

MEMORANDUM

TO: SEC Market Structure Advisory Committee

FROM: SEC Division of Trading and Markets¹

DATE: April 30, 2015

RE: Rule 611 of Regulation NMS

The purpose of this memorandum is to facilitate an assessment of Rule 611 of Regulation NMS, also known as the “Order Protection Rule” or “Trade-through Rule.” The memorandum first notes Rule 611’s place in the U.S. regulatory regime for equity market structure and then summarizes the Rule’s requirements and the SEC’s objectives for the Rule when adopted. Next, it addresses changes in equity market structure that have occurred since Rule 611 was adopted, supported by a series of tables. The tables provide data on changes in the market shares of trading venues, visible and dark fragmentation, trading volume, average trade size, and trade-through rates. All of the data is broken out between NASDAQ and NYSE stocks.² The changes in these metrics since Rule 611 are not sufficient to rigorously demonstrate causal relations, but rather are intended to provide basic factual starting points that will shed some light on the extent to which the Rule may or may not have achieved its objectives. The memorandum concludes by discussing several critiques of Rule 611 as it has affected the equity markets.

I. Rule 611 and its Place in U.S. Market Structure Regulation

Before beginning any consideration of Rule 611, it is important to place the rule in the context of the broader statutory and regulatory provisions that define the current U.S. equity market structure.

A logical starting point for any discussion of the U.S. regulatory regime is Section 11A of the Exchange Act. It charges the SEC with facilitating the establishment of a national market system that promotes five objectives: (1) economically efficient execution of securities transactions, (2) fair competition among broker-dealers, among exchange markets, and between exchange markets and non-exchange markets; (3) price transparency; (4) best execution of investor orders; and (5) an opportunity, consistent with economic efficiency and best execution, for investor orders to meet without the participation of a dealer. As discussed in Section III below, the SEC

¹ This is a memorandum by the Division of Trading and Markets of the U.S. Securities and Exchange Commission. The Commission has expressed no view regarding the analysis or statements herein.

² For purposes of this memorandum, the terms “NASDAQ stocks” and “NYSE stocks” mean all equities listed on NASDAQ and NYSE that are “NMS stocks,” as defined in Rule 600(b)(47) of Regulation NMS. This includes exchange-traded products (“ETPs”), though the great majority of ETPs are listed on exchanges other than NASDAQ and NYSE, and thus are not reflected in the tables. For periods prior to NASDAQ’s registration as an exchange in 2006, NASDAQ stocks comprises stocks qualified for inclusion in the National Market and SmallCap tiers of NASDAQ.

has noted that these objectives are not entirely congruent and can sometimes be difficult to reconcile.³

Another Exchange Act provision that significantly affects equity market structure is Section 17A. It directs that the SEC use its authority to facilitate the establishment of a national system for clearance and settlement, including the linking of facilities that clear and settle trades in equity securities. By requiring the linkage of such facilities, Section 17A effectively precludes vertically-integrated exclusive trading and clearing facilities that can inhibit competition among venues seeking to trade the same products. For products that trade in vertically-integrated structures (such as exchange-traded futures in the U.S. and Europe), trading volume generally is highly centralized at a single trading venue.

Rule 611 is one of twelve rules that, along with a definitional rule (Rule 600), collectively made up Regulation NMS as originally adopted. Although Regulation NMS was adopted in 2005, most of its twelve rules pre-existed Regulation NMS. The rules that predated Regulation NMS are: requirements for public dissemination of trade reports (Rule 601) and quotations (Rule 602), public display of customer limit orders (Rule 604), public disclosure of order execution and routing information (Rules 605 and 606), customer account statements (Rule 607), national market system plans (Rule 608), and registration of securities information processors (Rule 609).

The four new rules adopted as part of Regulation NMS are Rules 603, 610, 611, and 612. Rule 603 addresses the distribution, consolidation, and display of market data. Rule 610 addresses access to quotations and, among other things, it prohibits access fees in excess of 3/10th of a cent per share for stocks with prices of \$1 or more and restricts locking or crossing quotations. Rule 612 confirms the minimum pricing increment of one cent for orders or quotations with prices of \$1 or more that was first established with the decimalization of the equity markets in 2001. Finally, Rule 611 promotes intermarket price protection by restricting “trade-throughs” – the execution of trades on one venue at prices that are inferior to publicly displayed quotations on another venue.

In addition to Regulation NMS, there are other SEC rules that significantly affect equity market structure in the U.S. These include the adoption of Regulation ATS in 1998, which permits trading venues that otherwise would fall within the definition of an exchange to be regulated as alternative trading systems (“ATs”) rather than as registered exchanges and self-regulatory organizations (“SROs”).

Another key event in equity market structure regulation was the rescission in 2000 of NYSE Rule 390 and publication of a concept release on market fragmentation. Before Rule 390 was rescinded, it had restricted NYSE members from executing trades in NYSE stocks at off-exchange trading venues. In the same release as the proposed rule change to rescind Rule 390, the SEC published a concept release requesting comment on market fragmentation in general and on a number of options to address concerns about market fragmentation. These options included: (1) restricting broker-dealer internalization and payment for order flow arrangements, and (2) establishing a highly centralized national market system with price-time priority for all

³ See *infra* note 9 and accompanying text.

displayed trading interest. Many commenters at that time, however, supported promoting an opportunity for greater competition among trading venues, particularly the electronic communications networks (“ECNs”)⁴ that had recently captured an increasing share of trading in NASDAQ stocks. As discussed in Section IV below, today nearly every U.S. exchange originally commenced operations as an ECN or employs a trading model with many of the basic functionalities of ECNs as they operated prior to Regulation NMS.

II. Rule 611 Requirements and Exceptions

A. Intermarket Price Protection

The core of Rule 611 is paragraph (a)(1), which promotes intermarket price protection of orders by restricting the execution of trades on one venue at prices that are inferior to displayed quotations at another venue. Specifically, it requires a “trading center” to implement policies and procedures that are reasonably designed to prevent “trade-throughs” on that trading center of “protected quotations” that do not fall within one of the exceptions set forth in paragraph (b) of the Rule. The terms marked by quotation marks are defined separately in Rule 600(b) of Regulation NMS.

Trading center is defined broadly to include all of the types of venues that execute trades in today’s equity market structure, including registered exchanges, ATSs (both dark pools and ECNs), off-exchange market makers, and any other broker-dealers that execute trades internally, whether as principal or agent.

A trade-through is defined as the purchase or sale of an “NMS stock” during “regular trading hours” (9:30 a.m. to 4:00 p.m. ET), either as agent or principal, at a price that is lower than a protected bid or higher than a protected offer. An NMS stock generally means any exchange-listed security (other than listed options) for which consolidated market data is disseminated.

