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Page 1 of * 186

SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549
Form 19b-4

File No.* SR - 2020 - * 05
Amendment No. (req. for Amendments *)

Filing by NYSE National, Inc.

Pursuant to Rule 19b-4 under the Securities Exchange Act of 1934

Initial * ☑ Amendment * ☐ Withdrawal ☐

Section 19(b)(2) * ☐ Section 19(b)(3)(A) * ☑ Section 19(b)(3)(B) * ☐

Pilot ☐

Extension of Time Period for Commission Action * ☐

Date Expires *

Rule

- ☐ 19b-4(f)(1)
- ☑ 19b-4(f)(2)
- ☐ 19b-4(f)(3)
- ☐ 19b-4(f)(4)
- ☐ 19b-4(f)(5)
- ☐ 19b-4(f)(6)

Notice of proposed change pursuant to the Payment, Clearing, and Settlement Act of 2010

Section 806(e)(1) * ☐ Section 806(e)(2) * ☐

Security-Based Swap Submission pursuant to the Securities Exchange Act of 1934

Section 3C(b)(2) * ☐

Exhibit 2 Sent As Paper Document ☐ Exhibit 3 Sent As Paper Document ☐

Description

Provide a brief description of the action (limit 250 characters, required when Initial is checked *).

Proposal to establish fees for the NYSE National Integrated Feed

Contact Information

Provide the name, telephone number, and e-mail address of the person on the staff of the self-regulatory organization prepared to respond to questions and comments on the action.

First Name * Samir Last Name * Patel

Title * Senior Counsel, NYSE Group Inc.

E-mail * Samir.Patel@theice.com

Telephone * (212) 656-2030 Fax (212) 656-8101

Signature

Pursuant to the requirements of the Securities Exchange Act of 1934,

has duly caused this filing to be signed on its behalf by the undersigned thereunto duly authorized.

Date 02/03/2020

By Martha Redding

(Name *)

(Title *)

Assistant Secretary

NOTE: Clicking the button at right will digitally sign and lock this form. A digital signature is as legally binding as a physical signature, and once signed, this form cannot be changed.

Martha Redding,

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SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

For complete Form 19b-4 instructions please refer to the EFFS website.

Form 19b-4 Information *

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The self-regulatory organization must provide all required information, presented in a clear and comprehensible manner, to enable the public to provide meaningful comment on the proposal and for the Commission to determine whether the proposal is consistent with the Act and applicable rules and regulations under the Act.

Exhibit 1 - Notice of Proposed Rule Change *

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The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO] -xx-xx). A material failure to comply with these guidelines will result in the proposed rule change being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)

Exhibit 1A- Notice of Proposed Rule Change, Security-Based Swap Submission, or Advance Notice by Clearing Agencies *

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The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO] -xx-xx). A material failure to comply with these guidelines will result in the proposed rule change, security-based swap submission, or advance notice being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)

Exhibit 2 - Notices, Written Comments, Transcripts, Other Communications

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Exhibit Sent As Paper Document

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Copies of notices, written comments, transcripts, other communications. If such documents cannot be filed electronically in accordance with Instruction F, they shall be filed in accordance with Instruction G.

Exhibit 3 - Form, Report, or Questionnaire

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Exhibit Sent As Paper Document

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Copies of any form, report, or questionnaire that the self-regulatory organization proposes to use to help implement or operate the proposed rule change, or that is referred to by the proposed rule change.

Exhibit 4 - Marked Copies

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The full text shall be marked, in any convenient manner, to indicate additions to and deletions from the immediately preceding filing. The purpose of Exhibit 4 is to permit the staff to identify immediately the changes made from the text of the rule with which it has been working.

Exhibit 5 - Proposed Rule Text

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The self-regulatory organization may choose to attach as Exhibit 5 proposed changes to rule text in place of providing it in Item I and which may otherwise be more easily readable if provided separately from Form 19b-4. Exhibit 5 shall be considered part of the proposed rule change.

Partial Amendment

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If the self-regulatory organization is amending only part of the text of a lengthy proposed rule change, it may, with the Commission's permission, file only those portions of the text of the proposed rule change in which changes are being made if the filing (i.e. partial amendment) is clearly understandable on its face. Such partial amendment shall be clearly identified and marked to show deletions and additions.

