SECURITIES AND EXCHANGE COMMISSION

17 CFR Part 242

[Release No. 34–96494; File No. S7–30–22]

RIN 3235–AN23

Regulation NMS: Minimum Pricing Increments, Access Fees, and Transparency of Better Priced Orders

AGENCY: Securities and Exchange Commission.

ACTION: Proposed rule.

SUMMARY: The Securities and Exchange Commission (''Commission'' or ''SEC'') is proposing to amend certain rules of Regulation National Market System (''Regulation NMS'') under the Securities Exchange Act of 1934, as amended (''Exchange Act'') to adopt variable minimum pricing increments for the quoting and trading of NMS stocks, reduce the access fee caps, and enhance the transparency of better priced orders.

DATES: Comments should be received on or before March 31, 2023.

ADDRESSES: Comments may be submitted by any of the following methods:

Electronic Comments

- Use the Commission's internet comment form *https://www.sec.gov/rules/submitcomments.html;* or
- Send an email to *rule-comments@sec.gov*. Please include File Number S7–30–22 on the subject line.

Paper Comments

- Send paper comments to Secretary, Securities and Exchange Commission, 100 F Street NE, Washington, DC 20549–1090.

All submissions should refer to File Number S7–30–22. This file number should be included on the subject line if email is used. To help the Commission process and review your comments more efficiently, please use only one method of submission. The Commission will post all comments on the Commission's website (*https://www.sec.gov/rules/proposed.shtml*). Comments are also available for website viewing and printing in the Commission's Public Reference Room, 100 F Street NE, Washington, DC 20549 on official business days between the hours of 10 a.m. and 3 p.m. Operating conditions may limit access to the Commission's Public Reference Room. All comments received will be posted without change. Persons submitting comments are cautioned that we do not redact or edit personal identifying information from comment submissions. You should submit only information that you wish to make available publicly.

Studies, memoranda, or other substantive items may be added by the Commission or staff to the comment file during this rulemaking. A notification of the inclusion in the comment file of any materials will be made available on our website. To ensure direct electronic receipt of such notifications, sign up through the ''Stay Connected'' option at *www.sec.gov* to receive notifications by email.

FOR FURTHER INFORMATION CONTACT: Kelly Riley, Senior Special Counsel, Johnna Dumler, Special Counsel, Steve Kuan, Special Counsel, Marc McKayle, Special Counsel, and Ted Uliassi, Special Counsel, at (202) 551–5500, Office of Market Supervision, Division of Trading and Markets, Securities and Exchange Commission, 100 F Street NE, Washington, DC 20549.

SUPPLEMENTARY INFORMATION: The Commission is proposing amendments to the following rules under Regulation NMS:

Commission reference	CFR citation (17 CFR)
Rule 600(b)(59)	§ 242.600(b)(59)
Rule 600(b)(78)	§ 242.600(b)(78)
Rule 603	§ 242.603
Rule 610	§ 242.610
Rule 612	§ 242.612

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I. Introduction

Section 11A of the Exchange Act [1] directs the Commission to facilitate the establishment of a national market system in accordance with specified Congressional findings. In furtherance of this direction, the Commission adopted Regulation NMS in 2005, which includes several provisions that updated and modernized the national market system to take advantage of the data processing and communications technology that were available at that time and to address the then recent changes that had occurred in the markets. Regulation NMS was designed to achieve the objectives of section 11A of efficient, competitive, fair and orderly markets.[2]

In Section 11A of the Exchange Act, Congress recognized that new technology could ''create the opportunity for more efficient and effective market operations.'' [3] The market structure and technology available today is vastly different from what was available when Regulation NMS was adopted. Today, electronic trading has all but supplanted manual trading and electronic trading systems can handle and process data at speeds that would have been unheard of when Regulation NMS was adopted. As the national market system has evolved, the Commission has amended several aspects of Regulation NMS to address and reflect changes in the markets.[4] Most recently, in 2020, the Commission adopted rules to update and modernize the equity market infrastructure responsible for the collection, consolidation, and dissemination of equity market data in the national market system by expanding the content of NMS market data and establishing a decentralized consolidation model for NMS market data (''MDI Rules'').[5]

While the MDI Rules, in part, updated the NMS market data to enable investors to see, and more readily access, better-priced quotations,[6] the Commission believes that other aspects of Regulation NMS need to be updated in light of the current trading environment. Investors should have access to the best priced quotations available in the national market system and such prices generally should be determined by competitive market forces. Among the rules adopted under Regulation NMS, rule 610 sets forth standards governing access to quotations in NMS stocks and rule 612 establishes minimum pricing increments for NMS stocks.[7] In the current trading environment, rule 612 should be updated by reducing the minimum pricing increment for certain NMS stocks to allow market participants, including investors, to better determine the prices at which they would bid or offer. Further, rule 610 contains maximum access fee caps that were based on the trading environment in 2005. These access fee caps should be reduced in conjunction with the reduction of the minimum pricing increments under rule 612 to help to ensure that the access fee caps do not become too large in relation to the minimum pricing increments.[8] The Commission has not revised rule 610 or rule 612 since they were adopted and the Commission believes that these rules should be revised to reflect the current trading environment and so that they can continue to fulfill the goals of section 11A of the Exchange Act. The amendments proposed herein—varying and lowering the minimum pricing increments for the quoting and trading of certain NMS stocks, reducing the access fee caps, and accelerating the dissemination of information about quotations in smaller sizes—would enhance trading opportunities for all investors. They would also serve to help ensure that orders placed in the national market system reflect the best prices available for all investors.

Congress' findings promulgated in 1975 as set forth in section 11A of the Exchange Act continue to guide the Commission as it considers the issues that exist within the national market system in 2022. Among the findings that guide the Commission in overseeing the national market system, the Commission must consider the availability of ''[n]ew data processing and communications techniques [that] create the opportunity for more efficient and effective market operations'' [9] and that it is in the public interest, appropriate for investor protection and the maintenance of fair and orderly markets to assure ''economically efficient execution of securities transactions,'' ''fair competition among brokers and dealers, among exchange markets, and between exchange markets and markets other than exchange markets,'' and ''the practicality of brokers executing investors' orders in the best market.'' [10] These findings support our decision to propose amendments to rules 610 and 612 of Regulation NMS in light of the tremendous changes that have occurred in the markets since 2005.

Further, the MDI Rules are in the process of being implemented.[11] While the content of market data that will be made available within the national market system will provide many benefits to investors,[12] the Commission scheduled the implementation of the MDI Rules over a period of time to minimize disruption to the markets and to facilitate an orderly transition.[13] As discussed in section IV.B below, in part due to implementation delays after the adoption of the MDI Rules, the Commission believes that the transition period set forth in the MDI Adopting Release should be partially modified so that investors and market participants would be provided with some of the benefits of the MDI Rules, including greater transparency regarding the best priced orders available in the market, sooner than the originally adopted implementation schedule.[14] Section 11A of the Exchange Act provides that ''[i]t is in the public interest and appropriate for the protection of investors and the maintenance of fair and orderly markets to assure . . . the availability to brokers, dealers, and investors of information with respect to

[1] 15 U.S.C. 78k–1.

[2] 15 U.S.C. 78k–1(a).

[3] 15 U.S.C. 78k–1(a)(1)(B).

[4] *See* Securities Exchange Act Release No. 84528 (Nov. 2, 2018), 83 FR 58338 (Nov. 19, 2018) (''Disclosure of Order Handling Information'' in which the Commission adopted new order handling disclosure requirements). The Commission has continually reviewed the national market system and issues related to equity market structure since Regulation NMS was adopted. In 2010, the Commission issued a Concept Release on Equity Market Structure seeking public comments on high frequency trading, order routing, market data linkages, and undisplayed liquidity. *See* Securities Exchange Act Release No. 61358 (Jan. 14, 2010), 75 FR 3594 (Jan. 21, 2010) (''Concept Release on Equity Market Structure''). In 2015, the SEC formed the Equity Market Structure Advisory Committee (''EMSAC''), which considered issues related to Regulation NMS and equity market structure. The archives of these meetings are available at *https://www.sec.gov/spotlight/emsac/emsac-archives.htm.*

[5] Securities Exchange Act Release No. 90610 (Dec. 9, 2020), 86 FR 18596 (Apr. 9, 2021) (''MDI Adopting Release'').

[6] *Id.* at 18601.

[7] *See* 17 CFR 242.610 and 17 CFR 242.612.

[8] *See infra* section III for further discussion of the relationship between access fees and minimum pricing increments.

[9] 15 U.S.C. 78k–1(a)(1)(B).

[10] 15 U.S.C. 78k–1(a)(1)(c)(i), (ii), and (iv).

[11] *See* MDI Adopting Release, *supra* note 5.

[12] *Id.*

[13] *See id.* at 18699. As discussed below, the transition to the new MDI Rules has been delayed. *See infra* note 357 and accompanying text.

[14] *See infra* sections IV, V.D.5, and V.D.6 (discussing the costs and benefits of accelerating the round lot and odd-lot information definitions).

quotations for and transactions in securities.'' [15] Acceleration of some of the MDI Rules would help to fulfill this statutory goal.

A. Rule 612—Minimum Pricing Increments

The Commission adopted rule 612 of Regulation NMS to implement minimum pricing increments (also known as minimum price variations or tick sizes) for NMS stocks. Currently, quotations for NMS stocks priced at, or greater than, $1.00 per share the minimum pricing increment is $0.01, while quotations for NMS stocks priced less than $1.00 per share the minimum pricing increment is $0.0001. Specifically, rule 612(a) states that ''[n]o national securities exchange, national securities association, alternative trading system, vendor, or broker or dealer shall display, rank, or accept from any person a bid or offer, an order, or an indication of interest in any NMS stock priced in an increment smaller than $0.01 if that bid or offer, order, or indication of interest is priced equal to, or greater than, $1.00 per share.'' Rule 612(b) applies to bids, offers, orders, and indications of interest in any NMS stock priced less than $1.00 per share and specifies that the increment cannot be smaller than $0.0001. The Commission adopted rule 612 to address concerns about sub-penny quoting by protecting displayed limit orders and promoting transparent and consistent pricing. The Commission stated that the rule ''was designed to limit the ability of a market participant to gain execution priority over competing limit orders by stepping ahead by an economically insignificant amount.'' [16]

There are various issues related to market developments which suggest that the Commission should update the minimum pricing increments for the U.S. equity markets. Specifically, many NMS stocks today are constrained by the minimum pricing increment of $0.01 that is required under rule 612 and thus are not able to be priced by market forces. That is, based on liquidity and price competition, these stocks could be priced more aggressively within the spread than is possible with the current minimum pricing increment of $0.01. ''Tick-constrained'' stocks, *i.e.,* stocks that have a time weighted average quoted spread of 1.1 cents or less make up the majority of the current trading volume, and their presence suggests that the rule 612 minimum pricing increment of $0.01 may now be too large for certain stocks, which, in turn, results in the pricing of such stocks being artificially constrained.[17] Trading in tick-constrained stocks would be improved if competitive market forces could establish prices in sub-penny increments, which could reduce quoted spreads.

In addition, the competitive dynamic between trading in the certain parts of the over-the-counter (''OTC'') market and trading on national securities exchanges and alternative trading systems (''ATSs'') caused by, among other things, rule 612 has continued to shift over time.[18] Specifically, while rule 612 prohibits exchanges, ATSs and broker-dealers from displaying, ranking or accepting quotes and orders in NMS stocks that are priced at, or greater than, $1.00 per share in sub-penny increments, the rule does not prohibit trading in sub-penny increments. In application, however, certain OTC market participants are able to trade more freely in sub-penny increments than others. Specifically, while rule 612 requires an OTC market maker to only accept priced orders in a penny increment, it does not prevent OTC market makers from executing an order in a sub-penny amount. Trading on national securities exchanges and ATSs, however, largely occurs in penny increments because national securities exchanges and ATSs generally execute trades at the prices that orders and quotes must be displayed, accepted or ranked under rule 612.[19] Among other things, the ability of OTC market makers to trade more readily in finer increments (*i.e.,* offering sub-penny price improvement over the displayed quote) compared to the trading on exchanges and ATS has contributed to the increased percentage of executions that occur off-exchange.[20] Finally, since the adoption of rule 612, there have been technological advancements that enable trading and order routing systems of market participants to handle the increased message traffic that could occur if smaller or varied minimum pricing increments were implemented for NMS stocks.

Under section 11A(a)(1) of the Exchange Act, Congress found that ''[i]t is in the public interest and appropriate for the protection of investors and the maintenance of fair and orderly markets to assure—(i) economically efficient execution of securities transactions; [and] (ii) fair competition among brokers and dealers, among exchange markets, and between exchange markets and markets other than exchange markets. . . .'' [21] The Commission, consistent with the Congressional mandate and direction of section 11A(a)(2) of the Exchange Act to carry out these objectives, proposes to amend rule 612 to establish variable minimum pricing increments for quotations and orders in NMS stocks that are priced at, or greater than, $1.00 per share based on objective and measurable criteria and make such minimum pricing increments applicable to the trading of all NMS stocks regardless of price, subject to certain specified exceptions.[22]

As discussed in section II.F [23] the Commission is proposing to amend rule 612 in a manner that would extend

[15] 15 U.S.C. 78k–1(a)(1)(C)(iii).

[16] *See* Exchange Act Release No. 51808 (June 9, 2005), 70 FR 37496 (June 29, 2005) (''Regulation NMS Adopting Release''). *See also* Exchange Act Release No. 49325 (Feb. 26, 2004), 69 FR 11126 (Mar. 9, 2004) (''Regulation NMS Proposing Release''). The Commission issued a supplemental request for comment on proposed Regulation NMS in May 2004. *See* Securities Exchange Act Release No. 49749 (May 20, 2004), 69 FR 30142 (May 26, 2004) (''Supplemental Release''). On Dec. 16, 2004, the Commission re-proposed Regulation NMS in its entirety for public comment. *See* Securities Exchange Act Release No. 50870 (Dec. 16, 2004), 69 FR 77424 (Dec. 27, 2004) (''Re-proposing Release'').

[17] In this release, tick-constrained stocks are defined as those that have a time weighted quoted spread of $0.011 or less calculated during regular trading hours. *See infra* note 102 and accompanying text, *infra* note 448 and accompanying text and Table 4.

[18] *See infra* section II.D.

[19] Exchanges and ATSs execute orders in sub-penny increments if the price of the execution is the midpoint of the national best bid and national best offer (''NBBO''), if the orders are benchmark trades such as volume-weighted average price (''VWAP'') and time-weighted average price (''TWAP''), or if an exchange has a retail liquidity program (''RLP'') that operates pursuant to exemptions granted by the Commission that allow such programs to provide executions in tenths of a cent. *See* Regulation NMS Adopting Release, *supra* note 16, at 37556. *See also infra* section II.

[20] *See, e.g.,* Staff Report on Equity and Options Market Structure Conditions in Early 2021 (''Staff Report on Equity and Options Market Structure'') at section 2.4 for a discussion of Order Execution and Segmentation of Individual Investor Flow. Staff reports, Investor Bulletins, and other staff documents (including those cited herein) represent the views of Commission staff and are not a rule, regulation, or statement of the Commission. The Commission has neither approved nor disapproved the content of these staff documents and, like all staff statements, they have no legal force or effect, do not alter or amend applicable law, and create no new or additional obligations for any person. *See also* Edwin Hu and Dermot Murphy, ''Competition for Retail Order Flow and Market Quality'' (June 8, 2022), *available at https://ssrn.com/abstract=4070056* (retrieved from SSRN Elsevier database) (noting that approximately 27% of trading volume is routed from retail brokerages to seven internalizing broker-dealers and estimating that two of those firms handle 70% of the volume from 2017 to 2021; and concluding that promoting more competitive markets for retail order flow could save investors billions of dollars in transaction costs).

[21] 15 U.S.C. 78k–1(a)(1)(C).

[22] The proposed rule would not change the minimum pricing increment of rule 612(b), which permits sub-penny increments for quotations and orders in NMS stocks that are priced less than $1.00 per share. *See infra* section II.F.3.

[23] *See infra* section II.F.

beyond tick-constrained stocks. The Commission believes that it is timely, and consistent with section 11A of Exchange Act, to replace and modernize the current ''one-size-fits-all'' tick approach with an objectively calculated and varied approach that would determine the minimum pricing increments for particular NMS stocks in a manner that would reflect differences in their trading characteristics. The Commission believes that the proposed variable minimum pricing increments would address the issues related to tick-constrained stocks, help to prevent other stocks from becoming tick-constrained, and reduce transaction costs for many stocks without harming the displayed liquidity in, and execution quality of, NMS stocks that may be higher priced and/or trade with wider spreads. In addition, the Commission is proposing to apply the amended rule 612 minimum pricing increments to the quoting and trading of NMS stocks in order to promote fair competition and equal regulation between trading in the OTC market and trading on exchanges and ATSs, particularly as it relates to retail order flow.

The Commission believes that requiring orders to be executed in the minimum pricing increment would enhance competition among trading centers by ensuring that all trading centers would be able to compete in the same price increment. The Commission believes applying the proposed minimum pricing increments to the trading of NMS stocks regardless of trading venue would also preserve most meaningful price improvement opportunities and potentially benefit the market as increased competition for orders, and between market participants, could promote innovation.[24]

As further discussed in section II.F, the Commission is proposing to amend rule 612 such that the minimum pricing increment for quotations and orders in NMS stocks that are priced at $1.00 or more per share would be variable and no smaller than (1) $0.001, if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was equal to, or less than, $0.008; [25] (2) $0.002, if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was greater than $0.008 but less than, or equal to, $0.016; (3) $0.005, if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was greater than $0.016 but less than, or equal to, $0.04; and (4) $0.01, if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was greater than $0.04. Under this proposal, the primary listing exchanges would measure and calculate the Time Weighted Average Quoted Spread of each NMS stock in order to determine the applicable minimum pricing increment for such NMS stock during the months of March, June, September, and December of a particular calendar year (*i.e.,* ''Evaluation Period'') for the three months to follow. Finally, the Commission is proposing that the minimum pricing increments set forth by rule 612, subject to specified exceptions, be applicable to the trading of all NMS stocks.

B. Rule 610—Access to Quotations

The Commission adopted rule 610 to help to fulfill the statutory objectives of fair and efficient access to the individual markets that participate in the national market system.[26] The Commission described rule 610 as supporting the national market system objectives of assuring ''the practicability of brokers executing investors' orders in the best market'' [27] and ''the efficient execution of securities transactions.'' [28] Rule 610 addresses three issues related to access to quotations: (1) the means of access to quotations; (2) the fees for access to protected quotations and any other quotations that are the best bid or best offer of an exchange; and (3) locking and crossing quotations.

Rule 610 imposes a limit on the fees that can be charged for access to protected quotations.[29] For NMS stocks priced at, or greater than, $1.00 per share, a trading center [30] shall not impose, nor permit to be imposed, any fee for the execution of an order against a protected quotation that exceeds $0.0030 per share, and for NMS stocks that are priced at less than $1.00 per share, a trading center shall not impose, nor permit to be imposed, any fee for the execution of an order against a protected quotation that exceeds 0.3% of the quotation price per share. The Commission adopted the access fee caps to preserve the benefits of strengthened price protection and more efficient linkages among trading centers that could be disrupted if substantial fees for accessing quotations were charged.[31] The access fee caps were calculated based upon the then current fees that were charged by certain trading venues and reflect the minimum pricing increment of $0.01 per share.[32] The access fee caps have not changed since their adoption in 2005.

In the time since the adoption of rule 610, the national securities exchanges have adopted complex fee schedules, with fees charged and rebates paid, in part, to encourage the submission of liquidity.[33] The fee schedules of the national securities exchanges also include various volume-based tiers that seek to reward market participants for submitting a minimum level of liquidity.[34] The fees included in these schedules are largely calculated based on volume in a given month and are therefore calculated at month's end. This timing impedes the ability of market participants, including investors, to evaluate the total price of a trade at the time of execution and impedes a market participant's ability to evaluate best execution and order routing.

The Commission proposes to amend rule 610 in two ways. First, to reflect the lower variable minimum pricing increments proposed under rule 612, the Commission proposes to reduce the access fee caps for protected quotations in NMS stocks priced $1.00 or more to $0.0005 per share for NMS stocks that have a minimum pricing increment of $0.001; and $0.001 per share for NMS stocks that have a minimum pricing increment greater than $0.001 per share; and for protected quotations in NMS stocks priced less than $1.00 per share to 0.05% of the quotation price. The proposed level of the access fee caps seeks to balance the need to reduce the access fee caps to accommodate the reduction in the minimum pricing increments and preserve the ability of

[24] *See infra* sections V.D.2 and V.E.2.a.

[25] Currently, no NMS stock would qualify for this minimum pricing increment. *See infra* note 211.

[26] *See* Regulation NMS Adopting Release, *supra* note 16, at 37497, 37538.

[27] *Id.* at 37538. *See also* 15 U.S.C. 78k–1(a)(1)(C)(iv).

[28] *See* Regulation NMS Adopting Release, *supra* note 16, at 37538. *See also* 15 U.S.C. 78k–1(a)(1)(C)(i).

[29] A protected quotation is defined in rule 600(b)(71) as ''a protected bid or protected offer.'' 17 CFR 242.600(b)(71). A protected bid or protected offer is defined as ''a quotation in an NMS stock that: (i) Is displayed by an automated trading center; (ii) Is disseminated pursuant to an effective national market system plan; and (iii) Is an automated quotation that is the best bid or best offer of a national securities exchange, the best bid or best offer of the Nasdaq Stock Market, Inc., or the best bid or best offer of a national securities association.'' 17 CFR 242.600(b)(70).

[30] A trading center is defined in rule 600(b)(95) as ''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.'' 17 CFR 242.600(b)(95).

[31] *See* Regulation NMS Adopting Release, *supra* note 16, at 37544.

[32] *See id.* at 37545.

[33] *See infra* section III.A.2.

[34] *See infra* section III.A.2.

the agency market business models to charge fees for access.[35] Consistent with the Commission's proposal to adopt lower variable minimum pricing increments, the Commission is proposing reduced variable access fee caps based on the minimum pricing increment and the price of the protected quotation.[36] The Commission believes the proposed fee caps are consistent with current market practices and would lead to pricing that is better aligned with today's transaction costs.[37]

Second, to facilitate the ability of market participants to understand and calculate the total price of transactions at the time of execution, the Commission proposes to amend rule 610 to require exchanges to make the amounts of all fees and rebates determinable at the time of execution.

C. Transparency of Better Priced Orders

The Commission adopted the MDI Rules, which expanded the content of data that will be made available for dissemination within the national market system and adopted a decentralized consolidation model for the collection, consolidation, and dissemination of consolidated market data.[38] One goal in expanding the data made available within the national market system was to increase transparency about better prices available in the market.[39] To accomplish this, the Commission, in the MDI Rules, adopted a new definition of round lot, which will increase transparency about smaller sized orders in higher priced stocks by assigning NMS stocks priced over $250 to round lot sizes that are less than the 100 share round lot size that is predominant today.

In addition, the MDI Rules included odd-lot information in the data that will be made available within the national market system. ''Odd-lot information'' is defined as (1) odd-lot transactions, and (2) odd-lots at a price greater than or equal to the national best bid and less than or equal to the national best offer, aggregated at each price level at each national securities exchange and national securities association.[40] Therefore, once implemented, information regarding the prices and sizes of odd-lot orders priced better than the national best bid and national best offer (''NBBO'') will be made available within the national market system and is expected to be made widely available to investors.[41] These new definitions will significantly enhance transparency about better priced orders available in the market. For the reasons explained in the MDI Adopting Release, the Commission adopted a phased transition plan for the MDI Rules that sequenced the implementation of these data elements in the later stages of the transition.[42]

The Commission proposes to accelerate implementation of the round lot and odd-lot information definitions adopted under the MDI Rules so that this information is made available to investors within the national market system sooner. Information about better priced orders available in the market is important for investors to be able to understand the current prices and liquidity in the market when entering their orders.[43] This information is also important for market participants who have best execution obligations.[44]

Furthermore, while the odd-lot information definition includes all prices better than the NBBO for which there is liquidity available in an odd-lot size, it does not identify a consolidated best odd-lot order. Establishing a defined best odd-lot order would provide further relevant information to investors and market participants. A consolidated best odd-lot order would be useful to investors in deciding the terms of an order by providing information about the price, size, and market of the best priced buy and sell orders available in the market against which their own orders could execute. Further, a best odd-lot order would be useful to investors to measure the amount of price improvement they receive for the execution of their orders. The Commission believes that amending the definition of odd-lot information to include a best odd-lot order would be consistent with section 11A of the Exchange Act, which provides, among other things, that it is in the public interest and appropriate for the protection of investors and the maintenance of fair and orderly markets to assure the availability of information with respect to quotations in securities.[45] Further, a best odd-lot order would be consistent with section 11A(c)(1)(B) of the Exchange Act as it would assure the usefulness of quotation information.[46] Together with accelerating the implementation of the definitions of round lot and odd-lot information, these proposed amendments would provide investors with enhanced transparency about better priced orders available in the market.

II. Amendment to Rule 612 of Regulation NMS—Minimum Pricing Increment

A. Background

Prior to implementing decimal pricing in April 2001, fractions of a dollar were utilized to represent the minimum pricing increments for the United States equity markets (*e.g.,* 1/8, 1/16, and 1/32 of a dollar).[47] The conversion to decimal pricing reduced the allowable minimum pricing increment to $0.01 and the exchanges adopted rules that established minimum pricing increments of $0.01 for equities trading.[48] However, after the conversion to decimal pricing, the display and execution of sub-penny quotes increased off-exchange.[49] The increase

[35] Agency market trading centers are those that bring together buyers and sellers and typically charge a fee for their execution services. The Commission has previously recognized that ''agency trading centers perform valuable agency services in bringing buyers and sellers together, and that their business model historically has relied, at least in part, on charging fees for execution of orders against their displayed quotations.'' *See* Regulation NMS Adopting Release, *supra* note 16, at 37545.

[36] *See infra* section III.C.1.

[37] *See infra* note 297 and accompanying text.

[38] MDI Adopting Release, *supra* note 5. Several exchanges filed petitions for review in the U.S. Court of Appeals for the District of Columbia Circuit, which were denied on May 24, 2022. *The Nasdaq Stock Market LLC, et al* v. *SEC,* No. 21–1100 (D.C. Cir. May 24, 2022).

[39] *See* Securities Exchange Act Release No. 88216 (Feb. 14, 2020), 85 FR 16726, 16730–31 (Mar. 24, 2020) (''MDI Proposing Release''). *See infra* note 327 for a description of the data currently provided within the national market system.

[40] For example, if the national best bid for XYZ, Inc. is 100 shares at $25.00, and there are three orders of five shares and two orders of ten shares at $25.01 on Exchange A, this would be represented as ''35 shares at $25.01 on Exchange A'' pursuant to the definition of odd-lot information adopted under the MDI Rules. MDI Adopting Release, *supra* note 5, at 18613.

[41] MDI Adopting Release, *supra* note 5, at 18612–13.

[42] *See id.* at 18698.

[43] *See id.* at 18612.

[44] *Id. See also infra* note 359.

[45] 15 U.S.C. 78k–1(a)(1)(C)(iii).

[46] 15 U.S.C. 78k–1(c)(1)(B).

[47] A tick is the minimum pricing increment that can be used to trade securities. Decimalization set the tick size to penny increments from fractional increments, such as 1/8 or 1/16 of a dollar. For a discussion of the implementation of decimal pricing, *see* Order Directing the Exchanges and the Financial Industry Regulatory Authority to Submit a Tick Size Pilot Plan, Exchange Act Release No. 72460 (June 24, 2014), 79 FR 36840 (June 30, 2014).

[48] *See* Exchange Act Release No. 46280 (July 29, 2002), 67 FR 50739 (Aug. 5, 2002) (order approving proposed rule changes and amendments related to decimal pricing). In this order, the Commission approved the proposals of the then-existing exchanges and the National Association of Securities Dealers, Inc. (the predecessor to the Financial Industry Regulatory Authority, Inc. (''FINRA'')) to establish a minimum pricing increment of $0.01 for equity issues, $0.05 for option issues quoted under $3.00 a contract, and $0.10 for option issues quoted at $3.00 a contract or greater.

[49] *See* Regulation NMS Proposing Release, *supra* note 16, at 11163. *See also* Report to Congress on Decimalization, Commission (July 2012) (''Decimalization Report'') *available at https://www.sec.gov/files/decimalization-072012.pdf.*

of sub-penny quoting and trading in the OTC market raised concerns because these quotes were not readily transparent, or accessible, to many average investors.[50]

In 2004, as part of Regulation NMS, the Commission proposed rule 612 to implement minimum pricing increments for quoting in NMS stocks. The Commission stated that while the benefits of decimalization justified the costs, there was a potential for costs to investors and the markets to surpass the benefits if the minimum pricing increment decreased beyond a certain level.[51] Rule 612 was designed to ''deter the practice of stepping ahead of exposed trading interest by an economically insignificant amount,'' [52] which could discourage investors from submitting limit orders. The Commission reasoned that ''if orders lose execution priority because competing orders step ahead for an economically insignificant amount, liquidity could diminish.'' [53] Further, the Commission was concerned that sub-penny quotes could decrease market depth (*i.e.,* the number of shares of a security that is available at any given price), which in turn could increase transaction costs and cause institutions ''to rely more on execution alternatives away from the exchanges'' and ''[s]uch a trend could increase fragmentation of the securities markets.'' [54] In addition, the Commission stated that sub-penny quoting could inhibit the ability of broker-dealers to meet certain regulatory obligations by increasing the incidences of so-called ''flickering'' quotes.[55] At the time, the Commission did not believe that the potential benefits of marginally better prices offered by sub-penny increments for quotes and orders in securities priced at, or greater than, $1.00 per share were likely to justify the costs of permitting sub-penny quotes to be displayed, accepted and ranked.[56] However, the Commission acknowledged the possibility that the markets could evolve over time and cause the balance of the costs and benefits to shift.[57]

When rule 612 was adopted, the Commission considered the impact of sub-penny trading but did not believe that such trading raised the same concerns as sub-penny quoting. Specifically, the Commission stated that, unlike sub-penny quoting, sub-penny executions do not cause quote flickering, decrease depth at the inside of the market or raise systems capacity issues.[58] In addition, the Commission stated that sub-penny executions were generally beneficial to retail investors.[59]

B. Rule 612

In 2005, the Commission adopted rule 612 of Regulation NMS to establish uniform minimum pricing increments for NMS stocks. Rule 612 prohibits national securities exchanges, national securities associations, ATSs, vendors and broker-dealers from displaying, ranking, or accepting quotations, orders, or indications of interest in any NMS stock priced in an increment smaller than $0.01 if the quotation, order, or indication of interest is priced equal to, or greater than, $1.00 per share. Rule 612 also prohibits national securities exchanges, national securities associations, ATSs, vendors, and broker-dealers from displaying, ranking or accepting quotations, orders and indications of interest in an NMS stock in an increment smaller than $0.0001 if the quotation, order or indication of interest in an NMS stock is priced less than $1.00 per share. Under rule 612, an exchange, association, ATS, vendor or broker-dealer must reject a quote or order for an NMS stock that is explicitly priced in an impermissible increment.[60]

Rule 612 does not prohibit quotes and orders from being executed in sub-penny increments. In the Regulation NMS Adopting Release, the Commission stated that the rule does not prohibit a sub-penny execution resulting from a midpoint, volume-weighted algorithm, or from price improvement so long as the execution does not result from an impermissibly priced sub-penny order or quote.[61]

1. Exchange Retail Liquidity Programs (''RLPs'')

After its adoption, the Commission granted exemptions from rule 612 to various national securities exchanges to establish ''retail liquidity programs'' that allow them to accept and rank certain quotes and orders from certain participants in sub-penny increments as small as $0.001.[62] RLPs were designed to attract retail orders to exchanges by providing such orders potential price improvement at sub-penny levels because ''most marketable retail order flow is executed in the OTC markets, pursuant to bilateral agreements, without ever reaching a public exchange'' and that OTC market makers typically paid retail brokers for their order flow.[63]

The Commission stated that ''[i]nternalizing broker-dealer[s] can offer sub-penny executions, provided that such executions do not result from impermissible sub-penny orders or quotations'' by ''typically select[ing] a sub-penny price for a trade without quoting at that exact amount or accepting orders from retail customers seeking that exact price.'' [64] The Commission stated that, in contrast, exchange members, when submitting orders and quotations to exchanges, ''cannot compete for marketable retail order flow on the same basis because it would be impractical for exchange electronic systems to generate sub-

[50] *See* Regulation NMS Proposing Release, *supra* note 16 at 11164.

[51] *See id.* at 11165.

[52] *Id.* at 37553.

[53] *Id.* at 37551. Further, the Commission stated that ''[w]hen market participants can gain execution priority for an infinitesimally small amount, important customer protection rules such as exchange priority rules and [FINRA's] Manning rule could be rendered meaningless'' and that without such protections, ''professional traders would have more opportunity to take advantage of non-professionals,'' which could lead to lost executions or executions occurring at inferior prices. *Id.*

[54] *Id.* at 37552. The Commission stated that a decrease in market depth could ''lead to higher transaction costs, particularly for institutional investors (such as pension funds and mutual funds) that are more likely to place large orders,'' which ''would likely be passed on to retail investors whose assets are managed by the institutions.'' *Id.*

[55] *Id.* at 37552. The Commission described ''flickering quotations'' as occurring when the price of a trading center's best displayed quotations changes multiple times in a single second and stated that flickering quotations ''could make it more difficult for broker-dealers to satisfy their best execution obligations and other regulatory responsibilities.'' *Id.*

[56] *Id.* at 37553 (''Even assuming that quoting in sub-penny increments would reduce spreads, the Commission continues to believe, on balance, that the costs of sub-penny quoting are not justified by the benefits.'')

[57] *Id.* (''Nevertheless, the Commission acknowledges the possibility that the balance of costs and benefits could shift in a limited number of cases or as the markets continue to evolve.'')

[58] *See* Regulation NMS Adopting Release, *supra* note 16, at 37556.

[59] *See id.*

[60] *See id. See also, e.g.,* NYSE Rule 7.6 (Trading Differentials) (''The minimum price variation (MPV) for quoting and entry of orders in securities traded on the Exchange is $0.01, with the exception of securities that are priced less than $1.00 for which the MPV for quoting and entry of orders is $0.0001.''); *see also* Nasdaq Rule Equity 1 Equity Definitions (a)(13) (''The term minimum price increment means $0.01 in the case of a System Security priced at $1 or more per share, and $0.0001 in the case of a System Security priced at less than $1 per share.'').

[61] *See* Regulation NMS Adopting Release, *supra* note 12, at 37556.

[62] NYSE Rule 107C; Securities Exchange Act Release No. 67347 (July 3, 2012), 77 FR 40673 (July 10, 2012) (approving retail liquidity programs on a pilot basis for NYSE and NYSE Amex and granting rule 612 exemption) (NYSE Retail Liquidity Program Approval Order); CBOE BYX Rule 11.24; Securities Exchange Act Release No. 68303 (Nov. 27, 2012), 77 FR 71652 (Dec. 3, 2012) (CBOE BYX Retail Pilot Program Approval Order); Nasdaq BX Rule 4780; Securities Exchange Act Release No. 73702 (Nov. 28, 2014), 79 FR 72049 (Dec. 4, 2014) (NASDAQ BX Retail Pilot Program Approval Order).

[63] *See* NYSE Retail Liquidity Program Approval Order, *supra* note 62 at 40679.

[64] *Id.* at 40862.

penny executions'' without firms ''having first submitted sub-penny orders or quotations, which the Sub-Penny Rule expressly prohibits.'' [65] The Commission found that the first RLP, which was approved on a pilot basis, was reasonably designed to benefit retail investors by providing price improvement to retail order flow and ''could promote competition for retail order flow among execution venues.'' [66]

The Commission also found that the proposed RLPs were reasonably designed to minimize the concerns raised by sub-penny quoting.[67] Specifically, using the same analytical framework as the Regulation NMS Adopting Release, the Commission reasoned that the proposed RLPs did not raise concerns related to quote flickering or reduced depth at the inside quotation because the sub-penny prices would not be disseminated through the Equity Data Plans.[68] In addition, the Commission did not believe the proposed RLPs would reduce incentives to post limit orders because market participants that display limit orders were unable to interact with marketable retail order flow that was almost entirely executed in the OTC market.[69] Exchanges proposed RLPs, in part, to address the differences in market structure that divert retail liquidity off-exchange. However, to date, the RLPs have not attracted a significant volume of retail order flow.[70]

C. Tick Size Considerations Since Regulation NMS

Minimum pricing increments have been considered several times since the Commission adopted rule 612. In 2010, the Commission issued the Concept Release on Equity Market Structure, which examined the then current equity market structure and invited public comment on various market structure issues, including high frequency trading, order routing, market data linkages, and undisplayed liquidity.[71] Among other things, the Commission discussed internalization by broker-dealers and stated that ''[t]here may be greater incentives for broker-dealer internalization in low-priced stocks than in higher priced stocks.'' [72] The Commission stated that in low-priced stocks, the one cent per share minimum pricing increment is much larger on a percentage basis than it is in higher-priced stocks.[73] In the discussion on undisplayed liquidity, the Commission sought comment on whether public price discovery and execution quality may have suffered and specifically questioned whether the minimum pricing increment should be reduced for lower priced stocks.[74] In response, the Commission received several letters opposing [75] and supporting [76] a pilot program to test sub-penny tick increments. The Commission also received letters recommending a pilot program to test a wider variety of tick sizes.[77]

In 2010, three exchange operators jointly petitioned the Commission to use its exemptive authority under rule 612(c) to allow the exchanges to implement a 6-month pilot program that would reduce the minimum pricing increment to $0.005 for a limited set of 30 NMS stocks priced from $1.00 to $20.00 (including one exchange-traded fund (''ETF'') that was trading at greater than $20.00).[78] The Joint Petition stated that at that time a significant percentage of the volume in these securities (4%) was transacting at a $0.005 increment and that a large percentage of share volume in securities priced below $20 occurred in securities that were routinely quoted at the minimum pricing increment, indicating a likelihood that price discovery was being constrained.[79] The Joint Petition also stated that ''a disproportionately high percentage of transactions in securities priced between $1 and $20 dollars are occurring away from lit markets, which [they] believe indicates a lack of quote competition.'' [80] The petitioners stated that the $0.01 minimum pricing increment resulted in artificially wide publicly-displayed quotes for certain lower-priced, liquid securities, which, in turn, negatively impacted the public price discovery process and resulted in inferior execution prices for investors.[81]

In 2012, Congress passed the Jumpstart Our Business Startups Act (''JOBS Act''), which contained provisions relating to the impact of decimalization on small and middle capitalization companies. Section 106(b) of the JOBS Act directed Commission to conduct a study on how decimalization affected the number of initial public offerings (''IPOs'') and the liquidity and trading of smaller capitalization company securities. The Commission submitted a staff study to Congress in July 2012.[82] While the Decimalization Report did not reach any firm conclusions about the impact of

[65] *Id.*

[66] *Id.* at 40679.

[67] *Id.* at 40682. *See also* CBOE BYX Retail Pilot Program Approval Order, *supra* note 62 at 71658; and NASDAQ BX Retail Pilot Program Approval Order, *supra* note 62 at 72053.

[68] NYSE Retail Liquidity Program Approval Order at 40682. There are three effective national market system plans that govern the collection, consolidation, processing, and dissemination of certain NMS information. They are: (1) the Consolidated Tape Association Plan (''CTA Plan''); (2) the Consolidated Quotation Plan (''CQ Plan''); and (3) the 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 (''UTP Plan'') (together, the ''Equity Data Plans''). *See also* MDI Adopting Release, *supra* note 5.

[69] *Id.* at 40680.

[70] *See, e.g.,* How Can The Buy Side Interact With Retail Flow, Rosenblatt Securities, Feb. 14, 2022, *available at https://www.rblt.com/market-reports/how-can-the-buy-side-interact-with-retail-flow* (''The various exchange retail programs consistently account for less than 0.2% of consolidated volume.''). According to NYSE, most order handling processes ignore retail interest that is available in the RLPs because resting interest in RLPs does not display price or size. *See* NYSE, Price improvement, tick harmonization & investor benefit (Aug. 22, 2022) (''NYSE Tick Harmonization Paper''), *available at https://www.nyse.com/publicdocs/nyse/NYSE_Price_Improvement_202208.pdf. See also https://www.nyse.com/data-insights/what-exchanges-can-and-cannot-offer-retail-traders. See also* NYSE Retail Liquidity Program Approval Order at 40682.

[71] *See* Concept Release on Equity Market Structure, *supra* note 4.

[72] *Id.*

[73] *Id.*

[74] *Id.*

[75] *See, e.g.,* Letters from Karrie McMillan, General Counsel, Investment Company Institute, dated Apr. 21, 2010; Ann Vlcek, Managing Director and Associate General Counsel, Securities Industry and Financial Markets Association (''SIFMA''), dated Apr. 29, 2010; James J. Angel, Associate Professor, McDonough School of Business, Georgetown University; Lawrence E. Harris, Fred V. Keenan Chair in Finance, Professor of Finance and Business Economics, Marshall School of Business, University of Southern California; Chester S. Spatt, Pamela R. and Kenneth B. Dunn Professor of Finance, Director, Center for Financial Markets, Tepper School of Business, Carnegie Mellon University, dated Feb. 23, 2010.

[76] *See, e.g.,* Letters from Eric Swanson, General Counsel, BATS Exchange, Inc., dated Apr. 21, 2010 and Eric W. Hess, General Counsel, Direct Edge, dated Apr. 28, 2010.

[77] *See, e.g.,* Letters from Janet M. Kissane, SVP—Legal and Corporate Secretary, Office of the General Counsel, NYSE Euronext, dated Apr. 23, 2010; and John A. McCarthy, General Counsel, GETCO LLC, Christopher R. Concannon, Partner, Virtu Financial LLC, and Leonard J. Amoruso, General Counsel, Knight Capital Group, Inc., dated July 9, 2010.

[78] *See* Letter from Chris Isaacson, Chief Operating Officer, BATS Exchange, Inc., Eric Noll, Executive Vice President, NASDAQ OMX Group, Inc., and Larry Leibowitz, Chief Operating Officer, NYSE Euronext, Inc. to Elizabeth M. Murphy, Secretary, Commission, dated on Apr. 30, 2010 (''Joint Petition'') *available at https://www.sec.gov/spotlight/regnms/jointnmsexemption request043010.pdf.* The petitioners stated that the pilot would allow the Commission to collect data to study the impact of the reduction of the minimum increment without making a long term policy commitment. The petitioners did not propose to reduce the access fee caps under rule 610 because the $0.005 increment would have continued to be higher than the access fee cap, which would prevent the public display of a protected quote that is not accurate when the access fee is factored in. *Id.* at 7.

[79] *Id.* at 6.

[80] *Id.* at 2.

[81] *Id.* at 1.

[82] *See* Decimalization Report, *supra* note 49.

decimalization on the number of IPOs or the liquidity and trading of small capitalization companies, it did recommend that the Commission conduct a roundtable where recommendations could be presented on a pilot program that would generate data to allow the Commission to further assess decimalization's impact. Commission staff held a roundtable on February 5, 2013, during which there was broad support among panelists for the Commission to conduct a pilot program to gather information, particularly with respect to the impact of wider minimum pricing increments on liquidity in smaller capitalization companies.[83] In 2016, the Commission initiated a Tick Size Pilot for small- and mid-size capitalized stocks to test larger quoting and trading increments (''TSP'').[84] After the expiration of the 2-year pilot program, the Commission staff observed that, on average, increasing the tick size resulted in deteriorating market quality for stocks that became tick-constrained under the pilot.[85]

D. Issues Raised in the Current Market Structure

In 2005, when rule 612 was adopted, the markets were still largely typified by manual trading on exchange floors.[86] Since then, the markets have overwhelmingly transitioned to electronic trading with orders being accepted, routed, displayed, and executed via low latency trading systems.[87] Equity market structure and competitive dynamics have also changed,[88] and trading and order routing systems can handle and process an amount of data that would have been unprecedented and unfathomable in 2005.[89] NMS stocks are traded on-exchange (*i.e.,* on one or more of the 16 currently registered national securities exchanges) or off-exchange (*e.g.,* on one or more of the 33 currently registered NMS Stock ATSs [90] or by OTC market makers).[91] As of September 2022, on-exchange volume is approximately 58% while off-exchange/OTC volume is approximately 42%,[92] while in 2007, on-exchange share volume was 71% and off-exchange/OTC volume was approximately 29%.[93] The market structure of the OTC market that permits the execution of orders more readily in sub-penny amounts has been a factor that contributes to this result.

While rule 612 does not prohibit executions from occurring in sub-penny increments, there are various factors that lead to sub-penny trading occurring more frequently off-exchange compared to on-exchanges or ATSs. Specifically, exchanges and ATSs typically match quotes and orders in the penny increment in which explicitly priced quotes and orders must be submitted under rule 612. Sub-penny trading occurs on exchanges and ATSs pursuant to either: (1) exchange rules and order types that permit executions at midpoint of the NBBO or volume-weighted executions or (2) exemptions that have been granted by the Commission under rule 612(c) (*i.e.,* RLPs).[94] Accordingly exchange rules, and the requirement that such rules comply with rule 612, limit sub-penny trading on exchanges.

OTC market makers execute in sub-penny increments with more regularity as a result of their ability to offer price improvement in between the NBBO after such orders have been accepted by the OTC market maker in the permissible penny increment.[95] OTC market makers, unlike market participants on an exchange or ATS, are not limited by their market structure to generally execute orders in the minimum pricing increment that the order was accepted. Instead, OTC market makers are able to trade as principal with orders that they receive and in the increment that they determine. As a result, OTC market makers may trade more readily in sub-penny increments which helps to provide an advantage over their exchange and ATS counterparts in attracting order flow.

Today, most marketable retail order flow is executed off-exchange by OTC market makers who, in addition to not being limited by exchange rules, offer, in many cases, payment for order flow (''PFOF'') for retail orders.[96] Further, 37% of executions off-exchange are reported in sub-penny amounts that are not associated with midpoint trades.[97] As further discussed in the Economic Analysis, data suggests that of the total dollar value of sub-penny trades that are not midpoint trades, 11% occurred on-exchange while 89% occurred off-exchange.[98] While this dynamic provides retail orders that execute OTC with a measure of price improvement, the Commission is concerned that these retail orders are not exposed to competitive forces on the public market (since these retail orders are typically directed from one broker-dealer to another wholesale broker-dealer by contractual arrangement). As a result, these retail orders are not publicly displayed and do not contribute to the

[83] For a complete discussion about the Feb. 6, 2013 roundtable and the discussions that led to the implementation of the tick size pilot, *see* Securities Exchange Act Release No. 72460 (June 24, 2014), 79 FR 36840 (June 30, 2014) (Order Directing the Exchange and FINRA to submit a Tick Size Pilot Plan).

[84] *See* Securities Exchange Act Release No. 74892 (May 6, 2015), 80 FR 27513 (May 13, 2015) (Order Approving the National Market System Plan to Implement a Tick Size Pilot Program, *available at https://www.govinfo.gov/content/pkg/FR-2015-05-13/pdf/2015-11425.pdf).*

[85] DERA Tick Size Pilot and Market Quality (Jan. 31, 2018), *available at https://www.sec.gov/dera/staff-papers/white-papers/dera_wp_tick_size-market_quality. See also* Who Provides Liquidity, And When?, Sida Li, Xin Wang, and Mao Ye, Journal of Financial Economics 141, no. 3 (2021) (finding that wider tick sizes reduce liquidity, encourage the speed race among high-frequency traders, and allocate resources to latency reduction) and Yashar Barardehi, Peter Dixon, Qiyu Liu, and Ariel Lohr, *Tick Sizes and Market Quality: Revisiting the Tick Size Pilot* (working paper, Dec. 14, 2022) *available at https://www.sec.gov/files/dera_wp_ticksize-pilot-revisit.pdf* (observing that market quality improved at the end of the pilot for stocks that were tick constrained under the TSP). Dixon, Liu, and Lohr are financial economists in the Division of Economic and Risk Analysis at the SEC. Barardehi is at the Argyros School of Business & Economics, Chapman University, and is a part-time consultant with the SEC.

[86] *See* Concept Release on Equity Market Structure, *supra* note 4.

[87] *See* MDI Adopting Release, *supra* note 5.

[88] The Concept Release on Equity Market Structure describes the transition of the modern equity trading markets away from the largely centralized, manual structure to the dispersed automated structure that exists today. *See* Concept Release on Equity market Structure, *supra* note 4. *See also* Staff Report on Algorithmic Trading in the U.S. Capital Markets (Aug. 5, 2020) (''Staff Report on Algorithmic Trading'') (this staff report updated some of the Concept Release's details and described certain developments that have occurred since 2010).

[89] *See* Staff Report on Algorithmic Trading (describing the broad use of algorithms in contemporary securities markets).

[90] *See https://www.sec.gov/divisions/marketreg/form-ats-n-filings.htm.*

[91] *See* Staff Report on Equity and Options Market Structure, *supra* note 20.

[92] Source: Equity consolidated data feeds (CTS and UTDF), as collected by MIDAS; NYSE Daily TAQ.

[93] Source: Equity consolidated data feeds (CTS and UTDF), as collected by MIDAS; NYSE Daily TAQ.

[94] *See supra* section II.B.1.

[95] OTC market makers internalize orders by trading principally on the other side of the orders that they accept. *See* Staff Report on Equity and Options Market Structure, *supra* note 20.

[96] ''Payment for order flow'' is defined in Rule 10b–10 under the Exchange Act. 17 CFR 240.10b–10(d)(8). Rule 10b–10 further prescribes information that a broker or dealer must disclose to its customer on the customer's confirmation. The rule requires that the broker-dealer disclose to the customer, among other things, ''[t]he amount of any remuneration received or to be received by the broker from such customer in connection with the transaction . . .'' and ''the source and amount of any other remuneration received or to be received by the broker in connection with the transaction. . . .'' 17 CFR 240.10b–10(a)(2)(B) and (D).

[97] *See infra* section V.C.1.b and accompanying text.

[98] *See infra* section V.C.1.b and Table 8.

price competition and discovery mechanism of the lit markets. The Commission is seeking to address concerns about the competitive dynamic between exchanges/ATSs and OTC market makers because the ability of OTC market makers to more readily trade in finer sub-penny increments than exchanges and ATSs factors into the increasing percentage of equity volume that is executed off-exchange.[99]

The fact that rule 612 does not prohibit sub-penny trading and the underlying regulatory framework that results in greater opportunities to trade OTC in sub-penny increments makes it more difficult for exchanges and ATSs to compete with OTC market makers for retail order flow. The Commission believes that the contrast between on and off-exchange sub-penny trading and the competitive responses by market participants results in market complexity and inefficiencies (*e.g.,* inverted taker-maker fee structures, tiered fee structures, segmentation via RLPs, excessive fragmentation and intermediation).[100] The proposed amendments to rule 612 would level the competitive playing field in this regard by requiring market participants, regardless of trading venue, to offer price improvement to investor orders in the same minimum pricing increments, unlike today where OTC market makers are able to offer investor orders price improvement in smaller pricing increments compared to their exchange and ATS counterparts.

In addition, some NMS stocks are considered to be tick-constrained, meaning that they regularly experience a time-weighted average quoted spread of 1.1 cents or less, which indicates that these stocks are frequently quoted in the smallest increment permitted under the rule.[101] The Commission identified 1,337 NMS stocks that would be considered tick-constrained under this metric.[102] These tick-constrained NMS stocks account for 56.1% of estimated share volume and 23.2% of estimated dollar volume.[103] NMS stocks become tick-constrained because rule 612's minimum pricing increment prohibits quoting these stocks in increments smaller than provided under the rule. These stocks would experience smaller quoted spreads but for the requirement under rule 612.

Certain market participants have conducted data analysis on the effects of rule 612 and concluded that a $0.01 increment may not be appropriate for all stocks.[104] For instance, MEMX LLC (''MEMX'') issued a report in August 2021, which provided data that suggests that ''[a] significant portion of the U.S. equity market trades with a consistent penny spread throughout most of the trading day.'' [105] MEMX provided data from the first half of 2021 indicating that many tick-constrained stocks, based on MEMX's definition, are actively traded securities that ''as a group [account] for 47% of volume, 28% of trades, and 25% of notional value executed.'' [106] According to MEMX, the ''[q]uoted spreads in these securities are limited not by supply and demand, but rather by outdated regulatory constraints that apply the same tick regime to securities with different trading characteristics.'' [107]

MEMX analyzed tick-constrained stocks across different price buckets and found that tick-constraint occurs more frequently in lower-priced securities, ''where the one cent minimum increment is more ''economically significant'' relative to the price of a share of stock.'' [108] According to MEMX's analysis, ''two-thirds (66%) of all tick-constrained securities trade in the two lowest price buckets,'' which included stocks priced between $1.00 and $20.00 per share.[109] MEMX's analysis concluded that low-priced stocks are ''more likely to be tick constrained, and the impact of that tick constraint in terms of basis point spread, which is relevant when measuring the cost of entering into a transaction, is also largest in these securities.'' [110] However, MEMX stated that tick-constraint issues can occur across different price buckets, including in high-priced, actively-traded stocks.[111] MEMX's analysis also found that tick-constrained stocks typically have more liquidity at the NBBO than stocks that are not tick-constrained. The findings were similar for stocks and exchange traded products (''ETPs'') with varying notional values traded.[112]

MEMX analyzed securities that trade at least $100 million notional value each day and concluded that more than one half of equity ETPs are tick-constrained.[113] MEMX stated that tick-constrained actively-traded ETPs have spreads that are artificially wide ''despite the fact that ETPs can be priced more efficiently due to the ability to accurately derive ETP prices and an effective arbitrage mechanism that keeps ETP prices in line with those of its underlying securities.'' [114]

The New York Stock Exchange (''NYSE'') published a white paper that stated the current $0.01 minimum pricing increment is a wider tick than market forces would otherwise produce for tick-constrained stocks.[115] NYSE stated that tick-constrained stocks tend to trade with high volume, relatively low prices, and quoted spreads near $0.01, and exhibit higher levels of inaccessible liquidity (*i.e.,* order flow

[99] *See* Staff Report on Equity and Options Market Structure at 11. *See also* Kwan, Amy, Ronald Masulis, and Thomas H. McInish, ''Trading rules, competition for order flow and market fragmentation,'' Journal of Financial Economics 115, no. 2 (2015): 330–348.

[100] *See, e.g.,* Enhancing Competition, Transparency and Resiliency in U.S. Financial Markets, Citadel Securities (May 2021) *available at https://fe7a500fc6adae9c30fb.b-cdn.net/wp-content/uploads/2021/05/EnhancingCompetitionTransparencyandResiliencyinUSFinancialMarkets.pdf* (''Citadel Report'') (''This regulatorily mandated tick size impedes the ability of exchanges to compete for order flow in symbols that are highly liquid and commonly trade inside a bid-offer spread of a penny. We believe this 'constrained' tick size directly leads to complexities and inefficiencies—such as driving order flow into alternative venues, complex exchange pricing structures, and increased overall market fragmentation.''). *See also* Enhancing U.S. Equity Market Structure for Retail Investors, Committee on Capital Markets Regulation (Sept. 2021) (''CCMR Report'') *available at https://www.capmktsreg.org/wp-content/uploads/2021/09/CCMR-Enhancing-Retail-Equity-Market-Structure-09.01.2021-2.pdf.*

[101] *See infra* note 448.

[102] *See infra* note 448 and accompanying text and *infra* Table 4.

[103] *Id.*

[104] *See, e.g.,* The Tick-Constrained Stock Problem by Phil Mackintosh (Jan. 20, 2022), *available at https://www.nasdaq.com/articles/the-tick-constrained-stock-problem)* (''Nasdaq Paper''). *See also* Petition for Rulemaking to Amend Rule 612 of Regulation NMS to Adopt Intelligent Tick-Size Regime, dated Dec. 16, 2019, submitted by John A. Zecca, Executive Vice President, Chief Legal Officer & Chief Regulatory Officer, Nasdaq Inc. *available at https://www.sec.gov/rules/petitions/2019/petn4-756.pdf* (''Nasdaq Intelligent Tick Proposal''); The Impact of Tick Constrained Securities on the U.S. Equity Market (*available at https://www.nyse.com/publicdocs/Tick_Constrained_Stocks.pdf)* (''NYSE White Paper'') (no date available); and Cboe Proposes Tick-Reduction Framework to Ensure Market Structure Benefits All Investors (*available at https://www.cboe.com/insights/posts/cboe-proposes-tick-reduction-framework-to-ensure-market-structure-benefits-all-investors/)* (''Cboe Proposal'').

[105] *See* MEMX Tick Constrained Securities (Aug. 2021) (''MEMX Report'') *available at https://memx.com/wp-content/uploads/MEMX-Market-Structure-Report-Tick-Constrained-Securities.pdf.* MEMX reviewed data from the first and second quarter of 2021. MEMX data suggested that on average 998 stocks during the period were tick-constrained, which MEMX defined as those NMS stocks that had an average quoted spread of 1.1 cents or less. In addition, on Aug. 30, 2021, MEMX filed a Request for Exemptive Relief Pursuant to Rule 612(c) of Regulation NMS to Permit a Minimum Increment of $0.005 in ''Tick Constrained'' NMS Stocks. *See* Letter from Adrian Griffiths, Head of Market Structure, MEMX to Vanessa Countryman, Secretary, Commission dated Aug. 30, 2021 (''MEMX Exemption Request'').

[106] MEMX Report, *supra* note 105, at 9.

[107] *Id.* at 9.

[108] *Id.* at 10.

[109] *Id.*

[110] *Id.*

[111] *Id.* at 11.

[112] *Id.* at 15–17.

[113] *Id.* at 13.

[114] *Id.*

[115] *See* NYSE White Paper, *supra* note 104.

that is only available to select market participants)[116] which hampers transparency and price discovery.[117] NYSE stated that the uniform rule 612 minimum pricing increment of $0.01 for all NMS stocks that are priced at, or above, $1.00 per share increases inaccessible liquidity, which results in ''different market experiences for different participants.''[118]

NYSE explained that some high-volume, lower-priced securities ''trade consistently with a spread of exactly $0.01 and maintain very deep order books at the national best price.''[119] NYSE said that this dynamic makes ''it difficult for liquidity providers to receive a fill, except at undesirable times such as when the price is about to change'' and that ''queue competition contributes to high-cost infrastructure deployments'' as market participants need to develop low latency technology to be the fastest to a new price and has also led to the development of inverted fee venues, ''which allow, for a cost, liquidity providers to pay for better queue position.''[120] According to NYSE, these dynamics show that rule 612 has influenced an ''arms race'' in market technology and venue fragmentation. NYSE also stated that ''artificially wide tick sizes raise transaction costs and harm execution quality.''[121] NYSE estimated that ''trading in tick constrained securities typically increase[s] transaction costs by about one billion dollars per year . . .''[122]

NYSE developed a ''Tick Constrained Index'' based on consolidated quoted spread and NBBO coverage to identify stocks that it considered tick-constrained using data from 2019. NYSE's tick-constrained stocks represented 538 symbols in the second half of 2020, which had an average intraday volume of 4,254,664 shares per symbol, and 25.9% of intraday volume. NYSE estimated that the minimum $0.01 spread ''cost investors over $1.7 billion in the first half of 2020 . . . [and] $499 million'' in the second half of 2020.[123] NYSE also analyzed the impact of volatility in 2020 on tick-constrained stocks and concluded that tick-constrained stocks responded differently than non-tick-constrained stocks to extreme volatility. Specifically, tick-constrained stocks spreads did not widen (52.72%) as much as non-tick-constrained (163.33%), but the depth at the inside decreased significantly more in tick-constrained stocks (−73.24%) compared to non-tick-constrained stocks (−39.75%).[124] According to NYSE, market makers managed their risk in tick-constrained stocks by reducing liquidity because they could not reduce prices. NYSE also noted that exchange market makers are unable to compete with off-exchange providers in providing price improvement.[125]

More recently, NYSE published a study on price improvement and minimum pricing increments.[126] NYSE analyzed consolidated exclusive securities information processor (''SIP'') data from January 1, 2022, to June 30, 2022.[127] NYSE estimates that in the first half of 2022 approximately $72 million per day aggregated price improvement was provided and that of this amount 48% was delivered on exchange and 52% was delivered off-exchange.[128] Further, NYSE estimates that 12.4% of the total price improvement came from non-midpoint trades in either tenths or hundredths of a cent, which are increments that exchanges have limited ability to trade.[129] According to NYSE's analysis, harmonizing the trading increment across exchange and non-exchange trading ''could yield $6.3MM per day ($1.8B per year) in investor cost savings based on projected incremental savings if exchanges could offer sub-penny price improvement in a competitive manner.''[130]

NYSE stated that exchanges currently provide: (1) 1.17× the amount of off-exchange price improvement when combining the midpoint and round penny trade prices; and (2) 77% as much price improvement as off-exchange trades when spreads are wider than $0.01.[131] NYSE applied these ratios to current off-exchange sub-penny price improvement estimates to calculate an additional $7.3 million in daily price improvement.[132]

NYSE also examined data related to stocks that frequently trade with a $0.01 spread and found that trades did not frequently execute in increments as small as $0.0001, which is the increment that off-exchange market makers can use in executing trades.[133] In addition, according to NYSE, most price improvement is delivered to trades where the bid-offer spread is larger than $0.10. NYSE also examined price improvement trends during ''calm''[134] and volatile markets.[135] According to NYSE, exchanges tend to provide a larger share of the total price improvement during volatile markets, while off-exchange venues increase their share of total price improvement when volatility drops.[136]

Finally, NYSE considered the impact of allowing sub-penny quoting on market infrastructure.[137] NYSE stated that the industry is capable of accommodating an increase in message traffic that may accompany lower minimum pricing increments.[138] NYSE calculated several estimates of potential increased message traffic that resulted in increases in messages of the exchanges' best quotations between 25% and 152% and stated that these increases would ''lead to small changes in messaging levels relative to historical fluctuations and overall messaging rates that remain quite modest compared to data volumes prevalent in current-day options trading.''[139]

The Nasdaq Stock Market (''Nasdaq'') has also conducted studies on minimum pricing increments. According to Nasdaq, trading in tick-constrained stocks is more complicated and more expensive, with artificially wider spreads and longer order queues, which slows order fulfillment and leads to the increased routing to exchanges that have inverted taker/maker fee structures.[140] Nasdaq stated that as the price of the securities falls, the one penny minimum pricing increment becomes large as a percentage of value. For example, Nasdaq stated that for a stock priced above $1,000 per share, one penny is less than 0.10 basis point (one basis point is equal to 0.01% or 0.0001), while for a stock priced $1.00, one penny represents 100 basis points.

[116] NYSE stated that retail order flow is an example of inaccessible liquidity because it is largely sent to OTC market making firms that can execute such orders on a principal basis at prices inside the best displayed prices. *Id.* at 1. NYSE stated that retail order flow has increased as a percentage of the market. *Id.*

[117] *Id.* at 1.

[118] *Id.* at 2.

[119] *Id.*

[120] *Id.*

[121] *Id.*

[122] *Id.* at 12.

[123] *Id.* at 4.

[124] *Id.* at 6–7.

[125] *Id.* at 8.

[126] *See* NYSE Tick Harmonization Paper, *supra* note 70 at 2.

[127] *Id.* at 3.

[128] *Id.* at 4.

[129] *Id.*

[130] *Id.* at 2. NYSE described ''trade increment harmonization'' as ''equal trade pricing rules for all on and off exchange trading, with exchanges able to display quotes at twice the trade pricing increment.'' NYSE analyzed the possible impact of a half cent quoting increment coupled with a harmonized quarter cent trading increment. *Id.* at 5.

[131] *Id.* at 2.

[132] *Id.*

[133] *Id.* at 8.

[134] NYSE defined a ''calm'' market for purposes of its analysis as ''when there is a stable quoted market price for a restrictive 100 milliseconds before and after the trade.'' *Id.* at 9.

[135] *Id.*

[136] *Id.*

[137] *Id.* at 10–11.

[138] *Id.* at 10.

[139] *Id.* at 11.

[140] *See* Nasdaq Paper and Nasdaq Intelligent Tick at 4, *supra* note 104.

Nasdaq stated that this is harmful for smaller less liquid stocks because the minimum pricing increment represents a higher percentage of value which ends up costing investors money. Nasdaq stated that when faced with a spread constraint, market participants trade more on inverted venues to narrow the spread due to the inverted pricing structures. According to Nasdaq, substantial queue lengths result in inverted usage and stocks priced lower than $5 tend to have longer queues.

For higher priced stocks, Nasdaq stated that a tick size that is too small can result in increased volatility and less price competition which impairs price discovery. According to Nasdaq, higher stock prices from less frequent stock splits can eventually lead to wider spreads and more odd-lot trading. Nasdaq found that fill rates are generally higher for low-priced stocks, and fill rates begin to decline once a stock is priced greater than $100. Further, Nasdaq stated that a tick size that is too small can reduce the significance of time priority because traders can outbid resting orders by an economically insignificant amount. Nasdaq stated that this discourages traders from improving displayed prices and reduces incentives to post displayed liquidity. Nasdaq stated that certain high priced stocks with spreads closer to $1.00 have odd-lots inside the NBBO much more frequently than high priced stocks with spreads below $0.02. Nasdaq further stated that if high priced stocks traded at a wider tick, there would be more displayed depth at each tick increment.

Nasdaq concluded that if the minimum pricing increment is too wide (tick-constrained) or too small (stocks trading in multiple increments), the mismatch creates inefficiency that increases the issuer's cost of capital, hurting issuers and investor returns, potentially harming economic growth and retirement stability.

Recently, the Cboe Exchange, Inc. (''Cboe'') examined the NBBO of all NMS securities above $1.00 from January 3, 2022, to August 23, 2022, during regular trading hours, excluding opening and closing auctions and locked and crossed markets.[141] Cboe stated that most securities are not tick-constrained and that a one-size-fits-all finer minimum pricing increment ''risks creating a structure that attempts to solve a problem that does not exist for most securities and introduces roadblocks to the liquidity aggregation and price discovery process.'' [142]

Cboe stated that out of 10,125 securities, only 9% (877) should be considered preliminarily tick-constrained, which Cboe defined as stocks with an average quoted spread of 1.1 cents or less.[143] Cboe found that these 877 securities represent 49% of average daily volume and 22% of average daily notional value traded.[144] Cboe found that 88% of NMS stocks are quoted at spreads above $0.015 and 37% of securities representing 25% average daily notional value are being quoted at spreads above $0.10.[145]

E. Proposals by Market Participants

Various market participants have suggested that rule 612 be amended. Throughout the years, market participants have advocated that the minimum pricing increment: (1) only be reduced for NMS stocks that are tick-constrained; [146] (2) be varied based on certain objective and measurable trading characteristics of a particular NMS stock; [147] or (3) be increased for higher-priced stocks.[148] The Commission has studied and considered the alternative approaches that are described in this section, and at this time has determined to propose rule 612 amendments that would implement variable minimum pricing increments for the quoting and trading of NMS stocks priced at, or above, $1.00 per share based on the Time-Weighted Average Quoted Spread during an Evaluation Period.

As discussed more fully in section II.F., the Commission believes that the proposed amendments to rule 612 addresses the concerns that have arisen since its adoption in a manner that is consistent with the Congressional directives, set forth by section 11A of the Exchange Act, to facilitate the establishment of the national market system. Specifically, the Commission has designed the proposed rule 612 amendments to achieve the section 11A objectives of fair competition, economically efficient executions, and equal regulation by addressing concerns related to: (1) tick-constrained stocks; and (2) fair competition for retail order flow across trading venues.

1. Reduce the Tick Size to $0.005 for Tick-Constrained Stocks

Some market participants have recommended that rule 612 be amended to lower the minimum pricing increment to $0.005 only for NMS stocks that are tick-constrained.[149] Specifically, MEMX submitted a request that the Commission exercise its exemptive authority under rule 612(c) of Regulation NMS to permit market participants, including exchanges, associations, ATSs, vendors and broker-dealers, to display, rank, and accept bids or offers, orders, and indications of interest in $0.005 [150] increments for those NMS stocks that are ''tick-constrained,'' which MEMX would define as those stocks that trade with an average quoted spread of 1.1 cents or less.[151] MEMX requested that average daily spreads be calculated on a monthly basis and that a stock would have its minimum pricing increment reduced based upon a prior calendar month.[152] MEMX stated that the current increment ''is demonstrably too wide'' for certain stocks and ''imposes unnecessary costs on investors.'' [153] MEMX also stated that quoting in tick-constrained stocks is based on ''outdated regulatory constraints'' as opposed to ''supply and demand'' which in turn ''harm[s] public price discovery and increas[es] transaction costs.'' [154] Further, MEMX stated that reducing the minimum pricing increment for tick-constrained stocks would minimize implicit trading costs for investors, *e.g.,* spread costs.[155]

MEMX stated that reducing the minimum increment ''would reduce transaction costs and facilitate more robust price discovery by enabling liquidity providers to post more aggressive quotations within the current penny spread. . .'' [156] In addition, MEMX stated that reducing the minimum pricing increment for tick-constrained stocks would be in the

[141] *See* Cboe Proposal at 1, *supra* note 104.

[142] *Id.*

[143] *Id.*

[144] *Id.*

[145] *Id.*

[146] *See* Joint Petition, *supra* note 78. *See also* MEMX Exemption Request, *supra* note 105.

[147] *See* Nasdaq Intelligent Tick Proposal, *supra* note 104.

[148] *See* TSP, *supra* note 85.

[149] *See* Citadel Report, *supra* note 91 at 4 and CCMR Report, *supra* note 91 at 10. *See* MEMX Exemption Request, *supra* note 105.

[150] MEMX did not explain how MEMX arrived at the $0.005 increment. However, MEMX also requested that orders be permitted to execute at the midpoint of the NBBO.

[151] MEMX, in conjunction with its request for relief pursuant to rule 612(c) to reduce the minimum increment for tick-constrained stocks to $0.005, also requested relief pursuant rule 610(c) to limit access fees for tick-constrained stocks for any national securities exchange, national securities association, or other trading center. MEMX stated that the rule 610 access fee and the rule 612 minimum increment are ''intimately tied'' to each other. *See* MEMX Exemption Request, *supra* note 105 at 8.

[152] MEMX suggested using a calendar month calculation to be similar to the round lot calculation adopted under the MDI Rules. MEMX stated that using a similar schedule could reduce complexity. *See id.* at 3.

[153] *Id.* at 2.

[154] *Id.* at 1.

[155] *Id.* at 6.

[156] *Id.*

public interest and consistent with the protection of investors because ''the potential savings are likely to be substantial'' due to the amount of trading that occurs in tick-constrained stocks.[157]

MEMX addressed the factors that the Commission identified in the Regulation NMS Adopting Release for consideration of exemptions under rule 612(c). In the Regulation NMS Adopting Release,[158] the Commission stated that the factors it would consider and evaluate in the context of an exemption request under rule 612(c), amongst other things, would include: (1) if the security always trades with a penny spread and there is tremendous liquidity available on both sides of the market; [159] (2) whether the NMS stock was an ETF or other derivative that could be readily converted into its underlying securities or vice versa, in which case the true value of the security is derived from its underlying components and might be a sub-penny increment; (3) if there is a large volume of sub-penny executions in that security due to price improvement; and (4) if the security was low priced. Specifically, MEMX stated that ''(1) almost one thousand NMS stocks accounting for nearly half of all volume and about a quarter of all trades and notional value traded on a daily basis are tick constrained, meaning that they consistently trade with a penny increment; (2) such tick constrained NMS stocks trade with 'tremendous' liquidity at the NBBO as quoting activity is forced to cluster at the minimum increment instead of more aggressive prices that would offer improved economics to investors; (3) tick constraints occur frequently and are most impactful in (A) low-priced NMS stocks where a one cent spread is more economically significant in relation [to] the price of the security; and (B) ETPs whose prices can be appropriately derived from their underlying constituents.'' [160]

Further, MEMX stated that the objectives underlying rule 612 would not be jeopardized if the exemption was granted and the minimum pricing increment was reduced. Specifically, MEMX stated that because market participants are unable to improve displayed prices for tick-constrained stocks, the previously articulated policy concern of stepping ahead of displayed orders by ''economically insignificant amounts'' was not relevant. MEMX stated that reducing the tick size would promote price competition for those stocks that are currently hindered by regulation.[161]

Citadel also recommended that ''[t]he Commission should reduce the minimum tick size to a half-penny for symbols trading above $1.00 per share that are tick constrained (*i.e.,* have a penny spread the overwhelming majority of the time).'' [162] Citadel stated that the rule 612 minimum pricing increment ''impedes the ability of exchanges to compete for order flow in symbols that are highly liquid and commonly trade inside the bid-offer spread of a penny.'' [163] Citadel continued that tick constraints lead to ''complexities and inefficiencies,'' including ''driving order flow into alternative venues, complex exchange pricing structures, and increased overall market fragmentation.'' [164] Citadel stated that a reduced tick size for tick-constrained stocks would allow exchanges to display more aggressive prices and improve on-exchange execution quality and exchange competitiveness.[165] Citadel also suggested, without elaborating, that allowing sub-penny quoting more broadly ''could raise other concerns.'' [166]

Finally, the CCMR recommended that the Commission revise rule 612 to allow $0.005 increments in stocks that always trade with a penny spread.[167] CCMR cited the analysis conducted by MEMX to support its recommendation. CCMR, however, stated that it did not recommend a $0.001 tick size. CCMR stated that a tick size that is too narrow can harm market quality. CCMR stated that a smaller tick size that is too narrow ''can cause ''flickering quotations,'' in which a stock quote rapidly switches back and forth between prices complicating broker-dealer routing decisions and hindering their ability to get the best prices for investors.'' [168] In addition, CCMR stated that smaller tick sizes could ''enable ''stepping ahead'' whereby a trader uses an economically insignificant quote to ''step ahead'' of an existing order, reducing the likelihood that orders posted by fundamental investors will be executed,'' which would create a disincentive for the public display of orders.[169]

More recently, Cboe proposed a framework to reduce the minimum tick size to $0.005 for tick-constrained stocks that demonstrate other objective criteria.[170] Specifically, Cboe would designate a security as tick-constrained and thus eligible for a $0.005 minimum pricing increment if a stock exhibits: (1) a high quote-size-to-trade-size ratio; and (2) a high average daily notional turnover.[171] According to Cboe, a high quote-size-to-trade-size ratio demonstrates that ''even though there is an abundance of liquidity, the current $0.01 tick constraint disincentivizes investors to cross the spread due to high costs, resulting in a lack of trade executions.'' [172] Further, a high average daily notional turnover would be an objective criterion ''because it focuses the tick-reduction effort on high turnover securities that would benefit from the ability to trade in finer increments.'' [173] For each criterion, Cboe would include stocks that fall within the top 75 percentile in the lower minimum pricing increment.[174] Using its criteria and parameters, Cboe identified 67 stocks that would be eligible for a reduction in the minimum pricing increment.[175]

Cboe's proposal would include a reevaluation every quarter or bi-annually for the criteria and parameters.[176] Cboe would also decouple the quoting increments from trading increments.[177] Cboe stated that decoupling the quoting and trading increments would allow retail auctions to increase trading competition in finer increments without impacting the broader market.[178] Finally, Cboe proposed a consideration of wider ticks to facilitate enhanced liquidity

[157] *Id.*

[158] *See* Regulation NMS Adopting Release, *supra* note 16, at 37554. MEMX did not analyze whether there is large volume of sub-penny executions due to price improvement. MEMX stated that executions in sub-penny increments ''are likely to be indicative of retail internalization as opposed to market participants seeking to trade within a tick-constrained spread.'' *See* MEMX Exemption Request, *supra* note 105, at 4.