The definition of “protected bid or protected offer” (collectively, “protected quotations”) includes several key elements. First, they must be “automated quotations” displayed by an “automated trading center.” The definitions of automated trading center and automated quotation generally require that quotations must be immediately and automatically executable, without any programmed delay.⁵ Second, to be protected, a quotation must be disseminated in the consolidated market data feeds. Consequently, Rule 611 does not apply when the consolidated market data feeds are not operating. Third, to be protected, a quotation must be the “best bid” (highest-priced bid) or “best offer” (lowest-priced offer) of a national securities exchange (currently 11 exchanges trade NMS stocks) or a national securities association (currently FINRA through its Alternative Display Facility (“ADF”). This means that Rule 611

⁴ ECNs are ATSs that publicly display quotations – prices at which orders can be executed. Today, in contrast, nearly all ATSs that transact business in exchange-listed stocks operate as “dark pools” that do not publicly display quotations.

⁵ See Regulation NMS Adopting Release, 70 FR 37496, 37534 (June 29, 2005) (“The term “immediate” precludes any coding of automated systems or other type of intentional device that would delay the action taken with respect to a quotation.”)

only applies to the best prices on a national securities exchange or the ADF. It does not cover any additional depth-of-book prices that are outside the best prices displayed by an automated trading center (lower prices for bids and higher prices for offers).

Rule 611 does not affirmatively require the routing of orders to trading centers that are displaying the best prices. Rather, Rule 611 only restricts trades at prices worse than a protected quotation. Any trading center is free to execute trades at prices that are equal to or better than a protected quotation, regardless of whether such trading center is currently quoting at that price or is a dark venue that never displays quotations. Stated another way, Rule 611 does not require orders to be routed to execute against displayed quotations before trades could be executed at matching prices (sometimes referred to as a “trade-at” restriction). As noted in Section IV below, one of the more significant developments since Rule 611’s adoption has been the increasing volume of trading that is executed by dark venues (dark pool ATSs, off-exchange market makers, and other broker-dealers that execute trades internally) at prices that match displayed prices at lit venues. This practice has never been restricted by Rule 611.

Moreover, Rule 611 does not mandate transparency or force investors to display their trading interest even when they wish not to do so.⁶ Any investor can choose not to display an order, whether on an exchange or a dark venue, and such orders can be executed as long as they are executed at the best displayed prices or better.

B. Exceptions to Rule 611

Paragraph (b) of Rule 611 sets forth nine exceptions. The two most significant of these in terms of trading volume involve the use of “intermarket sweep orders” (“ISOs”). ISOs are defined as limit orders that are routed, as necessary, to execute against the full displayed size of all protected quotations with prices that are better than the price of the ISOs. In this respect, ISOs are exceptions to Rule 611, but are not exceptions to the Rule’s core objective of promoting intermarket price priority.

One ISO exception (Rule 611(b)(6)) allows a trading center (including exchanges and broker-dealers) to execute a trade immediately at any size and price as long as it simultaneously routes ISOs to execute against any better-priced protected quotations.

Another ISO exception (Rule 611(b)(5)) enables order routers to control the execution of their own orders, while effectively relieving trading centers of the necessity of checking protected quotations at other trading centers. For example, if an order router wishes to immediately access a large-sized quotation with a price inferior to protected quotations at other trading venues, it can route an ISO to execute against the large-sized quotation, while simultaneously routing additional ISOs to execute against all of the better-priced protected quotations.

⁶ For example, the Limit Order Display Rule (Rule 604 of Regulation NMS) provides an exception from display for all block-sized limit orders (unless the customer requests display), as well as an exception for limit orders of any size for which the customer expressly requests non-display.

Another important exception to Rule 611 is the “one-second window” (Rule 611(b)(8)). This exception is primarily designed to deal with the practical difficulties of preventing intermarket trade-throughs during a fast-moving market when quotations can change rapidly. If a trade is executed at a price that would not have been a trade-through of protected quotations as they stood at any point within the previous one second (the one-second window), then the trade is excepted from Rule 611. In granting the exception in 2005, the SEC noted that it “generally does not believe that the benefits would justify the costs imposed on trading centers of attempting to implement an intermarket price priority rule at the level of sub-second time increments.”⁷ The SEC emphasized, however, that the exception is not an exception to the duty of best execution. For example, a broker-dealer that owes a duty of best execution to its customers cannot disregard a quotation for purposes of best execution if experience shows that it is likely to be accessible.⁸

Other significant exceptions to Rule 611 include: (1) the “self-help” remedy that allows market participants to disregard the protected quotations of trading centers that are experiencing systems problems (Rule 611(b)(1)); (2) single-priced openings, reopenings, and closings (Rule 611(b)(3)); (3) trades during a crossed market when a protected bid is higher than a protected offer (Rule 611(b)(4)); and (4) trades executed at benchmark prices rather than current quoted prices (such as volume-weighted average price (“VWAP”) transactions and other types of average price transactions) (Rule 611(b)(7)).

III. Rule 611 Objectives

As noted in Section I above, the Exchange Act sets forth a variety of objectives for the national market system, including competition among different types of trading venues, best execution of investor orders, and an opportunity for investor orders to meet directly (often referred to as “competition among orders” or “order interaction”). The SEC has noted that these objectives can be difficult to reconcile.⁹ When multiple trading venues successfully compete for order flow in the same NMS stocks, the order flow will be dispersed among them. Particularly in the absence of effective linkages among the different trading venues, the fragmentation of order flow can complicate brokers’ efforts to obtain best execution of investor orders and can detract from the opportunity for investor orders to meet directly.

The SEC often has noted that one of the primary challenges in its oversight of the national market system is to facilitate an appropriately balanced market structure that promotes competition among markets, while minimizing the potentially adverse effects of fragmentation. When it adopted Regulation NMS, for example, the SEC emphasized that it “particularly has

⁷ Regulation NMS Adopting Release, 70 FR at 37523.

⁸ *Id.* at n. 213 (“In making a best execution determination, for example, a broker-dealer cannot rely on the Rule’s exception for flickering quotations to justify ignoring a recently displayed, better-priced quotation when experience shows that the quotation is likely to be accessible.”).