1. Text of the Proposed Rule Change

(a) Pursuant to the provisions of Section 19(b)(1) of the Securities Exchange Act of 1934 (the "Act")[1] and Rule 19b-4 thereunder,[2] NYSE National, Inc. ("NYSE National" or the "Exchange") proposes to establish fees for the NYSE National Integrated Feed.

A notice of the proposed rule change for publication in the Federal Register is attached hereto as Exhibit 1, and the text of the proposed rule change is attached as Exhibit 5.

(b) The Exchange does not believe that the proposed rule change will have any direct effect, or any significant indirect effect, on any other Exchange rule in effect at the time of this filing.

(c) Not applicable.

2. Procedures of the Self-Regulatory Organization

The Board of Directors of the Exchange and its Regulatory Oversight Committee have approved the proposed rule change. No further action is required under the Exchange's governing documents. Therefore, the Exchange's internal procedures with respect to the proposed change are complete.

The person on the Exchange staff prepared to respond to questions and comments on the proposed rule change is:

Samir M. Patel	Clare F. Saperstein
Senior Counsel	Associate General Counsel
NYSE Group, Inc.	NYSE Group, Inc.
(212) 656-2030	(212) 656-2355

3. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

(a) Purpose

The Exchange proposes to adopt the NYSE National Proprietary Market Data Fee Schedule ("Fee Schedule") and establish the fees for the NYSE National Integrated Feed that would be effective February 3, 2020.[3]

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1 15 U.S.C. 78s(b)(1).

2 17 CFR 240.19b-4.

3 The proposed rule change establishing the NYSE National Integrated Feed was immediately effective on May 31, 2018. See Securities Exchange Act Release

In summary, the NYSE National Integrated Feed is a NYSE National-only market data feed that provides vendors and subscribers on a real-time basis with a unified view of events, in sequence, as they appear on the NYSE National matching engine. The NYSE National Integrated Feed includes depth-of-book order data, last sale data, security status updates (*e.g.*, trade corrections and trading halts), and stock summary messages. Because the NYSE National Integrated Feed has a unified view of events, in sequence, it also includes information about the Exchange's best bid or offer at any given time.

The Exchange currently does not charge any fees for the NYSE National Integrated Feed market data product.[4]

The Exchange initially filed to introduce fees for the NYSE National Integrated Feed on December 4, 2019 (the "Initial Proposal").[5] Pursuant to the Initial Proposal, the fees would not be implemented until February 3, 2020. The Initial Proposal was published in the Federal Register and two comment letters were submitted in response. The Initial Proposal was temporarily suspended pursuant to a Suspension Order (the "Initial Suspension Order").[6] The Initial Suspension Order also instituted proceedings to determine whether to approve or disapprove the Initial Proposal.

Background

The Commission has repeatedly expressed its preference for competition over regulatory intervention in determining prices, products, and services in the securities markets. In Regulation NMS, the Commission highlighted the importance of market forces in determining prices and SRO revenues, and also recognized that current regulation of the market system "has been remarkably

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No. 83350 (May 31, 2018), 83 FR 26332 (June 6, 2018) (SR-NYSENAT-2018-09) ("NYSE National Integrated Feed Product Filing"). The NYSE National Integrated Feed Product Filing also established the NYSE National BBO and NYSE National Trades market data feeds.

4 The Exchange also currently does not charge any fees for the NYSE National BBO and NYSE National Trades market data products and proposes to adopt rule text on the Fee Schedule to reflect that there are no fees charged for NYSE National BBO and NYSE National Trades market data products.

5 See Securities Exchange Act Release No. 87797 (December 18, 2019), 84 FR 71025 (December 26, 2019).

6 See Securities Exchange Act Release No. 88109 (January 31, 2020) (SR-NYSENAT-2019-13) ("Initial Suspension Order").

successful in promoting market competition in its broader forms that are most important to investors and listed companies."[7]

As the Commission itself recognized, the market for trading services in NMS stocks has become "more fragmented and competitive."[8] Equity trading is currently dispersed across 13 exchanges,[9] 31 alternative trading systems,[10] and numerous broker-dealer internalizers and wholesalers, all competing for order flow. Based on publicly-available information, no single exchange has more than 18% market share (whether including or excluding auction volume).[11]

