed,⁴¹⁹ and whether certain high-speed traders are engaged in manipulative trading practices.

⁴¹⁴ *Id.*

⁴¹⁵ Press Release, U.S. SEC. & EXCH. COMM'N, SEC Seeks Public Comment on Plan to Create A Consolidated Audit Trail (Apr. 27, 2016), *available at* <http://www.sec.gov/news/pressrelease/2016-77.html>.

⁴¹⁶ U.S. SEC. & EXCH. COMM'N, Rule 613 (Consolidated Audit Trail) (Oct. 2014), *available at* <http://www.sec.gov/divisions/marketreg/rule613-info.htm>; *SEC Adopts Consolidated Audit Trail*, SIDLEY AUSTIN LLP 1 (Jul. 18, 2012), *available at* <http://www.sidley.com/en-US/SEC-Adopts-Consolidated-Audit-Trail-07-18-2012/>.

⁴¹⁷ Summary of the Consolidated Audit Trail Initiative (May 2015), *available at* <http://www.catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p571933.pdf>.

⁴¹⁸ Consolidated Audit Trail, 77 Fed. Reg. 45722 (Aug. 1, 2012).

⁴¹⁹ *Id.* at 45763.

The CAT is thus intended to address drawbacks of current trading data collection, including its fragmented nature, incompleteness, lack of timeliness, identification issues, and inconsistency in formats and content across sources.⁴²⁰ Most notably, the CAT will require the exchanges, FINRA, and broker-dealers (including both ATs and broker-dealer internalizers)⁴²¹ to abide by the same process when creating timestamps of each order (e.g., the date and time the order was “originated or received, routed out, and received upon being routed, modified, cancelled, and executed”).⁴²² In particular, the CAT timestamp plan would ensure that transactions are timestamped at the same millisecond increment level. Such standardization avoids the problems that persist with the current regime, where timestamp accuracy varies depending on whether the trading venue or broker-dealer uses increment measurements that are greater than a millisecond.⁴²³

According to information published by the SROs, the CAT will handle 58 billion records daily that cover over 100 million customer accounts.⁴²⁴ Importantly, Rule 613 requires that CAT trade data only be made available to the SEC and SROs regulatory staff, so the CAT can serve its intended purpose of enhancing regulatory surveillance without compromising market participants’ confidential information.⁴²⁵ Certain companies have bid for the right to build the audit trail, and the SROs have narrowed their choice to three bidders: FINRA, Thesys Technologies, and SunGard.⁴²⁶

⁴²⁰ *Id.* at 45722.

⁴²¹ Specifically, the requirement applies to “each national securities exchange, national securities association, and member of such exchange or association.” Transactions executed on ATs and by broker-dealer internalizers will be included in the timestamp requirement, because they are members of FINRA and/or registered exchanges.

⁴²² *Id.* at 45761.

⁴²³ *Id.* at 45762.

⁴²⁴ Summary of the Consolidated Audit Trail Initiative (May 2015), *available at* <http://www.catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p571933.pdf>.

⁴²⁵ Consolidated Audit Trail, 77 Fed. Reg. 45722, 45782 (Aug. 1, 2012). *See also* 17 C.F.R. § 242.613(e)(4) (2012).

⁴²⁶ Dave Michaels, *SEC Proposes Design of New Audit System to Better Catch Market Manipulation*, WALL ST. J. (Apr. 27, 2016), *available at* <http://www.wsj.com/articles/sec-proposes-design-of-new-audit-system-to-better-catch-market-manipulation-1461771646?cb=logged0.8366285158622173>. Notably, FINRA is teaming with Amazon Web

i. *Concerns with the CAT*

The CAT has the potential to substantially enhance regulatory oversight of the securities markets, but it is important to objectively recognize the practical issues associated with its design and implementation. For example, there will be a number of redundancies between the CAT and existing systems when the mechanism is first implemented.⁴²⁷ Although some degree of overlap will be necessary for regulators to maintain uninterrupted access to necessary surveillance data, excessive redundancies will be costly, inefficient, and potentially confusing for regulators. Minimizing these redundancies should therefore be a priority in resolving the final details of CAT implementation.

Another key concern is the potential incompleteness of CAT data due to its exclusion of equity derivative products, particularly futures. The CAT as presently designed does not cover these products, although the NMS Plan does not prohibit their potential inclusion. As explained in Chapter 4, there are significant interconnections between the equity markets and futures markets. As a result, a market event in the equity markets is likely to be transmitted to the futures market, and vice versa. Furthermore, the bad actors that are the targets of surveillance efforts are likely to trade in equities and equity derivatives. Ultimately, the connections between these markets necessitate a holistic approach to oversight: and we believe that a longer term goal could be the integration of futures and other derivative products into CAT data.

ii. *Cost of the CAT*

The CAT has been and will continue to be an extraordinarily costly regulatory project. The SEC has most recently projected that the one-time total cost

Services in pursuit of the project, while SunGard is similarly teaming with Google. *See* Bob Pisani, *It's Google vs. Amazon to create the biggest database in history*, CNBC (Apr. 27, 2016), available at <http://www.cnbc.com/2016/04/26/its-google-vs-amazon-to-create-the-biggest-data-base-in-history.html>.

⁴²⁷ *See* Notice of Filing of the National Market System Plan Governing the Consolidated Audit Trail, Exchange Act Release No. 77724, Appendix C, 93 (Apr. 27, 2016).

to build the CAT could be up to \$100 million and that industry reporting costs will be approximately \$1.7 billion annually.⁴²⁸ The SEC estimates that broker-dealers alone will incur approximately \$2 billion in initial implementation costs and \$1.5 billion in ongoing annual reporting costs.⁴²⁹ A 2015 industry presentation estimates aggregate ongoing costs for the industry in the range of \$2.8 billion to \$3.4 billion annually.⁴³⁰

By the SEC's own estimate, broker-dealers will shoulder the lion's share of the CAT costs—exchange costs are projected to be less than 1/10th of broker-dealers' costs.⁴³¹ The unbalanced cost allocation is noteworthy for two main reasons. First, the CAT is being developed as an NMS Plan, which means that the exchanges and FINRA have significantly greater control over all facets of the CAT's evolution than do broker-dealers.⁴³² The CAT thus represents another crucial component of the market structure over which the exchanges have disproportionate control relative to other major market participants, such as investors and broker-dealers. Broker-dealers' relative cost burden may indeed be a consequence of their limited role in NMS Plan development.

Second, there has been inadequate analysis of the implications for *investors* of the costs that broker-dealers will incur. Indeed, the SEC's economic analysis did not determine whether any of the \$2 billion in implementation costs and \$1.5 billion in annual reporting costs for broker-dealers was likely to be passed on to investors.⁴³³ Because the ultimate goal of the CAT is to serve the investing

⁴²⁸ Notice of Filing of the National Market System Plan Governing the Consolidated Audit Trail, Exchange Act Release No. 77724, 404-409 (Apr. 27, 2016).

⁴²⁹ Notice of Filing of the National Market System Plan Governing the Consolidated Audit Trail, Exchange Act Release No. 77724, Appendix A, Consolidated Audit Trail National Market System Plan Request for Proposal, 470 (Apr. 27, 2016).

⁴³⁰ Nicole Bullock, *The Long and Winding Road Towards An Audit Trail*, FINANCIAL TIMES (Oct. 13, 2005), available at <http://www.ft.com/intl/cms/s/0/7bbb8580-638c-11e5-9846-de406ccb37f2.html#axzz3pgS5g3xV>.

⁴³¹ Notice of Filing of the National Market System Plan Governing the Consolidated Audit Trail, Exchange Act Release No. 77724, Appendix A, Consolidated Audit Trail National Market System Plan Request for Proposal, 470 (Apr. 27, 2016).

⁴³² For a detailed discussion of NMS Plans and the associated process, see *supra* Chapter 2.

⁴³³ Notice of Filing of the National Market System Plan Governing the Consolidated Audit Trail, Exchange Act Release No. 77724, 478-479 (Apr. 27, 2016).

community, the potential costs that investors will incur in its implementation are highly relevant to its success. Before finalizing the CAT, it is vital that the SEC evaluate such potential costs head-on, to confirm that the CAT will be implemented efficiently and that costs are appropriately allocated among stakeholders.

Specific Recommendation:

13. The SEC’s cost benefit analysis for the Consolidated Audit Trail did not determine whether the \$2 billion in implementation costs and \$1.5 billion in annual reporting costs for broker-dealers would be passed on to investors. Prior to finalizing the CAT, the SEC should conduct a *publicly available* analysis that evaluates the costs and benefits of the CAT, and applies the cost benefit analysis to ensure that the CAT is implemented efficiently, with costs allocated appropriately amongst the stakeholders.

3) Odd Lots

Odd lots are trades for less than the standard trading unit of 100 shares (“round lots”) and are exempt from the order protection rule.⁴³⁴ Odd lot transactions have increased from 5.5% of share volume in 2005 to an average of 22.3% of share volume in 2015.⁴³⁵

The distinct regulatory treatment of odd lot transactions was initially established because odd lots traded on a separate market. The discrete odd lot market was created in an effort to provide an inexpensive and efficient order execution system compatible with the traditional odd lot investing practices of

⁴³⁴ *Responses to Frequently Asked Questions Concerning Rule 611 and Rule 610 of Regulation NMS*, U.S. SEC. & EXCH. COMM’N (2008), available at <http://www.sec.gov/divisions/marketreg/nmsfaq610-11.htm>.

⁴³⁵ *U.S. Stocks Odd Lot Rate (%)*, U.S. SECURITIES & EXCH. COMM’N, available at http://www.sec.gov/marketstructure/datavis/ma_stocks_oddlotrate.html#.ViVXI2SrRT5 (last accessed Mar. 8, 2016). Percent represents average rates (averaging across markets) for single stocks.

small, retail customers.⁴³⁶ However, this divergent structure has shifted over time. All orders now trade on the same electronic books and exchange systems treat odd lots the same as round lots for the purposes of ranking and execution.⁴³⁷ Specific pricing for odd lots has been discontinued and exchanges have removed the “Odd Lot Dealer” concept.⁴³⁸ Consequently, the theoretical underpinnings of subjecting odd lots to a separate regime are no longer applicable.

Today, odd lot trades receive less protection against being executed at inferior prices (trade-throughs), because they are not subject to the order protection rule. This creates an investor protection issue that especially impacts retail investors, who place the vast majority of odd lot orders.⁴³⁹ Moreover, due to high share prices these odd lot orders can often be for significant sums from the perspective of the retail investor. For example, class A common stock in Alphabet Inc. (the parent company of Google), trades on NASDAQ under the ticker symbol GOOGL at a price of over \$700 per share.⁴⁴⁰ An investor who places a 50 share GOOGL order is therefore investing over \$35,000, but because he is placing an odd lot order, he is not protected by the order protection rule.⁴⁴¹

Furthermore, because odd lot orders are exempt from the order protection rule, they are not included as part of the NBBO. Their exclusion can reduce the accuracy of stock prices, because a substantial portion of the supply and demand for that stock is not included in the best publicly available price.⁴⁴² This concern is particularly pronounced for higher priced stocks, as odd lots represent a high percentage of trades in these stocks. For example, an analysis of Google stock in

⁴³⁶ *Odd Lot Order Requirements Memo 07-60*, N.Y. STOCK EXCH. 1 (Jun. 29, 2007), available at <https://gset.gs.com/cgi-bin/upload.dll/file.pdf?z02a80f0azaa6bae9875d842378624f0ba3831d397>.

⁴³⁷ *U.S. Equity Market Structure: An Investor Perspective*, BLACKROCK 4 (Apr. 2014), available at <https://www.blackrock.com/corporate/en-au/literature/whitepaper/viewpoint-us-equity-market-structure-april-2014.pdf>.

⁴³⁸ *Id.*

⁴³⁹ CREDIT SUISSE, *Odd Lot (Ab)users 2* (Feb. 12, 2014).

⁴⁴⁰ Quote available at <http://www.nasdaq.com/symbol/googl>.

⁴⁴¹ BLACKROCK, *supra* note 437.

⁴⁴² *See id.* at 4.

Q3 2013 indicated that almost 60% of Google trades were odd lot executions, constituting over 25% of the stock's share volume.⁴⁴³

Given that odd lot trades occur more frequently among higher priced stocks and that the significance of trade size for retail investors is measured by the total cost to the investor rather than the number of shares, we recommend redefining odd lots according to dollar amount spent by an investor, instead of the 100 share standard. Specifically, we propose that an odd lot dollar value threshold be set, and that trades for more than that amount be made subject to the order protection rule. For example, while it might not be efficient to extend the order protection rule to a trade for 25 shares of a stock trading around \$1.00, it likely would be efficient to extend this rule to a similarly-sized trade for GOOGL, which would represent a roughly \$18,000 investment. This moderate reform would likely improve execution quality for investors at minimal cost.

Redefining odd lots would also improve the accuracy of important market quality metrics. For example, scholars have found that odd lot transactions engender exclusion bias, whereby measures of order imbalance (i.e., the mismatch between the number of buy and sell orders for a particular security) and investor sentiment (i.e., the mindset of the market based on price movements) are misstated as a result of odd lots not being reported.⁴⁴⁴ Order imbalance and investor sentiment are consistently used to construct key macro market measurements such as “stock returns,” “momentum,” and “market inefficiencies.” Redefining odd lots would therefore improve the accuracy of these macro measurements, which are used to assess overall market developments and trends.

⁴⁴³ *Id.* at 4.

⁴⁴⁴ Maureen O'Hara et al., *What's Not There: The Odd-Lot Bias in TAQ Data*, Johnson School Research Paper Series No. 31-2011, Midwest Finance Association 2012 Annual Meetings Paper, 1 (2011, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1892972).

Specific Recommendation:

14. The SEC should pass a rule applying the order protection rule to odd lot transactions above a threshold dollar amount, instead of a threshold share amount.

Part II: The Access Rule

The order protection rule and the duty of best execution would be ineffective if broker-dealers were unable to *access* trading venues for their customers in a fair and efficient manner. Rule 610 of Reg NMS sets forth the rules by which market participants may access trading venues. It is based on an approach whereby broker-dealers establish private linkages to trading venues in order to route customer orders across the national marketplace.⁴⁴⁵ Broker-dealers actively monitor liquidity at many different venues and use algorithmic order routing strategies to quickly and efficiently route investor orders to venues with liquidity.

Sophisticated market participants can also obtain “sponsored” access, whereby they use a broker-dealer’s identification to obtain direct access to exchanges and other trading venues.⁴⁴⁶ According to the SEC, sponsored access accounted for 50 percent of overall average daily trading volume in the U.S. equities market in 2010.⁴⁴⁷ Although the terms of sponsored access are privately negotiated between broker-dealers and market participants, Rule 15c3-5 imposes certain minimum standards on these arrangements.⁴⁴⁸ For example, broker-dealers may only provide a market participant with sponsored access if the broker-dealer has established reasonable credit and capital thresholds.⁴⁴⁹ The broker-dealer must also maintain risk management controls and supervisory procedures for the market

⁴⁴⁵ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-12-98 27-28 (Jan. 14, 2010), *available at* <https://www.sec.gov/rules/concept/2010/34-61358.pdf>.

⁴⁴⁶ Risk Management Controls for Brokers or Dealers with Market Access, Exchange Act Release No. 63241, File No. S7-03-10 (Nov. 3, 2010), *available at* <https://www.sec.gov/rules/final/2010/34-63241.pdf>; 17 C.F.R. § 240.15c3-5 (2010).

⁴⁴⁷ *Id.*

⁴⁴⁸ *Id.*

⁴⁴⁹ *See* 17 C.F.R. § 240.15c3-5 (2010).

participant.⁴⁵⁰ These standards are intended to mitigate the risk that a market participant with sponsored access could cause solvency concerns for the broker-dealer or volatility in the markets.⁴⁵¹

A. Access Fees

Trading venues have the authority to impose “access fees” on market participants that execute trades on their platforms.⁴⁵² Importantly, these access fees are not included as part of the publicly displayed price and there is a risk that high access fees could decrease the accuracy of publicly displayed prices and increase transaction costs for investors. In order to mitigate this risk, the SEC implemented an access fee cap of 30 cents/100 shares for publicly displayed orders in Rule 610 of Reg NMS.⁴⁵³ The 30 cent cap was chosen because it was consistent with prevailing access fees charged at the time of Reg NMS’s adoption.⁴⁵⁴

Although ATSS generally do not disclose their fees and they often vary depending on the market participant, in practice we estimate that they typically charge access fees of between 5-10 cents/100 shares. Broker-dealer internalizers often *pay* to attract order flow, and generally do not charge access fees. However, exchanges generally use a pricing system referred to as “maker-taker,” whereby they charge certain market participants the regulatory maximum fee of 30 cents/100 shares. We describe this pricing system below.

⁴⁵⁰ *Id.*

⁴⁵¹ Risk Management Controls for Brokers or Dealers with Market Access, Exchange Act Release No. 63241, File No. S7-03-10 94-97 (Nov. 3, 2010), *available at* <https://www.sec.gov/rules/final/2010/34-63241.pdf>.

⁴⁵² *See* Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Maker-Taker Fees on Equities Exchanges, U.S. SEC. & EXCH. COMM’N 29 (Oct. 25, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf>.

⁴⁵³ *See id.*

⁴⁵⁴ *See id.*; *see also* Larry Harris, *Maker-Taker Pricing Effects on Market Quotations*, USC MARSHALL SCHOOL OF BUSINESS 5 (Nov. 14, 2013), *available at* <http://bschool.huji.ac.il/.upload/hujibusiness/Maker-taker.pdf>.