⁹ *See, e.g.*, Concept Release on Equity Market Structure, 75 FR 3594, 3597 (January 21, 2010) (“Market Structure Concept Release”) (“the five objectives set forth in Section 11A can, at times, be difficult to reconcile”); Concept Release on Market Fragmentation, 65 FR 10577, 10580 (February 28, 2000) (“[A]lthough the objectives of vigorous competition on price and fair market center competition may not always be entirely congruous, they both serve to further the interests of investors and therefore must be reconciled in the structure of the national market system.”).

sought to avoid the extremes of: (1) Isolated markets that trade an NMS stock without regard to trading in other markets and thereby fragment the competition among buyers and sellers in that stock; and (2) a totally centralized system that loses the benefits of vigorous competition and innovation among individual markets.”¹⁰

With respect to Rule 611 specifically, the SEC emphasized that intermarket price protection was designed to promote national market system objectives in two primary ways:

- Promote the use of displayed “non-marketable” limit orders (orders with limit prices that are not immediately executable at current quoted prices).
- Minimize the extent to which investor market orders and marketable limit orders are executed at inferior prices.

Trade-through protection for displayed non-marketable limit orders was designed to encourage the use of such orders by increasing the likelihood of their receiving an execution in a timely manner. The SEC believed that greater use of displayed limit orders would improve the price discovery process and contribute to increased liquidity and depth.

Trade-through protection for market and marketable limit orders was designed both to prevent unfairness to investors and to facilitate broker-dealers’ ability to achieve best execution of their customer orders. If a broker-dealer routes an order to a trading venue that cannot execute the order at the best price, the venue cannot simply execute the order at an inferior price. It can either cancel the order back to the broker-dealer or route the order to another venue that will execute the order at the best price or better.

In adopting Rule 611, the SEC discussed empirical analyses of trade-through rates. For example, an SEC staff study found that 2.3% of trades in NASDAQ stocks were executed at prices outside the best displayed prices at the time of execution.¹¹ This figure was conservative because it was calculated with a full three-second quote window – a price was not considered a trade-through unless it was outside the widest national best bid and offer (“NBBO”) for a full second before the trade, the second of the trade, and a full second after the trade. As noted above, Rule 611 as adopted only permits a one-second quotation window.

Moreover, NASDAQ submitted a comment letter on Rule 611 with a study of trade-through rates in NASDAQ stocks finding that the trade-through rate for internalizing securities dealers was 3.2% in 2003, but dropped to 1.4% after the SEC first proposed Rule 611 in 2004.¹² The SEC noted that many internalized trades were the small trades of retail investors and was troubled by the fact that nearly 1 of 30 of these retail trades appeared to have been executed at prices inferior to readily available quotations at lit trading venues. It also noted that many of the investors whose orders were executed at inferior prices might not be aware they in fact had received an inferior price from their broker and trading venue. The SEC estimated that the annual cost of

¹⁰ Regulation NMS Adopting Release, 70 FR at 37499.

¹¹ *Id.* at 37507 & note 74. The methodology of the SEC staff study is described in Table 7.

¹² *Id.* at 37508.

inferior prices for investors whose orders traded through accessible quotations was \$320 million in 2003. It concluded that the trade-through data “appears to indicate a continuing need for regulatory action to reinforce the fundamental principle of best price for all NMS stocks.”¹³

IV. Market Structure Changes Since Rule 611

This Section will summarize some basic empirical data on U.S. equity market structure from before Regulation NMS was adopted in 2005, as contrasted with data from 2014. The data fall into three categories: (1) trading venue market share and market fragmentation, both visible and dark (Tables 1-4); (2) trading volume and average trade size (Tables 5-6); and (3) trade-through rates (Tables 7-8). The tables are intended to help assess the historical effects of Rule 611, which, in turn, may help assess the potential effects if Rule 611 were to be rescinded or modified.

Assessing the causal effects of Rule 611 on U.S. equity market structure is not, however, a straightforward task. Many factors shape equity market structure, including technology, competition, and regulation. Over the last 20 years, these factors have combined to work a sweeping transformation of equity market structure. The two traditional models of equity market structure that had dominated trading – floor-based auctions for NYSE stocks and dealer-based competition for NASDAQ stocks – evolved into today’s single market structure model that encompasses all exchange-listed stocks. Assessing the respective effects of technology, competition, and regulation on market structure at any particular time requires a great deal of judgment and is likely to spark a range of views. The tables provide pre-Rule 611 data and data from 2014 that are intended to provide a starting point for discussion.

The tables present data separately for NASDAQ stocks and for NYSE stocks. While the market structures for both NASDAQ and NYSE stocks are largely the same today, they were quite different prior to the adoption of Regulation NMS. Considering these differences can help distinguish the effects of Regulation NMS and Rule 611 from other factors, including prior regulatory initiatives such as decimalization, Regulation ATS, and the Limit Order Display Rule.

Prior to Regulation NMS, trading in NYSE stocks, as well as stocks listed on other exchanges, was governed by the Intermarket Trading System (“ITS”) Plan. NASDAQ, however, was not yet registered as an exchange, and NASDAQ stocks were never subject to the ITS Plan. Among other things, the ITS Plan imposed trade-through restrictions that required members of exchanges and NASD (now FINRA) to avoid initiating trade-throughs of quotations, including NYSE quotations that generally had to be accessed manually by sending orders to the NYSE floor. The ITS Plan also included a linkage mechanism through which “commitments to trade” could be sent to access quotations. A receiving exchange was granted at least 30 seconds to respond to a commitment to trade, which could not be canceled during the 30-second period.

The ITS Plan’s protection for manual quotations against trade-throughs, as well as its 30-second period for responding to attempts to access such quotations, was an impediment to competition from faster, electronic trading venues. In 2005, when Regulation NMS was under consideration,

¹³ Id.

the NYSE maintained a 78% share of trading in its listed stocks, and its average speed of execution for small, immediately executable orders was 10.1 seconds.¹⁴ Nearly all commenters on Regulation NMS supported elimination of the ITS trade-through rule as seriously outdated and in need of reform. They particularly focused on the problems created by affording equal protection against trade-throughs to both automated and manual quotations.¹⁵ When adopting Rule 611, the SEC stated that its new trade-through provisions, which only protected automated quotations that could be accessed immediately, would promote “equal regulation and fair competition among markets by eliminating any potential advantage that the ITS trade-through provisions may have given manual markets over automated markets.”¹⁶

Accordingly, an assessment of the effects of Rule 611 on trading in NYSE stocks must disentangle effects caused by elimination of the old trade-through requirements of the ITS Plan and effects caused by introduction of the new trade-through requirements of Rule 611. This task is not necessary, however, for NASDAQ stocks, which were never subject to the ITS trade-through requirements (though many other factors affect trading in NASDAQ stocks and can complicate an assessment of the effects of Rule 611).