The recent growth of NYSE National's market share demonstrates this competitive marketplace. Between February 2017 and mid-May 2018, NYSE National was non-operational, and therefore had 0% of market share. On May 21, 2018, NYSE National re-launched on its current platform as an affiliated exchange of New York Stock Exchange, LLC ("NYSE"), NYSE Arca, Inc. ("NYSE Arca, Inc."), and NYSE American LLC ("NYSE American"). Within four months, NYSE National began regularly executing 1% of consolidated trading volume. By August 2019, NYSE National began executing approximately 1.5% of consolidated trading volume on a more regular basis. By October 2019, the Exchange had 1.9% market share of executed volume of equity trades.[12]

As NYSE National's transaction market share has increased, so has the value of its market data. For example, in May 2018, when NYSE National re-launched trading operations, the Exchange had 12 customers for its NYSE National Integrated Feed. As NYSE National's market share has increased, the number of subscribers of the NYSE National Integrated Feed has steadily increased and as of

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7 See Securities Exchange Act Release No. 51808 (June 9, 2005), 70 FR 37495, 37499 (June 29, 2005) (S7-10-04) (Final Rule) ("Regulation NMS Adopting Release").

8 See Securities Exchange Act Release No. 51808, 84 FR 5202, 5253 (February 20, 2019) (File No. S7-05-18) (Transaction Fee Pilot for NMS Stocks Final Rule) ("Transaction Fee Pilot").

9 See Cboe Global Markets, U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/. See generally https://www.sec.gov/fast-answers/divisionsmarketregmrexchangesshtml.html.

10 See FINRA ATS Transparency Data, available at https://otctransparency.finra.org/otctransparency/AtsIssueData. A list of alternative trading systems registered with the Commission is available at https://www.sec.gov/foia/docs/atslist.htm.

11 See Cboe Global Markets, U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/.

12 See id.

November 2019, the Exchange had 57 customers that subscribed to the NYSE National Integrated Feed. In November 2019, customers of the NYSE National Integrated Feed accounted for over 99% of the executed trade volume on the Exchange.

On December 4, 2019, the Exchange filed the Initial Proposal to introduce fees for the NYSE National Integrated Feed, effective February 3, 2020. The Exchange explained in the Initial Proposal that it filed its proposed rule change early, in December 2019, because the Exchange believed it was appropriate to provide market participants with early notice of the proposed changes, so that they could begin determining whether the value of the NYSE National Integrated Feed to their businesses is such that they would choose to continue using the product once it was no longer provided for free. The Exchange explained that it believes that market participants should have the opportunity to begin such determinations before the Exchange begins charging fees.

Since the date of the Initial Proposal and before the proposed fees went into effect, five subscribers to the NYSE National Integrated Feed product (i.e., nearly nine percent of the prior subscriber base) have canceled their subscriptions. In each instance, the subscriber told the Exchange that its reason for cancelling its subscription was the imminent imposition of fees. A sixth customer informed the Exchange that if the Exchange is permitted to impose the fees, the customer will cancel its subscription to the NYSE National Integrated Feed product and instead subscribe to the NYSE National BBO feed, which will remain available for free. These six lost subscribers constitute 10.5 percent of the prior subscriber base.

Proposed NYSE National Integrated Feed Fees

To reflect the value of NYSE National's market data, as correlated to the Exchange's increased transaction volume market share, the Exchange proposes to establish the fees listed below for the NYSE National Integrated Feed, operative on February 3, 2020. The Exchange proposes to charge fees for the same categories of market data use as its affiliated exchanges (namely, NYSE, NYSE Arca, and NYSE American) currently charge. The Exchange believes that adopting the same fee structure as its affiliated exchanges would reduce administrative burdens on NYSE National market data subscribers that also currently subscribe to market data feeds from NYSE, NYSE Arca, or NYSE American.

1. Access Fee. For the receipt of access to the NYSE National Integrated Feed, the Exchange proposes to charge $2,500 per month. This proposed Access Fee would be charged to any data recipient that receives a data feed of the NYSE National Integrated Feed. Data recipients that only use display devices to view NYSE National Integrated Feed market data and do not separately receive a data feed would not be charged an Access Fee. The proposed Access Fee is charged only once per firm.