B. Maker-Taker Pricing System

Exchanges use the maker-taker pricing system to increase liquidity at the exchange, because the more liquidity that an exchange has in a certain stock, the more likely it is that the exchange can execute a trade in that stock. Of course, exchange earnings depend on trading volumes. So, exchanges pay market participants to encourage them to provide liquidity to the exchange and fund these payments by charging access fees to the market participants that “take” liquidity from the exchange.⁴⁵⁵ The access fees charged by exchanges are typically close to the 30 cent maximum and the rebates paid to liquidity providers are close to 20 cents.⁴⁵⁶ Exchanges earn the difference between the access fees and the rebates. A minority of exchanges use the “taker-maker” pricing system, which is the opposite of “maker-taker” (i.e., liquidity “makers” pay a fee and liquidity “takers” receive a rebate).⁴⁵⁷

⁴⁵⁵ For example, a “maker” sends a limit order to the venue, thus adding liquidity to the order book. The “taker” sends a market order to the venue that executes against the standing limit order, thus removing liquidity from the order book.

⁴⁵⁶ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, Maker-Taker Fees on Equities Exchanges, U.S. SEC. & EXCH. COMM’N 29 (Oct. 25, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf>.

⁴⁵⁷ *See infra* Figure 3.2.

Figure 3.2: Maker-Taker and Taker-Maker Arrangements⁴⁵⁸

Exchange	Take Fee (Take Rebate) ⁴⁵⁹	Make Fee (Make Rebate) \$ per 100 shares
	\$ per 100 shares	
BATS Z	0.30	(0.20)
BATS X	(0.15)	0.18
EDGE X	0.29	(0.20)
EDGE A	0.30	0.05
NASDAQ	0.30	(0.21)
NASDAQ BX	(0.06)	0.20
NYSE Arca	0.30	(0.20)
NYSE	0.27	(0.14)

In theory, the maker-taker pricing system should be effective at increasing liquidity at an exchange, because liquidity providers can profit from liquidity rebates and so they are incentivized to send orders to an exchange. By encouraging the public display of liquidity, the maker-taker pricing system can also lower bid-ask spreads for stocks and transaction costs for investors. Liquidity rebates also allow exchanges to compensate liquidity providers for the *signaling risk* that they incur when publicly displaying an order. Signaling risk is particularly significant on exchanges because all other market participants can see publicly displayed orders. On ATs and broker-dealer internalizers, signaling risk is lower because orders are typically not displayed to all market participants.

1) Criticisms of the Maker-Taker Pricing System

Although the maker-taker pricing system can incentivize the public display of liquidity, high access fees can have other less desirable side effects on market quality. First, the maker-taker pricing system can contribute to market

⁴⁵⁸ *Stocks, ETFs and Warrants – Tiered Pricing Structure*, INTERACTIVE BROKERS, available at <https://www.interactivebrokers.com/en/index.php?f=commission&p=stocks2>. Pricing can also vary by order type, share price, and volume tiers. We selected pricing arrangement for common displayed orders for shares with prices above \$1.00 (last accessed Jul. 15, 2016).

⁴⁵⁹ A negative take fee is essentially a take rebate; a negative make fee is essentially a make rebate.

complexity by producing a growth in order types.⁴⁶⁰ Second, high exchange access fees may interfere with the public display of orders by discouraging market participants from trading on exchanges.⁴⁶¹

a) *Market Complexity*

Order types have grown in number and complexity over the past decade, as set forth in detail in Figure 3.3. Maker-taker pricing has played a role in this recent proliferation, as order types often determine whether a market participant captures a liquidity rebate or pays an access fee.⁴⁶² For example, NASDAQ's "post only" orders are designed to execute only when the market participant would be deemed a liquidity provider (i.e. a maker) and therefore earn the liquidity rebate and not incur an access fee.⁴⁶³ Other exchanges have implemented similar order types that are designed to help traders avoid execution when doing so would incur an access fee.⁴⁶⁴

Our review of exchange rulebooks illustrates the explosion in order types. Exchange rules describing orders and their execution are now almost twice the length of Reg NMS itself.⁴⁶⁵ NYSE increased its order rule amendment rate by a factor of seven after the introduction of Reg NMS and Figure 3.3 shows that the rate of order type creation does not appear to have abated in recent years.⁴⁶⁶

⁴⁶⁰ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, *Maker-Taker Fees on Equities Exchanges*, U.S. SEC. & EXCH. COMM'N 21-27 (Oct. 25, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf>.

⁴⁶¹ *See id.* at 11-13 (discussing the increase in off-exchange trading and the role of rebates as the exchanges' primary tool to compete with off-exchange venues).

⁴⁶² *Id.* at 22-24.

⁴⁶³ *Id.*

⁴⁶⁴ *See, e.g.*, BATS Rule 11.9(c)(6) (BZX Post Only Order), *available at* http://cdn.batstrading.com/resources/regulation/rule_book/BATS_Exchange_Rulebook.pdf (describing a post-only order type similar to the NASDAQ post-only. BATS also offers a partial post-only limit order).

⁴⁶⁵ *See, e.g.*, Notice of Filing of Proposed Rule Change to Amend NYSE Arca Equities Rules 7.31, 7.32, 7.37, and 7.38 in Order to Comprehensively Update Rules Related to the Exchange's Order Types and Modifiers, Exchange Act Release No. 70637 (Oct. 9, 2013), *available at* <https://www.sec.gov/rules/sro/nysearca/2013/34-70637.pdf>.

⁴⁶⁶ *Id.*

Moreover, exchanges offer “optional attributes” and “modifiers” that multiply the effective number of order types. The number of permutations for interactions between order types and modifiers is virtually impossible to measure and can be difficult for broker-dealers to manage.

*Figure 3.3: Order Types Are Numerous, Complex, and Frequently Changing*⁴⁶⁷

Exchange	Order Types	Modifiers	Type X Modifier	Amendment per year Pre-NMS	Amendment per year Post-NMS	Length Compared to Reg NMS
BATS	33	6	198	---	5.1	181%
NASDAQ	13	13	169	---	11.1	479%
NYSE	13	7	91	0.5	7.9	154%
NYSE Arca	29	15	435	4.3	5.9	138%
Average	25	10.3	223	2.4	7.5	238%

Figure 3.3: The Pre-NMS period ends the last day before Reg NMS’s effective date of August 29, 2005. Results do not change qualitatively after excluding the NMS implementation period. Length compares word count of exchange’s order/modifier and execution rules to word count of core Reg NMS rules: Order Protection Rule (611); Access Rule (610); Sub-Penny Rule (612); Market Data Rules (601-603).

While innovative responses to competition are generally a sign of a healthy market, these order types add to market complexity and can reduce transparency for investors. Order types essentially allocate fees among market participants rather than reducing transaction costs overall. Indeed, the complexity that they create arguably increases costs to the system. For example, broker-dealers acting on behalf of institutional investors may need to invest resources in studying new order types and employing strategies to minimize access fees. Additionally, exchanges expend resources to design and implement new order types. In some regards, these complex and constantly changing order types therefore seem to run counter to the

⁴⁶⁷ CCMR staff analysis of NYSE Rules 13 and 1000-1004; NYSE Arca Rules 7.31 and 7.35; NASDAQ Rules 4702-4703 and 7018; and BATS Rules 11.9 and 11.13, as of June 2016.

Exchange Act objective of ensuring the “economically efficient execution of securities transactions.”⁴⁶⁸

The access fees and liquidity rebates themselves are also regularly updated. This includes pricing changes for particular market participants based on the volume that those market participants trade on an exchange. Volume-based pricing changes are often determined according to multiple “tiers” and these tiers are based on volume measured over a calendar month.⁴⁶⁹ Numerous volume tiers may add further uncertainty and complexity to the marketplace, as market participants must update their routing tables to accommodate pricing changes.⁴⁷⁰ The complexity of order types and maker-taker pricing schedules also makes it difficult for exchanges to meet their Exchange Act obligation to clearly describe their rules and proposed rule changes in public filings. This issue has been the subject of recent enforcement actions that certain exchanges have settled with the SEC.⁴⁷¹

b) *High Exchange Access Fees and Dark Trading*

Another concern with the maker-taker pricing system is that high access fees may actually be discouraging the public display of orders. This is because liquidity “takers” (such as institutional and retail investors) must pay high access fees to trade on an exchange, and so broker-dealers executing orders for liquidity takers may opt to execute customer orders internally or at an ATS to avoid exchange fees. Indeed, in recent years, exchanges have lost substantial trading volume to ATSs and broker-dealer internalizers. For example, off-exchange execution of NYSE

⁴⁶⁸ 15 U.S.C. § 78k-1(a)(1)(C) (2012).

⁴⁶⁹ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, *Maker-Taker Fees on Equities Exchanges*, U.S. SEC. & EXCH. COMM’N 28 n.118 (Oct. 25, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf>.

⁴⁷⁰ See *id.*

⁴⁷¹ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, *Maker-Taker Fees on Equities Exchanges*, U.S. SEC. & EXCH. COMM’N 26 (Oct. 25, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf>.

stocks increased from 13% in 2005 to 35% in 2014.⁴⁷² Similarly, off-exchange execution of NASDAQ stocks increased from 29% in 2005 to 39% in 2014.⁴⁷³

It is clear from the fact that exchanges are charging the regulatory maximum in access fees that they have not sought to compete with ATSS or broker-dealer internalizers by lowering the fees that they charge liquidity takers. We believe that the reason exchanges have failed to reduce access fees is that doing so could make an exchange less competitive vis-à-vis other exchanges. This is because if an exchange were to decrease access fees, it would need to concurrently reduce rebates (which are funded by access fees). A reduction in rebates could drive liquidity suppliers away from that exchange and encourage them to instead post those orders at another exchange, where rebates are higher. Thus, if an exchange were to compete with ATSS and broker-dealer internalizers by lowering access fees, it would likely lose market share in publicly displayed orders to other exchanges.

The NASDAQ's recent pilot program to reduce certain access fees and rebates is illustrative.⁴⁷⁴ The program lowered fees and rebates for 14 highly liquid stocks.⁴⁷⁵ As one might expect, NASDAQ was observed to have lost market share

⁴⁷² Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, *Maker-Taker Fees on Equities Exchanges*, U.S. SEC. & EXCH. COMM'N 11-12 (Oct. 25, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf>.

⁴⁷³ Although much of this loss in order flow may relate to higher relative access fees at exchanges, it is important to also note that exchanges cannot provide exclusive access to select market participants like ATSS or broker-dealer internalizers. Thus, for investors who are most concerned with controlling who is on the other side of their trades, trading via an ATS or broker-dealer internalizer in the dark is often preferable to trading on an exchange regardless of whether the access fee is lower on an exchange.

⁴⁷⁴ Luis A. Aguilar, Commissioner, U.S. SEC. & EXCH. COMM'N, *Public Statement, U.S. Equity Market Structure: Making Our Markets Work Better for Investors* (May 11, 2015) (quoting Exchange Act Release No. 73967), *available at* <https://www.sec.gov/news/statement/us-equity-market-structure.html>.

⁴⁷⁵ *Id.*; see John McCrank, *Nasdaq names 14 stocks to test lower fee and rebate program*, Reuters (Nov. 17, 2014), *available at* <http://www.reuters.com/article/2014/11/17/nasdaq-omx-fees-idUSL2N0T71GG20141117>.

to other exchanges.⁴⁷⁶ The maker-taker pricing system therefore appears to create a first-mover disadvantage that deters exchanges from reducing access fees. Indeed, several exchange representatives have expressed a desire to reduce access fees, but a practical inability to do so.⁴⁷⁷

C. Reducing the Access Fee Cap

The existing 30 cent access fee cap was intended to reflect market conditions in 2004,⁴⁷⁸ but in the intervening decade, access fees have grown to represent a greater fraction of overall transaction costs.⁴⁷⁹ We believe that reducing the access fee cap could reduce exchanges' incentive to frequently change order types and potentially encourage certain market participants to trade in lit markets.

We believe that it would be best for the SEC to consider reducing the access fee cap for the most liquid stocks, as there is likely sufficient fundamental supply and demand for these stocks that a high rebate is unnecessary to incentivize the public display of orders and to maintain narrow bid-ask spreads. At the same time, such a reduction in access fees could significantly benefit investors. For example, recent estimates are that reducing the access fee cap to 5 cents for only the most liquid stocks would decrease transaction costs by \$850 million annually.⁴⁸⁰

⁴⁷⁶ Nasdaq primarily lost market share to NYSE's Arca exchange, but BATS and Edge X also benefitted from Nasdaq's pilot program. Gary Stone, *Two Weeks Into the Market Structure Experiment... Results are Mixed*, BLOOMBERG TRADEBOOK (Feb. 19, 2015), available at <http://www.bloombergtradebook.com/blog/two-weeks-experiment/>.

⁴⁷⁷ Sarah N. Lynch, *Nasdaq CEO says maker-taker model has value, but fees too high*, Reuters (Jul. 28, 2014), available at <http://www.reuters.com/article/2014/07/28/nasdaq-omx-congress-marketsrulesidUSL2N0Q31FH20140728>.

⁴⁷⁸ See Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, *Maker-Taker Fees on Equities Exchanges*, U.S. SEC. & EXCH. COMM'N 29 (Oct. 25, 2015), available at <https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf>.

⁴⁷⁹ See Aguilar, *supra* note 474.

⁴⁸⁰ John McCrank, *Exchange Operator BATS Calls for U.S. Regulatory Reform*, REUTERS (Jan. 6, 2015), available at <http://www.reuters.com/article/2015/01/06/us-bats-markets-reform-idUSKBN0KF25920150106>.

Implementing a tailored approach for a fee reduction would require the consideration of appropriate groupings. For example, under a liquidity-based approach, securities could be segmented based on average daily volume over a fixed period of time, market capitalization, inclusion in certain indices (e.g., the Standard & Poor's 500 or the Russell 1000), security type (e.g., operating company, exchange traded fund, closed-end fund), or some combination thereof.⁴⁸¹ A process would also need to be developed to periodically reassess and update the list of securities that would qualify.⁴⁸²

Rather than immediately reducing access fees for a select sub-group, we believe that the SEC should first conduct a pilot program to measure the potential impact that such a change would have on market quality and trading behavior. We support the EMSAC Regulation NMS Subcommittee's recommended framework for an access fee cap pilot program that was submitted to the SEC on July 8, 2016.⁴⁸³ Although pilot programs can impose significant costs on market participants, we believe that this approach would most efficiently identify the optimal parameters of a lower access fee cap. In addition, these costs can be mitigated with the use of the infrastructure and data from pilots already planned or underway, such as the "Tick Size Pilot Program" program described below.

Specific Recommendation:

15. The SEC should implement a pilot program to evaluate the impact of a reduction in access fees and liquidity rebates on market quality and trading behavior. The structure of the pilot should generally conform to the

⁴⁸¹ Memorandum from SEC Division of Trading and Markets to SEC Market Structure Advisory Committee, *Maker-Taker Fees on Equities Exchanges*, U.S. SEC. & EXCH. COMM'N 32-33 (Oct. 25, 2015), *available at* <https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf>.

⁴⁸² *Id.*

⁴⁸³ *See* Memorandum from EMSAC Regulation NMS Subcommittee to Equity Market Structure Advisory Committee (EMSAC), *Framework for Potential Access Fee Pilot*, U.S. SEC. & EXCH. COMM'N (Apr. 19, 2016); Equity Market Structure Advisory Committee (EMSAC), *Regulation NMS Subcommittee Recommendation for an Access Fee Pilot*, U.S. SEC. & EXCH. COMM'N (Jun. 10, 2016), *available at* <https://www.sec.gov/spotlight/emsac/emsac-regulation-nms-recommendation-61016.pdf>; Ackerman, *supra* note 271.

framework proposed by the Equity Market Structure Advisory Committee Regulation NMS Subcommittee and leverage existing pilots as appropriate.⁴⁸⁴

D. Aligning Maker-Taker with the Disclosure Regime

Neither the duty of best execution nor the order protection rule specifies where a trade must occur if several trading venues are displaying the best publicly available price. Previously, this ambiguity was problematic in the context of the maker-taker system, because broker-dealers may have prioritized the execution of customer orders on venues with the highest rebates or lowest fees. This was a concern for investors, because the venues that offer the highest rebates or lowest fees may not provide the best execution of customer orders given the type of order flow that they tend to attract, according to some academic studies.⁴⁸⁵

Fortunately, both FINRA and the SEC have recently taken measures that should mitigate these concerns. FINRA took action in November 2015 to clarify the duty of best execution in the context of maker-taker. In Regulatory Notice 15-46, FINRA made clear that access fees and liquidity rebates should not interfere with broker-dealers' duty of best execution and should not "inappropriately affect their routing decisions."⁴⁸⁶ In July 2016, the SEC proposed changes to required broker-dealer disclosures that, if enacted, would improve transparency surrounding access fees and liquidity rebates. Specifically, the proposal would require the disclosure of access fees and rebates associated with both institutional and retail orders. For institutional reporting, broker-dealers would have to report average net execution fees or rebates (per 100 shares).⁴⁸⁷ For retail reporting, broker-dealers

⁴⁸⁴ Citadel dissents from this recommendation.

⁴⁸⁵ Robert H. Battalio et al., *Can Brokers Have It All? On the Relation Between Make-Take Fees and Limit Order Execution Quality* (Working Paper, 2012), available at <http://ssrn.com/abstract=2367462>.