Even prior to the adoption of Rule 611 in 2005, the market structure for NASDAQ stocks had undergone a major transformation. As a result of regulatory changes and other factors, the traditional dealer model for NASDAQ stocks had evolved into a new type of electronic market structure that was dominated by ECNs. Key elements of the pre-Regulation NMS market structure for NASDAQ stocks included:

- Significant fragmentation of trading volume among lit venues (ECNs and NASDAQ’s SuperMontage) that operated electronic matching engines.
- Use of a “maker-taker” fee model at ECNs that charged an access fee for taking liquidity (generally around 30 cents per hundred shares) and rebated the great majority of the take fee to the “makers” of the liquidity.
- Dissemination of low-latency direct data feeds by ECNs that were received by users prior to the consolidated data feeds.
- Active trading on ECNs by proprietary firms employing intra-day strategies that subsequently were to be called “high-frequency traders.”
- A large percentage of trading volume executed by internalizing broker-dealers that generally executed trades at prices established by the lit venues.

Today, nearly every exchange either originated as an ECN or operates a business model with characteristics of the ECN model. Given that this pre-Regulation NMS market structure for NASDAQ stocks developed in the absence of any trade-through restrictions, it is unlikely that

¹⁴ Market Structure Concept Release, 75 FR at 3595.

¹⁵ Regulation NMS Adopting Release, 70 FR at 37505 n. 55.

¹⁶ Regulation NMS Adopting Release, 70 FR at 37501.

these preexisting elements of market structure were caused by Rule 611. Consequently, the changes in the market structure for NASDAQ stocks after adoption of Rule 611 may provide a more straightforward view of the effects of Rule 611 than do changes in the market structure for NYSE stocks.

Consistent with the fact that the market structure for NASDAQ stocks largely had transformed prior to the adoption of Rule 611, the various tables indicate that the market structure for NASDAQ stocks has changed far less significantly in the years since Rule 611's adoption than the market structure for NYSE stocks. As discussed below, the net result is that the two market structures now look much alike, with both incorporating each of the five features listed above that characterized the pre-Rule 611 market structure for NASDAQ stocks.

Market Fragmentation – Visible and Dark

Market fragmentation can be divided into two types: (1) visible fragmentation – the dispersal of volume among lit venues that provide pre-trade price discovery by publicly displaying quotations, and (2) dark fragmentation – the percentage of volume collectively executed by dark venues that do not publicly display quotations. The economic literature suggests that these two distinct types of fragmentation affect markets differently, and each is considered separately below.¹⁷

For NASDAQ stocks, Table 1 indicates that the largest lit trading venue in February 2005 was Inet ECN, which resulted from the combination of the Instinet and Island ECNs and had a market share of 25.3%. In February 2014, the largest lit trading venue was NASDAQ, which resulted from the combination of SuperMontage, the Inet ECN, and the Brut ECN, and had a market share of 26.2%. The balance of lit venue trading volume was dispersed among a larger number of smaller venues in 2014 than in 2005, but Table 3 indicates that visible fragmentation (as measured by the Herfindahl-Hirschman Index for lit venues)¹⁸ increased only marginally from 0.73 to 0.76.

¹⁷ See Staff of the Division of Trading and Markets, U.S. Securities and Exchange Commission, “Equity Market Structure Literature Review, Part I: Market Fragmentation,” at 8-12 (October 7, 2013) (“Fragmentation Literature Review”) (available at <http://www.sec.gov/marketstructure/research/fragmentation-lit-review-100713.pdf>).

¹⁸ The Herfindahl-Hirschman Index is widely used measure of market fragmentation. It is calculated as 1 minus the sum of the squared market shares of lit venues. Under this metric, a fully centralized market would have a fragmentation level of 0 and the maximum level of fragmentation would be just less than 1. Fragmentation Literature Review at 9.

Table 1: Market Share – NASDAQ Stocks

Sources: NYSE TAQ Data; NASDAQ Monthly Market Share Data; BATS Global Markets Market Summary Data. In February 2005, NASDAQ, which then was operating as a facility of a national securities association, reported a total of 25.2% of volume in NASDAQ stocks. NASDAQ recently had purchased the BRUT ECN, but continued to operate it separately from NASDAQ SuperMontage in February 2005. When independent, the BRUT ECN executed approximately 6% of volume in NASDAQ stocks. Table 1 therefore estimates volume for BRUT ECN at 6% in February 2005, with the remaining 19.2% estimated for NASDAQ SuperMontage.

February 2005		February 2014	
NSX (reporting Inet ECN trades)	25.3%	NASDAQ	26.2%
NASDAQ SuperMontage (estimated)	19.2%	NYSE Arca	9.0%
PCX Arca (now NYSE Arca)	19.0%	EDGX	8.7%
Brut ECN (estimated)	6.0%	BATS Z	8.0%
CHX	0.5%	NASDAQ BX	2.7%
NASD ADF	0.5%	EDGA	2.6%
Amex (now NYSE MKT)	0.1%	BATS Y	1.8%
Dark ATs and Broker-Dealers	29.4%	FINRA ADF	0.7%
		NASDAQ PSX	0.5%
		CBSX (no longer operating)	0.4%
		NYSE MKT	0.3%
		NSX (no longer operating)	0.3%
		CHX	0.3%
		Dark ATs and Broker-Dealers	38.6%

In contrast, Table 2 indicates that the market share and visible fragmentation metrics for NYSE stocks changed dramatically from 2005 to 2014. NYSE, the largest venue, saw its market share decline from 78.9% to 20.1%, and the Herfindahl-Hirschman Index for visible fragmentation in NYSE stocks increased from 0.18 to 0.82.

Table 2: Market Share – NYSE Stocks

Sources: NYSE TAQ Data; NASDAQ Monthly Market Share Data; BATS Global Markets Market Summary Data.

February 2005		February 2014	
NYSE	78.9%	NYSE	20.1%
NASDAQ SuperMontage	2.1%	NASDAQ	14.2%
CHX	2.1%	NYSE Arca	8.4%
PCX Arca	1.7%	BATS Z	7.0%
BSE (now NASDAQ BX)	1.1%	EDGX	6.6%
NSX	0.7%	NASDAQ BX	2.9%
Phlx (now NASDAQ PSX)	0.4%	EDGA	2.5%
Dark ATs and Broker-Dealers	13.0%	BATS Y	1.9%
		ADF	0.5%
		NASDAQ PSX	0.4%
		CBSX (no longer operating)	0.4%
		CHX	0.3%
		NSX (no longer operating)	0.2%
		Dark ATs and Broker-Dealers	34.6%

Table 3: Visible Fragmentation – Herfindahl-Hirschman Index

The Herfindahl-Hirschman Index is calculated as 1 minus the sum of the squared market shares of lit venues as a percentage of total lit venue volume. The calculation excludes dark venue volume, which is considered in Table 4. Table 3 is calculated with the market share figures from lit venues in Tables 1 and 2.