2. Redistribution Fee. For redistribution of the NYSE National Integrated Feed, the Exchange proposes to establish a fee of $1,500 per month. The proposed Redistribution Fee would be charged to any Redistributors of the NYSE National Integrated Feed, which is defined to mean a vendor or any person that provides a real-time NYSE National market data product externally to a data recipient that is not its affiliate or wholly-owned subsidiary, or to any system that an external data recipient uses, irrespective of the means of transmission or access. The proposed Redistribution Fee is charged only once per Redistributor account.

3. User Fees. The Exchange proposes to charge a Professional User Fee (Per User) of $10 per month and a Non-Professional User Fee (Per User) of $1 per month. These user fees would apply to each display device that has access to the NYSE National Integrated Feed.

4. Non-Display Use Fees. The Exchange proposes to establish non-display fees for the NYSE National Integrated Feed that are based on the non-display use categories charged by NYSE, NYSE Arca, NYSE American, the Consolidated Tape Association, and the UTP Plan for non-display use.[13] Non-display use would mean accessing, processing, or consuming the NYSE National Integrated Feed, delivered directly or through a Redistributor, for a purpose other than in support of a data recipient's display or further internal or external redistribution ("Non-Display Use"). Non-Display Use would include trading uses such as high frequency or algorithmic trading as well as any trading in any asset class, automated order or quote generation and/or order pegging, price referencing for algorithmic trading or smart order routing, operations control programs,

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[13] See Endnote 1 to the NYSE Proprietary Market Data Fees, available here: https://www.nyse.com/publicdocs/nyse/data/NYSE_Market_Data_Fee_Schedule.pdf; Endnote 1 to the NYSE Arca Equites Proprietary Market Data Fees, available here: https://www.nyse.com/publicdocs/nyse/data/NYSE_Arca_Equities_Fee_Schedule.pdf; Endnote 1 to the NYSE American LLC Equities Proprietary Market Data Fees, available here: https://www.nyse.com/publicdocs/nyse/data/NYSE_American_Equities_Market_Data_Fee_Schedule.pdf; Endnote 8 to the Schedule of Market Data Charges for the Consolidated Tape Association, available here: https://www.ctaplan.com/publicdocs/ctaplan/notifications/trader-update/Schedule%20Of%20Market%20Data%20Charges%20-%20January%201,%202015.pdf; and Non-Display Usage Fees as set forth in the UTP Plan Fee Schedule and Non-Display Policy, available here: http://utpplan.com/DOC/Datapolicies.pdf. See, e.g., Securities Exchange Act Release Nos. 69278 (April 2, 2013), 78 FR 20973 (April 8, 2013) (SR-NYSE-2013-25) and 72923 (Aug. 26, 2014), 79 FR 52079 (Sept. 2, 2014) (SR-NYSE-2014-43).

investment analysis, order verification, surveillance programs, risk management, compliance, and portfolio management.

The Exchange proposes three categories of Non-Display Use of the NYSE National Integrated Feed and related fees applicable to each category. One, two, or three categories of Non-Display Use may apply to a data recipient.

- As proposed, the Category 1 Fee would be $5,000 per month and would apply when a data recipient's Non-Display Use of the NYSE National Integrated Feed is on its own behalf, not on behalf of its clients.

- As proposed, Category 2 Fees would be $5,000 per month and would apply to a data recipient's Non-Display Use of the NYSE National Integrated Feed on behalf of its clients.

- As proposed, Category 3 Fees would be $5,000 per month and would apply to a data recipient's Non-Display Use of the NYSE National Integrated Feed for the purpose of internally matching buy and sell orders within an organization, including matching customer orders for a data recipient's own behalf and/or on behalf of its clients. This category would apply to Non-Display Use in trading platforms, such as, but not restricted to, alternative trading systems ("ATSs"), broker crossing networks, broker crossing systems not filed as ATSs, dark pools, multilateral trading facilities, exchanges and systematic internalization systems. A data recipient will be charged $5,000 per month for each platform on which it uses the Non-Display data internally to match buy and sell orders, up to a cap of $15,000 per month; even if the data recipient uses the NYSE National Integrated Feed for more than three platforms, it will not pay more than $15,000 for such Category 3 use per month.