[159] *See* Regulation NMS Adopting Release, *supra* note 16, at 37554 (quoting a commenter).

[160] MEMX Exemption Request, *supra* note 105, at 6 (footnotes omitted).

[161] *See id.* at 7.

[162] Citadel Report, *supra* note 100 at 4.

[163] *Id.*

[164] *Id.*

[165] *See id.*

[166] *Id.*

[167] *See* CCMR Report, *supra* note 100 at 10.

[168] *Id.*

[169] *Id.*

[170] *See* Cboe Proposal, *supra* note 104, at 9.

[171] *See id.*

[172] *Id.* at 4.

[173] *Id.* Cboe further stated that thinly-traded securities, which would have a low notional turnover, should not be the focus of reducing minimum pricing increments.

[174] *See id.* at 6.

[175] *See id.* at 7.

[176] *See id.*

[177] *See id.*

[178] *See id.* (Cboe also proposed to accelerate the addition of odd-lot orders to the exclusive SIPs and to modernize rule 604 to increase the threshold to display block orders from 10,000 shares and $200,000 to 50,000 shares and $500,000).

aggregation of securities that trade with wider spreads.[179]

2. Variable Tick Sizes

In December 2019, Nasdaq submitted a petition for rulemaking to request that the Commission amend rule 612 to replace the current ''one-size-fits all'' tick regime with an ''intelligent tick regime'' that would utilize multiple tick sizes based on certain measurable criteria of NMS stocks.[180] Under the Nasdaq proposal: (1) stocks would trade in one of six increments ($0.005; $0.01; $0.02; $0.05; $0.10; and $0.25); (2) stocks would be categorized based upon their duration weighted average quoted spread over the measurement period; (3) stocks would be assigned the next smallest increment by quoted spread (*e.g.,* a stock with average spread of $0.12 would be in the $0.10 increment category); and (4) listing exchanges would calculate and calibrate quoted spreads, determine applicable increments, and publish stock lists. Nasdaq stated that an intelligent tick regime ''would improve markets and benefit all key stakeholders—investors, public companies, and exchange members alike.'' [181] Nasdaq stated that it is sub-optimal to apply the $0.01 increment equally ''regardless of market capitalization, volume, or share price.'' [182] Nasdaq stated that currently, under rule 612, ''a $2 stock'' quotes with the same minimum pricing increment ''as a $2,000 stock.'' [183]

According to Nasdaq, its proposal would address tick-related issues for: (1) low-priced tick-constrained securities; and (2) high-priced securities that trade with significantly wider spreads. Nasdaq stated that ''if the tick is too wide (tick constrained) or too small (stocks trading in multiple tick increments), the mismatch creates inefficiency that increases the companies' cost of capital . . . and hurts listed companies and investor returns. . . .'' [184] Specifically, Nasdaq stated that tick-constrained stocks tend to have lower prices and that ''tick-constraints create long quotation queues, [slow] fulfillment . . . [create inefficiencies] and . . . [diminish] price discovery. . . .'',[185] which drives trading ''to inverted taker-maker markets . . . where larger, lower priced, more liquid stocks tend to trade heavily.'' [186] Nasdaq stated that reducing the minimum pricing increment for tick-constrained stocks ''would reduce bid-ask spreads, [save] investors money, and make trading more efficient.'' [187]

Conversely, Nasdaq stated that high-priced stocks that trade with wider spreads ''increase[ ] investor costs, usage of odd-lots, flickering quotations, non-displayed trading that doesn't support price discovery, and price instability.'' [188] For such high-priced stocks, Nasdaq also states that ''outbidding becomes so inexpensive that time priority becomes essentially non-existent'' and ''[destroys] the reward and incentive to post passive liquidity and diminishing price discovery.'' [189]

F. Proposal To Amend Rule 612

The Commission believes that based on current market conditions it is appropriate to update and modernize the rule 612 minimum pricing increment for quotes and orders in NMS stocks priced equal to, or greater than, $1.00 per share. The proposed amendments to rule 612 would also help to ensure, among other things, the ''equal regulation of all markets for qualified securities and all exchange members, brokers, and dealers effecting transactions in such securities.'' [190] Moreover, the proposed amendments to rule 612 also would facilitate fair competition and equal regulation that would help market forces to determine the prices of NMS stocks.[191]

In the Regulation NMS Adopting Release, the Commission acknowledged the possibility that the balance of costs and benefits of sub-penny quoting and trading could shift as the markets evolved. The Commission believes such a shift has occurred and the benefits of quoting and trading in sub-pennies more broadly and consistently across the national market system would be consistent with the goals of section 11A of the Exchange Act and appropriate in today's market structure. Specifically, when rule 612 was adopted the Commission expressed concerns related to ''stepping ahead'' and quote flickering. The Commission believes that in today's market the concerns related to these issues have diminished or have been mitigated. For instance, in 2005 there was concern that quoting in sub-penny increments would allow orders to step ahead of displayed orders by economically insignificant amounts. However, data demonstrates that in today's market a significant percentage of executions occur in sub-penny increments as a result of midpoint executions and sub-penny price improvement provided by OTC market makers who internalize retail orders or RLPs on exchanges.[192] For many stocks, including those that are tick-constrained, a sub-penny execution is no longer economically insignificant. A majority of the trading volume for NMS stocks is tick-constrained, which indicates that the one cent minimum pricing increment is too large for such stocks, that a smaller sub-penny increment would be an economically meaningful increment for such stocks to be able to quote and trade, and that the current minimum pricing increment is constraining the ability of market participants to trade consistent with the principles of supply and demand. Further, the increased speed of quoting and trading has alleviated many of the concerns from 2005, as many market participants are now able to react to quote changes in microseconds.

As discussed in section V.D.1, the Commission estimates that the proposal to amend rule 612 would reduce the minimum pricing increment to $0.005 or less for 81.9% of the share volume, which represents approximately 60.2% of dollar volume that trades with a spread of approximately $0.04 or less.[193] These stocks generally have lower prices and consistent liquidity at the top of the book for both bids and offers. As a result of these characteristics, sub-penny increments, particularly in relation to the stock price, will generally be economically significant.[194] The Commission believes that because liquidity is consistently on both sides of the market for most tick and near tick-constrained securities, a smaller minimum pricing increment should be economically significant and allow market forces to better determine the appropriate price increment and depth for such stocks.

When rule 612 was adopted, the Commission was concerned about the potential for quotes to flicker if the quoting increment was too small. The Commission believes that for tick-constrained and near tick-constrained stocks, the proposed minimum pricing increments are not ''too small,'' rather,

[179] *Id.* at 9.

[180] *See* Nasdaq Intelligent Ticks, A Blueprint for a Better Tomorrow (''Nasdaq Intelligent Tick''), *available at https://www.nasdaq.com/docs/2019/12/16/Intelligent-Ticks.pdf.*

[181] *Id.* at 4.

[182] *Id.* at 4.

[183] *Id.* at 4.

[184] *Id.* at 15.

[185] *Id.* at 6.

[186] *Id.* at 6–7.

[187] *Id.* at 4.

[188] *Id.* at 4.

[189] *Id.* at 4. *See also* Cboe Proposal, *supra* note 104.

[190] 15 U.S.C. 78k–1(c)(1)(F).

[191] *See* Regulation NMS Proposing Release, *supra* note 49.

[192] *See infra* section V.C.1.

[193] *See infra* section V.D.1, Table 8.

[194] *See also* MEMX Exemption Request, *supra* note 105 at 7.

the current quoting and trading of these stocks suggest that the current minimum pricing increment is too large. Advancements in technology since 2005 should reduce flickering quotes concerns.[195] Specifically, the systems currently used in the market by exchanges and other market participants can accommodate many levels of data with extreme low latency [196] and should be able to readily adjust to any potential increase of system traffic that could result from price movements at a smaller minimum pricing increment.[197]

In the Regulation NMS Adopting Release, the Commission identified several factors that it would consider in the context of a request for an exemption from the minimum pricing increments required under the rule.[198] Specifically, the Commission said it would evaluate the following factors: (i) if an NMS stock was consistently trading with a penny spread with significant liquidity available on both sides of the market; [199] (ii) if the NMS stock is an ETF or other derivative that can be readily converted into its underlying securities or vice versa, in which case the true value of the security as derived from its underlying components might be at a sub-penny increment; [200] (iii) if a large volume of sub-penny executions in an NMS stock occurs due to price improvement; and (iv) if the NMS stocks are low-priced. Currently, there is evidence that: (1) a significant percentage of the total volume of NMS stocks is consistently tick-constrained with liquidity on both sides of the market,[201] (2) the majority of tick-constrained stocks trade at $30 or less,[202] and (3) a large volume of sub-penny executions occur in the market.[203] The Commission believes that rule 612 should be updated based on current market conditions.

The Commission proposes amendments to rule 612 to: (1) introduce a variable minimum pricing increment structure for quotes and orders in NMS stocks priced at, or greater than, $1.00 per share; and (2) require executions to occur in the minimum pricing increment, both on-exchange and OTC, subject to certain exceptions. The Commission preliminarily believes the proposed amendments to rule 612 would promote: (1) fair and orderly markets and economically efficient executions, particularly for tick-constrained NMS stocks and retail order flow; and (2) fair competition and equal regulation between OTC market makers, exchanges, and ATSs that compete for retail liquidity by requiring that NMS stocks trade with the same minimum pricing increment regardless of venue (*i.e.,* on or off-exchange). The Commission also believes that amended rule 612 would promote price discovery and price competition, particularly for tick-constrained stocks and retail order flow, by permitting the quoting and trading of certain NMS stocks in finer increments that would vary based on objective criteria but must be uniform across trading venues. The Commission believes this proposal would result in pricing that is more in accordance with the principles of supply and demand.[204]

1. Minimum Pricing Increments

Currently, rules 612(a) and (b) are structured in a parallel manner in that they both contain requirements for national securities exchanges, national securities associations, ATSs, vendors, brokers and dealers when displaying, ranking and accepting quotations, orders and indications of interest. Each paragraph establishes the minimum pricing increment based on the price of the quote, order, or indication of interest. Proposed rule 612(b), similar to current rules 612(a) and (b), would set forth when and how the minimum pricing increment requirements would be applicable to specific market participants. However, unlike current rules 612(a) and (b), proposed rule 612(b) would make the minimum pricing increment applicable to the quoting and trading of all NMS stocks. Specifically, proposed rule 612(b) would state that ''[n]o national securities exchange, national securities association, alternative trading system, vendor, or broker or dealer shall display, rank, accept from any person, or execute a bid or offer, an order, or an indication of interest in any NMS stock priced in an increment smaller than the applicable increment required by paragraph (c) or (d).'' As discussed further below, proposed rule 612(c) would add the proposed variable minimum pricing increments for quotations, orders and indications of interest in NMS stocks priced equal to, or greater than, $1.00 per share and proposed rule 612(d) would contain the minimum pricing increment for quotations, orders and indications of interest in NMS stocks priced less than $1.00 per share.

2. Quotations and Orders in NMS Stocks Priced at $1.00 or More

The Commission proposes to amend rule 612 to introduce a variable minimum pricing increment model for quotations and orders in NMS stocks that are priced equal to, or greater than, $1.00 per share. The Commission preliminarily believes that a variable

[195] In the Regulation NMS Re-Proposing Release, the Commission described ''flickering'' quotes as quotes that flashed for a short period of time solely to earn market data revenues, but were not truly accessible and therefore did not add any value to the consolidated quote stream. *See* Regulation NMS Re-Proposing Release, *supra,* note 16. Since 2004, market quotation and trading systems have improved along with technological advances. Today, low latency systems and ultrafast communication protocols allow market participants to access quotes and execute trades in microseconds. Therefore, the ''flickering'' issue discussed in 2004 is largely no longer relevant today.

[196] For example, in the second quarter of 2011, the average peak message per second for Tapes A and B as reported by the CTA/CQ Plan was 339,855 and for Tape C as reported by the UTP Plan was 97,370. In the second quarter of 2022, the average peak message per second for Tapes A and B was 1,015,000 and for Tape C was 408,300. In the second quarter of 2011, the average latency reported was less than one millisecond for Tapes A and B and 5.1 milliseconds for Tape C. In the second quarter of 2022, the average latency reported for Tape A and B was 18 microseconds and for Tape C it was 13.6 microseconds. *See https://www.ctaplan.com/publicdocs/CTA_Operating_Metrics_Q22011.pdf*; *https://www.ctaplan.com/publicdocs/ctaplan/CTAPLAN_Processor_Metrics_2Q2022.pdf* and *https://www.utpplan.com/DOC/UTP_website_Statistics_Q2-2022-June.pdf. See also* MDI Adopting Release, *supra* note 5, at 18638.

[197] For example, market participants that collect options market data from the Options Price Reporting Authority (''OPRA'') can readily handle message traffic that exceeds the messages disseminated in the national market system for NMS stocks. In the second quarter of 2022, OPRA reported 36.4 million messages per second. *See* OPRA Key Operating Metrics of U.S. Options Securities Information Processor, *available at https://www.opraplan.com/document-library. See also* NYSE Tick Harmonization Paper, *supra* note 126 at 11 (stating that OPRA handles many times more messages than the equities market).

[198] *See* Regulation NMS Adopting Release, *supra* note 16, at 37554.

[199] *See id.*

[200] Rule 612 applies to NMS stocks, including ETFs. In the Regulation NMS Adopting Release, the Commission considered whether sub-penny quoting of ETFs, which are derivatively priced, raised the same concerns as other NMS stocks. The Commission stated that a basis may exist to exempt actively traded ETFs from the rule. *See* Regulation NMS Adopting Release, *supra* note 16, at 37554. MEMX stated that its data shows that ''more than half of equity ETPs and the vast majority of fixed income, commodity, and other ETPs trading at least 100 million notional each day are tick-constrained.'' MEMX Exemption Request, *supra* note 105 at 6. Further, in the Joint Petition, the petitioners requested an exemption from rule 612 to allow sub-penny quoting for one ETF, the QQQQ. *See* Joint Petition, *supra* note 78 at 1.

[201] *See* MEMX stated that, according to its research, liquidity at the quote for tick-constrained stocks is five to eight times higher for corporate securities and nine to 59 times higher for ETPs than securities trading with a spread between $0.02 and $0.03. *See* MEMX Report, *supra* note 105, at 3. *See also* MEMX Exemption Request, *supra* note 105 at 4. *See also* NYSE White Paper, *supra* note 119 at 10.

[202] MEMX provided data that approximately 80% of tick-constrained stocks traded at $30 per share or less. *See* MEMX Report, *supra* note 105 at 10.

[203] *See supra* note 192 and accompanying text.

[204] *See infra* sections V.C.1 and V.D.1.

minimum pricing increment model would allow minimum pricing increments to be better suited to the trading characteristics of the particular stocks. Since rule 612 was adopted, several commenters have suggested that the single minimum pricing increment may not be appropriate for all stocks.[205]

The Commission proposes to vary the minimum pricing increment for quotations, orders and indications of interest in NMS stocks priced equal to, or greater than, $1.00 per share based on a Time Weighted Average Quoted Spread,[206] which would be calculated by the primary listing exchange for the particular NMS stock on a quarterly basis during a month long Evaluation Period.[207] Under this proposal, the four potential minimum pricing increments for a particular NMS stock would be:

(1) $0.001, if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was equal to, or less than, $0.008;

(2) $0.002, if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was greater than $0.008 but less than, or equal to, $0.016;

(3) $0.005, if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was greater than $0.016 but less than, or equal to, $0.04; and

(4) $0.01, if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was greater than $0.04.

Under this proposal, because the applicable minimum pricing increment for an NMS stock for a calendar quarter would be established based on the stock's Time Weighted Average Quoted Spread during the Evaluation Period, an NMS stock could have a different minimum pricing increment every quarter of the calendar year. The Commission believes that the proposal that the applicable minimum pricing increment for a particular NMS stock be effective for a three month period is appropriate in order to balance the need to update the minimum pricing increment at regular intervals such that the increment can reflect market conditions without updating too frequently as to introduce undue complexity to the market system.[208]

Preliminarily, the Commission believes that the proposed variable minimum pricing increments would address the issues related to tick-constrained stocks and help to prevent other stocks that trade with relatively small spreads from becoming tick-constrained. The Commission also believes that the proposal would reduce transaction costs for many NMS stocks without harming the execution quality or dispersing the liquidity of stocks that are not tick-constrained and trade with wider spreads. As discussed below, assigning a small minimum pricing increment to a stock that has a wider spread can be harmful to displayed liquidity as liquidity would be spread across more price increments.[209] Minimum pricing increments that are too small can also add to complexity in trading and increase the risk of stepping ahead. The Commission believes that proposing to vary the minimum pricing increments based on the Time Weighted Average Quoted Spread represents a balancing of pricing, liquidity, complexity, and price improvement opportunities.[210]

This proposal to amend rule 612 to implement variable minimum pricing increments would reduce the minimum pricing increment to $0.001 for all NMS stocks that are priced equal to, or greater than, $1.00 per share if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was equal to, or less than, $0.008.[211] Further, proposed rule 612 would reduce the minimum pricing increment to $0.002 for all NMS stocks that are priced equal to, or greater than, $1.00 per share if the Time Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was equal to, or less than, $0.016. Proposed rule 612 is designed to directly address the concerns that the current minimum pricing increment of $0.01 creates an artificial price constraint on certain NMS stocks and prevents such stocks from reaching a natural price that would be within a penny spread. The Commission estimates that tick-constrained stocks make up over half (approximately 56.1%) of the market's share volume, which is estimated to be the equivalent of 23.2% of dollar volume.[212] While the Commission cannot estimate the number of these stocks that would have a Time Weighted Average Quoted Spread of $0.008 or less due to the $0.01 minimum pricing increment, the Commission estimates that 1,707 stocks, which make up an estimated 64% of share volume, and represent 37.9% of estimated dollar volume, have average spreads that are less than $0.016.[213] The Commission believes that reducing the minimum pricing increment to $0.001 or $0.002 for such stocks would allow a more natural price discovery process to occur and preserve meaningful price discovery opportunities between the spread. In addition, the Commission believes that investor trading costs due to spreads would be reduced as a result of the smaller increments and spreads that would be permitted for stocks that are currently tick-constrained.

Currently, approximately 2,648 stocks, which is an estimated 17.9% of share volume, and an estimated 22.3% of dollar volume, trade with a spread that is greater than $0.016 and less than or equal to $0.04.[214] This proposal would also reduce the minimum pricing increment to $.005 for NMS stocks that trade with a Time Weighted Average Quoted Spread that is greater than $0.016 and less than or equal to $0.04.[215] The Commission believes that the proposal would provide pricing flexibility for these stocks that trade with smaller spreads and prevent such stocks from becoming tick-constrained in the future. The Commission also believes that, by reducing the minimum pricing increments for these stocks that trade with smaller spreads, investor trading costs would be reduced as a result of smaller spreads while price

[205] *See supra* section II.D.

[206] Proposed rule 612(a)(i) would define ''Time Weighted Average Quoted Spread'' as ''the average dollar value difference between the NBB and NBO during regular trading hours where each instance of a unique NBB and NBO is weighted by the length of time that the quote prevailed as the NBB or NBO.'' *See infra* section II.F.2.a.i.

[207] Proposed rule 612(a)(ii) would define ''Evaluation Period'' as the last month of a calendar quarter (Mar. in the first quarter, June in the second quarter, Sept. in the third quarter and Dec. in the fourth quarter) of a calendar year during which the primary listing exchange shall measure the Time Weighted Average Quoted Spread of an NMS stock that is priced equal to or greater than $1.00 per share to determine the minimum pricing increment to be in effect for an NMS stock for the next calendar quarter, as set forth by paragraph (c).'' *See infra* section II.F.2.a.ii.

[208] MEMX suggested in its proposal that NMS stocks be evaluated on a monthly basis to determine a stock's average quoted spread. MEMX stated that a monthly evaluation would minimize complexity as it would be similar to the schedule to determine an NMS stock's round lot. *See* MEMX Exemption Request, *supra* note 105, at 3. The Commission believes that a quarterly evaluation and assignment is appropriate to reflect the current trading characteristics of an NMS stock. Further, the Commission believes that a monthly shift in the pricing of an NMS stock would be more complex and disruptive to the markets than a monthly shift in the size of a round lot. The Commission requests comment on whether a quarterly basis is the appropriate timeframe. *See infra* section II.G.

[209] *See infra* section V.C.1.

[210] *See infra* sections V.C.1 and V.D.1.

[211] Initially, no NMS stock would qualify for the $0.001 minimum pricing increment due to the current rule 612 one cent minimum pricing increment restricting the minimum possible tick size. Further, as discussed below, the Commission proposes a staggered implementation of the new minimum pricing increments. *See infra* section II.G.

[212] *See infra* section V.C.1.

[213] *See* Table 8 *infra* section V.D.1.

[214] *See id.*

[215] *See infra* section V.D.1.

improvement opportunities would be preserved.

The Commission believes that the execution quality for stocks with a Time Weighted Average Quoted Spread of equal to, or less than, $0.04 would not be harmed under the proposal (*i.e.,* NMS stocks that would quote and trade with a minimum pricing increment of $0.001, $0.002 or $0.005).[216] Further, the Commission believes that the liquidity at or near the NBBO for such stocks would not disperse or thin out across price levels because, as discussed below, the proposal is designed such that stocks priced equal to, or greater than, $1.00 per share with a Time Weighted Average Quoted Spread of less than $0.04 would generally have at least 3 to 4 price points but not have more than eight price points inside the quoted spread.[217]

As further discussed in section V.D.1 below, the Commission believes that a certain minimum number of ticks intra-spread would be beneficial to market quality in the trading of NMS stocks. The proposal would increase the number of increments between the spread for those NMS stocks that are tick-constrained. Initially, these stocks would transition from having, on average, one increment between the spread to either having 1 to 8 increments or 4 to 5 increments between the spread, depending on whether the stock would be assigned to a $0.001 or $0.002 minimum pricing increment. Thereafter, if, for instance, the Time Weighted Average Quoted Spread for one of these NMS stocks widens during an Evaluation Period, such stock would be assigned to a larger minimum pricing increment for the next quarter. Conversely, if the Time Weighted Average Quoted Spread for one of these NMS stock narrows during an Evaluation Period, such stock would be assigned to a smaller minimum pricing increment for the next quarter, if available. The proposal is designed to maintain a certain number of increments between the spread for efficient trading, without creating too many increments between the spread which could impact execution priority for an infinitesimally amount or reduce market depth. Accordingly, NMS stocks would be moved between the proposed minimum pricing increments based on their quoting characteristics. In sum, the Commission believes that the proposal will allow NMS stocks that have relatively small average quoted spreads to be priced with minimum pricing increments that are more reflective of the principles of supply and demand and mitigate the dispersion of liquidity across price points.

Under the proposal, NMS stocks that are priced equal to, or greater than, $1.00 per share that have a Time Weighted Average Quoted Spread greater than $0.04 would continue to have a minimum pricing increment of $0.01. Based on current market conditions, the Commission estimates that approximately 7,792 stocks, which is estimated to be 18.1% of share volume, and estimated to be 39.8% of dollar volume, trade with a spread that is greater than $0.04.[218] The Commission believes that the proposal would have little or no impact on these NMS stocks that would continue to quote at the $0.01 minimum pricing increment.[219] The Commission proposes to retain the current minimum pricing increment for stocks that fall into this category because these stocks are neither tick-constrained nor near constrained stocks. Stated another way, stocks that have a Time Weighted Average Quoted Spread of greater than $0.04 are able to be competitively priced based on market forces and the principles of supply and demand so would continue to have a $0.01 minimum pricing increment. Further, as described above, if these stocks were to become tick-constrained, or experience a reduction in its average quoted spread, the minimum pricing increment would be adjusted downward following the next Evaluation Period.

Although certain market participants recommend that the minimum pricing increment be reduced to $0.005 only for tick-constrained stocks,[220] the Commission believes that many stocks that currently trade with an average quoted spread of $0.011 could continue to be tick-constrained if the minimum pricing increment for such stocks were only reduced to $0.005. Accordingly, the Commission is proposing to reduce the minimum pricing increment for tick-constrained stocks as well as stocks that are near tick-constrained or otherwise have average quoted spreads less than $0.04 to either $0.001, $0.002 or $0.005, which would likely reduce the minimum quoting increment for more than 81.9% of the trading volume for NMS stocks. Overall, the Commission expects that the impact on liquidity and trade execution would be positive because tick constraints prevent market participants from quoting the prices that reflect supply and demand, and the reduction in the minimum pricing increments would lead to narrower spreads and better market quality. The Commission determined to propose the reduced minimum pricing increments of $0.001, $0.002, and $0.005, in part, because many investors will have familiarity with, or an awareness of, trades that occur in these specific increments because of how trading is conducted today. The Commission believes this because today, two of the most common increments for the price improvement of stocks that trade OTC are $0.001 and $0.002, and price improvement on exchanges and ATSs often occurs through midpoint executions in an increment of $0.005. The Commission also selected these particular pricing increments because, as described above, the proposed amendments to rule 612 are designed to: (1) correlate the Time Weighted Average Quoted Spread to the minimum pricing increments, which limits the number of potential price points within the spread, which, in turn, should mitigate the loss of liquidity that can occur when the minimum tick size is reduced and the number of pricing increments increases;[221] and (2) preserve meaningful price improvement for the majority of NMS stocks that would trade at minimum pricing increments that are $0.005 or less.

For stocks priced equal to, or greater than, $1.00 per share with Time Weighted Average Quoted Spreads equal to or less than $0.04, the Commission believes the reduction in the minimum pricing increment would be largely beneficial to the trading environment. Specifically, the Commission believes that reducing the minimum pricing increment would remove tick-constraints for a large percentage of the total trading volume, and allow market participants to quote at the prices that equate supply and demand, which in turn would lead to narrower spreads and better market quality.

The Commission also believes the proposal would increase price discovery for stocks that are tick-constrained, or near-tick-constrained, and reduce transaction costs for investors without

[216] *See infra* section V.D.1

[217] For example, if the bid for a stock is $10.00, and the stock has an average quoted spread of $0.010, it would be assigned a $0.002 minimum pricing increment and would have four price levels within the average quoted spread (*i.e.,* 10.002, 10.004, 10.006, and 10.008). *See also infra* section V.D.1. However, if that same stock trades with a spread that is wider than the average quoted spread used to determine the minimum pricing increment there would be more than four price levels. For instance, if the bid for the stock was $10.00 and the ask was $10.02 then there would be nine price levels with the quoted spread (*i.e.,* 10.002, 10.004, 10.006, 10.008, 10.01, 10.012, 10.014, 10.016. 10.018).

[218] *See infra* section V.D.1, Table 8.

[219] *See infra* section V.D.1.

[220] *See supra* section II.E.1.

[221] *Id.*

negatively impacting execution quality for stocks that are not tick-constrained. The Commission's proposal differs from the tiered approach for minimum pricing increments suggested by market participants as described in section II.E.2. The Commission's proposed variable minimum pricing increments are designed to offset the potential dilution of liquidity and depth at the top of the book while providing market participants with a range of price points (generally four to eight) between the quoted spread to provide price improvement opportunities to investor orders.

With regard to changing the minimum pricing increment, the Commission proposes to target tick-constrained stocks, and those stocks that trade with relatively smaller spreads that could become tick-constrained by reducing and varying the minimum tick size. While some market participants have suggested that the Commission impose larger minimum pricing increments for certain NMS stocks,[222] the proposed rule would not change or increase the minimum pricing increment for any NMS Stocks that trade with a Time Weighted Average Quoted Spread greater than $0.04, or separately for higher-priced stocks. The Commission believes that the current $0.01 increment for NMS stocks that trade with a Time Weighted Average Quoted Spread greater than $0.04, regardless of price, remains sufficient based on their trading characteristics.[223] Commission review of academic literature suggests that there are not consistent results as to how a larger tick size would affect market quality for stocks with wider spreads.[224] Further, the Commission believes that increasing the tick size, for example for higher priced securities, which tend to trade with wider spreads, could result in the inadvertent and unintended constraining of the pricing of such stocks.[225] The Commission does not expect the trading environment for stocks with prices lower than $1.00 per share, or Time Weighted Average Quoted Spreads greater than $0.04, to be significantly impacted because under the proposal the minimum pricing increment would not change for such stocks.

a. Proposed Definitions

Proposed rule 612(a) would define the terms ''Time Weighted Average Quoted Spread'' and ''Evaluation Period.''

i. Time Weighted Average Quoted Spread

Proposed rule 612(a)(i) would define the term ''Time Weighted Average Quoted Spread'' as ''the average dollar value difference between the NBB and NBO during regular trading hours [226] where each instance of a unique NBB and NBO is weighted by the length of time that the quote prevailed as the NBB or NBO.'' The Commission proposes to use Time Weighted Average Quoted Spread as the measure for determining the minimum pricing increment because it would directly address the issue of tick-constrained stocks.[227] The Commission believes that this metric represents what the quoted spread typically would be at any point in time during the trading day for an NMS Stock. It also represents the expected costs of trading that market participants would have experienced throughout the day. In addition, the Commission believes that the primary listing exchanges should have experience using time weighted average quoted spread as a metric, and that calculating the minimum pricing increments for NMS stocks on a quarterly basis balances the need for regular updates of the tick size for NMS Stock based on the Time Weighted Average Quoted Spread with the need to avoid undue complexity related to more frequent updates.

ii. Evaluation Period

Proposed rule 612(a)(ii) would define the term Evaluation Period as ''the last month of a calendar quarter (March in the first quarter, June in the second quarter, September in the third quarter and December in the fourth quarter) of a calendar year during which the primary listing exchange shall measure the Time Weighted Average Quoted Spread of an NMS stock that is priced equal to, or greater than, $1.00 per share to determine the minimum pricing increment to be in effect for an NMS stock for the next calendar quarter, as set forth by paragraph (c).'' The Commission proposes that the Evaluation Period be one month in order to balance the need to select a period that is: (1) long enough such that a few extreme or aberrant days of trading activity during the Evaluation Period would not unduly effect the Time Weighted Average Quoted Spread calculation; and (2) short enough such that the calculation of the Time Weighted Average Quoted Spread would likely be representative of current market conditions.

As proposed, the applicable minimum pricing increment for the quoting and trading of the particular NMS stock, based on the Time Weighted Average Quoted Spread as prescribed by amended rule 612(c), would then be established for the following quarter on the first business day following the completion of the Evaluation Period.[228] Further, the Commission proposes that the calculation to determine the particular tick for an NMS stock be done on a quarterly basis in order to balance the need for regular updates of the tick size while not introducing undue complexity to the market system by updating the tick size too frequently. MEMX suggested that the minimum pricing increment be evaluated on a monthly basis.[229] The MEMX Exemption Request, however, would only develop one additional pricing increment for NMS stocks that would become tick-constrained. The Commission's proposal would be more complex and would require the potential reclassification to four minimum pricing increments.

iii. Regulatory Data

The Commission proposes to amend the definition of regulatory data in Rule 600(b)(78) of Regulation NMS to require the primary listing exchange for each NMS stock to calculate and provide to competing consolidators, self-aggregators, and the exclusive SIPs an

[222] *See* Nasdaq Intelligent Tick Proposal, *supra* note 180 at 8.

[223] *See also infra* note 548 and accompanying text. Further, minimum pricing increments that are too large or static could frustrate the natural pricing mechanism of quotes and orders. *See also supra* note 85. The Commission requests comment on whether larger tick sizes should be imposed on certain NMS stocks. *See infra* section II.H.

[224] *Id.*

[225] *See supra* note 223. *See also supra* note 85 and accompanying text.

[226] The Commission proposes to use quotations only during regular trading hours because after hours trading is generally less liquid and more volatile.

[227] Market participants have suggested similar measurements for determining minimum pricing increments. For example, MEMX suggested looking at the average quoted spread of an NMS stock to determine if such stock should be permitted to have a smaller minimum pricing increment. *See* MEMX Exemption Request, *supra* note 105 at 3. Nasdaq suggested categorizing stocks to a minimum pricing increment based a duration weighted average quoted spread over a measurement period. *See* Nasdaq Intelligent Tick, *supra* note 180 at 8. The Commission preliminarily believes that the proposed Time Weighted Average Quoted Spread would be more precise than the suggestions from MEMX and Nasdaq, and the proposed definition would be sufficiently specific to determine a stock's average quoted spread.

[228] As proposed, minimum pricing increments would be implemented on the first business day after an Evaluation Period. The Commission requests comment on whether this would be a sufficient amount of time for the market and market participants to implement new minimum pricing increments for any NMS stock that may experience a change in its Time Weighted Average Quoted Spread. *See* section II.H.

[229] *See* MEMX Exemption Request, *supra* note 105. *See also supra* section II.E.1.

indicator of the applicable minimum pricing increment required under the proposed amendments to rule 612. The Commission believes that it is appropriate and important that the primary listing exchanges play a central role in the administration of the proposed amendments to rule 612 by calculating the Time Weighted Average Quoted Spread for each NMS stock and to provide this information to the exclusive SIPs and competing consolidators for dissemination. The primary listing exchanges are well-situated to perform these functions as they have direct and immediate access to pricing information about their own listed securities, and already perform similar calculations—and provide the results to the exclusive SIPs—today.[230] In addition, under the MDI rules, the primary listing exchanges would be required to calculate and provide several regulatory data elements to competing consolidators and self-aggregators.[231] For example, the primary listing exchange will calculate the average monthly closing price of each of its NMS stocks, assign each stock to a round lot size corresponding to that average monthly closing price, and include an indicator of the applicable round lot size in the data it makes available to competing consolidators and self-aggregators.[232]

The proposed indicator would thus be included in NMS data[233] disseminated by the exclusive SIPs and competing consolidators, which should help to ensure the wide availability of information about the applicable minimum pricing increment for each NMS stock, which in turn will enable market participants to trade in a more informed manner. Further, the Commission believes that information about the relevant minimum pricing increment should be provided to the exclusive SIPs, competing consolidators, and self-aggregators because the minimum pricing increment might change from quarter to quarter.

3. Quotations and Orders in NMS Stocks Priced Less Than $1.00

Currently, the minimum pricing increment for quotations and orders in NMS stocks that are priced less than $1.00 per share is $0.0001. When it adopted this increment, the Commission stated that the sub-penny increment would largely represent genuine trading interest for low-price stocks rather than attempts to unfairly step ahead of displayed orders and that the sub-penny increment represents a significant amount of the price of the quotation or order.[234] The Commission believes that this increment remains appropriate for these NMS stocks.

Due to the other proposed amendments to rule 612, the minimum pricing increment for quotations and orders in NMS stocks that are priced less than $1.00 per share would be set forth in proposed rule 612(d). Rule 612(d) as proposed to be amended would state that ''[e]xcept as provided in paragraph (e), the minimum increment for any bid or offer, order, or indication of interest for an NMS stock priced less than $1.00 per share shall be no smaller than $0.0001.'' Proposed rule 612(b) would make the minimum pricing increment set forth in proposed rule 612(d) applicable to the quoting and trading of NMS stocks priced less than $1.00 per share. The Commission believes, for the reasons discussed below, that the minimum pricing increment should be applied to trading as well as quoting.[235]

4. Minimum Pricing Increment for Trading

The Commission proposes that the variable minimum pricing increments of rule 612 as proposed to be amended would apply to all trading—on exchanges, ATSs, and OTC. This means that all quotes and orders, regardless of price, would be required to execute in the applicable minimum pricing increments set forth by proposed rule 612(c) or (d), subject to the specified exceptions set forth in proposed rule 612(e). Proposed amendments to rule 612(e) would provide exceptions for: (1) orders that execute, but are not explicitly priced at, the midpoint of the NBBO or the protected bid and protected offer (''PBBO'');[236] and (2) orders that execute at a price that was not based, directly or indirectly, on the quoted price of an NMS stock at the time of execution and for which the material terms were not reasonably determinable at the time the commitment to execute the order was made (*e.g.,* VWAP or TWAP trades).[237]

The Commission is concerned about the increase of orders that are executed OTC in price increments that exchanges and ATSs cannot practically provide,[238] and believes that harmonization of the minimum pricing increment for the quoting and trading across venues would promote competition and innovation, while preserving most meaningful price improvement opportunities.[239] The Commission believes that amending rule 612 to require executions to occur at the relevant minimum pricing increment, subject to the specified exceptions, would help to address the competitive disparity that occurs, in part, because certain OTC executions may occur more freely in sub-penny increments, while the opportunity for sub-penny executions on exchanges and ATSs are much more limited.[240]

Currently, much of the sub-penny trading that occurs OTC is a result of price improvement (*i.e.,* executions that occur between the spread). The most commonly offered sub-penny increments for price improvement are $0.0001, $0.001 and $0.002.[241] Under this proposal, price improvement of $0.0001 would no longer be available for NMS stocks that are priced equal to, or greater than, $1.00 per share, but trades would be able to occur in $0.001 and $0.002 for those stocks that are assigned to such increments.[242] Further, executions at even finer increments would still be permitted to occur at the midpoint.

The variable minimum pricing increments have also been designed to facilitate trading between the spread to accommodate price improvement opportunities.[243] The Commission believes that applying the minimum pricing increment to trading across all venues should promote equal regulation and fair competition among market participants such as exchanges, OTC

[230] *See* MDI Proposing Release, *supra* note 39, at 16762; MDI Adopting Release, *supra* note 5, at 18634–35.

[231] 17 CFR 242.600(b)(78); *see* MDI Proposing Release, *supra* note 39, at 16759–63; MDI Adopting Release, *supra* note 5, at 18633–35.

[232] *See* MDI Adopting Release, *supra* note 5, at 18633–35 *See also infra* section IV.B (discussing proposed amendments to the definition of ''regulatory data'' that would require the primary listing exchange to provide an indicator of the applicable round lot size to the exclusive SIPs).

[233] *See infra* note 324.

[234] *See* Regulation NMS Adopting Release, *supra* note 16, at 37555.

[235] *See infra* section V.C.1.b.

[236] *See* 17 CFR 242.600(b)(70) for a definition of PBBO.

[237] *See supra* note 19.

[238] *See supra* section II.D. *See also infra* section V.C.1.b and Table 3.

[239] *See infra* section V.D.2.

[240] In the European Union, minimum pricing increments are applied to quoting and trading. *See* Art. 49 of the Directive 2014/65/EU of the European Parliament and of the Council Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU and Art. 17a of the Regulation (EU) 2019/2033 of the European Parliament and of the Council of 27 November 2019 on the prudential requirements of investment firms and amending Regulations (EU) No 1093/2010, (EU) No 575/2013, (EU) No 600/2014 and (EU) No 806/2014.

[241] *See infra* section V.D.2.

[242] *See infra* section V.D.2.

[243] *See supra* note 217. *See also* section V.D.2.

market makers, and ATSs for retail order flow.[244]

Finally, the Commission believes that the proposed exceptions to the requirement that orders in NMS stocks be executed in the applicable minimum pricing increment would promote fair and orderly markets and economically efficient executions.[245] These proposed exceptions would codify current trading activity that is common and widespread under rule 612. Today, orders that are not explicitly priced in an impermissible sub-penny increment may execute at the midpoint of the NBBO/PBBO, even if the midpoint price would be an otherwise impermissible sub-penny quoting increment.[246] Similarly, orders that are not explicitly priced in an impermissible sub-penny increment, such as benchmark trades (*e.g.,* VWAP or TWAP trades) may execute in an otherwise impermissible quoting increment under amended rule 612.[247] Mid-point and benchmark orders are widely used and viewed by liquidity providers as important options for handling orders and implementing trading strategies that can reduce the market impact of their trades. In addition, mid-point liquidity provides price improvement opportunities for market participants on the other side of these trades.

G. Proposed Implementation Period

The Commission proposes to stagger the implementation of the variable minimum pricing increments for NMS Stocks that are priced equal to, or greater than $1.00 in order to facilitate an orderly transition for NMS stocks that would have minimum pricing increments that are less than $0.01. The implementation period would also provide for longer periods than the proposed quarterly time period between Evaluation Periods to allow the market and investors to become accustomed to the smaller increments.

Time period	Minimum pricing increment
First Implementation Period[a] ..... The first and second quarters of effectiveness ..	(1) NMS stocks with a Time Weighted Average Quoted Spread that is $0.04 or less: $0.005 increment, and (2) NMS stocks with a Time Weighted Average Quoted Spread greater than $0.04: $0.01. Minimum pricing increments would not apply to trading.
Second Implementation Period[b] ..... The third and fourth quarters of effectiveness ...	(1) NMS stocks with a Time Weighted Average Quoted Spread that is $0.016 or less: $0.002 minimum pricing increment, (2) NMS stocks with a Time Weighted Average Quoted Spread that is greater than $0.016 but less than, or equal to, $0.04: $0.005 minimum pricing increment, and (3) NMS stocks with a Time Weighted Average Quoted Spread that is greater than $0.04: $0.01 minimum pricing increment. Minimum pricing increments would not apply to trading.
Third Implementation Period[c] ..... The fifth quarter of effectiveness	Full implementation. All of the minimum pricing increments would be effective. Minimum pricing increments would apply to trading.

[a] The primary listing exchanges would calculate the Time Weighted Average Quoted Spreads for NMS stocks during the first Evaluation Period that occurs after the proposed rule's effectiveness. For example, if the proposed rule was effective in July, the primary listing exchanges would calculate the Time Weighted Average Quoted Spreads in Sept. and assign the minimum pricing increments for the fourth quarter of that year and the first quarter of the following year.

[b] For the second implementation period, the primary listing exchanges would calculate the Time Weighted Average Quoted Spreads during the month in the Evaluation Period that would fall during the second quarter of effectiveness. In the example above, the primary listing exchange would calculate the Time Weighted Average Quoted Spreads during Mar. and assign minimum pricing increments during the second and third quarters of that year.

[c] For the final implementation period, the primary listing exchanges would calculate the Time Weighted Average Quoted Spreads during the month in the Evaluation Period that would fall during the fourth quarter of effectiveness. In the example above, the primary listing exchange would calculate the Time Weighted Average Quoted Spread in Sept. and assign the minimum pricing increments for the fourth quarter of that year.

Specifically, for the first implementation period, upon effectiveness of any amendments to rule 612, the primary listing exchanges would calculate the Time Weighted Average Quoted Spreads for all NMS stocks for the first proposed Evaluation Period[248] and assign the relevant minimum pricing increments as required under proposed rule 600(b)(78). The minimum pricing increments calculated during the first Evaluation Period would be in effect for the following two quarters (*i.e.,* for six months). During the first two quarters of proposed rule 612's effectiveness, proposed rule 612 would be implemented as follows: (1) NMS stocks with a Time Weighted Average Quoted Spread of $0.04 or less would be assigned to the $0.005 increment for the first quarter of effectiveness, and (2) NMS stocks with a Time Weighted Average Quoted Spread greater than $0.04 would be assigned to remain in the $0.01 minimum pricing increment.[249] The minimum pricing increments that are less than $0.005 (*i.e.,* $0.002 and $0.001) would not be implemented during the first quarter of effectiveness.

For the second implementation period, at the end of the second quarter of effectiveness of any proposed amendments to rule 612, the primary listing exchanges would calculate the Time Weighted Average Quoted Spreads during the next Evaluation Period (*i.e.,* the month at the end of the second quarter of effectiveness) and assign the relevant proposed minimum pricing increment as required under proposed rule 600(b)(78). The minimum pricing increments calculated during the Evaluation Period would be in effect for the following two quarters (*i.e.,* for six months). During the third and fourth quarters of proposed rule 612's effectiveness: (1) NMS stocks with a Time Weighted Average Quoted Spread that is $0.016 or less would be assigned

[244] *See* 15 U.S.C. 78k–1 (a)(1)(C)(ii) and (c)(1)(F).

[245] *See* 15 U.S.C. 78k–1 (a)(1)(C)(i).

[246] *See supra* note 61.

[247] *Id.*

[248] The initial proposed Evaluation Period (Mar., June, Sept., or Dec., as applicable) would be the first full calendar month after the effectiveness of rule 612. For example, if the effectiveness would be on Feb. 14, then the initial proposed Evaluation Period would be Mar. If the effectiveness would be on Mar. 15, then the initial proposed Evaluation Period would be June.

[249] The proposed changes to rule 610 would become effective during the first stage of implementing proposed rule 612. However, the $0.0005 access fee cap would not be become relevant until the final stage of implementing proposed rule 612 when the $0.001 minimum pricing increment becomes effective. While proposed rule 610 has proposed variable access fee caps, the proposed access fee caps are based on the relevant minimum pricing increment.

to the proposed $0.002 minimum pricing increment, (2) NMS stocks with a Time Weighted Average Quoted Spread that is greater than $0.016 but less than, or equal to, $0.04 would be assigned to the proposed $0.005 minimum pricing increment, and (3) NMS stocks with a Time Weighted Average Quoted Spread of greater than $0.04 would be assigned to the proposed $0.01 minimum pricing increment. The $0.001 minimum pricing increment would not be implemented during the third and fourth quarters of effectiveness.

Finally, for the third implementation period, at the end of the fourth quarter of effectiveness of any proposed amendments to rule 612, the primary listing exchanges would calculate the Time Weighted Average Quoted Spreads during the next Evaluation Period (*i.e.,* the month at the end of the fourth quarter) and assign the relevant proposed minimum pricing increment as required under proposed rule 600(b)(78). During the fifth quarter of effectiveness of proposed rule 612, all of the variable minimum pricing increments would be effective. Accordingly, (1) NMS stocks with a Time Weighted Average Quoted Spread that is $0.008 or less would be assigned to the proposed $0.001 minimum pricing increment, (2) NMS stocks with a Time Weighted Average Quoted Spread that is greater than $0.008 but less than, or equal to, $0.016 would be assigned the proposed $0.002 minimum pricing increment, (3) NMS stocks with a Time Weighted Average Quoted Spread that is greater than $0.016 but less than, or equal to $0.04, would be assigned to the proposed $0.005 minimum pricing increment, and (4) NMS stocks with a Time Weighted Average Quoted Spread that is greater than $0.04 would be assigned to the proposed $0.01 minimum pricing increment.

The Commission proposes to implement the requirement to trade in the applicable minimum pricing increment during the fifth quarter of effectiveness of any proposed amendments to rule 612. Accordingly, during the first two implementation periods of effectiveness (*i.e.,* the first four quarters), as today, market participants would be permitted to trade in increments that differ from those that are required under rule 612 for accepting, ranking and displaying of quotes and orders.[250] The Commission believes that delaying the requirement that orders in NMS stock be executed in the minimum pricing increments until the fifth quarter of effectiveness would help to facilitate an orderly transition by allowing market participants additional time to adjust and comply with the requirement to quote and trade with the proposed minimum pricing increments set forth by the rule for a particular category of NMS stocks. As discussed in section II.F.1 above, the proposed variable minimum pricing increments have been developed so that there are increments at which market participants can trade between the spread and they are assigned based on the quoting characteristics of each NMS stock. Therefore, the Commission proposes to implement the trading requirement once all of the proposed minimum pricing increments have become effective.

Thereafter, at the end of the fifth quarter of effectiveness of proposed rule 612, the primary listing exchanges would calculate the Time Weighted Average Quoted Spreads during the next Evaluation Period and assign the relevant proposed minimum pricing increment as required under proposed rule 600(b)(78). All of the variable minimum pricing increments for quoting and trading would be effective on a going forward basis.

H. Request for Comment

The Commission requests comment on the proposed amendments to rule 612 and on other potential alternatives to the proposed minimum pricing increments.

1. Would the proposed variable minimum pricing increments for quotes and orders in NMS stocks priced equal to, or greater than, $1.00 per share address the concerns that have been raised in the market about tick-constrained stocks? If not, why not?

2. Are the proposed minimum pricing increments appropriate for NMS stocks? If not, why not, and what minimum pricing increments would be appropriate?

3. Should all NMS stocks have the same minimum pricing increment instead of the proposed variable minimum pricing increments determined by the proposed Time Weighted Average Quoted Spreads? If so, why? What should be the minimum pricing increment?

4. Are the proposed average quoted spread thresholds for each proposed minimum pricing increment appropriate? Why or why not?

5. Are the proposed minimum pricing increments economically significant for the NMS stocks that have the relevant Time Weighted Average Quoted Spread? Please explain.

6. Would the proposed minimum pricing increments cause flickering quotes? Please explain.

7. Would the proposed minimum pricing increments reduce displayed liquidity? Please explain.

8. Is the Time Weighted Average Quoted Spread the appropriate measure for assigning a minimum pricing increment for orders in NMS stocks that are priced $1.00 or more per share? If not, what would be the appropriate measure and why?

9. Is the Evaluation Period an appropriate time period to calculate the Time Weighted Average Quoted Spread? If not, what would be an appropriate time period and why?

10. Should the minimum pricing increment be modified on a quarterly basis? If not, how often should the minimum pricing increments be potentially modified, *e.g.,* on a monthly basis, on a bi-annual basis, on an annual basis?

11. Should the minimum pricing increment be uniform for all NMS stocks based on the per share price of a quote or order similar to today? Should there be more than two minimum pricing increments structures based on the price of an order or quotation of an NMS stock in rule 612? For example, should there be other price cutoffs in addition to the $1.00 price cutoff for specifying the relevant minimum pricing increment structure? If so, what should the price cutoffs be and what should be the minimum increment? If so, what should the uniform minimum pricing increment be? What should the price threshold be?

12. Is the $0.01 minimum pricing increment for quotes and orders priced equal to, or greater than, $1.00 per share or more, appropriate for some NMS stocks? If so, which NMS stocks and why?

13. Is each of the proposed Time Weighted Average Quoted Spreads that would determine the relevant minimum pricing increments appropriate for establishing the proposed minimum pricing increments? Is each of the Time Weighted Average Quoted Spread thresholds appropriate? Is each of the proposed minimum pricing increments related to the relevant Time Weighted Average Quoted Spreads appropriate? If not, why not, and what would be more appropriate measures and increments? Please explain.

14. The proposed minimum pricing increments are determined based upon proposed Time Weighted Average Quoted Spreads and have been designed to facilitate trading within the spread to accommodate price improvement opportunities. Are the proposed

[250] *See supra* section II.D.

minimum pricing increments and the proposed spread requirements appropriate to allow price improvement opportunities within the spread? If not, why not? Are there too many or not enough minimum pricing increments?

15. Should a minimum pricing increment larger than $0.01 be imposed for some NMS stocks, such as high priced stocks with wider spreads? Why or why not? If so, what should the increased minimum pricing increment be? What objective criteria should be used to identify such NMS stocks and why?

16. Should NMS stocks that have a Time Weighted Average Quoted Spread greater than $0.04 retain the $0.01 minimum quoting increment? Is the proposed $0.04 Time Weighted Average Quoted Spread appropriate for retaining the $0.01 minimum pricing increment for such stocks? If not, why not and what would be more appropriate?

17. Is the $0.0001 minimum pricing increment for quotes and orders priced less than $1.00 per share still appropriate? Should it be reduced or increased? If so, why?

18. Should the minimum pricing increment be reduced only for those NMS stocks that are tick-constrained? Why or why not? If yes, what should the minimum pricing increment for tick-constrained stocks be? If yes, what should be the criteria to determine whether an NMS stock is tick-constrained?

19. Should certain types of NMS stocks, such as ETFs or NMS stocks with smaller market capitalization, have a different minimum pricing increment? [251] If so, which types of NMS stocks should have a different minimum pricing increment and why? If so, what should the minimum pricing increment for such stocks be and why?

20. Are there other means to categorize NMS stocks for determining a minimum pricing increment? For example, should categories be based on share price, market value, trading volume, any other criterion, or a combination of criteria? As proposed, NMS stocks would be assigned a minimum pricing increment based on the Time Weighted Average Quoted Spread. How should average quoted spread be computed, over what time horizon, and how often should this criterion be updated? Should the formula for calculating Time Weighted Average Quoted Spread accommodate other elements, such as, for example, certain corporate actions like stock splits and reverse stock splits that changes the price of the shares? If so, how?

21. New minimum pricing increments would be established for the following quarter on the first business day following the completion of the Evaluation Period. Is the Evaluation Period the appropriate number of days to calculate the new minimum pricing increments? Is the proposed time to implement, *i.e.,* on the first business day following the completion of the Evaluation Period, sufficient for the markets and market participants to implement? If not, what would be a more appropriate time period to implement the new minimum pricing increment and why?

22. Should the proposed minimum pricing increments apply to trading? Should the proposed trading increments be the same as the proposed quoting increments? Please explain why or why not.

23. Do the proposed minimum pricing increments provide sufficient price levels for trading within the quoted spread? Are there sufficient levels to provide price improvement opportunities given that the trading increments would be governed by the proposed rule? Should there be different minimum pricing increments for quoting and trading? Please explain.

24. Are the proposed exceptions for trading in the minimum pricing increment appropriate? Why or why not? Should there be other exceptions from the proposed requirement to trade in the minimum pricing increment, such as for retail or segmented orders? How should other exceptions, such as retail or segmented orders, be defined? Please explain.

25. Would the proposed variable minimum pricing increments be overly burdensome or complex for the markets to implement? Please explain.

26. Would the proposed variable minimum pricing increment be confusing for investors? Would the variable minimum pricing increments add unnecessary complexity to the market? If so, please explain.

27. Should the primary listing exchange be required to provide an indicator of the applicable minimum pricing increments to competing consolidators, self-aggregators, and the appropriate exclusive SIP? Why or why not?

28. In section V.F., the Commission discusses different reasonable alternatives—uniform $0.005 tick, a two-tier alternative ($0.005 and $0.01 depending on the Time Weighted Average Quoted Spread), $0.001 for retail or segmented trades, and variable tick size based on share price. Would any of these alternatives address the concerns identified in a more appropriate manner? If so, which alternative and why?

29. Should the Commission stagger the implementation of rule 612 as proposed? If yes, are the time periods for the staggered implementation appropriate? Should the implementation phases be structured differently, and if so, how? If not, should there be an additional time period to implement rule 612 so the market and market participants can have sufficient time? Should the proposed minimum pricing increments for trading be implemented at the end of the implementation period? If not, when should the proposed minimum pricing increment be applied to trading?

III. Amendments to Rule 610 of Regulation NMS—Fees for Access to Quotations

A. Background

1. Regulation NMS

Regulation NMS, among other things, established intermarket protection against trade-throughs for all NMS stocks.[252] The Commission supplemented those requirements with rules addressing fair and efficient access to quotations and limits on fees charged to access newly protected quotations.[253] The Commission stated that access to displayed quotations, particularly the best quotations of a trading center, is ''vital for the smooth functioning of intermarket trading.'' [254] Specifically, the Commission adopted rule 610, which addresses three areas related to access to quotations: (1) the means of access to quotations; (2) the fees for access to protected quotations and any other quotations that are the best bid or best offer of an exchange or national securities association; and (3) locking and crossing quotations.

In the context of fees for access to quotations, rule 610(c) imposes an access fee cap which prohibits a trading center from imposing, or permitting to be imposed, any fees for the execution of an order against a protected quotation [255] of the trading center or any other quotation of the trading center that is the best bid or best offer of an exchange or association that exceed or accumulate to more than $0.0030 per

[251] Currently, all types of NMS stocks are subject to the existing rule 612 minimum pricing increments and rule 612 does not differentiate between different types of NMS stocks. *See also* note 200, *supra.*

[252] *See* Rule 611 of Regulation NMS; 17 CFR 242.611.

[253] *See* Regulation NMS Adopting Release, *supra* note 16, at 37538–50.

[254] *See id.* at 37539.

[255] *See supra* note 29 (defining ''protected quotation'').

share for quotations of $1.00 or more per share.[256] Rule 610(c) also imposes an access fee cap of 0.3% of the quotation price if the price of the protected quotation or other quotation is less than $1.00 per share.[257] The access fee caps apply to executions against protected quotations[258] and therefore the fees of trading centers that do not display protected quotations, such as ATSs or OTC markets makers, are not subject to rule 610(c)'s access fee caps.[259] Further, the rule 610(c) access fee caps do not apply to non-displayed interest or depth-of-book quotes.[260] The Commission adopted the rule 610(c) access fee caps in order to prevent high fees from undermining Regulation NMS's price protection and linkage requirements, while leaving trading centers otherwise free to set fees subject only to other applicable standards (*e.g.,* prohibition on unfair discrimination).[261] The access fee caps were designed to ensure that all investors would have fair and non-discriminatory access to protected quotations.[262]

At the time of adoption, the $0.0030 fee limitation was consistent with the then-prevailing market level and general business practices, as very few trading centers charged fees in excess of that amount.[263] The Commission adopted the 0.3% fee limitation on quotations priced less than $1.00 to prevent fees from constituting an excessive percentage of share price.[264] The purpose of the access fee limitation was to help ensure the fairness and accuracy of displayed quotations by establishing an outer limit on the cost of accessing such quotations.[265] In adopting the rule, the Commission sought to ''assure order routers that displayed prices are, within a limited range, true prices.''[266] Since the adoption of rule 610 in 2005, the Commission has continued to consider the impact of access fees on market structure and market quality, but has not previously proposed to modify the amount of the access fee caps despite significant changes in the equity markets.[267]

2. Exchange Fee Models

The predominant pricing structure for transactions that has developed among the equities exchanges to attract order flow is the ''maker-taker'' pricing model, in which the exchange pays a rebate to a ''maker'' or provider of liquidity and charges a fee to a ''taker'' of liquidity.[268] The exchange earns as revenue the difference between the fee paid by the ''taker'' of liquidity and the rebate paid to the provider or ''maker'' of liquidity.[269] For maker-taker exchanges, the amount of the taker fee is typically limited by the access fee caps imposed by rule 610(c) on the fees the exchange can charge to access its protected

[256] *See* 17 CFR 242.610(c). *See also* Regulation NMS Adopting Release, *supra* note 16, at 37543–46. In the Regulation NMS Proposing Release, the Commission initially proposed to cap the access fees that any individual market participant could charge for equities at $0.001 per share, with a total accumulated access fee limit of $0.0020 per share in any transaction. *See* Regulation NMS Proposing Release, *supra* note 16, at 11158–59. In its proposal, the Commission expressed concern that access fees added significant non-transparent costs to transactions, potentially encouraged locked markets, and created an unequal playing field as non-ECN broker-dealers were not permitted to charge access fees in addition to their posted quotations. *See id.* at 11157–58. The Commission ultimately adopted an access fee cap of $0.0030 in order to simplify the initial proposal and align the amount of the cap with the amount charged by most trading centers at the time, among other reasons. *See* Regulation NMS Adopting Release, *supra* note 16, at 37502 and 37545.

[257] *See* Regulation NMS Adopting Release, *supra* note 16, at 37545 n.419 (noting that ''[f]or the relatively small number of NMS stocks priced under $1.00, fees will be limited to 0.3% of the quotation price per share to prevent fees from constituting an excessive percentage of share price.'').

[258] *See supra* note 29. As stated above, rule 610(c) also applies to any other quotation of a trading center that is the best bid or offer of an exchange or association. The Commission stated that the access fee caps should apply to manual quotations that are the best bid or offer to the same extent that it applies to protected quotations to preclude any incentive for trading centers to display manual quotations as a means to charge higher access fees. *See* Regulation NMS Adopting Release, *supra* note 16, at 37546. For purposes of this discussion, references to protected quotations also include manual quotations that are the best bid or best offer of an exchange or association.

[259] If an ATS or OTC market maker displayed a protected quotation, its fees would be subject to the access fee caps under rule 610(c). However, exchange fees and the fees of non-exchange trading centers are treated very differently under the Federal securities laws. For example, one of the distinguishing features of registered national securities exchanges is that—unlike non-exchange trading centers—their fees are subject to the principles-based standards set forth in the Exchange Act, as well as the rule filing requirements thereunder. In particular, the Federal securities laws require the entirety of each and every fee, due, and charge assessed by an exchange to be transparent and publicly posted, and must be an equitable allocation of reasonable dues, fees and other charges and not be unfairly discriminatory. *See* 15 U.S.C. 78f(b)(4) and (5). Similar requirements do not apply to the fees of non-exchange trading centers that do not provide public transparency into their respective fee schedules and typically are negotiated on a customer-by-customer basis. The fees assessed by non-exchange trading centers are bespoke, and the fees paid (or not paid) by market participants to ATSs and other off-exchange venues are negotiated between each market participant and the trading venue, the result being that the number of fee permutations and differences across brokers for any single ATS could be substantial.

[260] *See* Regulation NMS Adopting Release, *supra* note 16, at 37546.

[261] *See id.* at 37543–46 (The Commission expressed concern that without a fee limitation, the adoption of the Order Protection Rule and private linkages could ''significantly boost the viability of the outlier business model.'' Such outlier markets ''might well try to take advantage of intermarket price protection by acting essentially as a toll booth between price levels'' with the high fee market likely to be the last market to which orders would be routed, but prices could not move to the next level until someone routed an order to take out the displayed price at such outlier market. Therefore, the outlier market ''might see little downside to charging exceptionally high fees, such as $0.009, even if it is last in priority.''). *Id.* at 37546.

[262] *See id.* at 37497.

[263] The $0.0030 per share cap largely codified the then-prevailing fee level set through competition among the various trading centers. *See id.* at 37545 (stating that ''the $0.003 fee limitation is consistent with current business practices, as very few trading centers currently charge fees that exceed this amount.'').

[264] *See id.* at 37544 n.406.

[265] *See id.* at 37502, 37583, and 37595.

[266] *Id.* at 37502. (The Commission stated that the fee limitation was necessary to achieve the purposes of the Exchange Act because ''[a]ccess fees tend to be highest when markets use them to fund substantial rebates to liquidity providers, rather than merely to compensate for agency services.'' Consequently, [i]f outlier markets are allowed to charge high fees and pass most of them through as rebates, the published quotations of such markets would not reliably indicate the true price that is actually available to investors or that would be realized by liquidity providers.'' Section 11A(c)(1)(B) of the Exchange Act authorizes the Commission to adopt rules assuring the fairness and usefulness of quotation information. In adopting the current fee caps, the Commission stated that, for quotations to be fair and useful, ''there must be some limit on the extent to which the true price for those who access quotations can vary from the displayed price.'' The Commission concluded that ''the $0.0030 fee limitation will further the statutory purposes of the NMS by harmonizing quotation practices and precluding the distortive effects of exorbitant fees.''). *Id.* at 37584.

[267] *See* Securities Exchange Act Release No. 84875 (Dec. 19, 2018), 84 FR 5202 (Feb. 20, 2019) (''Transaction Fee Pilot Adopting Release''). Further, the Equity Market Structure Advisory Commission also considered, among other things, whether the access fee cap should be modified. *See* Equity Market Structure Advisory Committee, Oct. 27, 2015, information *available at https://www.sec.gov/spotlight/emsac/emsac-archives.htm.*

[268] *See* SRO fee schedules, which are available on each SRO's website. *See also infra* section V.C.2, Table 5. This discussion focuses on exchange fees because, currently, only exchanges display protected quotations. If an ATS or OTC market maker displayed a protected quotation, its fees would be subject to the access fee caps under rule 610(c). However, exchange fees and the fees of non-exchange trading centers are treated very differently under the Federal securities laws. *See supra* note 259.

[269] A few exchanges have adopted a ''taker-maker'' pricing model (also called an inverted model), in which they charge a fee the provider of liquidity and pay a rebate to the taker of liquidity. *See, e.g.,* Nasdaq BX fee schedule *available at https://www.nasdaqtrader.com/trader.aspx?id=bx_pricing* (as of July 5, 2022); NYSE National fee schedule *available at https://www.nyse.com/publicdocs/nyse/regulation/nyse/NYSE_National_Schedule_of_Fees.pdf* (as of Jan. 1, 2022); and Cboe EDGA fee schedule *available at https://www.cboe.com/us/equities/membership/fee_schedule/edga/* (as of Apr. 1, 2022). *See also infra* section V.C.2, Table 5. For taker-maker exchanges, the amount of the maker fee charged to the provider of liquidity is not bounded by the rule 610(c) access fee cap because such fee is not a charge to access the market's best bid/offer for NMS stocks, but such fees typically are no more than $0.0030.

quotation or best bid/offer for NMS stocks. The rule 610(c) access fee caps apply to the fees assessed on an incoming order that executes against a resting protected quote, but does not address the rebates that may be paid. However, the rule 610(c) access fee caps typically indirectly limit the average amount of the rebates that an exchange offers to less than $0.0030 per share in order to maintain net positive transaction revenues. Thus, an exchange may have higher access fees to fund higher liquidity rebates [270] to attract more trading volume.

In recent years, a variety of concerns have been expressed about the prevailing maker-taker fee model, in particular the rebates exchanges pay to attract orders. For example, many have argued that the prevailing access fee structure creates a conflict of interest for broker-dealers, who must provide the best execution to their customers' orders while facing potentially conflicting economic incentives to avoid fees or earn rebates from the trading centers to which they direct those orders for execution.[271] Others have expressed concern that maker-taker access fees may: (1) undermine market transparency since displayed prices do not account for exchange transaction fees or rebates and therefore do not reflect the net economic costs of a trade; [272] (2) serve as a way to effectively quote in sub-penny increments on a net basis when the effect of a maker-taker exchange's sub-penny rebate is taken into account even though the minimum quoting increment is expressed in full pennies; [273] (3) introduce unnecessary market complexity through the proliferation of new exchange order types (and new exchanges) designed solely to take advantage of pricing models; [274] (4) drive orders to non-exchange trading centers as market participants seek to avoid the higher fees that exchanges charge to subsidize the rebates they offer to attract liquidity; [275] and (5) may benefit sophisticated market participants like market makers and proprietary traders at the expense of other market participants.[276]

Conversely, others argue that the maker-taker model may have positive effects by enabling exchanges to compete with non-exchange trading centers and by narrowing quoted spreads by subsidizing posted prices.[277] Specifically, maker-taker fees may narrow displayed spreads in some securities insofar as the liquidity rebate effectively subsidizes the prices of displayed liquidity by allowing a maker to post a more aggressive price than it may have in absence of a rebate.[278] In turn, that displayed liquidity may establish the NBBO, which is often used as the benchmark for marketable order flow, including retail order flow, that is executed off-exchange by either matching or improving upon those prices.[279] Accordingly, retail orders may benefit indirectly from the subsidy provided by maker-taker exchanges.

B. Current Rule 610(c)

Rule 610(c) under Regulation NMS prohibits trading centers [280] from imposing, or permitting to be imposed, any fee or fees for the execution of an order against a protected quotation of the trading center or any other quotation of the trading center that is the best bid or best offer of an exchange or association in an NMS stock [281] that exceed or accumulate to more than $0.0030 per share if the price of the protected quotation or other quotation is $1.00 or more per share.[282] Rule 610 also imposes an access fee cap of 0.3% of the quotation price per share if the price of the protected quotation or other quotation is less than $1.00 per share.[283] As discussed above, the access fee caps apply to executions against protected

[270] This was one of the concerns the Commission identified when it approved the access fee caps. *See* Regulation NMS Adopting Release, *supra* note 16, at 37545 (''[T]he fee limitation is necessary to achieve the purposes of the Exchange Act. Access fees tend to be highest when markets use them to fund substantial rebates to liquidity providers, rather than merely to compensate for agency services.'').

[271] *See, e.g.,* Stanislav Dolgopolov, ''The Maker-Taker Pricing Model and its Impact on the Securities Market Structure: A Can of Worms for Securities Fraud?'' 8 Va. L. & Bus. Rev. 231, 270 (2014), *available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2399821* (retrieved from SSRN Elsevier database). One academic study of selected market data suggested that some broker-dealers route non-marketable orders to the trading center offering the highest rebate, and do so in a manner that the authors contended might not be consistent with the broker-dealers' duty of best execution. *See* Robert H. Battalio, Shane A. Corwin, and Robert H. Jennings, ''Can Brokers Have It All? On the Relation Between Make-Take Fees and Limit Order Execution Quality,'' *Journal of Finance* 71, 2193–2237 (2016), *available at https://onlinelibrary.wiley.com/doi/10.1111/jofi.12422/full* (''Battalio Equity Market Study'').

[272] *See* Letter from Richard Steiner, Global Equities Liaison to Regulatory & Government Affairs, RBC Capital Markets, to Elizabeth Murphy, Secretary, Commission, at 2–3 (Nov. 22, 2013), *available at https://www.sec.gov/comments/s7-02-10/s70210-411.pdf* (''RBC Capital Letter'') (commenting on potential equity market structure initiatives).

[273] *See* Larry Harris, ''Maker-Taker Pricing Effects on Market Quotations,'' at 24–25 (Nov. 14, 2013), *available at https://www.lexissecuritiesmosaic.com/gateway/sec/speech/hujibusiness_Maker-taker.pdf.*

[274] *See, e.g.,* Curt Bradbury, Market Structure Task Force Chair, Board of Directors, SIFMA, and Kenneth E. Bentsen Jr., President and Chief Executive Officer, SIFMA, Opinion, ''How to Improve Market Structure,'' N.Y. Times (July 14, 2014), *available at https://dealbook.nytimes.com/2014/07/14/how-to-improve-market-structure/?_r=0* (stating that the ''proliferation of order types designed to avoid access fees and capture rebates . . . adds complexity to the system, requires continuing technology changes and creates potential for market instability'' and recommending access fees charged by exchanges be ''dramatically reduced, if not eliminated''; RBC Capital Letter, *supra* note 272, at 2.

[275] *See* Menkveld, Albert J., Bart Zhou Yueshen, and Haoxiang Zhu, ''Shades of darkness: A pecking order of trading venues.'' *Journal of Financial Economics* 124, no. 3 (2017), at 503–534, *available at https://www.mit.edu/~zhuh/MenkveldYueshenZhu_2017JFE_dark.pdf;* RBC Capital Letter, *supra* note 272, at 2.

[276] *See* RBC Capital Letter, *supra* note 272, at 2–4; Letter from Mehmet Kinak, Vice President—Global Head of Systematic Trading & Market Structure, and Jonathan Siegel, Vice President—Senior Legal Counsel (Legislative & Regulatory Affairs), T. Rowe Price, to Brent J. Fields, Secretary, Commission, dated June 12, 2018, at 2, *available at https://www.sec.gov/comments/s7-05-18/s70518-3832746-162769.pdf* (*sec.gov*) (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks).

[277] *See, e.g.,* Michael Brolley & Katya Malinova, ''Informed Trading and Maker-Taker Fees in a Low Latency Limit Order Market,'' at 2 (Oct. 24, 2013), *available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2178102* (''If a maker rebate is introduced in competitive markets, the bid-ask spread will decline by (twice) the maker rebate.'' This article provided theoretical modelling, not empirical analysis.); Shawn O'Donoghue, ''The Effect of Maker-Taker Fees on Investor Order Choice and Execution Quality in U.S. Stock Markets'' (Jan. 23, 2015), *available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2607302;* and Jean-Edouard Colliard & Thierry Foucault, ''Trading Fees and Efficiency in Limit Order Markets,'' Oxford University Press, at n.13 (Sept. 1, 2012), *available at https://academic.oup.com/rfs/article/25/11/3389/1566107* (arguing that maker-taker rebates may help equities exchanges compete with off-exchange payment for order flow arrangements, in which wholesale broker-dealers purchase retail order flow for trading off-exchange).