	February 2005	February 2014	Change
NASDAQ Stocks	0.72	0.76	+0.04
NYSE Stocks	0.18	0.82	+0.64

Dark fragmentation increased significantly for both NASDAQ stocks and NYSE stocks from 2005 to 2014, but far more so for NYSE stocks. Tables 1 and 4 indicate that volume executed in NASDAQ stocks by dark ATs and broker-dealers was 29.4% in 2005 and 38.6% in 2014. Tables 2 and 4 indicate that volume executed in NYSE stocks by dark ATs and broker-dealers was 13.0% in 2005 and 34.6% in 2014. The end result is that the level of dark fragmentation now is similar for both NASDAQ and NYSE stocks.

Table 4: Dark Fragmentation – Total Percentage

Table 4 provides the total percentage of volume executed by dark ATs and broker-dealers set forth in Tables 1 and 2.

	February 2005	February 2014	Change
NASDAQ Stocks	29.4%	38.6%	+9.2%
NYSE Stocks	13.0%	34.6%	+21.6%

The substantial increase in trading by dark venues means that displayed limit orders interact with a much smaller percentage of volume today than they did prior to Rule 611. This development may suggest that Rule 611 has not achieved the objective of rewarding the display of limit orders by increasing their likelihood of execution.

Trading Volume and Average Trade Size

Trading volume increased far more for NYSE stocks than for NASDAQ stocks from 2005 to 2014.¹⁹ Table 5 indicates that average daily share volume for NASDAQ stocks remained relatively flat with a 7% increase, while average daily share volume for NYSE stocks increased by 87% as they moved from a manual to an electronic market structure.

Table 5: Average Daily Share Volume

Sources: NYSE TAQ Data; BATS Global Markets Market Summary Data. Table 5 includes the reported volume of all trading venues, not just the primary listing exchange.

	February 2005	February 2014	Change
NASDAQ Stocks	1.97 billion shares	2.11 billion shares	+7%
NYSE Stocks	1.96 billion shares	3.67 billion shares	+87%

In contrast to trading volume, average trade size fell substantially for both NASDAQ and NYSE stocks. Table 6 indicates that average trade size fell by 53% for NASDAQ stocks (from 434 to 204 shares) and by 75% for NYSE stocks (from 777 shares to 195 shares).

¹⁹ The competition for listings between NASDAQ and NYSE from 2005 to 2014 was relatively even-matched, with NYSE increasing its share of number of listed companies and the NASDAQ increasing its share of market capitalization of listed companies. In 2005, the number of listed companies on NASDAQ and NYSE was, respectively, 3164 and 2270, while in 2014 the number of listed companies on NASDAQ and NYSE was, respectively, 2782 and 2460. In 2005, the market capitalization of listed companies on NASDAQ and NYSE was, respectively, \$3.6 trillion and \$13.3 trillion, while in 2014 the market capitalization of listed companies on NASDAQ and NYSE was, respectively, \$7.0 trillion and \$19.4 trillion. Source: World Federation of Exchanges (available at <http://www.world-exchanges.org/statistics>).

Table 6: Average Trade Size

Sources: NYSE TAQ Data; BATS Global Markets Market Summary Data. Table 6 includes the reported trades of all trading venues, not just the primary listing exchange.

	February 2005	February 2014	Change
NASDAQ Stocks	434 shares	204 shares	-53%
NYSE Stocks	777 shares	195 shares	-75%

It is important to recognize that average trade size for both NYSE and NASDAQ stocks had been trending downward for several years prior to Rule 611’s adoption in 2005. For example, the GAO found that, from 1999 through 2004, the average size for trades reported by the NYSE in NYSE stocks (which differ from the average trade size statistics in Table 6 for trades reported by all venues) had steadily declined each year: 1,205 shares in 1999, 1,187 shares in 2000, 907 shares in 2001, 666 shares in 2002, 488 shares in 2003, and 383 shares in 2004.²⁰ Similarly, the GAO found that average trade size in the NASDAQ market also had declined significantly during this six-year period: 808 shares in 1999, 693 shares in 2000, 782 shares in 2001, 735 shares in 2002, 580 shares in 2003, and 477 shares in 2004.²¹

Although a key event affecting trades sizes was decimalization of the markets in 2001, when tick sizes generally were reduced to one cent, trade sizes continued to fall in each of the years subsequent to 2001 for both NYSE and NASDAQ stocks. At least one factor that may have contributed to the continuing decline in average trade size is the increasing use of algorithms that are capable of managing many small orders effectively, including small orders that are “child” orders of larger “parent” orders. Given the clear trend of smaller trade sizes prior to 2005, it is likely that algorithms and factors other than Rule 611 played an important role in the continuing decline in trade sizes after 2005.

Trade-Through Rates

Tables 7-8 indicate that trade-through rates for both NASDAQ stocks and NYSE stocks have fallen to very low levels since Rule 611 was adopted. In 2003, the trade-through rates for both groups of stocks were more than 2% for number of trades and more than 7% for share volume.²²

²⁰ U.S. Government Accountability Office (“GAO”), “Securities Markets: Decimal Pricing Has Contributed to Lower Trading Costs and a More Challenging Trading Environment,” GAO-05-535, at 49 (May 2005). The GAO figures for trade size in NYSE stocks are lower than the figures in Table 6 because the GAO figures reflect only trades reported by the NYSE, while Table 6 reflects trades reported by all venues. Average trade sizes at some types of off-exchange venues historically have been larger than at exchange venues.

²¹ *Id.* at 51.

²² The methodology for calculating trade-through rates is described in Table 7. To eliminate false trade-throughs, the trade-through rates from 2003 cited in the Regulation NMS Adopting Release were calculated using a three-second window – a quoted reference price must have been displayed one second before a trade and still have been displayed one second after a trade. The trade-through rates for February 2014 in Tables 7-8 were calculated using the much narrower one-second window exception set forth in Rule 611(b)(8). In addition, the analyses for both

As noted in Section III above, the SEC estimated that the annual cost of inferior prices for investors whose orders traded through accessible quotations was \$320 million in 2003. 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.²³

Table 7: Trade-Through Rates – Trades

Regulation NMS Adopting Release; NYSE TAQ Data. As described in the Regulation NMS Adopting Release, trade-through rates for 2003 were calculated with a three-second quote window – a trade is not identified as a trade-through unless the trade price was lower than the lowest national best bid or higher than the highest national best offer during the second before, during, and after the trade. Trades reported as average price trades or with other non-regular condition codes were excluded from the analysis. The trade-through rate for NASDAQ stocks in 2003 reflects a downward adjustment to account for orders that sweep multiple price levels. The trade-through rates for February 2014 were calculated with a one-second quote window consistent with the exception in Rule 611(b)(8). Trades reported as qualifying for the ISO exception and benchmark exception, and trades during crossed markets were excluded from the analysis. Trades qualifying for other types of Rule 611 exceptions, such as the self-help exception, were not excluded from the analysis.