The Exchange proposes to adopt the description of the three non-display use categories in the Fee Schedule in proposed endnote 1 on the Fee Schedule.[14]

Data recipients that receive the NYSE National Integrated Feed for Non-Display Use would be required to complete and submit a Non-Display Use Declaration before they would be authorized to receive the feed. A firm subject to Category 3 Fees would be required to identify each platform that uses the NYSE National Integrated Feed for a Category 3 Non-Display Use basis, such as ATSs and broker crossing systems not registered as ATSs, as part of the Non-Display Use Declaration.

5. Non-Display Use Declaration Late Fee. Data recipients that receive the NYSE National Integrated Feed for Non-Display Use would be required to complete and submit a Non-Display Use Declaration before they would be

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[14] See Fee Schedule, proposed endnote 1.

authorized to receive the feed. NYSE National Integrated Feed data recipients would be required to submit, by December 31 of each year, the Non-Display Use Declaration. The requirement to submit a Non-Display Use Declaration would apply to all real-time NYSE National data feed product recipients. The Exchange proposes to charge a Non-Display Use Declaration Late Fee of $1,000 per month to any data recipient that pays an Access Fee for the NYSE National Integrated Feed that has failed to timely complete and submit a Non-Display Use Declaration. Specifically, with respect to the Non-Display Use Declaration due by December 31 of each year, the Non-Display Use Declaration Late Fee would apply to data recipients that fail to complete and submit the Non-Display Use Declaration by the December 31 due date, and would apply beginning January 1 and for each month thereafter until the data recipient has completed and submitted the annual Non-Display Use Declaration.

The proposed Non-Display Use Declaration Late Fee would be set forth in endnote 2 on the Fee Schedule. Proposed endnote 2 would provide that a data recipient that pays an Access Fee and that fails to timely complete and submit a Non-Display Use Declaration must pay the Non-Display Use Declaration Late Fee.[15] Proposed endnote 2 to the Fee Schedule would also provide that the annual Non-Display Use Declaration would be due by December 31 of each year. Finally, proposed endnote 2 would provide that the Non-Display Use Declaration Late Fee would apply to data recipients that fail to complete and submit the annual Non-Display Use Declaration by the December 31 due date, and would apply beginning January 1 of each year and for each month thereafter until the data recipient has completed and submitted the annual Non-Display Use Declaration.
In addition, if a data recipient's use of the NYSE National Integrated Feed data changes at any time after the data recipient submits a Non-Display Use Declaration, the data recipient must inform the Exchange of the change by completing and submitting at the time of the change an updated declaration reflecting the change of use.

6. Multiple Data Feed Fee. The Exchange proposes to establish a monthly fee, the "Multiple Data Feed Fee," that would apply to data recipients that take a data feed for a market data product in more than two locations. Data recipients taking the NYSE National Integrated Feed in more than two locations would be charged $200 per additional location per month. No new reporting would be required.[16]

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15 See Fee Schedule, proposed endnote 2.

16 Data vendors currently report a unique Vendor Account Number for each location at which they provide a data feed to a data recipient. The Exchange considers each Vendor Account Number a location. For example, if a data recipient has five Vendor Account Numbers, representing five locations, for the receipt of the

7. Fee Waiver for Federal Agencies. The Exchange proposes to adopt rule text in the Fee Schedule with respect to Federal agencies that subscribe to the NYSE National Integrated Feed. The proposed rule would provide that market data fees would not apply to any Federal agency for their use of NYSE National real-time proprietary market data products. The term "Federal agency" as used in the Fee Schedule would include all Federal agencies subject to the Federal Acquisition Regulation (FAR),[17] as well as any Federal agency not subject to FAR that has promulgated its own procurement rules.[18] More specifically, the Exchange proposes to specify that access fees, professional user fees and non-display fees would not apply to Federal agencies for those products to which those fees apply.[19] The proposed fee waiver is designed to allow the Exchange to provide Federal agencies with NYSE National real-time proprietary market data products at no cost in support of Federal agencies' regulatory responsibilities. With the adoption of the proposed fee waiver, the Exchange is not waiving any other contractual rights, and all Federal agencies that subscribe to NYSE National real-time proprietary market data products will be required to execute the appropriate subscriber agreement, which includes, among other things, provisions against the redistribution of data.