[278] *See, e.g.,* Letter from Richie Prager, Managing Director, Head of Trading and Liquidity Strategies, BlackRock, Inc., to Mary Jo White, Chair, SEC, at 2 (Sept. 12, 2014), *available at https://www.sec.gov/comments/s7-02-10/s70210-419.pdf* (commenting on File No. S7–02–10 ''Concept Release on Equity Market Structure'' and File No. S7–01–13 ''Regulation Systems Compliance and Integrity, and Equity Market Structure Review'' by stating ''Some participants have called for elimination of rebates and maker-taker pricing in its entirety in conjunction with access fees, but BlackRock believes that incentives for providing liquidity positively impact market structure. Incentives promote price discovery in public markets, increase available liquidity and tighten spreads. Rebates compensate liquidity providers for exposing orders to adverse selection and information leakage.''). *See also infra* section V.C.2.

[279] *See, e.g.,* Concept Release on Equity Market Structure, *supra* note 4 (evaluating broadly the performance of market structure since Regulation NMS, particularly for long-term investors and for businesses seeking to raise capital, and soliciting comment on whether regulatory initiatives to improve market structure are needed).

[280] *See supra* note 30 (defining ''trading centers'').

[281] ''NMS stock'' is defined as ''any NMS security other than an option'' under 17 CFR 242.600(b)(55).

[282] *See* 17 CFR 242.610(c). *See also* Regulation NMS Adopting Release, *supra* note 16, at 37549.

[283] *See* Regulation NMS Adopting Release, *supra* note 16, at 37549.

quotations[284] and therefore the fees of non-exchange trading centers, such as ATSs or OTC markets makers that do not display protected quotations, are not subject to rule 610(c)'s access fee caps.[285]

C. Proposal To Reduce Fees for Access to Protected Quotations and Increase Fee Transparency

In light of the amendments proposed to rule 612 as well as the decrease in trading costs and increased trading efficiencies since NMS was adopted, the Commission believes that rule 610 should be amended in two ways. First, because the Commission proposes to reduce the minimum pricing increment under rule 612 and introduce a variable tick regime, the Commission also proposes to recalibrate the access fee caps that limit what a trading center could charge for the execution of orders against a protected quotation of the trading center or any other quotation of the trading center that is the best bid or best offer of a national securities exchange or association. Specifically, if the protected quotation or other quotation in an NMS stock is priced at $1.00 or more per share, the Commission proposes that the fee or fees assessed to execute against such quotation would not be permitted to exceed (1) $0.0005 per share for NMS stocks that have a minimum pricing increment of $0.001 and (2) $0.001 per share for NMS stocks that have a minimum pricing increment greater than $0.001. Further, the Commission proposes to reduce the access fee cap for an execution against a protected quotation or other quotation priced less than $1.00 per share to 0.05% of the quotation price.

The Commission's proposal with respect to the access fee caps modifies only the level of the caps and does not otherwise make any changes to its application.[286] As discussed in the Regulation NMS Adopting Release, the rule 610(c) access fee caps were ''designed to preclude individual trading centers from raising their fees substantially in an attempt to take improper advantage of strengthened protection against trade-throughs.'' [287] The Commission believes that retaining access fee caps for executions against protected quotations remains appropriate to achieve this purpose.

The Commission proposes to recalibrate the access fee caps to reflect the reduction in trading costs due to market efficiencies since rule 610 was adopted,[288] while minimizing the potential impact of reduced fees and rebates on trading centers' business models. Further, lowering the access fee caps in connection with the reduction of the minimum pricing increment, would help to ensure that the fees charged to access a protected quotation do not distort the true price that is available to investors.[289] Absent an adjustment to the current fee caps, access fees would make up a larger proportion of the per share quotation price than they do today because of the proposed decreases in the minimum pricing increments, which could lead to unintended market distortions and undermine price transparency. Second, to increase the transparency of exchange fees, and potentially help reduce broker conflicts of interest by allowing fees and rebates to more readily be passed through to customers,[290] the Commission proposes to amend rule 610 to require national securities exchanges to make the amounts of all fees and rebates determinable at the time of execution.[291] Each of these proposals is discussed below.

1. Reduce Fees for Access to Protected Quotations

The current access fee caps were designed to prevent fees from constituting an excessive percentage of the share price and reflected the then current rates that were assessed by trading centers.[292] In the intervening seventeen years since rule 610 was adopted, the markets have evolved dramatically. Market innovations and technological efficiencies have reduced transaction and trading costs (*e.g.,* lower commissions and more narrow bid/ask spreads) in the equities markets.[293] In light of the proposed changes to rule 612 discussed in section II above, and consistent with the original goals of Regulation NMS, the Commission

[284] *See supra* note 255 and accompanying text.

[285] *See supra* notes 255 and accompanying text, and 259. Non-exchange fees are not subject to the requirements applicable to exchange fees under section 19(b) and rule 19b–4. While equities exchanges charge transaction-based fees, ATSs, especially ''dark pool'' ATSs that are part of a large broker-dealer order handling business, typically do not charge separate transaction-based fees for executions in their ATSs, and instead might use bundled pricing that does not associate particular orders with particular fees. *See, e.g.,* Letter from William P. Neuberger and Andrew F. Silverman, Managing Directors and Global Co-Heads of Morgan Stanley Electronic Trading, to Brent J. Fields, Secretary, Commission (May 19, 2016), *available at https://www.sec.gov/comments/s7-23-15/s72315-37.pdf* (commenting on File No. S7–23–15 concerning regulation of NMS Stock ATSs and noting that ATS fees may be bundled with brokerage services and such commission rates are typically negotiated between the parties).

[286] Specifically, as discussed above, the access fee caps would continue to apply only to executions against protected quotations and therefore the fees of non-exchange trading centers, such as ATSs or OTC markets makers that do not display protected quotations, would continue not to be subject to Rule 610(c)'s access fee caps. *See supra* note 259 and accompanying text.

[287] Regulation NMS Adopting Release, *supra* note 16, at 37545.

[288] *See* Letter from Theodore R. Lazo, Managing Director & Associate General Counsel, SIFMA, to Brent J. Fields, Secretary, Commission, dated May 24, 2018, at 2 (''SIFMA Transaction Fee Pilot Letter'') (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks'') at 2 (discussing cost savings due to market efficiencies and stating that SIFMA has long recommended lowering the existing access fee caps because such caps have ''not been adjusted to reflect market developments since Regulation NMS was adopted more than a decade ago'') and Letter from Theodore R. Lazo, Managing Director & Associate General Counsel, SIFMA, to Brent J. Fields, Secretary, Commission, dated Mar. 29, 2017), at 3 (''SIFMA 2017 Letter'') (commenting that because spreads have narrowed and commissions have decreased since Regulation NMS was adopted, the existing access fee caps have become ''outsized relative to current market realities.'') *See also infra* notes 293, 315, 316, 317, and accompanying text.

[289] *See* Regulation NMS Adopting Release, *supra* note 16, at 37545 (Section 11A of the Exchange Act ''authorizes the Commission to adopt rules assuring the fairness and usefulness of quotation information'' and stating that for quotations to be fair and useful, there ''must be some limit on the extent to which the true price for those who access quotations can vary from the displayed price.'').

[290] If broker-dealers could more easily pass-through rebates to their customers, the potential financial benefit of such rebates would inure to the customer, not the broker-dealer. Thus, the potential conflict of interest faced by a broker-dealer when routing its customers' orders to a market for execution would be reduced or eliminated because the broker-dealer would have no direct economic interest in the level of the rebate and would be able to better objectively assess best execution for each customer's order.

[291] As discussed above, exchange fees and the fees of non-exchange trading centers are treated differently under the Federal securities laws. *See supra* notes 259 and 285.

[292] *See* Regulation NMS Adopting Release, *supra* note 16, at 37544, n.406 and 37545.

[293] *See, e.g.,* Citadel Report, *supra* note 100, at 4 (stating that advances in technology and innovation since the adoption of Regulation NMS have ''markedly improved conditions for all investors, who benefit from dramatically lower trading costs and market transparency,'' but recommending the Commission undertake further reform measures); SIFMA 2017 Letter, *supra* note 288, at 3 and 8 (arguing that the $0.0030 access fee cap is too high relative to today's narrower spreads and lower commission rates'' and stating ''[w]hile net costs to execute a transaction have been largely contained since Reg. NMS was adopted, access fees have become and remain an outsized element of overall transaction costs and do not reflect today's business practices and market realities.''); U.S. Equity Market Structure: Order Routing Practices, Considerations, and Opportunities, Charles Schwab (Sept. 7, 2022) (''Schwab Whitepaper''), *available at https://content.schwab.com/web/retail/public/about-schwab/Schwab-2022-order-routing-whitepaper.pdf* (offering observations on current market structure and recommendations for reform). The Schwab Whitepaper states that Regulation NMS was a ''watershed'' moment for the securities industry and the market evolution that ensued resulted in ''significantly improved trading outcomes for investors, particularly retail investors'' who benefitted from, among other things, lower trading costs (bid/ask spreads and commissions) and faster executions. *Id.* at 5.

believes the current access fee caps should be recalibrated to ensure that they do not represent an outsized portion of the displayed quotations.[294] A reduction in the minimum pricing increment without reducing the access fee caps could permit fees to become a higher percentage of the minimum pricing increment, which could potentially undermine price transparency and exacerbate the other concerns with maker-taker fees described in section III.A.2 above.

Therefore, the Commission proposes to reduce the level of the access fee cap for protected quotations in NMS stocks priced $1.00 or more and proposes to introduce a variable access fee cap structure to reflect the variable minimum pricing increments proposed in rule 612 for quotations priced equal to or greater than $1.00 per share. Specifically, for NMS stocks that have a minimum pricing increment of $0.001, the Commission proposes a $0.0005 access fee cap, and for NMS stocks that have a minimum pricing increment greater than $0.001, the Commission proposes a $0.001 access fee cap. This proposal would balance several considerations, such as ensuring that the access fees do not exceed half the minimum pricing increment [295] while also seeking to preserve the ability of trading centers [296] to continue to operate and affording them continued flexibility to develop and utilize different fee structures. For protected quotations in NMS stocks priced less than $1.00, the fee cap would be adjusted to 0.05% of the quotation price per share to maintain the current proportional structure with the access fee caps on protected quotations that are priced $1.00 or more. The Commission believes the proposed reduction of the access fee caps is necessitated by the changes to the minimum pricing increments. The adjustments are also designed to recalibrate the access fee caps to better align pricing limitations with current transaction costs.[297] Finally, the Commission has proposed access fee cap levels that would balance the need to reduce the access fee to reflect the lower minimum pricing increments and reduced trading costs, with leaving market centers otherwise free to establish fees to preserve the agency market business model.[298]

The proposed reduction in the minimum pricing increments under rule 612 without a corresponding adjustment to the access fee caps would permit access fees to become too high in relation to the minimum pricing increment, which would potentially undermine price transparency.[299] The proposed reduction to the access fee caps would ensure that access fees continue to be appreciably below the minimum pricing increment. If the access fee cap for protected quotations that have a minimum pricing increment of $0.001 were kept at the current level of $0.0030, an access fee set at the maximum allowed under rule 610(c) would add an undisplayed additional three ticks per share to the displayed price.[300] The Commission proposes the $0.0005 access fee cap for these NMS stocks so that the access fee cap does not exceed half the minimum increment, which could disrupt quote priority and result in unintended market distortions.[301]

Further, for an NMS stock that has a proposed minimum pricing increment of $0.002, the current access fee cap would be larger than the minimum pricing increment. In addition, for an NMS stock that has a minimum pricing increment of $0.005, the current access fee cap would exceed half the minimum pricing increment. Reducing the access fee caps to the proposed levels would help to ensure that the displayed protected quotation reflects the price of the quotation, within a reasonable range, which would not be the case if the current access fee caps were not reduced. In the Regulation NMS Adoption Release, the Commission stated when adopting the current limits that, for quotations to be fair and useful, ''there must be some limit on the extent to which the true price for those who access quotations can vary from the displayed price.'' [302] The proposed change to the access fee caps should preserve transparency regarding the true prices of protected quotations consistent with the requirements under section 11A(c)(1)(B) of the Exchange Act.[303]

The Commission proposes to allow a higher access fee cap ($0.001 per share) for those NMS stocks that have a minimum pricing increment greater than $0.001. The two proposed access fee caps would allow trading centers largely to maintain their current net capture rate and not impair the agency market business models, though some

[294] The Commission recognized the importance of reducing costs when it adopted Regulation NMS, stating ''[t]he transaction costs associated with the prices at which [investor] orders are executed represent a continual drain on their long-term savings'' and noting that ''[m]inimizing these investor costs to the greatest extent possible is the hallmark of efficient markets, which is a primary objective of the NMS.'' *See* Regulation NMS Adopting Release, *supra* note 16, at 37498. *See also* note 289 and accompanying text.

[295] *See also* MEMX Report, *supra* note 105, at 3 (''coupling . . . tick size changes with a targeted reduction in the access fee cap . . . would both prevent potential market distortions that could occur when fees exceed half the minimum increment and reduce industry take fee costs. . . .).'' MEMX requested an exemption from rule 612(c) to allow a minimum pricing increment of half of one cent ($0.005) for tick-constrained stocks and a corollary reduction of the fee cap in such stocks from $0.0030 to $0.0015. *See* MEMX Exemption Request, *supra note* 105, at 1 and 7.

[296] In practice, currently, the access fee caps limit only the fees imposed by the national securities exchanges because other trading centers (*e.g.,* ATSs and OTC market makers) do not have protected quotations. If in the future, other trading centers were to execute an order against a protected quotation, such trading centers' ability to impose fees would be bounded by the access fee caps as well.

[297] As discussed in section V.C.2, trading venues that utilize a flat fee model do not offer rebates. The fees for both taking and adding liquidity on such markets are significantly lower than the current $0.0030 fee cap and therefore do not appear to be economically constrained by rule 610(c). Similarly, ATSs appear to charge fees in the range of 10 mils. This suggests that the current access fee cap may not be reflective of the actual costs trading centers incur to provide execution services against protected quotations. *See* SIFMA 2017 Letter, *supra* note 288, at 8 (stating ''a significant portion of access fees are used to subsidize rebates with the exchanges' net capture reflecting today's market norms for accessing liquidity, which is approximately 3–5 cents per 100 shares traded . . . or 3–5 mils.).'' *See also infra* notes 303, 315 and 316 and accompanying text.

[298] Imposing a $0.001 access fee cap on executions against protected quotations regardless of the minimum pricing increment could result in access fees that exceed half the minimum pricing increment, which could have a negative impact on quote priority. Therefore, the proposal would establish a $0.0005 access fee cap only for NMS stocks that have a minimum pricing increment of $0.001 to ensure that for such stocks, the maximum access fee does exceed half the minimum pricing increment. For NMS stocks that have a minimum pricing increment greater than 0.001, the access fee cap would be $0.001 to avoid interference with existing agency market business models. Thus, the Commission's proposed level of the access fee caps seeks to balance the need to reduce the access fee caps to accommodate the reduction in the minimum pricing increments and preserve the ability of the agency market business models to charge fees for access.

[299] *See supra* note 289.

[300] *See* SIFMA Transaction Fee Pilot Letter, *supra* note 288 at 2 (recommending that the Commission reduce the access fee cap to ''no more than five cents per 100 shares because the cap has not been adjusted to reflect market developments since Regulation NMS was adopted'').

[301] *See supra* note 298.

[302] Regulation NMS Adopting Release, *supra* note 16, at 37545. The Commission stated that an important purpose of the fee cap was to prevent an ''outlier'' exchange from charging an exorbitant fee to access a protected quotation. *Id.* at 37503. One market participant stated that the current cap is ''simply too high'' and dislocated from ''true prices in the marketplace.'' *See* Letter from Paul M. Russo, Managing Director, Goldman Sachs & Co. LLC, to Brent J. Fields, Secretary, Commission, at 2 (May 24, 2018), *available at https://www.sec.gov/comments/s7-05-18/s70518-3711788-162473.pdf* (''Goldman Letter'') (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks'').

[303] 15 U.S.C. 78k–1(c)(1)(B). *See also* Goldman Letter, *supra* note 302, at 1 (''[A] reduction in the Fee Cap from $.0030 to $.0010 per share could be supported today and would be better calibrated with present-day trading and execution costs, which have decreased substantially since 2005 when the current Fee Cap was adopted.'').

business models may change.[304] For example, as discussed in section V.C.2, the exchanges use one of three pricing models, which result in different net capture rates. Such rates vary between $0.0002 and $0.0006 per share. However, the Commission estimates that, for the overwhelming majority of trading volume on exchanges, the average total net capture is around $0.0004 per share for all trading types and likely closer to $0.0002 for non-auction trading in stocks that have a price equal to or greater than $1.00.[305] The proposal to adopt two access fee caps for executions against protected quotations priced equal to, or greater than, $1.00 per share is designed to allow current business practices to continue while adjusting access fee levels to align with the proposed lower minimum pricing increments as well as reflect market innovations and technological efficiencies that have driven transaction costs down since rule 610(c) was adopted.[306] Reducing access fees to amounts slightly above the current net capture rates would continue to allow trading centers that choose to operate solely by charging transaction fees to continue to do so, while also minimizing the costs to investors who must access protected quotations.

The Commission took into account the then-current business models when it adopted the access fee cap levels in rule 610(c).[307] The Commission stated that ''agency trading centers perform valuable agency services in bringing buyers and sellers together, and that their business model historically has relied, at least in part, on charging fees for execution of orders against their displayed quotations.'' [308] At that time, the Commission did not want to unduly harm the agency market business model by prohibiting access fees entirely.[309] The Commission's proposal is designed to preserve the fairness and usefulness of quotes while minimizing the impact to current agency market business models. If the Commission adopted a flat $0.0005 access fee cap regardless of the minimum pricing increment, it would potentially impair certain agency market business models because such a fee level would not allow certain markets to maintain their current net capture rates.[310] Allowing a higher access fee cap for those NMS stocks that have a minimum pricing increment greater than $0.001 would preserve current agency market business models and would allow trading centers continued flexibility in structuring their businesses. The Commission's proposal seeks to balance concerns about lowering the access fee caps too far such that the reduction would jeopardize certain agency market business models while also recognizing that the access fee caps need to be reduced to accommodate the lower minimum pricing increments, capitalize on technological and cost improvements to the market that support lowering the caps, and avoid introducing market distortions.

The proposed rule would not establish individual access fee cap levels for each minimum pricing increment. Introducing four access fee caps to go along with the proposed four minimum pricing increments would introduce unnecessary complexity into the national market system. Exchange fee and rebate schedules are complex and change frequently.[311] The Commission believes that adding four access fee caps would increase the complexity of exchange fee and rebate structures.[312] The Commission believes that the two proposed access fee caps for protected quotations priced at $1.00 or more is appropriate to accommodate the reduction in the minimum pricing increments and would not introduce unnecessary complexity.

Some market participants have also suggested lowering the access fee caps, arguing that a reduction of the access fee caps to reflect the reduction in bid-offer spread may be appropriate if the Commission were to lower the minimum pricing increment.[313] Proponents of this approach maintain that a reduction in access fees that is proportionate to the tick size reduction would reduce trading costs and increase the competitiveness of on-exchange trading.[314] The Commission proposes to

[304] *See infra* section V.D.3 discussing impact of proposed lower access fee caps on exchanges' net capture. ''Net capture'' is the amount earned by the trading center for facilitating a transaction, which is typically the difference between the average access fee charged by the trading center and the average rebate paid by the trading center. One market participant stated that a review of the maker-taker exchanges fee schedules as of May 2018 indicated that the average net capture between the base level fee/rebate and the highest level fee/rebate was approximately $0.0005 per share. The market participant further stated that lowering the fee cap to $0.001 would still allow a maker-taker exchange to yield the same $0.0005 per share net capture rate. The market participant concluded that lowering the fee cap to $0.001 per share would shrink the range within which exchanges could set fees and rebates and fee schedules would likely vary less across exchanges, but exchanges could ''still choose to offer rebates to incentivize liquidity provision and maintain their current net capture rates.'' *See* Goldman Letter, *supra* note 302, at 3.

[305] *See* note 499 *infra* and accompanying text. *See also* SIFMA 2017 Letter, *supra* note 288 (stating ''the exchanges' net capture reflecting today's market norms for accessing liquidity, which is approximately 3–5 cents per 100 shares trading ($0.0003–$0.0005), or 3–5 mils.''). ATSs typically do not offer rebates, but generally do charge fees to access liquidity in the range of 10 mils, suggesting a net capture in the range of $0.001 per share. *See* Letter from Stacey Cunningham, President, NYSE, to Brent Fields, Secretary, Commission, dated Oct. 2, 2018 (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks'' and noting that a reduction of the fee cap to $0.001 per share ''would bring the fees exchanges charge for removing liquidity in line with those charged by ATSs''). However, the suggestion that the access fee caps be reduced to $0.001 per share was made in the context of the minimum pricing increment remaining at current levels under rule 612 (*i.e.,* one cent for NMS stock quotes and orders priced $1.00 or more). Because the Commission proposes to reduce the minimum pricing increment for some NMS stocks to $0.001, the Commission is proposing a smaller access fee cap for those NMS stocks so that the maximum access fee does not have a negative impact on quote priority.

[306] *See* SIFMA Transaction Fee Pilot Letter (stating that over time, ''competitive pressures, increased efficiencies from automation, and electronic trading have each operated to reduce transaction costs throughout the markets'' but ''access fees have remained at or near 30 cents per hundred shares.'').

[307] *See* Regulation NMS Adopting Release, *supra* note 16, at 37545.

[308] *Id.*

[309] *See* Regulation NMS Adopting Release, *supra* note 16, at 37545 (stating the adopted fee limitation of $0.0030 will not impair the agency market business model). Similarly, the Commission chose not to extend the application of the fee cap to all displayed quotes of a trading center (*e.g.,* including depth-off-book quotes), but instead concluded the fee caps should apply more narrowly only to the best bid or offer of a national securities exchange or national securities association, in part, to have a ''minimal impact on competition and individual business models'' while also preserving the fairness and usefulness of quotes. *Id.* at 37546.

[310] *See infra* note 585 and accompanying text.

[311] *See infra* section V.C.2.

[312] *See infra* section V.C.2 and Table 5 and accompanying text, discussing the complexity of the existing exchange fee schedules and the number of changes thereto. The exchanges would likely need to develop at least four different fee (and corresponding rebate) levels and would be required to file proposed rule changes to accommodate the four new access fee caps.

[313] *See, e.g.,* Citadel Report, *supra* note 100, at 5 (stating ''[t]o the extent the Commission reduces the minimum tick size for certain symbols, the access fee cap should be commensurately reduced to reflect the reduction in bid-offer spreads'' and recommending reduction of the current access fee cap ''by 50% to 15 cents per 100 shares for symbols trading above $1.00 per share that are tick constrained (*i.e.,* have a penny spread the overwhelming majority of the time)''). Citadel recommended the minimum pricing increment for tick-constrained symbols trading at or over $1.00 should be $0.005. *See also* MEMX Exemption Request, *supra* note 105, at 8 (requesting a reduction in the access fee cap as a condition to MEMX's request to lower the minimum pricing increment for tick-constrained stocks noting that ''a lower fee cap may be necessary in connection with an exemption that permits certain NMS stocks to trade in $0.005 increments, as any fee charged to access quotations in such securities would make up a commensurately larger proportion of the spread'').

[314] Citadel Report, *supra* note 100, at 5. *See also* MEMX Report, at 5 (''[A] change [to the minimum pricing increment for tick constrained stocks] should also be coupled with a targeted change to the access fee cap . . . further reducing costs in these securities.''). MEMX estimates a potential savings of as much as $879 million for investors

Continued

reduce the access fee caps in conjunction with reducing the minimum pricing increment, but is not reducing them proportionally so as to not unduly impair current agency market business models within the national market system.

Further, some market participants argue that the historic access fee cap reflects a non-competitive and artificially high rate.[315] Specifically, according to one market participant, ''there is well-developed, general consensus amongst market participants that a $0.0030 per share Fee Cap is an outdated benchmark for execution costs in today's trading environment . . . and creates an upper range that is simply too high and far from representative of true prices in the marketplace.'' [316] Others have stated that current pricing models have resulted in the kind of distortive pricing that rule 610(c) was designed to prevent.[317]

The rebates exchanges pay to attract liquidity have drawn much attention over the years. Typically, brokers do not directly pass along exchange fees and rebates to customers.[318] One academic study concluded that this creates conflicts of interest that may harm customer order execution quality because brokers route customer orders to the trading venues that offer the highest rebates and not the best execution quality.[319] This may also lead to excessive intermediation, *i.e.,* excessive quoting in sufficiently liquid securities in order to earn rebates, which crowds out individual investors from being able to supply liquidity, in tick-constrained stocks. The proposed reduction in the access fee caps to reflect the proposed changes in the minimum pricing increments might have the ancillary effect of addressing some of the concerns regarding the rebates exchanges pay to attract order flow because the reduction in the access fee caps might reduce the amount exchanges could offer as rebates and thus reduce the incentives available to divert order flow to a particular venue.[320]

Finally, the Commission is also proposing to delete the references to ''The Nasdaq Stock Market, Inc.'' in rule 610(c). Since the Nasdaq Stock Market is now a national securities exchange, the language is redundant.

annually if each exchange with a take fee of more than $0.0015 were to reduce the take fee to that level in tick-constrained securities. *See* MEMX Report, *id.* at 20 n.15.

[315] *See, e.g.,* Letter from Hubert De Jesus, Global Head of Market Structure and Electronic Trading, and Joanne Medero, U.S. Head of Global Public Policy, BlackRock, Inc., to Brent J. Fields, Secretary, Commission, dated May 23, 2018, at 1 (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks'' stating ''[T]he existing access fee cap is outdated and permits market forces to drive fees and rebates to excessive levels relative to the current magnitude of commissions and bid-ask spreads.''); Letter from Tim Gately, Managing Director, Head of Americas Equities, Citigroup Global Markets Inc., to Brent J. Fields, Secretary, Commission, dated May 25, 2018, at 1–2 (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks'' stating that ''today's 30-mil cap on access fees that the exchanges can charge to access liquidity on their venues represents a more significant percentage of the economics of each trade'').

[316] Goldman Letter, *supra* note 302, at 2 and 4 (stating there is ''broad support in favor of lowering the Fee Cap'' and noting that since the adoption of Rule 610(c), spreads have narrowed considerably and commission rates have contracted and therefore the access fee cap ''creates an upper-range that is simply too high and far from representative of true prices in the marketplace.''). *See also* Letter from Theodore R. Lazo, Managing Director & Associate General Counsel, SIFMA, to Brent J. Fields, Secretary, Commission, dated May 24, 2018, at 2 (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks'' and recommending a reduction to the access fee cap because ''the cap has not been adjusted to reflect market developments since Regulation NMS was adopted'' and noting that over time, ''competitive pressures, increased efficiencies from automation, and electronic trading have each operated to reduce transaction costs throughout the markets—but not access fees, which have remained at or near 30 cents per hundred shares.''); Letter from Stacey Cunningham, President, NYSE, to Brent Fields, Secretary, Commission, dated Oct. 2, 2018 (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks'' and acknowledging that ''the primary concern raised by EMSAC and many commenters'' is that ''the existing access fee cap is anachronistic'' and recommending the Commission study a reduction of the fee cap to $0.001 per share, which ''would bring the fees exchanges charge for removing liquidity in line with those charged by ATSs'').

[317] *See, e.g.,* Letter from Susan M. Olson, General Counsel, Investment Company Institute, to Brent J. Fields, Secretary, Commission, dated May 23, 2018, at 2 (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks'' stating ''Transaction fees and rebates also undermine market transparency because the prices displayed by exchanges—and provided on trade reports—do not include fee or rebate information and therefore do not fully reflect net trade prices.''); Goldman Letter, *supra* note 302, at 3 (stating that ''displayed prices do not reflect the actual economic costs because exchange fees and rebates are not reflected in those prices''); Letter from Cynthia Lo Bessette, General Counsel & Executive Vice President, OFI Global Asset Management, Inc., et al., Oppenheimer Funds, Inc., to Brent J. Fields, Secretary, Commission, dated May 25, 2018, at 2 (commenting on File No. S7–05–18 ''Transaction Fee Pilot for NMS Stocks'' stating ''[T]o the extent that transaction fees and rebates obfuscate the actual price bid or offered for a security, the 'maker-taker' pricing model has the potential to undermine price transparency . . . .''); SIFMA 2017 Letter, *supra* note 288, at 8 (stating ''in today's trading environment, a significant portion of access fees are used to subsidize rebates'').

[318] *See* Battalio Equity Market Study, *supra* note 271, at 2194.

[319] *See id.,* at 2193–2238.

[320] *See* MEMX Report, *supra* note 105, at 20 n.14 (stating ''[a]lthough the access fee cap pursuant to Rule 610(c) does not explicitly limit rebates provided by trading centers, it imposes a practical limitation on rebates as the amount that can be recouped by the trading center is limited by the access fee that it can charge'').

2. Require That All Exchange Fees and Rebates Be Determinable at the Time of an Execution

Today, many of the fees and rebates of the exchanges are calculated at the end of the month, which impedes the ability of market participants to understand at the time of execution the full cost of their transaction. For example, the exchanges have developed complex fee and rebate schedules, some of which include tiers or other incentives based on a market participant's relative monthly trading volume or relative volume compared to the consolidated trading volume in the current month, with higher volume tiers receiving a higher (lower) per unit rebate (fee). This means that the exact fee or rebate for an order cannot be determined until the end of the month, after an execution occurs, and is not known to the parties to the trade at the time of execution. This lack of transparency impedes the ability of market participants to understand at the time of execution the full cost of their transaction. Uncertainty regarding the fee amount at the time of execution has implications for market participants conducting best execution analyses and can affect order routing decisions.

To provide further transparency regarding transaction pricing, the Commission proposes to amend rule 610 to add a new subsection (d) ''Transparency of Fees,'' which would prohibit a national securities exchange from imposing, or permitting to be imposed, any fee or fees, or providing, or permitting to be provided, any rebate or other remuneration (*e.g.,* discounted fees, other credits, or forms of linked pricing) for the execution of an order in an NMS stock unless such fee, rebate or other remuneration can be determined at the time of execution. Under the proposal, any national securities exchange that imposes a fee or provides a rebate that is based on a certain volume threshold, or establishes tier requirements or tiered rates based on minimum volume thresholds, would be required to set such volume thresholds or tiers using volume achieved during a stated period prior to the assessment of the fee or rebate so that market participants are able to determine what fee or rebate level would be applicable to any submitted order at the time of execution.[321] For example, if an

[321] National securities exchanges establish and amend their fee schedules by filing proposed fee rule changes, pursuant to section 19(b) of the Exchange Act and rule 19b–4 thereunder, for Commission review. Some national securities exchanges currently use volume calculated on a monthly basis to determine the applicable threshold or tier rate. *See, e.g.,* fee schedules of Nasdaq PSX

exchange proposed a lower fee for members that reach a certain level of trading volume in a month, the required level of trading volume would have to be achieved based on a month prior to the imposition of the fee or payment of the rebate.[322]

The Commission believes that requiring all exchange fees, rebates and other forms of remuneration to be determinable at the time of execution would have several benefits. Certainty about the cost of a transaction at the time of the trade may help broker-dealers make better order routing decisions. The proposal should reduce order routing incentives that are based on achieving a threshold in order to gain a specific fee or rebate. Today, lower fees or higher rebates based on volume achieved in a current trading month can lead to routing to exchanges solely for purposes of achieving a certain level of volume or attaining a possible tier level rather than routing to achieve best execution.[323] In addition, the proposal would allow market participants to know with certainty the cost of their transactions at the time of the trade, which would facilitate a broker-dealer's ability to pass through the fee/rebate associated with a transaction because it would know at the time of the transaction the amount of the fee/rebate that is applicable to each execution. Further, the proposal would provide more transparency into whether a broker-dealer may be routing to certain venues based on the fee/rebate that venue assesses. Investors could more readily request details about fees and rebates related to their orders. If market participants pass through exchange fees/rebates, an ancillary benefit of the proposed amendment would be that the potential inducement to broker-dealers to route orders solely based on garnering the highest rebate/paying the lowest fee would be reduced since broker-dealers would no longer directly benefit from such remuneration, but instead would pass along such fees/rebates to their customers. Although a broker-dealer could still choose not to pass along fee/rebate, the proposal would facilitate a customer's ability to ask more direct questions of its broker-dealer about how the broker-dealer handles fees and rebates, which could increase accountability of the broker-dealer, which in turn could lead to better order execution and more transparency regarding fees/rebates.

The proposed rule would enhance transparency about the cost of executing a trade at the time of execution and would allow market participants to better assess the current state of the market when making trading and order routing decisions.

D. Request for Comment

The Commission requests comment on the proposed changes to rule 610 and on other potential reasonable alternatives, including:

30. Are the proposed levels of the access fee caps appropriate? Why or why not? If not, what factors should be considered in determining the appropriate level of the access fee caps?

31. Are the current access fee caps too high? What would be the appropriate level of an access fee cap(s)?

32. Should reduction of the access fee caps be proportional to the reduction of the minimum pricing increment? Why or why not?

33. Should rule 610(c) include access fee caps for each proposed minimum pricing increment? Why or why not?

34. If an access fee cap is proportional to the minimum pricing increment, what should the proportion of the access fee cap to the minimum pricing increment be and why?

35. Would two access fee caps for executions against protected quotations priced equal to, or greater than, $1.00 per share introduce additional complexity in the market? If so, please describe.

36. How would the proposed reduction in the amount of the access fee caps affect rebates provided by exchanges?

37. Would the proposed access fee caps preserve current agency market business models and allow for sufficient flexibility in structuring innovative business models? If not, why not?

38. Do current exchange fees and rebates impact order routing decisions? Would a reduction of the current access fee caps impact order routing decisions? If so, how?

39. Would proposed rule 610(d) affect the provision of volume-based discounts or other tiered fee structures by exchanges? If so, how?

40. Proposed rule 610(d) is designed to increase transparency regarding the amount of volume-based discounts and other tiered fee structures available at the time of execution. Do volume-based discounts and other tiered fee structures affect order routing decisions? If so, please explain. Do volume-based discounts and other tiered fee structures increase market complexity, present conflicts of interest, or burden competition? Why or why not? Is proposed rule 610(d) sufficient to address these concerns? If not, why not? What would be an appropriate means to address these concerns, for example, should volume based discounts or other tiers be limited or otherwise restricted?

41. Should exchange fees based on volume be determinable at the time of execution? Why or why not?

42. Would proposed rule 610(d) cause market participants to pass through fees and rebates to their customers? Why or why not?

43. In section V.F.3, the Commission discusses different reasonable alternatives to the proposed amendment to rule 610(c) access fee caps, including, for example, implementing higher or lower access fee caps than the levels proposed; implementing access fee caps that maintain the current 30% proportional relationship to the minimum pricing increment; adopting a uniform $0.001 access fee cap regardless of the minimum pricing increment; implementing a uniform $0.0003 or $0.0004 access fee cap regardless of minimum pricing increment; banning rebates and retaining the current access fee caps; or banning rebates and reducing the current access fee caps. Would any of these reasonable alternatives address the concerns identified regarding the current access fee caps in a more appropriate manner? If so, which alternative and why?

IV. Transparency of Better Priced Orders

A. Background

On December 9, 2020, the Commission adopted the MDI Rules, which expanded the data that will be made available for dissemination within the national market system (''NMS data'') and adopted a decentralized consolidation model—pursuant to which ''competing consolidators'' will eventually replace the exclusive SIPs—for the collection, consolidation, and

available at https://listingcenter.nasdaq.com/rulebook/phlx/rules/Phlx%20Equity%207 (as of July 2022) (calculating fees based on ''average daily volume during the month'') and Cboe EDGA *available at https://www.cboe.com/us/equities/membership/fee_schedule/edga/* (as of Apr. 1, 2022) (calculating fees based on ''average daily volume'' and ''daily volume'' on a monthly basis).

[322] This proposal does not alter an exchange's ability to determine the measurement period during which volume is calculated (*e.g.,* a week prior, two weeks prior, prior monthly, two months prior, or quarterly with one month lead time), rather it would instead require the measurement period to be prior to the date of execution so that market participants can determine the amount of the fee at the time of execution.

[323] While tiers that are based on volume from a previous time period could still induce routing by a broker-dealer to try to secure a higher rebate/lower fee tier in the following month, the proposal would allow broker-dealers to pass those fees and rebates through to their customers and enable investors to identify whether a broker-dealer is routing to secure a higher rebate/lower fee.

dissemination of this data.[324] The MDI Rules have been adopted but have not yet been implemented.[325] Therefore, the data currently disseminated within the national market system by the exclusive SIPs [326] includes, for each NMS stock, the price, size, and exchange of each last sale, each exchange's current highest bid and lowest offer and the shares available at those prices (the ''best bid and best offer'' or ''BBO''), the NBBO, odd-lot transaction information, and certain regulatory and administrative data (''SIP data'').[327] Information on NMS stock quotations is provided in round lots, which, until the round lot definition adopted pursuant to the MDI Rules is implemented, continue to be defined in exchange rules.[328] For most NMS stocks, a round lot is defined as 100 shares.[329] Information about orders that have a size less than a round lot, *i.e.,* odd-lot orders, is available on individual exchange proprietary data feeds, and market participants interested in quotation data for individual odd-lot orders must purchase these proprietary feeds.[330]

One goal of the expansion of NMS data in the MDI Rules is to increase transparency about the best priced quotations available in the market. To accomplish this goal, the Commission amended Regulation NMS to include a definition of round lot that assigns each NMS stock to a round lot size based on the stock's share price.[331] Specifically, for NMS stocks priced $250.00 or less per share, a round lot will be 100 shares; for NMS stocks priced $250.01 to $1,000.00 per share, a round lot will be 40 shares; for NMS stocks priced $1,000.01 to $10,000.00 per share, a round lot will be 10 shares; and for NMS stocks priced $10,000.01 or more per share, a round lot will be 1 share.[332] As a result of the round lot definition, each exchange's BBO and the NBBO for an NMS stock can be based upon smaller, potentially better-priced orders,[333] which will improve transparency regarding the better priced quotations available in the market and the ability of market participants to access these quotations.[334]

In addition, to further increase the transparency and availability of better priced orders in the market, the Commission adopted a definition of odd-lot information as part of the MDI Rules.[335] Odd-lot information is defined as (1) odd-lot transactions,[336] and (2) odd-lots at a price greater than or equal to the national best bid and less than or equal to the national best offer, aggregated at each price level at each national securities exchange and national securities association.[337] Therefore, once implemented, information on odd-lot orders priced better than the NBBO [338] will be included in NMS data that is made available to market participants within the national market system.[339]

The Commission believes that this information about the best priced orders available in the market should be readily and widely available. For the reasons discussed below, as part of a broader transition period for the implementation of the MDI Rules, the Commission decided to phase in the implementation of the definitions of round lot and odd-lot information.[340] However, in light of delays in the implementation of the MDI Rules,[341] the Commission now believes that a timelier implementation of these new data elements would allow investors to benefit from greater transparency and accessibility of better priced orders and improved execution quality [342] sooner. In addition, the Commission now believes that the best priced interest available in the market, including the best odd-lot order, should be identified and made widely and readily available. Identifying the best odd-lot order would enhance the utility of NMS data for trading and order routing and facilitate the ability of investors to assess execution quality.[343] Therefore, the Commission proposes to: (1) accelerate the implementation of the previously-adopted round lot and the odd-lot information definitions; and (2) amend the definition of odd-lot information to

[324] *See* MDI Adopting Release, *supra* note 5. For purposes of this release, ''NMS data'' refers to the ''information with respect to quotations for and transactions in securities'' that is collected, consolidated and disseminated within the national market system pursuant to section 11A of the Exchange Act. *See* 15 U.S.C. 78k–1(a)(1)(C). Under the existing exclusive SIP model, this consists of SIP data. *See infra* note 327 and accompanying text. Under the decentralized consolidation model, this will consist of ''consolidated market data,'' including ''core data,'' as defined in the MDI Rules. *See* 17 CFR 242.600(b)(19), (21).

[325] *See infra* notes 344–358 and accompanying text.

[326] Currently, the Securities Industry Automation Corporation (''SIAC,'' an affiliate of the New York Stock Exchange) is the exclusive SIP for the CTA and CQ Plans, and Nasdaq is the exclusive SIP for the UTP Plan. *See* MDI Adopting Release, *supra* note 5, at 18728.

[327] *See* MDI Proposing Release, *supra* note 39, at 16730.

[328] *See id.* at 16738. A ''round lot'' is not defined in the Exchange Act and, prior to the MDI Rules, it was not defined in Regulation NMS. Exchange rules typically define a round lot as 100 shares, but they also allow the exchange, or the primary listing exchange for the stock, discretion to define it otherwise. *See, e.g.,* NYSE rule 7.5 (''A 'round lot' is 100 shares, unless specified by the primary listing market to be fewer than 100 shares.''); Nasdaq rule 5005(a)(40) (''Round Lot' or 'Normal Unit of Trading' means 100 shares of a security unless, with respect to a particular security, Nasdaq determines that a normal unit of trading shall constitute other than 100 shares.'').

[329] According to NYSE Trade and Quote (''TAQ'') Data, as of Apr. 2022, eleven stocks had a round lot size other than 100. Nine stocks had a round lot of ten and two stocks had a round lot of one.

[330] *See* MDI Proposing Release, *supra* note 39, at 16738; MDI Adopting Release, *supra* note 5, at 18599.

[331] 17 CFR 242.600(b)(82); MDI Adopting Release, *supra* note 5, at 18617.

[332] 17 CFR 242.600(b)(82). The MDI Rules also required that a round lot indicator be included in NMS data so that market participants would know the size of a round lot for each NMS stock. Specifically, the definition of regulatory data requires the primary listing exchange to provide, among other things, an ''indicator of the applicable round lot size'' to competing consolidators and self-aggregators. 17 CFR 242.600(b)(78); MDI Adopting Release, *supra* note 5, at 18634. In addition, the MDI Rules require competing consolidators to represent quotation sizes for certain core data elements in terms of the number of shares, rounded down to the nearest multiple of a round lot. 17 CFR 242.600(b)(21)(iii); MDI Adopting Release, *supra* note 5, at 18615.

[333] As shown in the MDI Proposing and Adopting Releases, orders currently defined as odd-lots often reflect superior pricing. *See* MDI Proposing Release, *supra* note 39, at 16740 (describing analysis that found, among other things, that ''43% of [ ] odd-lot transactions [in Sept. of 2019] (representing approximately 39% of all odd-lot volume) occurred at a price better than the NBBO''); MDI Adopting Release, *supra* note 5, at 18616 (describing analysis that made similar findings using data from May of 2020). More recent data and updated analyses confirm that these pricing patterns in odd-lot trading have continued. *See infra* notes 364–369 and accompanying text.

[334] MDI Adopting Release, *supra* note 5, at 18613, 18742.

[335] 17 CFR 242.600(b)(59); MDI Adopting Release, *supra* note 5, at 18613.

[336] Odd-lot transaction information is currently collected, consolidated, and disseminated by the exclusive SIPs. *See* Securities Exchange Act Release Nos. 70793 (Oct. 31, 2013), 78 FR 66788 (Nov. 6, 2013) (order approving Amendment No. 30 to the UTP Plan to require odd-lot transactions to be reported to consolidated tape); 70794 (Oct. 31, 2013), 78 FR 66789 (Nov. 6, 2013) (order approving Eighteenth Substantive Amendment to the Second Restatement of the CTA Plan to require odd-lot transactions to be reported to consolidated tape).

[337] 17 CFR 242.600(b)(59); MDI Adopting Release, *supra* note 5, at 18613.

[338] Unlike orders in the round lot sizes adopted pursuant to the MDI Rules, odd-lots are not ''protected quotations.'' *See* 17 CFR 242.600(b)(70), (71), (11).

[339] Under the MDI Rules, competing consolidators are permitted to offer consolidated market data products that contain a subset of the information included in the definition of consolidated market data. *See* MDI Adopting Release, *supra* note 5, at 18659. The Commission, however, stated that it believed that there will be widespread demand for a product that contains all elements of consolidated market data, and particularly for the additional information included in core data. *See id.* at 18659–60.

[340] *See infra* section IV.A.1; notes 381–384 and accompanying text.

[341] *See infra* notes 356–360 and accompanying text.

[342] *See infra* notes 360–363 and accompanying text.

[343] *See infra* notes 421–425 and accompanying text.

include a new data element for the best odd-lot orders available in the market.

1. Infrastructure Implementation: Phased Transition Plan and Current Status

The Commission outlined a phased transition plan for the implementation of the MDI Rules.[344] Pursuant to the transition plan, the round lot definition is currently set to be implemented as part of the last phase and odd-lot quotation information is currently set to be implemented during a ''parallel operation period.'' [345]

The first step in the implementation of the MDI Rules was the filing of amendments to the effective national market system plan(s) as required under rule 614(e).[346] The Commission's approval of such amendments will be the starting point for the rest of the implementation schedule. While the Commission can approve NMS plan amendments within 90 days of the date of their publication in the **Federal Register** if the Commission finds them to be consistent with the standards set forth in rule 608 of Regulation NMS,[347] the Commission may, under rule 608(b)(2)(i), institute proceedings to determine whether to approve or disapprove proposed amendments, which proceedings must conclude within 180 days of notice publication of the proposed amendments but can be extended by an additional 120 days.[348] Therefore, the maximum time permitted under rule 608 for Commission action is 300 days.

After the Commission finds that the plan amendments required under rule 614(e) are consistent with the Rule 608 standards and approves such amendments,[349] the next step will be a 180-day development period, during which competing consolidators can register with the Commission. The development period is followed by a 90-day testing period.[350] Once the testing period concludes, a 180-day parallel operation period will begin during which the exclusive SIPs and the decentralized consolidation model will operate in parallel.[351]

Within 90 days of the end of the parallel operation period, the Operating Committee of the effective national market system plan(s), in consultation with relevant market participants, will make a recommendation to the Commission as to whether the exclusive SIPs should be decommissioned. The exclusive SIPs will only cease operations if the Commission approves an amendment pursuant to rule 608 to the effective national market system plan(s) to effectuate such a cessation.[352] Following the cessation of the operations of the exclusive SIPs, the changes necessary to implement the new round lot sizes will be tested for 90 days and then implemented.[353]

Therefore, based on the times provided in the transition plan for implementation of the MDI Rules, the full implementation of the MDI Rules, including the implementation of the round lot definition and the inclusion of odd-lots priced better than the NBBO based on the new round lot definition,[354] will be at least two years after the Commission's approval of the plan amendment(s) required by rule 614(e).

The Operating Committees of the CTA/CQ Plan and UTP Plan filed the MDI Plan Amendments on November 5, 2021.[355] On February 24, 2022, pursuant to rule 608(b)(2)(i), the Commission instituted proceedings to determine whether to approve or disapprove the proposed MDI Plan Amendments.[356] On September 21, 2022, the Commission disapproved the proposed amendments.[357] As a result, the participants to the effective national market system plan(s) will need to develop and file new proposed amendments pursuant to rule 608.

Accordingly, the implementation of the MDI Rules will take significantly longer than the Commission estimated when it adopted the transition plan.[358] At this time, because amendments to the effective national market system plan(s) required under rule 614(e) are not yet in place, full implementation pursuant to the phased implementation schedule likely will not occur until at least two years after new proposals are developed, filed, and approved by the Commission.

B. Accelerate Implementation of Round Lots and Odd-Lot Information

In light of the delay in the implementation of the MDI Rules, the Commission proposes to accelerate the implementation of the round lot and odd-lot information definitions. The Commission believes that the transition plan for implementing the MDI Rules should be modified so that the benefits of the round lot and the odd-lot information definitions would be made available to investors and other market participants sooner. Earlier implementation would accelerate the transparency benefits of these definitions by making information about better priced interest available in the

[344] MDI Adopting Release, *supra* note 5, at 18698–18701.

[345] *Id.* at 18700–01. *See also infra* note 351 and accompanying text (describing the parallel operation period).

[346] 17 CFR 242.614(e). The Operating Committees of CTA Plan and UTP Plan filed proposed amendments on Nov. 5, 2021, which were published for comment in the **Federal Register**. *See* Securities Exchange Act Release Nos. 93615 (Nov. 19, 2021), 86 FR 67800 (Nov. 29, 2021); 93625 (Nov. 19, 2021), 86 FR 67517 (Nov. 26, 2021); 93620 (Nov. 19, 2021), 86 FR 67541 (Nov. 26, 2021); 93618 (Nov. 19, 2021), 86 FR 67562 (Nov. 26, 2021) (''MDI Plan Amendments'').

[347] *See* 17 CFR 242.608(b)(2) (''The Commission shall approve a national market system plan or proposed amendment to an effective national market system plan . . . if it finds that such plan or amendment is necessary or appropriate in the public interest, for the protection of investors and the maintenance of fair and orderly markets, to remove impediments to, and perfect the mechanisms of, a national market system, or otherwise in furtherance of the purposes of the Act.'').

[348] *See* 17 CFR 242.608(b)(2). The Commission instituted proceedings to determine whether to approve or disapprove the MDI Plan Amendments. *See* Securities Exchange Act Release Nos. 94310 (Feb. 24, 2022), 87 FR 11748 (Mar. 2, 2022); 94309 (Feb. 24, 2022), 87 FR 11763 (Mar. 2, 2022); 94308 (Feb. 24, 2022), 87 FR 11755 (Mar. 2, 2022); 94307 (Feb. 24, 2022), 87 FR 11787 (Mar. 2, 2022).

[349] *See supra* note 347.

[350] *See* MDI Adopting Release, *supra* note 5, at 18699–700.

[351] During the parallel operation period, the exclusive SIPs will continue to disseminate the data that they currently disseminate and competing consolidators will be permitted to offer consolidated market data products, including odd-lot information. Because the round lot definition will be implemented during a later phase, the exclusive SIPs and competing consolidators will collect, consolidate and disseminate NMS data that will be based on the current exchange definitions of round lot. *Id.* at 18699–18701. *See also supra* note 328.

[352] MDI Adopting Release, *supra* note 5, at 18701.

[353] *Id.*

[354] Odd-lots priced better than the current round lot NBBO (typically based on orders of 100 shares or more) will be made more widely available in the national market system and could be included in the consolidated market data products offered by competing consolidators during the parallel operation period, which is scheduled to begin nine months after the Commission's approval of the plan amendment(s) required by rule 614(e). *See also supra* note 351 and accompanying text.

[355] *See supra* note 346.

[356] *See supra* note 348.

[357] *See* Securities Exchange Act Release Nos. 95848 (Sept. 21, 2022), 87 FR 58544 (Sept. 27, 2022); 95849 (Sept. 21, 2022), 87 FR 58592 (Sept. 27, 2022); 95850 (Sept. 21, 2022), 87 FR 58560 (Sept. 27, 2022); 95851 (Sept. 21, 2022), 87 FR 58613 (Sept. 27, 2022).

[358] The amendments to the effective national market system plan(s) required under rule 614(e) were published in the **Federal Register** in Nov. 2021 and, if consistent with the standard set forth in rule 608(b), could have been approved by the Commission by Feb. 2022. *See supra* notes 346–347 and accompanying text. Thereafter, the 180-day development period, 90-day testing period, and 180-day parallel operation period would have concluded by May 2023. *See supra* notes 350–351 and accompanying text. Plan amendment(s) to effectuate the cessation of the operations of the exclusive SIPs could then have been proposed and approved, and round lot testing and implementation completed, in 2024. *See supra* notes 352–353 and accompanying text.

market more widely available on a faster timetable.[359]

With respect to round lots, the Commission described in the MDI Rules that smaller sized orders in higher priced stocks are often priced better than the orders that are currently in round lots.[360] The Commission reduced the round lot size for high-priced NMS stocks to ''better ensure the display and accessibility of significant liquidity for higher-priced stocks'' and ''improve the comprehensiveness and usability of core data, facilitate the best execution of customer orders, and reduce information asymmetries.'' [361] The round lot definition will ''make these quotes [in sizes less than 100 shares for stocks priced over $250] visible . . . thereby improving transparency'' and ''narrow NBBO spreads for most stocks with prices greater than $250.'' [362] With respect to odd-lot information, the Commission stated that including better priced odd-lot orders in odd-lot information will ''help investors and other market participants to trade in a more informed and effective manner and to achieve better executions and reduce the information asymmetries that currently exist between subscribers to SIP data and subscribers to proprietary data.'' [363]

Since the adoption of the MDI Rules, the market dynamics that supported the Commission's adoption of the round lot and odd-lot information definitions have persisted. Average stock prices have continued to increase over time,[364] and odd-lot quoting and trading rates remain high, particularly for higher priced stocks.[365] Odd-lot quotes in higher priced stocks continue to offer prices that are frequently better than the round lot NBBO for these stocks,[366] and this better priced odd-lot liquidity is distributed across multiple price levels.[367] In addition, odd-lot rates have increased among lower priced stocks.[368]

Furthermore, as shown in Tables 1 and 2—which examine the portion of all corporate stock and ETP volume and trades executed on an exchange, transacted in a quantity less than 100 shares, at a price better than the prevailing NBBO, occurring in a quantity that would be defined as a round lot under the MDI Rules—the tier structure reflected in the round lot definition the Commission adopted in the MDI Rules continues to capture significant percentages of better priced odd-lot trades and volume.

[359] In addition to the round lot and odd-lot information definitions, the MDI Rules expanded the content of NMS data by, among other things, adopting definitions of ''depth of book data'' and ''auction information.'' *See* 17 CFR 242.600(b)(26), (5); *see also* MDI Adopting Release, *supra* note 5, at 18602. The Commission is proposing to accelerate the implementation of the round lot and odd-lot information definitions in particular because their inclusion in NMS data would offer investors direct opportunities to obtain price improvement by transacting against the best priced orders available in the market. Moreover, these definitions could be efficiently implemented under the current exclusive SIP model. *See infra* sections IV.B.4, V.D.5, V.D.6.c, and VI.D.

[360] *See supra* note 333.

[361] MDI Adopting Release, *supra* note 5, at 18615–16.

[362] *Id.* at 18742.

[363] *Id.* at 18612. The additional transparency resulting from the inclusion of better priced odd-lots in core data extends to lower priced stocks as well. *See id.* at 18618 (''The Commission acknowledges that increasing the minimum stock price for the first sub-100 share round lot tier from $50 to $250 will not improve odd-lot transparency for stocks priced between $50 and $250. However, as discussed above, the Commission is including information about all odd-lots priced at or better than the NBBO in core data, which will counterbalance this loss of odd-lot transparency.'') (citations omitted).

[364] *See* MDI Proposing Release, *supra* note 39, at 16739 (stating that ''between 2004 and 2019, the average price of a stock in the Dow Jones Industrial Average nearly quadrupled.''). Between Jan. of 2020 and Aug. of 2022, the average price of a stock in the Dow Jones Industrial Average increased by 18%. Sources: Equity consolidated data feeds (CTS and UTDF), as collected by MIDAS; NYSE Daily TAQ; Indices, Dow Jones Industrial Average, FINANCIAL TIMES (last visited Nov. 29, 2022), *available at https://markets.ft.com/data/indices/tearsheet/constituents?s=DJI:DJI* (describing the current constituent stocks of the Dow Jones Industrial Average); S&P Dow Jones Indices, *Salesforce.com, Amgen and Honeywell International Set to Join Dow Jones Industrial Average* (Aug. 24, 2020), *available at https://www.spglobal.com/spdji/en/documents/indexnews/announcements/20200824-1208960/1208960_aug20aaplsplitcrmxomamgnpfehonrtxdjia.pdf* (describing changes to the constituents of the Dow Jones Industrial Average in Aug. of 2020); Aparna Narayanan, *Raytheon Technologies Debuts On The Dow As Rival GE Deepens Cuts* (Apr. 3, 2020), *available at https://www.investors.com/news/raytheon-technologies-stock-debuts-dow-jones-industiral-average-ge-aviation-cuts/*(describing changes to the constituents of the Dow Jones Industrial Average in Apr. of 2020).

[365] Based on data from the SEC's MIDAS analytics tool, the daily exchange odd-lot rate (*i.e.,* the number of exchange odd-lot trades as a proportion of the number of all exchange trades) for all corporate stocks ranged from approximately 52% to 64% of trades and the daily exchange odd-lot rate for all ETPs ranged from 33% to 46% of trades in 2021. More recently, in June 2022, the daily exchange odd-lot rate for all corporate stocks averaged 65% and reached almost 41% for all ETPs in the same period. Exchange odd-lot volume as a proportion of total exchange-traded volume also rose in June 2022, reaching approximately 19% for all corporate stocks (and over 39% for the top decile by price) and approximately 7% for all ETPs. These levels are higher than the levels observed in the data from 2018 and 2019. *See* MDI Proposing Release, *supra* note 39, at 16739; MIDAS, *available at https://www.sec.gov/marketstructure/midas.html. See also* Cboe, An In-Depth View Into Odd Lots (Oct. 27, 2021), *available at https://www.cboe.com/insights/posts/an-in-depth-view-into-odd-lots/#:~:text=Odd%20lots%20currently%20make%20up,the%20beginning%20of%20the%20year* (''Odd lots currently represent 54.8% of all trades in the U.S. financial markets, up from 43% at the beginning of 2020 . . . While odd lot average daily executed share volume has decreased about 22% from the highs reached in Feb. and Mar. [of 2021], their percentage of trades continues to increase, and overall share volume remains higher than the prior year . . . As stock price increases, odd lot share volume percentage also increases. Since first-quarter 2020, the percentage of odd lots has increased across all price groups. The largest increase was in stocks priced between $100 and $499.99, where odd lots increased 3.3% to comprise 15.2% of share volume.''); Robert P. Bartlett, Justin McCrary, and Maureen O'Hara, The Market Inside the Market: Odd-lot Quotes (2022), *available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4027099* (retrieved from SSRN Elsevier database) (finding that the proportion of trades in S&P 500 stocks occurring in odd-lots increased from around 30% in 2016 to 65% in 2021 and that, based upon data from Jan. through Mar. of 2021, ''the rate of odd lot orders ranges from 5.6% of all submitted orders for less than 500 shares [for stocks priced $20 or lower] to 46.9% of all such orders [for stocks priced over $250].'').

[366] *See* Elliot Banks, BMLL Technologies, Inside the SIP and the Microstructure of Odd-Lot Quotes (observing an upward trend in odd-lot trading inside the NBBO from Jan. 2019 to Jan. 2022); Bartlett et al., *supra* note 365, at 2 (stating, based upon data from Jan. through Mar. of 2021, that ''[p]erhaps most intriguing are our results on the incidence of superior odd lot quotes relative to the NBBO. While for the lower price stocks this is only the case an average 5.1% of the time, this incidence reaches almost 30% for [stocks priced between $100 and $250] and it averages 42% for [stocks priced over $250]'').

[367] MDI Adopting Release, *supra* note 5, at 18616 (describing analysis that examined quotation data for the week of May 22–29, 2020 for stocks priced from $250.01 to $1000.00 and found that there is odd-lot interest priced better than the new round lot NBBO 28.49% of the time, and, in 48.49% of those cases, there are better priced odd-lots at multiple price levels). A similar analysis using data from all trading days in Mar. 2022 confirms that better-priced odd-lots continue to be distributed across multiple price levels.

[368] For example, odd-lot rates for corporate stock price deciles 1–3 (the lowest priced corporate stocks comprising 30% of all corporate stocks) have been higher on average in 2021 and June 2022 (34%, 39%) as compared to 2019 and 2020 (26%, 29%). Similarly, ETPs also exhibit higher average odd-lot rates in price quartiles 1 and 2 (the lowest priced ETPs comprising 50% of all ETPs) on average in 2021 and June 2022 (26%, 29%) compared to 2019 and 2020 (20%, 23%). *See* MIDAS, *available at https://www.sec.gov/marketstructure/midas.html.*

TABLE 1

Round lot tier	Round lot size	Portion of all corporate stock and ETP share volume executed on an exchange, transacted in a quantity less than 100 shares, at a price better than the prevailing NBBO, occurring in a quantity that would be defined as a round lot under the MDI Rules	
		May 2020 (%)	Mar. 25–31, 2022 (%)
$0–$250.00	100 Shares	0	0
$250.01–$1,000	40 Shares	65.35	54.77
$1,000.01–$10,000.00	10 Shares	88.28	79.36
$10,000.01 or more	1 share	100.00	100.00

Source: Equity consolidated data feeds (CTS and UTDF), as collected by MIDAS; NYSE Daily TAQ.

TABLE 2

Round lot tier	Round lot size	Portion of all corporate stock and ETP trades executed on an exchange, transacted in a quantity less than 100 shares, at a price better than the prevailing NBBO, occurring in a quantity that would be defined as a round lot under the MDI Rules	
		May 2020 (%)	Mar. 25–31, 2022 (%)
$0–$250.00	100 Shares	0	0
$250.01–$1,000	40 Shares	20.19	14.71
$1,000.01–$10,000.00	10 Shares	39.81	26.48
$10,000.01 or more	1 share	100.00	100.00

Source: Equity consolidated data feeds (CTS and UTDF), as collected by MIDAS; NYSE Daily TAQ.

Moreover, using exchange direct feed data from MIDAS for every trading day in March 2022, a simulation was conducted of a competing consolidator feed that provides quotation information for a sample of NMS stocks priced at or over $250.01 using the priced-based round lot sizes adopted in the MDI Rules as opposed to the round lot size that is applicable today (which is usually 100). Snapshots of this simulated feed were compared against snapshots of the exclusive SIP feed for that NMS stock at the same point in time. For each of the three price tiers and corresponding round lot sizes, the simulated feed showed better prices, on average, than the exclusive SIP feed. For stocks priced between $250.01 and $1,000.00 per share, which will have a round lot size of 40 under the round lot definition, the price reflected in the simulated competing consolidator feed was better than the exclusive SIP feed 21.47% of the time and worse less than .1% of the time. For stocks priced between $1,000.01 and $10,000.00 per share, which will have a round lot size of 10 under the round lot definition, the price reflected in the simulated competing consolidator feed was better than the exclusive SIP feed 64.67% of the time and worse less than .1% of the time.[369]

Since the adoption of the MDI Rules, some market participants have called for earlier implementation of the new round lot definition or otherwise welcomed its implementation.[370] In addition, the Operating Committees of the CTA and UTP Plans published a request for comment on a potential proposal to include the best priced odd-lots from each exchange, if at or better than that exchange's round lot BBO, as well as an ''Odd-Lot NBBO,'' if at or better than the round lot NBBO, on the exclusive SIP feeds.[371]

While the implementation of the MDI Rules proceeds, investors are not yet

[369] Only one stock, which is already quoted in one share round lots on the exclusive SIP feed, was priced over $10,000 per share, so the simulated feed and exclusive SIP feed showed the same prices for this stock.

[370] *See* MEMX, Why We Should Change Round Lots Now (June 2021), *available at https://memx.com/wp-content/uploads/MEMX_Round-Lots_white-paper.pdf* (''MEMX White Paper'') (''There is significant consensus among market participants on round lot reform and implementing these changes now will result in fairer and more efficient markets. Based on our analysis, it should also save investors billions in transaction costs over the next three years. As the saying goes, 'time is money' and investors will be left footing the bill if we don't act soon to expedite these changes. That's why we're asking the listing exchanges to work together with us and the industry to get round lot reform implemented ahead of schedule by voluntarily changing round lot sizes in their listed securities to match the infrastructure rule's requirements.''); letter from Citadel to CTA and UTP Plan Operating Committees (Apr. 27, 2022) *available at https://www.ctaplan.com/publicdocs/ctaplan/Citadel_Securities_Comment_Letter_on_the_Odd_Lot_Proposal.pdf* at 2 (''Citadel Odd-Lot Letter'') (stating, in response to a request for comment on a proposal from the Operating Committees of CTA and UTP Plans to add certain odd-lot quotes to SIP data, that ''[a] better solution to address the growth in odd lot trading is to recalibrate the definition of a round lot as directed by the SEC in its final Market Data Infrastructure Rule . . . we recommend that the SIP Operating Committees . . . pursue a market-led approach that is consistent with the Market Data Infrastructure Rule (including revising the round lot definition)''); Citadel Report, *supra* note 100, at 7 (''It is also important to note that the Commission recently finalized, but has yet to implement, a revised round lot definition that is tiered based on the price of a stock . . . We supported this revised round lot definition and look forward to it being implemented.'').

[371] *See* Proposal of the CTA and UTP Operating Committees Regarding Odd Lots on the SIPs (''2022 SIP Odd-Lot Request for Comment''), *available at https://www.ctaplan.com/publicdocs/ctaplan/CTA_Odd_Lots_Proposal_2022.pdf.* The 2022 SIP Odd-Lot Request for Comment would not include all odd-lot information as defined in rule 600(b)(59). Specifically, the 2022 SIP Odd-lot Request for Comment would include only the best odd-lot quote of each exchange, if at or better than that exchange's round lot BBO, and an ''Odd Lot NBBO,'' if at or better than the round lot NBBO, in SIP data. *Id.* at 2. By contrast, the Commission's definition of odd-lot information includes all odd-lot quotes priced at better than the NBBO *at every price level* (aggregated at each such price level by exchange). 17 CFR 242.600(b)(59).

receiving the benefits [372] of increased transparency of better priced orders available in the market through the distribution of NMS data. If the implementation of the definitions of odd-lot information and round lot is not accelerated, market participants—particularly those that do not subscribe to proprietary data products containing odd-lot quotation data—would not receive information about opportunities to trade against liquidity that has superior pricing, which could result in inferior executions and significant costs for investors.[373] By accelerating implementation of the round lot and odd-lot information definitions, investors and market participants would be able to receive these benefits and avoid these costs sooner and for a more extended period of time.[374] This period of time would vary depending upon the timing of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions and Commission approval of the plan amendments required under rule 614(e), but it is likely to be significant. For example, assuming 90 days after **Federal Register** publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions and the Commission's approval of the plan amendment(s) required by rule 614(e) occur at roughly the same time, the benefits of the round lot and odd-lot information definitions would accrue to investors and other market participants approximately two years sooner.

Therefore, the Commission proposes to accelerate the implementation of the round lot and odd-lot information definitions so that market participants can reap the benefits of increased transparency and enhanced execution quality sooner than originally planned.[375] Specifically, the Commission proposes to require compliance with the round lot and odd-lot information definitions 90 days from the publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions in the **Federal Register**.

1. Odd-Lot Information

Today, information about odd-lot quotations and transactions that is defined as odd-lot information in rule 600(b)(59) is provided in several ways. Odd-lot transaction information is collected, consolidated, and disseminated by the exclusive SIPs.[376] Odd-lot quotation and transaction information is also disseminated via the individual exchange proprietary feeds.[377] Pursuant to the MDI Rules, odd-lot quotation information as defined in rule 600(b)(59)(ii) will not be required to be collected, consolidated, or disseminated by the exclusive SIPs. Rather, this information will be collected, consolidated, and disseminated by competing consolidators, beginning during the parallel operation period.[378]

To accelerate the compliance date for odd-lot information as defined in rule 600(b)(59), the Commission proposes to require self-regulatory organizations (''SROs'') to provide the data necessary to generate odd-lot information to the exclusive SIPs and to require the exclusive SIPs to collect, consolidate, and disseminate odd-lot information. Specifically, the Commission proposes to amend rule 603(b) to require the national securities exchanges and national securities associations to make all data necessary to generate odd-lot information available to the exclusive SIPs and to require the exclusive SIPs to collect, consolidate, and disseminate odd-lot information.[379]

The Commission proposes to divide rule 603(b) into three new subsections to reflect the requirements under rule 603(b) that remain in effect until the changes to rule 603(b) that were adopted under the MDI Rules are implemented. Proposed rule 603(b)(1) would govern the applicability of proposed rules 603(b)(2) and (b)(3) by describing the compliance dates set forth in the MDI Rules for each of these proposed subsections. Specifically, proposed rule 603(b)(1) would state that compliance with proposed rule 603(b)(2) is required 180 calendar days from the date of the Commission's approval of the amendments to the effective national market system plan(s) required under rule 242.614(e).[380] It would also state that compliance with proposed rule 603(b)(3) is required until the date indicated by the Commission in any order approving amendments to the effective national market system plan(s) to effectuate a cessation of the operations of the plan processors that disseminate consolidated information regarding NMS stocks. Proposed rule 603(b)(2) would govern the provision of consolidated market data by competing consolidators and self-aggregators pursuant to the decentralized consolidation model set forth in the MDI Rules, which includes the collection, consolidation, and dissemination of odd-lot information. Proposed rule 603(b)(3) would govern the provision of NMS data by the exclusive SIPs, including the new requirements regarding the collection, consolidation, and dissemination of odd-lot information.

In the MDI Adopting Release, the Commission did not require the exclusive SIPs to collect, consolidate, or disseminate odd-lot information, stating that ''requiring the existing exclusive SIPs to continue disseminating the same data that they currently do will prevent the imposition of unnecessary costs—namely, any change to the data content

[372] *See supra* notes 361–363 and accompanying text.

[373] *See* MEMX White Paper, *supra* note 370, at 6 (estimating that investors could lose up to $7.5 billion if round lot implementation is delayed by three years). *Cf.* Letter from Cboe to CTA and UTP Plan Operating Committees re 2022 SIP Odd-Lot Request for Comment (Apr. 13, 2022) *available at https://www.ctaplan.com/publicdocs/ctaplan/Cboe_Comment_Letter_2022_Odd_Lot_Proposal.pdf* at 4 (''Cboe Odd-Lot Letter'') (''[C]ontinuing to withhold Odd Lot Quotations from the SIP would needlessly deprive investors of having access to the best prices available in the market.''). *See also infra* section IV.B.1.

[374] Letter from MEMX to CTA and UTP Plan Operating Committees re 2022 SIP Odd-Lot Request for Comment (Apr. 26, 2022) *available at https://www.ctaplan.com/publicdocs/ctaplan/Odd_Lot_20220426_MEMX_Comments_SIP_Proposal.pdf* at 3 (''MEMX Odd-Lot Letter'') (''Investors would . . . benefit from this information being made available sooner than may be the case if the industry were compelled to wait for competing consolidators to begin disseminating such data.'').

[375] *See supra* notes 361–363 and accompanying text.

[376] *See supra* note 336. Odd-lot information as defined in rule 600(b)(59)(i) includes ''[o]dd-lot transaction data disseminated pursuant to the effective national market system plan or plans required under § 242.603(b) as of April 9, 2021.''

[377] *See* MDI Proposing Release, *supra* note 39, at 16738; MDI Adopting Release, *supra* note 5, at 18599. Odd-lot information as defined in rule 600(b)(59)(ii) includes ''[o]dd-lots at a price greater than or equal to the national best bid and less than or equal to the national best offer, aggregated at each price level at each national securities exchange and national securities association.''

[378] *See supra* notes 351–354 and accompanying text.

[379] While the MDI Rules do not require competing consolidators to disseminate all consolidated market data elements, such as odd-lot information, in consolidated market data products, the Commission proposes to require the exclusive SIPs to collect, consolidate, and disseminate odd-lot information. Under the decentralized consolidation model, competing consolidators will be permitted to design consolidated market data products with different elements of consolidated market data for their subscribers and subscribers will be able to choose competing consolidators and consolidated market data products that meet their needs. *See* MDI Adopting Release, *supra* note 5, at 18659; *supra* note 339 and accompanying text. Under the existing exclusive SIP model, the exclusive SIPs are the only source of consolidated NMS data and—while proprietary data products offer some of the same data content, including odd-lot quotations—subscribers would have no alternative providers of *consolidated* NMS data if such data were not required to be collected, consolidated, and disseminated by the exclusive SIPs. Therefore, the Commission proposes that the exclusive SIPs be required to disseminate odd-lot information.