	2003	February 2014
NASDAQ Stocks	2.3%	0.11%
NYSE Stocks	2.5%	0.13%

Table 8: Trade-Through Rates -- Shares

Regulation NMS Adopting Release; NYSE TAQ Data. Trade-through share volume was calculated as described for Table 7.

	2003	February 2014
NASDAQ Stocks	7.7%	0.16%
NYSE Stocks	7.2%	0.18%

2003 and 2014 excluded other types of trades that might represent false trade-throughs. The 2003 analysis excluded average price trades and trades with other non-regular condition codes, and also reflected a downward adjustment for NASDAQ stocks to account for orders that sweep multiple price levels. The 2014 analysis excluded trades reported as qualifying for the ISO exception (which includes orders that sweep multiple price levels) and benchmark exception (which includes many average price trades), and trades during crossed markets. While the 2003 analysis did not exclude trades during crossed markets, a crossed market would have needed to persist for a full three second quote window before it would have affected the analysis. Trades qualifying for other types of Rule 611 exceptions, such as the self-help exception, were not excluded from the 2014 analysis. The differences in the calculations between 2003 and 2014 should be kept in mind when comparing the figures between the years.

²³ As noted in Table 7, the analysis of trade-throughs in February 2014 did not exclude all trades that qualified for an exception from Rule 611, particularly the self-help exception that entitles trading centers and ISO routers to disregard the protected quotations of trading centers that are experiencing systems problems. The exceptions to Rule 611 are discussed in Section II.B above.

These figures reflect a more than 95% decline in trade-through rates, despite the fact the 2003 estimate was calculated with a three-second quotation window and the 2014 estimate was calculated with a one-second quotation window. As discussed in Section III above, the SEC's adopting release for Rule 611 noted that as many as 1 in 30 retail orders in 2003 were executed by internalizing securities firms at prices inferior to readily accessible quotations. Consequently, the basis for this concern has been alleviated in the years since Rule 611 was adopted, though factors other than Rule 611 may also have contributed to the lower trade-through rates.

V. Critiques of Rule 611

This section notes several major critiques of Rule 611 of which staff is aware and highlights data and other points that are intended to provide context for assessing the critiques.

Critique 1: Some have suggested that Rule 611 has contributed to excessive fragmentation among trading venues, thereby increasing market complexity and connectivity costs of market participants.

As noted in Section IV above, visible fragmentation and dark fragmentation are distinct phenomena and will be discussed separately.

Visible Fragmentation

There is a direct link between trade-through restrictions and potentially greater fragmentation among lit venues. In particular, trade-through restrictions can require market participants to route orders to certain lit trading venues that they otherwise might choose not to do business with. For example, Rule 611 requires market participants to consider the protected quotations of each exchange and the ADF and to route orders to execute against those quotations in certain contexts (such as when a venue's protected quotation is alone at the national best bid or offer and when a market participant wants to use an ISO to simultaneously sweep multiple price levels).²⁴ If Rule 611 thereby enables more lit venues to stay in business than would otherwise be the case, visible fragmentation will increase. Increased fragmentation among lit venues can cause market participants to incur higher connectivity costs, as well as generally add to the complexity of monitoring quotes and routing orders.²⁵

An exchange's ability to display protected quotations does not necessarily guarantee business success. In 2014, for example, two exchanges ceased trading after attracting little volume for an extended period (CBSX in April 2014 and NSX in May 2014).

²⁴ As noted in Section II above, Rule 611 does not impose "trade-at" requirements and does not require a trading center to route orders to execute against protected quotations when it executes orders at or within the NBBO. Moreover, when multiple trading centers are displaying protected quotations at the NBBO, order routers can choose which of the trading centers they wish to access (assuming the order router does not intend to use an ISO to sweep multiple price levels.).

²⁵ Market participants need not connect to all trading centers that display protected quotations if they arrange to use "conduit" brokers to access one or more trading centers. Such market participants still will incur costs for connectivity because conduit brokers are likely to charge for this service.

Prior to Rule 611, there were eight operating equities exchanges (including NASDAQ, which then was operating as a facility of a national securities association). Currently, there are eleven operating equities exchanges (including NASDAQ, which is now registered as an exchange) – a net addition of three exchanges post-Rule 611. Three corporate groups operate all but one of the eleven exchanges – ICE/NYSE group (three exchanges), NASDAQ OMX group (three exchanges), and BATS group (four exchanges).

The BATS group now operates each of the new equity exchanges that have registered since Rule 611 was adopted. The new entrants were backed by a number of broker-dealers, at least in part as an effort to prevent a “duopoly” by NYSE and NASDAQ.²⁶ Rule 611, and Regulation NMS more broadly, may have made it easier for new exchanges to enter the market by lowering barriers to entry, such as by giving all exchanges, no matter their size, an opportunity to display a protected quotation.²⁷ Lower barriers to entry may have increased competition among lit trading venues. As noted above in Section III, however, such increased competition also can increase visible fragmentation.

CHX is the only non-group exchange. Most of its volume relates to executing the equity components of complex orders that include both options and equities components, rather than to executions against its protected quotations. For example, the average trade size on CHX currently is more than 3,000 shares, many times higher than the market-wide average trade sizes reflected in Table 6. The volume of executions against CHX protected quotations also is reflected in the amount of consolidated market data revenues distributed to CHX, which are derived from both quoting and trading activity. CHX’s revenues from consolidated market data declined by 74% after Regulation NMS was implemented, from \$5.4 million in 2004 to \$1.4 million in 2008.²⁸

The overall level of visible fragmentation for NASDAQ stocks, as measured by the Herfindahl-Hirschman Index, was high even prior to Rule 611 and did not increase a great deal after Rule 611 was adopted. This may indicate that the significant increase in visible fragmentation for NYSE stocks was caused by forces other than Rule 611 (such as the elimination of the old ITS trade-through rule concurrently with the adoption of Rule 611 that was noted in Section IV above).

Dark Fragmentation

²⁶ See, e.g., Woolsey, Matt, “BATS Takes a Cut at the NYSE,” *Forbes* (February 2, 2007) (multiple securities firms purchased equity stakes in ECN, “keen to prevent the establishment of a NYSE-Nasdaq duopoly over stock trading”) (available at http://www.forbes.com/2007/02/05/bats-nyse-nasdaq-biz-cx_mw_0205bats.html).

²⁷ Regulation NMS Adopting Release, 70 FR at 37607 (“[T]he Order Protection Rule will promote competition among markets by assuring new or smaller markets that, if they display the best prices, they will attract order flow, because larger, dominant markets will not be allowed to ignore their quotations. New or smaller markets also will benefit from the price transparency and open access elements of Regulation NMS, which preclude dominant markets from unreasonably restricting the availability of their market information or unfairly discriminating against competing markets by denying access to their displayed quotations.”).