⁴⁸⁶ FINRA, Regulatory Notice No. 15-46, Best Execution 6 (Nov. 2015), available at http://www.finra.org/sites/default/files/notice_doc_file_ref/Notice_Regulatory_15-46.pdf.

⁴⁸⁷ See Disclosure of Order Handling Information, Exchange Act Release No. 78309, File No. S7-14-16 (Jul. 13, 2016), available at <https://www.sec.gov/rules/proposed/2016/34-78309.pdf>. See also Press Release, U.S. SEC. & EXCH. COMM'N, SEC Proposes Rules to Enhance Order Handling Information Available to Investors (Jul. 13, 2016), available at <https://www.sec.gov/news/pressrelease/2016-140.html>.

would have to report both the fees paid (per share) and the rebates received (per share and in total) for orders routed to the venues that receive the most order flow from the reporting broker-dealer.⁴⁸⁸

While the July 2016 SEC proposal would enhance disclosure requirements surrounding maker-taker pricing, reporting requirements should be further amended so that broker-dealers must clarify *how* access fees and liquidity rebates impact their routing practices. This should include an explanation of how broker-dealers' routing decisions are consistent with their duty of best execution in light of the recent FINRA guidance. Broker-dealers should also be required to clarify whether they pass through liquidity rebates or access fees to their customers.

Specific Recommendation:

16. Broker-dealers should be required to disclose how access fees and liquidity rebates affect order routing practices and transaction costs for their customers.

Part III: The Sub-Penny Rule

Tick sizes are the minimum price variation (“MPV”) for *quotations* for stocks. During the mid-1990s, the majority of exchanges set tick sizes at fractions (e.g., 1/8th) of a dollar.⁴⁸⁹ In June 2000, the SEC issued an order directing the exchanges to jointly develop a plan to convert their quotations for stocks from

⁴⁸⁸ See *supra* note 487.

⁴⁸⁹ In 1994, NYSE Rule 62 set the MPV for stocks with a share price above \$1.00 at 1/8th of a dollar. AMEX Rule 127 set an MPV of 1/16th of a dollar for stocks with a price below \$5.00 and 1/8th for other stocks. NASD, the forerunner to FINRA, did not have a MPV rule for NASDAQ stocks, but the NASDAQ system was set up to process spreads of 1/32nd of a dollar for stocks with a bid below \$10.00 and 1/8th of a dollar for other stocks. See SEC Division of Market Regulation, Market 2000: An Examination of Current Equity Market Developments, U.S. SEC. & EXCH. COMM’N 37 n.43 (Jan. 1994), *available at* <https://www.sec.gov/divisions/marketreg/market2000.pdf>.

fractions to decimals.⁴⁹⁰ The primary motivating factor for this change was that fractional tick sizes were creating wide spreads, thereby increasing transaction costs for investors.⁴⁹¹ By April 2001, the exchanges had implemented \$.01 MPV rules, completing the move to decimalization.⁴⁹² Although exchanges required pricing in \$.01 increments, ATs were still permitted to accept orders in sub-penny increments.⁴⁹³ This practice ended in 2005, when the SEC adopted the sub-penny rule of Reg NMS, which generally prohibits any trading venue from displaying, ranking, or accepting orders in increments smaller than one penny.⁴⁹⁴ The move to the \$.01 MPV significantly reduced spreads and transaction costs for investors.⁴⁹⁵

Importantly, trading venues are allowed to *execute* orders at any pricing increment. And one might wonder why regulators have chosen to impose a minimum tick size on quotations—indeed, why should market participants not be allowed to price their orders as accurately as possible? According to the SEC, there are two problems associated with quoting stock prices in increments of less than a penny: flickering quotations and stepping ahead.⁴⁹⁶

Flickering quotations occur when the price for a stock repeatedly moves back and forth between prices (e.g., between \$10.001 and \$10.002).⁴⁹⁷ This is a

⁴⁹⁰ See Order Directing the Exchanges and the National Association of Securities Dealers, Inc. to Submit a Phase-In Plan to Implement Decimal Pricing in Equity Securities and Options, Exchange Act Release No. 42914, 65 Fed. Reg. 38010 (Jun. 8, 2000), *available at* <https://www.sec.gov/rules/other/34-42914.htm>.

⁴⁹¹ See Report to Congress on Decimalization, As Required by Section 106 of the Jumpstart Our Business Startups Act, U.S. SEC. & EXCH. COMM’N 4-5 (July 2012), *available at* <https://www.sec.gov/news/studies/2012/decimalization-072012.pdf>.

⁴⁹² *Id.*

⁴⁹³ In 2002, the Top of the Island ECN publicly displayed its limit order book with quotes in \$.0001 increments. LARRY HARRIS, *TRADING AND EXCHANGES* 73 (Oxford University Press: 2003). A more extensive discussion of post-decimalization, pre-NMS ECN sub-penny quotes and trades is *available at* <https://www.sec.gov/rules/proposed/s71004/bchakrabarty1.pdf>.

⁴⁹⁴ Rule 612(a) applies to stocks priced above \$1.00; Rule 612(b) applies a different set of tick size rules to stocks with a share price below \$1.00. Compare 17 C.F.R. § 242.612(a) (2005) with 17 C.F.R. § 242.612(b) (2005).

⁴⁹⁵ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37556 (Jun. 29, 2005), *available at* <https://www.sec.gov/rules/final/34-51808fr.pdf>.

⁴⁹⁶ *Id.* at 37503-37504.

⁴⁹⁷ *Id.* at 37503.

problem for equity markets because it can complicate order routing decisions for broker-dealers and hinder their ability to get the best prices for investors.⁴⁹⁸ It also strains market infrastructure, including market data feeds and private linkages established by broker-dealers.⁴⁹⁹

Second, without a minimum tick size for quotations, investors would be vulnerable to a trading strategy known as quote-matching or stepping ahead.⁵⁰⁰ In this strategy, a trader uses an economically insignificant tick to “step ahead” of an existing order, so that the trader’s order is filled prior to or instead of that order. This means that the orders posted by fundamental investors and liquidity suppliers are less likely to get executed. This can disincentivize the public display of orders by these investors and liquidity suppliers and can thereby increase bid-ask spreads and transaction costs.

However, tick sizes can also be too wide, as they were when fractional MPVs prevailed. A tick size that is too wide sets a floor on the range of permissible bid-ask spreads, which can increase transaction costs for investors. For example, suppose that the minimum tick size is fixed at \$.05 and the best publicly displayed offers to buy and sell a stock are \$10.00 and \$10.05. Further suppose that there is sufficient supply and demand for this stock such that there would otherwise be publicly displayed offers to buy and sell the stock at prices within the 5 cent tick, such as \$10.02 and \$10.03). In this example, due to the minimum tick size of \$.05, an investor’s bid to buy the stock could be executed at \$10.05, instead of \$10.03. Thus, it could cost an investor an additional 2 cents to buy the same stock under a 5 cent tick regime than it would have cost the investor if penny spreads prevailed.

When artificially wide tick sizes exist, there is also a greater incentive to execute trades in these stocks in the dark, because investors can get better prices for their orders by trading in the dark. This is because the SEC does not prohibit execution within the minimum tick size--they only prohibit pricing

⁴⁹⁸ See *id.* at 37553.

⁴⁹⁹ See *id.*

⁵⁰⁰ Harris, *supra* note 493, at 250.

orders/quotations in sub-pennies.⁵⁰¹ Exchanges and ATSs can use dark “mid-point match” order types to execute in sub-penny increments. Broker-dealer internalizers can offer sub-penny executions by entering into contractual agreements (e.g., PFOF agreements with retail brokerages) that provide that orders will receive sub-penny price improvement.⁵⁰²

The appropriate minimum tick size for a stock largely depends on the stock’s natural spread, which is based on its fundamental supply from sellers and demand from buyers. Stocks that have significant supply and demand generally have narrow natural spreads, because buyers or sellers of that stock can easily find a counterparty with whom they can transact in order to enter or exit their positions. Stocks with narrow natural spreads typically include large capitalization U.S. companies. Alternatively, stocks with low fundamental supply and demand generally have wide natural spreads, because it is more difficult for buyers and sellers to find counterparties willing to trade. Stocks with wide natural spreads typically include small capitalization U.S. companies.

For example, if the natural spread of a stock is 5 cents, then the ideal tick size for that stock would also be 5 cents. This tick size would allow buyers and sellers to trade efficiently, without exposure to the risks posed by artificially narrow ticks (e.g., having a trader “step ahead”)⁵⁰³ or artificially wide ticks (e.g., high transaction costs from wide spreads).⁵⁰⁴ However, determining each stock’s natural spread and using that information to set the ideal tick size for each stock is

⁵⁰¹ See 17 C.F.R. § 242.612 (2005).

⁵⁰² Robert N. Rapp, *NYSE program approved to permit sub-penny stock prices to benefit retail investors*, Calfee Halter & Griswold LLP (Jul. 17 2012) (“Today, orders to buy or sell securities by retail investors are routinely routed by their retail securities brokers not to national securities exchanges, but rather to over-the-counter (OTC) wholesale market makers who have agreed to pay the brokers for the order flow -- all part of a process known as “internalization” of orders by retail brokers. Wholesale market makers are permitted to execute retail orders routed to them at “sub-penny” prices, meaning that trades may occur using price increments as low as \$0.001 versus the market makers displayed quotations priced in whole pennies.”), *available at* <http://www.lexology.com/library/detail.aspx?g=49fa94b9-4d68-4ea3-81a9-57c4ccd24347>.

⁵⁰³ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37551 (Jun. 29, 2005), *available at* <https://www.sec.gov/rules/final/34-51808fr.pdf>.

⁵⁰⁴ *Id.* at 37552-37554.

not practicable. The natural supply and demand for each stock is difficult to identify with precision, is different for each stock, and changes over time. Because of this difficulty, the SEC takes a “one-size fits all” approach, which is not responsive to a stock’s individual liquidity characteristics.

A. Reducing Minimum Tick Sizes

The SEC has acknowledged that the trading characteristics of certain stocks could warrant sub-penny quotations.⁵⁰⁵ More specifically, the SEC notes that there are strong indications that the minimum tick size of one penny is too wide for a stock if the stock always trades with a penny spread and always has significant depth on both sides of the market.⁵⁰⁶

We believe that certain highly liquid stocks demonstrate both of the abovementioned trading characteristics. First, as demonstrated by Figure 3.4 below, even during instances of high market volatility, including the 2008 financial crisis, certain highly liquid stocks always trade at penny spreads. Indeed, the fact that the spread of these stocks does not adjust to extreme instances of market-wide volatility, like the 2008 financial crisis, strongly suggests that penny increments may be artificially expanding their spreads. Second, as demonstrated by Figure 1.9 in Chapter 1 (renamed Figure 3.5 below), there is consistently substantial depth (offers to buy and sell) on both sides of the NBBO for the most liquid stocks.

⁵⁰⁵ *Id.* at 37551.

⁵⁰⁶ *Id.* at 37554.

Figure 3.4: Quantiles of NBBO Spread over Time⁵⁰⁷

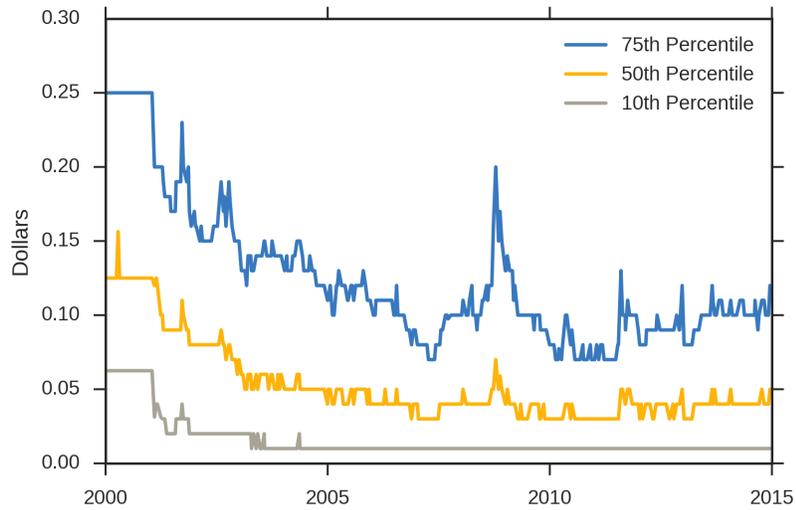
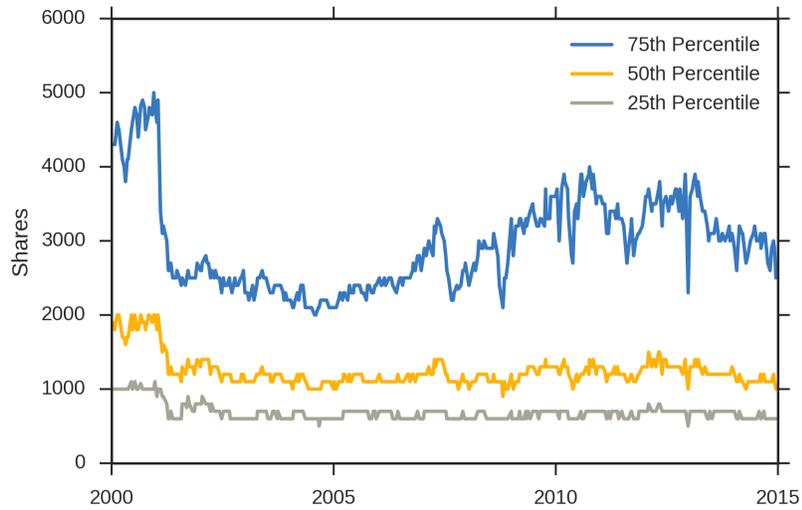


Figure 3.5: Volume Depth Available at NBBO⁵⁰⁸



However, it is important to note that decreasing a stock's tick size may have certain unintended consequences. For example, smaller tick sizes could lead to

⁵⁰⁷ Source: TAQ database.

⁵⁰⁸ Source: TAQ database.

increased data traffic flows, particularly during times of heightened market volatility, and could complicate broker-dealer order routing. The collateral consequences of reducing tick sizes could indeed detract from the potential benefits to the markets that such a change could otherwise produce.

We therefore recommend that the SEC implement a pilot program for reducing the tick size for certain highly liquid stocks from \$0.01 to \$0.005. The SEC should include a control group of highly liquid stocks that would continue to trade at one cent ticks, in order to compare trading in these stocks against the stocks that would trade at half cent ticks. The pilot program for highly liquid stocks should *not* include a trade-at rule, as this would create unnecessary complexity and could compromise the integrity of the pilot data.

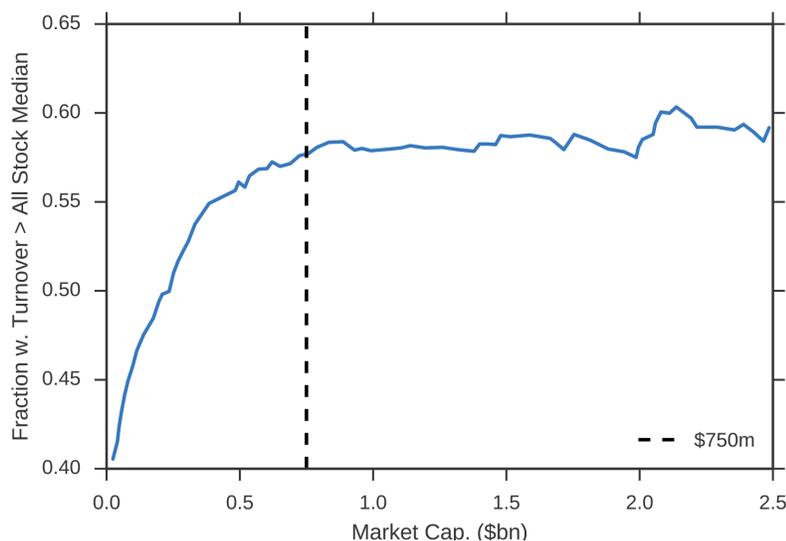
Specific Recommendation:

17. After concluding the access fee pilot, the SEC should conduct a pilot program for reducing the tick size for highly liquid stocks. The pilot should include a control group and should not include a trade-at rule.

B. Increasing Minimum Tick Sizes

As mentioned above, the stocks of companies with small market capitalizations (“small cap” companies) are more likely to have wider natural spreads, because there is lower supply and demand for these stocks from investors. Figure 3.6 demonstrates that as a stock decreases in capitalization, so does its liquidity, as measured by stock turnover (fraction of a stock’s market capitalization that is traded in one day). One concern is that because these stocks lack substantial liquidity, small cap companies may be discouraged from publicly listing their stocks, thereby foregoing a valuable potential source of capital and excluding public investors from the opportunity to fuel their growth.

Figure 3.6: Liquidity is lower for small capitalization stocks⁵⁰⁹



In 2011, Congress expressed concern that the one-cent MPV was contributing to low liquidity in small cap stocks.⁵¹⁰ It directed the SEC to study the effects of decimalization on small cap stocks and to widen spreads if necessary.⁵¹¹ The SEC concluded that decimalization was generally associated with positive effects on market quality, but also noted that it is difficult to separate the effects of decimalization from other factors like the contemporaneous trend towards automation.⁵¹² After further pressure from Congress⁵¹³ and other commenters,⁵¹⁴

⁵⁰⁹ Source: CRSP database. Compares stocks eligible for the Tick Size Pilot Program (discussed below) to all stocks. Pilot-eligible securities are US domiciled common stocks with a share price greater than \$2.00, a market capitalization of \$5 billion or less, and a daily volume of one million shares or less.