[380] *See* MDI Adopting Release, *supra* note 5, at 18700, n.1355.

the SIPs currently disseminate—on the existing exclusive SIPs immediately prior to their retirement.'' [381] However, in light of the delay of the implementation of the MDI Rules and the benefits—including enhanced transparency and usability of NMS data and improved execution quality [382]—that would be provided to the market by the ready and widespread availability of odd-lot information, the Commission believes that the exclusive SIPs should be required to collect, consolidate and disseminate odd-lot information. Moreover, in light of the delay in the implementation of the MDI Rules and the corresponding extension in the amount of time that the exclusive SIPs will continue to operate, the costs imposed on the exclusive SIPs by this requirement would not represent ''unnecessary costs'' on the exclusive SIPs ''immediately prior to their retirement.'' [383]

2. Round Lots

The Commission proposes to accelerate the implementation of the round lot definition set forth in rule 600(b)(82). In the MDI Adopting Release, the Commission stated that ''sequencing [round lot implementation] after the parallel operation period is important to avoid either: (1) potential confusion and market disruption that could result from two different round lot structures operating at the same time; or (2) imposing reprogramming costs on the exclusive SIPs for a limited time period prior to their retirement.'' [384] However, in light of the delay in the overall implementation of the MDI Rules and the benefits that would be available to investors sooner if implementation of this aspect of the MDI Rules is accelerated, the Commission believes that the benefits justify the costs.[385]

The Commission also proposes to amend an element of the definition of ''regulatory data'' under rule 600(b)(78) to facilitate the accelerated implementation of the round lot definition. Specifically, the Commission proposes to add new paragraph (b)(78)(iv) to require the primary listing exchanges also to make the indicator of the applicable round lot size available to the exclusive SIPs.[386] Under the MDI Rules, the definition of ''regulatory data'' requires the primary listing exchange to make an indicator of the applicable round lot size for each NMS stock available to competing consolidators and self-aggregators, but not to the exclusive SIPs (as they were to be retired by that time).[387] The Commission stated that this indicator will ''help market participants ascertain the applicable round lot size for each NMS stock on an ongoing basis'' [388] and ''reduce confusion as market participants adjust to the new round lot sizes.'' [389] Therefore, for these same reasons, the Commission believes that this indicator should be provided to the exclusive SIPs for collection and dissemination.[390]

3. Display of Round Lots and Odd-Lot Information

Because the exclusive SIPs would be required to collect and disseminate SIP data in the new round lot sizes,[391] the Commission proposes—consistent with the quotation size representation and rounding conventions required of competing consolidators under the MDI Rules [392]—to require the exclusive SIPs to represent quotation sizes in SIP data in terms of the number of shares and to round quotation sizes, except for odd-lot quotations, down to the nearest multiple of a round lot.[393] Currently, quotation sizes are represented in SIP data in terms of the number of round lots.[394] However, after the implementation of the round lot definition, which assigns each stock to one of four round lot sizes based on its share price, this convention could be confusing because the number of round lots will represent different quotation sizes depending upon the price of the stock.[395] In addition, in the MDI Rules, the Commission adopted a provision requiring the rounding of quotation sizes,[396] except for odd-lot quotations,[397] down to the nearest multiple of a round lot to help ensure that certain core data elements, such as each exchange's BBO, ''reflect orders of meaningful size'' and that, with respect to the NBBO in particular, ''the protected portion of the order is clearly represented, which addresses concerns about impacts on investor confidence and confusion that could result from showing unprotected size at the

[381] *Id.* at 18700.

[382] *See supra* notes 360–363 and accompanying text.

[383] MDI Adopting Release, *supra* note 5, at 18700. *See also infra* sections V.D.6.c and VI.D (describing the estimated costs of the proposed requirement that the exclusive SIPs collect, consolidate, and disseminate odd-lot information). Although the scope of the odd-lot quotation data that would be included in SIP data pursuant to the 2022 SIP Odd-Lot Request for Comment is more limited than odd-lot information as defined in the MDI Rules, *see supra* note 371, the 2022 SIP Odd-Lot Request for Comment nonetheless demonstrates that the Operating Committees of the CTA and UTP Plans may be willing to enhance SIP data content for a period of time before the exclusive SIPs are ultimately retired and to incur the costs of such enhancements. Similarly, many comments submitted in response to the 2022 SIP Odd-Lot Request for Comment reflect support for earlier availability of some odd-lot quotation data via the exclusive SIPs, as opposed to waiting for odd-lot information to become available pursuant to the original implementation schedule set forth in the MDI Rules. *See generally* comment file for 2022 SIP Odd-Lot Request for Comment, *available at https://www.ctaplan.com/oddlots*.

[384] MDI Adopting Release, *supra* note 5, at 18701. The Commission stated that ''the consolidated market data products offered by competing consolidators during the initial parallel operation period would be based on the current definition of round lot.'' *Id.* at 18700. However, because the Commission now proposes to accelerate implementation of the round lot definition, the exclusive SIPs would be providing SIP data that reflects the new round lot sizes during the initial parallel operation period. Further, the acceleration of the implementation of the round lot definition would result in its use during the parallel operation period by both the exclusive SIPs and competing consolidators.

[385] *See infra* sections V.D.5.a and V.D.6.c.

[386] The Commission proposes that the compliance date for this requirement would coincide with the proposed compliance date for the round lot definition (*i.e.,* 90 days from the publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions in the **Federal Register**).

[387] *See supra* note 332.

[388] MDI Proposing Release, *supra* note 39, at 16762.

[389] MDI Adopting Release, *supra* note 5, at 18619.

[390] As discussed below, since the MDI Rules already require the primary listing exchanges to provide an indicator of the applicable round lot size to competing consolidators and self-aggregators, the Commission believes that the incremental cost of providing this indicator to the two exclusive SIPs would be low. *See infra* section VI.G.

[391] *See supra* section IV.B.2; *infra* section IV.B.4.

[392] Under the MDI Rules, the definition of ''core data'' requires competing consolidators to represent certain core data elements, including the best bid and best offer, the NBBO, and protected quotations—but not including odd-lot information—in terms of the number of shares, rounded down to the nearest multiple of a round lot. MDI Adopting Release, *supra* note 5, at 18615; 17 CFR 242.600(b)(21)(iii).

[393] This amendment would be reflected in proposed rule 603(b)(3), which would govern the provision of NMS data by the exclusive SIPs. *See supra* section IV.B.1. *See also* MDI Adopting Release, *supra* note 5, at 18615 (providing the following example of the required quotation size representation and rounding convention: ''a 275 share buy order at $25.00 for a stock with a 100 share round lot would be disseminated as ''200.'').

[394] MDI Adopting Release, *supra* note 5, at 18615 (''For example, if a 200 share bid at $25.00 establishes the national best bid, the SIP feed shows ''2'' at $25.00.'').

[395] *Id.* (''For example, an investor would have to know that, for a $300 stock, ''2'' means 80 shares pursuant to the adopted round lot sizes.'').

[396] ''Quotation size'' is defined in rule 600(b)(76). 17 CFR 242.600(b)(76).

[397] Consistent with the approach taken in the MDI Rules, *see supra* note 392, the Commission is proposing to exclude odd-lot quotations from the rounding convention that would be required of the exclusive SIPs under proposed rule 603(b)(3) because it would defeat the purpose of including odd-lots in NMS data—particularly the transparency and usability benefits associated with their inclusion—to round odd-lots down to the nearest round lot; since odd-lots are, by definition, less than a round lot, such an approach would result in ''0'' being shown rather than the number of shares associated with an odd-lot quotation.

NBBO.'' [398] For these reasons, the Commission proposes to require the exclusive SIPs to represent quotation sizes in SIP data in terms of the number of shares, rounded down to the nearest multiple of a round lot, except for odd-lot quotations.[399]

4. Proposed Compliance Date

The Commission proposes to amend the date by which market participants must comply with the odd-lot information and round lot definitions, including, as required under proposed rule 603(b)(3), that national securities exchanges and associations make the data necessary to generate odd-lot information available to the exclusive SIPs and that the exclusive SIPs disseminate odd-lot quotation information as defined in rule 600(b)(59). Specifically, the Commission proposes to require compliance with the odd-lot information and round-lot definitions 90 days from **Federal Register** publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions. Advancing the compliance date for odd-lot information to 90 days from **Federal Register** publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions would significantly move up the date by which this information would be more widely available in the national market system.[400] Under the implementation schedule set forth in the MDI Adopting Release, the odd-lot information definition will not be fully implemented in the near term. Specifically, odd-lot quotation information as defined in rule 600(b)(59)(ii) that is based on the definitions of round lot set forth in the rules of national securities exchanges [401] will not be made available until the ''parallel operation period,'' which does not begin until nine months after Commission approval of the amendments to the effective national market system plan(s) required by rule 614(e).[402]

Pursuant to the MDI Rules implementation schedule, the round lot definition set forth in rule 600(b)(82) will be implemented after the retirement of the exclusive SIPs, which the Commission estimates will be at least two years after the approval of the effective national market system plan(s) amendment required under rule 614(e).[403] The implementation of the round lot definition affects the full implementation of odd-lot information definition, as odd-lot information that is based on round lots as defined in rule 600(b)(82) will not occur until the round lot definition is implemented.[404] Therefore, full implementation of the odd-lot information definition will not occur until the exclusive SIPs have been retired, which, as estimated above, will be at least two years from the Commission's approval of the plan amendment(s) required by rule 614(e).[405]

The Commission preliminarily believes that a compliance date of 90 days from **Federal Register** publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions would provide market participants with sufficient time to make the changes necessary to implement the round lot and odd-lot information definitions.[406] These changes would include reprogramming systems to facilitate the acceptance and handling of orders in the one round lot size that is not currently in use (*i.e.,* 40) and to assign the approximately 181 NMS stocks priced above $250 [407] to their relevant round lot size, and systems enhancements to support the distribution and consumption of odd-lot information.

For the round lot definition, broker-dealers would need to modify their systems to accept and handle orders in the new round lot sizes. Trading centers would need to modify their systems to accept and process orders in the new round lot sizes.[408] The exclusive SIPs would need to modify their systems to accept and process orders in the new round lot sizes. The exclusive SIPs would also have to make systems changes to represent quotation sizes in the number of shares rounded down to the nearest multiple of a round lot.[409]

For odd-lot information, broker-dealers would need to make changes to their systems that accept SIP data that would now reflect additional information, *i.e.,* certain quotations in odd-lot sizes as defined in rule 600(b)(59)(ii). The SROs would have to make systems changes to provide the information necessary for the generation of odd-lot information to the exclusive SIPs, and the exclusive SIPs would have to make systems changes to collect, consolidate, and disseminate odd-lot information. As discussed above, the SROs already provide, and the exclusive SIPs already collect, consolidate, and disseminate, transaction information for executions of odd-lot orders. Therefore, the systems changes necessary for the SROs and exclusive SIPs related to implementing the odd-lot information definition would be limited to changes necessary to accommodate quotations in odd-lots as defined in rule 600(b)(59)(ii). These systems changes would include modifications necessary to aggregate odd-lot quotes at each price better than the NBBO at each exchange.

As discussed below, the Commission does not believe that the proposed

[398] *See* rule 600(b)(21)(iii); MDI Adopting Release, *supra* note 5, at 18615.

[399] The Commission proposes that the compliance date for this requirement would coincide with the proposed compliance date for the round lot definition (*i.e.,* 90 days from the publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions in the **Federal Register**) so that the exclusive SIPs could continue the current convention of representing quotation sizes in terms of the number of round lots until such time as they would be required to provide SIP data using the new round lot definition, at which point that convention would become confusing.

[400] Currently, odd-lot quotation information is available only on the exchanges' proprietary data feeds. *See supra* note 330 and accompanying text. By moving up the compliance date for odd-lot information, this data would no longer be limited to the exchanges' proprietary data products.

[401] *See supra* note 328.

[402] *See supra* note 351 and accompanying text. ''Odd-lot'' is defined as ''an order for the purchase or sale of an NMS stock in an amount less than a round lot.'' 17 CFR 242.600(b)(58). Hence, until the round lot definition is implemented, odd-lot quotation information will reflect the existing, exchange-based definition of round lot. *See also* MDI Adopting Release, *supra* note 5, at 18700 (''The consolidated market data products offered by competing consolidators during the initial parallel operation period would be based on the current definition of round lot.'').

[403] *See supra* note 354 and accompanying text. Further, this time frame could potentially be considerably longer depending upon a number of factors, including the evaluation of the performance of the decentralized consolidation model during the parallel operation period by the Operating Committee of the effective national market system plan(s), the timing of when an NMS plan amendment to effectuate the cessation of the exclusive SIPs is submitted to the Commission, and whether and when the Commission approves such an amendment.

[404] *See supra* note 402.

[405] *See supra* note 354 and accompanying text.

[406] *Cf. supra* note 371 and accompanying text (comparing the scope of odd-lot data that the exclusive SIPs would disseminate pursuant to the 2022 SIP Odd-Lot Request for Comment with the data included in the definition of odd-lot information adopted as part of the MDI Rules); 2022 SIP Odd-Lot Request for Comment, *supra* note 371, at 1 (stating that the Operating Committees of the CTA and UTP Plans anticipate that certain odd-lot data could be made available through the exclusive SIPs by the first half of 2023); MDI Adopting Release, *supra* note 5, at 18701 (''For a period of 90 days starting with the date of the cessation of the operation of the exclusive SIPs, the changes necessary to implement the new round lot sizes will be tested. At the end of the 90 day test period, the new round lot sizes will be implemented.'').

[407] Based on average closing prices on the primary listing exchange in Mar. 2022, there are 181 NMS stocks priced over $250.

[408] The exchanges that have defined round lots in their rules would need to file proposed rule changes pursuant to section 19(b) of the Exchange Act and rule 19b–4 thereunder to change their rules to reflect the implementation of rule 600(b)(82). *See supra* note 328.

[409] *See supra* note 399 and accompanying text.

accelerated compliance date for the round lot and the odd-lot information definitions—rather than implementing these definitions under the implementation schedule set forth in the MDI Adopting Release—would greatly increase the costs of implementing these definitions.[410] The acceleration of the implementation of the round lot and odd-lot information definitions, however, would impose costs on the exclusive SIPs that would not have resulted from the MDI Rules. The exclusive SIPs would have to make systems changes in order to collect, consolidate, and disseminate SIP data that reflects the round lots as defined in rule 600(b)(82) and odd-lot quotation information. The Commission believes that the costs of these changes would be relatively modest. First, round lot sizes of 100, 10, and 1 are already in existence today, so the exclusive SIPs can already accept information in three out of the four new round lot sizes, which would limit the scale of the necessary reprogramming. Further, the round lot definition affects a relatively low number of NMS stocks. Based on pricing during March 2022, only 181 stocks would have been assigned a new round lot size as a result of having a share price that is $250 or higher.[411] However, representing quotation sizes in terms of the number of shares, rounded down to the nearest multiple of a round lot, would be a departure from the current convention of representing quotation sizes in terms of the number of round lots, and would require the exclusive SIPs and the users of SIP data to modify their systems.[412]

For odd-lot information, the exclusive SIPs would have to modify their systems to collect, consolidate, and disseminate quotations that are included in the definition of odd-lot information. The additional odd-lot information would likely increase message traffic coming in to the exclusive SIPs and in the exclusive SIP feeds.[413] Therefore, the exclusive SIPs would have to modify their systems to accommodate increased message traffic and to calculate odd-lot information. The Commission believes that the benefits of implementing the round lot definition and providing odd-lot information would justify the costs of the necessary technological changes.[414]

C. Request for Comment

The Commission requests comment on all aspects of the proposed accelerated implementation of the round lot and odd-lot information definitions. In particular the Commission solicits comment on the following:

44. Should the implementation of the round lot definition adopted as part of the MDI Rules be accelerated? Why or why not?

45. If so, by how much time should the round lot definition be accelerated? Does the proposal to require compliance with the new definition within 90 days of **Federal Register** publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions provide market participants with sufficient time to make necessary changes and adjustments? Please explain the specific modifications that each type of market participant—including, but not limited to, broker-dealers, trading centers, and the exclusive SIPs—would have to make to comply with the round lot definition. In addition, please explain the amount of time each type of market participant would need to make such modifications and whether a timeframe shorter or longer than the proposed compliance date of 90 days from **Federal Register** publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions would be more appropriate?

46. Should the exclusive SIPs be required to represent quotation sizes in terms of the number of shares, rounded down to the nearest multiple of a round lot, rather than the number of round lots? Why or why not? If not, would investors be confused by representing quotation sizes in the number of lots? Please describe any systems changes to the exclusive SIPs, SIP data users, or other market participants that would be necessary to represent quotation sizes in terms of the number of shares, rounded down to the nearest multiple of a round lot.

47. Should the primary listing exchange be required to provide an indicator of the applicable round lot size for each NMS stock to the appropriate exclusive SIP? Why or why not?

48. Should the implementation of the definition of odd-lot information, which would include odd-lots priced better than the NBBO in NMS data, be accelerated? Why or why not?

49. If so, by how much time should the odd-lot information definition be accelerated? Does the proposal to require compliance with the new definition 90 days after publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions in the **Federal Register** provide market participants with sufficient time to make necessary changes and adjustments? Please explain the specific modifications that each type of market participant—including, but not limited to, broker-dealers, trading centers, and the exclusive SIPs—would have to make to comply with the odd-lot information definition. In addition, please explain the amount of time each type of market participant would need to make such modifications and whether a timeframe shorter or longer than the proposed compliance date of 90 days from **Federal Register** publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions would be more appropriate.

50. Should the round lot and odd-lot information definitions be accelerated by different amounts of time (as opposed to requiring compliance with both definitions 90 days after publication of any Commission adoption of an earlier implementation of the round lot and odd-lot information definitions in the **Federal Register**, as proposed)? For example, would the modifications necessary to comply with the round lot definition take longer to implement than the modifications necessary to comply with the odd-lot information definition (or vice-versa)? Please explain.

51. Do the costs or benefits of the round lot or odd-lot information definitions depend upon when they are implemented? Please explain.

D. Proposed Definition of Best Odd-Lot Orders

As discussed above, in the MDI Rules, the Commission defined odd-lot

[410] *See infra* sections V.D.5 and V.D.6.

[411] *See supra* note 407 and accompanying text.

[412] *See* MEMX White Paper, *supra* note 370, at 8 (''Specifically, the infrastructure rule requires: (1) the dissemination of an indicator that displays the applicable round lot size for the security; and (2) that information disseminated in consolidated market data be represented in actual shares. Of these two changes, the potential implementation burden rests almost entirely with the dissemination of actual shares, which would require systems changes for both the SIPs and downstream users of SIP data whose systems may also need to be coded to the new specifications.'').

[413] *Cf.* 2022 SIP Odd-Lot Request for Comment, *supra* note 371, at 4 (''The OCs project that this proposal will result in a 35% increase in the amount of quotation traffic sent to the SIPs each day, as well as a 35% increase in the quotation messages generated during peak periods.''). As the exclusive SIPs already collect and disseminate odd-lot transaction data, *see supra* note 336 and accompanying text, accelerated implementation of the odd-lot information definition would impose no additional costs on the exclusive SIPs with respect to odd-lot transaction data.

[414] *See infra* sections V.D.5 and V.D.6. *Cf.* Cboe Odd-Lot Letter, *supra* note 373, at 3 (''[T]he technology efforts needed to manage Odd Lot Quotations on the SIPs will be far outweighed by the benefits Odd Lot Quotations will provide to today's investors.'').

information to include odd-lots at a price greater than or equal to the national best bid and less than or equal to the national best offer, aggregated at each price level at each national securities exchange and national securities association.[415] The Commission stated that ''this better-priced odd-lot liquidity needs to be reflected in core data because it will help investors and other market participants to trade in a more informed and effective manner and to achieve better executions and reduce the information asymmetries that currently exist between subscribers to SIP data and subscribers to proprietary data.''[416]

The Commission proposes to amend the definition of odd-lot information to include a specified best odd-lot order to buy and best odd-lot order to sell.[417] Specifically, for each NMS stock, the best odd-lot order to buy would mean the highest priced odd-lot order to buy that is priced higher than the national best bid, and the best odd-lot order to sell would mean the lowest priced odd-lot order to sell that is priced lower than the national best offer.[418] Similar to the definition of the NBBO, in the event that two or more national securities exchanges or associations provide odd-lot orders at the same price, the exclusive SIPs, competing consolidators and self-aggregators would be required to determine the best odd-lot order by ranking all such identical odd-lot buy orders or odd-lot sell orders (as the case may be) first by size (giving the highest ranking to the odd-lot buy order or odd-lot sell order associated with the largest size), and then by time (giving the highest ranking to the odd-lot buy order or odd-lot sell order received first in time).[419]

The Commission believes that proposing to require the identification and dissemination of the best odd-lot orders to buy and sell[420] consolidated across all national securities exchanges and national securities associations is consistent with the goals set forth in section 11A of the Exchange Act because it would make information about quotations in NMS stocks available to broker-dealers and investors[421] and would enhance the usefulness of odd-lot information.[422] Although odd-lot liquidity better than the NBBO often resides at multiple price levels and information reflecting all of these odd-lot prices is already included in the definition of odd-lot information,[423] requiring the identification and dissemination of *the best* of all such inside the NBBO odd-lots on both the buy and sell side would help inform market participants of the best possible prices at which their orders (or their customers' orders) could—in whole or in part—be executed. The identification and dissemination of the price, size, and market of the best odd-lot orders would enhance the ability of market participants to make effective trading and order routing decisions using NMS data and facilitate best execution.[424]

Moreover, including the best odd-lot order in odd-lot information would help to ensure the wide availability of a useful metric against which investors could assess the execution quality of their orders. For example, rule 605 execution quality statistics[425] could leverage this data point to provide more meaningful information, such as the quantity of orders that are executed at, outside, or with price improvement with respect to the best odd-lot order. Using the best odd-lot orders as a benchmark in this manner could provide investors with an enhanced view of how their orders are handled and executed.

The Commission proposes a compliance date of 90 days from **Federal Register** publication of any Commission adoption of an amended definition of odd-lot information to include the best odd-lot orders in NMS data. The Commission preliminarily believes this timeframe should be sufficient to make the systems changes necessary to implement this data element because the process of determining and disseminating the best odd-lot quote at a given time from among the odd-lot quotes submitted to the exclusive SIPs by the national securities exchanges and associations is fundamentally similar to the process of determining and disseminating the prevailing NBBO, which the exclusive SIPs already do today based on the quotation information they receive from national securities exchanges and associations.[426]

E. Request for Comment

The Commission requests comment on all aspects of the proposed definition of best odd-lot order. In particular, the Commission solicits comment on the following:

52. Should the definition of odd-lot information include the best odd-lot order to buy and best odd-lot order to sell? Why or why not?

53. How would market participants use information about the best odd-lot orders to buy and sell? Do commenters believe this information would be useful for market participants? How so? Would it promote more informed trading or facilitate best execution? Please explain.

54. Should rule 605 require the reporting of execution quality statistics in which the best odd-lot order is used as a benchmark? If so, what specific statistics would be most useful? Please explain.

55. Should the definition of ''consolidated display''[427] be amended so that rule 603(c), known as the ''Vendor Display Rule,'' would require the best odd-lot orders to buy and sell to be provided in contexts in which a trading or order-routing decision can be implemented? Please explain the costs and benefits of such a requirement.

56. Should national securities exchanges and associations be required

[415] *See* 17 CFR 242.600(b)(59); *see also supra* note 335 and accompanying text.

[416] MDI Adopting Release, *supra* note 5, at 18612.

[417] The best odd-lot order would not be a ''protected quotation'' for purposes of Regulation NMS, including rules 611 (order protection rule) and 610 (access to quotations). 17 CFR 242.611, 610. The term ''protected quotation'' is defined in rule 600(b)(71) as a protected bid or protected offer; the term bid or offer is further defined in rule 600(b)(11) and is limited to round lots. *See* 17 CFR 242.600(b)(11), (71).

[418] The best odd-lot order to buy (sell) will only be included in NMS data when it is priced higher (lower) than the NBB (NBO). Because the best odd-lot order will be defined as odd-lot information, the proposed amendments to rule 603(b) to require SROs to provide the data necessary to generate odd-lot information to the exclusive SIPs and to require the exclusive SIPs to disseminate odd-lot information, *see supra* note 379, will require the SROs to provide the data necessary to generate the best odd-lot order to the exclusive SIPs and the exclusive SIPs to disseminate the best odd-lot order.

[419] *See* 17 CFR 242.600(b)(50) (defining NBBO and setting forth the manner in which the NBBO is determined ''in the event two or more market centers transmit to the plan processor, a competing consolidator or a self-aggregator identical bids or offers for an NMS security'').

[420] *See supra* note 418.

[421] 15 U.S.C. 78k–1(a)1)(C)(iii).

[422] 15 U.S.C. 78k–1(c)(1)(B).

[423] *See supra* note 367 and accompanying text; 17 CFR 242.600(b)(59).

[424] The 2022 SIP Odd-Lot Request for Comment contains an ''odd-lot NBBO,'' similar to this proposal's best odd-lot order. *See supra* note 371 and accompanying text. *See also* comment file for 2022 SIP Odd-Lot Request for Comment, *available at https://www.ctaplan.com/oddlots*.

[425] 17 CFR 242.605 (requiring market centers to make available standardized, monthly reports of statistical information concerning their order executions). The Commission has issued a proposal to amend rule 605, which includes execution quality metrics based on the best odd-lot order. Securities Exchange Act Release No. 96493 (Dec. 14, 2022) (File No. S7–29–22) (Disclosure of Order Execution Information). The Commission encourages commenters to review that proposal to determine whether it might affect their comments on this proposing release.

[426] MDI Proposing Release, *supra* note 39, at 16738–39; 17 CFR 242.600(b)(50). In addition, the proposed definition of best odd-lot order and the method by which it is determined from among the information submitted by national securities exchanges and associations is modelled upon and parallel to the definition of NBBO. *See supra* notes 418–419 and accompanying text.

[427] *See* 17 CFR 242.600(b)(17).

to provide the data necessary to generate odd-lot information, including the best odd-lot orders to buy and sell, to the exclusive SIPs, and should the exclusive SIP be required to identify and disseminate this information? Why or why not? By how much would such a requirement increase message traffic for the exclusive SIP feeds?

57. Is 90 days from **Federal Register** publication of any Commission adoption of an amended definition of odd-lot information to include the best odd-lot orders in NMS data an appropriate amount of time for the exclusive SIPs to make any changes necessary to calculate and disseminate the best odd-lot orders? Would other market participants—including, but not limited to, broker-dealers and trading centers—need to make modifications to facilitate the calculation, dissemination, or use of the best odd-lot orders? Please describe any such modifications and the amount of time each type of market participant would need to make such modifications and whether a timeframe shorter or longer than 90 days from **Federal Register** publication of an amended definition of odd-lot information to include the best odd-lot orders in NMS data would be more appropriate.

V. Economic Analysis

A. Introduction

The Commission has considered the economic effects of the proposed Rule and, wherever possible, the Commission has quantified the likely economic effects of the proposed Rule.[428] The Commission is providing both a qualitative assessment and quantified estimates of the potential economic effects of the proposed Rule where feasible. The Commission has incorporated data and other information to assist it in the analysis of the economic effects of the proposed Rule. However, as explained in more detail below, because the Commission does not have, and in certain cases does not believe it can reasonably obtain, data that may inform the Commission on certain economic effects, the Commission is unable to quantify certain economic effects. Further, even in cases where the Commission has data, it is not practicable to quantify certain economic effects due to the number and type of assumptions necessary, which render any such quantification unreliable. Our inability to quantify certain costs, benefits, and effects does not imply that such costs, benefits, or effects are less significant. The Commission requests that commenters provide relevant data and information to assist the Commission in quantifying the economic consequences of the proposed Rule.

The Commission believes that the proposed amendments to rule 612 establishing a variable minimum pricing increment, where the tick size would be determined by the stock's Time-Weighted Average Quoted Spread, would result in lower transaction costs for the subset of affected stocks. The Commission expects lower transaction costs primarily because the proposed tiered tick size regime would help mitigate the impact of some mechanical impediments currently preventing the market from realizing otherwise more competitive bid and ask prices. Thus, the proposal prescribes a tick size reduction to the NMS stocks that have Time-Weighted Average Quoted Spread of $0.04 or less.[429]

The Commission believes it is reasonable to assume that the proposed changes to rule 612 to apply a minimum pricing increment to trade executions, subject to exceptions, could result in greater competition between exchanges and ATSs with other OTC market makers,[430] including wholesalers,[431] while still preserving opportunities for economically meaningful price-improvement.[432] Due to their greater reliance on quotations, harmonizing the minimum pricing increment for the quoting and trading would allow exchanges and ATSs to better compete on price for order flow with OTC market makers. When taken together with harmonization, the proposed changes to the tick size are expected to maintain sufficient intra-spread price levels to allow OTC market makers to continue to provide economically meaningful price improvement over the best displayed quotes.

The Commission expects that the proposed amendments to rule 610, which would lower the access fee caps, would also lower transaction costs and promote market efficiency. Lowering the access fee caps would lower the total amount of access fees collected and rebates distributed, reducing, though not eliminating, any distortionary effects of exchange rebates on order routing and likely improving market efficiency.[433] The reduction in access fees would lower transaction costs for liquidity demanders.[434]

The Commission preliminarily believes that the primary impact of earlier implementation of the definition of round lots and including odd-lot information in NMS data would be to accelerate some, but not all, of the benefits articulated in the MDI Adopting Release.[435] Given the delay in the full implementation of the MDI Rules, the Commission believes that putting off longer the benefits of those provisions is not justified and, as a result, the Commission is now proposing to accelerate the implementation of those portions of the MDI Rules.[436] The Commission expects that the proposed amendments to accelerate the implementation of the new definition of round lot and the inclusion of odd-lot information in NMS data, would improve price transparency and facilitate monitoring execution quality.[437]

The Commission expects that the proposed amendments to specify the best odd-lot orders to buy and sell (BOLO) would further facilitate execution quality monitoring by providing a standard benchmark with which to compare trades. Odd-lot trades make up an increasingly important part

[428] Section 3(f) of the Exchange Act requires the Commission, whenever it engages in rulemaking and is required to consider or determine whether an action is necessary or appropriate in the public interest, to consider, in addition to the protection of investors, whether the action would promote efficiency, competition, and capital formation. Additionally, section 23(a)(2) of the Exchange Act requires the Commission, when making rules under the Exchange Act, to consider the impact such rules would have on competition. Exchange Act section 23(a)(2) prohibits the Commission from adopting any rule that would impose a burden on competition not necessary or appropriate in furtherance of the purposes of the Exchange Act.

[429] *See infra* sections V.D.1 and V.E.1 for a discussion of the effects of the proposed changes to tick size on trade execution and market efficiency.

[430] *See infra* section V.E.2.a for a discussion of the effects of tick size harmonization on competition for execution services.

[431] Wholesalers are OTC market makers that, according to CAT analysis, execute around 90% of the dollar volume of individual investor NMS stock orders on a principal basis via internalization. There are currently 6 wholesalers in the U.S. handling NMS stock orders.

[432] *See supra* section II.F.4 for a description of the possible exceptions.

[433] Absent a reduction in the 30 mil access fee cap, distortions could increase because the access fee could, in some instances, exceed the spread. *See infra* note 713.

[434] *See infra* section V.C.2 for a discussion of the effects of access fees and rebates on the markets. *See infra* section V.D.3 for a discussion of the benefits of the proposed lower access fee cap.

[435] *See* MDI Adopting Release, *supra* note 5.

[436] For the reasons explained in the MDI Adopting Release, when adopting the MDI Rules the Commission decided not to implement the adopted provisions for the round-lot definition and incorporating odd-lot information into NMS data until after the competing consolidator model came online. *See* MDI Adopting Release, *supra* note 5, at 18701.

[437] As the proposal would not accelerate the implementation of the decentralized consolidation model adopted pursuant to MDI Rules, it would not result in the acceleration of the benefits of the decentralized consolidation model, including the consolidation and dissemination to market participants of NMS data at lower latencies.

of the market.[438] However only round-lot quotes are disseminated as part of the NMS data; having a standardized price for the best available odd-lot orders would provide a more relevant benchmark than the round-lot NBBO for odd-lot trades. As the Commission anticipates that the BOLO will be an important benchmark for estimating the execution quality of some trades, requiring the exclusive SIPs and competing consolidators to compute and disseminate the BOLO would promote standardization.[439]

Lastly, the proposed amendments would make fees and rebates determinable at the time of trade. Certainty about the cost of transactions at the time of trade could help broker-dealers make better order routing decisions.[440] Second, being able to determine the fees and rebates at the time of trade would make it easier for customers to ask more direct questions of broker-dealers and facilitate broker-dealers passing on fees and rebates to end customers if they so desire.[441] Passing fees and rebates through to end customers may mitigate or eliminate the potential conflicts of interest caused by exchange rebates.[442]

The proposal would result in a number of costs. For affected stocks, the proposed smaller tick size may increase the cost of executing large orders by fragmenting liquidity across multiple price levels and increasing the complexity of locating shares for the orders.[443] The Commission expects the proposed reduction in the access fee caps would decrease the overall net capture of exchanges primarily due to the decreased fees from sub-$1.00 stocks.[444] Rebate disbursement is expected to decrease under the proposal, and so firms that profit from rebates, such as high-frequency trading firms that specialize in rebate capture trading strategies, would experience revenue declines and some that rely on rebates could exit the market.[445] Reduced access fees could increase the amount of volume routed to exchanges compared to off exchange by making exchanges less expensive venues to transact and potentially causing some order flow that was previously directed off exchange to avoid high fees to revert to exchanges.

There would be implementation and ongoing compliance costs associated with the proposal. Exchanges and market participants would need to update systems to account for the new tick sizes. Market participants would need to reconfigure order routing strategies to account for the different tick sizes and lower access fees. Additionally, market participants would experience an acceleration of many of the costs associated with odd-lot information articulated in the MDI Adopting Release including the need for exchanges to adjust and maintain systems to provide odd-lot information to the NMS data feed. The exclusive SIPs would need to adjust and maintain systems to receive and disseminate odd-lot information, and market participants receiving SIP data would need to adjust systems to receive odd-lot information.[446]

B. Market Failure

The Commission is proposing to update regulations that set and apply a minimum pricing increment (tick size), reduce the access fee caps to better improve the market's capacity for efficient price competition, and promote more efficient order routing by resolving deficiencies in the information available to market participants. Current tick sizes for NMS stocks restrict price competition in stocks for which the tick size may be too large, leading to greater transaction costs. The lack of harmonization between minimum quoting and trading increments has also restricted the degree to which exchanges and ATSs can compete on price with OTC market makers including wholesalers.

The minimum achievable bid-ask spread for a stock is constrained by the minimum pricing increment and limits price competition. A high tick size can artificially increase transaction costs, keeping the bid-ask spread wider than it might otherwise be. Consider, for example, a stock that would trade at an ask price of $10.005 absent the $0.01 tick, should the tick size be $0.005. If forced to trade at a $0.01 tick size, the prevailing ask price would most likely be $10.01, namely a half cent worse.[447] Stocks that would otherwise trade with a spread less than the tick size, were they allowed to do so, are considered to be tick-constrained. Because these stocks cannot trade with spreads less than the tick size, they typically trade with spreads that are at or near the minimum tick size.[448] A stock that is near-tick-constrained is one that has a reasonable probability of becoming tick-constrained in the course of normal trading, or one for which the tick is a substantial portion of the spread.[449] Even if a stock is not tick-constrained but is near-tick-constrained, Commission analysis suggests that the tick size increases transaction costs for market participants. This may be because the tick constraint sometimes binds for these stocks, or because there may be market participants who want to

[438] One academic paper, examining order book data from 2009 to 2011, finds that odd-lot trades make up 24% of trades in the median stock. *See* Maureen O'Hara, et al., *What's Not There: Odd Lots and Market Data,* 69 J. Fin. 2199 (Oct. 2014). Another, more recent study, finds evidence that odd-lot quotes provide valuable information to traders with access to the data. *See* Bartlett, et al. (2022), *supra* note 365. *See also* MDI Adopting Release, *supra* note 5, at 18729.

[439] This would also avoid other market participants having to estimate their own BOLO, as they would currently do if using it as a benchmark.

[440] Broker-dealer fees and rebates are generally tied to the monthly aggregate trading volume of the broker-dealer on different exchanges.

[441] Under Rule 606(b)(3), broker-dealers are required to provide a customer, upon request, a report on the broker-dealer's handling of that customer's NMS stock orders, which includes information on the average fees and rebates paid/received from those orders. If fees and rebates were determinable at the time of execution, customers could more easily evaluate the 606(b)(3) disclosures or request additional, more specific information. *See* Disclosure of Order Handling Information, *supra* note 4.

[442] If broker-dealers had to internalize and could not pass through fees (but were free to pass through rebates), a potential conflict of interest would still exist as there would exist an incentive to minimize fees at the potential expense of other factors important to order execution.

[443] *See* section V.D.1 for a discussion of the potential costs of a smaller tick size.

[444] *See* section V.D.3.

[445] *See* section V.D.3 and section V.E.2.a.

[446] Some of these adjustments might constitute new rather than accelerated costs if they are incompatible with future data feeds under MDI's competing consolidator model.

[447] This thought experiment considers only the direct effect of the reduction in spread on the tick size in order to define what it means to be tick-constrained. Note that the spread is unlikely to ever be zero due to inventory costs, adverse selection risks, the direct costs associated with providing liquidity, and trading rules meant to prevent the locking and crossing of markets. *See* P.C. Kumar, *Bid-Ask Spreads in U.S. Equity Markets,* 43 Q. J. Bus. & Econ 85 (2004).

[448] For the purpose of empirically identifying stocks that are constrained by the $0.01 tick; tick-constrained stocks are those with time weighted quoted spreads equal to $0.011 or less calculated during regular trading hours on a given day. *See supra* note 17 and accompanying text defining ''tick-constrained'' for the release, and *infra* Table 4 and accompanying text. Because of the $0.01 minimum pricing increment for NMS stocks priced equal to or greater than $1.00 per share, a stock cannot have a quoted spread less than $0.01 unless markets become locked or crossed. The existence of locked and crossed markets can in some cases result in time weighted quoted spread that are very slightly lower than $0.01. Even for stocks with spreads most constrained by the tick, a large trade can exhaust liquidity deeper in the limit order book such that the stock's quoted spread temporarily increases from $0.01. Thus, time weighed quoted spreads will virtually always be greater than $0.01. Consequently, the Commission has selected the threshold of $0.011 as the threshold that identifies stocks that are likely tick-constrained. These stocks quote at $0.01 most of the time and thus could be considered tick-constrained.

[449] Empirically, near-tick-constrained stocks are defined as those with time average quoted spreads between $0.011 and $0.02 during regular trading hours.

improve the price and offer a narrower spread, but not to the point where they are willing to narrow the spread by an entire tick. In the first 5 months of 2022 approximately 56% of share volume transacted in NMS stocks was considered to be tick-constrained while an additional 16% traded in stocks that was considered to be near-tick-constrained.[450] Thus, approximately 72% of share volume transacted in stocks that are tick or near-tick-constrained during that time period.

Access fees and their associated rebates tend to increase transaction costs for demanders of liquidity as well as exacerbate a problem of liquidity oversupply for stocks with narrow spreads while doing very little to enhance liquidity in stocks with wide spreads.[451] Broadly speaking, spreads reflect a price of liquidity and, when they are constrained to be wider than they could otherwise be, a greater amount of liquidity will be supplied at the constrained price point. This extra liquidity supply corresponds to longer limit order queues, which makes it more difficult for non-high-frequency traders to execute their trades via passive orders. Thus, they will resort to using liquidity-demanding orders more frequently, thus increasing transaction costs.[452] In the current predominant maker-taker structure, where demanders of liquidity pay an access fee while providers of liquidity receive a rebate, the fee and rebate effectively widen the spread. In other words, the distortion from being tick-constrained is exacerbated by adding the access fee and rebates, which further effectively widens an already too wide spread.

The lack of harmonization between quoting and trading increments has also restricted the degree to which exchanges and ATSs can compete on price with OTC market venues.[453] This competitive disparity is particularly acute in competition for order-flow in tick-constrained and near-tick-constrained stocks where the ability to publicly quote a more competitive price is restricted.

Some minimum pricing increment is necessary for proper functioning of markets.[454] The problem of coordinating across multiple venues and participants suggests a role for setting a price increment through regulation rather than leaving it to market forces. In principle, variation in fees and rebates across trading venues could allow for a degree of intra-tick pricing, though it has offsetting costs in terms of fragmentation and complexity, making it an inefficient solution.[455]

The Commission does not believe that exchanges will lower access fees or their associated rebates absent the proposed regulatory action to lower the access fee cap. Contrasted with marketable orders, market participants have greater discretion in the routing of liquidity-supplying orders. Under rule 611, the NBBO restricts the routing behavior of marketable orders and often forces liquidity demanders to pay the access fee to trade against a NBBO order. Exchanges are thus incentivized to attract more competitively priced liquidity with large rebates, which are funded by similarly large access fees, in order to capture more trading volume. The effects of these incentives are evident: both average fees and rebates have remained near the 30 mil access fee cap introduced in 2005, despite technological and market structure changes.[456] The Commission believes that the exchanges do not lower their access fees and rebates because a unilateral reduction in rebates would likely cause market participants to route their competitive liquidity-providing orders to another exchange.[457]

C. Baseline

A significant fraction of total trading volume occurs in stocks that are tick- or near-tick-constrained, which can cause them to trade at spreads wider than they would otherwise.[458] Access fees, which are frequently used to fund rebates to liquidity providers, increase the relative cost of demanding liquidity, particularly for stocks with narrower spreads. Exchange access fees and rebates are also complex. Lastly, the delay in the implementation of the MDI Rules postpones their anticipated benefits.

1. Tick Sizes

Rule 612 of Regulation NMS establishes tick sizes and applies to ranking, accepting, and displaying quotes. In determining what tick size is optimal for any given stock, there is a tradeoff between price competition on the one hand, and incentives for liquidity provision on the other. A smaller tick allows liquidity providers to better compete on price. On the other hand, a smaller tick can also leads to

[450] *See supra* note 17 for a definition of tick-constrained, and *supra* note 449 for a definition of near-tick-constrained. *See infra* note 458 for discussion of near-tick-constrained stocks. *See also* Table 4 and surrounding text for a further discussion of volumes associated with tick-constrained and near-tick-constrained stocks.

[451] The effect of access fees and rebates as incentives becomes less pronounced as spreads widen. For example, if the spread is 10 cents wide, an access fee of 30 mils would represent only 6% of the half spread. Thus, as spreads widen the effectiveness of rebates to induce liquidity provision diminishes.

[452] *See infra* sections V.C.1.c and V.C.2 for additional discussion on why the trading environment of tick-constrained stocks tends to favor high-frequency traders.

[453] *See* section V.C.1.b and section V.C.1.a for discussion of how applying a minimum pricing increment to quotes but not trades limits price competition between exchanges and ATSs and other OTC market venues.

[454] *See, e.g.,* Lawrence E. Harris, *Minimum Price Variations, Discrete Bid–Ask Spreads, and Quotation Sizes,* 7 Rev. Fin. Stud. 149 (1994). *See also* Anne Dyhrberg, et al., *When Bigger is Better: The Impact of a Tiny Tick Size on Undercutting Behavior,* J. Fin. & Quantitative Analysis (2022).

[455] For example, consider the case of one maker-taker and one inverted exchange, both with rebates and fees equal to 20 mils with both exchanges quoting a 1.01x1.02 spread. Using net-fee/rebate prices, the maker-taker exchange would effectively be quoting at 1.008x1.022 whereas the inverted exchange would be quoting at 1.012x1.018. The degree of intra-spread pricing would be limited to the number of exchanges and the variation in their fees and rebates. For example, a market with 3 exchanges could collectively make possible only 3 intra-spread levels to any one market participant at a time. *See infra* section V.D.3 for a discussion of intra-tick pricing. *See infra* section V.C.2 for a discussion of current state of the fees and rebates and the variation in pricing structure across exchanges.

[456] Technological advances that would improve the efficiency of exchange functions such as matching trades, as well as changes in the market environment such as the proliferation of high frequency market making that increases the amount of trading volume, could increase the feasibility for exchanges to lower fees and/or rebates without reducing revenues.

[457] The Commission believes that the exchanges do not lower their access fees and rebates because doing so may cause the exchange to lose market share. Notably, research surrounding a NASDAQ experiment where it unilaterally lowered fees and rebates found that NASDAQ lost market share to other maker-taker venues with a higher rebate. *See, e.g.,* Yiping Lin, et al., *A Model of Maker-Taker Fees and Quasi-Natural Experimental Evidence* (working paper Feb. 8, 2021), *available at https://ssrn.com/abstract=3279712* (retrieved from SSRN Elsevier database). Consequently, it could be harmful to an exchange to unilaterally reduce access fees and their associated rebates if other exchanges do not follow suit. Further, even if each of the exchanges lowered its fees, there would be the risk that a new exchange would see the opportunity and enter the market with high fees and rebates and thus capture market share, inducing the other exchanges to abandon their low fee models to remain competitive.

[458] As a concept, the degree to which a stock is tick-constrained lies on a continuum. At one end of the continuum are stocks that would always trade narrower if the tick size constraint was relaxed, and on the other are stocks that would only rarely trade narrower than the current tick size given a smaller tick. For empirical purposes tick-constrained stocks are defined as in *supra* note 17. *See also* section I.A, and *supra* note 448 for additional details. We define near-tick-constrained stocks as those with time average quoted spreads less than two ticks wide ($0.02) but greater than $0.011 (the threshold for being defined as tick-constrained) during regular trading hours. *See supra* note 449. In contrast to tick-constrained stocks which quote at the tick size all or most of the time, near-tick-constrained stocks will alternate between quoting at the tick size or at one tick size wider implying that that they are sometimes tick-constrained and other times not tick-constrained. *See also* Table 4 and surrounding text for a further discussion of volumes associated with tick-constrained and near-tick-constrained stocks.

pennying, which reduces the economic gains to posting liquidity, leading to a lower incentive to post liquidity.[459] The tick size determines the minimum amount of price improvement required to gain priority over existing quotes, as the tick size gets smaller the value of time priority at a price becomes less important.[460] Other considerations include market complexity and the spreading of liquidity over more price levels (though it is also the case that market complexity may increase with wider ticks, as participants adjust to inefficient pricing), and the fact that too small ticks may inefficiently award speed.[461] As discussed below in Section V.C.1.c, the Commission estimates that 72% of share volume and 45% of dollar volume in U.S. equity markets occurs in stocks that are tick or near-tick-constrained stocks, suggesting that for many stocks the tick size may be a hindrance to market quality.

a. Current Regulations

Rule 612 of Regulation NMS, which was adopted on April 6, 2005, and had a compliance date of January 31, 2006, prohibits a national securities exchange, national securities association, ATS, vendor, or broker or dealer from displaying, ranking, or accepting quotations, orders, or indications of interest in any NMS stock priced in an increment smaller than $0.01 if the quotation, order, or indication of interest is priced equal to or greater than $1.00 per share. If the quotation, order, or indication of interest is priced less than $1.00 per share, the minimum pricing increment is $0.0001. Most listing exchanges require stocks listed on their exchanges to maintain a price greater than $1.00 per share, and consequently $0.01 is the prevailing tick size for most quotes and orders for NMS Stocks.[462] Regulation NMS effectively establishes $0.01 as the minimum spread that can be quoted for stocks priced equal to, or greater than, $1.00 per share because the NBBO is determined by the best displayed round lot quotes, and locked and crossed markets are prohibited.

b. Sub-Penny Transactions

While NMS stocks cannot be quoted in a sub-penny increments, they may trade in sub-penny increments.[463] Sub-penny trading on exchanges and ATSs occurs in limited circumstances while sub-penny trading by off-exchange market makers occurs more often. Sub-penny trading on exchanges and ATSs occurs primarily as a result of midpoint orders and benchmark trades. Benchmark trades, such as VWAP and TWAP orders, may not be explicitly priced in an impermissible sub-penny increment, but the ultimately determined execution price may be in a sub-penny increment. Additionally, ATSs sometimes offer order types where the execution price is determined to be some fraction of the way between the prevailing midpoint and the NBB or NBO. Sub-penny trading on registered exchanges may also occur as a result of their RLPs. Since 2012, the Commission has offered limited exemptive relief from rule 612 for these programs so that they may offer qualifying retail trades price improvement relative to the NBBO, usually in increments of $0.001.[464] Exchanges established RLPs as a competitive response to the various market structure and trading dynamics that divert retail order flow from exchanges to OTC market makers, referred to as wholesalers, who can trade more readily in sub-penny increments.[465]

ATSs also offer sub penny transactions separate from midpoint or benchmark trades. Some ATSs offer order types which effectively split the distance between the NBB or NBO and the midpoint. These trades offer price improvement to the liquidity demander—though not at the same levels as a midpoint trade—while still enabling the liquidity provider to earn at least some spread on the transaction. They are a form of pre-set price-improvement trades.

Trading at sub-penny increments also occurs as a result of broker-dealers, including some OTC market makers known as wholesalers, internalizing customer order flow at sub-penny prices.[466] OTC market makers, including wholesalers, receive market orders and offer price improvement over the NBBO for the orders they receive, which often originate from individual investors, often in sub-penny increments.[467] For example, if a broker-dealer acting as a wholesaler, has two customers, and one submits a market order to buy a stock while the other submits a market order to sell a stock, the wholesaler is not required to send those orders to an exchange or ATS for execution. Rather, the broker-dealer can internalize the two trades by executing both against internal inventory; it could also cross the two trades internally at a price that is within the NBBO because doing so would not involve a quote subject to rule 612, or it could route some or all of the trades to an exchange or ATS for execution. If the wholesaler chooses to act in a principal capacity and transact both orders against its own inventory—earning the bid-ask spread in the process—the wholesaler can execute the order in any pricing increment that it chooses so long as the wholesaler meets its best execution obligation.[468] Increments of $0.01, $0.001 and $0.0001 are typical in off-exchange trading.[469] Using data from FINRA for the first quarter of 2022, we estimate that wholesalers internalized approximately 24% of all share volume.[470]

[459] The term 'pennying' refers to when a market participant gets to the front of the queue by posting an economically trivial price improvement.

[460] *See* text at *infra* note 478 for a further discussion of this effect.

[461] *See* Barardehi, et al. (2022), *supra* note 85, for additional analysis of this tradeoff.

[462] *See, e.g., NYSE Continued Listing Standards, § 802.01C, available at https://www.nyse.com/listings/resources* (last visited Sept. 29, 2022); *The Nasdaq Stock Market LLC Rules, § 5400, available at https://listingcenter.nasdaq.com/rulebook/nasdaq/rules* (last visited Sept. 29, 2022).

[463] *See supra* section II.F.4.

[464] NYSE Retail Liquidity Program Approval Order, *supra* note 62. *See supra* note 62 and accompanying text for a discussion regarding exchange RLPs. *See also* Pankaj K. Jain, et al., *An Examination of the NYSE's Retail Liquidity Program,* 80 Q. Rev. Econ. Fin. 367 (2021), for a discussion of and analysis of NYSE's RLP.

[465] *See* Sean Foley, et al., *Tick Size Wars: The Market Quality Effects of Pricing Grid Competition* (working paper Dec. 2, 2021), *available at https://ssrn.com/abstract=2866943* (retrieved from SSRN Elsevier database).

[466] The term ''wholesaler'' is not defined in Regulation NMS, but commonly refers to a broker-dealer acting as an OTC market maker that primarily focuses on attracting orders from broker-dealers that service the accounts of a large number of individual investors, referred to in this release as ''retail brokers.''

[467] Based on analysis of retail broker rule 606(a)(1) reports, there are six broker-dealers classified as wholesalers.

[468] If the wholesaler uses proprietary data feeds that offer a more complete view of the market than the SIP feeds offers—for example—for their own trades, then FINRA would expect that wholesaler to use that same data to determine the range of prices at which the broker can internalize trades. *See* FINRA, Regulatory Notice 15–46, 1, 3 n.12 (2015) (''The exercise of reasonable diligence to ascertain the best market under prevailing market conditions can be affected by the market data, including specific data feeds, used by a firm. For example, a firm that regularly accesses proprietary data feeds, in addition to the consolidated SIP feed, for its proprietary trading, would be expected to also be using these data feeds to determine the best market under prevailing market conditions when handling customer orders to meet its best execution obligations.''). *See also* Securities Exchange Act Release No. 65895 (Dec. 5, 2011), 76 FR 77042 (Dec. 9, 2011) (approving FINRA Rule 5310 on best execution).

[469] However, research suggests that $0.0001 is a common increment used by wholesalers. *See* Ekkehart Boehmer, et al., *Tracking Retail Investor Activity,* 76 J. Fin. 2249 (Oct. 2021).

[470] FINRA OTC (Non-ATS) Transparency Data Monthly Statistics provides monthly information on wholesaler execution volumes. This data, is combined with Cboe historical market volume data,

Not all price improvement occurs in sub-penny increments. A trade receives price improvement if it transacts at a price superior to the NBBO. Trades can transact inside the NBBO on an exchange due to an odd-lot order priced better than the NBBO or due to hidden orders. Table 3 provides price improvement statistics for the first half of 2022.[471] Summing the total dollar value of price improvement associated with trades that execute in sub-penny increments that are not midpoint trades (rows 5, 7, 9, and 11) reveals that approximately 18% of the daily dollar value of price improvement, or approximately $12 million, was from trades which transacted at a sub-penny pricing increment and was not associated with a midpoint or VWAP trade—*i.e.,* trades that make use of the fact that rule 612 does not apply to trading.[472] Of this value, 11% occurred on exchange, and the remaining 89% occurred off exchange. Extrapolating from these estimates, by multiplying the $12 million of price improvement in trades which executed at sub-penny pricing increments by 252 trading days, suggests that sub-penny pricing enabled by rule 612 not applying to trades offers investors price improvement relative to the NBBO of approximately $3 billion per year.

TABLE 3—PRICE IMPROVEMENT STATISTICS DAILY AVERAGE JAN. TO JUNE 2022 [a b]

Panel A: Price Improvement Volume

Row	Midpoint	On or off exchange	Odd or round lot	Sub-penny	Number of trades (millions)	Share volume (millions)	Dollar volume (billions)
1	Yes	On	Odd		3.8	85.9	7.3
2	Yes	On	Round		2.9	488.8	23.8
3	Yes	Off	Odd		2.1	35.9	3.7
4	Yes	Off	Round		2.4	735.1	37.3
5	No	On	Odd	Sub-Penny	0.4	9.5	0.6
6	No	On	Odd	Penny	12.5	249.7	42.0
7	No	On	Round	Sub-Penny	0.7	130.2	4.7
8	No	On	Round	Penny	2.8	369.9	38.9
9	No	Off	Odd	Sub-Penny	3.7	64.6	7.8
10	No	Off	Odd	Penny	1.5	27.9	6.0
11	No	Off	Round	Sub-Penny	2.6	1413.3	60.0
12	No	Off	Round	Penny	0.9	219.4	22.9

Panel B: Daily Average Price Improvement Total

Row	Midpoint	On or off exchange	Odd or round lot	Sub-penny	PI (millions of dollars)	Total (%)	PI (BPS)
1	Yes	On	Odd		2.0	3.0	5.7
2	Yes	On	Round		6.3	9.3	7.6
3	Yes	Off	Odd		1.5	2.3	7.0
4	Yes	Off	Round		14.1	20.8	8.2
5	No	On	Odd	Sub-Penny	0.2	0.3	5.9
6	No	On	Odd	Penny	11.5	16.9	4.8
7	No	On	Round	Sub-Penny	1.1	1.6	7.1
8	No	On	Round	Penny	10.7	15.8	7.0
9	No	Off	Odd	Sub-Penny	1.4	2.0	3.1
10	No	Off	Odd	Penny	1.7	2.5	6.2
11	No	Off	Round	Sub-Penny	9.2	13.6	3.7
12	No	Off	Round	Penny	8.0	11.8	8.9

and U.S. historical market volume data FINRA data. *See OTC Transparency Data,* FINRA, *available at https://otctransparency.finra.org/otctransparency/OtcData* (last visited Sept. 29, 2022); *see also Historical Market Volume Data,* Chi. Bd. Options Exch., *available at https://cboe.com/us/equities/market_statistics/historical_market_volume/* (last visited Sept. 29, 2022).

[471] The analysis uses data from prior to the implementation of the MDI Rules and once implemented, the changes to the current arrangements for consolidated market data may impact the numbers reported in Table 3 and throughout, including by reducing those for realized spread, effective spread, and amount of price improvement. The NBBO will likely tighten in stocks priced greater than $250 because it will be calculated based on a smaller round lot size. A tighter NBBO spread could increase the number of NMS stocks which are considered tick-constrained or near-tick-constrained. *See infra* section V.C.3. The effects on effective and realized spreads is more uncertain, because they are measured against the NBBO midpoint, which may not change if both the NBB and NBO decrease by the same amount. However, if marketable orders are more likely to be submitted when there are imbalances on the opposite side of the limit order book (*i.e.,* more marketable buy orders are submitted when there is more size on the offer side of the limit order book than the bid side), then the NBBO midpoint may change such that it is closer to the quote against which the marketable order executes, which may decrease the effective and realized spreads in stocks above $250 when the MDI Rules are fully implemented. It is also uncertain how or to what degree these changes would affect the proportion of trading volume that executes off-exchange. This analysis is qualitatively and quantitatively similar to the analysis provided by NYSE in its NYSE Tick Harmonization Paper, *supra* note 70.

[472] For the purposes of this analysis a sub-penny transaction is any regular trade for which the execution price of the trade is not a multiple of $0.01. *See* Table 3 note a.

TABLE 3—PRICE IMPROVEMENT STATISTICS DAILY AVERAGE JAN. TO JUNE 2022 [a] [b]—Continued

Row							
Total PI.	.....	.....	.....	.....	67.8	100	.....

[a] This table provides estimates of the average daily volume of trades receiving some form of price improvement from Jan. 2022 to June 2022, as well as estimates of the magnitude of the price improvement received. For purposes of this table, a trade is determined to have received price improvement if it occurred within the prevailing NBBO at the time of the trade. The numbers in the table represent daily averages. Panel A provides statistics for the total number of trades as well as the total share and dollar volume of trades that receive some form of price improvement while Panel B provides estimates of the total dollar value of the price improvement that is received. Price improvement statistics are computed for 12 categories of trade representing a unique combination of trading volume associated with midpoint, on versus off exchange, round versus odd-lot, and sub-penny versus penny transactions. The analysis includes all normal trades that execute during normal trading hours from TAQ. Normal trades are identified in TAQ data by sale conditions "blank, @, E, F, I, S, Y" which correspond to regular trades, intermarket sweep orders, odd lot trades, split trades, and yellow flag regular trades. A trade receives price improvement if it executes inside the prevailing NBBO. Price improvement for trades that occur above the prevailing midpoint is equal to the (NBO − price)*number of shares transacted, for trades that occur below the prevailing midpoint price improvement is equal to the (price − NBB)*number of shares transacted. For trades that occur at the midpoint price improvement is equal to one half the spread between the NBO and NBB multiplied by the number of shares transacted. Estimates are provided based on midpoint, location of the trade, odd-lot status, and sub-penny status. A trade is defined as a midpoint trade if it occurs at exactly the midpoint of the NBB and NBO at the time of the trade. Off exchange trades are those with exchange code 'D' attached to the trade. Odd-lot trades are trades in sizes other than multiples of 100, and sub penny trades are those executing in prices with three or more decimal places.

[b] *See* MDI Adopting Release, *supra* note 5. The effect of amending the definition of odd-lot information to include the best odd-lot quotes and accelerating the inclusion of odd-lot information might be marginal should the proposal described in a Mar. 2022 request for comment by the SIPs, CTA/UTP SIP Odd-Lot Request for Comment (*available at https://www.ctaplan.com/publicdocs/ctaplan/CTA_Odd_Lots_Proposal_2022.pdf*), be filed with the Commission as a proposed Plan amendment and approved. Even if that proposal were filed with the Commission and approved, however, it would result in the provision of less odd-lot information than would become available under this proposed rule. *See supra* notes 374, 386.

c. Tick Sizes and Quoted Spreads

Table 4 presents data on trading volume in the first five months of 2022 based on average time weighted quoted spreads. The analysis breaks trading volume each day into one of 16 average quoted spread buckets. The first bucket is for tick-constrained stocks, which we define empirically as stocks that have time weighted quoted spreads less than or equal to $0.011 on a given day.[473] The second bucket is for near-tick-constrained stocks with quoted spreads less than $0.02. Each succeeding bin increases the spread by $0.01 until the last bin which contains all stocks with quoted spreads greater than $0.15. This analysis indicates that 56% of share trading volume (23% of dollar volume) occurs in stocks that are tick-constrained. That is, in the absence of a one cent tick, these stocks would likely have quoted spreads that are narrower than what they currently experience. Table 4 also reports that 15% of share volume (22% of dollar volume) occurs in stocks that are near-tick-constrained. Table 4 also reports the daily average number of stocks in each bin.

TABLE 4—SHARE VOLUME BY QUOTED SPREAD JAN. TO MAY 2022 [a]

Quoted spread	Share volume (%)	Dollar volume (%)	Average # stocks
Quoted Spread < $0.011	56.1	23.2	1,337
$0.011< Quoted Spread <= $0.02	15.5	21.7	1,093
$0.02 < Quoted Spread <= $0.03	7.8	9.8	1,170
$0.03 < Quoted Spread <= $0.04	4.2	5.7	946
$0.04 < Quoted Spread <= $0.05	2.5	3.2	762
$0.05 < Quoted Spread <= $0.06	1.8	2.5	629
$0.06 < Quoted Spread <= $0.07	1.2	1.8	531
$0.07 < Quoted Spread <= $0.08	1.2	2.1	468
$0.08 < Quoted Spread <= $0.09	1.0	1.7	426
$0.09 < Quoted Spread <= $0.10	0.9	1.5	383
$0.10 < Quoted Spread <= $0.11	0.8	1.3	337
$0.11 < Quoted Spread <= $0.12	0.7	1.1	279
$0.12 < Quoted Spread <= $0.13	0.6	1.0	243
$0.13 < Quoted Spread <= $0.14	0.5	0.9	214
$0.14 < Quoted Spread <= $0.15	0.5	0.8	190
$0.15 < Quoted Spread	4.8	21.6	2,500

[a] This table provides share volume by stocks with different quoted spread profiles. To create this table, for each day the universe of stocks covered in the WRDS Intra-Day Indicators data are assigned into one of the 16 quoted spread bins based on that days' time-weighted quoted spread as computed by WRDS Intra-Day Indicators. Then all share and dollar trading volume across all trading days in Jan.–May 2022 is aggregated for each of the 16 quoted spread bins. Percentages based on these totals are then computed. This table also presents the daily average number of stocks in each bin. To compute this variable, for each trading day in Jan.–May 2022 the number of stocks in each bin is tabulated, then the average across all trading days is presented here. Certain items in this Table 4 may also be affected by the MDI Rules once they are fully implemented. *See* Table 3 note b.

[473] Other studies may define tick-constrained stocks differently. *See also supra* note 17 and *supra* note 448 and accompanying text defining and discussing "tick-constrained" for the release.

For tick-constrained stocks, spreads are potentially wider than they would otherwise be. Wider quoted spreads mean greater cost to liquidity demanders and greater revenue to liquidity suppliers.[474] An artificially wide spread due to the tick constraint subsidizes liquidity provision. Because the compensation is above what would exist in a competitive market there is an increased incentive to provide liquidity via limit orders, so queues of limit orders tend to be longer, wait times to get a limit order executed also tend to be longer, and, thus the likelihood that the market moves away from an investor's limit order increases, leading to lower overall fill rates for limit orders.[475] These dynamics mean that some investors who might originally have wanted to trade using a limit order and earn the quoted spread instead trade using a marketable order and pay the quoted spread.[476] There is also evidence that when tick sizes are too wide volatility can increase.[477]

When a stock is tick-constrained or near-tick-constrained it is particularly important for a liquidity provider to get its quote to the front of the queue (*i.e.,* establish price/time priority on an order book). Stock exchange priority rules give greater priority to better priced orders and generally factor order entry time into the priority of limit orders at the same price. Because liquidity providers cannot establish price priority in when the NBBO spread is one tick, establishing time priority becomes more important.[478] Consequently, an environment where stocks are tick-constrained with artificially wider spreads and longer order queues tends to favor traders who are better able to establish positions more quickly so they can be at the front of the queue. Often the key differentiator to get to the front of the queue, and to avoid unfavorable executions once there, is speed.[479] If a liquidity provider is too slow to establish a new quote, then that quote could be buried in the queue. Conversely, even with a favorable position in the queue, if the market moves in an economically disadvantageous manner to a liquidity provider, it will seek to avoid an adverse execution (*e.g.,* by canceling an order) and adjust its order to account for the new prevailing price of the NBB (NBO). Liquidity providers that are too slow run the risk of having their now-stale quote ''sniped.'' [480] Sniping is costly to those liquidity providers who get sniped and, so, effectively adds to adverse selection risk for slower liquidity providers.[481]

Trading quality among stocks that are near-tick-constrained, can also be significantly affected by the tick size.[482] For example, consider a stock that would otherwise trade at an offer price of $10.015 and a bid of $10.005 absent the $0.01 tick. This stock would have a spread of $0.01. However, due to tick constraints the stock will quote at the best feasible ask price above $10.015 [483] which is $10.02 and the best feasible bid price below $10.005 which is $10.00.[484] Consequently, due to the tick constraint, the stock's actual quoted spread is $0.02 instead of $0.01, or 100% wider than the spread would otherwise be. According to the analysis in Table 4 approximately 16% of trading volume occurs in stocks that are near-tick-constrained. Combining this volume with the 56% of trading volume that occurs in tick-constrained stocks means that approximately 72% of share trading volume in current markets occurs in stocks that are tick-constrained or near-tick-constrained.

2. Access Fees

The market for trading services in NMS stocks where traders either demand or supply liquidity is primarily served by the national equity exchanges and ATSs along with 6 wholesalers who internalize large portions of individual investor order flow. Exchanges and ATSs charge an access fee or pay a rebate to either those demanding liquidity or to those supplying it. Liquidity is typically provided through the provision of passive limit orders, which commit to execute against marketable orders that take liquidity. Rebates are typically captured by traders, such as market makers and some high-frequency traders, which specialize in the provision of liquidity and access fees are typically paid by demanders of liquidity.

Rule 610(c) limits exchange fees for accessing protected quotations with prices of $1.00 per share or greater to $0.0030 per share (or 30 cents per 100 shares). This level is commonly referred to as 30 mils. The rule also prohibits access fees in excess of 0.3% of the price for stocks priced less than $1.00 per share. The 30 mil fee cap was adopted as a part of Regulation NMS in conjunction with the order protection rule and was implemented to prevent exchanges from charging excessive fees to orders that were required to trade with a protected quote. The 30 mil fee

[474] Market participants can use inverted exchanges or ISO orders to help ameliorate some of the negative effects of tick size constraints.

[475] *See e.g.,* Barbara Rindi and Ingrid M. Werner, *U.S. Tick Size Pilot* (working paper Mar. 4, 2019), *available at https://ssrn.com/abstract=3041644* (retrieved from SSRN Elsevier Database); Mao Ye and Chen Yao, *Tick Size Constraints, Market Structure and Liquidity* (working paper Dec. 26, 2019), *available at https://ssrn.com/abstract=2359000* (retrieved from SSRN Elsevier database); Phil Mackintosh, *Why Ticks Matter,* Nasdaq (May 19, 2022), *available at https://www.nasdaq.com/articles/why-ticks-matter;* and MEMX Report, *supra* note 105.

[476] *See, e.g.,* Roberto Riccó et al., *Optimal Market Asset Pricing* (working paper Feb. 4, 2021), *available at https://ssrn.com/abstract=3779195* (retrieved from SSRN Elsevier database) (showing in a theoretical model that rebates can be optimal for exchanges because they both induce and attract high-frequency trading activity).

[477] *See, e.g.,* Edwin Hu, et al., *Tick Size Pilot Plan and Market Quality* (DERA White Paper, Jan. 31, 2018), *available at https://www.sec.gov/files/dera_wp_tick_size-market_quality.pdf;* Hendrick Bessembinder, *Trade Execution Costs and Market Quality After Decimalization,* 38 J. Fin. & Quantitative Analysis 747 (2003); and Tavy Ronen and Daniel G. Weaver, *Teenies Anyone?,* 4 J. Fin. Mkt. 231 (2001).

[478] An order with time priority is executed first when multiple orders are at the best price, regardless of how many orders are at the best price. In longer order queues, liquidity-providing orders deeper in the queue, which do not have time priority, are less likely to be filled in a timely manner and, conditional on being filled, the probability of the order having been adversely selected tends to be greater compared to orders with greater fill priority. Typically, liquidity providers compete to gain priority over other resting orders by quoting a better price but tick-constraints make doing so difficult. In the case when the spread is constrained to a single tick, it would be impossible to improve on the displayed price without locking markets. Even for near-tick-constrained stocks, when the quoted spread may be greater than a single tick, improving the price by an entire tick may be too much in the sense that doing so may narrow the spread beyond what the liquidity providers could tolerate. A narrower tick de-emphasizes time priority on a stock exchange by making it easier to compete on price. *See* Hu, et al. (2018), *supra* note 477; and Todd G. Griffith and Brian S. Roseman, *Making Cents of Tick Sizes: The Effect of the 2016 U.S. SEC Tick Size Pilot on Limit Order Book Liquidity,* 101 J. Banking Fin. 104 (2019).

[479] *See, e.g.,* Chen Yao and Mao Ye, *Why Trading Speed Matters: A Tale of Queue Rationing Under Price Controls,* 31 Rev. Fin. Stud. 2157 (2018).

[480] Sniping occurs when prices move against a quote and a very fast market participant executes the now stale quote before the quote submitter can cancel the now stale quote. *See* Sida Li, et al., *Who Provides Liquidity, and When?,* 141 J. Fin. Econ. 968 (2021).

[481] *Id.*

[482] *See supra* notes 449 and 458 for the empirical definition and discussion of near-tick-constrained stocks. Near-tick-constrained stocks are those with time average quoted spreads greater than $0.011 and less than $0.02.

[483] This assumes that stock prices are expected to revert to the next worse level. This may occur because standard economic theory suggests that in a competitive market liquidity providers will compete to provide liquidity until the spread—*i.e.,* their compensation for providing liquidity—is equal to the break-even point for liquidity provision. *See also* Jonathan Brogaard and Corey Garriott, *High-frequency Trading Competition,* 54 J. Fin. & Quantitative Analysis 1469 (2019) (documenting that as more high-frequency liquidity providers enter the market, spreads decrease until they converge to competitive levels).

[484] The range of infeasible quoting prices narrows somewhat in the presence of rebates for liquidity providers. Section V.C.2 discusses these effects.

cap was also determined based on existing market practices.[485] Rule 610(c) only regulates fees to access protected quotes; it does not regulate fees to access non-protected quotes, nor does it regulate rebates that exchanges can offer. However, the 30 mil fee cap has become a central component of the structure of fees and rebates as access fees for non-protected quotes generally do not exceed the 30 mil fee cap, nor do average rebates.

Fee/rebate schedules can be quite complex, and the fee schedules change frequently.[486] The actual fee or rebate that an investor is assessed on most exchanges also generally depends on which tier a market participant falls into based on trading volume in that month, with higher volume market participants receiving a higher rebate or a lower fee.[487] Exchanges file their fee and rebate schedules with the Commission and post them on their websites, which means that the rebate and fee rates associated with each volume based tier can be known at the time a market participant trades. However, market participants may not know which volume based tier they would fall under at the time of the trade (and thus the fee or rebate rate that would apply to their particular trade) because the volume tier they would fall under is determined based on their trading volume during the current month, which is not finalized until the end of the month.[488] More specifically, the volume based fees or rebates a market participant receives from an exchange are often determined by a market participant's average total daily traded share volume on the exchange during the month as a percentage of either the average total daily market volume reported by one of the consolidated tapes during the month or as a percentage of the average total daily market volume reported by all consolidated tapes during the month.[489]

Some information on average exchange fees and rebates is also available through reports available under rule 606. With respect to held orders, rule 606(a)(1) requires broker-dealers to produce quarterly public reports regarding their routing of non-directed orders[490] in NMS stocks that are submitted on a held basis. Along with other information, these reports require the broker-dealer to report both the total dollar amount and per share average of net transaction fees paid and net transaction rebates received for different order types for each trading venue to which the broker-dealer reports routing orders.[491] Additionally, rule 606(b)(3) requires broker-dealers to produce reports pertaining to order handling upon the request of a customer that places, directly or indirectly, one or more orders in NMS stocks that are submitted on a not held basis, subject to a de minimis exception.[492] For each venue to which the broker-dealer routed the customer's orders, these reports require the broker-dealer to disclose, among other things, the average net execution rebate or fee for shares of orders providing liquidity and the average net execution rebate or fee for shares of order s removing liquidity.[493] However, these reports only provide market participants with information on historical average transaction fees and rebates and may not accurately reflect the current exchange fees and rebates a market participate would encounter at the time of its transaction.[494]

The fee structure on an exchange can take one of three forms. The most common is maker-taker, in which liquidity demanders (*i.e.,* takers) are assessed the access fee and liquidity providers (*i.e.,* makers) are offered a rebate. Exchanges can also be inverted (also known as taker-maker), in which liquidity demanders are offered a rebate and liquidity providers are assessed an access fee. The last form of fee structure is flat; a flat exchange either charges one or both sides a fee but does not offer rebates. While the exchanges are free to subsidize rebates beyond what they earn through collecting access fees, in practice this does not appear to happen.[495] The difference between the average access fee charged and the average rebate paid is the net capture earned by the exchanges for facilitating a transaction.

The regulatory access fee cap is most relevant for maker-taker markets where the trader accessing a protected quote must pay the access fee. This is because the access fee cap applies only to fees for accessing protected quotations and does not apply to fees for posting quotations. Therefore, on an inverted venue the exchange is not restricted by rule 610 in terms of the rebate that it can offer to access a protected quote or the fee to post a protected quote.[496] Flat rate

[485] *See* Regulation NMS Adopting Release, *supra* note 16, at section I.C.2 (page 28 in the SEC version) which states that the selection of the access fee cap was chosen because ''it will not seriously interfere with current business practices'' and ''[i]n the absence of a fee limitation, some 'outlier' trading centers might take advantage of the requirement to protect displayed quotations by charging exorbitant fees to those required to access the outlier's quotations.''