²⁸ Regulation NMS Adopting Release, 70 FR at 37558 (2004 figures); Market Structure Concept Release, 75 FR at 3601 (2008 figures, the last year for which data is publicly available).

In contrast to lit venues that display protected quotations, dark venues do not directly benefit from Rule 611. The Rule does not require that orders be routed to dark venues in any context. Consequently, there is no direct link between Rule 611 and the increased volume of trading on dark venues.

Nevertheless, dark fragmentation increased significantly for both NASDAQ stocks and NYSE stocks in the years after Rule 611 was adopted. Table 4 indicates that, from February 2005 to February 2014, the collective share of dark venue trading in NYSE stocks increased from 13% to 35%, and the collective share of dark venue trading in NASDAQ stocks increased from 29% to 39%. These increases suggest that there might be some form of indirect causal connection between dark fragmentation and Rule 611 (or perhaps one of the three other new rules included in Regulation NMS).

For example, Rule 611 may create an indirect incentive for market participants to trade in dark venues by causing them to be less willing to trade in lit venues. This potential incentive to avoid lit venues is discussed next.

Critique 2: Some have suggested that Rule 611 indirectly led to more dark trading by constraining the nature of competition on lit venues to factors such as speed, fees, and exotic order types, in contrast to factors that are more appealing to investors, such as liquidity and stability.

Rule 611 does not require exchanges or other lit venues to display protected quotations. Any exchange or other lit venue is free to adopt other trading models, such as having a “slow” quotation that is unprotected against trade-throughs or conducting frequent batch auctions without any firm displayed quotations. Thus far, all exchanges have chosen to operate as automated trading centers that continuously display protected quotations. This fact may suggest that exchanges believe that the ability to display protected quotations is valuable as a means to successfully attract order flow. They also may believe, however, that the viability of alternative trading models is compromised by Rule 611’s restriction on trading through the protected quotations of other exchanges.

If a lit venue chooses to display protected quotations, Rule 611 imposes specific requirements to assure that protected quotations are automatically and immediately accessible by anyone who wishes to access the liquidity. As noted in Section II above, the SEC has not defined “immediate” in absolute terms, but rather has required that a trading center’s systems should provide “the fastest response possible without any programmed delay.”²⁹ In this respect, Rule 611 constrains the exchanges by requiring them to provide high-speed access to their displayed quotations.

In other important contexts, however, Rule 611 does not constrain the exchanges in how they deal with speed. One such context, for example, is the race to reach the top of the priority queue at a particular price on exchanges that employ “price-time” priority for resting orders. Under

²⁹ Regulation NMS Adopting Release, 70 FR at 37519.

price-time priority, the first order received by an exchange at a price generally has priority over subsequent comparable orders at the same price, even when the difference in arrival time is as little as a microsecond (millionth of a second). Rule 611 does not require automated trading centers to adopt price-time priority, yet nearly every equity exchange has adopted price-time as a primary priority rule.

An exception is NASDAQ OMX PSX, which in 2010 adopted a price-size priority model that was explicitly intended to de-emphasize speed. It attracted little volume and was dropped in 2012, though NASDAQ OMX PSX revived the price-size model in 2014. Thus far, it once again has attracted little volume. NASDAQ OMX PSX executed 0.96% of volume in NMS stocks in January 2015.

The exchanges' experience with priority rules for resting orders suggests that competitive forces reward exchanges that offer speed advantages, even in a context without any regulatory mandate for speed.

Exchanges also must address speed issues in the context of identifying the protected quotations at other venues that they will protect against trade-throughs. As discussed in Section II above, Rule 611 provides a "one-second window" exception that allows trading centers to disregard newly displayed protected quotations at another trading center. No exchange has adopted a rule that would allow it to utilize this exception. In this respect, the exchanges may be influenced by competitive forces that militate against use of the one-second window. For example, much of the concern about "latency arbitrage" is based on the possibility that exchanges or other trading centers may execute trades at prices that were bettered by a quotation displayed for less than a few milliseconds at another venue.

Moreover, trading speed is characteristic of a wide range of market structures for financial products other than U.S. equities. For example, exchange-traded futures in the U.S. typically are traded in a highly centralized market structure in which a single exchange dominates volume. One very active equity-related product is the E-Mini S&P 500 futures contract ("E-Mini"). Studies indicate that high frequency traders execute more than 50% of volume in the E-Mini, and that trading speed is a key factor in achieving profits for HFT firms.³⁰

The E-Mini market helps illustrate that proprietary firms actively trade in many venues (including both exchange and non-exchange venues) that are not subject to Rule 611. Another example is Virtu Financial, Inc. ("Virtu"), which filed an amendment to its Form S-1 with the SEC in February 2015. Virtu described itself in that filing as "a leading technology-enabled market maker and liquidity provider to the global financial markets" that "make[s] markets by providing quotations to buyers and sellers in more than 11,000 securities and other financial instruments on more than 225 unique exchanges, markets and liquidity pools in 34 countries around the world." Virtu also stated that it had incurred a trading loss on only one day in the previous five years. While this disclosure attracted some attention, what was less noted is that

³⁰ See Staff of the Division of Trading and Markets, U.S. Securities and Exchange Commission, "Equity Market Structure Literature Review, Part II: High Frequency Trading," at 16-17, 32-33 (March 18, 2014) ("HFT Literature Review") (available at http://www.sec.gov/marketstructure/research/hft_lit_review_march_2014.pdf).

only 20% of Virtu's trading revenues derived from U.S. equities. The other 80% of its revenues derived from a variety of other financial products, such as futures, currencies, and foreign equities. None of these products trade in a market structure with trade-through obligations, and indeed some, such as U.S. exchange-traded futures, trade in markets that are highly centralized (that is, with little or no visible or dark fragmentation).

In sum, the trade-through restrictions in Rule 611 do not appear to be essential elements for the prevalence of high-speed proprietary trading strategies. Rather, there appear to be significant competitive and technology forces at work that enable active proprietary trading firms to succeed across a wide variety of market structures, most of which do not operate with trade-through restrictions.

Critique 3: Some have suggested that Rule 611 has harmed institutional investors that need to trade in large size by forcing them to access small-sized quotations and thereby signal their trading intentions to short-term proprietary traders.

Institutional investors typically need to trade in large size. If the market can infer their trading intentions from their trading activities before the full size of their trading interest is executed, the likely result will be an unfavorable price move against the institutional investor ("price impact"). To minimize this price impact, institutional investors often seek to execute their orders by splitting them into many, smaller-sized "child" orders that are fed into the market over time.