⁵¹⁰ See Report to Congress on Decimalization, As Required by Section 106 of the Jumpstart Our Business Startups Act, U.S. SEC. & EXCH. COMM'N 5 (July 2012), available at <https://www.sec.gov/news/studies/2012/decimalization-072012.pdf>.

⁵¹¹ Pub. L. No. 112-106, 126 Stat. 306 (2012) (codified in scattered sections of 15 U.S.C.).

⁵¹² Report to Congress on Decimalization, As Required by Section 106 of the Jumpstart Our Business Startups Act, U.S. SEC. & EXCH. COMM'N 19-22 (July 2012), available at <https://www.sec.gov/news/studies/2012/decimalization-072012.pdf>.

⁵¹³ SMALL CAP LIQUIDITY REFORM ACT OF 2014, H.R. 3448, 113th Cong. (2014).

⁵¹⁴ Equity Capital Formation Task Force, *From the On-Ramp to the Freeway: Refueling Job Creation and Growth by Reconnecting Investors with Small-Cap Companies* (Nov. 11, 2013), available at <http://www.securitytraders.org/wp-content/uploads/2013/11/ECF-From-the-On-Ramp-to-the-Freeway-vF.pdf>.

the SEC directed the exchanges and FINRA to implement a “Tick Size Pilot Program” that would expand tick sizes for certain small cap stocks in order to determine whether wider tick sizes would enhance market liquidity.⁵¹⁵ Although the Committee has supported the Tick Size Pilot Program in principle, we sent a letter to the SEC in 2014 noting our concerns with the complexity of the pilot program.⁵¹⁶

A pilot to assess the potential benefits of wider tick sizes is based in part on the argument that wider tick sizes in certain stocks could increase the profitability for market makers dealing in those securities and encourage them to invest in research for those stocks.⁵¹⁷ More research on small cap stocks would increase the availability of information on these stocks and potentially increase demand from fundamental investors. However, there is much skepticism as to whether wider tick sizes would actually result in more investment research.⁵¹⁸ As a separate matter, some experts believe that wider tick sizes could prevent the “quote matching” practices described above.⁵¹⁹ If realized, each of these potential effects could improve liquidity in small cap stocks, and we believe that the success of the plan should be measured by its success at enhancing liquidity in these stocks.

Part IV: Market Data

The Exchange Act requires the SEC to ensure that investors are able to obtain consolidated market data, and that investors are not required to pay unreasonable or unfair fees for such information.⁵²⁰ The SEC is also committed to

⁵¹⁵ See 79 Fed. Reg. 66423.

⁵¹⁶ See Comment Letter from Comm. on Capital Markets Regulation to U.S. SEC. & EXCH. COMM’N, Re: Plan to Implement a Tick Size Pilot Program (Dec. 19, 2014), *available at* http://capmktreg.org/app/uploads/2014/12/2014-12-19_Tick_Size_Comment.pdf.

⁵¹⁷ See, e.g., Letter to Brent J. Fields from John A. McCarthy, General Counsel of KCG re: Proposed Tick Size Pilot Plan, File No. 4-657 5 (Dec. 19, 2014).

⁵¹⁸ See *generally* Roundtable on Decimalization, U.S. SEC. & EXCH. COMM’N (Feb. 5, 2013), *available at* <https://www.sec.gov/news/otherwebcasts/2013/decimalization-transcript-020513.txt>.

⁵¹⁹ Scott Kupor and Jeffrey M. Solomon, Equity Co-Chairs of Equity Capital Formation Task Force, Letter to Brent J. Fields, Secretary of SEC, Re: Comments to Plan to Implement a Tick Size Pilot Program (Dec. 18, 2014).

⁵²⁰ See *generally* 15 U.S.C. § 78k-1 (2012).

ensuring that the trading venues that provide the data do so in an effective and timely manner.⁵²¹

A. Consolidated Market Data

Consolidated market data includes both: (1) pre-trade transparency — timely information on the best-priced public quotations and (2) post-trade transparency — real-time reports of trades as they are executed.⁵²² Pre-trade transparency serves an essential linkage function by helping to inform the public of the best displayed prices for stocks no matter where they are in the national market system.⁵²³ Post-trade transparency enables investors to monitor the prices at which orders are executed and assess whether their orders received best execution.⁵²⁴

The current regulatory structure *requires* that trading venues and broker-dealers have access to consolidated market data. This is because the order protection rule and duty of best execution require that trading venues and broker-dealers seek to ensure that trades are executed at the best publicly displayed prices. Consolidated market data is necessary to make this determination.

1) The Securities Information Processors (SIPs)

Reg NMS requires trading venues to submit publicly displayed quotes and trade executions to securities information processors (**SIPs**).⁵²⁵ The SIPs aggregate this data from all trading venues and then disseminate the consolidated market data to broker-dealers and trading venues.⁵²⁶ Importantly, Reg NMS requires that the consolidated data for *each* individual NMS stock be disseminated through a *single*

⁵²¹ *Id.* See also Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37560, 37567 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>.

⁵²² Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-02-10, 75 Fed. Reg. 3594, 3600 (proposed Jan. 21, 2010).

⁵²³ *See id.*

⁵²⁴ *See id.*

⁵²⁵ *See* 17 C.F.R. § 242.602.

⁵²⁶ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>.

SIP, which can only be established and operated by an SRO.⁵²⁷ This provision has effectively prohibited competition among SIPs.

In practice, there are three SIPs, each of which disseminates information on a specific subset of stocks. NASDAQ operates one SIP for all NASDAQ-listed stocks and the NYSE operates another SIP for all NYSE-listed stocks.⁵²⁸ Because companies sometimes choose to list their stocks on other exchanges (e.g., BATS), there is another SIP for these stocks, which the NYSE also operates.⁵²⁹

Exchanges charge market participants to access the SIPs. Although the SEC must approve SIP fees, changes to them can be deemed effective when filed with the SEC, leaving market participants with little opportunity for input.⁵³⁰ SIP revenues are generally not publicly disclosed, and are allocated among exchanges based on their respective market shares of publicly displayed quotes at the NBBO and trade executions.⁵³¹ In 2004 and 2008, the SEC did disclose the revenue of the SIPs. In 2004, the consolidated data feed revenues were \$393.7 million,⁵³² in 2008, they were \$449.1 million.⁵³³ More recent examples of the significance of these revenues can be determined from public disclosures by NASDAQ and BATS. For example, in 2015 NASDAQ earned approximately \$120 million in revenue from the SIPs, while BATS earned approximately \$110 million in revenue from the SIPs.⁵³⁴ NYSE did not disclose its revenues from the SIPs.

⁵²⁷ 17 C.F.R. § 242.603(b).

⁵²⁸ See NASDAQ, UTP Vendor Alert #2016 – 1: SIP Launch of Enhanced INET Platform Scheduled for Q4 2016 (Feb. 1, 2016), *available at* <http://www.nasdaqtrader.com/TraderNews.aspx?id=utp2016-01>; Consolidated Tape Association Overview, *available at* <https://www.ctaplan.com/index>.

⁵²⁹ See Consolidated Tape Association Overview, *available at* <https://www.ctaplan.com/index>.

⁵³⁰ 17 C.F.R. § 242.608(b)(3) (2006).

⁵³¹ Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37503 (Jun. 29, 2005), *available at* <https://www.sec.gov/rules/final/34-51808fr.pdf>.

⁵³² Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37558 (Jun. 29, 2005), *available at* <https://www.sec.gov/rules/final/34-51808fr.pdf>.

⁵³³ Concept Release on Equity Market Structure, Exchange Act Release No. 61358, File No. S7-02-10, 75 Fed. Reg. 3594, 3601 (proposed Jan. 21, 2010).

⁵³⁴ NASDAQ Investor Presentation July 2016, Slide 5, 8, *available at* <http://files.shareholder.com/downloads/NDAQ/2440323683x0x809729/A0286863-57CE-476E-BC33-ACA29A5E8143/NDAQInvestorPresentation.pdf>; Bats Global Markets, Inc., Prospectus

2) Proprietary Data Feeds

Reg NMS also permits trading venues to sell access to their own private or “proprietary” data feeds.⁵³⁵ Trading venues and broker-dealers can purchase market data from each trading venue’s proprietary data feeds and then consolidate the data themselves in order to obtain consolidated market data. However, we note that in practice trading venues and broker-dealers must still purchase access to the SIPs.

Rule 603(a) of Reg NMS requires all trading venues that sell these proprietary data feeds to make their data feeds available on terms that are fair and reasonable and not discriminatory.⁵³⁶ However, despite the fact that the SEC requires that trading venues send information to proprietary data feed users at the same time that they send information to the SIPs,⁵³⁷ the transmission speed of proprietary data is faster than that of the SIP. So, data from these proprietary feeds actually arrive at users faster than SIP data arrives at users.

It is important to note that the SEC has recently increased its efforts to minimize the speed differential between the SIPs and proprietary data feeds and, as a result, the effective difference has been significantly reduced. SIP internal processing latency has declined from nearly 1 second in 2006 to less than half a

(424B4), 21, 55 (Apr. 15, 2016) (noting that for 2015, approximately 84.0% of BATS’ \$131 million in market data fees represents their share of tape fees from the U.S. tape plans), *available at* <http://www.snl.com/Cache/33875681.pdf>.

⁵³⁵ See Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37567 (Jun. 29, 2005), *available at* <https://www.sec.gov/rules/final/34-51808fr.pdf>.

⁵³⁶ See *id.* Under Section 11A(c)(1)(c) of the Exchange Act, the more stringent “fair and reasonable” requirement is applicable to an “exclusive processor,” which is defined in Section 3(a)(22)(B) of the Exchange Act as an SRO or other entity that distributes the market information of an SRO on an exclusive basis. Rule 603 (a)(1) extends this requirement to non-SRO markets when they act in functionally the same manner as exclusive processor and are the exclusive source of their own data. Applying this requirement to non-SROs is consistent with Section 11A(c)(1)(F) of the Exchange Act, which grants the SEC rulemaking authority to “assure equal regulation of all markets” for NMS Securities.

⁵³⁷ *Id.*

millisecond as of 2013,⁵³⁸ and has been reduced even further in the last few years.⁵³⁹ However, a meaningful difference in speed persists.⁵⁴⁰

B. Criticisms of the Market Data Rules

1) Conflicts of Interest and Underinvestment in SIP Technology

Each SIP is governed by a board of “Plan Participants” comprised entirely of SROs (the exchanges and FINRA).⁵⁴¹ These boards have uniformly awarded contracts for SIP operation to exchanges. We believe that this governance system produces a conflict of interest problem, as exchanges derive significant revenue from their competing proprietary data feeds.⁵⁴² This conflict of interest stems from the fact that if the SIPs were just as fast as the proprietary feeds, then market participants could rely solely on the SIPs to access the best priced quotes or most

⁵³⁸ See Consolidated Tape Association, Notice of Filing and Immediate Effectiveness of the Nineteenth Charges Amendment to the Second Restatement of the CTA Plan and Eleventh Charges Amendment to the Restated CQ Plan, Exchange Act Release No. 70010, 78 FR 44984, 44992 (Jul. 25, 2013) (“Average quote feed latency declined from 800 milliseconds at the end of 2006 to 0.6 milliseconds in April 2013 and average trade feed latency declined from about one second at the end of 2006 to 0.4 milliseconds in April 2013...”).

⁵³⁹ The CTA Plan and UTP Plan SIPs currently maintain latencies of approximately 230 microseconds and 500 microseconds, respectively. See <https://www.ctaplan.com/index>; <http://www.utpplan.com/overview>; (last accessed Jul. 15, 2016). See also Wigglesworth, *infra* note 540 (“Nasdaq also points to investments made in the SIP in recent years that will dramatically increase its speed from about 225 milliseconds a decade ago to 500 microseconds today, and soon to 50 microseconds.”).

⁵⁴⁰ Robin Wigglesworth et al., *Costly data battle heats up between traders and equity exchanges*, FINANCIAL TIMES (Jul. 5, 2016) (“Because exchanges also sell rival data feeds that are faster and more efficient, critics argue they have starved the SIP of investment. Also, the SIP is slow compared with direct feeds and most brokers feel compelled to pay for an exchange’s increasingly expensive pipelines.”), available at <https://next.ft.com/content/785092ec-33d8-11e6-ad39-3fee5ffe5b5b>.

⁵⁴¹ See Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37592 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>.

⁵⁴² For one example of criticism of this practice, see IEX Services LLC, SEC Comment Letter, Re: Governance of the NMS Plans Concerning Securities Information Processors and the Consolidated Audit Trail, U.S. SEC. & EXCH. COMM’N (Dec. 10, 2014), available at <https://www.sec.gov/comments/s7-02-10/s70210-425.pdf>.

recent trade execution data.⁵⁴³ This would likely reduce the demand for proprietary data feeds and the exchange revenue derived from them. Indeed, the exchanges generate a significant portion of their total revenue from their proprietary data feeds. For example, NASDAQ derives almost \$200 million in annual revenue from sales of its proprietary data feeds, which represents nearly 10% of NASDAQ's total revenue.⁵⁴⁴

Underinvestment in SIP technology has produced SIPs that are not only slow, but also prone to failure. SIP failures are of particular concern to investors because they can require the shutdown of the entire market. For example, in August 2013, a technical glitch at the NASDAQ SIP caused a three-hour trading halt across all markets in \$5 trillion of NASDAQ-listed securities.⁵⁴⁵ The NASDAQ SIP server crashed because it did not have enough memory to manage the quotation data stream coming from exchanges.⁵⁴⁶

2) SIPs and the Order Protection Rule

Certain trading venues use the SIP NBBO as part of their “policies and procedures reasonably designed” to comply with the order protection rule,⁵⁴⁷ whereas other exchanges use a synthetic NBBO (derived from proprietary market data feeds). For example, NYSE uses the SIP data feeds to determine protected quotations on other venues for purposes of compliance with the order protection

⁵⁴³ *Id.* at 2; SIFMA, SEC Comment Letter, Re: Recommendations for Equity Market Structure Reforms 8 (Oct. 24, 2014), *available at* <https://www.sec.gov/comments/s7-02-10/s70210-422.pdf>.

⁵⁴⁴ NASDAQ Investor Presentation July 2016, Slide 5, 8, *available at* <http://files.shareholder.com/downloads/NDAQ/2440323683x0x809729/A0286863-57CE-476E-BC33-ACA29A5E8143/NDAQInvestorPresentation.pdf>.

⁵⁴⁵ Michael P. Regan, et al., *Server Crash Spurs 3-Hour NASDAQ Halt as Data Link Lost*, BLOOMBERG (Aug. 26, 2013), *available at* <http://www.bloomberg.com/news/articles/2013-08-26/NASDAQ-three-hour-halt-highlights-vulnerability-in-market>.

⁵⁴⁶ *Id.*

⁵⁴⁷ However, because SIP NBBOs include unprotected manual quotes, trading venues using only SIP data feeds must calculate a version of the NBBO that excludes those manual quotes in order to comply with the order protection rule. *See* Notice of Filing of the National Market System Plan Governing the Consolidated Audit Trail, Exchange Act Release No. 77724, Appendix A, Consolidated Audit Trail National Market System Plan Request for Proposal, 25 (Apr. 27, 2016), *available at* <https://www.sec.gov/rules/sro/nms/2016/34-77724.pdf>.

rule.⁵⁴⁸ On the other hand, NASDAQ uses proprietary feeds to determine protected quotations on most other venues.⁵⁴⁹

The speed differential between the SIPs and proprietary data feeds gives rise to the concern that investors may not be getting the best prices for their orders.⁵⁵⁰ This is because if an order is executed on a trading venue that relies on the slower SIP NBBO for compliance with the order protection rule, then that trading venue could allow such a trade to occur at a price that is inferior to the best publicly displayed price on another venue (a trade-through). However, if the trading venue used the faster synthetic NBBO, then it would have known of the better priced quotation of another venue and, in compliance with the order protection rule,⁵⁵¹ would have sent the order to the venue with the better price. Thus, because some trading venues use the slower SIP NBBO, investors may not be getting the best available prices for their orders.

⁵⁴⁸ NYSE Rule 19 Supplementary Material .01 *available at* <http://nyserules.nyse.com/NYSE/Rules/>; Self-Regulatory Organizations; New York Stock Exchange LLC; Notice of Filing and Immediate Effectiveness of Proposed Rule Change Clarifying the Exchange's Use of Certain Data Feeds for Order Handling and Execution, Order Routing, and Regulatory Compliance, Exchange Act Release No. 72710, File No. SR-NYSE-2014-38 4 (Jul. 28, 2014), *available at* <http://www.sec.gov/rules/sro/nyse/2014/34-72710.pdf>.

⁵⁴⁹ NASDAQ Rule 4759 *available at* <http://nasdaq.cchwallstreet.com/NASDAQ/Main/>. Self-Regulatory Organizations; The NASDAQ Stock Market LLC; Notice of Filing and Immediate Effectiveness of Proposed Rule Change to Disclose Publicly the Sources of Data Used for Exchange Functions, Exchange Act Release No. 72684, File No. SR-NASDAQ-2014-072 4 (Jul. 28, 2014), *available at* <http://www.sec.gov/rules/sro/NASDAQ/2014/34-72684.pdf>.