[486] *See* Table 5 for information on how often exchanges amend their fees.

[487] *See* Letter from Richard Steiner, Electronic Trading Strategist, RBC Capital Markets, to Brent Fields, Secretary, Commission (Oct. 16, 2018), *available at https://www.sec.gov/comments/s7-05-18/s70518-4527261-176048.pdf* (commenting on the transaction fee pilot).

[488] *See* Chester Spatt, *Is Equity Market Exchange Structure Anti-Competitive?,* (Dec. 28, 2020) (unpublished manuscript), *available at https://www.cmu.edu/tepper/faculty-and-research/assets/docs/anti-competitive-rebates.pdf.* However, not all exchanges offer volume-based tiers in their fee structures. For example, LTSE does not charge fees to transact and IEX does not offer volume based tiering. For exchanges like these, it is possible to determine with certainty the cost to transact prior to executing a trade.

[489] The Equity Data Plans disseminate SIP data over three separate networks: (1) Tape A for securities listed on the New York Stock Exchange (''NYSE''); (2) Tape B for securities listed on exchanges other than NYSE and Nasdaq; and (3) Tape C for securities listed on Nasdaq. These tapes are referred to as the ''consolidated tapes.'' The CTA Plan governs the collection, consolidation, processing, and dissemination of last sale information for Tape A and Tape B securities. The CQ Plan governs the collection, consolidation, processing, and dissemination of quotation information for Tape A and Tape B securities. Finally, the UTP Plan governs the collection, consolidation, processing, and dissemination of last sale and quotation information for Tape C securities. For details on exchange volume based fees and rebates, *see, e.g., Add and Remove Rates,* NASDAQ, *available at https://www.nasdaqtrader.com/Trader.aspx?id=PriceListTrading2; New York Stock Exchange Price List 2022,* NYSE, *available at https://www.nyse.com/publicdocs/nyse/markets/nyse/NYSE_Price_List.pdf; and Cboe U.S. Equities Fee Schedules EDGX Equities,* Chi. Bd. Options Exch., *available at https://www.cboe.com/us/equities/membership/fee_schedule/edgx/.*

[490] A ''non-directed order'' means any order from a customer other than a directed order. *See* 17 CFR 242.600(b)(56). A ''directed order'' means an order from a customer that the customer specifically instructed the broker or dealer to route to a particular venue for execution. *See* 17 CFR 242.600(b)(27).

[491] Rule 606(a)(1) requires broker-dealers to report separate information for market orders, marketable limit orders, non-marketable limit order, and other orders. *See* 17 CFR 242.606(a)(1) for the items that need to be disclosed in reports under rule 606(a)(1).

[492] *See* 17 CFR 242.606(b)(3). In addition, under rule 606(b)(5)'s customer-level de minimis exception, broker-dealers need not provide upon request execution quality reports for customers that traded on average each month for the prior six months less than $1,000,000 of notional value of not held orders in NMS stocks through the broker-dealer. *See* 17 CFR 242.606(b)(5).

[493] *See* 17 CFR 242.606(b)(3)(iii) and (iv).

[494] Reports under rule 606(a)(1) are produced by broker-dealers at the end of the quarter and disclose information on average fees and rebates for each month in that quarter. Reports issued by broker-dealers to their customers under rule 606(b)(3) disclose summarized information on the handling of the customer's orders for each calendar month over the prior six months. The broker-dealer must issue these reports to the customer within seven business days of receiving the customer's request.

[495] *See infra* section V.D.1 for more discussion on why exchanges may not subsidize rebates from other sources of revenue. *See also* Eric Budish, et al., *A Theory of Stock Exchange Competition and Innovation: Will the Market Fix the Market?* (working paper May 22, 2019) *available at https://ssrn.com/abstract=3391008* (retrieved from SSRN Elsevier database).

[496] As can be seen from Table 5, which presents information on access fees and rebates for the 16 operating exchanges, in practice the fee that is charged on an inverted fee venue to post liquidity

venues, which do not offer rebates, do not appear to be economically constrained by rule 610(c) as their fees for both taking and adding liquidity are significantly lower than the 30 mil fee cap.

Table 5 provides an analysis of current fee and rebate schedules based on rule 19b–4 filings with the Commission for each of the equity exchanges operating in the United States as of June 1, 2022 as well as a review of the transaction prices that each exchange posts.[497] What becomes apparent from this analysis is that the current structure of fees and rebates is complex and consistently changing. On average, each exchange filed 11.4 rule 19b–4 filings per year with the Commission. Market participants interacting with all exchanges had to adjust to an average of 155 fee changes per year across all exchanges. Exchanges also tend to have numerous fee and rebate categories. The effect of the 30 mil fee cap as an anchor point is also apparent. For most exchanges the maximum fee assessed, presumably for non-protected quotes, is close to the 30 mil fee cap for protected quotes. The maximum rebate is generally in the vicinity of 30 mils, further suggesting the 30 mil access fee cap effectively limits what the exchanges offer as rebates.

Panel B provides information on the exchange's fee schedules for stocks priced lower than $1.00. For these transactions the fee schedules tend to be simpler. Most exchanges do not offer a rebate for transactions lower than $1.00 even if the exchange offers rebates for other transactions—only two exchanges offer any sort of baseline rebate.[498] Additionally, the exchanges tend to charge the maximum access fee of 0.3% of the share price. A few exchanges charge a fee to both sides to transact with one exchange charging 0.3% to both sides of a transaction.

TABLE 5—SUMMARY OF TRANSACTION-BASED FEE SCHEDULES FOR U.S. NATIONAL EQUITIES EXCHANGES AS OF MAY 2022 [a]

Panel A: Fees and Rebates for Transactions Greater than $1.00

Exchange	Fee model	Number of revisions Jan 2018–June 2022 (per year)	Date of fee schedule	Fees (number of categories)	Rebates (number of categories)
Cboe BZX [b]	Maker-Taker	98 (21.8)	4/1/2022	$0.0030 (5)	[$0.0000–$0.0032] (11)
Cboe BYX [c]	Inverted	42 (9.3)	5/2/2022	[$0.0010–$0.0030] (10)	[$0.0000–$0.0015] (6)
Cboe EDGA [d]	Inverted	26 (5.8)	4/1/2022	[$0.0008–$0.0030] (12)	[$0.0000–$0.0024] (9)
Cboe EDGX [e]	Maker-Taker	71 (15.8)	5/2/2022	[$0.0000–$0.0030] (7)	[$0.0000–$0.0032] (14)
BX [f]	Inverted	45 (10.0)	10/12/2021	[$0.0010–$0.0030] (9)	[$0.0000–$0.0021] (15)
Phlx (PSX) [g]	Maker-Taker	48 (10.7)	1/2/2022	$0.0030 (1)	[$0.0005–$0.0020] (5)
Nasdaq [h]	Maker-Taker	83 (18.4)	4/12/2022	[$0.0004–$–$0.0030] (3)	[$0.0000–$0.00325] (7)
NYSE Arca [i]	Maker-Taker	77 (17.1)	5/1/2022	[$0.0000–$0.0030] (15)	[$0.0000–$0.0032] (21)
NYSE American	Maker-Taker	11 (2.4)	5/1/2022	[$0.0010–$0.0030] (9)	[$0.0020–$0.0030] (10)
NYSE	Maker-Taker	82 (18.2)	5/1/2022	[$0.0000–$0.0030] (50)	[$0.0000–$0.0030] (69)
NYSE National	Inverted	27 (6.0)	1/2/2022	[$0.0022–$0.0029] (16)	$0.0000 (1)
NYSE Chicago	Maker-Taker	7 (1.6)	5/1/2022	[$0.0010–$0.0010] (5)	$0.0010 (6)
IEX [j]	Flat	19 (4.2)	4/1/2022	[$0.0006–$0.0010] (2)	[$0.000 (1)
Members MEMX [k]	Maker-Taker	NA	6/1/2022	[$0.0000–$0.0030] (3)	[$0.0018–$0.0035] (4)
Miami MIAX [l]	Maker-Taker	NA	9/24/2020	$0.0028 (1)	[$0.0022–$0.0028] (2)
Long Term LTSE [m]	Free	NA	N/A	$0.0000 (1)	$0.0000 (1)

Panel B: Fees and Rebates for Transactions Under $1.00

Exchange	Fee model	Rebate	Fee	Charged both sides
Cboe BZX	Maker-Taker	0	0.30	
Cboe BYX	Inverted	0	0.10	
Cboe EDGA	Inverted	0	0.30	

is generally very close to the 30 mil access fee cap even though not constrained by rule 610.

[497] Panel A of Table 5 provides the category of exchange, maker-taker, inverted, or flat/free, the number of fee revisions since Jan. 2018 as indicated by the number of transaction fee specific rule 19b–4 filings that the exchange has filed with the Commission, the date that each exchange's website states that the fee schedule posted there is effective and the range of fees and rebates along with the number of categories of fees and rebates for transactions priced equal to, or greater than, $1.00 per share.

[498] The two are Cboe EDGX and Members MEMX.

Exchange	Fee model	Rebate	Fee	Charged both sides
Cboe EDGX	Maker-Taker	0.00009 (per share)	0.30	
BX	Inverted	0	0.30	
Phlx (PSX)	Maker-Taker	0	0.20	
Nasdaq	Maker-Taker	0	0.30	
NYSE Arca	Maker-Taker	0	0.30	
NYSE American	Maker-Taker	0	0.25	
NYSE	Maker-Taker	0	0.30	
NYSE National	Inverted	0	0	
NYSE Chicago	Maker-Taker	0	0.10	Yes.
IEX	Flat	0	0.30	Yes.
Members MEMX	Maker-Taker	0.10% (of value)	0.25	
Miami (MIAX)	Maker-Taker	0	0.30	
Long Term (LTSE)	Free	0	0.30	

[a] The number of fee revisions is obtained by counting each rule 19b–4 filing for each exchange that is not clearly marked for a non-transaction fee related purpose such as connectivity fees, listing fees, options fees, etc. To determine the fee and rebate information each exchange's webpage was searched for its current posted access fee and rebate schedule and collected information only on access fees and rebates pertaining to non-auction trading in stocks priced equal to, or greater than, $1.00 per share. Sources for Current Access Fee Data were effective on the dates shown in Panel A of Table 5, and were accessed during May 2022 at the websites shown beneath the table.
[b] *https://www.cboe.com/us/equities/membership/fee_schedule/bzx/.*
[c] *https://www.cboe.com/us/equities/membership/fee_schedule/byx/.*
[d] *https://www.cboe.com/us/equities/membership/fee_schedule/edga/.*
[e] *https://www.cboe.com/us/equities/membership/fee_schedule/edgx/.*
[f] *https://listingcenter.nasdaq.com/rulebook/bx/rules/BX%20Equity%207.*
[g] *https://listingcenter.nasdaq.com/rulebook/phlx/rules/phlx-equity-7.*
[h] *https://listingcenter.nasdaq.com/rulebook/nasdaq/rules/Nasdaq%20Equity%207.*
[i] All NYSE Exchange Family fees: *https://www.nyse.com/markets/fees.*
[j] *https://exchange.iex.io/resources/trading/fee-schedule/.*
[k] *https://info.memxtrading.com/fee-schedule/.*
[l] *https://www.miaxoptions.com/sites/default/files/alert-files/MIAX_PEARL_Equities__Initial_FS_09242020.pdf.*
[m] *https://ltse.com/trading/faqs.*

Complex fee schedules and volume based tiers mean that it is difficult to determine the net capture on a given exchange (the difference between average fees levied and rebates paid). Additionally, financial statements for exchange groups generally do not break down performance on a per venue level and they generally combine auction access fees collected with regular trading access fees. Furthermore, some exchanges are privately held and thus do not release the same financial statements that public exchanges do. Using information from the financial statements of the three major exchange groups which collectively account for the overwhelming majority of trading volume on exchanges, the Commission estimates that the average total net capture is around 4 mils for all trading types.[499] However, the Commission understands based on Staff conversations with industry members that the net capture for non-auction trading in stocks that have a price equal to or greater than $1.00 is likely close to 2 mils, and in further analysis where the net capture needs to be assumed, we use 2 mils. This analysis suggests that the primary reason that access fees remain near 30 mils on most exchanges is to fund rebates. For stocks trading below $1.00 the Commission estimates an average net capture of around 0.28% of the transaction volume.[500] This amount is very close to the 0.30% access fee cap and arises because, as seen in Panel B of Table 5, most exchanges set their baseline fee at 0.30% but do not offer baseline rebates for transactions under $1.00 and some charge fees to both sides of the transaction leading to more than 0.30% per trade earned by the exchange.

Table 6 presents tabulations of the total share (Panel A) and dollar (Panel B) trading volume executed on the 16 exchanges in the first six months of 2022. This table provides estimates for the total volume that executed below $1.00 and that which executed above $1.00. These numbers represent an estimate of the total number of shares that would have been subject to the access fees and rebates discussed in this release.

TABLE 6—TRADING VOLUME BY EXCHANGE, EXCHANGE TYPE, AND EXCHANGE GROUP JAN. TO JUNE 2022 [a]

Panel A: Share Volume

Exchange name	Exchange type	<$1 Volume (billions)	>=$1 Volume tick-constrained (billions)	>=$1 Volume non-tick-constrained (billions)	% of exchange volume
Off Exchange		67.6	258.1	296.6	
Nasdaq	Maker-Taker	13.3	111.8	169.2	26.5

[499] Intercontinental Exchange, the parent firm of NYSE, reports on page 51 of its 2021 Form 10–K filing that their net capture for U.S. equity transactions was approximately 4.2 mils in 2021. Nasdaq did not report its net capture in its Form 10–K filing, however Nasdaq provides information on its investor relations web page which, when we average the relevant 2021 volumes, indicates that the average net capture across all Nasdaq platforms for U.S. equity transactions was 5.9 mils (*see Nasdaq 2022/2021 Monthly Volumes,* NASDAQ, *available at https://ir.nasdaq.com/static-files/465d2157-c476-4546-a9f7-8d7ad0c9be77*). Cboe reports in its Form 10–K filing that its net capture for U.S. equity transactions was approximately 2 mils.

[500] The estimate for the 0.28% net capture is obtained by taking the estimated net transaction fee for each exchange and multiplying it by the dollar trading volume presented in Panel B of Table 6 below.

TABLE 6—TRADING VOLUME BY EXCHANGE, EXCHANGE TYPE, AND EXCHANGE GROUP JAN. TO JUNE 2022 [a]—CONTINUED

Exchange name	Exchange type	<$1 Volume (billions)	>=$1 Volume tick-constrained (billions)	>=$1 Volume non-tick-constrained (billions)	% of exchange volume
NYSE Arca	Maker-Taker	8.7	62.2	53.5	14.1
NYSE	Maker-Taker	1.2	48.8	54.9	12.9
Cboe BZX	Maker-Taker	2.8	45.3	38.3	10.6
EDGX	Maker-Taker	7.1	38.8	40.7	10.3
MEMX	Maker-Taker	1.9	36.8	22.9	7.6
IEX	Flat	0.5	14.7	26.0	5.2
EDGA	Inverted	0.7	13.1	9.6	2.9
Cboe BYX	Inverted	0.7	14.1	6,.5	2.6
MIAX Pearl	Maker-Taker	0.4	10.6	4.0	1.9
NYSE National	Inverted	0.2	10.9	3.0	1.8
Nasdaq OMX PSX	Maker-Taker	0.08	9.3	3.9	1.6
Nasdaq OMX BX	Inverted	0.2	4.2	4.1	1.0
NYSE American	Maker-Taker	0.7	3.8	2.5	0.9
NYSE Chicago	Maker-Taker	0.02	0.5	1.9	0.1
LTSE	Free	0.002	0.003	0.01	0.0
Total		106.0	683.1	737.6	
Exchange Total		38.4	425.1	441.0	

Panel B: Dollar Volume

Exchange name	Exchange type	<$1 Volume (billions)	>=$1 Volume tick-constrained (billions)	>=$1 Non-tick-constrained (billions)	% of exchange volume
Off Exchange		$31.5	$5,947.1	$23,715.1	
Nasdaq	Maker-Taker	6.6	2,896.6	15,518.6	30.2
NYSE Arca	Maker-Taker	4.0	1,953.9	5,274.7	15.1
NYSE	Maker-Taker	0.6	1,080.5	4,034.4	11.5
Cboe BZX	Maker-Taker	1.2	1,278.2	3,807.3	11.3
EDGX	Maker-Taker	3.5	857.5	3,213.9	8.9
MEMX	Maker-Taker	1.0	841.3	1,588.8	5.5
IEX	Flat	0.2	387.7	2,356.1	6.3
EDGA	Inverted	0.4	373.0	802.4	2.7
Cboe BYX	Inverted	0.4	319.8	626.2	2.1
MIAX Pearl	Maker-Taker	0.2	285.2	424.8	1.6
NYSE National	Inverted	0.09	280.4	209.4	1.1
Nasdaq OMX PSX	Maker-Taker	0.04	270.7	411.5	1.5
Nasdaq OMX BX	Inverted	0.09	139.1	438.9	1.3
NYSE American	Maker-Taker	0.3	90.0	222.9	0.7
NYSE Chicago	Maker-Taker	0.01	20.3	351.5	0.3
LTSE	Free	0.001	0.1	1.0	0.0
Total		50.1	17,021.7	62,997.5	
Exchange Total		18.6	11,074.6	39,282.4	

[a] This table is created by aggregating all trade information from the TAQ database for every trading day in Jan. to June 2022. Only trading volume reflecting normal trades during regular trading. Normal trades are identified in TAQ data by sale conditions ''blank, @, E, F, I, S, Y'' which correspond to regular trades, intermarket sweep orders, odd lot trades, split trades, and yellow flag regular trades. We aggregate total remaining share volume by exchange, exchange type (maker-taker, inverted, flat, free), and exchange family (NYSE, Nasdaq, CBOE, Independent). We combine volume from exchange codes T and Q into 'Nasdaq.' Panel A presents share volume totals and Panel B presents dollar volume totals. Certain items in this Table 6 may also be affected by the MDI Rules once they are fully implemented. *See* Table 3 note b.

Transaction fees for trades in stocks priced equal to or greater than $1.00 are generally levied per share transacted. From Table 6 we see that in the first half of 2022, there were approximately 1.4 trillion shares transacted at prices equal to or greater than $1.00 per share across all venues, 59% of which (866 billion shares) were executed on a registered exchange.[501] Of these on-exchange transactions priced equal to or greater than $1.00 per share, approximately half were in tick-constrained securities while the other half were not. These numbers provide the basis for estimating the total amount of access fees and rebates collected and distributed in transactions priced equal to, or greater than, $1.00 per share. For transactions less than $1.00 per share the access fee is generally levied as a percent of the transaction share price. In Panel B we see that in the first half of 2022 there was approximately $18 billion transacted on exchanges in shares priced less than $1.00 per share.

Panels A and B of Table 7 break down the share and dollar volume statistics presented in Table 5 by venue type: maker-taker, inverted, and flat/free. The overwhelming majority of both dollar and share exchange trading volume occurs on maker-taker venues with approximately 88% of both dollar and share volume executing on maker-taker

[501] 1.4T shares 683 billion tick-constrained shares + 737 billion non-tick-constrained shares. Also, off exchange trading volume has increased in recent years. *See, e.g.,* Jonathan Brogaard and Jing Pan, *Dark Pool Trading and Information Acquisition,* 35 Rev. Fin. Studies 2625 (2022).

venues. Inverted exchanges capture about 6% of both dollar and share volume, and the remaining share volume transact on flat/free exchanges.

TABLE 7—VOLUME BY EXCHANGE TYPE AND ESTIMATED ACCESS FEE/REBATE ESTIMATES JAN. TO JUNE 2022 [a]

	Price <$1 (billions)	Price >$1 tick-constrained (billions)	Price >$1 non-tick-constrained (billions)	% Total
Panel A: Exchange Share Volume By Venue Type				
Maker-Taker	35.5	364.1	389.3	88.7
Inverted	1.9	38.4	18.9	6.6
Flat/Free	0.5	14.7	26.1	4.6
Panel B: Exchange Dollar Volume by Venue Type				
Maker-Taker	17.1	9,484.4	34,625.4	88.4
Inverted	1.0	986.1	2,036.9	6.1
Flat/Free	0.2	387.8	2,357.1	5.5
Panel C: Estimated Fees Collected and Rebates Distributed (Billions)				
Fees Collected		$2.55		
Rebates Distributed		2.31		
Exchange Capture		0.24		
Panel D: Total Estimated Net Fees by Liquidity Type (Billions)				
Demander		$2.13		
Provider		−1.89		
Exchange Capture		0.24		

[a] Certain items in this Table 7 may also be affected by the amendments in the MDI Rules once they are fully implemented. *See* Table 3 note b.

Panel C provides an estimate of the total amount of access fees collected and rebates distributed.[502] In the first 6 months of 2022 there were an estimated $2.55 billion in access fees collected across all exchanges and $2.31 billion in rebates distributed, resulting in a net capture to all exchanges of $242 million.

Panel D of Table 7 provides estimates of the net access fee paid by liquidity demanders and liquidity suppliers.[503] In the first 6 months of 2022 liquidity demanders paid an estimated $2.1 billion in net access fees and liquidity providers received an estimated $1.89 billion in rebates. With the difference of $242 million being the exchanges' estimated net capture.

Although not subject to rule 610(c), because they do not post protected quotes, ATSs also often assess transaction fees.[504] As of the second quarter of 2022 there were 32 ATSs that reported trading volume to FINRA transacting a total of 81 billion shares.[505] Unlike exchanges, the fees that ATSs charge generally do not have a standard structure and are often negotiated between the ATS and the customer. Based on a review of item 19 in form ATS–N, ATSs generally do not provide rebates, and when transaction fees are explicitly discussed, they are often in the range of 10 mils.

3. Round Lots and Market Data Infrastructure

Currently, information on odd-lots inside the NBBO is only available to investors who subscribe to proprietary data feeds, and comprehensive odd-lot information is only available to market participants who subscribe to the proprietary data feeds of all the exchanges.[506] The implementation of the MDI Rules will include odd-lot information inside the NBBO.[507] The MDI Rules will also change the definition of a round lot. Specifically, the MDI Rules will lower the round lot size to 40 shares for stocks priced greater than $250 and less than $1,000. The round lot definition will become 10 shares for stocks priced greater than $1,000 and less than $10,000. The round lot definition will become 1 share for stocks priced greater than $10,000.

[502] These estimates are computed by assuming a 30 mil access fee and 28 mil rebate on all transactions that occur on maker-taker or inverted exchanges and an 8 mil access fee (and no rebate) on the volume priced equal to, or greater than, $1.00 per share that occurs on IEX. For trading in sub $1.00 transactions, the various access fees and rebates for each exchange presented in Panel B of Table 5 are multiplied by the corresponding dollar volume of trade in transactions priced less than $1.00 per share to compute the total access fees collected and rebates distributed for this volume. The figures are summed together to provide the estimates of total access fees collected and rebates distributed.

[503] This estimate presumes that for shares transacted in prices equal to or greater than $1.00 per share on maker-taker venues the liquidity demander pays a 30 mil access fee and the liquidity provider receives a 28 mil rebate. On inverted exchanges the opposite occurs. On IEX it is presumed that liquidity demanders pay an 8 mil access fee and liquidity providers receive no rebate. For trading in sub $1.00 transactions the various access fees and rebates for liquidity suppliers and demanders are computed by taking the respective fees and rebates for sub $1.00 transactions for each exchange presented in Panel B of Table 5 and multiplying them by the corresponding dollar volume of trade in transactions priced less than $1.00 to compute the total access fees collected and rebates distributed for liquidity-providing and demanding trades. The figures are summed together to provide the estimates of total access fees collected and rebates distributed.

[504] IntelligentCross ATS, for example, offers matching processes for all NMS stocks eligible for trading, and disseminates bids and offers in real-time to subscribers to the ATS's proprietary data feed, but these are not protected quotes. *See* IntelligentCross, Form ATS–N, Item 15 (Display) (dated Apr. 11, 2022) *available at https://www.sec.gov/Archives/edgar/data/1708826/000170882622000002/xslATS-N_X01/primary_doc.xml.*

[505] *See ATS Transparency Data Quarterly Statistics, available at https://www.finra.org/filing-reporting/otc-transparency/ats-quarterly-statistics.*

[506] *See supra* note 371 and accompanying text for a discussion of a current request for comment by the exclusive SIPs about the potential to amend the plans to include some odd-lot information in the SIP data.

[507] *See supra* section IV.A.1 for a discussion on the expected time of the implementation of the MDI Rules.

When adopting the MDI Rules, the Commission enumerated numerous economic effects specifically related to changing the round lot definition and including odd-lot information as a part of core data. For the change in the definition of round lots, these effects include: (1) a mechanically tighter NBBO for higher priced stocks due to the redefinition of the round lot sizes,[508] (2) increased transparency and better order execution,[509] and (3) potentially more orders for high priced stocks being routed to exchanges instead of ATSs.[510] The costs of changing the round lot definition are also discussed and include upgrading systems to account for additional message traffic and modifying and reprogramming systems.[511] The Commission also discussed the expected effect that changing the round lot definition would have on other rules and regulations.[512]

For the inclusion of odd-lot information inside the NBBO to core data,[513] these effects include reducing information asymmetries between investors who currently have access to odd-lot information through proprietary data feeds and those who do not, leading to better order execution and price efficiency.[514] Providing a reasonable alternative to some market participants to proprietary data will allow some market participants to reduce data expenses required for trading.[515] The costs of including odd-lot information inside the NBBO include: [516] the cost of upgrading existing infrastructure and software to handle the dissemination of additional core data message traffic, the cost to SROs to implement system changes required in order to make regulatory data and other data needed to generate consolidated market data available to competing consolidators, the cost of technological investments market participants might have to make in order to receive the new core message traffic, and lastly, the cost to users of proprietary data whose information advantage would dissipate somewhat.[517]

The MDI Rules do not require the competing consolidators to disseminate odd-lot information. However, the Commission estimated that at least one competing consolidator will disseminate the odd-lot information because it believed that there will be demand for the data.[518]

4. Affected Entities and Markets

The proposal would affect trading in NMS Stocks, particularly on exchanges that charge high access fees and in stocks with lower quoted spreads, many odd-lots inside the spread, or higher prices. Therefore, the proposal would affect a wide variety of market participants, including national securities exchanges, other trading venues, exclusive SIPs and their data users, competing consolidators (eventually), broker-dealers operating order entry and order routing systems, and others who engage in the trading of NMS Stocks, including investors.

There are 16 national securities exchanges on which NMS Stocks are traded that would be affected by the proposal. The exchanges compete with each other and other trading venues to attract order flow. Exchanges compete with each other in how they set the rules that dictate how orders routed to it interact given the broader requirements of the Exchange Act and rules thereunder. Such rules are coded into the systems of exchanges that match buy and sell orders. Exchanges also differentiate themselves with the access fees they charge or the rebates they pay out for particular order types.[519] As a subset of national securities exchanges, the five listing exchanges, set rules for listing standards for securities and are responsible for tracking certain regulatory information regarding their listed stocks.

Other trading venues, including 33 ATSs and 238 other FINRA members, including OTC market makers, also compete with exchanges and each other to attract order flow in NMS Stocks and can route orders to the various trading venues. The order flow they attract depends on a number of factors such as fees and price improvement over the NBBO amongst other aspects of execution quality.

Pending the full implementation of the MDI rules, the market for market data is serviced by the two exclusive SIPs and exchange proprietary feeds. The two exclusive SIPs collect trade, quote, and regulatory data from the 16 exchanges and three trade reporting facilities,[520] consolidate those data, determine an NBBO, and disseminate those data directly to users or through vendors and broker-dealers. The exclusive SIPs can also collect information from the alternative display facility (''ADF'') operated by FINRA though no one currently uses the ADF to display quotes. Upon full implementation of the MDI Rules, the exclusive SIPs will be retired and an unknown number of competing consolidators will take over the collection, consolidation, estimation, and dissemination. The volume of data to be processed through these competing consolidators will be greater than that currently processed through exclusive SIPs, but competing consolidators will have flexibility to design data products tailored to different user types. In addition to the exclusive SIPs, the exchanges also disseminate market data to paying subscribers via proprietary data feeds. These proprietary data feeds provide more data than the exclusive SIPs at a lower latency.[521] Following the transition to a competing consolidator model for market data, the Commission expects total fees for market data are likely to decline.[522]

Broker-dealers typically route their own orders or their customers' orders for execution to trading venues. There were 3,564 registered broker-dealers as of the end of calendar year 2021. A portion of these broker-dealers focus their business on individual and/or institutional investors in the market for NMS stocks.[523] According to CAT data,

[508] *See* MDI Adopting Release, *supra* note 5, section V.C.1.(b).(i) for the full discussion of the effect of changing the round lot size on the NBBO.

[509] *See* MDI Adopting Release, *supra* note 5, sections V.C.1.b.(ii) and V.C.i.b.(iii) for the full discussion of the effect of changing the round lot size on transparency and execution quality.

[510] *See* MDI Adopting Release, *supra* note 5, section V.C.1.b.(iv) for the full discussion of the effect of changing the round lot size on exchange competition and order routing.

[511] *See* MDI Adopting Release, *supra* note 5, section V.C.1.b.(vi) for the full discussion of the expected costs of changing the round lot size.

[512] *See* MDI Adopting Release, *supra* note 5, section V.C.1.b.(vii) for the full discussion of the effect of changing the round lot size on other rules and regulations.

[513] *See* MDI Adopting Release, *supra* note 5, section V.C.1.c.(i) for the full discussion of the effect of including odd-lot information inside the NBBO in its definition of core data.

[514] *Id.*

[515] *Id.*

[516] *See* MDI Adopting Release, *supra* note 5, sections V.C.1.c.(iv), for the full discussion of the costs associated with expanding core data to include odd-lot information inside the NBBO.

[517] *Id.*

[518] *See* MDI Adopting Release, *supra* note 5, at footnote 1945 and surrounding text.

[519] Exchanges can also facilitate the routing of orders to other exchanges.

[520] Trade Reporting Facilities (TRFs) are facilities through which FINRA members report off-exchange transactions in NMS stocks, as defined in SEC Rule 600(b)(47) of Regulation NMS.

[521] *See supra* note 330 and *infra* note 612 and associated text for a further discussion on the nature of proprietary data feeds.

[522] *See* MDI Adopting Release, *supra* note 5, at 18773–64.

[523] Based on information from broker-dealers' 2021 FOCUS Report Form X–17A–5 Schedule I. This includes both carrying broker-dealers, who maintain custody of customer funds and securities, and introducing broker-dealers, who accept customer orders and introduce their customers to a carrying broker-dealer that will hold the customers' securities and cash.

there were approximately 1,037 broker-dealers that originated NMS stocks orders on behalf of individual investors and approximately 909 broker-dealers originated NMS stocks orders on behalf of institutional investors.[524] Institutional investor orders are typically ''not held'' orders, which provides the broker-dealer with more time and price discretion to execute the order or to minimize price impact.[525] In contrast, broker-dealers must attempt to execute a marketable held order immediately, which typically better suits individual investors who tend to seek immediate executions and rely less on broker-dealer order handling discretion since their orders typically have much lower price impacts.[526] Brokers-dealers serving individual investors often distinguish themselves by the customer service and financial advice they provide and the accessibility and functionality of their trading platforms.

Many broker-dealers that handle customer accounts do not directly access national securities exchanges or ATSs for their orders and rely on other broker-dealers to facilitate market access for them through those broker-dealers' order entry systems. The Commission estimates that there are 1,192 broker-dealers with order entry systems that submit orders in NMS stocks to exchanges in the minimum pricing increments.[527] Of these broker-dealers, an estimated 282 broker-dealers operate smart order routers to facilitate order routing.

D. Economic Effects

The Commission expects the proposal to lead to lower transaction costs for liquidity demanders on exchanges trading in stocks with narrow spreads. The proposal for a minimum increment to trading would improve exchanges' and ATSs' abilities to potentially innovate in ways that could potentially increase competition for retail order flow. A lower access fee cap would reduce the transaction costs of liquidity demanders in the predominant maker-taker structure. Making fees and rebates determinable at the time of trade may enhance broker-dealer order routing by helping mitigate a potential conflict of interest and providing clarity in terms of all in execution costs. Accelerating the inclusion of odd-lot information into the exclusive SIPs, updating the definition of a round lot, and providing the best odd-lot order, would accelerate some of the benefits of the MDI Rules, and could also lead to better order-execution by enhancing benchmarking. The proposed rule would also impose compliance costs on various market participants.

1. Modification of Rule 612 To Create a Tiered Tick Structure

The proposal would create a smaller tick size for some NMS stocks. A smaller tick, as proposed, would have two competing effects on transaction costs. First, a smaller tick leads to pricing that more effectively balances liquidity supply and demand—which, all else equal, can lower transaction costs. Second, a smaller tick fragments liquidity in the order book into more price levels, which can increase complexity and the incidence of pennying[528]—which could harm liquidity. The primary mechanism by which a smaller tick would lead to improved market quality is by reducing the tick size constraints that prevent spreads from narrowing. The proposal would not change the tick for NMS stocks when their prices drop below $1.00 or for stocks with Time-Weighted Average Quoted Spread greater than $0.04 during an evaluation month. The Commission expects that the trading environment for stocks with these characteristics is unlikely to be significantly affected.[529]

The proposal assigns each NMS stock priced equal to, or greater than, $1.00 to one of 4 tick sizes: $0.001, $0.002, $0.005, and $0.01 depending on the stock's Time-Weighted Average Quoted Spread during an evaluation month. Table 8 presents estimates of the amount of share trading volume that would have been associated with each of the four tick sizes.

TABLE 8—PROPOSED TICK SIZES AND QUOTED SPREAD [a]

Average quoted spread	Tick	Number of stocks	Estimated % share volume	Estimated % dollar volume
Spread ≤$0.016	$0.001, 0.002	1,707	64.0	37.9
$0.016 <Spread <$0.04	0.005	2,648	17.9	22.3
$0.04 <Spread	0.01	7,792	18.1	39.8

[a] Quoted spreads are determined by computing the time-weighted quoted spread during regular trading hours as computed by the WRDS intra-day indicators for every sym_root and sym_suffix combination in the dataset and taking the equal weighted average across all trading days in Mar. 2022. The number of stocks assigned to each group is indicated in the *Number of Stocks* column. The tick size is then applied to all trading volume for Apr. to June 2022 with the fraction of share and dollar trading volume attributable to each tick group presented in the respective columns.

Once implemented, the changes to the current arrangements for consolidated market data pursuant to the MDI Rules may impact the number of stocks and their estimated % volumes anticipated for each tick level. In particular, under the MDI Rules, NMS stocks priced $250 or more will receive reductions in round lot sizes which is anticipated to lower their quoted spreads; however the effect on the reported numbers is likely small both because these stocks make up less than 3% of share volume and because they are unlikely to have spreads less than $0.04. Based on an analysis of data from Mar. 2022, the average spread of a stock priced between $250 and $1,000 was $0.35 in Mar. 2022, far greater from the $0.04 that would trigger a smaller minimum increment. Similarly, for stocks priced between $1,000 and $10,000 the average quoted spread was $2.90 in Mar. 2022 and the only stock that had a value weighted average price greater than $10,000 already has a round lot size of one share and was not near-tick-constrained.

[524] Customer accounts are identified in CAT as accounts belonging to either the ''Institutional Customer'' account type, defined as accounts that meet the definition in FINRA Rule 4512(c), or the ''Individual Customer'' account holder type, defined as accounts that do not meet the definition of FINRA Rule 4512(c) and are also not a proprietary account.

[525] *See* Disclosure of Order Handling Information, *supra* note 4 at nn.59–60 and corresponding text. Meanwhile, a broker-dealer must attempt to execute a held order immediately, which typically better suits individual investors who seek immediate executions and rely less on broker-dealer order handling discretion.

[526] FINRA's best execution obligation requires that, ''A member must make every effort to execute a marketable customer order that it receives fully and promptly.'' *See* FINRA Rule 5310, Supplementary Material paragraph .01.

[527] *See infra* note 625.

[528] *See supra* note 459 for the definition of pennying.

[529] It is possible that changes in the stocks priced greater than $1.00 with quoted spreads of less than $0.04 could have spill-over effects in these stocks, but the net effect of such is uncertain and likely insignificant. For instance, tighter spreads in stocks receiving a tick size reduction could potentially result in the withdrawal of some liquidity providers from all markets (which would harm liquidity in stocks with no tick size adjustment) and/or lead some liquidity providers to shift their activity to stocks with no tick size adjustment (improving liquidity in those stocks).

[b] Initially the Commission expects that no stock would qualify for the $0.001 tick size due to the minimum pricing increment restricting the time weighted-average quoted spread. Thus, after the first evaluation period stocks that would eventually be assigned a $0.001 tick size would initially be assigned a tick size of $0.002.

Table 8 indicates that if March 2022 were the first evaluation month then almost two thirds of stocks would have retained the $0.01 tick size because they have Time-Weighted Average Quoted Spreads greater than $0.04. These stocks account for approximately 18% of share trading volume and 40% of dollar trading volume. The next most frequent outcome would be among the approximately 22% of stocks that would have received a $0.005 tick because they have Time-Weighted Average Quoted Spreads between $0.016 and $0.04. These stocks account for approximately 18% of share volume and approximately 22% of dollar volume. For the remaining approximately 14% of stocks, those with spreads less than $0.016, there is significant uncertainty regarding which bin these stocks would be assigned to, either the $0.001 or $0.002 tick size bin. The $0.01 tick size creates a floor on Time-Weighted Average Quoted Spreads that, absent an actual tick size change, makes it difficult to determine the prevailing tick size that may occur given a smaller tick.[530] Thus, Table 8 combines together statistics for all stocks with prevailing quotes less than $0.016. These stocks comprise approximately 64% of total share volume and 38% of dollar trading volume.

For the 14% of stocks that would likely receive either the $0.001 or $0.002 tick, the Commission expects liquidity to generally improve. Empirical analysis presented and discussed below in Table 9 suggests that for stocks with fewer than approximately 2 ticks intra-spread, a 1:5 reduction in the tick size generally improved market quality. This is a similar reduction in the tick size to what the proposal would offer and so the Commission believes it is reasonable to extrapolate from this analysis that these stocks would see an improvement in liquidity.[531] For the 22% of stocks that would receive a $0.005 tick size under the proposal the effect of the proposal is less certain. For these stocks, the proposal would target 3–8 ticks intra-spread whereas currently these stocks have approximately 1.5–4 ticks intra-spread. In this case, the empirical guidance from the analysis in Table 9 is not clear as to which regime produces better market quality outcomes. Stocks that retain the $0.01 tick would have market quality that is likely unchanged relative to the baseline.

All else equal, reducing the tick size could narrow the spread. In a competitive market, and in the absence of rebates or other price distortions, the prevailing bid or ask price would be the feasible price equal to just worse than the price that equates liquidity supply and demand—as any price better than this would lead to an excess of liquidity demand which would induce more liquidity providers. This tick size effect diminishes as spreads widen. As a conceptual example, consider a stock that, should the tick size be $0.0005, would trade at an ask of $10.0065 and a bid of $10.0045. If the minimum tick were at a penny, absent other effects, it is reasonable to believe that the ask would be $10.01 and the bid $10.00. In contrast, were the tick size to be $0.001, it would be feasible to have an ask of $10.007 and a bid of $10.004. Rather than $0.01, the spread would be $0.003. In this conceptual example that abstracts from other effects described below, the stock would receive a 70% reduction in its quoted spread if the tick size decreased from $0.01 to $0.001.

As spreads widen, tick-size-induced distortions attenuate. To see this, consider the same example above, but two orders of magnitude larger where the prices that equate liquidity supply and demand are an ask price of $1000.65 and a bid price of $1000.45. In the current one-cent tick regime, the prevailing ask and bid would equal the spread that equates liquidity supply and demand and there would be no tick-size induced distortion. Consequently, reducing the tick size could have a significant effect for stocks with narrow spreads, and this effect may attenuate as the stock's spread widens. A risk of a smaller tick is that it spreads liquidity over more price levels, which may potentially create adverse effects—particularly for larger orders.

Additionally, a smaller tick could increase the incidence of pennying, which occurs when limit order providers get to the front of the queue by providing economically trivial price improvement, and could reduce the importance of time priority. The risk of being pennied could discourage liquidity provision, particularly by market participants that are slower to respond to changes in market conditions, and could increase trading costs for these investors.[532] To compensate for additional costs associated with a fragmented order book, liquidity providers may post less aggressive quotes leading to worse market quality. The reduction in the importance of time priority would lower the risk of sniping and increase the opportunity for slower traders (non-high-frequency traders) to fill orders using liquidity-providing instead of liquidity-demanding transactions.[533] This could reduce adverse selection costs for these traders, countering the effects of pennying.

In contrast to the pricing effect discussed above, the pennying effect would be most pronounced for stocks with wide spreads because there are more intra-spread price levels and the cost of gaining priority over other liquidity providers, by updating the best price by a single tick, is lower.[534] For example, a stock with a spread of one cent, and a $0.001 tick, would have 10 price levels within the spread, whereas a stock with a $0.10 spread would have 100. Because price has first priority in order execution, a primary way to gain priority for a trader providing liquidity is to price-improve over existing orders. Without a small tick size relative to the spread, getting to the front of the queue via price improvement would be more costly, requiring larger relative price concessions.[535]

[530] Some stocks could potentially have spreads just less than $0.01 due to locked or crossed markets. This is more likely to occur among stocks with relatively low prices and very high trading volume. *See supra* note 448.

[531] It is possible that, for unknown reasons, some stocks may trade better with a wider tick even though their quoted spread suggests that a smaller tick may be warranted, though the Commission does not think the scenario to be likely. For example, one market participant expressed the idea that the optimal tick size could be a function of the stock's price and trading volume, rather than the stock's current quoted spread. Based on this analysis, it is possible that due to variation in price and volume, a stock in this proposal could trade outside the optimal tick range according to this market participant. *See* Phil Mackintosh, *Looking for the Perfect Stock Price,* Nasdaq (Sept. 19, 2019), *available at https://www.nasdaq.com/articles/looking-for-the-perfect-stock-price-2019-09-19.*

[532] *See* Dyhrberg, et al., *supra* note 454, studying the effects of imposing a tick size on a crypto exchange that previously did not have a tick size. The authors report an improvement in market quality due largely to a reduction in pennying behavior.

[533] *See supra* note 478 and related text.

[534] The pennying effect would be particularly acute for wide spread stocks with lower stock prices because a lower stock price reduces the amount of capital needed to supply a round-lot quote and hence make pennying less capital intensive.

[535] For example, if a stock has a spread of one cent and a $0.001 tick, gaining priority through price improvement would require narrowing the

Continued

In the presence of an NBBO and a differentiation between pricing feeds that disseminate top of book versus depth of book data, there may be informational consequences of a change in the tick size. As mentioned above, fragmenting of the order book reduces the displayed liquidity at the NBBO. This would temporarily reduce the information about liquidity available in the market for market participants who do not receive depth of book information from proprietary data feeds. Having less information about available liquidity could make it more difficult, more complex, and more expensive to locate shares for larger trades and to manage liquidity provision strategies.[536]

For those who do not currently receive depth of book data or those who would otherwise not purchase depth of book data from competing consolidators, the proposal could increase the demand to purchase depth of book data. Before the full implementation of the MDI Rules, this could result in more market participants purchasing data from exchange depth of book proprietary data feeds than do currently. Afterward, this could result in more market participants purchasing depth of book data from either competing consolidators or exchanges than in the absence of the proposal.

The expectation that a smaller tick size would lead to tighter spreads for stocks that currently have narrow spreads finds empirical support. The academic literature examining the effect of tick sizes on financial markets largely studies two events: decimalization, which occurred in 2001[537] and reduced the tick from 1/16th ($0.0625) to $0.01; and the TSP which ran from October 2016 to October 2018 and temporarily increased the minimum tick increment to $0.05 for a sample of small cap stocks.[538] Most of the literature surrounding decimalization suggests that, on average, decimalization was associated with a decline in spreads consistent with the notion that, on average, and during this time period, lowering the tick relieved distortions related to having a tick size that is too wide.[539] Industry studies show examples of reverse splits leading to large reductions in spreads and hence trading costs.[540] When a stock undergoes a reverse split its share price goes up, the current penny tick is lower as a fraction of the share price, implying that in economic terms, the stock could go from being tick-constrained to non-tick-constrained.

The Commission supplements existing analysis with its own analysis on the TSP. Focusing on the TSP, as opposed to decimalization, has several advantages. Additionally, the Commission relies more on its own analysis and the existing literature on the TSP than that for decimalization for this purpose because market dynamics have changed dramatically in the more than two decades since decimalization. Most notably over that period, electronic, algorithmic, and high-frequency trading have come to dominate the trading landscape today, whereas they were much less prominent in 2001.[541]

Using the TSP for analysis also has limitations because the TSP affected a subset of small cap stocks and primarily focused on changes in tick size[542]—it did not affect access fee caps for instance. The TSP also did not contain ETPs. Nonetheless, the fact that it concluded relatively recently suggests that its outcomes may be more generalizable to current markets than decimalization.

The academic literature studying the TSP shows that for stocks with average quoted spreads close to $0.05 prior to the TSP (namely, stocks likely to fall under our conceptual definition of tick-constrained), the TSP led to an increase in effective and quoted spreads.[543] That is, these stocks tended to trade better with a $0.01 tick than with a $0.05 tick. These results suggest that a tick that is too wide increases the cost of transacting small and average sized orders. Mechanically wider spreads in some stocks could mean that relatively small orders that do not need to take advantage of any additional NBBO depth may execute at a higher cost.[544]

The TSP literature provides mixed results with regards to the trading costs for large orders.[545] Multiple academic studies have found that a wider tick increases depth at the NBBO.[546] This finding is intuitive because all the quotes that would have been placed within the spread with a $0.01 tick prior to the TSP, congregated at the next best available prices under the $0.05 tick. In addition, any wider spreads and greater pennying costs associated with a larger tick would also serve to attract more liquidity to the NBBO. More depth at the NBBO would mean that a larger order could execute without having to go deeper into the book—potentially decreasing the cost to executing a larger order if the added depth at the NBBO is sufficient to overcome costs from the wider tick. However, one empirical study using different data for the TSP found evidence suggesting that the TSP led to a decrease in cumulative liquidity beyond the NBBO for test group stocks with an average pre-pilot quoted spread less than $0.05 suggesting an increase in the cost to transact a large order—although the authors do not articulate a clear mechanism for this result.[547]

half-spread (*i.e.,* the distance between the current quote and the midpoint) by 20%. If instead a stock has a spread of $0.10 with a $0.001 tick, a market participant would only need to improve the half spread by 2% to get to the front of the queue.

[536] However, the inclusion of odd lot information helps to mitigate this effect, and the eventual inclusion of depth of book information in consolidated market data due to the implementation of the MDI rules would render this effect temporary. At that point in time, consolidated market data is expected to contain depth information at many more price points, which would largely counteract the effects of a reduction in displayed depth from a reduction in tick size.

[537] *See, e.g.,* Exchange Act Release No. 42914 (June 8, 2000), 65 FR 38010 (June 19, 2000) (''Decimal Pricing Release''); *Commission Notice: Decimals Implementation Plan for the Equities and Options Markets,* SEC (July 24, 2000), *available at https://www.sec.gov/rules/other/decimalp.htm.*

[538] *See supra* note 84.

[539] *See* Bessembinder (2003) *supra* note 477. *See also* Michael A. Goldstein and Kenneth A. Kavajecz, *Eighths, Sixteenths and Market Depth: Changes in Tick Size and Liquidity Provision on the NYSE,* 56 J. Fin. Econ. 125 (2000) and Charles M. Jones and Marc L. Lipson, *Sixteenths: Direct Evidence on Institutional Execution Costs,* 59 J. Fin. Econ. 253 (2001), both examining the earlier tick size change from ⅛ to 1/16 of a dollar. *See also* Sugato Chakravarty, Venkatesh Panchapagesan, and Robert A. Wood, *Did Decimalization Hurt Institutional Investors?,* 8 J. Fin. Mkts. 400 (Nov. 2005) and Sugato Chakravarty, Bonnie F. Van Ness, and Robert A. Van Ness, *The Effect of Decimalization on Trade Size and Adverse Selection Costs,* 32 J. Bus. Fin. & Acc. 1063 (June/July 2005), both suggesting that large institutional trades may have become more costly following decimalization.

[540] *See* MEMX Report, *supra* note 105; *see also* Adrian Griffiths, *The Tick Size Debate Revisited,* MEMX (Jan. 2022), *available at https://memx.com/wp-content/uploads/MEMX_MSR_Tick-Constrained-Securities-2_03b.pdf.*

[541] *See, e.g.,* Terrence Hendershott, Charles M. Jones, and Albert J. Menkveld, *Does Algorithmic Trading Improve Liquidity?,* 66 J. Fin. 1 (Feb. 2011).

[542] *See* Barardehi, et al. (2022) *supra* note 85.

[543] *See* Hu, et al. (2018), *supra* note 477; Kee H. Chung, et al., *Tick Size Liquidity for Small and Large Orders, and Price Informativeness: Evidence From the Tick Size Pilot Program,* 136 J. Fin. Econ. 879 (2020); Rindi and Werner (2019) *supra* note 475; Griffith and Roseman (2019) *supra* note 478; Barardehi, et al. (2022), *supra* note 85. Part of this effect may be mechanical.

[544] *See, e.g.,* Chung, et al. (2020) *supra* note 543; Rindi and Werner (2019) *supra* note 475; and Maureen O'Hara, et al., *Relative Tick Size and the Trading Environment,* 9 Rev. Asset Pricing Stud. 47 (2019).

[545] Griffith and Roseman (2019) *supra* note 478 find evidence that the imposition of the TSP had either no effect on or slightly increased the cost of trading large trades for treatment stocks with an average pre-pilot quoted spread greater than $0.05, though the results were not statistically significant. They found statistically significant evidence that trading costs for large trades increased for treatment stocks with an average pre-pilot quoted spread less than $0.05. Barardehi, et al. (2022), *supra* note 85, and Chung, et al. (2020), *supra* note 543, both document that depth increases and the cost of executing large trades decreases.

[546] *See, e.g.,* sources cited *supra* note 543.

[547] Griffith and Roseman (2019), *supra* note 478, use the order book data from (NASDAQ) and find

The current literature offers little guidance regarding the expected effect of a tick size change for stocks with wider spreads. For stocks that were not tick-constrained by the $0.05 tick, *i.e.,* those with quoted spreads wider than $0.05 prior to the TSP, the literature examining the TSP is much less uniform in its assessment of the effect of a wider tick on market quality for stocks with wider spreads.[548] The fact that this literature does not provide consistent results on how a wider tick affects stocks with wider spreads is likely the result of the different researchers using different definitions of tick-constrained, and by virtually all studies simply bifurcating stocks into either tick or non-tick-constrained stocks to perform comparisons and assuming that all non-tick-constrained stocks will be affected in a similar manner by the tick size change.[549] In contrast, the theoretical discussion at the beginning of this section suggests that a simple bifurcation might not be the proper way to study the effect of tick size on stocks with various quoted spreads, since the relation between market quality and tick size is unlikely to be a binary function of whether or not the stock is tick-constrained, but rather depends on the number of ticks within the spread. That is, if there were to be negative effects on spreads when ticks are made too narrow, theory suggests that these would be most likely to be observed in stocks for which spreads are especially wide, with many ticks within the spread.

The Proposal would reduce the tick size for some stocks with narrower spreads that do not meet the definition of tick-constrained. To provide greater insight into the impact of tick sizes on various aspects of market quality across the quoted spread spectrum, Table 9 provides additional analysis that examines the impact of the TSP on a wider range of quoted spread profiles than simply tick-constrained or not. This analysis focuses on the end of the TSP, when the tick size was reduced from $0.05 back to $0.01, because that event more closely matches the proposal, which considers a tick size reduction.

The analysis presented in Table 9 uses a difference-in-difference methodology to study the effect of lowering the tick size from $0.05 to $0.01 on TSP stocks at the end of the TSP.[550] TSP treated and control stocks are assigned near the end of the TSP into one of four bins ranging from the most tick-constrained in the first bin to the least constrained in the fourth bin.[551] Key variables such as quoted depth and spreads were measured before and after the tick size was lowered and difference in difference estimation methods were used to examine how these variables reacted to the tick size change. The analysis uses ordinary least squares[552] and quantile (median) regressions[553] to estimate the following regression model:[554]

$$Y_{j,t} = \alpha_0 + \alpha_P Pilot_j + \alpha_E Event_t + \beta(Pilot_j \times Event_t) + u_{j,t}$$

where the quantile regression optimizes:[555]

$$\beta \in \underset{\alpha_0,\alpha_P,\alpha_E,\beta}{\operatorname{argmin}} \sum_{j,t} \rho_{0.5}(u_{j,t})$$

that cumulative depth away from the BBO is lower and larger trades became more costly to execute for treatment stocks with an average pre-pilot quoted spread less than $0.05 and hence became tick-constrained by the TSP. By focusing on a single exchange the paper does not take into consideration depth available on other exchanges, which could affect the paper's measure of trading cost.

[548] Existing studies do not to agree on the overall impact of a wider tick for stocks that were not tick-constrained by the $0.05 tick. For example, Rindi and Werner (2019), *supra* note 475, document that while quoted spreads increased among non-tick-constrained stocks, effective spreads decreased for these same stocks suggesting that while displayed prices were worse with a $0.05 spread, the actual transaction prices that investors received improved. Chung, et al., (2020), *supra* note 543 find that in general, transaction costs among stocks that were not tick-constrained decreased with a $0.05 tick. Griffith and Roseman (2019), *supra* note 478 find that the $0.05 tick was not associated with any change in order book depth for non-tick-constrained stocks. Additionally, DERA White Paper (2018), *supra* note 477 finds that for non-tick-constrained stocks, the imposition of a $0.05 spread led to no change in quoted spreads and very little change in effective spreads.

[549] The exact threshold, in terms of the time weighted quoted spread at which a stock is considered tick-constrained, is subject to debate and researchers use various thresholds. The Commission's review of the literature and of industry publications suggests that a time-weighted quoted spread of $0.011 is the most commonly used. That spread is used for the analysis herein.

[550] Difference-in-differences is a statistical technique in which the effect that a treatment has on some response variable is estimated by comparing the average change in the response over time in the treatment group to the average change in the control group.

[551] Bin assignments are calculated according to the stock's average quoted spreads for May and June of 2018, near the end of the TSP. Specifically, we use WRDS Intra-day indicators to collect the time-weighted quoted spread for all TSP and control stocks for each trading day in May and June 2018. Then for each stock we calculate the equally-weighted average quoted spread across all trading days. Based on this average, TSP and control stocks are sorted into one of four bins. The first bin is for stocks with quoted spreads ($0.00, $0.06). Empirically, for stocks in the TSP, this bin is said to include those stocks that were tick-constrained by the $0.05 tick increment during the pilot. The second bin is for stocks with quoted spreads in the range ($0.06, $0.09]. For stocks in the TSP, this bin is said to include those stocks that were near-tick-constrained by the $0.05 tick increment during the pilot. The third bin is for stocks that had quoted spreads of ($0.09, $0.15) or approximately 2–3 ticks intra at a $0.05 tick increment. The fourth bin is for stocks with quoted spreads greater than $0.15. The TSP had three test groups: the first group applied the $0.05 tick only to quoting, the second group applied the $0.05 tick to quoting and trading (with exceptions for benchmark and midpoint trades and for certain retail price improvement trades), and the third group applied the $0.05 tick to trades and quotes the same as the second group but also had a trade at rule applied. Because the proposal would apply the tick size to both trading and quoting, the analysis presented here includes only stocks in the latter two groups—*i.e.,* test groups two and three. Barardehi, et al. (2022), *supra* note 85 provide similar analysis, and also expand the analysis in many dimensions and find evidence that all key results presented here are robust to the test group analyzed and to many other factors.

[552] Ordinary least squares (OLS) regression refers to a statistical technique for estimating the linear relationship between an independent variable and dependent variables by minimizing the sum of squared errors between the estimate and the observed independent variable. The use of OLS and quantile regressions is common in the literature on the TSP pilot.

[553] The primary advantage to quantile regressions is that they are less sensitive to outliers that can affect mean inference in OLS. Thus median regressions provide additional robustness to the analysis and ensure that results are not driven by outliers.

[554] In this equation the variable Y denotes the response variable of interest such as quoted spread and depth. The subscripts j and t serve to index stocks and days respectively. α_o, α_p, α_e, and β are coefficients (to be estimated), and $u_{j,t}$ is the error term. $Pilot_j$ is an indicator variable that equals 1 if stock j was in the treatment group, or 0 if stock j was in the control group. $Event_t$ is a indicator variable which is equal to 1 if the day t was post the treatment event and equals 0 otherwise. Table 9 reports the difference-in-difference estimator of β for a different response variable Y across the different spread bins.

[555] In this equation $u_{j,t}$ is the error term from the previous regression specification equation, *supra* note 554, and the loss function is defined as: $\rho_\tau(u) = \tau \max(u, 0) + (1-\tau) \max(-u, 0)$; where $0 < \tau < 1$.

TABLE 9—EFFECTS OF A REDUCTION IN TICK SIZE ON QUOTING AND TRADING OUTCOMES [a]

	OLS				Quantile (median) regression			
	Quoted spread ($) May & June 2018				Quoted spread ($) May & June 2018			
Spread bin #	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Depth (100 shares)	*** −22.5	*** −5.30	*** −1.55	−0.51	*** −11.8	*** −3.16	*** −0.96	*** −0.21
	[−12.02]	[−7.09]	[−4.40]	[−1.30]	[−16.99]	[−23.52]	[−17.81]	[−4.30]
Depth ($1,000)	*** −16.7	*** −8.41	*** −4.67	*** −2.06	*** −11.2	*** −7.27	*** −3.96	*** −1.48
	[−14.58]	[−10.94]	[−7.82]	[−3.66]	[−22.04]	[−20.70]	[−12.58]	[−4.14]
Quoted Spread ($)	*** −0.033	*** −0.027	*** 0.023	*** 0.12	*** −0.034	*** −0.031	*** 0.012	*** 0.12
	[−18.71]	[−6.46]	[2.99]	[5.51]	[−35.41]	[−10.31]	[2.03]	[6.80]
Relative quoted Spread	*** −0.0049	* −0.00097	0.00034	*** 0.0046	*** −0.0041	*** −0.0014	0.00021	*** 0.0034
	[−9.59]	[−1.80]	[0.53]	[3.30]	[−8.54]	[−6.89]	[0.74]	[4.66]
Effective spread ($)	*** −0.027	−0.026	*** 0.029	** 0.038	*** −0.026	*** −0.021	−0.0018	*** 0.051
	[−4.97]	[−1.43]	[5.17]	[2.16]	[−58.10]	[−12.81]	[−0.63]	[4.81]
Relative eff. spread	*** −0.0039	0.00043	0.0055	*** 0.0028	*** −0.0030	*** −0.0010	−0.00013	*** 0.0016
	[−3.12]	[0.17]	[1.36]	[4.42]	[−10.78]	[−9.58]	[−1.09]	[3.23]
Cancel-to-trade	*** 5.10	*** 6.69	*** 7.56	*** 18.8	*** 4.56	*** 5.49	*** 6.87	*** 12.3
	[5.99]	[6.38]	[6.79]	[8.44]	[7.75]	[7.79]	[10.44]	[10.61]
Odd-lot rate (%)	*** 4.89	*** 5.61	*** 2.85	** 1.49	*** 5.59	*** 6.39	*** 3.29	** 1.85
	[9.62]	[8.04]	[4.35]	[2.15]	[8.02]	[8.99]	[4.72]	[2.51]
Realized spread ($)	*** −0.014	*** −.0099	.00037	*** 0.040	*** −0.014	*** −0.013	*** −0.0068	*** 0.038
	[−27.94]	[−7.43]	[0.12]	[4.45]	[−48.36]	[−17.96]	[−5.13]	[5.64]
Relative real. spread	*** −.0024	−.00032	−.00039	** .0014	*** −.0014	*** −.00054	*** −.00013	*** .0012
	[−11.82]	[−1.36]	[−1.25]	[2.37]	[−14.08]	[−12.52]	[−2.77]	[3.65]
Volume (1,000 shares)	26.5	** 30.3	12.5	−5.41	19.1	3.35	0.20	** −3.25
	[1.30]	[2.13]	[1.32]	[−1.07]	[1.42]	[0.40]	[0.04]	[−2.44]
Cum Depth 10c from mdpt	*** −0.17	*** −0.26	** −0.27	** −0.34	*** −0.49	*** −0.54	*** −0.45	** −0.63
	[−3.93]	[−5.00]	[−2.59]	[−2.37]	[−5.51]	[−6.29]	[−4.91]	[−3.15]
Cum Depth −10c from mdpt	*** −0.22	*** −0.19	*** −0.37	** −0.45	*** −0.49	*** −0.42	*** −0.50	** −0.79
	[−5.28]	[−3.74]	[−3.44]	[−2.83]	[−6.33]	[−5.21]	[−5.68]	[−2.75]
CRT 10 round lots	*** −0.026	−0.001	*** 0.035	*** 0.14	*** −0.037	*** 0.085	*** 0.035	** 0.075
	[−19.56]	[−0.19]	[3.99]	[1.03]	[−2.72]	[2.75]	[4.20]	[2.37]

[a] This table presents the effects of a reduction in minimum tick size from $0.05 to $0.01 cent on various quoting and trading outcome variables. The 1st bin is most tick-constrained and the 4th bin is least tick-constrained. *See supra* note 554 for bin descriptions. A difference in difference regression with no control variables is estimated using data covering Control, Test Group 2, and Test Group 3 TSP stocks from 08/01/2018–11/30/2018. All observations are at the stock day level. The same model is used for all outcome variables. *See supra* note 554 for a discussion of why Test Group 2 and Test Group 3 were selected. For each outcome variable Y_{jt}, the table presents only the difference in difference coefficient estimates that indicate the effect of the TSP on the dependent variable. Estimates are performed by past quoted spread subsamples that decompose the sample based on average quoted spreads during June and July of 2018. Each regression is estimated using both OLS and quantile (median) regressions. The first four columns present the result from OLS regression results, the last four columns present the results from quantile regression results. Column titles 1st, 2nd, 3rd, and 4th represent results estimated for bin 1, bin 2, bin 3 and bin 4 stocks respectively. The quoted spread refers to the distance between the NBBO midpoint and the NBBO quote. The effective spread is the distance between the NBBO midpoint and the realized trade price; the realized spread is the distance between a future NBBO midpoint (5-minutes ahead) and the trade price. Relative spread measures are calculated as the spread scaled by the NBBO midpoint. The cancel-to-trade ratio is the daily number of order cancellations divided by the number of trades, for displayed orders. The odd-lot rate is the percentage of trades in a day which executed against an odd-lot quote. CRT 10, or the cost of a round-trip trade of 10 round lots, measures the cumulative transaction costs from buying and then immediately selling 10 round lots. The CRT assumes that an order that is larger than the displayed depth at the best price will not execute in full at that price. Instead, the assumed unfilled portion will execute at worse prices until completely filled with displayed depth. All data are Winsorized at the 1% and 99% level. The numbers in the [ ] brackets reflect t-statistics that are based on two-way stock-and-date clustered standard errors. Symbols *, **, and *** reflect statistical significance at 10%, 5%, and 1% type-1 error levels.

This analysis provides evidence of a fundamental tradeoff between accurate pricing on one hand and incentives for liquidity provision on the other. Across all specifications, the end of the TSP was associated with a decrease in depth at the NBBO, when the tick size was reduced from $0.05 to $0.01, as signified by the negative and, in most cases, statistically significant coefficients reported. The magnitude of the coefficients suggest that the reduction in shares available at the NBBO was the greatest for stocks with tighter spreads and smaller for stocks with wider spreads. The finding that tighter spread stocks experience the greatest decline in depth at the NBBO is consistent with the -idea that, for these stocks, the $0.05 tick was the most constraining, and so liquidity that would have naturally spread out within the quoted spread given a smaller tick, bunched at the wider tick increments, and that once the tick-constraint was relaxed this liquidity naturally spread out over the additional price levels. For less tick-constrained stocks, the bunching was less severe since liquidity already had some room to spread out.

For stocks in the first or second bins, we find that lowering the tick to $0.01 leads to significantly lower quoted spreads. These stocks went from having approximately 1–2 ticks inside the spread, with a $0.05 tick, to having 1–10 ticks inside the spread, with a $0.01 tick. For these bins, relaxing the tick size served to narrow the spread. This finding is consistent with the idea that for stocks that are tick-constrained, or near-tick-constrained, the effect of decreasing the tick size will narrow spreads by improving competition. For the stocks in the third and fourth bins, the story is different, as the reduction in the tick size was associated with a widening of the quoted spread. These stocks went from having more than two or more ticks within the spread, with a $0.05 tick, to having more than 10 ticks within the spread, with a $0.01 tick. This result is consistent with the idea that for wider spread stocks, the prevailing effect of reducing the tick size was to increase fragmentation of liquidity and the risk of pennying which made trading more costly leading to wider spreads. This pattern of results—namely narrower spreads for the first and second bins and wider spreads for the fourth—holds regardless of whether dollar spreads, relative spreads, OLS, or quantile regressions are used, suggesting this as a robust outcome of the end of the TSP.

The pattern for effective spreads is similar to that observed for quoted spreads. Effective spreads measure the average realized transaction cost for trades as it measures the absolute distance between the realized trade price and the NBBO midpoint at the time of the trade. Effective spreads do not always equal quoted spreads because trades can execute inside the NBBO for numerous reasons, such as odd-lot trades, midpoint trades, and

hidden orders. For stocks in bin one—*i.e.,* stocks for which the $0.05 tick was the most restrictive—all specifications suggest that reducing the tick size was associated with a decrease in realized transaction costs as measured by effective spreads. For stocks in bin four, those with the widest spreads prior to the tick size reduction, all specifications suggest that the reduction in the tick size lead to an increase in transaction costs, measured by effective spreads. For stocks in between these extremes in bins two and three, the results are not as uniform. For stocks in bin two, the sign of the coefficients for all estimates (dollar effective spreads, relative effective spreads, OLS, and quartile regressions) suggest that lowering the tick size decreased effective spreads, although not all specifications agree as to statistical significance. The OLS regressions suggest that the effect was statistically insignificant, while the quantile regressions found a statistically significant effect and suggest that effective spreads decreased. For stocks in the third bin, the analysis did not find a consistent, statistically significant change in effective spreads, or in other words, lowering the tick size did not appear to reliably help or harm transaction costs as measured by effective spreads.

These results, like the results for quoted spread, suggest that for stocks for which the narrowing of the spread meant that the stock went from having less than 2 ticks within the spread to 1–10 ticks within the spread, the effect of reducing the tick was beneficial in terms of reducing transaction costs. For stocks with very wide spreads, reducing the tick size appeared to harm liquidity, which is consistent with fragmentation and pennying being the prevailing effect.

The theoretical discussion above suggests that executing an order may become more complex with a smaller tick size—meaning it may take visiting more venues as well as across more price levels to execute an order with a smaller tick size. This potential outcome is explored using the ''cancel-to-trade'' ratio. A higher ratio indicates more frequent canceling of orders per the amount of trading volume, and is an indication that market participants are more active in managing their quotes and their order strategies. In this analysis, both the OLS and the quantile regressions confirm that a smaller tick resulted in a statistically significant increase in the cancel to trade ratio, suggesting more complexity. Additionally, the magnitude of the effect is increasing in the quoted spread, with wider quoted spreads having larger coefficients, suggesting a larger effect in the cancel-to-trade ratio than stocks with narrower spreads. This pattern is consistent with pennying and increased complexity having a greater impact on stocks with wider spreads.

The analysis also looks at the effect of lowering the tick size at the end of the TSP on the usage of odd-lot orders. Across all quoted spread bins, the usage of odd-lot orders increases when the tick size decreases. This finding is consistent with the notion that liquidity would be spread out over more levels and liquidity providers would be willing to offer less liquidity at a given price level—leading to an increased use of odd-lot orders to allow liquidity providers to offer smaller levels of liquidity at finer price increments. This result also suggests that a lower tick size increases the need for market participants to have ready access to odd-lot information given that the lower tick size can be expected to increase the usage of odd-lot quotes.

Effective spreads provide a measure of liquidity providers' revenue and the contrasting economic effects also have implications for how liquidity providers' revenue would be affected by a lower tick. The effective spread captures the liquidity premium, paid by those submitting orders for immediate execution, and can theoretically be decomposed into two components: *Effective Spread = Realized Spread + Price Impact.*[556] One component of the effective spread is the price impact or adverse selection component. It is the change in the NBBO midpoint at the time of trade to some point in the future. This component of the spread captures the portion of the spread liquidity providers lose from trading with investors who are more informed than they are, and is also referred to as the adverse selection component of the bid ask spread. The remainder of the effective spread, after removing the adverse selection component, is the realized spread. This portion of the spread acts as a proxy[557] for the compensation to the liquidity provider for its non-adverse selection costs. If a smaller tick decreases revenue for liquidity providers, by allowing bid and ask prices to more accurately reflect supply and demand, then this effect should manifest as a decrease in realized spreads for liquidity providers. However, if increased order book fragmentation and pennying risk increase the cost of providing liquidity, then liquidity providers would need to be compensated for these costs in order to provide liquidity and, thus, realized spreads would increase. To the extent that the two effects offset one another, realized spreads might not change.

For tick-constrained stocks in bin one, the analysis indicates a decrease in realized spreads across all specifications, and when using dollar or relative realized spreads when the tick size was reduced from $0.05 to $0.01. This result is consistent with the notion that liquidity providers' non-adverse selection revenues would decrease due to bid and ask prices being more reflective of supply and demand with a smaller tick. The opposite occurs for stocks with wide spreads in bin four, where realized spreads increase significantly—consistent with liquidity providers needing to be compensated for the increased cost and complexity associated with trading a wide spread stock in a small tick environment. For stocks in the middle two bins, the effect of lowering the tick size on realized spreads is unclear, as about half of the specifications indicate no change in realized spreads while the other half indicate lower effective spreads. The specifications often do not agree between relative and effective spread specifications and between OLS and quantile regressions.

The analysis also uses MIDAS data to study how the tick size change affected liquidity deeper in the book. Analyzing liquidity deeper in the book is valuable because it gives an indication of how trading larger orders that must go deeper in the book to be fulfilled may be affected by a change in the tick size. This analysis uses MIDAS data to calculate the daily average cumulative

[556] Effective spreads can be interpreted as what liquidity providers expect to earn from providing liquidity, assuming that prices do not change before the liquidity provider is able to unwind its position and realize their profit. Under this interpretation, realized spreads would proxy for what they actually earn, taking into account that the market price may have moved against the liquidity provider before it could unwind its position. *Effective Spread = Realized Spread + Price Impact.* For a full mathematical decomposition of effective spreads into realized spread and price impact components *see* Peter N. Dixon, *Why Do Short Selling Bans Increase Adverse Selection and Decrease Price Efficiency,* 11 Rev. Asset Pricing Stud. 122 app. at 165 (2021).

[557] Realized spreads do not measure the actual trading profits that market makers earn from supplying liquidity. In order to estimate the trading profits that market makers earn, we would need to know at what times and prices the market maker executed the off-setting position for a trade in which it supplied liquidity (*e.g.,* the price at which the market maker later sold shares that it bought when it was supplying liquidity). If market makers offset their positions at a price and time that is different from the NBBO midpoint at the time lag used to compute the realized spread measure (Rule 605 realized spread statistics are measured against the NBBO midpoint 5 minutes after the execution takes place), then the realized spread measure is an imprecise proxy for the profits market makers earn supplying liquidity.

shares available at $0.10 above and below the midpoint for control and treated stocks, and uses the same difference-in-difference analysis to examine the effect of reducing the tick size on cumulative depth.[558] Our analysis suggests that reducing the tick size also reduced the total depth available deeper in the book with the coefficient for bin 4—*i.e.,* those with the widest spreads—being the largest in magnitude. This finding is consistent with a smaller tick discouraging the posting of displayed liquidity due to pennying concerns for stocks with wide spreads.

These depth of book findings do not directly imply that trading deeper in the book became more expensive for two reasons. First, research suggests the use of non-displayed quotations increases significantly when the tick size is reduced.[559] Thus the decline in liquidity that we document is only a decline in displayed liquidity. Second, quotes tend to congregate at the price just worse than the quoter's desired price so that the quoter does not lose money on a transaction. When a wider tick is tightened, quotes that were previously congregated at the wide tick will spread out at prices better than the previous tick allowed. Thus, a market participant taking liquidity from multiple price layers in the order book to fulfill an order would have some shares that transact at superior prices than it would have with the wider tick.[560]

Table 9 also presents the effect of the TSP conclusion on the round-trip cost to transact a trade for 10 round lots (1,000 shares).[561] This analysis suggests mixed results for the effect of the tick size reduction on the cost of executing a 10 round lot trade. For pilot stocks that were tick-constrained by the Pilot with a $0.05 tick, the total round-trip cost of a 10 round lot trade decreased when the tick size was lowered—suggesting an improvement in liquidity deeper in the book. For near-tick-constrained stocks, the effect was not clear. The OLS regressions suggested no effect, while the quantile regressions suggested an increase in trading cost. For stocks in bins 3 and 4 (*i.e.,* those that were not tick-constrained by the $0.05 tick), the effect of lowering the tick size was to increase transaction costs for larger trades. These results cohere with the idea that when stocks are tick-constrained the pricing efficiency made possible by a smaller tick improves liquidity, and for stocks with wider spreads a smaller tick harms liquidity by making individuals less willing to post displayed liquidity due to complexity and the risk of pennying.