Some have suggested that Rule 611 harms institutional investors by requiring them to access small-sized protected quotations at the national best bid or offer ("NBBO") before they are permitted to access larger sized quotations at prices outside the NBBO. For example, if an institutional investor was a buyer, and only one exchange was displaying a protected offer at the national best price of \$20.00 for 100 shares, while other exchanges were offering thousands of shares at \$20.01 or higher, the claim is that Rule 611 requires the institutional investor to first route an order to execute against the 100-share protected quotation before it can access the larger-sized quotations. Public dissemination of the resulting 100-share trade could send a signal that there is a large buyer and thereby result in the rapid removal of larger-sized quotations on other trading centers. The removal of the large-sized quotations could be caused by either cancellation of the quotations or by other traders routing orders to execute against the quotations.

This critique, however, is based on a misunderstanding of Rule 611. The Rule provides a number of alternatives for institutional investors that do not wish to risk signaling their trading intentions by executing first against small-sized quotations. The ISO exception, for example, can be used by an exchange or other trading center to execute incoming orders immediately at its full depth-of-book prices, as long as it simultaneously routes ISOs to execute against any better-priced protected quotations at other trading centers. Moreover, many exchanges offer order types that allow their customers to use this ISO functionality to immediately access the full size of their depth-of-book prices.³¹ To the extent that an institutional investor wishes immediately to

³¹ For example, the NYSE offers an "NYSE IOC Order" that "will be automatically executed against the displayed quotation up to its full size and sweep the Display Book® system, to the extent possible, with portions of the order routed to other markets if necessary in compliance with Regulation NMS and the portion not executed will be

access large depth-of-book size at these exchanges, the institutional investor simply can route the appropriate order type to the exchanges, and the exchanges will handle the ISO requirement to route to smaller-sized protected quotations.

It should be noted, however, that institutional investors may not favor a large order execution strategy based on using ISOs to sweep the books at several trading centers because it may signal the existence of large buying or selling interest and lead to significant price impact.

Another alternative for institutional investors seeking to access displayed liquidity without leaking information about their trading intentions is to use brokers with the technological sophistication to access displayed liquidity across multiple exchanges simultaneously. Importantly, this result is not achieved simply by sending orders simultaneously. Depending on the speed of a broker's connections to the various trading centers, the orders, even though sent simultaneously, may arrive at the various trading centers at times that are multiple milliseconds apart. When this happens, market participants using today's sophisticated order generation and routing tools are able to (1) receive the public report of a trade on the exchange that first received one of the institutional investor's routed orders, (2) generate a new order or cancellation for other exchanges, and (3) deliver the cancellation or new order to the other exchanges before the additional routed orders of the institutional investor reach the other exchanges (even though those routed orders were sent prior to execution of the first trade).

Some brokers have developed technology tools that assure that orders arrive at multiple trading centers simultaneously. Using these tools, brokers have reported success in capturing very high percentages of the displayed liquidity at multiple trading centers.³² Their results suggest that displayed liquidity is accessible to institutional investors in a fragmented market with trade-through restrictions. Of course, brokers will incur costs in developing sophisticated routing technology and presumably will pass on those costs to their institutional customers in some form.

Critique 4: Some have suggested that Rule 611 has not succeeded in achieving the SEC's stated objective of enhancing the reward for the display of limit orders.

As noted in Section IV above, dark fragmentation has increased substantially in the years since Rule 611 was adopted. The flip side of this change, of course, is that the percentage of share

immediately cancelled.”(https://www.nyse.com/publicdocs/nyse/markets/nyse/NYSE_Order_Types.pdf). NASDAQ offers a “MOPP” routing strategy that “[r]outes to all protected quotes for display size only. Depending on the time-in-force on the order, the remaining shares will be posted to the NASDAQ book or be cancelled back to the entering party.” (<http://www.nasdaqtrader.com/Trader.aspx?id=routing>).

³² IEX Exchange, Inc. reported that its router achieved a “first wave inside price” fill rate of 98.29% across all protected quote venues in July 2014 (IEX router stats are available at <http://www.iextrading.com/insight/stats/>). See also Nina Mehta, “Morgan Stanley Overhauls Equity Systems to Cut Microseconds (May 8, 2013) (“When carrying out buy or sell orders for customers, the changes will enable the bank to get 99 percent of the shares available on exchanges at a specific price, up from the high 80s two years ago, he said.”) (available at <http://www.bloomberg.com/news/2013-05-08/morgan-stanley-overhauls-equity-technology-to-shave-milliseconds.html>); Steve Rosenbush, “RBC Takes on High Frequency Predators,” *Institutional Investor* (February 2, 2012) (“[S]ince THOR has been employed, 99 percent of its orders in Canada have been filled at the desired price. In the US, the fill rate is 98 percent, according RBC.”) (available at <http://www.institutionalinvestor.com/Article/2971794/RBC-Takes-On-High-Frequency-Predators>).

volume executed by lit venues that publicly display limit orders has decreased proportionally to the increase in dark fragmentation. Table 4 indicates that, from February 2005 to February 2014, the share of volume executed by lit venues declined from 70.6% to 61.4% for NASDAQ stocks and from 87.0% to 65.4% for NYSE stocks. Data analysis indicates that more than 50% of dark trading volume is executed at prices that merely match displayed prices, and an additional 19% of volume is executed at prices less than ½ cent better than displayed prices.³³ Consequently, the great majority of dark volume is executed at prices that are not substantially better than those offered by displayed limit orders.

The declining percentage of total trading volume that interacts with displayed limit orders suggests that Rule 611 has not achieved the objective of enhancing rewards for the display of limit orders. Despite the declining percentage share of volume at lit venues, however, quoted spreads have narrowed and the level of displayed liquidity at lit venues has increased significantly in the years since Rule 611 was adopted.³⁴ These facts suggest that the incentives to display limit orders, at least for some types of market participants, remain strong.

³³ Fragmentation Literature Review at 15.

³⁴ See, e.g., Angel, James J., Lawrence E. Harris and Chester S. Spatt, “Equity Trading in the 21st Century: An Update,” at 5-10 (June 21, 2013) (“Angel, Harris and Spatt (2013)”) (available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1584026) (charts indicating that, for NMS stocks, spreads remained the same or narrowed and displayed size increased from 2005 through 2013); Castura, J., R. Litzberger and R. Gorelick, RGM Advisors, LLC, “Market Efficiency and Microstructure Evolution in U.S. Equity Markets: A High-Frequency Perspective (March 2012 Update),” at 2-3 (March 2012) (available at <http://www.sec.gov/comments/s7-02-10/s70210-364.pdf>) (charts indicating that, for both Russell 1000 and Russell 2000 stocks, quoted bid-ask spreads narrowed and displayed liquidity increased from 2006 through 2011).