⁵⁵⁰ *See generally* White, *supra* note 540.

⁵⁵¹ *See* 17 C.F.R. § 242.611 (2015).

Figure 3.7: Exchange Data Feed Use⁵⁵²

Exchange	Data Source
BATS Z	Primarily direct feeds
BATS Y	Primarily direct feeds
EDGE A	Primarily direct feeds
EDGE X	Primarily direct feeds
NASDAQ	Primarily direct feeds
NASDAQ BX	Primarily direct feeds
NYSE Arca	Primarily direct feeds
NYSE	SIP only
NYSE MKT	SIP only

C. How to Reform the Market Data Rules

1) Step 1: Improve SIP Transparency

As a first step to reform this system, we recommend that the SEC implement rules to raise the bar on SIP governance. The SEC should require that SROs each publicly disclose their revenues earned from (1) proprietary data feeds and (2) operating the SIPs. The disclosures should also include data regarding the relative performance of proprietary data feeds and the SIP. In particular, the disclosures would contain information regarding the processing speeds of the proprietary data feeds and the SIP, which directly impact when end users receive market data. As

⁵⁵² See BATS BZX Exchange Rule 11.26, available at http://cdn.batstrading.com/resources/regulation/rule_book/BATS_Exchange_Rulebook.pdf (BATS Z); BATS BYX Exchange Rule 11.26, available at http://cdn.batstrading.com/resources/regulation/rule_book/BYX_Rulebook.pdf (BATS Y); BATS EDGA Exchange Rule 13.4, available at http://cdn.batstrading.com/resources/regulation/rule_book/EDGA_Rulebook.pdf (EDGE A); BATS EDGX Exchange Rule 13.4, available at http://cdn.batstrading.com/resources/regulation/rule_book/EDGX_Rulebook.pdf (EDGE X); NASDAQ Rule 4759, available at <http://nasdaq.cchwallstreet.com/NASDAQ/Main/> (NASDAQ); NASDAQ BX Rule 4759, available at <http://nasdaqomxbx.cchwallstreet.com/NASDAQOMXBX/Main/> (NASDAQ BX); NYSE Arca Rule 7.37P, available at <http://wallstreet.cch.com/PCX/PCXE/> (NYSE Arca); NYSE Rule 19 Supplementary Material .01, available at <http://nyserules.nyse.com/NYSE/Rules/> (NYSE); NYSE MKT Rule 19 Supplementary Material .01, available at <http://wallstreet.cch.com/MKT/Rules/> (NYSE MKT). Last accessed Jul. 15, 2016.

further explained above, latency is a crucial execution quality metric that impacts, inter alia, the price at which trades are executed relative to the prevailing NBBO. Disclosures regarding processing speed would therefore provide a key piece of quantifiable data that could be used to objectively evaluate the performance of SIPs vis-à-vis proprietary feeds. Making this information publicly available would not only increase transparency, but would immediately force the SROs to accept greater accountability for any SIP deficiencies.

Specific Recommendations:

18. The SEC should require exchanges to publicly disclose revenues from the SIPs, the allocation of market data revenues among SIP Plan Participants and revenues from proprietary data feeds.

19. The SEC should require exchanges to disclose performance data for the SIPs and proprietary data feeds to facilitate a comparison of the relative speeds with which investors can obtain actionable market data from each.

2) Step 2: Allow Competition Between Multiple SIPs

The vigorous competition encouraged by other aspects of Reg NMS has produced innumerable benefits for investors.⁵⁵³ Ultimately, subjecting SIPs to the same competitive forces would likely produce similar results. However, when it adopted Reg NMS, the SEC expressly rejected a competing SIPs model, citing concerns that competition would not reduce costs for data consumers but would erode the benefits of a single point of reference.⁵⁵⁴ The SEC noted that even if there were multiple SIPs, market participants would still need to purchase a data feed from each exchange to determine the NBBO, and this would leave “little room” for price competition.⁵⁵⁵ However, the single SIP structure has failed to produce its anticipated benefits and has also demonstrably created new concerns

⁵⁵³ See, e.g., Aguilar, *supra* note 474.

⁵⁵⁴ See Regulation NMS, Exchange Act Release No. 51808, 70 Fed. Reg. 37496, 37559 (Jun. 29, 2005), available at <https://www.sec.gov/rules/final/34-51808fr.pdf>.

⁵⁵⁵ *Id.*

and costs for the markets. We believe that allowing competition between SIPs would address these new concerns that we describe below.

First, we believe that subjecting SIPs to competition will narrow their performance gap with private data feeds. Speed is a crucial metric of performance for data consolidators, so a significantly slower SIP would not be able to survive under competitive pressure. This change would level the playing field between investors who rely on the SIPs with those who also use proprietary data feeds.

Second, the current model establishes the SIPs as single points of failure where technological glitches can disrupt trading for all market participants. Introducing competition to the SIP structure would force SIP operators to invest more in developing SIP technology. Competition could therefore encourage improvements in resiliency. Moreover, the availability of alternative sources of consolidated data would likely prevent market-wide paralysis in the event that one SIP fails.⁵⁵⁶

Third, the existing SIP structure compromises the effectiveness of the order protection rule and broker-dealers' duty of best execution (for those broker-dealers relying on slower SIP data). Introducing competition would likely ameliorate this problem by encouraging improvements in SIP speed. Faster SIPs would likely mean that trading venues that rely on the SIP NBBO would allow for fewer trade-throughs. It would also improve routing strategies for broker-dealers that rely on the SIPs when routing orders. This is because there should be fewer differences between the quotations included in the SIP NBBO and synthetic NBBOs as the speed differential decreases.

Finally, competition among multiple SIPs could also substantially reduce the total cost of market data. Today, many broker-dealers are effectively required to purchase access to proprietary data feeds *and* the SIP, even though both provide

⁵⁵⁶ See Corporate Stock Trading Volume, Spreads and Depth Before, During and After the NYSE Trading Suspension on July 8, 2015, Data Highlight 2016-01, U.S. SEC. & EXCH. COMM'N (Feb. 3, 2016), available at <https://www.sec.gov/marketstructure/research/highlight-2016-01.html>.

highly similar data.⁵⁵⁷ If competition improved the speed of the SIPs, then broker-dealers could potentially avoid having to pay for proprietary data feeds in addition to the SIP.

a) *Implementing a Competing Consolidators Structure*

Competition among SIPs should be implemented through a progressive series of reforms. First, the SEC should eliminate the Reg NMS provisions that allow only SROs to create and operate SIPs,⁵⁵⁸ opening up a so-called competing consolidator model. Eligibility to create and operate a SIP should depend on compliance with established functional and operational standards, not a formalistic, entity-based classification. An entity-based restriction unnecessarily limits the number of potential SIP operators. Opening up operator eligibility also drives innovation by introducing a greater diversity of strategies and technologies tailored towards this issue.

Second, the SEC should enact reforms to improve the minimum performance of the current SIPs. The SEC could establish latency caps and mandatory resiliency mechanisms at each SIP. Requiring SIPs to meet objective data quality metrics, such as a minimum speed threshold, would ensure the achievement of a performance baseline. Establishing resiliency standards and related risk control requirements would facilitate the smooth functioning of the markets regardless of technological hiccups and would promote investor confidence. The existence of SIP competitors would then provide an incentive to exceed these standards.

⁵⁵⁷ See Wigglesworth, *supra* note 540. See also *infra* Chapter 4, Part IV.

⁵⁵⁸ See, e.g., 17 C.F.R. § 242.603(b); 17 C.F.R. § 242.600(b)(55). See also 15 U.S.C. § 78c(a)(22)(B).

Specific Recommendations:

20. After requiring disclosure of exchange market data revenues, the SEC should adopt a “Competing Consolidator” model for data dissemination. As a first step to implementing this framework, the SEC should promote reforms in the governance and transparency of the current SIPs.

CHAPTER 4: UNDERSTANDING AND ENHANCING MARKET RESILIENCY

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CHAPTER 4: UNDERSTANDING AND ENHANCING MARKET RESILIENCY

Part I of this Chapter explains the 2010 flash crash (the “Flash Crash”), the market break of 1987 and the market-wide disruptions experienced on August 24, 2015. Part II of this Chapter describes the existing volatility controls and sets forth specific recommendations for how to strengthen the resiliency of our equity markets.

Part I: Examining Incidences of Extreme Volatility in U.S. Equity Markets

A. The 2010 Flash Crash

On May 6, 2010 E-mini S&P 500 futures dropped 5.1% over a period of 13 minutes, before rebounding 6.4% over the next 23 minutes.⁵⁵⁹ The E-mini S&P 500 derives its value from the components of the S&P 500 and contributes substantially to price discovery in S&P 500 stocks. Therefore, the futures market dislocation was rapidly transmitted to cash equity markets and the decline in the S&P 500 index mirrored the E-mini decline in almost real time.⁵⁶⁰ To put these losses into context, \$1 trillion in stock market value disappeared in just 13 minutes during the Flash Crash.⁵⁶¹

According to a joint report by the SEC and CFTC regarding the events of May 6, 2010 (the “**Joint Report**”), the price crash was likely triggered by a mutual fund executing an algorithmic trade for a series of unusually large and aggressive

⁵⁵⁹ Andrei Kirilenko et al., *The Flash Crash: The Impact of High Frequency Trading on an Electronic Market*, 5-6 (2014), available at http://www.cftc.gov/idc/groups/public/@economicanalysis/documents/file/oc_e_flashcrash0314.pdf.

⁵⁶⁰ *Id.* at 36.

⁵⁶¹ Aruna Viswanatha et al., ‘Flash Crash’ Charges Filed, WALL ST. J. (Apr. 21, 2015), available at <http://www.wsj.com/articles/u-k-man-arrested-on-charges-tied-to-may-2010-flash-crash-1429636758>.

sell orders. The sell order was for 75,000 E-Mini contracts (valued at \$4.1 billion).⁵⁶²

The Joint Report also describes the role of HFT market makers in the Flash Crash.⁵⁶³ In this context, the term “market maker” describes a trading strategy, rather than a formal registration requirement.⁵⁶⁴ Importantly, these strategies often involve trading large gross volumes to achieve small changes in net position. For example, these strategies might involve buying 10 contracts and selling 11 contracts in order to reduce net exposure by 1 contract. According to the Joint Report, HFT market makers played a game of “hot potato” as they reduced their inventory, rapidly exchanging large numbers of contracts to effect small changes in net position.⁵⁶⁵ Unfortunately, the mutual fund’s algorithm was designed to enter increasingly aggressive sell orders as trading volume increased. As a result, a *negative feedback loop* developed, whereby the trading strategies of HFT market makers caused the mutual fund’s algorithm to enter even more aggressive sell orders, further driving down stock prices.⁵⁶⁶

The sharp and sudden drop in individual stock prices left many HFT market makers unsure about the financial risk that they were taking by continuing to trade in these stocks, so they either widened spreads or stopped offering buy-side liquidity.⁵⁶⁷ HFT market makers also began entering “stub quotes.”⁵⁶⁸ Stub quotes are bids and offers that are so far from the current market prices that they are clearly not intended to be executed, but are posted merely to satisfy a market maker’s obligation (as explained below).⁵⁶⁹ However, due to the rapid withdrawal of liquidity, the stub quotes became the best price available in certain stocks and

⁵⁶² Findings Regarding the Market Events of May 6, 2010, Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues 2 (Sept. 30, 2010), available at <https://www.sec.gov/news/studies/2010/marketevents-report.pdf>.

⁵⁶³ *Id.* at 3.

⁵⁶⁴ *Id.* at 13.

⁵⁶⁵ *Id.* at 3.

⁵⁶⁶ *Id.* at 3.

⁵⁶⁷ *Id.* at 5, 64.

⁵⁶⁸ *Id.* at 5, 38.

⁵⁶⁹ *Id.* at 63.

orders were executed against stub quotes at unrealistically low prices.⁵⁷⁰ One such stock was Accenture, which briefly traded for \$0.01 before rebounding to close at \$41.09; the drop from \$30 to \$0.01 occurred in a 7-second span.⁵⁷¹

Additionally, broker-dealer internalizers and ATSs responded to the market uncertainty by routing customer orders to exchanges rather than executing them.⁵⁷² Indeed, ADF/TRF volume, which represents trades executed by internalizers and ATSs, dropped from approximately 25-30% to around 11% during the crash.⁵⁷³

The selling pressure continued until the prices in the E-mini contracts had fallen far enough to trigger a 5-second trading halt at the Chicago Mercantile Exchange (a futures exchange).⁵⁷⁴ After this trading halt, market participants slowly stepped in to purchase contracts and the price of the E-mini and the related stocks largely rebounded. In the end, May 6 was characterized by price swings in a number of securities that were both rapid and severe. Between 2:40pm and 3:00pm that day, more than 20,000 trades in over 300 securities were executed at prices 60% or further from their price before that timeframe.⁵⁷⁵ However, the effects of the volatility during the Flash Crash were generally limited to these 300 securities. More than 98% of the total U.S. trading volume in that time period received executions at prices within 10% of their 2:40pm price.⁵⁷⁶ As a result, market-wide circuit breakers that would shut down trading in all stocks were not triggered.

Due to events like the Flash Crash, there is concern that the added liquidity provided by market makers in today's market structure is illusory because during volatile market conditions market makers will withdraw from the market, thereby exacerbating rather than relieving market stress. We reviewed the relevant academic literature on this issue in Chapter 1.

⁵⁷⁰ *Id.* at 5.

⁵⁷¹ *Id.* at 83.

⁵⁷² *Id.* at 5, 58, 65.

⁵⁷³ *Id.* at 58-62.

⁵⁷⁴ *Id.* at 12, 15.

⁵⁷⁵ *Id.* at 6.

⁵⁷⁶ *Id.* at 5.

To further evaluate these concerns we examine the rules that applied to market makers in manual markets and compare them to the rules that apply to market makers in today's automated markets. We identify the key differences between these requirements and explain the policy rationale for these rule changes. Finally, we compare the performance of market makers during the Flash Crash with the performance of market makers during the market break of 1987. We find that, despite differences between the rules applicable to market makers, the actions of market makers in each crash were similar in certain respects.

B. Automated Market Makers and Manual Market Makers

The Exchange Act does not require that an exchange have designated market makers to provide liquidity for stocks. However, Exchange Act Rule 11b-1 established by the SEC in 1964 provides that national securities exchanges may establish rules for members of an exchange to register as “specialists.”⁵⁷⁷ Those rules require that a member registered as a specialist must “engage in a course of dealings for his own account to assist in the maintenance, so far as practicable, of a fair and orderly market.”⁵⁷⁸ Until 2008, the NYSE designated one specialist for each NYSE stock who acted as a market maker for that stock and through whom substantially all activity for that security was routed.⁵⁷⁹ In 2008, the NYSE eliminated specialists and replaced them with designated market makers (“DMMs”).⁵⁸⁰ After NASDAQ became a national securities exchange in 2006,

⁵⁷⁷ 17 C.F.R. § 240.11b-1(a).

⁵⁷⁸ 17 C.F.R. § 240.11b-1(a)(2)(ii).

⁵⁷⁹ Self-Regulatory Organizations; New York Stock Exchange, LLC; Notice of Filing of Amendments Nos. 2 and 3 and Order Granting Accelerated Approval to a Proposed Rule Change, as Modified by Amendment Nos. 1, 2, and 3, to create a New NYSE Market Model, with certain Components to Operate as a One-Year Pilot, That Would Alter NYSE's Priority and Parity Rules, Phase Out Specialists by Creating a Designated Market Maker, and Provide Market Participants with Additional Abilities to Post Hidden Liquidity, Exchange Act Release No. 58845, 13 (Oct. 24, 2008), *available at* <https://www.sec.gov/rules/sro/nyse/2008/34-58845.pdf> [hereinafter 2008 SEC Release].

⁵⁸⁰ *See generally* 2008 SEC Release; Self-Regulatory Organizations; New York Stock Exchange, LLC; Order Granting Approval of a Proposed Rule Change Making Permanent Rules of the NYSE New Market Model Pilot and the NYSE Supplemental Liquidity Providers Pilot, Exchange Act Release No. 75578 (Jul. 31, 2015), *available at* <https://www.sec.gov/rules/sro/nyse/2015/34-75578.pdf> [hereinafter 2015 SEC Release].

NASDAQ adopted similar rules for the registration of what it calls “NASDAQ Market Makers” (“NMMs”).⁵⁸¹

Below we described the obligations applicable to NYSE and NASDAQ designated market makers and we compare them with the obligations that applied to NYSE specialists. We also explain why the SEC effectively eliminated the role of specialists in favor of the designated market maker.

1) NYSE and NASDAQ Designated Market Makers

The NYSE allows its broker-dealer members to seek registration as DMMs if they file an application and meet the NYSE’s capital requirements, among other considerations.⁵⁸² However, only one DMM is assigned to each issuer listed on the NYSE. Generally, an issuer selects its DMM through an interview process prior to its initial public offering and can change DMMs at its discretion.⁵⁸³ Today, there are only six DMMs on the NYSE.⁵⁸⁴

The NYSE requires that DMMs “engage in a course of dealings for their own account to assist in the maintenance of a fair and orderly market insofar as reasonably practicable.”⁵⁸⁵ The NYSE rules state that this obligation “implies the maintenance of price continuity with reasonable depth . . . and the minimizing of the effects of a temporary disparity between supply and demand.”⁵⁸⁶ NYSE rules further state that “when lack of price continuity, lack of depth, or disparity between supply and demand exists or is reasonably to be anticipated,” then “it is commonly desirable” that the DMM act under its own account to maintain a fair and orderly market.⁵⁸⁷

⁵⁸¹ *See generally* In the Matter of the Application of the Nasdaq Stock Market LLC for Registration as a National Securities Exchange, Exchange Act Release No. 53128 (Jan. 13, 2006).