In conclusion, the analysis provided here suggests that, for stocks that were limited to just 1–2 ticks intra-spread by the $0.05 tick, the reduction to a $0.01 tick provided an improved trading environment. Thus, trading in an approximate 1–10 tick range intra-spread provided a superior environment to trading in a 1–2 ticks intra spread range. Additionally, for stocks with spreads greater than $0.15, where a $0.01 tick implied more than 15 ticks intra-spread, a $0.05 tick where there were only 3 ticks intra-spread, appeared to provide a superior trading environment. For stocks with spread between $0.10 and $0.15, it is not clear which tick size provided a superior trading environment.

These conclusions are consistent with results in Barardehi, et al. (2022), which more broadly examines the effect of tick size changes under the TSP.[562] Barardehi, et al. (2022) arrives at the same conclusions with respect to the effects of a tick size reduction in the context of the TSP while using different methodology. Specifically, the Commission's analysis focuses on the end of the TSP, when the tick size for treated stocks was reduced, because the proposal would lower the tick size for some stocks. In addition to looking at the end of the TSP, Barardehi, et al. (2022) also considers the effect of raising the tick size at the initiation of the TSP. Both the Commission's analysis and Barardehi, et al. (2022) find that stocks that either were tick-constrained or near-tick-constrained by the $0.05 tick benefited from a reduction in the tick size. Examining the imposition of the TSP, Barardehi, et al. (2022) additionally found a deterioration in market quality for stocks that became tick-constrained by the $0.05 tick. All together, these results provide robust support for the benefits of reducing the tick size in tick-constrained stocks.

Another methodological difference between the Commission's analysis and Barardehi, et al. (2022) is in the selection of TSP stocks used in the analyses. The Commission's analysis focuses on comparing TSP test groups that experienced a change in both trading and quoting increments, whereas Barardehi, et al. (2022) looked at a wider set of TSP test group combinations, including looking at the test groups separately.[563] Robustness checks in Barardehi, et al. (2022) show that analytical conclusions are similar regardless of the test groups used, thereby showing the robustness of the Commission's results as well. Barardehi, et al. (2022) further provide additional tests of the effect of tick size changes on trading costs, none of which provide results inconsistent with the Commission's analysis.[564]

Barardehi, et al. (2022) includes an exhibit with more granular analysis on the impact of a reduction in tick size at the end of the TSP, from 5 cents to 1 cent, on investor transaction costs, as captured by effective spreads. That exhibit is included below in Figure 1, and its results are broadly consistent

[558] In the regressions we take the natural log of shares available. This conversion helps standardize shares available for stocks with different prices by making the interpretation in terms of percentage changes.

[559] *See* analysis presented in Nasdaq Intelligent Tick Proposal, *supra* note 180; *see also* Justin Cox, et al., *Increasing the Tick: Examining the Impact of the Tick Size Change on Maker-Taker and Taker-Maker Market Models,* 54 Fin. Rev. 417 (2019); Amy K. Edwards, Paul Hughes, John Ritter, Patti Vegella, and Hao Zhang, *The Effect of Hidden Liquidity: Evidence from an Exogenous Shock (working paper Mar. 1, 2021), available at https://ssrn.com/abstract=3766512* (2021) (retrieved from SSRN Elsevier database).

[560] Consider a numeric example. A market with a $0.05 tick is quoting asks of 500 shares at $10.05 and 500 shares at $10.10. An investor wishing to purchase 700 shares would purchase 500 at $10.05 and 200 at $10.10 for a total price of $7,045. If the tick shrinks to $0.01 and cumulative shares posted decline by 20%—for example—but those shares are spread evenly over the finer grid then there would be 80 shares at each price level from $10.01 to $10.10. An investor wishing to buy 700 shares would need to purchase 80 shares at each price level from $10.01 to $10.08 and 60 shares at $10.09 for a total purchase price of $7,034. So even though total depth declined, the cost to execute a 500 share trade would decrease due to more efficiently spreading liquidity across more price levels.

[561] A round trip trade refers to executing an order to buy or sell the stock and immediately reversing the position with an equal countervailing order. We compute the cost of a round trip trade following the methodology laid out in Griffith and Roseman (2019), *supra* note 478, and Chung, et al. (2020), *supra* note 543. The methodology uses MIDAS data to take snapshots of the order book at 15 minute increments throughout the trading day and calculates the transaction costs associated with walking the book up 5 or 25 round lots to execute a large trade.

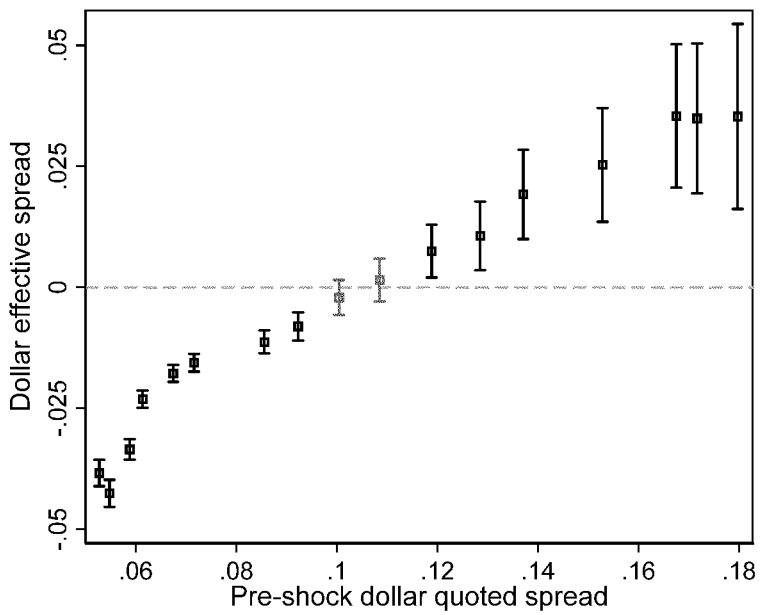
[562] *See supra* note 461.

[563] *See supra* note 551. Barardehi, et al. (2022), *supra* note 85 use stocks from TSP test groups 1 and 2 in their analysis. In order to provide more statistical power the authors, in addition to test group 1, include test group 2 stocks, citing that extant literature had shown little statistical differences between test group 1 and test group 2 stocks. By contrast, Table 9 analyzes test groups 2 and 3 because these involved comparing TSP test groups that experienced a change in both trading and quoting increment—with the caveat that the conclusion of the tick size pilot ended the harmonization of the quote and trade increments that had been implemented under that program, while this proposal would introduce it.

[564] Barardehi, et al. (2022), *supra* note 85 also included additional analysis to demonstrate that the results were also robust to bifurcating the TSP sample into high and low trading volume, to the exclusion of penny stocks, and using quantile regressions at the 25th and 75th quantiles as opposed to the median.

with the findings reported in Table 9. Figure 1 shows how the quoted spread of a stock during the pilot (''pre-shock dollar quoted spread'') correlates with how effective spreads changed when the pilot ended. For stocks with an average of fewer than two ticks intra-spread (those with pre-shock quoted spreads of $0.10 or less), a reduction in tick size from 5 cents to 1 cent significantly reduces effective spreads.[565] Whereas for stocks with an average of more than three ticks intra-spread (those stocks with pre-shock quoted spreads greater than $0.15), a narrower tick size increases effective spreads.

Figure 1



Source: Barardehi, et al. (2022), Figure 3, supra note 85

The Commission's results in Table 9 help provide guidelines for predicting how the proposed tick size reductions may affect market quality for stocks priced at, or greater than, $1.00 per share compared to the current baseline. For stocks that are tick-constrained by the current $0.01 tick, the proposal would increase the number of ticks intra-spread from 1 to either 1–8, or 4–5 depending on whether the stock was assigned a $0.001 or a $0.002 tick. The analysis in Table 9 suggests that 1–10 ticks intra spread provides a better trading environment than does just one tick intra-spread.[566] Additionally, the results for bin 2 stocks suggest that moving from 1–2 ticks intra spread to 5–10 ticks also generally improves market quality across most measures. Regardless the tick size that a current tick-constrained stock receives ($0.001 or $0.002) Table 9 suggests that across most liquidity metrics, liquidity would likely improve for these stocks. For stocks with a time-weighted average spread below $0.016, there are currently an average of 1–1.6 ticks intra spread. The proposal would increase this number to 4–8 ticks intra-spread by assigning a $0.002 tick to these stocks. The analysis of bin 2 stocks is analogous to stocks that would be subject to the $0.002 tick in terms of the effect of the tick size change on market quality. In both cases, the stocks are moving from

[565] Barardehi, et al. (2022), *supra* note 85, subset their sample into overlapping segments of TSP stocks based on their quoted spreads and perform difference-in-difference analyses on each segment to quantify the effect of a narrower tick size as a function of number of intra-spread ticks. In their setting, each segment of stocks is identified based on average quoted spreads in a period prior to the end of the TSP (08/08/2018–11/20/2018), where tick size decreased from 5 cents to 1 cent for pilot stocks. The stocks are grouped into overlapping 6-cent intervals of average May and June 2018, (pre-shock) quoted spreads in cents {($0.00, $0.06), ($0.01, $0.07), ($0.02, $0.08), . . . , ($0.15, $0.21), ($0.16, $0.22)}. For each intervals, the effect of a tick size change on dollar effective spreads are estimated in a difference-in-difference setting using quantile (median) regressions that control for date fixed effects and double-cluster standard errors by stock and date. Point estimates of the treatment effects along with the corresponding 95% confidence intervals are plotted against the median pre-shock quoted spread in the respective interval.

[566] One academic theoretical paper suggests that having a two tick spread is optimal. *See* Sida Li and Mao Ye, *The Optimal Nominal Price of a Stock: A Tale of Two Discretenesses,* (working paper Nov. 3, 3021), *available at https://ssrn.com/abstract=3763516* (retrieved from SSRN Elsevier database). The paper suggests that stocks reach their optimal price whenever the quoted spread is two ticks wide. While the paper advocates for a lower tick size, particularly for tick-constrained stocks, the two tick spread conclusion is the result of a highly stylized trading model which does not take into account pertinent factors from outside the model which likely affect spreads such as considerations of time priority and pennying concerns. Conditional on there being non-infinitesimal tick and round-lot sizes, their model suggests that a two-tick wide spread is optimal. Otherwise, their model suggests an optimal policy choice of infinitesimal tick and round-lot sizes.

an environment with just less than two ticks intra spread to one of 5–10 ticks intra spread in the case of the TSP, or 4–8 ticks in the case of the proposal. These changes are likely similar enough that comparison of the two groups is instructive. The analysis of bin 2 stocks in Table 9 indicated that across most liquidity metrics these stocks experienced improved liquidity with the smaller tick. Consequently, the Commission also expects that on average, stocks receiving the $0.002 tick size would likely experience an improvement in market quality. The analysis is less clear about the effect of the proposal in trading in stocks that would receive the $0.05 increment: stocks with Time-Weighted Average Quoted Spreads between $0.016 and $0.04. These stocks would transition from having an average 1.6–4 ticks intra spread to having 3–8 ticks intra spread. The TSP analysis in Table 9 suggested that, for stocks with approximately 2–3 ticks intra spread, moving to 10–15 ticks intra spread was not clear, while for stocks with 3 or more ticks intra spread, moving to 15 or more ticks intra spread appears to have been harmful.[567] None of the stocks in the proposed $0.005 tick group would have prevailing spreads with more than 15 ticks intra spread, so for this group the analysis does not provide clear predictions regarding the effect of the tick size reduction on transaction costs for these stocks.

Quoted spreads are not static from day to day. It is possible that a stock could have a narrow quoted spread during an evaluation month, and thus be assigned a small tick, and then during the following month it could experience points in time where the quoted spread is much wider.[568] If the spread widens sufficiently, relative to the quote, then the stock could trade in a range of ticks intra-spread that may harm market quality.[569] To provide an estimate of the fraction of trading volume that could be affected in this manner, the following estimation is computed. March 2022 is treated as a hypothetical evaluation month and all stocks are assigned a tick size based on their prevailing time-weighted quoted spread during this month.[570] No stock is assigned a $0.001 tick in this estimation, as Time-Weighted Average Quoted Spreads for stocks priced at, or greater than, $1.00 per share are currently have a lower bound because of the $0.01 tick. Thus, all stocks with Time-Weighted Average Quoted Spreads below $0.016 are assigned a tick of $0.002. Then, for the months of April through June 2022, all trading volume during regular trading hours is evaluated for all stocks and the Time-Weighted Average Quoted Spread is determined at the time of trade. If the NBB for the trade is below $1.00, that trade is assigned a tick size of $0.0001. Trading volume with an NBB greater than $1.00 that would have received a tick size lower than $0.01 based on March 2022 Time-Weighted Average Quoted Spreads is then analyzed. The total trading volume within this subsample that executed at a time when the quoted spread would have had more than 10 or 15 ticks within the spread if it had had the lower tick size is computed and presented in Table 10 as a fraction of total trading volume during the period.

TABLE 10—VOLUME RECEIVING A TICK REDUCTION EXECUTING DURING PERIODS OF WIDE SPREADS [a]

	10 + ticks (%)	15 + ticks (%)
Share Volume	3.4	1.1
Dollar Volume	7.4	2.2

[a] This table provides estimates of the amount of share and dollar trading volume in stocks that meet the following conditions. The NBB is greater than $1.00 per share at the time of trade. The stock had a time-weighted quoted spread of less than $0.04 in Mar. 2022, and the stock's quoted spread was greater than 10 or 15 times its hypothetical tick size based on Mar. 2022 time-weighted quoted spreads computed from the WRDS Intra-day indicators. The universe of securities in the WRDS intra-day indicators dataset is used. Only trading volume associated with normal trades during regular trading hours is considered. Normal trades are identified in TAQ data by sale conditions "blank, @, E, F, I, S, Y" which correspond to regular trades, intermarket sweep orders, odd lot trades, split trades, and yellow flag regular trades. We exclude these trades because they are not typically representative: for example the codes include trades that result from an acquisition, trades reported out of sequence, and extended hour trades.

Table 10 provides an estimate that approximately 3.4% of total share trading volume met the following conditions. It would have been associated with a stock receiving a lower tick size and would have executed when spreads were wider than 10 ticks based on the estimated tick size. Table 10 also provides an estimate that 1.1% of total share volume would have executed when spreads were more than 15 ticks wide. For this fraction of trading volume, it is possible that the reduction in the tick size could lead to a worse trading environment for the period of time that spreads remain significantly higher than the evaluation period compared to what the trading environment could have been had the stock retained a $0.01 tick. This effect would not be indefinite because, if a stock's spread remains elevated, then at the end of the next evaluation period, the stocks would be assigned a wider tick—mitigating the negative consequences of having a tick size that is too narrow relative to the quoted spread.

2. Minimum Pricing Increment for Trading

The proposal would require all trades that are not midpoint or benchmark trades, including trades executed by OTC market makers, including wholesalers, to execute in increments determined by the minimum pricing increment for trading, which would be harmonized with the minimum pricing increment for quoting. Applying a minimum pricing increment to trading, coupled with reducing the minimum pricing increment for quoting, could affect measures of the frequency and magnitude of price improvement either

[567] Barardehi, et al. (2022), *supra* note 85, show that statistical results for wider spread stocks, such stocks in bin #4 in Table 9, vary somewhat when they estimate their model separately on data for each of the three TSP groups. When separately estimated, the effects for lower spread stocks, bins 1 and 2, remain consistent and statistically significant across all three TSP test groups.

[568] Likewise, two stocks with equal average quoted spreads may not be equally tick-constrained. For example, one stock with a $0.02 average quoted spread could have a $0.01 quoted spread 40% of the time while another has a $0.01 spread 10% of the time. The effect of the proposal on market quality could differ in much the same way as the effects described in this paragraph.

[569] The empirical analysis in this section suggesting that a lower tick size benefits tick and near-tick-constrained stocks is an "on average" result. While the Commission expects that a lower tick would on average decrease transaction costs for tick and near-tick-constrained stocks, for some of these stocks, a smaller tick could lead to wider spreads. For these stocks, if spreads increase to a sufficient degree then the stock could be re-assigned a wider tick after the next evaluation month.

[570] We use WRDS intra-day indicators for all stocks in the database to estimate the time weighted quoted spreads for Mar. 2022. No stock is assigned a $0.001 tick in this estimation as quoted spreads for stocks priced $1.00 or more per share are currently constricted by the $0.01 tick. Thus all stocks with Time-Weighted Average Quoted Spread below $0.02 are assigned a tick of $0.002.

positively, negatively or insignificantly, on average. The Commission recognizes that any changes to these measures could affect transaction costs paid by investors or could affect where broker-dealers route customer order flow, or both, potentially leveling the playing field between exchanges/ATSs and off-exchange dealers in attracting retail order flow. Because of this competitive pressure, the Commission expects that trading venues will continue to compete on providing price improvement and that the harmonization of trading and quoting increments will not mitigate the execution quality improvements from a reduction in the minimum pricing increment.

Requiring trades to occur at the minimum pricing increment would have uncertain net effects on total price improvement, which is the primary mechanism for the economic effects of a trading increment. The Commission expects that for most trading volume receiving a smaller tick, quoted spreads would likely narrow, on average. While narrower spreads mean less opportunity for further price improvement, investors would not be getting worse trade prices under the proposed rules, because the narrower spreads imply better prices for most trades. While price improvement is a measure of execution quality, lower price improvement does not necessarily translate into worse outcomes for investors, particularly when quoted spreads are narrowing. Because price improvement is measured relative to the quoted spreads, price improvement is a more meaningful measure of execution quality when quoted spreads are held constant. Therefore, an increase in the frequency and level of price improvement in conjunction with an expected narrowing of quotes does not inform on overall investor execution quality from the proposal, though it may inform on whether the harmonization furthers or mitigates the expected improvements from narrower quotes in execution quality for investors.

The Commission does not anticipate that the proposal for a minimum trading increment would affect most current price improvement. In particular, Table 3 indicates that most price improvement in stocks with prices greater than $1 currently occurs as a result of midpoint trades or in increments of $0.01, neither of which would be affected by the proposed trading increment.[571]

From Panel B of Table 3, we observe that 82.5% of the dollar value of price improvement fits this description. The remaining 17.5% of price improvement ($12 million per day)[572] occurred in sub-penny increments and were not associated with midpoint trades and, therefore, could potentially be affected by the rule. In addition, the harmonization of tick sizes across venues will likely have very little impact on trades for stocks priced less than $1.00. The designated increment of $0.0001 already appears to be the minimum pricing increment for wholesaler price improvement.[573]

The proposed pricing increment for quoting and the proposed acceleration of the round lot definition would have an effect on price improvement that alters the basis by which the isolated effects of the trading increment are compared. However, the Commission is uncertain of the effect these proposals would have on the magnitude of price improvement, but anticipates they could increase the frequency of price improvement and change the basis for the effects of the trading increment. Because price improvement is benchmarked to the NBBO, the magnitude of price improvement available could decline as a result of reductions in the NBBO from the change in the round lot definition, which would narrow the spread in stocks priced more than $250, or from a smaller tick, which could narrow the spread in tick-constrained stocks. Conversely, the frequency and magnitude of price improvement could also increase for stocks that are currently tick-constrained because, for tick-constrained stocks, the only way to offer price improvement on an exchange or ATS is with a midpoint trade. If the reduction in tick sizes results in tick-constrained stocks no longer being tick-constrained, then exchanges and ATSs could accept odd-lot orders inside the NBBO that offer price improvement relative to the NBBO. It is unclear which effect would dominate: the decline in the NBBO spread leading mechanically to less reported price improvement or the increased ability to offer price improvement on stocks that are currently tick-constrained.

For currently price improved trades the effect of the proposal would depend on a few factors. Consistent with the analysis in Table 3, one study also reports that common price improvement levels are $0.0001, $0.001 and $0.002.[574] For stocks priced equal to or greater than $1.00, price improvement of $0.0001 would no longer be achievable. However, for a stock priced at $20, price improvement of $0.0001 represents only 0.05 bps of price improvement, which is not economically meaningful. The Commission expects that on such trades the wholesaler would likely round down to the price improvement that it offers in the majority of cases to the nearest permissible increment reducing price improvement by $0.0001 per share traded by retail investors, which could mitigate some of the benefits of the proposal as a whole. This is because the cost to an OTC market maker of rounding up almost an entire tick could be high. For price improvement that occurs in increments of $0.001 or $0.002 the effect of the rule would be dependent on the stock's designated tick size. For the estimated approximately half of trading volume that would likely receive a $0.001 tick, price improvement of either $0.001 or $0.002 would still be possible because both increments align with the $0.001 tick size. For the fraction of trading volume receiving a $0.002 tick, price improvement of $0.001 would not be possible but price improvement of $0.002 would still be possible. For the subset of retail trades in stocks that would have a $0.002 tick and would have received price improvement of $0.001 absent harmonization, the OTC market maker could offer greater price improvement on these trades to $0.002, or it could choose to not offer price improvement. Both options come with costs to the OTC market maker, so the decision depends on the margins earned by OTC market makers when internalizing trades. If it chooses to price improve from $0.001 to $0.002 it would earn $0.001 less per share transacted. However, if it fails to price improve then both the total price improvement offered to retail investors and the fraction of trades receiving price improvement would decline, potentially making the OTC market maker appear less competitive in terms of attracting retail order flow. Additionally, the less price improvement that OTC market makers in sum offer to retail traders, the less attractive they might appear to the broker-dealers who handle retail traders. This coupled with the fact that OTC

[571] Here, price improvement is defined as any trade that transacts inside the NBBO and includes midpoint and intra-spread trades executed on ATSs and exchanges in addition to OTC market maker internalized trades. A $0.01 price improvement would be feasible with any of the tick sizes considered in this proposal.

[572] This figure does not represent the potential harm to retail investors. The discussion later in this section explains that these trades could be positively or negatively affected. Further, trades that do not have an opportunity for price improvement currently, could have an opportunity for price improvement under the proposed rules.

[573] *See, e.g.,* Boehmer, *et al.* (2021), *supra* note 469. For this reason, the remainder of the discussion in this section focuses on the effects of harmonization on stocks priced equal to, or greater than, $1.00 per share.

[574] *See* Boehmer, et al. (2021), *supra* note 469.

market makers would be restricted to the same minimum trading increment as exchanges and ATSs would put competitive pressure on OTC market makers to price improve trades because exchanges and other ATSs would have an increased ability to potentially innovate and compete for retail order with OTC market makers, including wholesalers.[575]

Similar arguments follow for stocks that receive a tick size of $0.005 or $0.01. A wholesaler would not be able to offer price improvement at common levels and could thus offer less or no price improvement—which might harm its competitive standing in terms of competing for retail order flow. To offset this consequence the OTC market makers, including wholesalers, could instead increase the amount of price improvement that it offers.

To the extent that OTC market makers choose to not offer as much price improvement, total price improvement received by retail investors might decrease. But, to the extent that OTC market makers choose to increase the levels of price improvement to match the tick, then retail price improvement might increase. If OTC market makers increase price improvement in some instances to match the tick and decrease it in others, the net effect for retail price improvement could be positive, negative, or neutral.[576] The Commission believes that investors may benefit overall from harmonizing trading and quoting increments regardless of the effect on price improvement because of the potential long-term competitive effects.[577]

3. Lower Access Fee Cap

The proposal would lower the access fee cap from $0.003 per share (30 mils) to $0.001 per share (10 mils) for NMS stocks priced $1.00 or greater and having a minimum pricing increment greater than $0.001, from $0.003 (30 mils) to $0.0005 (5 mils) for NMS stocks priced $1.00 or greater and a minimum pricing increment of $0.001, and from 0.3% to 0.05% of the share price for stocks with prices less than $1.00.

Most exchanges currently charge the maximum access fee allowed under the cap. For stocks with narrow spreads such as tick-constrained stocks, a 30 mil access fee can increase the cost of demanding liquidity by as much as 60%.[578] The direct economic effect of a lower access fee cap is therefore likely to be a lower price to take liquidity, and thereby lowering the cost of trading for many investors. Moreover, to avoid increasing distortions in order routing, a reduction in the tick size must be accompanied by a reduction in the access fee cap in the presence of the NBBO. Because the NBBO offers quote protection, a liquidity taker must go to the best quote regardless of the fee, limiting the ability for market forces alone to lower access fees. Some reduction in the access fee cap would be necessary to prevent a situation in which the access fee exceeds the quoted spread.

At present, many exchanges offer rebates for liquidity providers and charge fees for liquidity takers (Section V.C.2), with a net capture rate of 2 mils for stocks with prices greater than or equal to $1.00. Table 11 estimates the rebates exchanges would pay, should this 2 mil capture fee prevail; that is, for stocks with a 10 mil access fee, the rebate would on average be 8 mils per share, for example. The analysis also assumes that the behavior of inverted exchanges and off-exchange venues changes proportionally, though the proposal would not require this. As shown in Table 11 below, the Commission estimates that the reduction in the access fee cap would lead to a decrease in the total access fees collected and rebates distributed of approximately $3.8 billion per year, amounting to a 73% reduction in access fees paid or an 80% reduction in rebates distributed.[579] Balancing out expected rebates paid on make-take, inverted, and flat fee venues, the Commission expects that liquidity demanders would pay $3.2 billion per year less in access fees netted across all venues under the proposal and liquidity providers would receive $3.2 billion per year less in rebates netted across all venues. These numbers represent an 80% reduction in rebates received by liquidity providers and a 73% reduction in access fees paid by liquidity demanders. Additionally, the Commission estimates that the reduction in the access fee cap could decrease the net capture of the exchanges by $89 million per year with the decline in net capture coming almost exclusively from a lower net capture for trading in stocks priced less than $1.00 (see below).[580]

The analysis in this section assumes that exchanges would maintain the practice of financing rebates through access fees, and thus for transactions in stocks priced $1.00 or more the Commission expects the average access fee to be near the 10 or 5 mil access fee cap and the rebate to be approximately 2 mils lower on average.[581] There are several reasons for this assumption to hold, at least approximately. First, on inverted venues, there is currently no restriction on the level of fees for taking liquidity or rebates for posting, yet as shown in Table 5 inverted venues generally have fee and rebate levels similar to maker-taker venues and approximately a 2 mil capture rate. Second, this proposal does not directly alter the ability or the incentives for an exchange to subsidize rebates. Additionally, if exchanges were to subsidize rebates by taking a net loss per share transacted, they would be vulnerable to experiencing extreme and unpredictable losses if volumes spike. Trading volumes can vary significantly through time with very little ability to predict the timing and magnitude of changes in trading volume. For example, in January 2021 volume spiked dramatically for certain stocks relative to pre-January 2021 levels.[582] The Commission nonetheless acknowledges uncertainty over whether this 2 mil capture rate would persist or be lower. The capture rate could be lower should exchanges choose to subsidize rebates on stocks priced $1.00 or more to a greater extent, choose to subsidize trading on stocks with prices less than $1.00, or choose to alter their business model in response to the changes.

Table 11 uses volume estimates from Table 6 to provide estimates of the fees

[575] *See infra* sectionV.E.2.a. for further discussion on these competitive effects.

[576] Market participants have also expressed similar uncertainty. NYSE, providing an analysis of the potential effect of a $0.0025 tick increment that applies in all settings, stated, ''We expect the reaction to [harmonizing the tick increment] will be some mix of favorable and unfavorable changes for marketable orders. For example, some buy orders will pay higher prices, but some will also pay lower prices as additional market participants can effectively use price points previously available only on bilateral trades.'' *See* NYSE Tick Harmonization Paper, *supra* note 126 at 6. Given the uncertainty regarding how OTC market makers, including wholesalers could react to applying the tick size to trading situations, the Commission is not providing quantitative estimates of the effect of the proposal on retail price improvement.

[577] *See infra* section V.E.2.a. for further discussion on these competitive effects.

[578] For a tick-constrained stock, the cost of demanding liquidity is one half the spread ($0.005) plus the access fee. An increase of $0.005 to $0.008 is a 60% increase.

[579] Estimates in this paragraph are computed by multiplying by two the estimates in Table 11.

[580] The exception is IEX, which the Commission estimates might experience a reduction in access fees collected on trading in tick-constrained stocks greater than $1.00. This is because the 5 mil access fee cap for these stocks is lower than the estimated 6 mils that IEX currently charges to access protected quotes. Thus the Commission estimates that the IEX might lose approximately $3 million per year in transaction revenue on trading in these securities.

[581] At certain pricing tiers rebates may exceed the access fee cap. However, because total overall fees exceed the total rebates paid out, the average rebate would remain lower than the average access fee.

[582] *See* Staff Report on Equity and Options Market Structure, *supra* note 20.

and rebates that would have been collected and disbursed in the first six months of 2022 if the proposed access fees were implemented.[583] Annualized estimates are simply these estimates multiplied by two. Panel A shows that under the current system with a 30 mil access fee cap for quotations priced $1.00 or more and a 0.3% access fee cap for transactions less than $1.00 the exchanges collected an estimated $2.55 billion in access fees and distributed $2.31 billion in rebates in the first six months of 2022, providing an estimated net capture of $240 million for the exchanges in that time period.[584] Under the proposed amendment to rule 610 the Commission estimates that the exchanges would collect $652 million in access fees and distribute $455 million in rebates, providing the exchanges a net capture of $197 million over the same time period. Thus total access fees collected would be expected to decline by $1.91 billion ($3.82 billion annually) and rebates distributed by $1.86 ($3.72 billion annually) billion in the first six months of 2022. This amounts to an estimated decline in net capture of $44.5 million ($89 million annually) across all exchanges.

Panel B provides estimates of the effect of the proposal on access fees paid and rebates received by liquidity demanders and providers separately under the proposed rule. The Commission estimates that under the proposed rule liquidity demanders would pay $1.56 billion ($3.12 billion annually) less in access fees and liquidity providers would receive $1.52 billion ($3.04 billion annually) less in rebates over the same time period. Thus, the current estimated $1.9 billion transfer facilitated by access fees and rebates from liquidity demanders to liquidity providers in the first six months of 2022 would be decreased by 80% under the proposal.

TABLE 11—ESTIMATED ACCESS FEES AND REBATES COLLECTED CURRENT AND PROPOSED JAN. TO JUNE 2022 [a]

	Current	Proposed	Difference
Panel A: Estimated Access Fees Collected and Rebates Distributed Jan–Jun 2022			
Fees Collected	$2,554,250,000	$652,318,000	−$1,901,932,000
Rebates Distributed	2,312,561,000	455,081,000	−1,857,480,000
Exchange Capture	241,688,000	197,237,000	−44,451,000
Panel B: Estimated Fees by Liquidity Type			
Liquidity Demander	2,135,292,000	568,631,616	−1,566,668,000
Liquidity Provider	−1,893,604,000	−371,394,303	1,522,210,000
Exchange Capture	241,688,000	197,237,312	−44,451,000

[a] This table takes trading volumes presented in Table 6 to calculate aggregate fee and rebate estimates under the proposal. It separately accounts for volume priced less than $1.00 as well as trading that occurred in stocks that had time weighted quoted spreads less than or equal to $0.011—*i.e.,* stocks that would likely have received a $0.001 tick under the proposed changes to rule 612. These stocks are determined using Dec. 2021 time weighted quoted spreads for all trading volume in Jan. through Mar. and Mar. 2022 time weighted quoted spreads for volume Apr. through June. Current estimates are drawn from Table 7 while proposed estimates are computed assuming that non-tick-constrained volume priced equal to or greater than $1.00 on maker-taker or inverted exchanges pay a 10 mil access fee and receive an 8 mil rebate. For tick-constrained volume the assumption is 5 mil access fee and 3 mil rebate. For IEX we assume a 6 mill access fee for non-tick-constrained volume and a 5 mil access fee for tick-constrained volume. For volume priced less than $1.00 we assume that no exchange offers a rebate and that all exchanges charge 0.05% to take liquidity except for IEX whom we assume charges both sides 0.05%. Computations are made at the exchange and then aggregated as shown above.

Table 11 presents analysis suggesting that the exchanges could lose approximately $89 million per year in net capture. This estimated decline in transaction revenue comes almost exclusively from the reduction in the access fee cap for transactions in securities below $1.00. This is because for transactions priced equal to or greater than $1.00 the Commission expects that, except for exchanges that choose to rely mostly on transaction fee revenue which tend to have a higher net capture, the exchanges would largely maintain their current net capture.[585] Thus the decline in exchange net capture would be driven almost exclusively by an anticipated decline in the net capture on transactions below $1.00. For these transactions most exchanges currently charge the maximum 0.3% but offer no rebates.[586] Because very few exchanges offer rebates on stocks priced below $1.00, the access fee represents the exchange's net capture. Lowering the access fee from 0.3% to 0.05% on these transactions would represent a decrease in net capture of 83% for many exchanges. This decline would not be expected to be uniform. Some exchanges do not charge any fees for trading in sub $1.00 securities while others charge a fee to both sides of a sub $1.00 transactions. Additionally, the exchanges differ in the fraction of sub $1.00 trading volume that they handle. Table 12 provides annualized estimates of the effect of lowering the access fee on exchange net capture given realized volumes in the first 6 months of 2022.

[583] This assumes that exchanges continue the practice of funding rebates through access fees, that trading volumes are unchanged relative to the first six months of 2022, that the distribution of trading volume across exchanges is unchanged, and that the distribution of trading volume priced below $1.00 and at or above $1.00 remains unchanged.

[584] *See* Table 7 for additional analysis on current estimates of exchange net capture.

[585] As discussed in section III.C.2, the Commission believes that most exchanges have a net capture of approximately 2 mils on transactions priced greater than $1.00. For reasons discussed in this section the Commission believes that it is reasonable to assume that exchanges with a current 2 mil net capture would be able to continue to earn a 2 mil net capture. The Commission expects one exception to its general belief that all exchanges would likely be able to maintain their net capture on transactions priced greater than $1. The Commission believes that IEX might receive a lower net capture for transactions associated with volume assigned the 5 mil access fee cap. The Commission estimates, based on Table 5 that IEX has estimated net capture of 6 mils per transaction priced equal to, or greater than, $1.00 per share. Under the assumption IEX would not begin charging access fees to liquidity providers, its maximum net capture per transaction on stocks with a 5 mil access fee cap would be 5 mils. Thus our estimates assume that IEX would lose 1 mil of net capture on estimated volume that IEX executed that would have received the 5 mil access fee cap. The Commission estimates that this loss would account to approximately $1.5 million in lost transaction fee revenue in the first six months of 2022, or $3 million annualized.

[586] *See* Table 5.

TABLE 12—ESTIMATED EFFECT OF POLICY ON EXCHANGE TRANSACTION CAPTURE [a]

	Revenues ($)	Revenues (%)
Nasdaq	−$33,527,000	−21
NYSE	−24,676,000	−20
Cboe	−22,356,000	−20
MEMX	−1,960,000	−7
IEX	−5,378,000	−10
MIAX	−1,005,000	−14
LTSE	0	0
Total	−88,902,000	−18

[a] To compute the variable Revenue ($) which provides an annualized estimate of the effect of the proposed amendment to rule 612 on exchange net capture, we assume that IEX loses 1 mil on transactions that are priced equal to, or greater than, $1.00 per share and are tick-constrained and (and thus may receive the $0.001 tick and 5 mil access fee). For all other exchanges the net capture on transaction priced equal to, or greater than, $1.00 per share is expected to remain unaffected by the proposal. For transaction volume below $1.00 per share estimates for the decline in transaction revenue is computed by assuming that under the proposal all exchanges would charge 0.05% to one side of the transaction and nothing to the other side of the transaction. Sub $1.00 dollar volume estimates for each exchange are taken from Table 6. This revenue is then compared to the estimated transaction revenue in the current environment that is estimated using the sub $1.00 transaction fees/rebates for each exchange presented in Table 5 Panel B and multiplying them by volume estimates for each exchange from Table 6. The difference is presented in the table. To estimate the impact on total transaction fee revenues the Commission assumes that all make-take and inverted exchanges would earn 2 mils on all transactions priced equal to or greater than $1.00 per share and Flat fee venues earn 6 mils. This revenue is added to the sub $1.00 transaction revenue estimated as stated earlier in this footnote. The variable Revenue (%) is computed as the Revenue ($) divided by the revenue total revenue converted to a percent. To annualize, all totals are multiplied by 2.

The estimated $3 billion annual reduction in rebates received by liquidity providers under the proposal could impact market participants, specifically algorithmic and high-frequency traders, which specialize in liquidity provision and rebate capture strategies. Holding the spread constant, a rebate of 28 mils provides a significant fraction of the total revenue earned by liquidity providers on each share transacted.[587] Even absent a reduction in the tick increment, the reduction in rebates from an estimated 28 mils average to either 8 or 3 mils would significantly decrease the revenue earned per share transacted by a liquidity provider.[588] Any additional reduction in the spread due to the reduction in the tick size for tick-constrained stocks would further reduce the revenue earned by liquidity providers.

The primary likely effect of the decline in rebates disbursed and access fees collected would be to reduce the amount of liquidity provision—particularly among stocks with narrow spreads. This reduction in liquidity provision may not be harmful to trading quality for these stocks, under the reasoning that the reduction in rebates would alleviate currently existing distortions that lead to an oversupply of liquidity relative to the demand of liquidity, and would better allow the forces of supply and demand to determine market prices and lower overall transaction costs for liquidity demanders.

If tick sizes were infinitely small, and absent other distortions, then fees and rebates would not affect the cost of trading because markets would simply adjust quotes by the amount of the rebate such that the spread with rebates included is the same.[589] However, current U.S. equity markets differ from this frictionless construct because there is a finite tick. In this environment, and particularly for stocks with narrower spreads, high access fees and rebates can distort liquidity supply and demand by artificially increasing the cost of taking liquidity and the revenue to providing liquidity. This dynamic creates an environment with too much liquidity supply relative to liquidity demand.

Consider a stock with a $0.01 spread. In this case, a liquidity provider offering a protected quote at a maker-taker venue under the current system with a 30 mil access fee and a 28 mil rebate will earn one half the spread ($0.005) plus the rebate ($0.0028) yielding a profit of $0.005+$0.0028=$0.0078 per share traded. In this case a rebate of 28 mils increases the liquidity provider's profit on the transaction by approximately 50%. For liquidity demanders, the 30 mil access fee produces the exact opposite effect, increasing transaction costs by approximately 50%. The existence of a $0.01 tick prevents spreads from adjusting to levels that can equate liquidity supply and demand, leading to an oversupply of liquidity relative to demand.

Reducing the access fee cap to 10 or 5 mils significantly reduces the effect that access fees have on the incentive to demand and provide liquidity and would allow markets to realize prices that better reflect the underlying economics of liquidity supply and demand. For example, consider a stock with a prevailing spread of approximately $0.01, an access fee cap of 5 mils, and an average rebate of 3 mils. In this case a liquidity provider on a maker-taker exchange will earn half the spread plus a 3 mil rebate for a total of ($0.005+$0.0003=) $0.0053. In this case the total cost to demanding liquidity falls by approximately 50% and the access fee is just 5.7% of the total transaction costs. For a stock with a $0.03 spread and a $0.005 tick, a 10 mil access fee, and an 8 mil rebate the liquidity provider in this case earns half the spread plus the rebate for a total of ($0.0150+$0.0008=) $0.0158. In this case the rebate is only 5% of the total revenue for providing liquidity. The effect of rebates diminishes as an economic incentive as spreads widen. For example, consider a stock with a $0.10 spread. Even in the baseline case with a 28 mil rebate. A liquidity provider will earn half the spread plus a 28 mil rebate for a total revenue of ($0.0500+$0.0028=) $0.0528 per share. In this case the rebate is 5.6% of the total cost, a fraction that drops to 1.5% with an 8 mil rebate under the proposal.

[587] *See supra* section V.C.2

[588] For example, on a stock with a $0.01 spread the liquidity demander would earn half the spread ($0.005) plus the rebate ($0.0028), or $0.0078 per share in the current market. Under the current regime if this stock was assessed a 5 mil access fee cap the expected rebate would decline to $0.0003 for a total profit of $0.0053, or a 32% reduction in total revenue to the liquidity provider on the transaction. This reduction would occur before any tick size reduction in the spread is taken into account.

[589] *See, e.g.,* Colliard and Foucault (2012), *supra* note 277; James Angel, Lawrence Harris, and Chester Spatt, *Equity Trading in the 21st Century,* 1 Q. J. Fin. 1 (2011).

Standard supply and demand arguments suggest that if the revenue earned per share transacted decreases—*i.e.,* the price of liquidity decreases—the amount of liquidity supply will also decrease, reducing the oversupply of liquidity. This reduction in liquidity provision likely means that some proprietary trading desks and firms that currently specialize in providing liquidity and capturing rebates would cease operation as the market adjusts from one with significant liquidity subsidization to one with less subsidization and where the ask and bid prices are more reflective of the forces of supply and demand for liquidity.[590]

The primary beneficiaries of the reduction in the access fee cap would be liquidity demanders. For stocks with narrow spreads such as tick-constrained stocks, a 30 mil access fee can increase the cost of demanding liquidity by as much as 60%.[591] Consequently, reducing the access fee significantly reduces the cost of demanding liquidity in the predominant maker-taker trading environment. This effect coupled with the expected decrease of liquidity suppliers can be expected to decrease competition to provide liquidity. Less competition to provide liquidity means that queue lengths could decrease and fill rates increase because it would be easier to get to the front of the order book. This effect could allow non high-frequency traders -more opportunity to fill orders using liquidity-providing instead of liquidity-demanding transactions.

The Commission expects the decline in the access fee to have opposing effects on trading volume. If more investors end up interacting with one another without the intermediation of a specialized liquidity provider or high frequency market makers the total number of transactions and trading volume may decrease. However, the basic forces of supply and demand suggest that as the price of a good decreases, the demand for that good increases. Thus, if the cost of demanding liquidity decreases, more investors will seek to trade which would increase trading volume. This could occur as market participants take advantage of the lower cost of demanding liquidity to more actively manage their portfolios—generating more trading.[592] Taken alone, a reduction in the access fee could lead to wider spreads in some cases by reducing the ability to use rebates as a form of intra-tick pricing. However, the reduction in tick size also reduces the need for intra-tick pricing. For instance if the ask price that equates supply and demand is equal to $10.0015 then absent a rebate and with a $0.01 tick, the prevailing ask price would be $10.01—the next feasible price. This price would indicate a distortion of $0.0085. However, with a 28 mil rebate, the prevailing ask price will be $10.00 because once the rebate is taken into account, the net price including the rebate would be $10.0028 which is greater than $10.0015. While still a distortion, the distortion in this case would be smaller at $0.0015. Thus, in this case the existence of a 28 mil rebate can narrow the spread by allowing a form of intra-tick pricing. In this example with a rebate of either 3 or 8 mils the prevailing price would still be $10.01 because the net price including rebates on a maker-taker venue would still be less than $10.0015. However, because the reduction in the access fee is also accompanied by a reduction in the tick size, markets would be able to more naturally find prices that equate supply and demand without needing rebates to minimize the distortion. In the example, where the ask price that equates liquidity supply and demand is $10.0015, and if the stock were assigned a tick of $0.001 under the proposed changes, the prevailing ask price would be $10.002 and the distortion would be $0.005. Thus because of the reduced tick, the need for intra-tick pricing via rebates is significantly reduced.

The reduction of the access fee cap, as well as relaxing of the tick constraint, could also simplify markets by reducing the need for complex order types that are designed to take advantage of the system of fees and rebates. The reduction would also likely simplify the overall system of fees by compressing the fees that are possible to charge and thereby also constraining the ability for exchanges to offer multiple pricing tiers with economically meaningful differences. This simpler market structure could reduce the cost associated with designing and executing an order routing strategy and could thus decrease transaction costs. Simpler fees and rebates could also translate into a reduced frequency and complexity of amendments to exchange access fees and rebates. If so, the proposal could result in cost savings to exchanges associated with fewer Rule 19b–4 filings.

A lower access fee cap could induce some trading volume that currently transacts on ATSs to revert to exchanges. This would occur to the extent that traders who may route orders to ATSs in order to avoid high access fees instead route orders to exchanges due to lower access fees.[593] More trading volume on exchanges could improve overall price efficiency.[594] However, these effects could be lessened or reversed due to the reduction in rebates, since rebates incentivize trading on exchanges versus off-exchange.

Finally, for stocks priced less than $1.00 the effect of lowering the access fee will primarily be to lower the transaction costs associated with trading in these securities. Most exchanges do not offer rebates for stocks priced less than $1.00, or if they do the rebates are quite small. Therefore, the effect of the proposal on such rebates is likely to be minimal. Lower transaction costs for these securities may improve liquidity for stocks with prices less than $1.00. However, given the relatively low natural trading interest, the Commission does not expect a significant improvement in the trading environment for these securities.

4. Exchange Fees and Rebates Determinable at the Time of Execution

The proposal requires that exchange fees and rebates be determinable at the time of execution. In the current environment, the prices adjusted for the fees and rebates that investors pay can vary by as much as 60 mils (0.6c) per share for orders with the same nominal execution price.[595] Thus, allowing market participants to determine the applicable fees and rebates at the time of execution could help improve investor execution quality by providing certainty as to the net fee and rebate price applicable at a given exchange at the time that an order is routed to that exchange.

Having fees and rebates determinable at the time of execution could make it easier for broker-dealers to pass such fees and rebates on to the end customer. Currently, it is difficult for a broker-

[590] Market participants sometimes refer to the oversupply of liquidity relative to demand as excessive intermediation (*see supra* note 100). Thus reducing the access fee would reduce excessive intermediation.

[591] For a tick-constrained stock, the cost of demanding liquidity is one half the spread ($0.005) plus the access fee. An increase of $0.005 to $0.008 is a 60% increase.

[592] *See, e.g.,* Roni Michaely, Jean-Luc Vila, and Jiang Wang, *A Model of Trading Volume with Tax-induced Heterogeneous Valuation and Transaction Costs,* 5 J. Fin. Intermediation 340 (Oct. 1996) for an empirical analysis of the relation between trading volume and transaction costs.

[593] *See* Menkveld, et al. (2017), *supra* note 275.

[594] *See* Foley, et al. (2016), *supra* note 465.

[595] If rebates and transaction fees are both approximately 30 mils on both maker-taker and inverted venues, then the realized price difference for an order with the same nominal value can be as much as 60 mils depending on where the order is submitted.

dealer to pass on fees and rebates to individual customers because the level of fees and rebates is not determinable at the time of execution and the tier into which a broker-dealer falls, which determines total fees and rebates, is based on total broker-dealer activity and not an individual trade.

Access fees create potential conflicts of interest. Passing on fees and rebates to end customers could eliminate such distortions and lead to improved overall order execution for end customers. Additionally, the ability to pass on the fees and rebates to end customers might also make customers more aware of these fees and rebates so that they can better inform their broker-dealers how to route with respect to fees and rebates which could also lead to better execution for end customers.

While the ability to determine fees and rebates at the time of execution would make passing fees and rebates on to the end customer more feasible, it is not clear in practice how much this would occur as there are significant uncertainties regarding how much demand currently exists for rebates to be passed through by end investors. Academic research shows that execution skill can have a significant impact on an investor's portfolio returns.[596] It is possible that more sophisticated market participants with high trading volumes, and thus higher transaction costs, might welcome the opportunity to better manage access fees and rebates for their trades. On the other hand, less sophisticated traders with low trading volumes might be less inclined to request that their broker-dealers pass through access fees and rebates.

Making fees and rebates determinable at the time of execution could also enable the customers of broker-dealers to better discuss transaction fees and rebates with their broker-dealers, and potentially request data on such fees. Doing so could improve broker-dealer accountability and lead to better outcomes for customers.[597]

5. Acceleration of the MDI Rules and Addition of Information About Best Odd-Lot Orders

The proposal would result in four changes to NMS data. Two of the changes would accelerate the implementation of specific aspects of MDI, namely the round lot definition and the inclusion of odd-lot quotations priced better than the NBBO in NMS data, and would, therefore, result in realizing the economic effects of these MDI Rules sooner. The Commission acknowledges that the economic effects of the proposed acceleration would be temporary only until the accelerated aspects of the MDI Rules would otherwise have been implemented. The proposal would impose a new requirement on the exclusive SIPs to disseminate the accelerated odd-lot information until the exclusive SIPs are retired, the effect of which is to guarantee that the odd-lot information would be disseminated.[598] The proposal does however present the possibility that the new requirements on the SIPs could reduce competing consolidator competition, which could reduce the expected benefits of the MDI Rules.[599] The proposal would also require the dissemination of a standardized best odd-lot order or BOLO. The primary economic effect of this would be to provide a standard benchmark that market participants could use to gauge execution quality—particularly for smaller or odd-lot orders.

a. Round Lot Definition

The round lot definition in the MDI Rules will result in numerous economic effects and the proposal would result in realizing these effects sooner. The primary effects stem from the MDI Rules round lot definition mechanically shrinking the NBBO for stocks priced greater than $250.[600] Other effects of changing the round lot definition include increased transparency and better order execution,[601] as well as any effects from potentially having more orders routed to exchanges instead of ATSs.[602] The costs of changing the round lot definition derive from upgrading systems to account for additional message traffic and modifying and reprogramming systems.[603] The Commission also expects that changing the round lot definition will impact the mechanics of other rules and regulations.[604] These economic effects would be realized earlier than is currently estimated under the existing MDI timeline because this portion of the MDI Rules is not set to be implemented until the end of the implementation timeline. Further, because the first steps of the timeline have not been accomplished,[605] and the Commission is uncertain when exactly the round lot definition otherwise will be implemented, the degree of the effect of the acceleration, is unknown.[606]

The Commission recognizes that the earlier implementation of the round lot definition could affect the proposed tiered tick structure by sooner increasing the number of stocks subject to a minimum pricing increment of less than $0.01, but does not expect this effect to be substantial. Specifically, a mechanically tighter NBBO would reduce the Time-Weighted Average Quoted Spread used to determine the appropriate tick increment for stocks priced greater than $250. However, higher-priced stocks also tend to have higher spreads that are unlikely to narrow enough for the proposal to result in a smaller minimum pricing increment.[607]

The Commission also recognizes that both the reduction in tick size and accelerating the definition of round lot would reduce the depth of liquidity at the NBBO. These effects might amplify each other in a small set of stocks. A

[596] *See* Amber Anand, et al., *Performance of Institutional Trading Desks: An Analysis of Persistence in Trading Costs,* 25 Rev. Fin. Stud. 557 (2012).

[597] *See infra* section V.E.2.c.

[598] *See infra* Section V.D.5.c. for additional discussion of this effect. While this proposal requires the exclusive SIPs to distribute odd-lot data, the MDI Rules do not require the competing consolidators to disseminate odd-lot data. However, the MDI Adopting Release anticipated that at least one competing consolidator will do so because there would be demand for the data. *See supra* section V.C.3.

[599] *See infra* section V.E.2.c for additional discussion of MDI acceleration and the potential effect on competitive consolidator competition.

[600] *See* MDI Adopting Release, *supra* note 5, section V.C.1.(b).(i), for the full discussion of the effect of changing the round lot size on the NBBO.

[601] *See* MDI Adopting Release, *supra* note 5, sections V.C.1.b.(ii) and V.C.1.b.(iii), for the full discussion of the effect of changing the round lot size on transparency and execution quality.

[602] *See* MDI Adopting Release, *supra* note 5, sections V.C.1.b.(iv) for the full discussion of the effect of changing the round lot size on exchange competition and order routing.

[603] *See* MDI Adopting Release, *supra* note 5, section V.C.1.b.(vi) for the full discussion of the expected costs of changing the round lot size. *See also infra* section V.D.6. for an estimation and discussion of these compliance costs as they pertain to the proposed acceleration.

[604] *See* MDI Adopting Release, *supra* note 5, section V.C.1.b.(vii), for the full discussion of the effect of changing the round lot size on other rules and regulations.

[605] *See supra* section IV.A.1 for a discussion of the delays.

[606] *See supra* section II.B. for a discussion of the factors that affect when MDI will be implemented and a discussion of an estimate of the proposed acceleration of at least two years after the Commission's approval of the plan amendment(s) required by rule 614(e).

[607] *See supra* Table 8 note a, for a discussion of the impact of the round lot definition on the estimates of which stocks would receive a reduced tick size. In the MDI Rules the Commission estimated an average reduction in quoted spreads, conditional on the round lot definition resulting in a reduction of roughly 15% for stocks priced $250-$1,000 and 28% for stocks priced $1,000-$10,000. Given the average quoted spread of $0.35 for stocks priced $250–1,000 and $2.90 for stocks priced $1,000-$10,000 the expected mechanical reductions are likely not sufficient to reduce the spreads of many of these stocks to the point where they would qualify for a lower tick size in this proposal. *See* MDI Adopting Release, *supra* note 5, section V.C.1.b.(i).

reduction in tick size would spread liquidity across more price levels while the implementation of the round lot definition would result in displaying smaller quotes at the NBBO. The proposal could result in this effect being amplified for stocks that trade above $250 with spreads narrower than $0.04 as these stocks would receive both smaller tick and smaller round lot sizes, which is likely only a small number of stocks. This reduction in depth at the NBBO would temporarily reduce the information about liquidity available in the market for market participants who do not receive depth of book information from proprietary data feeds. However, the eventual implementation of including the depth of book information in consolidated market data due to the implementation of the MDI rules would render this effect temporary. At that point in time, consolidated market data is expected to contain depth information at many more price points, which would largely counteract the effects of a reduction in displayed depth from the implementation of the round lot definition and even from a reduction in tick size.

b. Including Odd-Lots in NMS Data

The proposed acceleration of the implementation of the MDI Rules that expands the NMS data to include odd-lot information inside the NBBO would result in sooner realizing some, but not all economic effects of this aspect of the MDI Rules.[608] The Commission believes that this odd-lot information could be useful to consumers of SIP data who could use it to make inferences about market conditions and, thus, could lead to better investment decisions and increased market efficiency. It could also lessen the effect of a reduction in displayed depth at the NBBO resulting from either a smaller tick size or a smaller round lot. Specifically, the proposal to expedite implementation of inclusion of odd-lot data would sooner allow individual investors whose broker-dealers subscribe to the data to visually monitor the market environment and determine profitable trading opportunities. In addition, the proposal would change the timing and magnitude of compliance costs and other costs.[609] These costs would include: the cost for exclusive SIPs to upgrade existing infrastructure and software to handle the dissemination of additional message traffic, the cost to SROs to implement system changes required in order to make the data needed to generate odd-lot information available to exclusive SIPs, and the cost of technological investments market participants might have to make in order to receive the proposed SIP data.[610]

While these economic effects would be realized sooner, the Commission does not expect that the proposal would accelerate all the effects described in the MDI Rules related to adding to NMS data odd-lot information inside the NBBO. The proposal would not accelerate the benefits from allowing some market participants to reduce data expenses required for trading by providing a reasonable alternative to some market participants to proprietary data.[611] As such, the proposal would also not accelerate the cost to users of propriety data whose information advantage would dissipate somewhat. In particular, the Commission does not believe that adding the specified odd-lot information to the exclusive SIPs would result in low-latency traders substituting the exclusive SIPs for their current proprietary data usage. This is because a key component of the MDI Rules for this functionality is an expected reduction in latency of NMS data anticipated from the competing consolidator model of NMS data distribution.[612] The exclusive SIPs are not expected to be fast enough to replace proprietary data because existing SIP latency would not be reduced or affected by this proposal. Thus, the proposal would not accelerate the benefits anticipated in the MDI Rules that pertain to using low-latency odd-lot information. Instead, the Commission expects these effects after the implementation of all MDI Rules.

Market participants who receive and use odd-lot information from the exclusive SIPs would also incur costs if the acceleration results in additional systems changes. Specifically, if the exclusive SIPs changed data specifications to add odd-lot information, market participants receiving odd-lot information from exclusive SIPs would need to make systems changes upon implementation of the proposal. Because the data specifications of the competing consolidators are unknown and could differ from the data specification of the exclusive SIPs, market participants receiving SIP data could need to make systems changes again to receive the additional data from a competing consolidator upon full implementation of the MDI Rules. If there are significant fixed costs associated with system changes that are incurred on each change, then multiple system changes would be inefficient and could increase costs. Because market participants who receive odd-lot information from the exclusive SIPs would need to make an extra systems change stemming from this proposal, they could be discouraged from making systems changes to make use of the odd-lot information and, instead, wait until MDI implementation. This could dampen some of the benefits of the proposal.

To the extent that some market participants store SIP data for various purposes (such as transaction cost analysis) the storage costs could increase with the proposal as the amount of SIP data increases with the inclusion of odd-lot data. Many factors affect these costs, such as the number of market participants storing SIP data, the data structures they use to store SIP data, whether these market participants would choose to store all or just some of the SIP data provided by the proposal, and the period over which the proposal would affect these storage costs. Based on the nature of several of these factors, the Commission is unable to estimate these costs.

[608] *See* MDI Adopting Release, *supra* note 5, section V.C.1.c.(i), for the full discussion of the effects of including odd-lot information inside the NBBO in its definition of core data. Also, the MDI Rules do not require that the competing consolidators to disseminate odd-lot information, but the Commission anticipated in the MDI Adopting Release that at least one would do so. The proposed requirement that the exclusive SIPs disseminate odd-lot information helps ensure that the economic effects of the proposed acceleration of the MDI Rules occur. *See infra* section V.D.6. for a discussion of the costs to the exclusive SIPs.

[609] *See* MDI Adopting Release, *supra* note 5, at section V.C.1.c.(iv) for the full discussion of the costs associated with expanding core data to include odd-lot information inside the NBBO. *See also infra* section V.D.6 for further discussion of compliance costs.

[610] *Id.*

[611] *Id.*

[612] *See* MDI Adopting Release, *supra* note 5, at n.1939.

c. Dissemination of Odd-Lots in SIP Data

The proposed requirement for the exclusive SIPs to disseminate odd-lot data would ensure realizing the benefits of accelerating the implementation of including odd-lot information in NMS data while imposing costs on exclusive SIPs and potentially market participants.[613] The MDI Rules do not require the competing consolidators to disseminate odd-lot data. However, the Commission estimated that at least one competing consolidator will do so because there would be demand for the data.[614] Unlike competing consolidators, each exclusive SIP is the only distributor of the entirety of its data and may lack the incentive to disseminate the data. As a result, the Commission is not certain whether the exclusive SIPs would disseminate odd-lot information absent a requirement to do so, the benefits of the acceleration could be at risk without the requirement to disseminate.[615]

While the inclusion of the odd-lot data could impose costs on those who receive and use exclusive SIP odd-lot data, the requirement that exclusive SIPs disseminate the data could impose costs on those who receive but do not have an interest in using odd-lot information provided in SIP data. In particular, depending on the SIP data specifications, such SIP data users might need to alter their systems to remove odd-lot information. Further, such SIP data users could incur the cost of any SIP data fee increases intended to offset the costs to exchanges and exclusive SIPs. However, the Commission notes that SIP data fees did not increase when the exclusive SIPs started to include odd-lot trades.

d. Best Odd-Lot Order Definition

The proposal goes beyond the MDI Rules by proposing that NMS data also include information on the best priced odd-lot orders across all markets. Including the best odd-lot order in a standardized form would offer market participants a standard benchmark, like the NBBO, to use to measure execution quality. Currently, this information is only available to market participants who have proprietary data feeds, and even then there could be differences across market participants with this data in how exactly market participants calculate the best odd-lot order (or how many proprietary feeds they include). The best odd-lot information in the NMS data would provide a standardized benchmark. This benchmark may allow market participants to better monitor the execution quality of their broker-dealers and send more trading volume to broker-dealers with better performance.[616] Thus, including the best odd-lot information could enhance competition among broker-dealers leading to better trade execution and perhaps a lower cost to customers for execution services.

6. Compliance Costs

The Commission believes that various market participants would incur implementation and ongoing costs to comply with the proposal. These costs are presented in Table 13 and discussed below. Some costs presented in Table 13 represent costs that might not be new but rather were anticipated in the MDI Rules. Specifically, those costs are associated with the acceleration of aspects of the MDI Rules. These include an estimated $1.1 million of one-time costs and $340 thousand in annual ongoing costs to exclusive SIPs. If we assume that exclusive SIPs will become competing consolidators absent this proposal and that the cost of estimating and disseminating the best odd-lot order is minimal,[617] the cost of the proposal would be approximately $57.3 million in one-time costs and $158,000 per year in ongoing costs. However, the Commission recognizes some uncertainty in the assumption that exclusive SIPs will be competing consolidators and recognizes that exclusive SIPs would incur costs to estimate and disseminate the best odd-lot order. Therefore, the Commission estimates that total costs of the proposal if exclusive SIPs will otherwise not be competing consolidators would be approximately $58.4 million in initial one-time costs and $500 thousand in annual ongoing costs. Further, the ongoing costs for exchanges and exclusive SIPs to comply with proposed rules 600 and 603 would be incurred only until the exclusive SIPs are retired, after which time these costs were previously accounted for in the MDI Adopting Release.

[613] *See infra* section V.D.6 for additional discussion of the costs the exclusive SIPs are expected to incur.

[614] *See supra* note 518.

[615] The Commission recognizes that the exclusive SIPs have some incentive to offer odd-lots as indicated by the exclusive SIPs seeking comment on doing so. *See, e.g.,* 2022 SIP Odd-Lot Request for Comment, *supra* note 371.

[616] While the Commission does not expect most retail traders would engage in this sort of benchmarking due to a lack of technical capacity to do so among most retail traders, institutional traders likely have such capacity and so would engage in this type of monitoring. Institutional traders have strong incentives to monitor all aspects of transaction costs as these costs can significantly affect portfolio performance. *See* Anand, et al. (2012), *supra* note 596.

[617] This is consistent with the expectations that exclusive SIPs would likely become competing consolidators expressed in the MDI Adopting Release, *supra* note 5, at section V.C.2.(a)(ii).

TABLE 13—COMPLIANCE COST ESTIMATES

Rule #/incurring entities	Initial	Ongoing	Number of entities	Total initial	Total ongoing
612/All Trading Venues	$140,000		286	$40,040,000	
612/Listing Exchanges	19,000	$9,000	5	95,000	$45,000
612/Order Entry Systems	11,000		1,192	13,112,000	
612/Smart Order Routers	11,000		282	3,102,000	
610/Exchanges	57,000		15	855,000	
603, 600/Exchanges	4,000	7,000	16	62,864	112,800
603, 600/SIPs	567,000	170,000	2	1,134,000	340,000
Total				58,401,000	498,000

a. Estimates for Proposed Rule 612

According to Table 13, the primary driver of costs for the proposed tiered tick structure would be the costs to all trading venues of $40 million. The $40 million comes from an estimated $140,000 [618] in one-time costs incurred by each trading venue to update systems to comply with rule 612 [619] aggregated across an estimated 286 trading venues. The estimate of 286 trading venues comes from the number of entities who report rule 605 statistics. Therefore, if additional trading venues incur compliance costs, the costs to trading venues of the proposal could be greater than $40 million.

The estimated one-time cost of $19,000 [620] and $9,000 per year in ongoing costs [621] for listing exchanges is to calculate Time-Weighted Average Quoted Spreads and to transmit the associated tick size to the exclusive SIPs under the proposal. This estimate is based on the Commission's belief that the listing exchanges currently have access to the data needed to calculate the Time-Weighted Average Quoted Spreads because such data, specifically the NBBO, is needed for the exchanges to compile 605 reports. Thus, the Commission does not believe that the exchanges would incur additional costs associated with gathering data. Additionally, the listing exchanges have experience computing statistics conceptually similar to Time-Weighted Average Quoted Spreads for their 605 reports.[622] The listing exchanges also already have connections to the exclusive SIPs, and thus the listing exchanges would need to modify rather than build new systems to transmit tick sizes to the exclusive SIPs. Further, once competing consolidators replace the exclusive SIPs, it is the competing consolidators that have the responsibility to connect to the exchanges in order to receive data and thus, under the MDI Rules the exchanges would not incur additional costs in terms of connecting to the competing consolidators.[623] Consequently, the compliance cost estimates provided here represent costs associated with modifying existing systems rather than building systems from scratch. The Commission does not believe that having the listing exchange compute Time-Weighted Average Quoted Spreads and transmit the associated tick to the exclusive SIPs currently, or to the competing consolidators once the exclusive SIPs are discontinued, would require listing exchanges to acquire new hardware or systems.

The estimated $11,000 [624] in one-time costs to all broker-dealers with order entry systems assumes that broker-dealers with order entry systems would not need to acquire new hardware or develop new systems but rather they would modify existing systems. This assumption is based on the fact that broker-dealers with order entry systems must already have order entry systems that account for multiple tick sizes that can dynamically switch between the $0.01 tick for stocks priced equal to or greater than $1.00 and the $0.0001 tick for stocks priced less than $1.00. These systems would need to be expanded to incorporate data from the exclusive SIPs or the competing consolidators on the tick size and to allow for additional tick sizes for stocks priced equal to or greater than $1.00. The Commission believes that all broker-dealers with order entry systems currently subscribe to SIP data and will subscribe to data from competing consolidators and thus, would not incur additional data expenses to receive regulatory data as a result of the tick size change. The $11,000 cost also depends on an assumption that the costs to modify existing systems to accommodate the proposed tick size regime would be similar for both larger and smaller

[618] An exchange commenting on the tick size pilot estimated $140,000 as its expected expense to comply with the tick size pilot's requirement to change the tick size for some stocks. The Commission views this estimate as reasonable, but also notes that the proposal is simpler in some aspects than the tick size pilot and more complex in others. Specifically, although the proposal would have more tick levels than the tick size pilot, it would not impose any variation in ''trade at'' requirements. Thus, the Commission expects the estimate of $140,000 per exchange to be a reasonable estimate of the cost associated with the tick size change for exchanges and ATSs. *See* James G. Ongena, Chicago Stock Exchange (CHX), Comment Letter Re: File No. 4–657; Notice of Filing of the Proposed National Market System Plan to Implement a Tick Size Pilot Program On a One-Year Pilot Basis (Dec. 2014), *available at https://www.sec.gov/comments/4-657/4657-67.pdf.*

[619] The technical aspect of a wholesaler updating its system to reflect the tiered tick regime is likely similar to that of an exchange or an ATS. Thus the Commission is applying the same estimate to wholesalers and other to update systems as exchanges and ATSs. There were 16 registered exchanges, 32 ATSs, 6 wholesalers, and 232 other FINRA members. *See ATS Transparency Data Quarterly Statistics, 2022 Quarterly Tables, 1st Quarter, NMS Stocks,* FINRA (2022), *available at https://www.finra.org/filing-reporting/otc-transparency/ats-quarterly-statistics* for the number of ATSs. In the first quarter of 2022, there were 286 total entities affected.

[620] Salaries are derived from SIFMA's Management & Professional Earnings in the Securities Industry 2013, modified to account for an 1,800-hour work-year and inflation, and multiplied by 5.35 to account for bonuses, firm size, employee benefits and overhead: [(Sr. Programmer at $368 for 25 hours) + (Sr. Systems Analyst at $316 for 10 hours) + (Compliance Manager at $344 for 10 hours) + (Director of Compliance at $542 for 5 hour)] ≈ $19,000 per listing exchange).

[621] [((Compliance Attorney at $406 for 6 hours) + (Compliance Manager at $344 for 2 hours)) × 4 tick size revisions per year] ≈ $9,000 per listing exchange for a total annual monetized burden of $45,000 ($9,000 × 5 listing exchanges).

[622] Current rule 605 reports require trading centers to compute and report share-weighted average time to execution statistics among others. Additionally, some listing exchanges have issued white papers that include statistics based on Time-Weighted Average Quoted Spreads. *See, e.g.,* Nasdaq Intelligent Tick, *supra* note 180 at Chart 3 and Cboe Proposal, *supra* note 104 at Exhibit 1.

[623] *See* MDI Adopting Release, *supra* note 5, at n.1133 and surrounding text. The costs for the competing consolidators to connect to the exchanges is accounted for in the MDI Rules and thus would not represent costs associated with this proposal.

[624] This estimate reflects the Commission's experiences with and burden estimates for broker-dealer systems changes: [(Attorney (5 hours) × $401) + (Compliance Manager (10 hours) × $298) + (Programmer Analyst (20 hours) × $232) + (Senior Business Analyst (5 hours) × $265)] ≈ $11,000. *See also* Transaction Fee Pilot Adopting Release, *supra* note 267 at n.770.

broker-dealers with order entry systems because the specific code to manage existing systems likely does not depend on the size of the market participant. The Commission estimates that there are 1,192 broker-dealers with order entry systems.[625] Thus, the Commission estimates that the proposal would lead to a one-time aggregate cost of ($11,000*1,192) ≈ $13 million across broker-dealers with order entry systems to update their systems to account for the new tick sizes.

The $11,000[626] estimated one-time cost to broker-dealers operating smart order routers assumes that broker-dealers operating smart order routers would not need to acquire new hardware or build new systems to comply with the proposed tick size changes. These broker-dealers already have systems that can adjust for tick sizes that change around the $1.00 threshold. Thus, the Commission expects that they would modify existing systems rather than build new systems. Any broker-dealers that would need to build new systems would likely incur more than $11,000 to do so. On the other hand, any broker-dealers that use vendors for their smart order routers could incur lower costs.

The Commission estimates an upper bound of 282 broker-dealers operating smart order routers.[627] This number provides an upper bound as it assumes that all entities with direct connections to exchanges or ATSs use a smart order router, which the Commission believes is an over-estimate. Thus, the Commission estimates a one-time upper bound cost of ($11,000*282) = $3.1 million for market participants to update smart order routers.[628] If fewer than 282 broker-dealers operate their own smart order routers, then the $3.1 million estimate is likely higher than the aggregate cost for broker-dealers to adjust their order routing systems to comply with the proposal.

Further, the Commission believes that these broker-dealers operating smart order routers also already subscribe to SIP data and will subscribe to consolidated market data products once the competing consolidators become operative and thus would not incur additional data expense to receive the regulatory messages necessary to comply with rule 612. The Commission also assumes that system updates would impose a similar cost on larger and smaller entities given that once code is written, scaling it up is relatively inexpensive.

Lastly, the Commission recognizes that proposed rule 612 could increase the overall implementation costs of the MDI Rules. In particular, in stocks for which the proposal would result in a smaller tick size and that would become less tick-constrained as a result, such stocks could have more odd-lot quotes inside the NBBO than anticipated when the Commission adopted the MDI Rules. As a result, the costs to SROs and competing consolidators of collecting, transmitting, consolidating, and disseminating odd-lot information would be greater than those described in the MDI rules. The Commission is unable to estimate this cost increase with any degree of precision because an estimation would require predicting a complex interaction between behavior changes from multiple types of market participants and the resulting effect on the number of ticks inside the NBBO and the volume of odd-lots submitted inside the NBBO. However, any such increase is unlikely to be of a greater magnitude than the other compliance costs discussed here.

b. Estimates for Proposed Rule 610

In Table 13, the $57,000 in estimated cost to exchanges to comply with proposed changes to rule 610 relate to the cost of preparing a rule 19b–4 filing to amend access fees and rebates and to make fees and rebates determinable at the time of execution.[629] This estimate assumes that exchanges will combine their proposals to include both amendments to fees and rebates and making fees and rebates determinable at the time of execution in the same rule 19b–4 filing and that this combination would not increase the cost of those filings. The Commission recognizes that if these filings would not be efficiently combined, the costs to exchanges could be higher than $57,000. The Commission estimates assume that LTSE would not file a rule 19b–4 filing with the Commission because it does not currently charge access fees or offer rebates, but that the other 15 exchanges would file rule 19b–4s. If so, the proposal would lead to an estimated one-time total cost of $855,000 for the exchanges to comply with the proposed rule 610.[630]

c. Estimates for Proposed Rules 600 and 603

The exclusive SIPs and exchanges would also face compliance costs associated with including the odd-lot information in SIP data to include the best priced odd-lot order, and to update the round lot definitions. The adoption of updated round lot definitions and the inclusion of odd-lot data inside the NBBO are both parts of the MDI Rules. Thus, the proposal would accelerate the compliance costs associated with these aspects of the MDI Rules. One difference is that the MDI Adopting Release anticipated that these changes to NMS data will occur after the competing consolidator model was up and running. Thus, the MDI Adopting Release did not anticipate that the current exclusive SIPs would incur such costs unless they chose to become competing consolidators. The addition of the best odd-lot order to the SIP data was not

[625] This estimate is obtained using consolidated audit trail data ''CAT'' data from the month of June 2022. The Commission calculated the total unique number of Central Registration Depository Numeric Identifier ''CRDs'' that originated an order in the month of June 2022 as an estimate of the number of entities with an order entry system.