⁵⁸² NYSE Rule 103(a)(i).

⁵⁸³ NYSE Rule 103B(I), (III), (IV).

⁵⁸⁴ NYSE, *NYSE Membership*, <https://www.nyse.com/markets/nyse/membership> (last visited Jul. 18, 2016).

⁵⁸⁵ NYSE Rule 104(a).

⁵⁸⁶ NYSE Rule 104(f)(ii).

⁵⁸⁷ *Id.*

The NYSE rules also impose explicit affirmative duties on DMMs to maintain a fair and orderly market. First, the DMM must provide “liquidity as needed to provide a reasonable quotation” and maintain “a continuous two-sided quote with a displayed size of at least one round lot, generally 100 shares.”⁵⁸⁸ To satisfy this first obligation, the DMM must maintain a bid or offer at the NBBO for at least 10% of the trading day for securities for which it is the DMM that have a consolidated average daily volume of one million or more shares.⁵⁸⁹ Second, at the time of entry of its bid or offer, the price of the bid or offer shall generally not be more than between 8% and 30% away from the then current NBBO.⁵⁹⁰ These responsibilities are also intended to facilitate the opening and closing of trading for each security.⁵⁹¹ Other than during the market open and close, the NYSE rules generally do not prohibit a DMM from trading for its own account.⁵⁹²

The NASDAQ rules for NMMs are similar. An NMM must be a broker-dealer member registered with NASDAQ and must satisfy certain minimum requirements, as determined by NASDAQ.⁵⁹³ Unlike DMMs, however, there is more than one NMM for a given security. That is because once registered as an NMM, the NMM may register as an NMM for any or all issuers. The registration for a specific issuer becomes effective the day the NMM makes the registration request.⁵⁹⁴ Indeed, there are over 300 NMMs in total and an average of 14 NMMs for each stock listed on NASDAQ.⁵⁹⁵

Like the NYSE DMM, an NMM has an affirmative obligation to “engage in a course of dealings for its own account to assist in the maintenance, in so far as

⁵⁸⁸ NYSE Rule 104(a)(1); NYSE Rule 55.

⁵⁸⁹ NYSE Rule 104(a)(1)(A).

⁵⁹⁰ NYSE Rule 104(a)(1)(B).

⁵⁹¹ NYSE Rule 104(a)(2), (3).

⁵⁹² NYSE Rule 104(g)(i).

⁵⁹³ NASDAQ Rule 4611, 4612.

⁵⁹⁴ NASDAQ Rule 4612(b).

⁵⁹⁵ NASDAQ, About NASDAQ 46, <http://www.nasdaq.com/about/about.pdf> (last visited Jul. 15, 2016).

reasonably practicable, of fair and orderly markets.”⁵⁹⁶ NASDAQ rules impose two explicit affirmative obligations to satisfy that requirement. First, “[f]or each security in which a member is registered as a [NMM], the member shall be willing to buy and sell such security for its own account on a continuous basis during regular market hours and shall enter and maintain a two-sided trading interest . . . that is identified to the [NASDAQ] as the interest meeting the obligation and is displayed in the [NASDAQ’s] quotation montage at all times.”⁵⁹⁷ The NMM’s bid or offer must be for at least 100 shares of stock.⁵⁹⁸ Second, an NMM’s bid or offer must meet certain pricing requirements. Specifically, at the time of entry of a bid or offer of interest, the price of the bid or offer must generally not be more than 8% to 30% away from the then current NBBO.⁵⁹⁹

a) *NYSE Specialists*

Until replaced in 2008, Rule 104.10 of the NYSE rules for specialists stated that “the function of a member acting as regular specialist on the Floor of the Exchange includes, in addition to the effective execution of commission orders entrusted to him, the maintenance insofar as reasonably practicable, of a fair and orderly market.”⁶⁰⁰ This requirement was similar to the overarching obligation DMMs have today, although the rules for specialists did not prescribe the percentage of the trading day for which a specialist needed to maintain a bid or an offer for their stock or impose restrictions regarding the disparity between a specialist’s bid or offer and the NBBO.

However, NYSE rules did set forth important restrictions on a specialist’s ability to trade for his or her own account in a security for which he was a specialist. First, specialists could not trade for their own accounts “unless such

⁵⁹⁶ NASDAQ Rule 4613.

⁵⁹⁷ NASDAQ Rule 4613(a)(1).

⁵⁹⁸ *Id.*

⁵⁹⁹ NASDAQ Rule 4613(a)(2).

⁶⁰⁰ Nicholas Wolfson & Thomas A. Russo, *The Stock Exchange Member: Liability for Violation of Stock Exchange Rules*, 58 CALIF. L. REV. 1120, 1144 n.113 (1970) (citing NYSE Rule 104.10 as then in effect).

dealings [were] reasonably necessary” to maintain a fair and orderly market.⁶⁰¹ Exchange Act Rule 11b-1 required the NYSE to impose that rule on specialists and it was known as the “negative obligation.”⁶⁰² Second, specialists were generally required by NYSE rules to trade against the trend of the market. For example, if the price of a specialist’s stock was trending upwards, then the specialist could not purchase shares at a price higher than the last completed trade to increase its long position.⁶⁰³ However, while specialists were expected to dampen *abrupt* price movements, they were not obligated to curb a general movement in prices in one direction.⁶⁰⁴

Importantly, DMMs are not required to satisfy either of the abovementioned NYSE rules. Therefore, the primary differences between NYSE specialists and DMMs are that: (1) DMMs are generally allowed to trade for their own account, whereas specialists were subject to the negative obligation that restricted such trading; and (2) DMMs are not required to trade against the market trend, whereas specialists were required to trade against the market.

The SEC orders approving the NYSE’s reforms to eliminate specialists and create DMMs indicate that the SEC allowed these changes primarily due to the practical differences between market making in manual markets and automated markets.⁶⁰⁵

⁶⁰¹ Self-Regulatory Organizations; New York Stock Exchange LLC; Notice of Filing and Order Granting Accelerated Approval to Proposed Rule Change, as Amended, Relating to Exchange Rule 104.10 (“Dealings by Specialists”), Exchange Act Release No. 54860 at 2 (Dec. 1, 2006), *available at* <https://www.sec.gov/rules/sro/nyse/2006/34-54860.pdf> [hereinafter 2006 SEC Release] (citing NYSE Rule 104 as then in effect).

⁶⁰² Rule 11b-1(a)(2)(iii).

⁶⁰³ 2006 SEC Release at 3.

⁶⁰⁴ *The October 1987 Market Break*, U.S. SEC. & EXCH. COMM’N 4-3 (1988) (“The specialists’ responsibilities to trade do not require them to stem general downward or upward price movements, but only to temper sudden price movements and keep any general price movements orderly.”).

⁶⁰⁵ *See* 2006 SEC Release at 16-18, 30, 33-37; 2008 SEC Release at 37-38; 2015 SEC Release at 1-3, 22-24.

First, according to the SEC’s 2008 order, automated markets enabled other market participants to compete with specialists over market making.⁶⁰⁶ This is because in electronic markets specialists did not have the informational advantage that they had in a floor-based market where the specialist was at the center of substantially all of the exchange’s activity for a specific security.⁶⁰⁷ In an automated marketplace, competitors to specialists now had access to the same market information as the specialists and were not subject to the “negative obligation.” The negative obligation would therefore put specialists at a competitive advantage to their competitors.⁶⁰⁸

Second, in a high-speed automated trading system it would be difficult for a specialist to accurately track price movements for every trade.⁶⁰⁹ If specialists could not track price movements for every trade, then they would be at risk of inadvertently violating the NYSE rule that they always trade against the market trend. Therefore, in light of the automation of the marketplace, the SEC concluded it was appropriate for the NYSE to move to a DMM model that did not impose the same restrictions specialists endured as to when and at what price a market maker could trade for its own account.⁶¹⁰

An analysis of the actions of specialists during a price crash in the manual markets is informative as to whether the rules applicable to specialists prevented market makers from exiting markets, as market makers did in the 2010 Flash Crash. We explore the actions of NYSE specialists during the 1987 market break below.

C. The 1987 Market Break

Between Tuesday October 13, 1987 and “Black Monday” October 19, 1987, the market value of U.S. equities fell approximately \$1 trillion, representing more

⁶⁰⁶ See 2008 SEC Release at 36-37.

⁶⁰⁷ *Id.* at 13.

⁶⁰⁸ *Id.* at 18-19.

⁶⁰⁹ *Id.* at 16.

⁶¹⁰ See 2006 SEC Release at 16-18, 30, 33-37; 2008 SEC Release at 13; *see generally* 2015 SEC Release.

than 20% of GDP that year.⁶¹¹ The disruption continued through “Terrible Tuesday,” when trading halted in 175 stocks and S&P 500 futures declined 25% over a period of several hours before quickly rebounding.⁶¹²

Efforts by NYSE specialists to preserve price stability during this period varied markedly. As a group, specialists aggressively countered the downward trend for the first hour of trading on Black Monday,⁶¹³ but by the end of the day, 13 of 55 NYSE specialists had exhausted their buying power by hitting capital constraints.⁶¹⁴ A sample of specialists for 50 large cap stocks found that 30% of specialists ended the day as net sellers,⁶¹⁵ while an additional 10% ended the day with a net short position.⁶¹⁶ Indeed, on Terrible Tuesday, 82% of specialists were net sellers.⁶¹⁷ According to a report by the Presidential Task Force on Market Mechanisms, many specialists simply refused to “sacrifice large amounts of capital in what must have seemed like a hopeless attempt to stem overwhelming waves of selling pressure.”⁶¹⁸ The SEC report on the 1987 market break, characterized NYSE specialist performance on Terrible Tuesday as “uniformly weak and reflective of the panic and exhaustion prevalent on the NYSE floor.”⁶¹⁹

Ultimately, specialists were unwilling or unable to meaningfully effect price stability during the chaos. With a combined total of roughly \$1 billion in capital, NYSE specialists may have been powerless to impact prices when volumes reached \$15-\$25 billion.⁶²⁰ The SEC recommended that the NYSE evaluate whether specialists made adequate efforts to ensure continuity and depth and

⁶¹¹ Nicholas F. Brady et al., *Report of the Presidential Task Force on Market Mechanisms*, WASHINGTON: GOVERNMENT PRINTING OFFICE (Jan. 1988), available at <https://ia802605.us.archive.org/0/items/reportofpresiden01unit/reportofpresiden01unit.pdf>.

⁶¹² *Id.* at 37, 45.

⁶¹³ *Id.* at 49.

⁶¹⁴ *The October 1987 Market Break*, U.S. SEC. & EXCH. COMM’N 4-2 (1988).

⁶¹⁵ Brady et al., *supra* note 611, at 49.

⁶¹⁶ *Id.*

⁶¹⁷ *Id.*

⁶¹⁸ *Id.* at 50.

⁶¹⁹ *The October 1987 Market Break*, U.S. SEC. & EXCH. COMM’N 4-27 (1988).

⁶²⁰ See U.S. Congress, Office of Technology Assessment, *Electronic Bulls and Bears: U.S. Securities Markets and Information Technology* 59-60 (Sept. 1990), available at <https://www.princeton.edu/~ota/disk2/1990/9015/9015.PDF>.

suggested that the NYSE reallocate stocks to other specialists if necessary.⁶²¹ The following year, NYSE punished poor performing specialists by reallocating 11 stocks from 7 specialist groups.⁶²²

We believe that HFT market makers during the Flash Crash exhibited notable similarities to their specialist counterparts during the 1987 market break. Most importantly, they purchased aggressively when declines began,⁶²³ but were “overwhelmed by a very large liquidity imbalance” that continued to develop.⁶²⁴ They also widened spreads and reduced depth when the large price drop triggered self-imposed limits.⁶²⁵ Therefore, at this time we do not make any specific recommendations to change the rules applicable to market makers, as we do not believe the Flash Crash provides clear support for such changes.

D. Market Events of August 24, 2015

On August 24, 2015, concerns about the health of the Chinese economy led to a dramatic (8.5%) overnight decline in the Shanghai Composite Index in China, setting the stage for a shaky open to the U.S. stock market.⁶²⁶ That morning, U.S. equity markets experienced delayed openings, severe price dislocations, extreme

⁶²¹ *The October 1987 Market Break*, U.S. SEC. & EXCH. COMM’N 4-28 (1988).

⁶²² See Robert A. Schwartz, *Reshaping the Equity Markets: A Guide for the 1990s* (1993); See U.S. Congress, Office of Technology Assessment, *Electronic Bulls and Bears: U.S. Securities Markets and Information Technology* 59-60 (Sept. 1990), available at <https://www.princeton.edu/~ota/disk2/1990/9015/9015.PDF>.

⁶²³ Findings Regarding the Market Events of May 6, 2010, Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues 1-6 (Sept. 30, 2010), available at <https://www.sec.gov/news/studies/2010/marketevents-report.pdf>.

⁶²⁴ Andrei A. Kirilenko et al., *The Flash Crash: The Impact of High Frequency Trading on an Electronic Market* 14 (Dec. 28, 2015), available at http://www.cftc.gov/idc/groups/public/@economicanalysis/documents/file/oc_flashcrash0314.pdf.

⁶²⁵ Findings Regarding the Market Events of May 6, 2010, Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues 38 (Sept. 30, 2010), available at <https://www.sec.gov/news/studies/2010/marketevents-report.pdf>.

⁶²⁶ *Strengthening U.S. Equity Market Structure to Better Address Extreme Volatility*, N.Y. STOCK EXCH. 36 (Jan. 28, 2016), available at https://www.nyse.com/publicdocs/Strengthening_US_equity_market_structure.pdf; Mark Thompson & Charles Riley, *World markets plunge as China stocks crash*, CNN (Aug. 24, 2015), available at <http://money.cnn.com/2015/08/23/investing/world-stock-markets/>.

volatility, and an uneven and unusual level of trading halts. The S&P 500 index fell more than 5% within the first five minutes of the market open.⁶²⁷ Nearly half of NYSE-listed stocks had not yet opened ten minutes into the trading day and stocks that had opened on time were trading at extreme price levels.⁶²⁸ For example, blue chip stocks including General Electric, Ford, and JP Morgan experienced price declines of more than 20%.⁶²⁹ In addition to the overall market decline, an abnormally high number of trading halts were imposed on 471 individual stocks with nearly 1,300 halts occurring throughout the trading day.⁶³⁰

Turmoil in the stock market also caused disruptions in the exchange-traded fund (“ETF”) market. ETF market makers generally provide quotes for an ETF based on the prices of an ETFs’ underlying securities.⁶³¹ For example, the iShares Core S&P 500 ETF (ticker: IVV) tracks the performance of the S&P 500 index.⁶³² ETF market makers provide efficient quotes for IVV largely based on the aggregated market prices of the individual stocks that make up the S&P 500. However, without reliable prices for the individual S&P 500 stocks (due to trading halts), pricing the IVV ETF becomes much more difficult and risky. Accordingly, market makers were reluctant to supply liquidity for ETFs on August 24, because they did not have access to reliable price information for the underlying securities that they use to price the ETFs.⁶³³ In addition, trading halts undermined market makers’ confidence that they could reliably execute trades in the individual stocks, making it difficult to continue to provide liquidity in the associated ETFs. At one point, the price of the IVV ETF declined 20%, even though the S&P 500 index that

⁶²⁷ Emma O'Brien et al., *S&P 500 Pulls Back From Correction While Risk-Asset Rout Deepens*, BLOOMBERG (Aug. 24, 2015), available at <http://www.financial-planning.com/news/s-p-500-pulls-back-from-correction-while-risk-asset-rout-deepens>.

⁶²⁸ See *US Equity Market Structure: Lessons from August 24*, BLACKROCK 7 (Oct. 2015), available at <https://www.blackrock.com/corporate/en-us/literature/whitepaper/viewpoint-us-equity-market-structure-october-2015.pdf>.

⁶²⁹ *Id.*

⁶³⁰ *Id.*

⁶³¹ *Id.*

⁶³² See *iShares Core S&P 500 ETF Overview*, available at <https://www.ishares.com/us/products/239726/ishares-core-sp-500-etf>.

⁶³³ See BLACKROCK, *supra* note 628, at 7.

it tracked never fell more than 7%.⁶³⁴ Roughly 20% of ETFs listed in the U.S. were subject to trading halts throughout the day.⁶³⁵

We believe that the SEC should pursue reforms that would support the efficient pricing of ETFs in the face of trading halts of the underlying securities. The NYSE has suggested that the SEC consider aligning trading halt procedures between individual equities and ETFs.⁶³⁶ While we do not have a specific recommendation at this time, we tentatively agree that the SEC should consider rules that would halt the trading of an ETF if a sufficiently high percentage of its underlying securities are subject to a trading halt. Subjecting an ETF to a trading halt is likely better than allowing an ETF to dramatically fall in value simply because market makers are unable to provide liquidity.