[626] This estimate reflects the Commission's experiences with and burden estimates for broker-dealer systems changes: [(Attorney (5 hours) × $401) + (Compliance Manager (10 hours) × $298) + (Programmer Analyst (20 hours) × $232) + (Senior Business Analyst (5 hours) × $265)] ≈ $11,000. *See also* Transaction Fee Pilot Adopting Release, *supra* note 267 at n.796 where the cost to broker dealers to update systems for the TSP was estimated to be $9,000, here we are allowing for an additional 10 hours of Programmer Analyst time.

[627] This number is estimated by counting the number of unique CRDs that submitted an order directly to an exchange or ATS in the month of June 2022.

[628] The Commission also expects there may be other costs associated with updating systems to account for an increase in message traffic resulting from the new tick sizes. However, absent an estimate in the change in message traffic or existing bandwidth capacities it would be impractical for the Commission to attempt to place a reliable estimate on these costs. Estimating the change in message traffic would involve predicting how various types market participants would change their trading behavior and how those changes would interact with each other. Such an estimation would depend heavily on tenuous assumptions.

[629] The Transaction Fee Pilot was expected to impose a similar requirement for exchanges to file rule 19b–4 filings with the Commission to bring access fees into compliance with the TFP. The Commission estimated in the TFP proposing release that each filing would cost the exchanges approximately $48,400 [(Attorney (40 hours) × $401) + (Compliance Attorney (40 hours) × $352) + (Assistant General Counsel (25 hours) × $449) + (Director of Compliance (15 hours) × $470)] = $48,395 ≈ $48,400. *See* OMB Control No. 3235–0045 (Aug. 19, 2016), 81 FR 57946 (Aug. 24, 2016) (Request to OMB for Extension of rule 19b–4 and Form 19b–4 Filings). *See* Transaction Fee Pilot Adopting Release, *supra* note 267 at section IV.C.2(a)(v). To account for inflation the Commission multiplies this amount by 18% (derived from BLS inflation estimates from 2018 to 2022) to arrive at an estimate of approximately $57,000. *See CPI Inflation Calculator,* U.S. Bureau Lab. Stats., *available at https://www.bls.gov/data/inflation_calculator.htm,* for BLS inflation estimates.

[630] The Commission does not expect other market participants to incur significant incremental costs associated with the proposed change in the access fees and rebates. As shown in Table 5, market participants deal with over 100 fee changes per year across all exchanges and thus the Commission believes it reasonable to expect that one fee change by the exchanges to bring their fees into compliance with the proposal would represent an economically trivial incremental cost to these market participants.

part of the MDI Rules and would thus be a new cost under this proposal. The discussion below distinguishes costs to the exclusive SIPs accordingly as those included in the MDI Rules and new costs from this proposal.

The estimated initial one-time cost of $4,000 and $7,000 in ongoing costs for at least two years for exchanges to comply with the proposed amendments to rule 603 and 600 [631] account for the proposed acceleration of the necessary data to generate the odd-lot information, including the best odd-lot order, and transmit to the exclusive SIPs. The costs reported here account for an increase in the costs associated with the MDI Rules that will require the exchanges to transmit all of the data necessary to generate consolidated market data to competing consolidators.[632]

Consequently, for the exchanges, the costs associated with providing the exclusive SIPs with odd-lot information would represent an acceleration of costs anticipated in the MDI release rather than new costs—with a few differences. First, the odd-lot information would be transmitted to the exclusive SIPs as opposed to the competing consolidators. Second, the ongoing costs of the proposal would be incurred only until the exclusive SIPs are retired, which the Commission estimates will be at least two years after the Commission's approval of the plan amendment(s) required by rule 614(e).

The estimated one-time cost of $567,000 and ongoing costs of $170,000 imposed on the exclusive SIPs to comply with the proposed amendments to Rules 603 and 600 relate to the requirement for the exclusive SIPs to develop, operate, and maintain systems to collect and disseminate the odd-lot information inside the NBBO as required by the proposal.[633] The exclusive SIPs would incur these costs to receive and disseminate odd-lot information inside the NBBO and to estimate and disseminate the best odd-lot order. The Commission expects these costs are primarily made up of costs an exclusive SIP would incur to convert to become a competing consolidator. Thus, for exclusive SIPs that will become competing consolidators in the absence of the proposal, the initial costs represent an acceleration of costs articulated from the MDI Rules more than they do new costs. Further, the ongoing costs for exclusive SIPs to comply with proposed rules 600 and 603 would be incurred only until the exclusive SIPs are retired, after which time these costs were previously accounted for in the MDI Adopting Release.

If one or both exclusive SIPs will not become competing consolidators in the absence of the proposal, the initial and ongoing costs in Table 13 would represent new costs associated with the proposal. However, the MDI Adopting Release expressed an expectation that exclusive SIPs would likely become competing consolidators.

Likewise, the Commission recognizes that requiring the exclusive SIPs to build out the capacity to disseminate aspects of the data required by the MDI Rules increases the likelihood that the exclusive SIPs would choose to become competing consolidators because they would already have even more of the technology implemented in order to comply with the requirements of a competing consolidator—lowering the relative cost of becoming a competing consolidator.[634] The Commission recognizes that if the proposal results in one or both exclusive SIPs becoming competing consolidators, the costs in Table 13 could underestimate the full costs of exclusive SIPs because it does not account for the full costs of becoming a competing consolidator. However, as expressed in the MDI Adopting Release, the Commission expects that exclusive SIPs would likely become competing consolidators and therefore, believes that the costs in Table 13 are not underestimated.

The Commission recognizes that proposed rule 600 could increase the initial costs of becoming a competing consolidator and would increase the ongoing costs of competing consolidators, but believes that such costs are already accounted for in the MDI Adopting Release.[635] In particular, competing consolidators could incur additional compliance costs to estimate and disseminate the best odd-lot order. To the extent such costs are not accounted for in the MDI Adopting Release, they would likely be a small fraction of the compliance costs of including odd-lot information in SIP data noted above because the competing consolidators would already have the information necessary to calculate the BOLO, so most of the cost would be the initial cost of coding the information and the cost of processing that code in real time.

E. Effect on Efficiency, Competition, and Capital Formation

1. Efficiency

The Commission believes that the proposals would improve price efficiency relative to the baseline. The improvement in price efficiency is expected largely to come through the reduction in the tick size and the reduction of the access fee cap. The acceleration of portions of the MDI Rules could also increase price efficiency, but those effects are largely to accelerate the economic impact already anticipated in the MDI Rules.

The Commission expects that lowering the tick size for some NMS stocks with prices equal to or greater than $1.00, as well as lowering the access fee cap for all stocks to either 5 or 10 mils for stocks with prices equal to or greater than $1.00, or to 0.05% for stocks with prices lower than $1.00, would increase price efficiency. The Commission expects the reduction in the tick size for some stocks along with the reduction of the access fee cap for all stocks would improve liquidity for many stocks while causing little to no harm. This reduction is expected because research suggests that when trading becomes less costly, market participants have an increased incentive to gather more information because doing so is more profitable.[636] Gathering more information and trading on that information means that prices are more reflective of the fundamental value of the firm. Consequently, for stocks that receive an improvement in liquidity due to the lower tick size or the reduction in the access fee the Commission expects an improvement in price efficiency.[637]

Making fees and rebates determinable at the time of execution, along with the reduction of the access fee cap could also increase price efficiency by helping minimize potential conflicts of interest. The inability for broker-dealers to determine access fees and rebates at the

[631] In the MDI Adopting Release, *supra* note 5, section V.C.2(d)(ii), the Commission estimated costs to the exchanges of collecting and transmitting the necessary information to the competing consolidators to be approximately $70,000 in one-time costs and approximately $130,000 in ongoing costs. The additional $4,000 in one-time costs and $7,000 in ongoing costs here represent a 5% addition over the costs in the MDI release to account for the proposed new requirement to send the necessary data to generate odd-lot information to the exclusive SIPs ($70,000 × 0.05 = $3,929 ≈ $4,000 and $130,000 × 005 = $7,050 ≈ $7,000). *See infra* note 739 and accompanying text.

[632] *Supra* note 404 and accompanying text.

[633] *See infra* notes 728, 730, 732, and 733 and accompanying text for a breakdown of these cost estimates.

[634] In the MDI Adopting Release, the Commission anticipated that both exchanges operating exclusive SIPs would have strong incentives to enter the competing consolidator market. *See* MDI Adopting Release, *supra* note 5, at V.C.2.(a).(ii).

[635] *See supra* section V.D.6 for further discussion of how or whether this requirement would alter the compliance costs of competing consolidators.

[636] *See, e.g.,* Dixon, *supra* note 556 for a discussion of this concept in the context of short selling.

[637] *Id.*

time of execution makes it difficult to effectively pass them on to their customers.[638] To the extent that order routing decisions are affected by potential conflicts of interest, these potentially conflicted decisions could harm efficiency by leading to inefficient trading decisions and thus an inefficient incorporation of information into stock prices.[639] Lowering the access fee and decreasing the tick size will, for tick-constrained stocks at least, lower overall transaction costs for demanding liquidity and diminish the role that access fees and rebates might play in order routing decisions. Further, making access fees determinable at the time of execution would further enhance efficiency by allowing market participants certainty concerning the fees that they will be charged per transaction. This certainty could also allow broker-dealers to more efficiently examine their own best-execution performance. Additionally, to the extent that this feature allows broker-dealers to pass fees on to end customers they could help eliminate entirely distortions that might occur due to potential conflicts of interest. Greater certainty about fees and rebates in advance of routing an order could also increase the efficiency of the broker-dealers' best execution assessments by providing them with greater certainty about the full cost of a transaction prior to placing the order.

The acceleration of adding odd-lot information to NMS data and the inclusion of information relating to the best odd-lot quote would realize many of the price efficiency benefits to this data articulated in the MDI Rules at a sooner date, providing improved price efficiency earlier than anticipated in the MDI Rules. Not all efficiency-related benefits articulated in the MDI Rules associated with the inclusion of odd-lot information will be realized sooner because the Commission acknowledges that the proposal would not reduce the latency of SIP data.[640] Specifically, research suggests that adding information on the shares available at price levels inside the NBBO may improve price efficiency.[641] Currently only market participants who subscribe to proprietary data feeds can view the odd-lot information and thus can adjust trading strategies and decisions based on the information contained therein. Expanding the exclusive SIP feeds to include odd-lot information will sooner provide new information to those investors who subscribe to the SIP data but do not subscribe to proprietary data feeds. The extent to which investors can quickly incorporate this information into stock prices before the full implementation of the MDI Rules and increase efficiency is limited.[642]

2. Competition

a. Trading

i. Modification of Rule 612 To Create a Tiered Tick Structure

A smaller tick could lead to greater competition on pricing, which more effectively balances liquidity supply and demand. This greater competition on pricing comes with a reduced importance on time priority and discourages liquidity oversupply thereby allowing slower traders to better compete with faster traders to provide liquidity and earn the spread.

Reducing the tick size for tick-constrained stocks could induce some order flow onto the exchanges. Academic and industry research suggests that tick size constraints create a competitive disadvantage for exchanges because they create long queues for limit order execution and increase the incentives to internalize, leading to more off-exchange trading.[643] The disadvantage comes because in stocks that are tick-constrained, queues are longer, fill rates lower, and the relative cost of crossing the spread higher. If a narrower tick alleviates these disadvantages, then more order flow in these securities could be routed to the exchanges.

ii. Minimum Pricing Increment for Trading

Applying a minimum pricing increment to trading, coupled with reducing the minimum pricing increment for quoting, could affect measures of the frequency and magnitude of price improvement, as previously explained in Section V.D.2. The Commission recognizes that changes to these measures could affect transaction costs paid by investors as well as where broker-dealers route customer order flow. For example, the less price improvement that OTC market makers offer to retail traders, the less attractive they might be to broker-dealers who handle retail traders. This coupled with the fact that OTC market makers would be restricted to the same minimum trading increment as exchanges and ATSs would help level the competitive playing field between exchanges/ATSs and off-exchange dealers when it comes to attracting retail order flow. Such a development would put competitive pressure on OTC market makers to price improve trades because exchanges and other ATSs would have an increased ability to potentially innovate and compete for retail orders with wholesalers. Accordingly, the Commission expects that trading venues would further compete on providing price improvement and that the harmonization of trading and quoting increments would not mitigate the execution quality improvements from a reduction in the minimum pricing increment.[644]

In the longer term, the proposed modification of rule 612 to require the tick size to apply to trading could make exchanges and ATSs more competitive in terms of their ability to attract retail order flow. This stems from the fact that currently one reason retail broker-dealers route orders to wholesalers is to take advantage of sub-penny price improvement that exchanges and ATSs do not offer. By harmonizing the trading increment the proposal would create a more level playing field for exchanges and ATSs to innovate to attract retail order flow. Certainly, the exchanges and ATSs face obstacles to more effectively compete for order flow, but requiring all trade to occur in units of the tick size makes it more likely that the exchanges and ATSs could find a way to innovate. While the Commission cannot predict the type of innovation that that exchanges and ATSs may design to attract retail order flow, a more level playing field increases the likelihood that such innovation could occur.

[638] *See* section V.C.2 describing how transaction fees and rebates are currently determined.

[639] If order routing decisions are not significantly affected by access fees then the effect on efficiency would be negligible.

[640] *See supra* section V.D.5.b for additional discussion.

[641] *See* Bartlett, et al. (2022), *supra* note 365.

[642] The MDI Rules do not require the competing consolidators to distribute odd-lot information. Thus, it is possible that competing consolidators may not choose to distribute odd-lot information, in which case the positive effect on price efficiency will be lost. The Commission believes that this outcome is unlikely because the odd-lot information appears to be valuable in terms of having information relevant to stock prices (*see* Bartlett, et al. (2022), *supra* note 365), and the alternative to odd-lot information from the competing consolidators would be to subscribe to all of the proprietary data feeds, which is expensive. Thus, the Commission believes that there will be significant demand for the odd-lot information and that the competing consolidators will therefore offer the data.

[643] *See* Kwan, Masulis, and McInish (2015), *supra* note 99, *see also* MEMX Report, *supra* note 105.

[644] One industry study suggests that it is not the presence of on-exchange quoting restrictions that drives off-exchange price improvement. This study shows, using Rule 605 data, that stocks with very wide spreads have more price improvement than otherwise. *See Market Lens: Unlevel Playing Field? What 605s Can Tell Us About Tick Sizes,* Citadel Sec. (Sept. 8, 2022), *available at https://www.citadelsecurities.com/news/market-lens-unlevel-playing-field-what-605s-can-tell-us-about-tick-sizes/* (''Citadel Paper'').

However, if such innovation by exchanges were to occur, it could increase the fraction of retail trading volume on the exchanges.

iii. Access fees

The lower access fees under this proposal could affect certain exchanges' business models. For instance, as discussed in Section V.D.3, lowering the access fee cap is expected to lower the total amount of access fees collected and rebates distributed by certain exchanges, and the Commission estimates that exchanges could lose approximately $89 million per year in net capture under their current business models. Exchanges might respond, in part, by adjusting the rebates they offer, which could affect order routing. For instance, exchanges for which high rebates are currently the means of attracting certain flows could have to adjust their business model or find revenues sources, other than access fees collected, to fund rebates.

These effects could impact competition between trading venues. First, since the proposal would make the exchanges more similar in terms of fee structures (*i.e.,* fee/rebate levels and tiers),[645] competition in other key dimensions of trading—such as execution quality like fill rates, transaction costs, and speed of execution—could increase and spur innovations, ultimately to the benefit of investors. Second, some exchanges' profitability, and accordingly their operations, could be impacted, especially in the short run as these exchanges adapt their business models. In an extreme case, some existing exchanges could ultimately shut down, though the Commission notes that exchanges derive revenues from other sources, such as data and connectivity fees, which also impact their viability.[646] Third, certain exchanges' competitiveness could be affected relative to other exchanges as well as relative to other trading venues.

iv. Acceleration of the MDI Rules and Addition of Information About Best Odd-Lot Orders

The acceleration of the inclusion of odd-lot information in the NMS data along with the implementation of the MDI Rules round lot definition might lead to increased competition between exchanges and ATSs and OTC market makers, including wholesalers. NMS stocks priced greater than $250.00 would be expected to benefit sooner from a tighter NBBO, thereby increasing the competiveness of the best displayed protected quotes, following the proposed accelerated implementation of the round lot definition. A greater visibility of more competitively priced odd-lot orders with the NBBO could increase the competitive position of exchanges and ATSs and attract greater order-flow. This effect would be temporary, only lasting until the full implementation of the MDI Rules. After the full implementation of the MDI Rules the effect on competition is accounted for by the MDI Rules.

b. Broker-Dealer Services

The Commission believes that the proposal could affect certain broker-dealers' current business model to the extent that they rely on rebates for revenues. This could affect these broker-dealers' operations as they adjust to the new competitive environment. Making fees and rebates determinable at the time of execution could enable the customers of broker-dealers to better discuss transaction fees and rebates with their broker-dealers, and potentially request data on such fees, which could increase competition between broker-dealers along this dimension, leading to better order execution and lower costs. In particular, while there is currently no requirement to either pass on the fees and rebates, or account for them when assessing execution quality, the Commission believes that there could be competitive pressure to do so as it would be straightforward for a competing broker-dealer to include fees and rebates in its transaction cost analysis, or to simply pass them through to the customer.

The Commission also believes that including odd-lot information in the exclusive SIPs and providing the best odd-lot order information, as well as making fees and rebates determinable at the time of execution, would enhance competition for broker-dealer services. First, making the best odd-lot order information accessible through the exclusive SIPs would facilitate better analysis of a broker-dealer's execution quality than is currently available with just NBBO data.[647] Thus, it could be easier for some customers to monitor the performance of their broker-dealers.[648] Additionally, making the fees and rebates determinable at the time of execution would further allow customers to monitor the performance of their broker-dealers as it would increase the ability for a customer to request more detailed information on the fees and rebates that the broker-dealer pays and to have them either passed on to the customer or to have them accounted for when evaluating execution costs.[649]

Additionally, the Commission does not believe that the proposal initially would alter the competition to provide market access to retail brokers. Many retail broker-dealers find it economically beneficial to rely on OTC market makers, including wholesalers, who maintain access to multiple trading venues, to facilitate market access rather than becoming a member or subscriber to an exchange or ATS themselves and directly route orders to the venues.[650] The benefits from being able to selectively choose what order-flow to internalize helps OTC market makers support payment for order flow to retail broker-dealers, which further incentivizes broker-dealers to continue

[645] Currently, as explained in Section V.C.2, exchanges can differentiate themselves by offering different fee schedules—*e.g.,* inverted, flat fee, or maker-taker with numerous price strata and volume based pricing tiers. That said, the Commission also noted (Table 5 in SectionV.C.2) that the data do not show a high variation in the highest fees charged, which would suggest that the reduction in variation of fee and rebate levels under this proposal would primarily make different exchange fee models more similar.

[646] This effect considers the impact of MDI implementation on proprietary data feed revenues. Exchanges are expected to collect these data and connectivity fees from competing consolidators and self-aggregators in addition to revenue from proprietary feeds, which may supply information beyond the core data that would be distributed. The MDI Adopting Release anticipated that data revenue for the exchanges is likely to diminish after the full implementation of the MDI Rules. This effect will decrease the likelihood that a new exchange or a low volume exchange could gather sufficient revenue from market data to become or remain viable. *See* MDI Adopting Release, *supra* note 5, section V.C.2.(ii).(d), for the full discussion of the effect of the competing consolidator model on exchange data fees.

[647] While the Commission does not expect most retail traders would engage in this sort of benchmarking due to most retail traders lacking the technical capacity to do so, some institutional traders likely have this capacity and so would likely engage in such benchmarking. Institutional traders have strong incentives to monitor all aspects of transaction costs as these costs can significantly affect portfolio performance. *See* Anand, et al. *(2012), supra* note 596.

[648] It is possible that some institutional traders have access to proprietary data feeds that provide the ability to benchmark trades against odd-lot orders. Or they could contract with specialized firms that have access to the data and provide transaction cost analysis.

[649] Under the baseline it would be difficult in many cases for a broker-dealer to allocate specific rebates received or fees paid to one customer's trade because the fees or rebates in a given month are based, in many instances, on that broker-dealer's total trading volume across all customer accounts (*see* section V.C.2.b.iv). However, if the fees and rebates are determinable at the time of execution the broker-dealer could feasibly track a specific fee or rebate to a specific trade making it possible for a customer to request such information.

[650] Retail-broker-dealers may also route to wholesalers to avoid the expenses associated with establishing connections to some the exchanges. Wholesalers also frequently offer other services such as free routing on orders that they do not internalize.

to route order-flow to OTC market makers such as wholesalers. Thus, lower access fees or harmonized trading increments might not materially affect a retail broker-dealer's decision to route to an OTC market maker instead of an exchange. Second, while the proposal does not allow OTC market makers to price improve at any level that they wish, the proposal is designed to ensure that there are usually at least 4 ticks within the spread for nearly all stocks.[651] Thus, the Commission believes it is reasonable to expect that the OTC market makers, including wholesalers, would still be able to provide meaningful price improvement at the designated tick sizes. Because the Commission expects that OTC market makers would still be able to provide price improvement to retail orders, broker-dealers handling retail trades would still have an incentive to route to wholesalers.[652] Thus, it would still likely be cost effective for retail broker-dealers to continue to route to wholesalers. For these reasons, the Commission does not expect the proposal to lead to a significant reduction in retail orders routed to wholesalers.

c. Market Data

Expediting the inclusion of odd-lot data into the exclusive SIPs could increase competition among data providers of odd-lot information prior to the full implementation of the MDI Rules though it would do so less than envisioned in the MDI release, for the period until the MDI Rules are fully implemented. Specifically, under the implementation schedule in the MDI Rules, adding odd-lot information to core data would occur during the parallel operation period. Adding odd-lot information to the current exclusive SIPs would enable the exclusive SIPs to compete directly with the exchange's proprietary data products for use in visual display settings. Currently, the only means to get odd-lot information is to subscribe to multiple proprietary data feeds. This would change if odd-lots are a part of SIP data. Unlike the data provided by the competing consolidators, the Commission does not believe that the current exclusive SIPs are fast enough for use in certain trading. Thus, the competition for odd-lot data would be limited to odd-lot information used in visual display settings. To the extent that some market participants subscribe to proprietary data for use in visual display settings, the introduction of odd-lot information to the exclusive SIPs can provide competition to this segment of the market and could reduce the prices of odd-lot information provided by the proprietary data feeds. However, the Commission does not believe that this market is very large. Currently, for most display settings market participants use SIP data or one of the top of book data products offered by one of the three highest volume exchange groups and it is unclear to what extent market participants subscribe to proprietary data with odd-lot information for use in visual display settings. However, if the exclusive SIPs choose to charge more for data, then this price increase could provide a competitive advantage to the providers of top of book data as it would become relatively less expensive.

The proposed requirement on the exclusive SIPs to disseminate the accelerated odd-lot information until the exclusive SIPs are retired, would guarantee that the odd-lot information would be disseminated.[653] This aspect of the proposal presents the possibility that the new requirements on the SIPs could reduce competing consolidator competition, which could reduce the expected benefits of the MDI Rules. However, this effect could be small because non-SIP competing consolidators would still have an opportunity to compete for a significant market share. The proposed requirement could increase the competitive advantage of exclusive SIP competing consolidators relative to non-SIP competing consolidators[654] because they would have established a market for odd-lot information before having to face competition. Because data users could increase the costs to switch to another competing consolidator, they could stay with a SIP competing consolidator to avoid incurring those costs. The proposal could also reduce the costs for exclusive SIPs to become competing consolidators by accelerating those costs before they transition, increasing the likelihood that they would do so.[655] The Commission recognizes that this additional competitive advantage could dissuade some potential competing consolidators from entering the market but believes it is reasonable to expect this to have a limited effect on competition. In particular, if competing consolidators can offer a lower latency product, they can capture a part of the market that the proposal would not affect—those who would use the odd-lot information in ways other than visual display.[656] If this market is significantly bigger than the visual display market, the competitive advantage of the exclusive SIPs would be less likely to dissuade entry and competing consolidators could have sufficient incentive to enter the market, thus limiting the effect on competition from the proposal.

3. Capital Formation

The Commission expects that the proposal could enhance capital formation through two channels. First, the proposed reduction in the access fee cap would reduce the amount of access fees paid by liquidity demanders, who are more likely to be non-high-frequency traders.[657] Analysis presented above in Table 11 estimates that, if the proposal had been in place in the first six months of 2022, then it would have saved liquidity demanders approximately $1.56 billion in access fees not paid in that period. Similarly, the Commission expects that the proposal would likely lead to an overall reduction in transaction costs due to the reduction in the tick size.[658] Table 4 indicates that approximately 56% of trading volume occurs in stocks that are tick-constrained and this volume can be expected to experience a decrease in transaction costs due to a lower tick size facilitating bid and ask prices that better equate liquidity supply and demand. Lower transaction costs caused by the lower tick size for some stocks and the lower access fee mean more capital available to investors to fund investment.

[651] The exceptions would be if a stock with a price greater than $1.00 has a quoted spared less than $0.004. In this case, the stock would be assigned a tick of $0.001 and there would be less than 4 ticks within the spread. The other case would be if a stock had a wide spread during an evaluation period and was thus assigned a wide tick and then subsequently the tick size shrank such that there were fewer than 3 ticks intra-spread. In this case the stock would have fewer than 4 ticks intra spread until after the next evaluation period.

[652] The effect of the proposal on retail price improvement is discussed in greater detail in section V.D.2.

[653] *See infra* section V.D.5.c for additional discussion of the effects of this requirement, such as to guarantee that the odd-lot information would be disseminated. While this proposal requires the exclusive SIPs to distribute odd-lot data, the MDI Rules do not require the competing consolidators to disseminate odd-lot data. However, the MDI Adopting Release anticipated that at least one competing consolidator will do so because there would be demand for the data. *See supra* section V.C.3.

[654] *See* MDI Adopting Release, *supra* note 5, for a discussion of how competing consolidators have higher barriers to entry than exclusive SIPs, such as in the form of compliance costs associated with Reg SCI.

[655] In the MDI Adopting Release, the Commission anticipated that both exchanges operating exclusive SIPs would have strong incentives to enter the competing consolidator market. *See* MDI Adopting Release, *supra* note 5, at V.C.2.(a).(ii).

[656] *See* discussion in section V.D.5.b.

[657] *See* discussion in section V.C.1 and V.C.2.

[658] *See supra* section V.D.1.

F. Reasonable Alternatives

This section considers alternatives to the proposal. These alternatives would have different costs and benefits than the proposal and these relative costs and benefits are discussed in this section. The alternatives are organized around three key elements of the proposal: the extension of rule 612 to apply to trading increments; alternative tick sizes; and alternative access fee regimes. These alternatives could be used together or in combination with each other and could also be paired with other elements of the proposal. Where applicable the Commission, when considering the economic impact of an alternative, has specified which alternatives would likely be paired together.

1. Alternative Trading Increment

A primary motivation for extending rule 612 to apply to minimum pricing increments for trading (or ''trading increments'') is to provide exchanges and ATSs an improved opportunity to potentially innovate in ways that would allow them to be more competitive in terms of attracting retail order flow, which could in turn increase overall competition for retail trades and lead to higher quality order executions for retail trades.[659] This section discusses two alternative methodologies that the Commission could pursue to level the playing field in this regard between exchanges and ATSs on the one hand and OTC market makers on the other in terms of competing for retail order flow. It also discusses the economic effects of choosing not to extend rule 612 to apply to trades.

a. $0.001 Trading Increment

Instead of modifying rule 612 to apply to trades, the Commission could instead modify rule 612 to require trading of all stocks priced equal to or greater than $1.00 to occur in increments of $0.001 regardless of the tick size applicable to quotes. For stocks with prices less than $1.00 the Commission would propose no change relative to the proposal: stocks priced less than $1.00 would be allowed to trade in increments of $0.0001. This alternative would also preserve an exception for midpoint or benchmark trades, such as VWAP trades, to execute at finer price increments.

This alternative would preserve the ability for exchanges and ATSs to potentially innovate in order to try and attract retail order flow, though to a lesser extent than would be expected of the proposal by creating a level playing field with respect to the trading increment between exchanges and ATSs on the one hand and OTC market makers on the other.[660] Under this alternative suppliers of liquidity would, in many instances, be restricted to post their quotes at price increments larger than the trading increment. Relative to the proposal, this could be expected to lower the amount of order flow executed at exchanges that rely on posted liquidity to attract trading interest. This alternative would also allow OTC market makers such as wholesalers to offer price improvement on a price lattice that is at least as fine and in some cases finer than what is included in the proposal.[661] The net effect of this alternative on retail price improvement is uncertain. As with the proposal it is not clear whether constraining retail price improvement to a finer price lattice would on average improve or harm the total amount of price improvement received by retail traders relative to what they currently receive.[662] In some cases constraining the lattice upon which price improvement can be offered could improve price improvement relative to the baseline by inducing OTC market makers to round up price improvement. In other cases they may round down. The net effect is uncertain.

While the net effect of this alternative on retail price improvement is uncertain relative to the baseline, the proposal's net effects are more uncertain. This is because allowing retail price improvement to always occur in increments of $0.001 is a smaller deviation from the baseline than what is considered in the proposal.

This alternative would have somewhat lower implementation costs relative to the proposal. This is because market participants would not have to develop trading systems that have to account for four tick sizes for stocks priced equal to or greater than $1.00 and where the trading increment can change periodically. Instead, they would have to design systems with only one trading increment that applies to all stocks with prices equal to or greater than $1.00 which would be consistent through time. Consequently, the Commission estimates that this alternative would decrease one-time implementation costs by $1.1 million relative to the proposal.[663]

b. Do Not Apply Rule 612 to Trading

The Commission could amend rule 612 to apply only to accepting, ranking, and quoting but not to trading—reflecting the current baseline application of rule 612. The advantage to this alternative would be that broker-dealers, including wholesalers, could still offer price improvement relative to exchanges in whatever increments they choose—leaving unchanged a wholesaler's ability to offer price improvement relative to the baseline. This alternative would eliminate the uncertainty in the proposal regarding how applying the tick increment to trading could affect retail price improvement.[664]

Not applying the tick increment to trading would reduce the ability of exchanges and ATSs to potentially innovate in ways that could make them more competitive at some point when competing for retail order flow. This would occur because the OTC market makers would retain their advantages in terms of sub-penny pricing that exchanges and ATSs do not have.[665]

The Commission preliminarily believes that the compliance costs associated with this alternative would be less than those discussed for the proposal.[666] The proposal would require market participants to update systems to account for rule 612 being applied to trading systems. This alternative would remove that proposed expansion of rule 612 and would thus lower the associated compliance costs. The Commission estimates that this alternative would reduce the one-time implementation costs of the proposal by an estimated $3.8 million.[667]

[659] *See* text surrounding *supra* note 239.

[660] *See supra* section V.E.2.a.ii.

[661] For stocks with a $0.001 tick, this alternative would offer the same price lattice for price improvement as the proposal. For stocks with a wider tick, this alternative would offer a finer pricing lattice for wholesalers to offer price improvement relative to the proposal.

[662] *See supra* section V.D.5.

[663] A uniform trading increment would primarily affect trading centers as opposed to other market participants. To reflect the simplicity of this alternative relative to the proposal, the Commission is revising down the implementation cost for trading centers by $20,000: from $140,000 per trading center to $120,000, for a total reduction in cost of approximately [$20,000*54 ≈] $1.1 million.

[664] *Id.*

[665] *See supra* section V.C.1. for a discussion on why the application of the tick size to only quoting provides an advantage to wholesalers competing for order flow.

[666] *See supra* section V.D.6.

[667] Not applying rule 612 to trading increments would primarily affect the implementation costs associated with trading venues as opposed to other market participants. For this alternative the Commission estimates that this alternative would lower compliance costs for trading centers by half because that the alternative would only require modifications to one aspect of the systems of market participants (quoting) as opposed to both quoting and trading. Thus, this alternative would lower the initial $140,000 compliance cost estimate for

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c. Segmented Trade Exemption

Similarly, the Commission could also apply the tick increment to trading and quoting, but exempt segmented trades, such as most retail trades, from the trading requirements of rule 612 in one of two ways as follows. First, to conform with current retail liquidity programs, the Commission could allow a lower uniform trading and quoting increment of $0.001 for segmented orders such as those executed off-exchange (such as by a wholesaler) or on-exchange Retail Liquidity Program in stocks priced equal to or greater than $1.00. This alternative would allow for qualifying segmented orders in an exchange retail liquidity program or an off-exchange trading center such as a wholesaler to receive price improvement on qualifying orders in increments of $0.001. Second, the Commission could exempt segmented trades from the trading requirements of rule 612 altogether, thus not placing any restrictions on the trading increment of segmented trades.

Either of these alternatives would produce the same net effect on retail price improvement as those discussed earlier in this section. Specifically, applying a $0.001 increment to retail trades would lead to a net uncertain effect on overall retail price improvement, while exempting retail trades from the trading requirements of proposed rule 612 would leave retail price improvement unchanged relative to the baseline.

Additionally, the effect on ATSs' and exchanges' abilities to potentially innovate to attract retail order flow would likewise be unchanged. In the case of a $0.001 segmented trading tick, the ability for exchanges and ATSs to potentially innovate in ways that could increase their ability to compete for retail order flow would be increased relative to the baseline and would be similar to the proposal. In the case where retail trades are exempt from the trading requirements of proposed rule 612 the competitive position of exchanges and ATSs relative to OTC market makers would be unchanged relative to the baseline.

The originating broker would need to identify qualifying segmented orders [668] with the addition of a segmented order identifier affixed to the order. This alternative would use a two-part definition of the term ''segmented order.'' First, the order must be for an account of a natural person, or an account held in legal form on behalf of a natural person or group of related family members. Second, for such an account, the average daily number of trades executed in NMS stocks must be less than 40 in each of the preceding six calendar months. Defining ''segmented order'' this way would encompass the marketable orders of individual investors with expected low adverse selection costs that retail brokers currently route to wholesalers for handling and execution. These orders already are segmented in practice.

Limiting qualifying segmented orders to ''natural persons'' for purposes of this alternative would draw on existing rules designed to identify the orders of individual investors. For example, the definition of ''retail customer'' in the Commission's Regulation Best Interest (''Regulation BI'') is limited to a ''natural person.'' [669] Moreover, several national securities exchanges operate programs for trading ''retail'' orders that are limited to accounts of natural persons or certain accounts on behalf of natural persons. This definition of segmented order would be closely related to these rules,[670] as well as to FINRA's fee schedule for Nasdaq's Trade Repository Facility.[671] Patterning the definition of segmented order on existing SRO rules would leverage market knowledge. This would help minimize the costs of compliance because broker-dealers would already be familiar with identifying orders as for the accounts of natural persons, or for related accounts, in these other contexts. In addition to the accounts of natural persons themselves, the definition would, consistent with SRO rules, cover accounts held in legal form on behalf of natural persons or groups of related family members. Including related family members in this alternative is designed to not restrict the types of arrangements that may be set up to benefit family groups, including individual retirement accounts, corporations, and limited liability companies for the benefit of related family members.

The second part of such a definition of segmented orders would focus on the frequency of trading in an account. It would limit the average daily number of trades executed in NMS stocks in an account to less than 40 for each of the six preceding calendar months. This would exclude very active traders whose orders are likely to impose a much higher level of adverse selection costs on liquidity providers than the less-active accounts that are more typical of individual investors. For example, very active traders may use sophisticated trading tools, such as application programming interfaces (APIs) and computer algorithms, to submit their orders. These tools can enable highly active trading strategies that impose much higher adverse selection costs on liquidity providers than the manual placement of orders by a natural person. Rather than prohibiting any opportunity for investors to use potentially beneficial trading tools,[672] however, the proposed definition specifies a maximum level of trading activity as a means to limit the level of adverse selection costs.

The level is supported by an analysis of the distribution of order activity across accounts reported to the Consolidated Audit Trail as being held for the benefit of an ''Individual Customer'' for the first six months of 2022.[673] Across this period, slightly

trading centers by $70,000, to $70,000, for a total reduction in cost of approximately [$70,000*54 ≈] $3.8 million.

[668] For this alternative the Commission would define an originating broker as any broker with responsibility for handling a customer account, including, but not limited to, opening and monitoring the customer account and accepting and transmitting orders for the customer account.

[669] 17 CFR 240.15l–1(b)(1) (defining ''retail customer'' as, among other things, a natural person who receives a recommendation of any securities transaction from a broker-dealer and uses the recommendation primarily for personal, family, or household purposes).

[670] *E.g.,* IEX Rule 11.190(b)(15) (providing, among other things, that ''[a] Retail order must reflect trading interest of a natural person'' and that ''[a]n order from a retail customer can include orders submitted on behalf of accounts that are held in a corporate legal form—such as an Individual Retirement Account, Corporation, or a Limited Liability Company—that have been established for the benefit of an individual or group of related family members, provided that the order is submitted by an individual.''); and Nasdaq, Equity 7, section 118 (defining a ''Designated Retail Order'' as originating from a ''natural person'' and explaining that ''[a]n order from a 'natural person' can include orders on behalf of accounts that are held in a corporate legal form—such as an Individual Retirement Account, Corporation, or a Limited Liability Company—that has been established for the benefit of an individual or group of related family members, provided that the order is submitted by an individual'').

[671] FINRA Rule 7620A (defining a ''Retail Order'' as originating from a ''natural person'' and explaining that ''[a]n order from a 'natural person' can include orders on behalf of accounts that are held in a corporate legal form, such as an Individual Retirement Account, Corporation, or a Limited Liability Corporation that has been established for the benefit of an individual or group of related family members, provided that the order is submitted by an individual'').

[672] Some SRO rules, for example, prohibit the use of any computerized methodology for submitting retail orders. *See, e.g.,* NYSE Rule 7.44(a)(3) (defining ''retail order'' in the context of NYSE's RLP to require that ''the order does not originate from a trading algorithm or any other computerized methodology'').

[673] Analysis of Consolidated Audit Trail data for all orders originated from an account marked as held for the benefit of an Individual Customer, Jan. 1, 2022, through June 30, 2022. This analysis counted any order associated with one or more trades or fills in an order lifecycle. For the Consolidated Audit Trail, account type definitions

more than 99.9% of Individual Customer accounts originated, on an average daily basis, 40 or fewer orders associated with a trade. The median number of daily-average orders associated with a trade from accounts at or below this threshold was less than one.[674] The median number of daily-average orders associated with a trade from accounts above this threshold was approximately 68.[675] Accordingly, the threshold in the proposed rule is designed to capture the overwhelming majority of individual investor accounts while excluding accounts that might impose a higher level of adverse selection costs on liquidity providers.[676]

The Commission expects that this alternative would result in additional costs beyond those of the proposal. The Commission believes it reasonable to expect that the definition of a qualifying segmented retail order used for purposes of this alternative would result in direct initial and ongoing costs to broker-dealers associated with the monitoring of retail accounts and the affixation of an identifier to segmented retail orders. The Commission estimates that a total of 157 originating brokers and routing brokers would incur a one-time implementation costs of $170,000 to add a segmented order marker to existing systems.[677] The 157 originating brokers would incur an estimated additional initial cost of $33,760 per broker related to hiring in-house and outside counsel to review and update existing policies and procedures to identify segmented retail orders along with $3,472 per year for ongoing review.[678] The Commission would not expect the collection of data on account trading frequency to introduce new costs as brokers are already required to maintain customer trading information.[679] However the Commission estimates that originating brokers would have to modify existing technology to explicitly monitor customer trade frequency for an estimated one-time cost per broker-dealer of $95,480.[680] Market centers where segmented retail orders would be transacted are estimated to have to incur similar initial one-time costs of $170,000 to update their systems to receive and manage orders marked as a segmented retail order.

Alternatively, the Commission could use a definition of retail order that is qualitative in nature, for example as originating from a natural person and not using an application-program interface. Relative to the alternative outlined above, this alternative might be less costly because there would not be the need to monitor trading activity. However, it would still be necessary to adopt systems to identify retail customers. Moreover, this alternative might achieve less of the benefit of harmonization across trading and quoting, as off-exchange venues have greater ability to segment and therefore to attract the retail order flow.

2. Alternative Tick Sizes

One reason why the Commission chose the particular tick size cutoffs in this proposal was to have sufficient ticks intra-spread to preserve meaningful price improvement.[681] Most current price improvement would be unaffected by the proposal because it occurs as a result of a midpoint trade, or it occurs in increments that currently align with the baseline tick of $0.01.[682] However, for the minority of price improvement that could potentially be affected by the tick size change and the application of the tick size to trading applications, 4–8 ticks intra-spread can help preserve meaningful price improvement opportunities—though the net effect is uncertain.[683] The range of 4–8 ticks intra-spread comes at the cost of increasing the likelihood that, due to natural variation in spreads, a stock could trade with a smaller tick when a wider tick might provide a better trading environment.[684] If the Commission were to adopt one of the alternatives in section V.F.1 then the Commission could utilize alternative tick regimes that do not consider the need to provide price improvement only in units of the tick size. This section discusses alternative tick size regimes that the Commission could implement in this case.

To clarify the discussion, for all alternatives discussed in this section the following conditions apply. First, the Commission would not amend rule 612 to apply to trading situations. Thus, all alternatives here apply tick sizes only to quoting.[685] This allows the Commission

are available in Appendix G to the CAT Reporting Technical Specifications for Industry Members (*https://catnmsplan.com/*), for the field name ''accountHolderType.'' Account types represent the beneficial owner of the account for which an order was received or originated, or to which the shares or contracts are allocated. Possible types are: Institutional Customer, Employee, Foreign, Individual Customer, Market Making, Firm Agency Average Price, Other Proprietary, and Error. An Institutional Customer account is defined by FINRA Rule 4512(c) as a bank, investment adviser, or any other person with total assets of at least $50 million. An Individual Customer account means an account that does not meet the definition of an ''institution'' and is also not a proprietary account. Therefore, the CAT account type ''Individual Customer'' includes natural persons as well as corporate entities that do not meet the definitions for other account types.

[674] *Id.*

[675] *Id.*

[676] In other contexts, national securities exchanges currently characterize certain types of orders according to the level of activity associated with a market participant's account. With respect to trading in listed options, several exchanges include the concept of ''Professional'' order, and these orders, which must be identified as such, are distinguished from other customer orders. For example, pursuant to Cboe Exchange, Inc. (''CBOE'') Rule 1.1, ''Professional'' means any person or entity that is not a broker or dealer in securities and places more than 390 orders in listed options per day on average during a calendar month for its own beneficial account(s). Under CBOE's rules, all Professional orders are distinguished from other public customer orders (*i.e.,* orders for persons other than broker-dealers), must be marked as such, and are handled by CBOE's trading platform in the same manner as broker-dealer orders unless otherwise specified. *See* CBOE Rule 1.1. *See also* NYSE Arca Rule 1.1; Nasdaq, Options 1, section 1(a)(47); and BOX Rule 100(a)(52).

[677] This estimate is based on industry sources of the cost to program systems to add a new marking classification and adjusted for inflation. *See, e.g.,* Securities Exchange Act Release No. 94313 (Feb. 25, 2022), 87 FR 14950, 14976 (Mar. 16, 2022) (proposing amendments to Regulation SHO) (''Regulation SHO Amendment Proposal'').

[678] The Commission estimates the initial costs related to employing legal counsel to review and update policies to be: (Attorney at $462 for 40 hours) + (Compliance Counsel at $406 for 10 hours) + (Deputy General Counsel at $663 for 5 hours) + (Chief Compliance Officer at $589 for 5 hours) + (10 hours of review × ($496/hour for outside counsel service) = $33,760. With ongoing annual costs to be: (Attorney at $462 for 4 hours) + (Compliance Counsel at $406 for 4 hours) = 8 ongoing burden hours and $3,472.

[679] *See* 17 CFR 240.17a–3(a) (requiring broker-dealers to make and keep, among other things, current blotters containing an itemized daily record of all purchases and sales of securities and the account for which each such purchase and sale was effected).

[680] The Commission estimates this cost to be: (Sr. Programmer at $368 for 160 hours) + (Sr. Database Administrator at $379 for 40 hours) + (Sr. Business Analyst at $305 for 40 hours) + (Attorney at $462 for 20 hours) = 260 initial burden hours and a monetized cost of $95,480.

[681] *See supra* section II.F.2 for additional discussion. Specifically, see text surrounding *supra* note 210 where the Commission states, ''[t]he Commission believes that proposing to vary the minimum pricing increments . . . represents a balancing of pricing, liquidity, complexity, and price improvement opportunities.'' *See also* text surrounding *supra* note 221 where the Commission states ''The Commission also selected these particular pricing increments because, as described above, the proposed amendments to rule 612 are designed to (1) correlate the Time Weighted Average Quoted Spread to the minimum pricing increments by limiting the number of potential price points within the spread which in turn should mitigate the loss of liquidity that can occur when the minimum tick size is reduced, and (2) preserve meaningful price improvement for the majority of NMS stocks that would trade at minimum pricing increments that are $0.005 or less.''

[682] *See* Table 3 and surrounding analysis finding that only 18% of current price improvement occurs in sub-penny increments and not as a result of a midpoint trade.

[683] *See supra* section V.D.5 for additional analysis on this topic.

[684] *See* Table 10 and surrounding analysis.

[685] The economic effects of not applying rule 612 to trading are discussed in section V.F.1. Alternatively, the Commission could adopt any of the other alternatives presented in section V.F.1, the

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to consider tick size regimes without having to balance the need for OTC market makers to have sufficient ticks intra-spread in order to offer price improvement, though these alternatives would not offer the benefit of leveling the playing field across execution venues with respect to price improvement. Second, the tick sizes discussed refer explicitly to stocks priced equal to or greater than $1.00. For stocks with a share price of less than $1.00 in every case there would be no change in rule 612 relative to the baseline—*i.e.,* a tick of $0.0001 that does not apply to trading.[686] This reflects the fact that in the proposal the only change to rule 612 for stocks priced less than $1.00 was that the tick size of $0.0001 would also apply to trading. Given the fact that all alternatives in this section are predicated on rule 612 not being expanded to trading, the trading environment for stocks priced less than $1.00 would not change relative to the baseline, and so the analysis in this section focuses exclusively on tick sizes for stocks priced equal to or greater than $1.00. These first two conditions would lower implementation costs. Third, the access fee cap would not deviate from the proposal. Specifically, for stocks priced equal to or greater than $1.00 the access fee cap would be 10 mils whenever the tick size is greater than or equal to $0.002 and 5 mils for stocks with tick sizes less than $0.002 and prices greater than or equal to $1.00. For stocks priced less than $1.00 the access fee cap would be 0.05% of the value.[687] This condition acknowledges that the alternative tick sizes discussed in this section do not affect the economics of access fees or the reasons why the Commission is seeking to reduce the access fee.[688] Consequently, for all alternatives discussed in this section the Commission would retain the tick size regime in the proposal. This condition would lead to the same implementation costs associated with access fee caps that is presented in the proposal.[689] Fourth, all proposals in this section would provide a tick size exception for midpoint trades and benchmark trades such as VWAP or TWAP trades—reflecting the value that such trades offer to investors.[690] This condition likewise does not deviate from the proposal, and thus the compliance costs associated with this condition are accounted for in Section V.D.6. Fifth, for the quoted spread based tick size regimes the Commission would use the same process described in the proposal to determine a stock's Time-Weighted Average Quoted Spread: Evaluation Periods that last one month and occur four times per year where Time-Weighted Average Quoted Spread is the time weighted quoted spread during normal trading hours.[691] Because this condition does not represent a change relative to the proposal, the implementation costs would be as discussed in the proposal.[692]

a. Quoted Spread Based Approaches

Without the need to balance the ability of OTC market makers such as wholesalers to offer retail price improvement when determining the tick size thresholds, the Commission could shrink the bands where the given tick sizes apply or consider different tick size structures. Shrinking the bands limits the risk that stocks may trade with too many ticks intra-spread due to time series variation in quoted spreads by both limiting the total number of stocks that receive a tick size reduction and also limiting the size of the tick size reduction for stocks that do qualify for a tick size reduction relative to the proposal.

In Table 10, the Commission estimated that if the proposal had been implemented in the first six months of 2022, approximately 3.4% of share volume and 7.4% of dollar volume would have received a lower tick size and then transacted when spreads were wider than 10 ticks intra spread—the point at which analysis suggested TSP stocks would have traded better with a wider tick.[693] By shrinking the bands where the tick sizes apply the Commission could mitigate the risk of shrinking the tick too much and harming market quality for some trading volume while still providing relief to stocks that are currently tick or near-tick-constrained in the current $0.01 tick regime.

In addition to narrowing Time-Weighted Average Quoted Spread bands at which the proposed tick sizes apply, the Commission could also revise the total number of tick sizes. The proposal has 4 tick sizes for stocks priced equal to or greater than $1.00. The Commission could adjust this number down to increase simplicity but at the cost of potentially assigning a stock to a tick regime that may not be optimal, or up to expand the tick size regime to stocks with wider spreads—increasing complexity but ensuring that all stocks have a tick size that is tailored to their Time-Weighted Average Quoted Spread.

i. Alternative Tick Threshold

The proposal contains a total of 4 tiers for stocks equal to or above $1, and targets between 4 and 8 ticks intra-spread. Alternatively, the Commission could reduce the number of tiers from 4 to 3, with similar ticks but with tighter criteria for reducing the tick size, as follows:

i. No smaller than $0.0025, if the Time-Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was less than $0.01.

ii. No smaller than $0.0050, if the Time-Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was greater than $0.01 but less than or equal to $0.02;

iii. No smaller than $0.01, if the Time-Weighted Average Quoted Spread for the NMS stock during the Evaluation Period was greater than $0.02.

This alternative would target 2–4 ticks intra-spread. The empirical analysis presented in Section V.D.1 suggested that stocks with less than 2 ticks intra-spread generally benefited from the reduction in the tick size that accompanied the end of the TSP while stocks with more than 15 ticks may have been harmed. By targeting 2–4 ticks intra-spread this alternative would provide relief to stocks that are currently tick or near-tick-constrained while also reducing the risk that a stock is harmed by trading with too many ticks intra-spread.

A key difference of this alternative relative to the proposal is that a smaller fraction of overall trading volume would be assigned a smaller tick size: only those stocks with Time-Weighted Average Quoted Spreads less than $0.02. Thus a higher fraction of overall trading volume would remain at the $0.01 tick size.

The Commission estimates that the costs to implement this alternative

effect of which would be to combine the economic effects discussed in this section with those of the specific alternative in V.F.1 adopted.

[686] This stems from the first assumption which is that rule 612 is not amended in this alternative to apply to trading situations. For stocks with prices less than $1.00, this was the only proposed change to rule 612 relative to the baseline. Consequently, the economic effects of this aspect of the alternatives discussed in this section are not discussed here. *See* section V.C.1 for a discussion of the tick size baseline for stocks with prices less than $1.00.

[687] The economic effects of this aspect of the alternatives discussed in this section are not discussed here, but are discussed in the discussion of the proposal. *See, e.g.,* sections V.D.2 and V.E.

[688] *See supra* sections III.C, V.C.2, and V.D.2.

[689] *See supra* section V.D.6 for a discussion of these implementation costs.

[690] *See* text surrounding *supra* note 247 for a discussion of the role that midpoint and benchmark trades play.

[691] *See supra* section II.F.2.a for additional details on this process.

[692] *See supra* section V.D.6 of a discussion of the costs of implementing this aspect of the proposal.

[693] *See supra* section V.D.1.

would be similar or slightly lower as compared to the proposal because there would be three rather than four tick sizes that market participants would be required to adapt to, and the process for determining which stock received which tick size would be the same as the proposal.

Relative to the proposal, this alternative would more specifically target trading volume that is tick or near-tick-constrained as a stock would be required to have a Time-Weighted Average Quoted Spread less than $0.02 to qualify for any reduction in the tick size. Additionally, by targeting 2–4 ticks intra-spread instead of 4–8, this alternative would lower the risk that normal variation in quoted spreads through time could lead trading in some stocks some of the time to be worse off relative to the proposal.

Another difference between this alternative and the proposal pertains to what would occur should a reduction in the tick size result in a widening of spreads. Consider, for example, a stock that trades at a Time-Weighted Average Quoted Spread of $0.013. If the proposal were adopted, and after the implementation period, such a stock could go from a tick size of $0.01 to $0.001. One possible scenario is that spreads might widen (though the analysis suggests this is not the most likely scenario). Should spreads widen to, say $0.03, the tick would revert to $0.005; however spreads would be wider than they had been. In contrast, under this alternative, the stock would be assigned to the $0.005 bucket, rather than the $0.002 bucket. Spreads would be less likely to widen, but should they do so (consider $0.03), the tick would revert to $0.01. Under the proposal, spreads would have to undergo a 3-fold increase, to $0.04, to once again qualify for $0.01. Under this alternative, due to the less severe reduction in the tick size relative to the proposal, the spread would be less likely to widen due to a smaller tick, and were it to widen, it would need a less severe increase in the spread to revert to a tick of $0.01.

This alternative would also result in a smaller financial impact on any exchange relying on access fee revenue because none of the buckets would qualify for the 5 mil access fee. Additionally, because the smallest tick size would be assigned an access fee cap of 10 mils, the access fee cap for stocks trading beneath $1.00 would be 0.10% rather than 0.05% in the proposal—resulting in a smaller reduction in exchange transaction revenue for this trading volume.

ii. Two-Tiered Alternative

Alternatively, the Commission could simplify the tick size proposal and consider a two-tiered tick alternative for stocks priced equal to or greater than $1.00 where only tick-constrained stocks, *i.e.,* those with Time-Weighted Average Quoted Spreads less than or equal to $0.011 during an evaluation month, receive a tick of $0.005 while all other stocks retain a tick of $0.01.[694]

One advantage of this alternative relative to the proposal is that it would be simpler than the proposal as it would eliminate two of the tick sizes. Market participants, but retail investors in particular, might find it less confusing if the only two tick sizes were one penny and half a penny.

Also, to the extent that the proposal raises the concern that tick sizes would be too small for some stocks, this alternative would have the benefit that fewer stocks would be trading at a smaller tick, and the minimum tick itself would be substantially wider.

However, the analysis in Section V.D.1 suggests that this alternative could leave some stocks with a spread that is artificially wide, specifically near-tick-constrained stocks which could trade at spreads that are wider than they would be with a smaller tick. For example, a stock with average spread of $0.013 would be frequently trading with just one tick in between the best bid and best offer. Empirical analysis from section V.D.1 suggests that reducing the tick for this stock would, on average, reduce costs for investors. Moreover, if a stock priced equal to or greater than $1.00 has a Time-Weighted Average Quoted Spread of $0.005 then under the proposed changes to rule 612 that stock would receive a tick size of $0.001 providing 5 ticks intra-spread. Under this alternative that same stock would receive a $0.005 tick and would be tick-constrained with only one tick intra-spread. Albeit with the smaller tick relative to the current environment the distortive effects of the tick size would be smaller than what they currently are.

This alternative would have somewhat lower implementation costs relative to the proposal due to the fact that market participants would only be required to program systems to account for two tick sizes instead of four tick sizes. However, the reduction in cost relative to the proposal would be relatively small because market participants would still be required to build systems to adapt to multiple tick sizes that could periodically change. Once this functionality is built out, the Commission preliminarily believes that the cost of two tick size tiers would not be significantly larger than the cost of four tick size tiers. Thus, while acknowledging that the implementation costs of this proposal would likely be somewhat lower than those of the proposal, the Commission believes that the estimates for the proposal would be reasonable and seeks comment on this belief.

Because no stock would be assigned a tick size of $0.001 in this alternative, the access fee cap for all transactions priced greater than $1.00 would be 10 mils. At this level the Commission expects that IEX could maintain its current net capture on all transactions priced greater than $1.00 and thus a cost of the proposal to IEX would be eliminated. Additionally to harmonize the access fee cap for trading above and below $1.00 the Commission would enact a transaction fee cap of 0.1% (instead of 0.05%) for transactions priced less than $1.00. This higher transaction fee cap would effectively double, relative to the proposal, the revenue that the exchanges could earn from transactions priced less than $1.00 which would cut in half the expected lost revenue associated with the proposal articulated in Table 12. Specifically, this alternative would reduce the estimated lost revenue to exchanges by approximately $45 million per year.[695]

iii. Include Wider Ticks Than $0.01

The Commission could expand the proposal to include ticks wider than $0.01 for stocks with spreads wider than $0.04. In doing so the Commission could seek to target 4–8 ticks intra-spread for all wider-spread stocks. This alternative would apply the results from the empirical analysis suggesting that stocks with two or fewer ticks intra-spread would benefit from a reduction in the tick size while stocks with 10–15+ ticks intra spread would not.[696] Consequently, the Commission could extend the 4–8 tick intra-spread target in the proposal to all stocks. For example stocks with spreads greater than $0.08 and less than $0.16 could have a tick of

[694] For stocks with prices equal to, or greater than, $1.00 per share, a $0.01 tick would provide a floor on the feasible quoted spread (*see supra* note 448). *See supra* note 448 for a discussion of using a $0.011 threshold for the spread of tick-constrained stocks.

[695] In Table 12, the Commission estimated that the reduction in the access fee cap for transactions priced less than $1.00 from the baseline 0.3% to 0.05% in the proposal would lead to approximately $89 million per year reduction in exchange transaction revenue. Half of $89 million is approximately $45 million.

[696] *See* analysis in *supra* section V.D.1, Table 9.

$0.02. Stocks with spreads greater than $0.16 but less than $0.32 could have a tick size of $0.04 and so on.

This alternative could potentially improve the trading environment for stocks with wider spreads by minimizing the costs associated with having too many ticks intra-spread.[697] It would also increase complexity relative to the proposal because market participants would need to adapt to an environment with a larger number of tick sizes.

iv. Alternative Proposed in NASDAQ White Paper

Nasdaq has offered an alternative in a white paper.[698] This alternative would have stocks trading with spreads below 0.011 receive a tick size of $0.005. Stocks with spreads between $0.01 and $0.02 would continue to trade at an increment of $0.01, stocks with spreads between $0.02 and $0.05 would trade at an increment of $0.02, between $0.05 and $0.1 at $0.05, $0.1 to $0.25 to $0.10 and those above $0.25 to $0.25. Spreads would be determined every six-months based on the Time-Weighted Average Quoted Spread over the prior six months. The Commission believes that the compliance costs of this alternative would be similar to the proposal due to the similar nature of the alternative.

This alternative has two distinct disadvantages relative to the proposal. First, a stated assumption underlying this proposal is that ''stocks should trade at or near their Time-Weighted Average Quoted Spread.'' [699] Consequently, the proposal targets at most 2.5 ticks intra spread for most stocks.[700] The empirical analysis provided in Section V.D.1 indicated that TSP stocks that had fewer than two ticks intra-spread prior to the conclusion of the TSP benefited from the reduction in the tick size when the stock's tick size reverted from $0.05 to $0.01. Thus, our analysis indicates that fewer than 2 ticks intra-spread is on average too few and that stocks would trade better with more ticks intra spread. Thus this alternative might harm market quality relative to the proposal for many stocks. Additionally, this alternative does not provide a mechanism for most stocks to receive a lower tick size. For example if a stock is trading with a Time-Weighted Average Quoted Spread of $0.025, under this alternative it would receive a tick size of $0.02. However, since the tick size also defines the minimum tick possible this stock could never trade at less than $0.02 and thus would never qualify for a smaller tick. This disadvantage could be solved by multiplying all of the tick size thresholds by some multiple such as 1.1 to allow stocks that become tick-constrained by the assigned tick to receive a smaller tick size.

This alternative shares some of the benefits with the proposal. In both cases the proposal would reduce the risk of pennying by ensuring that for most stocks there would be relatively few ticks intra-spread. It reduces the risk that that the proposal could narrow spreads too much for some stocks. It also provides some relief to tick-constrained stocks by allowing them to trade at a $0.005 tick.

v. Step-Down/Step-Up Mechanism

The Commission could alternatively add a ''step-up/step-down'' mechanism to the proposal or to any of the alternatives above to prevent stocks from transitioning more than one tick size tier at a time. For example, under the proposal, a stock trading with a $0.005 tick that ends the quarter with a time-weighted average spread of $0.006 would switch to a minimum increment of $0.001, skipping over the minimum increment of $0.002. With a step-up/step-down mechanism, this stock would ''step-down'' to rather than skip the minimum of $0.002; only stocks with a minimum increment of $0002 and a Time-Weighted Average Quoted Spread of less than $0.008 would be eligible to move to a minimum increment of $0.001. Likewise, a stock would be assigned the next larger tick in the tick size schedule if it traded with a wider spread than prescribed by its tick size tier, regardless of whether the spread was large enough to be assigned to a tier with an even larger tick size.

A step-up/step-down mechanism would help avoid any potentially large shifts in tick size under the proposal. This alternative, however, could prolong the costs associated with being tick-constrained or near-tick-constrained and tick assignment. Further, this alternative would be more complex as the resulting tick size would not only depend on the stock's time-weighted average spread but would also depend on the stock's prevailing minimum increment. This additional complexity may lead to confusion amongst market participants who would not actively track tick size assignments, though in terms of implementation the Commission does not expect that the additional requirement of tracking a stock's previous tick size would lead to higher implementation costs than those in the proposal.

b. Other Approaches

i. Uniform $0.005 Tick for All Stocks Priced Equal to or Greater Than $1.00

The Commission could reduce the minimum tick size to a half a cent ($0.005) for the quoting and trading of all NMS stocks that are priced at or above $1.00. A primary advantage of this alternative is that it would reduce complexity relative to the proposal as there would be a uniform tick size for all stocks trading equal to or greater than $1.00 while also allowing tick-constrained stocks a smaller tick. Additionally, there is a risk that, for unknown reasons, some stocks that would qualify for a smaller tick under the proposal would trade better with a wider tick. For these stocks this alternative would be better than the proposal both because the tick size reduction is not as severe as the proposal. The disadvantage to this proposal is that, as shown in section V.D.1, a smaller tick for wide spread stocks can harm liquidity, thus applying a smaller tick to all securities would likely harm execution quality for some stocks with wide spreads.

This alternative would also have lower initial one-time compliance costs and no ongoing costs relative to the proposal because this alternative provides just one modification to the current tick size regime: a reduction in the tick from $0.01 to $0.005 for all stocks priced greater than $1.00. Thus it would be cheaper to implement. The Commission estimates that this alternative would lower implementation costs relative to the proposal by approximately $14 million.[701]

[697] *See* Barardehi, et al. (2022), *supra* note 85.

[698] *See* Nasdaq Intelligent Tick, *supra* note 180. *See also supra* section II.E.2.

[699] *See* Nasdaq Intelligent Tick, *supra* note 180, at 16.

[700] The proposal would limit increases in the tick size to $0.25, and so to the extent that a stock's prevailing spread surpasses this amount, it could trade at more than 2.5 ticks intra spread. However, as indicated in Table 4, transactions in stocks with quoted spreads greater than $0.25 represent less than 4% (20%) of share (dollar) volume thus the intelligent tick proposal would target the majority of trading volume with less than 2.5 ticks intra-spread.

[701] *See* Table 13 for enumerated cost estimates of the proposal. For trading centers, the Commission estimates that this alternative would lower compliance costs by $90,000 from $140,000 to $50,000 to reflect the fact that the rule would only apply to quoting and not to trading, thus only one part of the trading center's systems would need to be modified and that the modifications to the quoting systems would be simpler than the proposal. There would be no one-time or ongoing costs associated with monitoring Time-Weighted Average Quoted Spreads. Additionally, entities adjusting order entry systems for the new tick would not need to adjust their systems to add any tick size dynamism beyond what exists in the baseline. Thus, the Commission estimates that entities with order entry systems would see their implementation costs decline by $7,000 from $11,000 to $5,000 per order entry system. For the

Additionally, because no stock would be assigned a tick size of $0.001 in this alternative, the access fee cap for all transactions priced greater than $1.00 would be 10 mils if kept proportional to the tick size. At this level the Commission expects that IEX could maintain its current net capture on all transactions priced greater than $1.00 and thus a cost of the proposal to IEX would be eliminated. Additionally to harmonize the access fee cap for trading above and below $1.00 the Commission would enact a transaction fee cap of 0.1% (instead of 0.05%) for transactions priced less than $1.00. This higher transaction fee cap would effectively double, relative to the proposal, the revenue that the exchanges could earn from transactions priced less than $1.00 which would cut in half the expected lost revenue associated with the proposal articulated in Table 12. Specifically, this alternative would reduce the estimated lost revenue to exchanges by approximately $45 million per year.[702]

ii. Variable Tick Size Based on Price

The Commission could also implement a tick regime that is based solely on the share price of the securities. This alternative effectively would expand the current regime where quotes for NMS stocks priced less than $1.00 have a tick of one hundredth of a penny while quotes for NMS stocks priced at or greater than $1.00 have a tick of $0.01. The advantage to this approach relative to the quoted spread tick alternative discussed in the previous section is that it is simpler to implement as it would be a static rule that requires no computations by the listing exchange. The primary disadvantage to this alternative relative to using the quoted spread based measures is that price, while a useful benchmark because it is correlated with quoted spreads, is not perfectly correlated with the quoted spread—the key economic variable of interest when determining tick sizes—and stocks with similar prices can have spreads that vary significantly.[703] Thus it is likely that under a price based regime some stocks would have a tick size that is too wide relative to their quoted spread and others too small.

The Commission could implement a price based tick schedule as follows.

Price	Tick
Less than $1	$0.0001
$1 to $10	0.001
$10 to $50	0.005
Greater than $50	0.01

This tick schedule effectively would add two intermediate tick levels to the current regime. For stocks with prices below $1.00 and above $50.00, there would be no change relative to the existing tick regime. However, for stocks with prices between $1.00 and $10.00 the tick would be $0.001, and for stocks between $10.00 and $50.00 the tick would be $0.005.

Table 14 provides descriptive statistics based on data from March 2022 for the various price levels.[704] The first price group of stocks is those with prices less than $1.00. Trading in these stocks accounted for approximately 8% of share trading volume in March 2022. For these stocks, there would be no change in the trading environment relative to what is currently in place. Stocks in price group two with prices between $1.00 and $10.00, *i.e.,* stocks that would be assigned a tick size of $0.001 under this alternative accounted for a total of 28% of all share trading volume. Of this trading volume, the majority (78%) occurred in tick-constrained stocks, while 21% of volume in this price group occurred in stocks with a spread between $0.01 and $0.10. In this group of stocks very little trading volume occurred in stocks with a spread greater than $0.10. Thus, the effect of lowering the tick to a tenth of a cent for stocks in this price group would likely improve the trading environment for the 78% of trading that is currently tick-constrained in this price range. For the remaining 22% of trading volume in this price category, the trading in stocks that are not currently tick-constrained, the effect of reducing the tick to a tenth of a cent could be negative based on the analysis in section V.D.1.

TABLE 14—SHARE VOLUME BY PRICE GROUP AND QUOTED SPREAD [a]

Price group	Spread group	Average number of stocks	% Total share volume	% Group share volume	% Total dollar volume	% Group dollar volume	% of stocks	% of group stocks
Less than $1	Tick-Constrained	259	7	93	0	91	2	25
	$0.011 < Spread < $0.10.	651	1	7	0	9	6	64
	Spread > $0.10	112	0	0	0	0	1	11
$1 < Price < $10	Tick-Constrained	540	22	78	2	74	5	18
	$0.011 < Spread < $0.10.	1,994	6	21	1	24	17	67
	Spread > $0.10	454	0	2	0	2	4	15
$10 < Price < $50	Tick-Constrained	397	23	59	12	57	3	7
	$0.011 < Spread < $0.10.	2,982	14	37	8	39	26	55
	Spread > $0.10	2,017	1	4	1	4	18	37
Price > $50	Tick-Constrained	97	6	24	10	13	1	5

same reasons, the Commission estimates that operators of smart order routers would see their compliance costs decrease from $11,000 to $5,000. [$90,000*54 (trading centers) + $7,000*1,192 (order entry systems) + $7,000*282 (smart order routers) ≈ $14 million].

[702] In Table 12, the Commission estimated that the reduction in the access fee cap for transactions priced less than $1.00 from the baseline 0.3% to 0.05% in the proposal would lead to approximately $89 million per year reduction in exchange transaction revenue. Half of $89 million is approximately $45 million.

[703] *See* Mackintosh, *supra* note 475, for evidence that stock prices and quoted spreads are correlated but not perfectly so.

[704] Each day, total trading volume for a stock would be allocated into one of the four price groups based on that stock's VWAP on that day. Then, the total trading volume in each of the price groups, as well as average number of stocks that fall into each price group each day is computed for the month of Mar. 2022 (the hypothetical first evaluation month in the examples presented in section V.G.1.b.). This methodology is an estimate of the amount of trading volume that would have been allocated to each of the price groups. For example, in this methodology, a stock with a VWAP of just below $1.00 on a trading day would have all of its trading volume allocated to the $1.00 trading bin even though some fraction of its trading volume may have occurred intra-day at prices at or above $1.00. However, this bias will be minor because there will also be some stocks with prices just above the relevant thresholds and the incorrect trades will likely mostly cancel out. Additionally, the overwhelming majority of trading volume does not occur right on the thresholds, so the noise created by using a VWAP based methodology instead of a trade by trade methodology is likely to be minor.

TABLE 14—SHARE VOLUME BY PRICE GROUP AND QUOTED SPREAD [a]—Continued

Price group	Spread group	Average number of stocks	% Total share volume	% Group share volume	% Total dollar volume	% Group dollar volume	% of stocks	% of group stocks
	$0.011 < Spread < $0.10.	715	14	55	41	54	6	34
	Spread > $0.10	1,264	5	21	25	33	11	61

[a] This table provides estimates of the distribution of trading volume that occurs in stocks with various price and quoted spread levels. Each day in Mar. 2022 stocks are divided into four price groups (less than $1.00, $1.00 < Price < $10, $10 < Price < $50, and Price > $50) and three quoted spread groups (Spread < $0.011 *i.e.,* tick-constrained, $0.011 < Spread < $0.10, and Spread > $0.10). Price is determined using that day's VWAP, and quoted spreads are computed using the time weighted quoted spread during regular trading hours. Both statistics are obtained from the WRDS intra-day indicators. Once a stock is assigned to a particular quoted spread and price group all of that stock's trading volume across all venues for that day is determined. This table computes the average number of stocks in each of the 12 unique price/spread groups during our sample. It also presents the total share and dollar volume falling into each of the 12 groups. The table also provides percentage summations for each price group that illustrate what fraction of trading volume in each price group falls into each quoted spread category. These computations are presented in columns with titles beginning with % *Group.*

Stocks with a price range of between $10.00 and $50.00, *i.e.,* stocks that would be assigned a half cent tick, represent about 38% of share trading volume. Of this 38% of trading volume, approximately 59% occurs in stocks that are currently tick-constrained, 37% occurs in stocks that are not tick-constrained but have an average spread of less than $0.10. The remaining 4% occurs among stock with spreads wider than $0.10. For tick-constrained stocks, a reduction in the tick size to a half a penny from the current one cent would likely improve market quality for these stocks. For the 37% of trading volume in this price range that occurs in stocks with spreads less than $0.10 but that are not tick-constrained, the average quoted spread is approximately $0.05. For these stocks, a half cent tick represents 10 ticks within the quoted spread. Ten ticks intra-spread is in line with the maximum number of intra-spread ticks allowable for stocks receiving a tick size reduction under the proposal, and the empirical analysis in Section V.D.1 suggests that stocks trading at approximately 10 ticks or less intra-spread do not need a reduction in the spread to improve market quality. For the 4% of trading volume in this group with average quoted spreads above $0.10, the average quoted spread is approximately $0.27, and a half cent tick would introduce over 50 price levels within the spread. At this level, the half cent tick could be too small and could harm market quality by increasing complexity and the risk of pennying.

The last category of stocks, those with prices greater than $50, account for approximately 28% of share trading volume. For these stocks, the tick would not change relative to the baseline environment.

This alternative would have implementation costs similar to those discussed section V.D.6 with the exception that the 5 listing exchanges would not be required to monitor quoted spreads and to send tick size information to the SIPs, reducing one-time costs by $95,000 and ongoing costs by $45,000 per year.[705]

This alternative would also reduce the effect relative to the proposal on IEX's net capture. Specifically, in the proposal the Commission estimated that approximately half of trading volume is in tick-constrained stocks that would receive a tick size of $0.001 and an associated access fee cap of 5 mils. This is the volume that IEX would be estimated to receive a reduced net capture of 1 mil. However, as shown in Table 14, stocks priced between $1.00 and $10.00 only account for an estimated 28% of total share volume. Consequently, this alternative would reduce by approximately half the estimated fraction of trading volume that would receive the 5 mil access fee cap and thus would reduce IEX's lost net capture on trades priced greater than $1.00 relative to the proposal by about half.

iii. Cboe Proposal

Cboe has also put forth an alternative methodology for determining the tick size.[706] This alternative would apply three layers of filtering to stocks to determine if the stock qualified for a $0.005 tick. First, the stock would need to be consistently trading with a Time-Weighted Average Quoted Spread of $0.011. Then among those stocks, only those with high quote-size-to-trade-size-ratios would be further considered for a tick size reduction. Cboe argues that a high quote-size-to-trade-size-ratio is indicative of there being ample liquidity but investors being discouraged from crossing the spread due to the high tick. If a stock's quote-size-to-trade-size-ratio is greater than the 75th percentile among stocks that are trading with quoted spreads less than $0.011 then it would qualify for consideration as a candidate for a tick size reduction. The last criterion relates to the notional-turnover-ratio. This criterion is designed to eliminate stocks that are relatively thinly traded from consideration for a tick size reduction. To be a candidate for a tick reduction a stock must also be above the top 75th percentile among stocks with a Time-Weighted Average Quoted Spread less than $0.011. Thus, the three criteria to receive a tick size reduction would be a Time-Weighted Average Quoted Spread less than $0.011, and the stock must be above the 75th percentile among stocks with a Time-Weighted Average Quoted Spread less than $0.011 in both its quote-size-to-trade-size-ratio and its notional-turnover-ratio. This plan would re-evaluate stocks on a quarterly or bi-annual basis.