Part II: Enhancing Volatility Controls

A. Market-wide Circuit Breakers

Market-wide circuit breakers are designed to briefly shut down trading in all stocks across all trading venues to promote the orderly functioning of markets. Shutting down trading promotes the orderly functioning of markets, because it provides market participants with additional time to assess new information and significant changes in market prices and to adjust automated trading systems that may be executing trades at unintended prices. This can reduce the market impact of abrupt price movements.⁶³⁷

⁶³⁴ SEC Division of Trading and Markets, Research Note: Equity Markets Volatility on August 24, 2015, U.S. SEC. & EXCH. COMM'N (Dec. 2015), *available at* https://www.sec.gov/marketstructure/research/equity_market_volatility.pdf.

⁶³⁵ *Id.*

⁶³⁶ *See* N.Y. STOCK EXCH., *supra* note 626.

⁶³⁷ Findings Regarding the Market Events of May 6, 2010, Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues 7 (Sept. 30, 2010), *available at* <https://www.sec.gov/news/studies/2010/marketevents-report.pdf>.

Market-wide circuit breakers existed before the Flash Crash and were tied to single-day declines in the Dow Jones Industrial Average.⁶³⁸ The thresholds at which the original circuit breakers would be activated were price declines of 10%, 20%, and 30%.⁶³⁹ However, the market-wide volatility during the Flash Crash did not exceed the lowest threshold. This is because the crash was limited to 300 different securities and so a sufficient decline in the Dow Jones did not take place that day.⁶⁴⁰ The SEC responded to the Flash Crash by lowering the thresholds at which the market-wide circuit breakers are triggered⁶⁴¹ to price declines of 7%, 13%, and 20%.⁶⁴² In addition, the SEC now uses the S&P 500 as the reference index instead of the Dow Jones.⁶⁴³

Despite the lower threshold, the market-wide circuit breaker was not triggered during the more recent August 24, 2015 market disruption, even though nearly 1,300 trading halts occurred throughout the day. In fact, the market-wide circuit breakers that were established after the Flash Crash have never been triggered and would only have been triggered 12 times since 1980.⁶⁴⁴ According to the SEC, a primary reason that the market-wide circuit breakers were not triggered on August 24 was that many components of the S&P 500 did not open on time, so the prices of those components were not accurately reflected in the reference index.⁶⁴⁵ If all NYSE-listed stocks had opened promptly, then the S&P 500 index would

⁶³⁸ See Mark Koba, *Market Circuit Breakers: CNBC Explains*, CNBC (Aug. 10, 2011), available at <http://www.cnbc.com/id/44059883>.

⁶³⁹ *Id.*

⁶⁴⁰ Findings Regarding the Market Events of May 6, 2010, Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues 6 (Sept. 30, 2010), available at <https://www.sec.gov/news/studies/2010/marketevents-report.pdf>.

⁶⁴¹ Self-Regulatory Organizations; Notice of Filing of Amendments No. 1 and Order Granting Accelerated Approval of Proposed Rule Changes as Modified by Amendments No. 1, Relating to Trading Halts Due to Extraordinary Market Volatility, Exchange Act Release No. 67090 (May 31, 2012), available at <http://www.sec.gov/rules/sro/bats/2012/34-67090.pdf>.

⁶⁴² *Id.* at 4, 5.

⁶⁴³ *Id.*

⁶⁴⁴ See BLACKROCK, *supra* note 628, at 7.

⁶⁴⁵ See SEC Division of Trading and Markets, Research Note: Equity Markets Volatility on August 24, 2015, U.S. SEC. & EXCH. COMM’N 16 (Dec. 2015), available at https://www.sec.gov/marketstructure/research/equity_market_volatility.pdf.

have reflected the actual market decline and the market-wide circuit breakers would have been triggered.⁶⁴⁶

Certain market experts believe that a market-wide circuit breaker would have been a better mechanism for market stabilization on August 24, instead of multiple individual trading halts.⁶⁴⁷ Indeed, widespread individual trading halts may have actually fueled the instability. Trading halts were applied over a thousand times, but were not implemented uniformly or simultaneously. As a result, market participants were uncertain as to whether their trades would be completed. Additionally, reopening trading in a halted stock was highly problematic.⁶⁴⁸

Of course, in order to achieve the mechanism's market stabilizing purpose, a market-wide circuit breaker requires a trigger threshold that is actually activated during times of severe disruption. One potential approach to implementing more effective circuit breakers would be to further lower the threshold decline in the reference index that triggers the circuit breakers. However, lowering the trigger to a percent variation less than the current 7% threshold could make the circuit breakers too sensitive to price fluctuations in the S&P 500. Hyperactive circuit breakers could produce unnecessary disruptions in trading activity or enhance negative market sentiments founded on the perception of widespread volatility.

Indeed, the failed implementation of a market-wide circuit breaker in China provides a cautionary tale. The Shanghai and Shenzhen Stock Exchanges implemented a circuit breaker in January 2016 that suspended trading for 15 minutes when the market index fell by 5 percent and halted trading for the rest of the day after a fall of 7 percent.⁶⁴⁹ On the inaugural day of the circuit breaker, a 5-percent 15-minute suspension was triggered less than four hours into the trading

⁶⁴⁶ *Id.*

⁶⁴⁷ See BLACKROCK, *supra* note 628, at 7.

⁶⁴⁸ *Id.* at 3-5.

⁶⁴⁹ Lee Chyen Yee & Samuel Shen, China suspends market circuit breaker mechanism after stock market rout, REUTERS (Jan. 7, 2016), *available at* <http://www.reuters.com/article/us-china-stocks-idUSKBN0UL1RC20160107>.

day with a full day 7-percent halt occurring only two minutes thereafter.⁶⁵⁰ Two days later, the full day 7-percent halt was triggered again after only 33 minutes of trading, making it the shortest trading day in the history of the Chinese stock market.⁶⁵¹ As a result of these disastrous disruptions in trading, the circuit breaker was scrapped by the end of the week.⁶⁵²

We do not recommend further lowering the volatility thresholds for triggering market-wide circuit breakers. Instead, we recommend the calibration of the market-wide circuit breaker thresholds to respond to extreme volatility in a fixed number of securities. The threshold number or percentage of securities should represent a significant portion of the market, but should encompass scenarios where volatility may be concentrated in certain groups of securities. Such an approach should address situations like August 24, when volatility was particularly acute in markets for ETFs and their underlying securities, but not widespread enough to activate the circuit breakers. In addition, breaches of LULD thresholds (discussed below) should be treated as the signal of critical levels of volatility in individual stocks. In other words, market-wide circuit breakers should be activated once a fixed number of stocks have triggered LULD halts. Determining the exact number or percentage of securities that should trigger the circuit breakers is a highly technical question. The SEC should promptly appoint experts to research this issue and propose appropriate thresholds.

Specific Recommendation:

21. Thresholds for market-wide circuit breakers should be adjusted so that they are triggered when a pre-determined number of stocks or percentage of an index display extreme volatility by triggering their individual trading halts.

The Flash Crash and the August 24 market disruption each highlighted the significant interconnection between equity markets and futures markets. In the case

⁶⁵⁰ Alan Lok, *China's Circuit Breaker: Boon or Bane?*, CFA INST. (Jan. 14, 2016), available at <https://blogs.cfainstitute.org/marketintegrity/2016/01/14/chinas-circuit-breaker-boon-or-bane/>.

⁶⁵¹ *Id.*

⁶⁵² *Id.*

of the Flash Crash, activity in the futures market transmitted disruptions to individual stocks in the equity markets. In the case of the August 24, 2015 market events, prices in the futures market were severely dislocated from the prices of the underlying equities, further exacerbating uncertainty in both markets.⁶⁵³

This connection between equity markets and the futures market also impacts the effectiveness of volatility controls like market-wide circuit breakers. Without inter-market coordination, shutting down trading in one asset class could spur extreme disruptions in markets in related securities. Indeed, the Joint Report recommended that circuit breaker rules be applied to the futures market: “because markets are fragmented and inter-connected, regulatory attention must also focus on the linkages between and across markets, recognizing that coordination issues are fundamental to the efficient functioning of both equity and equity derivative markets.”⁶⁵⁴ For market-wide circuit breakers to have their intended effect of stabilizing trading by giving market participants time to respond to information, it is important that thresholds are harmonized between the equity markets and futures market.

Specific Recommendation:

22. The SEC and the Commodity Futures Trading Commission should work together to harmonize the thresholds for market-wide circuit breakers in the stock market with the futures market.

B. Trading Halts for Individual Stocks

Following the 2010 Flash Crash, the SEC implemented a “limit up-limit down” (“LULD”) mechanism that responds to abrupt and dramatic shifts in the

⁶⁵³ See BLACKROCK, *supra* note 628, at 7.

⁶⁵⁴ Recommendations Regarding Regulatory Responses to the Market Events of May 6, 2010: Summary Report of the Joint CFTC-SEC Advisory Committee on Emerging Regulatory Issues 3-4 (Feb. 18, 2011), *available at* http://www.cftc.gov/idc/groups/public/@aboutcftc/documents/file/jacreport_021811.pdf.

price movements of *individual* securities.⁶⁵⁵ LULD promotes the orderly functioning of markets in a manner similar to the market-wide circuit breakers. The mechanism prevents trade execution outside a fixed price band and institutes a trading pause if price volatility is not quickly corrected.⁶⁵⁶ LULD therefore protects market participants from executing trades at extreme and unintended prices and provides time for them to respond to new information and adjust their orders during periods of extreme volatility. In addition, LULD responds more directly to the types of abrupt price declines that occurred during the Flash Crash, because it applies to the volatility of individual securities rather than market-wide volatility.

LULD imposes a price band within which trades in a certain security may occur. The band is based on the price deviation from the stock's average price over the most recent five minute trading period.⁶⁵⁷ There are three primary price band groups, to which securities are assigned according to their price: 5%, 10%, or 20%.⁶⁵⁸ The applicable band group is determined under an NMS Plan designed by the SROs.⁶⁵⁹ Generally, the price band that applies to a stock becomes narrower as the price and liquidity of the stock increase.⁶⁶⁰ This is because, for instance, a 5% price change in five minutes is more likely to constitute extreme volatility for highly liquid stocks that typically do not fluctuate in price in such a manner than it is for less liquid, highly volatile stocks that often fluctuate in this manner. During the open and close of the trading day, the price bands are doubled.⁶⁶¹

⁶⁵⁵ See Joint Industry Plan; Order Approving the Tenth Amendment to the National Market System Plan to Address Extraordinary Market Volatility, Exchange Act Release No. 77679, File No. 4-631 2 (Apr. 21, 2016), *available at* <https://www.sec.gov/rules/sro/nms/2016/34-77679.pdf>. The pilot period is currently set to expire on April 21, 2017.

⁶⁵⁶ Investor Bulletin: Measures to Address Market Volatility, U.S. SEC. & EXCH. COMM'N (Jan. 4, 2016), *available at* <http://www.sec.gov/investor/alerts/circuitbreakersbulletin.htm>.

⁶⁵⁷ Plan to Address Extraordinary Market Volatility 8, *available at* <https://www.sec.gov/news/press/2011/2011-84-plan.pdf>.

⁶⁵⁸ Investor Bulletin: Measures to Address Market Volatility, U.S. SEC. & EXCH. COMM'N (Jan. 4, 2016), *available at* <http://www.sec.gov/investor/alerts/circuitbreakersbulletin.htm>.

⁶⁵⁹ See Plan to Address Extraordinary Market Volatility Submitted to The Securities and Exchange Commission Pursuant to Rule 608 Of Regulation NMS Under the Securities Exchange Act of 1934, *available at* <https://www.sec.gov/rules/sro/nms/2015/34-75917-exa.pdf>.

⁶⁶⁰ *Id.* at Appendix A.

⁶⁶¹ *Id.* at 11.

When a security's quoted price is outside the applicable price band, trading in the security enters a 15 second "limit state."⁶⁶² During the limit state, trading is permitted only at prices that are at or inside the band, to allow the quoted price to stabilize.⁶⁶³ If quotes do not return to a price within the price band after 15 seconds, a five minute trading pause is implemented.⁶⁶⁴ After the five minute pause, the security's primary listing exchange re-opens trading in the security. The primary listing exchange also has authority to extend the pause for an additional five minutes.⁶⁶⁵

LULD was extensively deployed during the market events of August 24, 2015. As discussed in the previous section, there were roughly 1,300 LULD trading pauses throughout the day, and the widespread but non-universal halts likely fed the market instability. Indeed, the LULD mechanism is intended to respond to anomalous price movements in a small number of securities, while widespread events like that on August 24 may be better controlled by market-wide circuit breakers. Our approach in Recommendation 21 is intended to address such a scenario by coordinating LULD and market-wide circuit breakers to curb extraordinary market disruptions. In addition, we believe that certain key measures could enhance the effectiveness of LULD. The recommendations outlined by the NYSE in response to the August 24 market events are generally aligned with our suggested reforms.⁶⁶⁶

In our view, LULD price bands should be adjusted so that they are uniform throughout the trading day, rather than doubled during the open and close of

⁶⁶² See BLACKROCK, *supra* note 628, at 8-9.

⁶⁶³ *Id.*

⁶⁶⁴ *Id.*

⁶⁶⁵ *Id.* See also N.Y. STOCK EXCH., *supra* note 626; Letter to Brent J. Fields from Christopher B. Stone, FINRA, Re: Supplemental Joint Assessment on the Plan to Address Extraordinary Market Volatility, 14 (May 28, 2015) available at <https://www.sec.gov/comments/4-631/4631-39.pdf>; Memorandum from EMSAC Trading Venues Regulation Subcommittee to Equity Market Structure Advisory Committee (EMSAC), Recommendations Relating to Trading Venues Regulation, U.S. SEC. & EXCH. COMM'N (Apr. 19, 2016), available at <https://www.sec.gov/spotlight/emsac/emsac-trading-venues-subcommittee-recommendations-041916.pdf>.

⁶⁶⁶ See N.Y. STOCK EXCH., *supra* note 626, advocating changes to LULD procedures.

trading. The current doubling of bands during the first 15 minutes and last 25 minutes of the day effectively permits greater volatility during these periods. On one hand, wider bands during these periods makes sense: volatility is especially likely during the open and halts imposed at the close of trading could be exceptionally disruptive. However, the *inconsistency* in bands throughout the trading day can create problems, especially following a volatile open. Doubling the bands during the open allows extreme price deviations, but after 15 minutes LULD restrictions will become active at a much more moderate price. This inconsistency means that: (1) price volatility could result in immediate LULD halts after 15 minutes; and (2) prices will have a harder time self-correcting out of LULD states that were entered during the first 15 minutes of the day.

To illustrate the second point, suppose a security is subject to a 10% LULD price band. During the opening, the band would double to 20%. Therefore, if a security's price dropped 20% during the open, for example from \$100 to \$80, it would activate a "limit down" halt. After the first 15 minutes of the trading day, the LULD price band would drop to 10%. For the price of the security to then correct itself from \$80 to \$100 (i.e., increase \$20), it would have to undergo two separate "limit up" halts at the normal 10% trigger. Thus not only do the current doubled price bands accommodate excessive volatility, but they impede the self-correction process.

Furthermore, on August 24 "limit up" halts (773) exceeded "limit down" halts (505) on a day with an overload of sells orders. This asymmetry further demonstrates that the narrowing of the price bands after the open constrained the recovery. We recommend that consistent LULD thresholds be applied throughout the trading day, including the market open and close. This change would promote predictability and better equip the markets to recover from volatile conditions.

Specific Recommendation:

23. The SEC should establish uniform LULD intraday price bands, instead of wider bands during the market open and close.

The LULD mechanism has the potential to serve a major stabilizing role in our markets. It controls unexpected volatility in individual stocks, so that public companies and their investors can be confident that erratic stock movements will be contained. And by quelling volatility in smaller groups of stocks, LULD can keep these anomalies from affecting the markets more broadly. However, the events of August 24, 2015 exposed certain flaws in the current LULD design. Below, we briefly identify these fundamental problems and potential reforms that we believe policymakers should further explore. Given their highly technical nature, we do not take a position on the advisability of any of these major reforms.

The first consideration worth noting is a potential adjustment to the time periods of the LULD limit state and trading pause to minimize market disruption. During the 15 second limit state, trading in a security is still permitted at prices that fall *within the applicable price band*. In contrast, the trading pause that results if a security's quoted price does not quickly normalize prohibits *all* trading in the security. The 15-second limit state is stabilizing by design, and extending the time period for the limit state could be helpful to give securities outside the LULD price band more time to self-correct. In contrast, a trading pause is somewhat disruptive by design. While a 5-minute trading pause affords market participants time to respond to volatility, it also interrupts trading and can create uncertainty as to whether trades will be executed as intended. Additionally, a five minute halt in trading is likely more time than necessary for market participants to adjust their trading and can delay the normalization of prices. We therefore tentatively believe that extending the LULD limit state and reducing trading pauses could be advisable.

We also note that a more dramatic overhaul of the LULD mechanism has recently gained momentum among market experts as a potential reform. This model typically incorporates (1) *adjustable* price bands for stocks that remain in limit conditions; (2) an extended limit state; and (3) the elimination of trading pauses.⁶⁶⁷ The goal of this structure is to allow prices of a stock to organically

⁶⁶⁷ Memorandum from EMSAC Trading Venues Regulation Subcommittee to Equity Market Structure Advisory Committee (EMSAC), Recommendations Relating to Trading Venues Regulation, U.S. SEC. & EXCH. COMM'N (Apr. 19, 2016), *available at*

move closer to equilibrium while avoiding trading halts. In theory, removing the trading pause not only curbs the disruptive nature of these pauses, but also obviates the need for re-opening processes and the problems that they can cause.