Relative to the proposal, this alternative would limit the tick size reduction to an estimated 4% of dollar trading volume. This proposal would also limit the tick size reduction for these stocks to $0.005. Thus to the extent that some stocks that would receive a lower tick size in the proposal but would not benefit from a lower tick size for unknown reasons, these stocks would be better off under this alternative due to its limited scope.

This alternative would be considerably more complex than the proposal and it is unclear which entity would have responsibility for computing the quote-size-to-trade-size-ratio and the notional-turnover-ratio 75th percentile thresholds as these thresholds require a standardized methodology to be applied to all stocks regardless of listing exchange. This alternative could also leave some stocks that could perhaps benefit from a smaller tick size with a wider one, thus the problem of tick-constrained stocks might persist to a greater extent in this alternative than in the proposal.

[705] *See* Table 13 for enumerated cost estimates of the proposal.

[706] *See* Cboe Proposal, *supra* note 104.

3. Alternative Access Fee

The Commission could also consider alternative access fee caps that are higher or lower than those in the proposal. These alternative access fee caps could be paired with either the tick sizes in the proposal or the alternatives considered in Section V.F.2. To the extent that a given alternative access fee cap interacts with tick sizes, the Commission addresses that in the discussion below.

a. Higher or Lower Access Fees

For stocks priced below $1.00 the Commission could consider access fees that are higher than 0.05% of the share price. Doing so would increase the amount of net revenue that the exchanges could earn on transactions in stocks priced less than $1.00 which would limit the costs of the proposal for the exchanges. However, doing so comes with the tradeoff that it risks creating an access pricing discontinuity at $1.00 whereby it becomes more expensive at $1.00 to transact. Since stocks priced less than $1.00 tend to be smaller market cap stocks, this discontinuity could make it relatively more expensive to trade these smaller stocks.[707]

The baseline access fee cap of 0.3% is equivalent to 30 mils if the share price is exactly $1.00. Thus at $1.00 the access fee cap of 0.3% is equivalent to 30 mils and begins to decline from there as the price declines. Thus there is a smooth transition in terms of the access fee cap between stocks priced equal to or greater than $1.00 to those priced less than $1.00. The proposal is similarly designed to create a smooth transition between the per share access fee cap of 5 mils for stocks priced equal to or greater than $1.00 and the proportional access fee cap of 0.05% for stocks priced less than $1.00.

Choosing an access fee greater than 0.05% would create a discontinuity where at $1.00 it becomes relatively more expensive on a per share level to transact. For example a stock priced at $1.00 would have either a 5 or 10 mil access fee cap under the proposal. If the Commission retained the current baseline 0.3% access fee cap for stocks priced less than $1.00 then as soon as the stock price dropped below $1.00 the access fee cap would jump to the equivalent of approximately 30 mils at the $1.00 threshold.[708] As the share price continued to decline below $1.00 the access fee cap would also decline, but would not be lower than the equivalent of 10 mils on a per share basis until the stock price crossed below $0.30 per share and would not be lower than 5 mils until the stock price dropped below $0.15. Thus raising the access fee cap for stocks priced less than $1.00 higher than the proposed level of 0.05% would create a discontinuity at $1.00 where it becomes more expensive to transact.

Making it relatively more expensive to transact shares priced less than $1.00 risks, the alternative would create a discontinuity, which could potentially harm liquidity for smaller cap stocks. Despite such a discontinuity, this alternative would still lower trading costs relative to the baseline so long as the proportion chosen for the access fee cap for sub $1.00 transactions was below the baseline level of 0.3%. Thus, relative to the baseline, it would likely become less expensive to trade sub $1.00 stocks on most exchanges—potentially improving their liquidity relative to the baseline, but not relative to the proposal.[709]

For stocks priced greater than $1.00 the Commission could likewise raise or lower the access fees from those in the proposal. The primary advantage to lowering the access fee cap would be that it could help reduce supply and demand distortions caused by access fees and their associated rebates. However, if the access fee cap is lowered beneath approximately 3 mils, then the exchanges could struggle to maintain their net capture and their estimated financial losses due to a lower net capture would increase. If the access fee cap is lowered beneath 6 mils, then, while most exchanges would be able to maintain their net capture, IEX would likely not, placing it at a disadvantage relative to other exchanges because IEX primarily funds itself through access fees. The Commission estimates that this alternative would carry the same compliance costs as the proposal because it is structurally the same as the proposal.[710]

Under the assumption that exchanges maintain the 2 mil net capture rate, rebates would rise or fall with access fees. To the extent that lower rebates aid market quality, this benefit would be differentially realized relative to the proposal.

b. Tie Access Fee to the Tick Size With Current Proportion of 30%

The current access fee cap for quotations $1.00 or more of 0.3 cents per share on a one cent tick size is 30% of the tick size. The proposal would lower access fee caps within set parameters of the stock price and minimum pricing increment. As an alternative to the proposal, the Commission could implement an access fee cap that applies proportionally at any tick size. This alternative would carry the same implementation costs as the proposal. It would also allow fees and rebates to facilitate similar intra-tick pricing as the current system of fees and rebates, which can narrow spreads in certain instances.[711] It would also allow for greater rebates to be paid in stocks with wider ticks, which under the proposal are those with wider spreads, which could lead to a more efficient manner of rewarding liquidity provision.

The proposal considers a schedule with ticks of $0.001, $0.002, $0.005, and $0.01 for different stocks. Under this alternative, for stocks with a $0.01 tick size, the proportional access fee cap would remain 30 mils per share. For stocks with a tick size of $0.005, the access fee cap would be 15 mils. For stocks with a tick size $0.002, the access fee cap would be 6 mils. Lastly, for stocks with a tick size of $0.001, the access fee cap would be 3 mils. Thus this alternative would reduce fees on stocks with ticks of $0.001 and $0.002 relative to the proposal but would otherwise raise fees. Under the assumption that exchanges set their access fee at the cap and their rebate approximately 2 mils lower to maintain their estimated 2 mil net capture, the prevailing access fee would equal 3 mils and rebates 1 mil for stocks with a $0.001 tick. For stocks with a $0.002 tick size the access fee would be 6 mils and rebates 4 mils. Given the low level of these rebates, it is possible that exchanges might cease offering rebates because they are too low to play a role in routing decisions. On the other hand, under the same net capture assumption that places the rebate 2 mils lower than the cap, rebates may be more significant than under the proposal for stocks with a $0.005 tick. For stocks with a $0.01 tick and a 30 mil access fee the market could operate the same as it currently does; thus, the Commission expects the

[707] *See* Qianqiu Liu, S. Ghon Rhee, and Liang Zhang, *On the Trading Profitability of Penny Stocks,* (working paper Aug. 26, 2011), *available at https://ssrn.com/abstract=1917300* (retrieved from SSRN Elsevier database) for a description of the characteristics of low priced stocks.

[708] $1.00*0.3% = $0.0030 or 30 mils.

[709] This statement presumes prevailing market practice continues whereby exchanges charge one side of the transaction the full access fee for sub $1.00 transactions and offer no rebates. In this case, the Commission believes it reasonable to expect that following the reduction of the transaction fee cap for stocks priced less than $1.00, the average access fee charged would go down to the new and lower access fee cap for these transactions.

[710] *See supra* section V.D.6 for an estimate of the compliance costs associated with the proposal.

[711] *See supra* section V.D.3.

trading environment to be as described in the baseline section V.C.2.

As with the proposal, reducing the profit that can be earned by providing liquidity could induce some market participants that specialize in liquidity provision to reduce participation in such stocks. For stocks that are currently tick-constrained, this would likely improve market quality as it would reduce fill times, fill rates, and queue lengths on maker-taker exchanges due to less competition to provide liquidity. For stocks with wider spreads, the effect of lowering the access fee cap to 15 mils might not play a significant role in the participation rate of market makers given that the access fee and rebate for these stocks is such a small fraction of the spread.

Relative to the proposal, the Commission does not expect there would be significant operational costs added to exchanges or broker-dealers to implement a variable access fee regime. The Commission expects that each of the 15 exchanges that charge access fees for trading would be required to prepare and submit a Rule 19b–4 filing with the Commission at a cost of $48,400 per exchange for a total one-time cost of $726,000 across all exchanges. Although the anticipated cost of adding a variable access fee regime likely would not differ from the proposal, adding four access fee caps would increase the complexity of exchange fee and rebate structures because the exchanges would need to add at least four fee/rebate levels to reflect the four new access fee caps.

Relative to the proposal, and under the assumption that most exchanges maintain a net capture of 2 mils, this alternative is not likely to affect net capture for any exchange except potentially IEX. Because IEX is funded primarily through net capture, it appears to have a higher capture rate than other exchanges and, under this alternative, that would be bounded from above by 3 mils on stocks with tick sizes less than $0.001. Assuming a net capture of 6 mils, the proposed changes to rule 612, with a 5 mil access fee cap, would represent a reduction in the net capture on volume with a $0.001 tick of 1 mil. In section V.D.3 the Commission estimates that IEX would lose an estimated $3 million annually in revenue due to the 5 mil access fee cap reducing by 1 mil its net capture on volume that would be assigned a $0.001 tick. Using the same methodology, this alternative would increase the estimated decline in net transaction fee revenue to $9 million, or combining with a decrease in net transaction revenue among sub $1.00 stocks, a decline of 22% in total net transaction fee revenue. Thus, this alternative would disadvantage IEX more than the proposal.

Alternatively, the Commission could have proposed this alternative in combination with alternatives on the tick sizes that do not have a minimum increment as low as $0.001. In these cases, this alternative would not have this disadvantage. As a variation on this alternative, the Commission could tie access fees to exchanges at a level other than 30%. A fixed percentage rather than level would preserve the ability to reward liquidity providers when spreads are higher. However, relative to the proposal, access fees would remain high, or, depending on the level chosen, be higher.

c. Uniform 10 Mil Access Fees Regardless of Tick Size

The Commission could impose a uniform access fee cap of $0.0010, or 10 mils, across all NMS stocks for quotes equal to or greater than $1.00. A uniform 10 mil access fee cap would help to preserve the structure of the current transaction based business model for exchanges while still mitigating many of the distorting effects of rebates for stocks with tighter spreads. An additional benefit from having a uniform access fee cap would be to avoid any additional market complexity associated with a variable access fee cap. The Commission recognizes that an access fee cap of 10 mils for stocks that would otherwise have a 5 mil access fee cap under the proposal, would provide exchanges with enough pricing freedom to continue to offer economically meaningful rebate-tiering.

Implementing a uniform 10 mil access fee cap would necessitate an alternative tick size schedule as the access fee cap should not be greater than ½ of the tick size in order to preserve coherence between net and nominal price rankings of trading venues.[712] This would not be possible with an access fee cap of $0.001 and a lowest possible proposed tick size of the same amount, as would be the case for the smallest tick size tier from the proposal. For example, suppose that the quoted price on an inverted venue is one tick less competitive than that displayed on a maker-taker venue. If the access fee on the maker-taker venue and the rebate on the inverted venue are together greater than one tick (the difference in the nominal quoted prices), a marketable order would receive a better net execution on the inverted venue despite the maker-taker venue having a more competitive quoted price.[713] If the Commission were to adopt this alternative, the combination of tick size and access fee cap would allow for incoherent venue rankings, and there would be instances where some trades would have to execute at suboptimal net prices because current Regulation NMS rules dictate that marketable orders be routed to venues with the best nominal quoted prices without regard to what the net proceeds may be.[714] In order to accommodate a uniform access fee cap of $0.001, the Commission might also consider modifying the proposal to eliminate the $0.001 tick. In short, the Commission could impose a minimum tick of $0.002 on all transactions with Time-Weighted Average Quoted Spreads less than $0.02. The Commission does not expect that the adoption of this alternative tick size regime to introduce any differential implementation costs compared to those presented under the proposal.

Avg quoted spread	Tick	Access fee cap
$0.02 or less	$0.0020	$0.0010
$0.02–$0.05	0.0050	0.0010
Greater than $0.05	0.0100	0.0010

[712] Net and nominal price rankings are coherent if sorting trading venues on the competiveness of their nominal quoted prices yields the same ordering as sorting on prices net of fees and rebates.

[713] To illustrate, with a $0.001 tick size: Exchange A has a top bid quote of $10.011 and charges a taker fee of $0.0007, over half the tick size, so the net price to sell is $10.0103. Exchange B, an inverted venue, has a top bid of $10.010 with a taker rebate of $0.0006 so the net price to sell is $10.0106. On net, executing a sale on exchange B would result in a better execution than on exchange A even though exchange A is posting a better nominal price.

[714] *See* CFR 242.611.

Eliminating the $0.001 tick could mean that stocks that are currently tick-constrained would receive a $0.002 tick instead of a $0.001 tick. Thus, these stocks would have at most 5 ticks intra spread. To the extent that these stocks would further benefit from a smaller tick, as envisioned under the proposal, those benefits would be limited. However, based on the empirical analysis in section V.D.1 the Commission does not expect this change to significantly harm market quality for these stocks. However, for stocks with spreads that would have qualified them for a $0.001 tick under the proposal, the amount of price improvement that retail investors could receive from wholesalers or retail liquidity programs could be limited. The wider tick would make it more likely that a wholesaler would find it unprofitable to offer price improvement to a retail trade and could reduce the total price improvement offered to retail traders in these stocks.

d. Lower Uniform Access Fee

The Commission could require a uniform access fee cap for all transactions priced equal to or greater than $1.00 regardless of the tick size that is imposed for that given stock transaction to reflect the uniform nature of the variable costs incurred by the exchanges to facilitate transactions and that is as low as possible to allow most exchanges to maintain their estimated 2 mil net capture on protected transactions.[715] Consequently the Commission could impose a uniform access fee cap of 3 mils on all transactions priced equal to or greater than $1.00 regardless of the tick. This alternative is structurally similar to the proposal and thus the Commission believes that this alternative would carry with it the same implementation costs as the proposal.[716]

At this level most exchanges could maintain their estimated net capture of approximately 2 mils per transaction without leaving much, if any, excess revenue for the exchanges to fund rebates or volume based tiering. Thus, the economic effect of this alternative would be to effectively eliminate rebates and volume based tiering.

For an exchange, managing the system of fees and rebates along with associated volume based tiering is not costless. Thus, if the exchanges believe that the incentives offered through tiered pricing and rebates would not be meaningful enough to affect behavior sufficiently to justify the costs then it may cease to offer them opting instead for a simpler fee structure that might or might not include rebates. The Commission views this outcome as possible and even probable, however there would be significant uncertainty regarding how likely this outcome is because the Commission lacks data on how expensive these programs are to administer. What is certain is that the dramatic reduction in the range of fees and rebates that the exchanges could offer under a 3 mil fee cap would mean that even if the exchanges continue offering rebates or volume based tiering, the economic impact of these programs would be significantly diminished.[717]

The reduction or elimination of rebates that is expected to accompany the reduction in the access fee cap would significantly reduce the total revenue per share traded that liquidity providers earn on maker-taker exchanges relative to either the baseline or the proposal. Thus, this alternative would likely decrease the profits earned by liquidity providers specifically algorithmic and high-frequency traders that specialize in liquidity provision and rebate capture strategies. These traders would likely see their trading profits decrease more under this alternative than the proposal.

Another key difference with a 10 mil access fee cap is more apparent at larger tick levels, such as at a full cent tick, a 3 mil access fee would provide very little in the way of intra-tick pricing given that the access fee and associated rebate would be such a small fraction of the tick size. Thus, for stocks with larger ticks this alternative would be more restrictive than the proposal in terms of pricing levels that could be realized once fees and rebates are included in the price.

A significant disadvantage of this alternative relative to the proposal is that it would severely constrain exchanges like IEX that choose to fund themselves primarily through access fees. IEX has an estimated 6 mil net capture, and reducing the access fee cap to 3 mils would cut by around half IEX's net revenue from transactions. This reduction in revenue could require IEX to change its business model. The Commission estimates that if nothing else were to change concerning trading volume relative to the first six months of 2022, then this alternative could cost IEX as much as 40% of its transaction fee revenue (approximately $20 million per year).[718]

e. Ban on Rebates

The Commission could also ban rebates but leave the access fee cap unchanged, or lowered to 10 mils for transactions priced equal to or greater than $1.00. For stocks priced lower than $1.00 the Commission could either leave the access fee cap unchanged at 0.3% or lowered to 0.1% to match any reduction in the access fee cap for stock priced equal to or greater than $1.00 to 10 mils. This alternative would eliminate the liquidity provision distortions associated with rebates, to the extent these continue to exist under the proposal.[719] Also, because high access fees would not be needed to fund rebates, the Commission expects that this alternative would lead to access fees that are less than 5 mils on most exchanges. It would also provide an advantage relative to the proposal in that it would leave exchanges that use access fees as their primary source of revenue the opportunity to continue doing so without restriction. Consequently, if the Commission chose to ban rebates but leave the access fee cap unchanged relative to the baseline, then this alternative would have the advantage relative to the proposal in that it would not affect the exchange's net capture and thus the exchanges would not be financially worse off under this alternative. If the Commission chose to lower the access fee cap to 10 mils for stocks priced equal to or greater than $1.00 and to 0.1% for stocks priced less than $1.00, then the exchanges would still lose money on transactions priced below $1, but could still earn their full estimated net capture on transactions equal to or greater than $1.00. A disadvantage of this alternative relative to the proposal is that it restricts the ability for the exchanges to innovate with respect to

[715] For transactions below $1.00, the Commission could implement an access fee that harmonizes the access fee for greater than $1.00 transactions with those less than $1.00—*e.g.,* an access fee cap of 10 mils on transactions greater than $1 would be accompanied by an access fee cap of 0.10% for transactions below $1.00 and an access fee cap of 5 mils on transactions priced equal to or greater than $1.00 would be accompanied by an access fee cap of 0.05% for transactions less than $1.00. In this case, the access fee cap of 3 mils for transactions greater than $1.00 would coincide with an access fee cap of 0.03% on transactions less than $1.00.

[716] *See supra* section V.D.6. for a discussion of implementation costs related to the change in the access fee cap.

[717] The economic effects of rebates are discussed in *supra* section V.D.3 including liquidity provision effects, intra-tick pricing, and order routing. Each of these effects would be greatly mitigated with a lower access fee cap. Volume based tiering creates an incentive for broker-dealers to concentrate orders on one exchange to qualify for higher rebates or lower access fees. Reducing the access fee cap to 3 mils would significantly reduce this incentive by reducing the total amount of discount that an exchange could offer.

[718] This estimate uses the same methodology as is used to produce the estimates in Table 12 but applies a 3 mil net capture on trading volume at or above $1.00.

[719] *See supra* section V.D.3 for additional discussion of these distortions.

rebates. While rebates could be an inefficient and distortive form of liquidity subsidization, exchanges potentially could innovate with rebates to increase their efficiency and decrease their distortive effects. Banning rebates would foreclose such an outcome. Banning rebates could potentially result in exchanges using other means to attract liquidity which might have other drawbacks such as offering beneficial pricing for other products or special privileges to large liquidity providers.[720]

4. Do Not Accelerate Odd-Lot Information or Create BOLO

The Commission could alternatively accelerate the definition of round lot but not accelerate the odd-lot information from the MDI Rules or the requirement to establish a BOLO.[721] Doing so would help mitigate any potential deleterious effects that MDI acceleration would have on future competing consolidator (CC) competition as well as lower the implementation costs of the proposal for exchanges and SIPs. It could also reduce the costs on data users. However, the alternative would result in a stronger economic effect from the decline in depth expected from the reduction in tick size and the definition of round lot.[722]

This alternative would avoid harming the competition in the competing consolidator market that would result from the competitive advantage afforded to SIPs by the proposal. Requiring the exclusive SIPs to invest in the needed infrastructure necessitated by the proposed acceleration of the odd-lot information from the MDI Rules may increase the SIPs competitive advantage by reducing their costs to become competing consolidators.[723] The alternative would not provide this competitive advantage because the odd-lot information from the MDI Rules would be implemented during the transition period, allowing non-SIP competing consolidators the same opportunity as SIP competing consolidators to capture this market share.

This alternative would have lower implementation costs relative to the proposal as forgoing the proposed MDI acceleration would reduce many of the compliance costs necessitated by the proposal. The SIPs would not have to incur the costs associated with collecting and disseminating any additional information that would result from the inclusion of odd lot information in NMS data until the full implementation of the MDI Rules. The SIPs would avoid any redundant costs from having to update their systems twice. Similarly, the exchanges would not incur costs associated with reporting odd-lot information until the full implementation of the MDI Rules.[724]

This alternative would reduce the benefits of the MDI acceleration. In particular, this alternative would not result in the benefits associated with allowing individual investors whose broker-dealers subscribe to the data to visually monitor the market environment and determine profitable trading opportunities as early as they would be able to under the proposal. It would also not result in the benefits of offering market participants a standard benchmark that reflects available odd-lot liquidity.

The alternative would also increase the effects of a reduction in displayed depth at the NBBO resulting from either a smaller tick size or a smaller round lot. If the odd lot information is not included in the SIP data feed, the proposal could result in market participants who rely on the SIPs receiving less information regarding the liquidity available in the market. This is because the reduction in tick size is expected to distribute liquidity across more price levels, reducing the depth reported at the NBBO.[725] This loss of information could be further exacerbated with the implementation of the round lot definition, which will lower the depth of liquidity reported at the NBBO. Market participants who do not receive odd lot and depth of book information from proprietary data feeds would incur a loss of information content for stocks priced greater than $250. Avoiding such loss would entail incurring fees to subscribe to such data.

G. Request for Comment

The Commission is sensitive to the potential economic effects, including costs and benefits, of the proposed Rule. The Commission has identified certain costs and benefits associated with the proposal and requests comment on all aspects of its preliminary economic analysis, including with respect to the specific questions below. The Commission encourages commenters to identify, discuss, analyze, and supply relevant data, information, or statistics regarding any such costs or benefits.

58. Has the Commission accurately described the market failures in this release? Why or why not? Are there additional market failures or other economic justifications related to these issues that are not described in this release?

59. Has the Commission sufficiently described the baseline for its economic analysis concerning tick sizes, access fees, and round lot data, its characteristics and structure? Are there additional relevant market features or participants that are not discussed in the baseline which relate to this release? If so, please describe.

60. Has the Commission accurately assessed the baseline of the use and prevalence of subpennies and subpenny price improvement? Why or why not? Are there any additional statistics or analysis that the Commission should consider in the baseline? If so, please provide that analysis.

61. Has the Commission accurately assessed the degree of tick-constraints in current markets? Why or why not? Is the Commission using appropriate conceptual and empirical definitions of tick-constrained and new tick-constrained? If not, what would be more appropriate definitions and what difference would those alternative definitions have on the baseline analysis, costs, and benefits? Are there additional statistics or analysis that the Commission should consider in the baseline? If so, please provide that analysis.

62. The tick size baseline incorporates the implementation of the MDI Rules. Has the Commission accurately assessed how the baseline for the proposal differs from the status quo, including in the data analyses presented? Why or why not?

63. Has the Commission accurately assessed the impact of access fees and rebates, and the inability to determine access fees at the time of trade, on potential conflicts of interest? Why or why not? Are there other sources of data or other analysis that the Commission could use to assess the impact of access fees and rebates and the inability to determine access fees at the time of trade on potential conflicts of interest? If so please provide such data and analysis.

64. Has the Commission accurately assessed the net capture of the exchanges between access fees and rebates on non-auction trading in shares

[720] Proposed rule changes cannot take effect unless approved by the Commission or otherwise permitted by subsection 19(b) of the Exchange Act. 15 U.S.C. 78s(b)(1).

[721] *See* section IV.B. regarding the acceleration of including odd lot information as a part of core data and implementing the round lot definition from the MDI Rules. *See* section IV.D. with regards to the proposed establishment of specifying the best odd lot orders to buy and sell (BOLO).

[722] *See* sections V.D.1. and V.D.5 for discussions of these effects.

[723] *See* section V.E.2.c. in relation to MDI acceleration and CC competition.

[724] *See supra* sections V.D.5 and V.D.6 for a discussion of the estimated costs of accelerating the MDI Rules.

[725] *See supra* section V.D.1.

priced greater than $1.00 as approximately 2 mils? Why or why not? If not please provide analysis supporting a different net capture level.

65. Has the Commission accurately assessed the net capture of the exchanges on non-auction trading in shares priced less than $1.00 as approximately 0.28% of value? Why or why not? If not please provide analysis supporting a different net capture level.

66. Has the Commission accurately described current market practice where fees and rebates are generally not passed through from broker-dealers to their customers? Why or why not? If not please provide analysis describing how and when fees and rebates are passed through to end customers.

67. Has the Commission accurately described the baseline of the MDI implementation? Why or why not? Is two years a reasonable estimate of when the round lot definition and the odd lot information will be implemented in the absence of this proposal? If not, what is a reasonable estimate?

68. Has the Commission accurately assessed the economic effects of lowering the tick size for some stocks? Why or why not? Are there significant economic effects that are not discussed? If so please explain and describe these effects.

69. The proposal would allow for stocks to potentially transition across multiple tick sizes, skipping one or more tick size tiers, in one evaluation period. Are there economic effects associated with transitioning across multiple tick sizes that are not discussed? If so, what are they? Please provide quantitative estimates of the effects and how frequently stocks might transition across multiple tick size tiers.

70. Has the Commission accurately assessed the economic effects of increased market complexity caused by the dynamic tiered structure of the proposed changes to rule 612? Why or why not? Are there significant economic effects that are not discussed? If so, please explain and describe these effects.

71. Has the Commission accurately assessed the economic effect of having an evaluation month for the tick size be once every three months with the associated tick size applying for the next three months? Why or why not? Are there other evaluation periods that may be more appropriate? If so please provide analysis supporting an alternative evaluation period.

72. Has the Commission accurately assessed the effect of the proposal to harmonize quoting and trading increments? Specifically, has the Commission correctly assessed the effect the proposed harmonization on retail price improvement and the resulting impact on execution quality? If not, then please provide a detailed explanation along with quantitative estimates, if possible. How would harmonization affect execution quality through it effect on competition for order flow between exchanges/ATSs and off-exchange dealers? Please explain.

73. Has the Commission accurately assessed the economic effects of lowering the access fee cap? Why or why not? Are there significant economic effects that are not discussed? If so please explain and describe these effects.

74. Based on the baseline, the Commission assumes that the prevailing maker-taker structure of fees and rebates has average rebates approximately 2 mils lower than average access fees on most exchanges. Is this assumption reasonable? Please explain. If not reasonable, how would a different assumed net capture affect the conclusions of the analysis? Please provide additional analysis and describe the market environment likely to result from the reduction in the access fee cap.

75. Has the Commission accurately assessed the economic effects of requiring access fees and rebates to be determinable at the time of execution? Why or why not? Are there significant economic effects that are not discussed? If so, please explain and describe these effects.

76. Has the Commission accurately assessed the economic effects of accelerating the implementation of the MDI round lot definitions? Why or why not? Is there a cost to accelerating the redefinition of a round lot, in the absence of depth of book data, resulting from a loss of information about liquidity? Are there significant economic effects that are not discussed? If so please explain and describe these effects.

77. Has the Commission accurately assessed the economic effects of accelerating the MDI implementation with respect to adding odd-lot information in NMS data? Why or why not? Are there significant economic effects that are not discussed? If so please explain and describe these effects.

78. Has the Commission accurately described the uncertainties associated with costs of data users making system changes at two times rather than once? Why or why not? Are there other sources of uncertainty? If so please provide such data and analysis with quantitative estimates of the costs if possible.

79. Has the Commission accurately described the uncertainties associated with potential costs for data users moving from two data providers (the exclusive SIPs) to one competing consolidator? Why or why not? Is there data or analysis that could help mitigate any of the cost uncertainties? If so please provide such data and analysis with quantitative estimates of the costs if possible.

80. Has the Commission accurately assessed the economic effects of requiring SIPs to disseminate odd lot information in NMS data? Why or why not? Are there significant economic effects that are not discussed? If so please explain and describe these effects.

81. Has the Commission accurately described the uncertainties associated with determining whether or not the exclusive SIPs would charge more for the data including odd-lot data? Why or why not? Is there data or analysis that could help mitigate any of the cost uncertainties? If so please provide such data and analysis with quantitative estimates of the costs if possible.

82. Has the Commission accurately assessed the economic effects of providing the best odd-lot order in NMS data? Why or why not? Are there significant economic effects that are not discussed? If so, please explain and describe these effects.

83. Has the Commission accurately quantified the compliance costs that the proposed Rule imposes on various market participants? If not, please provide alternative estimates. Are there any sources of compliance costs not included in the Commission's estimates? If so, please describe the activity that generates the cost and provide estimates.

84. Has the Commission accurately quantified the compliance costs associated with the proposal in terms of updating systems to adapt to the change in the tick size, specifically that compliance costs would likely be similar for large and small market-participants? Why or why not? Please provide a quantitative discussion if possible.

85. Has the Commission accurately described the uncertainties associated with the compliance costs of the proposal? Why or why not? Are there other sources of uncertainty? Is there data or analysis that could help mitigate any of the cost uncertainties? If so, please provide such data and analysis with quantitative estimates of the costs if possible.

86. How does the assumption on whether the SIPs will otherwise become competing consolidators affect SIP

compliance costs? How accurate are the Commission's estimates of compliance costs assuming the SIPs will become competing consolidators and how accurate are the costs assuming instead that SIPs will otherwise not become competing consolidators? Please explain and provide alternative estimates, if available.

87. Has the Commission accurately described the uncertainties associated with costs of SIPs who become competing consolidators and exchanges making system changes at two times rather than once? Why or why not? Are there other sources of uncertainty? If so, please provide such data and analysis with quantitative estimates of the costs if possible.

88. Has the Commission accurately described the uncertainties associated with the implementation date for the MDI Rules? Why or why not? Is there data or analysis that could help mitigate any of the cost uncertainties? If so, please provide such data and analysis with quantitative estimates of the costs if possible.

89. Do you believe that the proposal would significantly increase the amount of message data? In particular would an increase in the amount of odd-lot quotes resulting from the smaller tick size increase the anticipated implementation costs under the MDI Rules? Please explain.

90. Has the Commission accurately assessed the likely impacts of the proposal on efficiency, competition and capital formation? Why or why not?

91. Has the Commission accurately assessed the likely effects of the reduction in tick size for some NMS stocks and the reduction in the access fee cap for all NMS stocks on price efficiency through impacts on liquidity? Has the Commission accurately assessed the likely effects of the reduction in the access fee cap for all NMS stocks and on making fees and rebates determinable at the time of execution on price efficiency through impacts on conflicts of interest? Has the Commission accurately assessed the likely effects of the proposal on the efficiency of broker-dealers' best-execution assessment? Has the Commission accurately assessed the likely effects of the acceleration of the round lot definition and the inclusion of odd lot information proposal on efficiency? Please explain.

92. Has the Commission accurately assessed the likely effects of the proposal on the competitive landscape in trading services? Please explain. Would the proposal likely change the number of competitors in trading services and, if so, how would the change in the number of competitors affect the level competition? Please explain.

93. Has the Commission accurately assessed the likely effects of the proposal on the competitive landscape in liquidity provision? Please explain. Would the proposal change the playing field among different types of competitors? If so, how would this affect the level of competition? Please explain.

94. Has the Commission accurately assessed the likely effects of the proposal on the competitive landscape in broker-dealer services? Please explain.

95. Has the Commission accurately assessed the likely effects of the proposal on the competitive landscape in market data? Please explain. Would the proposal affect the number of eventual competing consolidators? If so, would this affect the level of competition among competing consolidators? Why or why not? What would be the resulting economic effects of any changes in competing consolidator competition?

96. Has the Commission accurately assessed the likely impact of the proposal on capital formation? Please explain.

97. Has the Commission accurately assessed the economic tradeoffs associated with reasonable alternatives contained in this economic analysis? Please explain. Has the Commission accurately assessed the compliance costs associated with the various alternatives? Why or why not? If not, please provide as much analysis as possible. Are there other costs associated with any of the alternatives which are not discussed? If so please provide a detailed analysis including quantitative estimates if possible. Should the Commission implement any other reasonable alternatives? If so, please describe such alternatives and how the potential costs and benefits of the alternative would compare to the proposal? Please provide quantification, if possible.

98. The Commission has discussed an alternative whereby trading would be required to occur on an increment no less than a minimum increment of $0.001 regardless of the tick size assigned. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

99. The Commission has discussed an alternative whereby rule 612 is not extended to apply to trades. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

100. The Commission has discussed alternatives whereby the tick size would not apply to segmented trades or that segmented trades would be subject to a tick size of $0.001. Has the Commission adequately described the economic effects of these alternatives? Why or why not? Please explain and provide as much analysis and discussion as possible.

101. The Commission has discussed a number of alternative quoted spread-based tick size structures. Has the Commission adequately described the economic effects of these alternatives? Why or why not? Please explain and provide as much analysis and discussion as possible.

102. Has the Commission accurately assessed the effect on compliance costs of alternatives that keep the overall structure of the proposal but change the number of tick sizes? Specifically, is the Commission's assumption that adding or removing additional tiers is likely to have a small effect on overall compliance costs reasonable? Why or why not? If not, please provide additional analysis with detailed costs estimates if possible.

103. The Commission has discussed alternative quoted-spread based tick size structures with different thresholds for tick levels and fewer tiers of tick sizes. Has the Commission adequately described the economic effects of these alternatives? Why or why not? Please explain and provide as much analysis and discussion as possible.

104. The Commission has discussed an alternative quoted spread-based tick size structure that would result in an increased tick size for some stocks. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

105. The Commission has discussed an alternative quoted spread-based tick size structure that mirror a structure from a NASDAQ white paper. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

106. The Commission has discussed an alternative that would add ''step-up/step-down'' mechanism to the proposal or to any of the quoted spread-based alternatives. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

107. The Commission discussed an alternative that would reduce the minimum tick size to $0.005 for all NMS stocks. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

108. The Commission discussed an alternative that would set tick sizes based on share price. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

109. The Commission has discussed an alternative put forth by Cboe for determining the tick size. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

110. The Commission has discussed a number of alternative access fee regimes to the proposal. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

111. Has the Commission accurately assessed the effect of alternatives that raise the access fee cap for stocks prices less than $1.00? Why or why not? If not please provide detailed additional analysis.

112. The Commission has discussed various tick size and access fee alternatives. These alternatives could be adopted separately or in combination. Has the Commission adequately described the economic effects of combining various alternatives? Why or why not? Please explain and provide as much analysis and discussion as possible.

113. The Commission has discussed an alternative that would accelerate the implementation of the round lot definition from the MDI Rules but would not accelerate the inclusion of odd lot information in NMS data and would not require a BOLO. Has the Commission adequately described the economic effects of this alternative? Why or why not? Please explain and provide as much analysis and discussion as possible.

114. In addition to the proposal, should the Commission also accelerate the inclusion of depth of book information in NMS data from the MDI Rules? What would be the costs and benefits or other economic effects of accelerating the inclusion of depth information in NMS data? How would such an acceleration impact eventual competition among competing consolidators or the realization of the anticipated costs and benefits of the MDI Rules? Please explain.

VI. Paperwork Reduction Act

Certain provisions of the proposed rules and proposed rule amendments contain ''collection of information requirements'' within the meaning of the Paperwork Reduction Act of 1995 (''PRA''). The Commission is submitting these collections of information to the Office of Management and Budget (''OMB'') for review in accordance with 44 U.S.C. 3507(d) and 5 CFR 1320.11. The title of the new collection of information is ''Odd-Lot Information Acceleration.'' An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the agency displays a currently valid control number.

The Commission does not believe that the proposed amendments to rules 610 and 612 contain any collection of information requirements as defined by the PRA, but the Commission encourages comments on this point.[726]

A. Summary of Collection of Information

The proposed rules and rule amendments would include a collection of information within the meaning of the PRA. Specifically, the proposed amendments to rule 603(b) would require the exclusive SIPs to collect, consolidate, and disseminate odd-lot information, including the best odd-lot orders to buy and sell. The exclusive SIPs would also be required to disseminate indicators of the applicable round lot size and minimum pricing increment for each NMS stock, both of which would be provided to the exclusive SIPs by the primary listing exchange.

B. Proposed Use of Information

The information collected under the proposed amendments to rule 603(b) would be consolidated and disseminated by the exclusive SIPs to market participants who would use this odd-lot information for trading. Widespread availability of odd-lot information promotes fair and efficient markets and facilitates the ability of brokers and dealers to trade more effectively and to provide best execution to their customers. The round lot and minimum pricing increment indicators that would be disseminated by the exclusive SIPs would provide market participants with information about the parameters for trading in a particular NMS stock.

C. Respondents

The collection of information in the proposed changes to rule 603(b) would apply to the two exclusive SIPs.

D. Total Annual Reporting and Recordkeeping Burden

1. Initial Burden Hours and Costs

The Commission preliminarily believes that the two exclusive SIPs would have to modify their systems to collect, consolidate, and disseminate the odd-lot information, including the best odd-lot orders to buy and sell, that they do not currently collect, consolidate, and disseminate[727] and to disseminate the round-lot and minimum pricing increment indicators provided by the primary listing exchange. These modifications would involve the addition of new hardware, network infrastructure, and bandwidth, as well as programming and development costs, to take in additional inbound odd-lot quotation messages from SROs, to calculate odd-lot information, and to consolidate and disseminate odd-lot information and the round lot and minimum pricing increment indicators to subscribers.

The Commission estimates that each exclusive SIP would incur 440 initial burden hours to modify its systems to collect, calculate, consolidate and disseminate odd-lot information and to disseminate the round-lot and minimum pricing increment indicators[728] and initial external costs of $412,500 to purchase the necessary technology to effect such modifications.[729] Thus, the

[726] 44 U.S.C. 3501 *et seq.*

[727] The exclusive SIPs currently disseminate odd-lot transaction data.

[728] The Commission estimates the monetized initial burden for this requirement to be $154,580, broken down as follows: [(Sr. Programmer at $368/hour for 210 hours) + (Sr. Systems Analyst at $316/hour for 180 hours) + (Compliance Manager at $344/hour for 20 hours) + (Director of Compliance at $542/hour for 10 hours) + (Compliance Attorney at $406/hour for 20 hours)] = 440 initial burden hours to modify its systems to comply with the requirement to collect, calculate, and disseminate odd-lot information. The Commission based these estimates on 10% of the initial burden hour estimates for each exclusive SIP to become a competing consolidator provided in the MDI Rules to account for the fact that this proposal does not require the exclusive SIPs to calculate and disseminate full consolidated market data (*e.g.,* depth of book data or auction information) as defined in the MDI Rules. *See* MDI Adopting Release, *supra* note 5, at 18712–13. The Commission derived the hourly rate figures from SIFMA's Management & Professional Earnings in the Securities Industry 2013, modified to account for an 1,800-hour work-year and inflation, and multiplied by 5.35 to account for bonuses, firm size, employee benefits, and overhead.

[729] The Commission arrived at this estimate by dividing the initial external cost estimate provided

Continued

Commission estimates that the total initial burden hours for two exclusive SIPs would be 880 burden hours [730] and that total initial external costs would be $825,000.[731] The Commission solicits comment on the accuracy of these estimates.

2. Ongoing Burden Hours and Costs

The Commission preliminarily believes that the two exclusive SIPs would incur annual ongoing burden hours and external costs to operate and maintain their modified systems to collect, calculate, and disseminate odd-lot information and to disseminate the round-lot and minimum pricing increment indicators. The Commission estimates that each exclusive SIP would incur 132 ongoing, annual burden hours [732] and ongoing, annual external costs of $123,725 to operate and maintain its systems to collect, calculate, and disseminate odd-lot information and to disseminate the round-lot and minimum pricing increment indicators.[733] Thus, the Commission estimates that the total ongoing, annual burden hours for two exclusive SIPs would be 264 burden hours [734] and that total ongoing, annual external costs would be $247,450.[735] The Commission solicits comment on the accuracy of these estimates.

E. Collection of Information Is Mandatory

The collection of information discussed above would be a mandatory collection of information.

F. Confidentiality

This information collection would be public.

G. Revisions to Current MDI Rules Burden Estimates

Currently, the MDI Rules impose ''collection of information'' requirements within the meaning of the PRA. Specifically, pursuant to rule 603(b), SROs are required to make available all data necessary to generate consolidated market data to competing consolidators and self-aggregators. As explained in more detail below, the Commission is proposing to revise the burden estimates associated with this requirement in light of the amendments the Commission is proposing. In the MDI Rules, the Commission estimated that each SRO will require an average of 220 initial burden hours of legal, compliance, information technology, and business operations personnel time to prepare and implement a system to collect the information necessary to generate consolidated market data (for a total cost per SRO of $70,865).[736] The Commission estimated that each SRO would incur an annual average burden on an ongoing basis of 396 hours to collect the information necessary to generate consolidated market data required by Rule 603(b) (for a total cost per SRO of $128,064).[737]

As described above, the Commission is proposing to amend rule 603(b) to require SROs to make available all data necessary to generate odd-lot information to the exclusive SIPs. The SROs already provide certain quotation information to the exclusive SIPs, and many SROs already provide odd-lot quotation information to customers through their proprietary data feeds.[738] Nevertheless, providing the exclusive SIPs with the data necessary to generate odd-lot information may entail additional burdens. Specifically, technical development work may be needed to direct odd-lot quotations to the exclusive SIPs and to expand the capacity of the existing connections through which the SROs provide data to the exclusive SIPs to support the additional message traffic associated with odd-lot quotations. Therefore, the Commission is proposing to revise its burden estimates for rule 603(b) upwards by 5% to account for the provision of the data necessary to generate odd-lot information to the exclusive SIPs.[739] Specifically, the Commission is proposing to add 11 initial burden hours [740] and 19.8 annual

in the MDI Rules for each exclusive SIP to become a competing consolidator by three to account for the fact that the exclusive SIPs would not need to build aggregation systems in three separate data centers to collect, calculate, and disseminate odd-lot information. *See* MDI Adopting Release, *supra* note 5, at 18712–13.

[730] The Commission estimates the monetized initial burden for this requirement to be $309,160, broken down as follows: [(Sr. Programmer at $368/hour for 210 hours) + (Sr. Systems Analyst at $316/hour for 180 hours) + (Compliance Manager at $344/hour for 20 hours) + (Director of Compliance at $542/hour for 10 hours) + (Compliance Attorney at $406/hour for 20 hours)] × [(2 exclusive SIPs)] = 880 total initial burden hours across the exclusive SIPs.

[731] The Commission estimates total initial external costs as follows: initial external costs of $412,500 per exclusive SIP × (2 exclusive SIPs) = $825,000.

[732] The Commission estimates the monetized annual ongoing burden for this requirement to be $46,374, broken down as follows: [(Sr. Programmer at $368/hour for 63 hours) + (Sr. Systems Analyst at $316/hour for 54 hours) + (Compliance Manager at $344/hour for 6 hours) + (Director of Compliance at $542/hour for 3 hours) + (Compliance Attorney at $406/hour for 6 hours)] = 132 ongoing, annual burden hours to operate and maintain its systems to comply with the requirement to collect, calculate, and disseminate odd-lot information. The Commission based these estimates on 10% of the ongoing, annual burden hour estimates provided in the MDI Rules for each exclusive SIP competing consolidator to operate and maintain its systems to comply with Rules 614(d)(1) through (4) to account for the fact that this proposal does not require the exclusive SIPs to calculate and disseminate full consolidated market data (*e.g.,* depth of book data or auction information) as defined in the MDI Rules. *See* MDI Adopting Release, *supra* note 5, at 18712–13. The Commission derived the hourly rate figures from SIFMA's Management & Professional Earnings in the Securities Industry 2013, modified to account for an 1,800-hour work-year and inflation, and multiplied by 5.35 to account for bonuses, firm size, employee benefits, and overhead.

[733] The Commission arrived at this estimate by dividing by three the ongoing, annual external cost estimate provided in the MDI Rules for each exclusive SIP competing consolidator to operate and maintain its systems to comply with rules 614(d)(1) through (4) to account for the fact that the exclusive SIPs will not need to build aggregation systems in three separate data centers to collect, calculate, and disseminate odd-lot information. *See* MDI Adopting Release, *supra* note 5, at 18712–13.

[734] The Commission estimates the monetized annual ongoing burden for this requirement to be $92,748, broken down as follows: [(Sr. Programmer at $368/hour for 63 hours) + (Sr. Systems Analyst at $316/hour for 54 hours) + (Compliance Manager at $344/hour for 6 hours) + (Director of Compliance at $542/hour for 3 hours) + (Compliance Attorney at $406/hour for 6 hours)] × [(2 exclusive SIPs)] = 264 total ongoing, annual burden hours across the exclusive SIPs.

[735] The Commission estimates total annual ongoing external costs as follows: annual ongoing external costs of $123,725 per exclusive SIP × (2 exclusive SIPs) = $247,450.

[736] The Commission estimated the monetized initial burden for this requirement to be $70,865. The Commission derived this estimate based on per hour figures from SIFMA's Management & Professional Earnings in the Securities Industry 2013, modified to account for an 1,800-hour work-year and inflation, and multiplied by 5.35 to account for bonuses, firm size, employee benefits, and overhead: [(Compliance Manager at $310 for 105 hours) + (Attorney at $417 for 70 hours) + (Sr. Systems Analyst at $285 for 20 hours) + (Operations Specialist at $137 for 25 hours)] = 220 initial burden hours and $70,865.

[737] The Commission estimated the monetized ongoing, annual burden for this requirement to be $128,064. The Commission derived this estimate based on per hour figures from SIFMA's Management & Professional Earnings in the Securities Industry 2013, modified to account for an 1,800-hour work-year and inflation, and multiplied by 5.35 to account for bonuses, firm size, employee benefits, and overhead: [(Compliance Manager at $310 for 192 hours) + (Attorney at $417 for 48 hours) + (Sr. Systems Analyst at $285 for 96 hours)] = 336 initial burden hours and $128,064.

[738] *See* MDI Proposing Release, *supra* note 39, at 16738; MDI Adopting Release, *supra* note 5, at 18599.

[739] The Commission believes that 5% of the initial and ongoing, annual burden hour estimates provided in the MDI Rules for each SRO to make the data necessary to generate consolidated market data available to competing consolidators and self-aggregators is appropriate because the SROs already collect the data necessary to generate odd-lot information and this information is a subset of consolidated market data as defined in the MDI Rules.

[740] The Commission estimates the monetized initial burden for this requirement to be $3,929. The Commission derived this estimate based on per hour figures from SIFMA's Management & Professional Earnings in the Securities Industry 2013, modified to account for an 1,800-hour work-year and inflation, and multiplied by 5.35 to account for bonuses, firm size, employee benefits, and overhead: [(Compliance Manager at $344 for 5.25 hours) + (Attorney at $462 for 3.5 hours) + (Sr.

burden hours [741] to its previous estimates.

In addition, the Commission is proposing to require the primary listing exchange for each NMS stock to provide an indicator of the round lot size to the applicable exclusive SIP for dissemination and to calculate and provide to competing consolidators, self-aggregators, and the applicable exclusive SIP an indicator of the applicable minimum pricing increment for dissemination. The primary listing exchange is already required to calculate the applicable round lot size and provide it to competing consolidators and self-aggregators under the MDI Rules, and the incremental burden of providing this indicator to the two exclusive SIPs is likely to be minimal. However, calculating the applicable minimum pricing increment and providing it to competing consolidators, self-aggregators, and the exclusive SIPs would entail additional burdens. Specifically, primary listing exchanges would need to program systems to calculate the applicable minimum pricing increment for each NMS stock that they list each quarter based on its Time Weighted Average Quoted Spread and to include this information in the data that they provide to competing consolidators, self-aggregators, and the exclusive SIPs. Therefore, the Commission is proposing to revise its burden estimates for rule 603(b) upwards to account for the calculation of the applicable minimum pricing increment and the provision of this information to competing consolidators, self-aggregators, and the exclusive SIPs. Specifically, the Commission is proposing to add 50 initial burden hours [742] and 32 annual burden hours [743] for each primary listing exchange to its previous estimates and 250 total initial burden hours [744] and 160 total annual burden hours [745] for five primary listing exchanges. The Commission solicits comment on the accuracy of these revised estimates.

In addition, the MDI Rules include a collection of information requirement under rules 614(d)(1) through (3), which require competing consolidators to collect from the SROs quotation and transaction information for NMS stocks, calculate and generate a consolidated market data product, and make the consolidated market data product available to subscribers.[746] As discussed above, the Commission is proposing to amend the definition of odd-lot information to include a specified best odd-lot order to buy and best odd-lot order to sell. Since the odd-lot quotes that a competing consolidator would use to identify and disseminate the best odd-lot orders—if the competing consolidator offers a consolidated market data product that includes this information—are already included in the data necessary to generate odd-lot information, the Commission believes that the existing burden estimates for rules 614(d)(1) through (3) account for the identification and dissemination of the best odd-lot orders. The Commission solicits comment on whether, and the extent to which, amending the definition of odd-lot information to include the best odd-lot orders would affect the burden estimates for rules 614(d)(1) through (3).

H. Request for Comments

Pursuant to 44 U.S.C. 3506(c)(2)(B), the Commission solicits comments to:

115. Evaluate whether the proposed collections of information are necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility;

116. Evaluate the accuracy of our estimates of the burden of the proposed collection of information;

117. Determine whether there are ways to enhance the quality, utility, and clarity of the information to be collected;

118. Evaluate whether there are ways to minimize the burden of collection of information on those who are to respond, including through the use of automated collection techniques or other forms of information technology; and

119. Evaluate whether the proposed amendments would have any effects on any other collection of information not previously identified in this section.

Persons submitting comments on the collection of information requirements should direct them to the Office of Management and Budget, Attention: Desk Officer for the Securities and Exchange Commission, Office of Information and Regulatory Affairs, Washington, DC 20503, and should also send a copy of their comments to Secretary, Securities and Exchange Commission, 100 F Street NE, Washington, DC 20549–1090, with reference to File Number S7–30–22. Requests for materials submitted to OMB by the Commission with regard to this collection of information should be in writing, with reference to File Number S7–30–22 and be submitted to the Securities and Exchange Commission, Office of FOIA/PA Services, 100 F Street NE, Washington, DC 20549–2736. As OMB is required to make a decision concerning the collection of information between 30 and 60 days after publication, a comment to OMB is best assured of having its full effect if OMB receives it within 30 days of publication.

VII. Consideration of Impact on the Economy

For purposes of the Small Business Regulatory Enforcement Fairness Act of 1996 (''SBREFA''),[747] the Commission requests comment on the potential effect of the proposed rule on the United States economy on an annual basis. The Commission also requests comment on any potential increases in costs or prices for consumers or individual industries, and any potential effect on competition, investment, or innovation. Commenters are requested to provide empirical data and other factual support for their views to the extent possible.

VIII. Regulatory Flexibility Act Certification and Initial Regulatory Flexibility Act Analysis

The Regulatory Flexibility Act (''RFA'') [748] requires Federal agencies, in promulgating rules, to consider the impact of those rules on small entities. Section 603(a) [749] of the Administrative Procedure Act,[750] as amended by the

Systems Analyst at $316 for 1 hour) + (Operations Specialist at $152 for 1.25 hours)] = 11 initial burden hours and $3,929.

[741] The Commission estimates the monetized ongoing, annual burden for this requirement to be $7,050. The Commission derived this estimate based on per hour figures from SIFMA's Management & Professional Earnings in the Securities Industry 2013, modified to account for an 1,800-hour work-year and inflation, and multiplied by 5.35 to account for bonuses, firm size, employee benefits, and overhead: [(Compliance Manager at $344 for 10.6 hours) + (Attorney at $462 for 3.4 hours) + (Sr. Systems Analyst at $316 for 5.8 hours)] = 19.8 annual burden hours and $7,050.

[742] The Commission estimates the monetized initial burden for this requirement to be $19,000 per primary listing exchange. *See supra* notes 620–623 and accompanying text.

[743] The Commission estimates the monetized ongoing, annual burden for this requirement to be $9,000 per primary listing exchange. *Id.*

[744] 50 initial burden hours per primary listing exchange × 5 primary listing exchanges = 250 total initial burden hours. The Commission estimates the total monetized initial burden of this requirement to be $95,000 ($19,000 per primary listing exchange × 5 primary listing exchanges = $95,000). *Id.*

[745] 32 annual burden hours per primary listing exchange × 5 primary listing exchanges = 160 total annual burden hours. The Commission estimates the total monetized annual burden of this requirement to be $45,000 ($9,000 per primary listing exchange × 5 primary listing exchanges = $45,000. *Id.*

[746] MDI Adopting Release, *supra* note 5, at 18703.

[747] Public Law 104–121, Title II, 110 Stat. 857 (1996) (codified in various sections of 5 U.S.C., 15 U.S.C. and as a note to 5 U.S.C. 601).

[748] 5 U.S.C. 601 *et seq.*

[749] 5 U.S.C. 603(a).

[750] 5 U.S.C. 551 *et seq.*

RFA, generally requires the Commission to undertake a regulatory flexibility analysis of all proposed rules, or proposed rule amendments, to determine the impact of such rulemaking on ''small entities.'' [751] Section 605(b) of the RFA states that this requirement shall not apply to any proposed rule or proposed rule amendment, which if adopted, would not have a significant economic impact on a substantial number of small entities'' [752]

A. Proposed Amendments to Rule 612—Initial Regulatory Flexibility Analysis

The Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA), in accordance with the provisions of the RFA [753] regarding the proposed amendments to rule 612 of Regulation NMS.

1. Reasons for the Proposed Action

As discussed in section II.F., the Commission believes that rule 612 should be amended to update and modernize the rule for the current trading environment. Rule 612 establishes the minimum pricing increments for NMS stocks and these increments have not been adjusted since they were adopted in 2005. Today, several NMS stocks experience tick-constraint, in that they are unable to be priced in an amount that would be determined by competitive market forces and supply and demand. Further, while rule 612 does not restrict trading outside of the minimum pricing increments required by the rule, the structure of the market impedes the ability of certain trading centers to trade in sub-penny increments and allows others to readily trade in such increments. The proposed amendments to rule 612 would harmonize the trading in NMS stocks in the minimum pricing increments set forth in rule 612.

2. Legal Basis

Pursuant to the Exchange Act and, particularly, sections 3(b), 5, 6, 11A, 15, 15A, 17(a) and (b), 23(a), and 36 thereof, 15 U.S.C. 78c(b), 78e, 78f, 78k–1, 78o, 78o–3, 78mm, 78q(a) and (b), and 78w(a), the Commission proposes to amend rule 612.

3. Small Entities Subject to the Rule

Proposed rule 612 would apply to national securities exchanges, national securities associations, ATSs, vendors, and broker or dealers.

a. National Securities Exchanges and National Securities Associations

None of the national securities exchanges is a small entity as defined by Commission rules. Exchange Act Rule 0–10(e) [754] states that the term ''small business'' when referring to an exchange means any exchange that has been exempted from the reporting requirements of Exchange Act rule 601 and is not affiliated with any person that is not a small business or small organization. There is only one national securities association, and the Commission has previously stated that it is not a small entity as defined by 13 CFR 121.201.[755]

b. Broker-Dealers

Commission rule 0–10(c) defines a broker-dealer as a small entity for the purpose of this section if the broker-dealer had a total capital (net worth plus subordinated liabilities) of less than $500,000 on the date in the prior fiscal year as of which its audited financial statements were prepared, had less than $200 million of funds and securities in its custody of control at all times during the preceding fiscal year, and the broker-dealer is not affiliated with any person (other than a natural person) that is not a small entity.[756] The Commission estimates that as of June 30, 2022 there were approximately 761 Commission registered broker-dealers that would be small entities for purposes of the statute that would be required to comply with the proposed amendments to rule 612 regarding quotation and trading in the proposed minimum pricing increments.

Rule 612 apples to NMS stocks and therefore, the rule would apply to NMS Stock ATSs. NMS Stock ATSs that are not registered as exchanges are required to register as broker-dealers.[757] Accordingly, NMS Stock ATSs would be considered small entities if they fall within the standard for small entities that would apply to broker-dealers. The Commission examined recent FOCUS data for the 33 broker-dealers that currently operate NMS Stock ATSs and, applying the test for broker-dealers described above, believes that none of the NMS Stock ATSs currently trading NMS stocks were operated by a broker-dealer that is a ''small entity.''

c. Vendors

A vendor is defined in rule 600(b)(100) of Regulation NMS as any SIP engaged in the business of disseminating transaction reports, last sale data, or quotations with respect to NMS securities to brokers, dealers, or investors on a real-time or other current and continuing basis, whether through an electronic communications network, moving ticker, or interrogation device.[758] Commission rule 0–10(g) states that the term small business when referring to a SIP, means any SIP that had gross revenues of less than $10 million during the preceding year, provided service to fewer than 100 interrogation devices or moving tickers at all times during the preceding year, and is not affiliated with any person that is not a small business or small organization.[759] The Commission estimates that there are approximately 80 vendors, 13 of which would be small entities.

4. Reporting, Recordkeeping, and Other Compliance Requirements

Rule 612 as proposed to be amended would not impose any new reporting, recordkeeping, or other compliance requirements on market participants that are small entities.

5. Duplicative, Overlapping, or Conflicting Federal Rules

The Commission believes that there are no federal rules that duplicate, overlap, or conflict with the proposed rule.

6. Significant Alternatives

Pursuant to section 3(a) of the RFA, the Commission must consider the following types of alternatives: (a) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (b) the clarification, consolidation, or simplification of compliance and reporting requirements under the proposed rule for small entities; (c) the use of performance rather than design standards; and (d) an exemption from coverage of the proposed rule, or any part thereof, for small entities.

The primary goal of rule 612 is to provide uniform minimum pricing increments for NMS stocks. This primary goal continues with the proposed amendments to rule 612. As

[751] The Commission has adopted definitions for the term ''small entity'' for purposes of Commission rulemaking in accordance with the RFA. Those definitions, as relevant to this proposed rulemaking, are set forth in 17 CFR 240.0–10 (Rule 0–10). *See* Securities Exchange Act Release No. 18451 (Jan. 28, 1982), 47 FR 5215 (Feb. 4, 1982) (File No. AS–305).

[752] 5 U.S.C. 605(b).

[753] 5 U.S.C. 603.

[754] 17 CFR 240.0–10(e).

[755] *See, e.g.,* Securities Exchange Act Release No. 62174 (May 26, 2010), 75 FR 32556, 32605 n. 416 (June 8, 2010) (''FINRA is not a small entity as defined by 13 CFR 121.201.''); MDI Adopting Release, *supra* note 5, at 18808.

[756] 17 CFR 240.0–10(c).

[757] Rule 301(b)(1) of Regulation ATS.

[758] 17 CFR 242.600(b)(100).

[759] 17 CFR 240.0–10(g).

such, the Commission believes that imposing different compliance or reporting requirements or possibly a different timetable for implementing compliance or reporting requirements, for small entities could undermine the goal of uniformity. In addition, the Commission has concluded similarly that it would not be consistent with the primary goal to further clarify, consolidate or simplify the proposed amendments to rule 612 for small entities. The proposed amendments to rule 612 are performance standards and do not dictate for entities of any size any particular design standards (*e.g.,* technology) that must be employed to achieve the objectives of the proposed rule. The Commission also preliminarily believes that it would be inconsistent with the purposes of the Exchange Act to specify different requirements for small entities or to exempt broker-dealers from the proposed amendments to rule 612.

7. Request for Comments

The Commission encourages written comments on matters discussed in the IRFA. In particular, the Commission requests comments on (i) the number of small entities that would be affected by the proposed amendments to rule 612; (ii) the nature of any impact that the proposed amendments to rule 612 would have on small entities and empirical data supporting the extent of the impact; and (iii) how to quantify the number of small entities that would be affected by and/or how to quantify the impact of the proposed amendments to rule 612. Such comments will be considered in the preparation of the Final Regulatory Flexibility Analysis, if the proposed amendments to rule 612 are adopted, and will be placed in the same public comment file as comments on the proposed amendments to rule 612 itself.

B. Proposed Amendments to Rule 610

The proposed changes to rule 610(c) would apply to trading centers as defined in Rule 600(b)(95) that impose fees for access against a protected quotation or any other quotation of the trading center that is the best bid or best offer of a national securities exchange or national securities association. As discussed above, currently national securities exchanges are the only trading centers that publish protected quotations. Pursuant to Rule 0–10(e), none of the national securities exchanges are a small entities for the purposes of the RFA.[760]

Proposed rule 610(d) would apply to national securities exchanges registered with the Commission under section 6 of the Exchange Act. Pursuant to rule 0–10(e), none of the national securities exchanges are a small entities for the purposes of the RFA.[761]

Therefore, for the purposes of the RFA, the Commission certifies that the proposed amendments to rule 610(c) and proposed rule 610(d) would not have a significant economic impact on a substantial number of small entities.

The Commission requests comment regarding this certification. In particular, the Commission solicits comment on the following:

1. Do commenters agree with the Commission's certification? If not, please describe the nature of any impact on small entities and provide empirical data to illustrate the extent of the impact.

C. Proposed Amendments to Rule 603 and Definitions Odd-Lot Information and Regulatory Data Under Rule 600

The proposed amendments to rule 603(b) and to the definitions of odd-lot information and regulatory data in rule 600(b) would apply to national securities exchanges registered with the Commission under section 6 of the Exchange Act, national securities associations registered with the Commission under section 15A of the Exchange Act, and the exclusive SIPs. Pursuant to rule 0–10(e), none of the national securities exchanges are small entities for the purposes of the RFA.[762] There is only one national securities association, and the Commission has previously stated that it is not a small entity as defined by 13 CFR 121.201.[763] With respect to the exclusive SIPs, neither SIAC nor Nasdaq[764] meet the criteria for a ''small business'' or ''small organization'' when used with reference to a securities information processor.[765] Thus, the proposed amendments to Rules 600(b) and 603(b) would not affect any small entities.

As discussed above, the proposed amendments to rule 603(b) and the definitions of odd-lot information and regulatory data under rule 600 would not apply to any ''small entities.'' Therefore, for the purposes of the RFA, the Commission certifies that the proposed amendments to rule 603(b) and rule 600(b) would not have a significant economic impact on a substantial number of small entities.

The Commission requests comment regarding this certification. In particular, the Commission solicits comment on the following:

1. Do commenters agree with the Commission's certification? If not, please describe the nature of any impact on small entities and provide empirical data to illustrate the extent of the impact.

Statutory Authority and Text of the Proposed Rule Amendments

Pursuant to the Exchange Act, and particularly sections 2, 3(b), 5, 6, 11, 11A, 15, 15A, 17, 19, 23(a), and 36 thereof, 15 U.S.C. 78b, 78c, 78e, 78f, 78k, 78k–1, 78*o,* 78*o*–3, 78q, 78s, 78w(a), and 78mm the Commission proposes to amend Sections 242.600, 242.603, 242.610, and 242.612 of chapter II of title 17 of the Code of Federal Regulations.

List of Subjects in 17 CFR Part 242

Regulations M, SHO, ATS, AC, NMS, and SBSR and Customer Margin Requirements for Security Futures.

For the reasons stated in the preamble, the Commission is proposing to amend title 17, chapter II of the Code of Federal Regulations as follows:

PART 242—REGULATIONS M, SHO, ATS, AC, NMS, AND SBSR AND CUSTOMER MARGIN REQUIREMENTS FOR SECURITY FUTURES

■ 1. The authority citation for part 242 continues to read as follows:

Authority: 15 U.S.C. 77g, 77q(a), 77s(a), 78b, 78c, 78g(c)(2), 78i(a), 78j, 78k–1(c), 78*l,* 78m, 78n, 78*o*(b), 78*o*(c), 78*o*(g), 78q(a), 78q(b), 78q(h), 78w(a), 78dd–1, 78mm, 80a–23, 80a–29, and 80a–37.

* * * * *

■ 2. Amend § 242.600 paragraph (b) by:

■ a. Removing in paragraph (59)(i) the text ''and'' from the end of the paragraph;

■ b. Adding in paragraph (59)(ii) the text ''and'' to the end of the paragraph;

■ c. Adding paragraph (59)(iii);

■ d. Removing in paragraph (78)(i)(D) the text ''and'' from the end of the paragraph;

[760] 17 CFR 240.0–10(e).

[761] 17 CFR 240.0–10(e).

[762] *See* 17 CFR 240.0–10(e). Paragraph (e) of rule 0–10 states that the term ''small business,'' when referring to an exchange, means any exchange that has been exempted from the reporting requirements of rule 601 of Regulation NMS, 17 CFR 242.601, and is not affiliated with any person (other than a natural person) that is not a small business or small organization as defined in rule 0–10. Under this standard, none of the exchanges subject to the amendments to rules 600(b) or 603(b) are ''small entities'' for the purposes of the RFA. *See* MDI Adopting Release, *supra* note 5, at 18808.

[763] *See supra* note 755.

[764] *See supra* note 326.

[765] *See* 17 CFR 240.0–10(g). *See also* Securities Exchange Act Release No. 61595 (Feb. 26, 2010), 75 FR 11232, 11320 (Mar. 10, 2010) (determining that SIAC and Nasdaq are not small entities for purposes of the RFA).

■ e. Removing in paragraph (78)(i)(E) the period from the end of the paragraph and adding the text ''; and'' in its place;
■ f. Adding paragraphs (78)(i)(F) and (iv).

The additions and revisions read as follows:

§ 242.600 NMS security designation and definitions.

* * * * *

(b) * * *

(59) * * *

(iii) *Best odd-lot order to buy and best odd-lot order to sell.* The best odd-lot order to buy means the highest priced odd-lot order to buy that is priced higher than the national best bid, and the best odd-lot order to sell means the lowest priced odd-lot order to sell that is priced lower than the national best offer, for an NMS stock that are calculated and disseminated on a current and continuing basis by a competing consolidator or plan processor or calculated by a self-aggregator; provided, that in the event two or more market centers transmit to a competing consolidator, plan processor, or a self-aggregator identical odd-lot buy orders or odd-lot sell orders for an NMS stock, the highest priced odd-lot buy order or lowest priced odd-lot sell order (as the case may be) shall be determined by ranking all such identical odd-lot buy orders or odd-lot sell orders (as the case may be) first by size (giving the highest ranking to the odd-lot buy order or odd-lot sell order associated with the largest size), and then by time (giving the highest ranking to the odd-lot buy order or odd-lot sell order received first in time).

* * * * *

(78) * * *

(i) * * *

(F) An indicator of the applicable minimum pricing increment required under § 242.612.

* * * * *

(iv) The primary listing exchange shall also provide the information required under paragraphs (b)(78)(i)(E) and (F) of this section to the applicable plan processor for dissemination.

* * * * *

■ 3. Amend § 242.603 by revising the section heading and paragraph (b) to read as follows:

§ 242.603 Distribution, consolidation, dissemination, and display of information with respect to quotations for and transactions in NMS stocks.

* * * * *

(b) *Consolidation and dissemination of information.*

(1) Application of paragraphs (b)(2) and (3) of this section:

(i) Compliance with paragraph (b)(3) of this section is required until the date indicated by the Commission in any order approving amendments to the effective national market system plan(s) to effectuate a cessation of the operations of the plan processors that disseminate consolidated information regarding NMS stocks.

(ii) Compliance with paragraph (b)(2) of this section is required 180 calendar days from the date of the Commission's approval of the amendments, filed as required under § 242.614(e), to the effective national market system plan(s).

(2) Every national securities exchange on which an NMS stock is traded and national securities association shall act jointly pursuant to one or more effective national market system plans for the dissemination of consolidated market data. Every national securities exchange on which an NMS stock is traded and national securities association shall make available to all competing consolidators and self-aggregators its information with respect to quotations for and transactions in NMS stocks, including all data necessary to generate consolidated market data, in the same manner and using the same methods, including all methods of access and the same format, as such national securities exchange or national securities association makes available any information with respect to quotations for and transactions in NMS stocks to any person.

(3) Every national securities exchange on which an NMS stock is traded and national securities association shall act jointly pursuant to one or more effective national market system plans to disseminate consolidated information, including a national best bid and national best offer and odd-lot information, on quotations for and transactions in NMS stocks. Such plan or plans shall provide for the dissemination of all consolidated information for an individual NMS stock through a single plan processor and such single plan processor must represent quotation sizes in such consolidated information in terms of the number of shares, rounded down to the nearest multiple of a round lot. Every national securities exchange on which an NMS stock is traded and national securities association shall make available to a plan processor all data necessary to generate odd-lot information.

* * * * *

■ 4. Amend § 242.610 by:
■ a. Revising paragraph (c);
■ b. Redesignating paragraphs (d) and (e) as (e) and (f); and
■ c. Adding new paragraph (d).

The revisions and additions read as follows:

§ 242.610 Access to quotations.

* * * * *

(c) *Fees for access to quotations.* A trading center shall not impose, nor permit to be imposed, any fee or fees for the execution of an order against a protected quotation of the trading center or against any other quotation of the trading center that is the best bid or best offer of a national securities exchange or the best bid or best offer of a national securities association in an NMS stock that exceed or accumulate to more than the following limits:

(1) If the price of a protected quotation or other quotation is $1.00 or more, the fee or fees cannot exceed or accumulate to more than:

(i) $0.0005 per share for an NMS stock that has a minimum pricing increment of $0.001 and

(ii) $0.001 per share for an NMS stock that has a minimum pricing increment greater than $0.001; or

(2) If the price of a protected quotation or other quotation is less than $1.00, the fee or fees cannot exceed or accumulate to more than 0.05% of the quotation price per share.

(d) *Transparency of fees.* A national securities exchange shall not impose, nor permit to be imposed, any fee or fees, or provide, or permit to be provided, any rebate or other remuneration, for the execution of an order in an NMS stock that cannot be determined at the time of execution.

* * * * *

■ 5. Revise § 242.612 to read as follows:

§ 242.612 Minimum pricing increment.

(a) *Definitions.* For purposes of this rule only, the following terms shall have the meanings set forth in this rule.

Evaluation Period means the last month of a calendar quarter (March in the first quarter, June in the second quarter, September in the third quarter and December in the fourth quarter) of a calendar year during which the primary listing exchange shall measure the Time Weighted Average Quoted Spread of an NMS stock that is priced equal to or greater than $1.00 per share to determine the minimum pricing increment to be in effect for an NMS stock for the next calendar quarter, as set forth by paragraph (c) of this section.

Time Weighted Average Quoted Spread means the average dollar value difference between the NBB and NBO during regular trading hours where each instance of a unique NBB and NBO is weighted by the length of time that the quote prevailed as the NBB or NBO.

(b) *Minimum pricing increments (MPIs).* No national securities exchange, national securities association, alternative trading system, vendor, or broker or dealer shall display, rank, accept from any person, or execute a bid or offer, an order, or an indication of interest in any NMS stock priced in an increment smaller than the applicable increment required by paragraph (c) or (d) of this section.

(c) *MPIs for orders priced equal to or greater than $1.00.* Except as provided in paragraph (e) of this section, the minimum increment for any bid or offer, order, or indication of interest or trade in any NMS stock priced equal to or greater than $1.00 shall be:

(1) No smaller than $0.001, if the time weighted average quoted spread for the NMS stock during the Evaluation Period was equal to, or less than, $0.008;

(2) No smaller than $0.002, if the time weighted average quoted spread for the NMS stock during the Evaluation Period was greater than $0.008 but less than, or equal to, $0.016;

(3) No smaller than $0.005, if the time weighted average quoted spread for the NMS stock during the Evaluation Period was greater than $0.016 but less than, or equal to, $0.04;

(4) No smaller than $0.01, if the time weighted average quoted spread for the NMS stock during the Evaluation Period was greater than $0.04.

(d) *MPIs for orders priced less than $1.00.* Except as provided in paragraph (e) of this section, the minimum increment for any bid or offer, order, or indication of interest for an NMS stock that is priced less than $1.00 per share shall be no smaller than $0.0001.

(e) *Exceptions.* (1) Orders that execute at, but are not explicitly priced at, the midpoint between the national best bid and the national best offer or the midpoint between the best protected bid and the best protected offer; and

(2) Orders that execute at a price that was not based, directly or indirectly, on the quoted price of an NMS stock at the time of execution and for which the material terms were not reasonably determinable at the time the commitment to execute the order was made.

(f) *Exemptions.* The Commission, by order, may exempt from the provisions of this section, either unconditionally or on specified terms and conditions, any person, security, quotation, or order, or any class or classes of persons, securities, quotations, or orders, if the Commission determines that such exemption is necessary or appropriate in the public interest, and is consistent with the protection of investors.

By the Commission.

Dated: December 14, 2022.

J. Matthew DeLesDernier,

Deputy Secretary.

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