C. “Breaking” Clearly Erroneous Trades

SROs have the authority necessary to cancel, or “break,” trades on any trading venue, if a trade exceeded a minimum percentage deviation from the last trade.⁶⁶⁸ In other words, two counterparties that entered into a trade on an exchange would no longer be bound by their trade if an exchange broke that trade. Similarly, FINRA can break the trades of ATSS and broker-dealer internalizers.⁶⁶⁹

Historically, trades were generally broken when the price of an executed trade indicated that an obvious error existed, suggesting that it was unrealistic to expect that the counterparties had come to a meeting of the minds regarding the terms of the transaction.⁶⁷⁰ The nullification of such “clearly erroneous trades” promotes fair and orderly markets and protects investors.⁶⁷¹

However, prior to the Flash Crash, the SEC and FINRA had set low floors for granting SROs the discretion to cancel a trade and there was no percentage

<https://www.sec.gov/spotlight/emsac/emsac-trading-venues-subcommittee-recommendations-041916.pdf>.

⁶⁶⁸ Order Granting Approval of Proposed Rule Changes Relating to Clearly Erroneous Transactions, Exchange Act Release No. 62886, 4-5 (Sept. 10, 2010), *available at* <https://www.sec.gov/rules/sro/bats/2010/34-62886.pdf>.

⁶⁶⁹ See FINRA Rule 11892 (amended 2015), *available at* http://finra.complinet.com/en/display/display_main.html?rbid=2403&element_id=8854.

⁶⁷⁰ See, e.g., Self-Regulatory Organizations; Philadelphia Stock Exchange, Inc.; Order Granting Approval of a Proposed Rule Change, as Modified by Amendment Nos. 1 and 2 Thereto, Relating to Obvious Errors, Exchange Act Release 57712, File No. SR-Phlx-2007-69 3 (Apr. 24, 2008), *available at* <https://www.sec.gov/rules/sro/phlx/2008/34-57712.pdf>.

⁶⁷¹ See, e.g., Self-Regulatory Organizations; Financial Industry Regulatory Authority, Inc.; Order Granting Approval of Proposed Rule Change Relating to FINRA’s Rules Governing Clearly Erroneous Executions, Exchange Act Release 61080, File No. SR-FINRA-2009-068 (Dec. 1, 2009), *available at* <https://www.sec.gov/rules/sro/finra/2009/34-61080.pdf>.

Pre-Flash Crash FINRA release: “These rules provide important safeguards against market disruptions caused by trader errors, system malfunctions or other extraordinary events that result in erroneous executions affecting multiple market participants and/or securities.”

deviation that required an exchange to cancel a trade. For example, exchanges had the authority to cancel a trade if there had been only a 5% deviation from the previous trade in that stock, even if such volatility was common.⁶⁷² As a result, when market participants observed the extreme price volatility during the Flash Crash, they were aware of SROs' authority to cancel trades under the clearly erroneous trade rules, but the discretion built into those rules left them unsure as to which trades would be honored and which would be cancelled.⁶⁷³ This negatively affected participation in the markets and the provision of liquidity.⁶⁷⁴ For example, HFT market makers seeking to earn spreads could not accurately gauge their risk exposure, because certain trades could be cancelled. The SROs ultimately chose a 60% deviation from prices at 2:40pm as the threshold for trade cancellation that day, but did so "in a process that, from the perspective of market participants, was not clear or transparent, and led to further uncertainty and confusion in the market."⁶⁷⁵

⁶⁷² Self-Regulatory Organizations; Order Granting Approval of Proposed Rule Changes Relating to Clearly Erroneous Transactions, Exchange Act Release No. 62886 4 (Sept. 10, 2010), *available at* <https://www.sec.gov/rules/sro/bats/2010/34-62886.pdf>.

⁶⁷³ Recommendations Regarding Regulatory Responses to the Market Events of May 6, 2010: Summary Report of the Joint CFTC-SEC Advisory Committee on Emerging Regulatory Issues 7, 64 (Feb. 18, 2011), *available at* http://www.cftc.gov/idc/groups/public/@aboutcftc/documents/file/jacreport_021811.pdf; Self-Regulatory Organizations; Order Granting Approval of Proposed Rule Changes Relating to Clearly Erroneous Transactions, Exchange Act Release No. 62886 (Sept. 10, 2010), *available at* <https://www.sec.gov/rules/sro/bats/2010/34-62886.pdf>; Leonard J. Amoroso, Senior Managing Director and General Counsel, Knight Capital Group, Inc., Written Statement Submitted before the CFTC-SEC Advisory Committee 5-6 (Jun. 22, 2010), *available at* http://www.cftc.gov/ucm/groups/public/@newsroom/documents/file/jointmeeting062210_amoroso.pdf.

⁶⁷⁴ Recommendations Regarding Regulatory Responses to the Market Events of May 6, 2010: Summary Report of the Joint CFTC-SEC Advisory Committee on Emerging Regulatory Issues 7 (Feb. 18, 2011), *available at* http://www.cftc.gov/idc/groups/public/@aboutcftc/documents/file/jacreport_021811.pdf.

⁶⁷⁵ Self-Regulatory Organizations; Order Granting Approval of Proposed Rule Changes Relating to Clearly Erroneous Transactions, Exchange Act Release No. 62886 5 (Sept. 10, 2010), *available at* <https://www.sec.gov/rules/sro/bats/2010/34-62886.pdf>.

In September 2010, the SEC approved a rule that set bright-line thresholds at which trades must be broken.⁶⁷⁶ The rule provides for trade cancellation based on a percentage deviation from a reference price for events relating to *multiple stocks* executed within a 5-minute period.⁶⁷⁷ For events affecting 20 or more securities, executions at prices 30% or more from the reference price trigger cancellation, while a price deviation of 10% or more is the cancellation threshold for stock events involving 5 through 19 securities.⁶⁷⁸ For events involving less than 5 securities, the numerical trade cancellation guidelines that applied before the Flash Crash continue to apply. Exchanges and FINRA are generally prohibited from canceling trades that do not exceed these minimums.⁶⁷⁹

Despite revisions to the clearly erroneous rules, uncertainty continued to play a role in the market disruption of August 24, 2015, so cancellation rules may need to be revisited. In particular, LULD thresholds and “clearly erroneous” thresholds are not the same. For example, an LULD halt might not be triggered for a stock unless its price is 40% away from the last sale. However, a trade in that same stock could be subject to a “clearly erroneous” review at just a 10% price deviation.

Indeed, we believe that the clearly erroneous standard and LULD thresholds should be revised so that a clearly erroneous trade would be prevented by the LULD threshold in the first place. Aligning the thresholds should eventually allow

⁶⁷⁶ *See id.* In 2014, the pilot period was updated to coincide with that for the Limit Up-Limit Down Plan. *See* Self-Regulatory Organizations; Order Granting Approval of Proposed Rule Changes Relating to Clearly Erroneous Executions, Exchange Act Release No. 72434 4-6 (Jun. 19, 2014), *available at* <https://www.sec.gov/rules/sro/bats/2014/34-72434.pdf>.

⁶⁷⁷ Self-Regulatory Organizations; Order Granting Approval of Proposed Rule Changes Relating to Clearly Erroneous Transactions, Exchange Act Release No. 62886 5-6 (Sept. 10, 2010), *available at* <https://www.sec.gov/rules/sro/bats/2010/34-62886.pdf>.

⁶⁷⁸ *Id.* The rules have recently been updated to account for “Multi-Day Events,” in which a series of transactions in one security on multiple days can constitute one event that is eligible for cancellation. *See also* Self-Regulatory Organizations; Order Granting Approval of Proposed Rule Changes Relating to Clearly Erroneous Executions, Exchange Act Release No. 72434 5-6 (Jun. 19, 2014), *available at* <https://www.sec.gov/rules/sro/bats/2014/34-72434.pdf>.

⁶⁷⁹ Self-Regulatory Organizations; Order Granting Approval of Proposed Rule Changes Relating to Clearly Erroneous Transactions, Exchange Act Release No. 62886 5-6 (Sept. 10, 2010), *available at* <https://www.sec.gov/rules/sro/bats/2010/34-62886.pdf>.

the automated LULD mechanisms to largely replace the outmoded and less predictable “clearly erroneous” process. This recommendation is echoed by the NYSE in its response to the August 24 market events.⁶⁸⁰

Specific Recommendation:

24. The SEC should eliminate clearly erroneous trade guidelines by aligning them with the thresholds for LULD rules.

D. Kill Switches

Mandatory kill switches on trading venues are intended to prevent market participants from experiencing losses due to malfunctioning software, errant algorithms or human errors that do not sufficiently move prices to trigger other volatility controls. For example, Knight Trading lost approximately \$440 million in less than 45 minutes due to an errant software program.⁶⁸¹ Knight Capital’s trades did not sufficiently move stock prices to trigger LULD or clearly erroneous trade thresholds and Knight had to bear its own losses. Had a kill switch been successfully implemented, Knight’s losses would have been substantially mitigated.⁶⁸² Overall, the implementation of a standardized kill switch would help avoid significant market losses associated with human error and algorithm-related trading errors. Kill switches would also effectively reduce the risk of trading for automated market participants, including HFT market makers, thereby reducing their financial risk and potentially the transaction costs for investors that benefit from their services.

Kill switches halt trading for a specific market participant on a trading venue when that entity’s trading activity has breached a pre-established exposure

⁶⁸⁰ See N.Y. STOCK EXCH., *supra* note 626, at 4, recommending “[s]ynchronization of Clearly Erroneous Execution (CEE) and LULD bands.”

⁶⁸¹ Whitney Kisling, *Knight Capital Reports Net Loss After Software Error*, BLOOMBERG (Oct. 17, 2012), available at <http://www.bloomberg.com/news/2012-10-17/knight-capital-reports-net-loss-as-software-error-takes-toll-1-.html>.

⁶⁸² Settlement Order, Knight Capital Americas LLC, Exchange Act Release No. 70694, File No. 3-15570 1, 4 (Oct. 16, 2013), available at <https://www.sec.gov/litigation/admin/2013/34-70694.pdf>.

threshold on that trading venue.⁶⁸³ This is different from other volatility controls that stop trading for *all market participants* when the price volatility of the market or an individual stock exceeds a pre-determined threshold. Although a number of market participants have individual controls that operate like kill switches,⁶⁸⁴ these kill switches can malfunction when a larger problem occurs at that firm.

Currently, certain exchanges have kill switches for broker-dealer members.⁶⁸⁵ However, existing exchange-level kill switches are of limited usefulness for several reasons. First, these kill switches are optional and can slow trading for broker-dealers. This optionality enables and incentivizes broker-dealers to choose not to use kill switches, and if enough broker-dealers do not use the kill switches then they may not be effective in reducing market-wide volatility due to trading errors.⁶⁸⁶ In addition, existing kill switches lack uniformity across exchanges.⁶⁸⁷ A lack of uniformity “significantly reduces utility and efficacy because it requires significant resources to properly configure and maintain overlapping and inconsistent kill switch parameters at each exchange.”⁶⁸⁸ Due to the highly automated nature of algorithmic trading, it is particularly difficult for a market participant to adjust its trading programs to function compatibly with exchange-level kill switches that are designed differently.

We recommend that regulators require uniform, mandatory kill switches across exchanges for all broker-dealer members. Each kill switch should have an

⁶⁸³ *Prepared Written Testimony Before the S. Comm. on Banking, Housing, and Urban Affairs*, 113th Cong. 2 (2014) (statement of Hal S. Scott, Nomura Professor and Director of the Program on International Financial Systems, Harvard Law School).

⁶⁸⁴ Loch Adamson, *Kill Switches Come to Life*, INSTITUTIONAL INVESTOR (Oct. 18, 2012), available at <http://www.institutionalinvestor.com/article/3105080/banking-and-capital-markets-trading-and-technology/kill-switches-come-to-life.html#.Vzqc8pErLIU>.

⁶⁸⁵ See, e.g., NASDAQ, *Equity Kill Switch: Frequently Asked Questions*, available at <https://www.nasdaqtrader.com/content/EquityKillSwitch.pdf>.

⁶⁸⁶ See generally *The Role of Regulation in Shaping Equity Market Structure and Electronic Trading: Before the S. Comm. on Banking, Housing, and Urban Affairs*, 113th Cong. 2, 8-9 (2014) (statement of Kenneth C. Griffin, Founder and Chief Executive Officer, Citadel LLC), available at <https://www.citadel.com/files/uploads/2014/07/Kenneth-Griffin-Written-Testimony.pdf>.

⁶⁸⁷ *Id.*

⁶⁸⁸ *Id.*

automatic trigger at both the exchange and the exchange member when the relevant threshold is breached. These new kill switches should be standardized across exchanges, to facilitate market participants' understanding of applicable trading thresholds and to reduce the costs of shifting to this new regime.

Specific Recommendation:

25. The SEC should require mandatory kill switches on all exchanges for all exchange members.

E. Regulatory Trading Halts

Exchanges have the authority to call regulatory trading halts for their listed securities under the CTA Plan for NYSE listed securities or the UTP Plan for NASDAQ listed securities.⁶⁸⁹ Once a listing exchange decides a regulatory halt is appropriate and institutes one, the listing exchange must notify other exchanges and FINRA.⁶⁹⁰ Importantly, regulatory trading halts are generally effective across all trading venues.⁶⁹¹

The CTA Plan and UTP Plan are both NMS Plans. Each plan similarly defines a regulatory trading halt as a halt or suspension of trading in a security because of: (i) inadequate or pending disclosure of material information to the public; or (ii) “regulatory problems relating to” a security “that should be clarified

⁶⁸⁹ CTA Plan, *infra* note 692, at 48; UTP Plan, *infra* note 692, at 17.

⁶⁹⁰ CTA Plan, *infra* note 692, at 48; UTP Plan, *infra* note 692, at 17.

⁶⁹¹ Bidisha Chakrabarty et al., When a Halt is Not a Halt: An Analysis of Off-NYSE Trading during NYSE Market Closures, JOURNAL OF FINANCIAL INTERMEDIATION 2 (2011), *available at* http://www3.nd.edu/~scorwin/documents/OffNYSETrading_000.pdf (noting that regulatory halts are “generally coordinated” across venues). When the NASDAQ institutes a regulatory trading halt for NASDAQ listed securities, all parties to the UTP Plan, which include NASDAQ exchanges, 11 other exchanges, and FINRA, shall “halt or suspend trading in that security until notified that the halt or suspension is no longer in effect.” UTP Plan at 17. If the NYSE institutes a regulatory halt, technically the CTA Plan does not require other venues to halt trading in the security. CTA Plan at 48. However, CTA participants have their own rules that provide them authority to halt trading if NYSE institutes a regulatory trading halt. *See, e.g.*, FINRA Rule 6120(a).

before trading therein is permitted to continue,” including extraordinary market activity due to system misuse or malfunction.⁶⁹²

However, in the event of operational difficulties (e.g., a SIP outage), the CTA Plan, UTP Plan and the exchanges’ rulebooks do not include standardized rules for whether a regulatory trading halt should be implemented.⁶⁹³ This broad discretion leads to unpredictability, which can discourage the provision of liquidity during operational failures.

For example, when the NYSE SIP went down on October 30, 2014, the NYSE did not call a regulatory trading halt. As a result, market participants were able to continue trading in NYSE-listed stocks, even though their ability to confirm that they were trading at the NBBO was limited.⁶⁹⁴ As a result, broker-dealers facilitating trades for customers were unsure whether they were executing trades at a price that was inferior to the NBBO. Had there been clear standards in place for regulatory trading halts in the event of an operational failure, then this problem would have been avoided. To avoid such uncertainty in the future, we believe that it is important to have clear standards in place for such regulatory trading halts. The importance of these standards will only increase in the future as developments in financial markets introduce innovative new products to trading venues.

⁶⁹² Second Restatement of Plan Submitted to the Securities and Exchange Commission Pursuant to Rule 11Aa3-1 Under the Securities Exchange Act of 1934, 48, *available at* https://www.nyse.com/publicdocs/ctaplan/notifications/trader-update/CTA_Plan_Composite_as_of_September_1_2015.pdf; Joint Self-Regulatory Organization Plan Governing the Collection, Consolidation and Dissemination of Quotation and Transaction Information for NASDAQ-Listed Securities Traded on Exchanges on an Unlisted Trading Privileges Basis, 5, *available at* http://www.utpplan.com/DOC/UTP_Plan.pdf.

⁶⁹³ The listing exchanges’ rules are not uniform or standardized regarding when a regulatory halt for operational difficulties should be implemented. For example, NYSE’s rules generally permit the NYSE CEO to order a halt if it would be in the interest of “the maintenance of fair and orderly markets or protection of investors or otherwise in the public interest due to extraordinary circumstances.” NYSE Rule 51(c). NASDAQ’s rules also provide that it can halt trading in NASDAQ-listed securities in the event of operational difficulties resulting in “extraordinary market activity.” NASDAQ Rule 4120(a)(6). In both cases, the exchanges are left with significant discretion.

⁶⁹⁴ Nick Baker et al., *Disaster Averted in NYSE Stocks as Backup Feed Kicks In*, BLOOMBERG (Oct. 30, 2014), *available at* <http://www.bloomberg.com/news/articles/2014-10-30/disaster-averted-in-nyse-stocks-as-backup-feed-kicks-in>.

Specific Recommendation:

26. The SEC should clarify exchange regulatory trading halt procedures in the event of specific operational failures (e.g., SIP failure).