8. One-Month Free Trial. Finally, the Exchange proposes a one-month free trial for any firm that subscribes to a particular NYSE National market data product for the first time. As proposed, a first-time subscriber would be any firm that has not previously subscribed to a particular NYSE National market data product listed on the Fee Schedule. As proposed, a first-time subscriber of a particular NYSE National market data product would not be charged the Access Fee, Non-Display Fee, any applicable Professional and Non-Professional User Fee, and Redistribution Fee for that product for one calendar month. For example, a firm that currently subscribes to NYSE National BBO for free would be eligible to receive a free one-month trial of the NYSE National Integrated

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NYSE National Integrated Feed product, that data recipient will pay the Multiple Data Feed fee with respect to three of the five locations.

17 FAR is the principal set of rules governing the process by which the U.S. federal government purchases goods and services.

18 See 48 CFR 2.101. FAR defines "Federal agency" as "any executive agency or any independent establishment in the legislative or judicial branch of the Government (except the Senate, the House of Representatives, the Architect of the Capitol, and any activities under the Architect's direction)." "Executive agency" is defined as "an executive department, a military department, or any independent establishment within the meaning of 5 U.S.C. 101, 102, and 104(1), respectively, and any wholly owned Government corporation within the meaning of 31 U.S.C. 9101."

19 Currently, pursuant to this proposed rule change, the NYSE National Integrated Feed is the only product to which fees would apply.

Feed, whether in a display-only format or for non-display use. On the other hand, if a firm pays an Access Fee and receives the NYSE National Integrated Feed for non-display use, it would not be eligible to receive a free one-month trial of the NYSE National Integrated Feed in a display-only format (or vice-versa). The proposed free trial would be for the first full calendar month following the date a subscriber is approved to receive trial access to the particular NYSE National market data product. The Exchange would provide the one-month free trial for each particular product to each subscriber once.

The Exchange believes that providing a one-month free trial to NYSE National market data products listed on the Fee Schedule would enable potential subscribers to determine whether a particular NYSE National market data product provides value to their business models before fully committing to expend development and implementation costs related to the receipt of that product, and is intended to encourage increased use of the Exchange's market data products by defraying some of the development and implementation costs subscribers would ordinarily have to expend before using a product.

Application of Proposed Fees

The Exchange is not required to make the NYSE National Integrated Feed available or to offer any specific pricing alternatives to any customers, nor is any firm required to purchase the NYSE National Integrated Feed. Firms that choose to purchase the NYSE National Integrated Feed do so for the primary goals of using it to increase their revenues, reduce their expenses, and in some instances to compete directly with the Exchange (including for order flow). Those firms are able to determine for themselves whether or not the NYSE National Integrated Feed or any other similar products are attractively priced.

The Exchange produces and disseminates the NYSE National Integrated Feed as part of its market data offerings to support its transaction execution services. Since May 2018, when NYSE National relaunched trading, the Exchange has observed a direct correlation between the steady increase of subscribers to the NYSE National Integrated Feed and the increase in the Exchange's transaction market share volume over the same period.

Based on the reported usage of the NYSE National Integrated Feed, the Exchange believes that its data subscribers use the order-by-order detail information available in this market data product to make trading decisions that directly benefit the transaction services that the Exchange offers. Specifically, in the period before the Initial Proposal was published, subscribers of the NYSE National Integrated Feed represented firms that provided over 99% of the Exchange's executed transaction volume. More than half of the feed's subscribers overall (*i.e.*, 34 of 57) reported "Category 1" non-display use of the NYSE National Integrated Feed, which means that they used the data for trading on their own behalf. This figure confirms that a substantial portion of the NYSE

National Integrated Feed's subscribers analyzed whether it was in their business interest to use the feed for their own trading, and concluded that it was.

The Exchange determined the level of the fees to charge for the NYSE National Integrated Feed based on the value of the Exchange's transaction services. As noted above, over an 18-month period, NYSE National has grown from 0% to nearly 2% market share of consolidated trading volume. During that same period, the Exchange has had a steady increase in the number of subscribers to the NYSE National Integrated feed.

The proposed fee structure is not novel as it is based on the fee structure currently in place for the NYSE American Integrated Feed.[20] Both NYSE American and NYSE National trade all NMS Stocks. As noted above, in October 2019, NYSE National had 1.9% market share; for that same month, NYSE American had 0.29% market share.[21] Even though NYSE National's market share is several times higher than NYSE American's, the Exchange is proposing fees for the NYSE National Integrated Feed that are based on the existing fee structure and rates that data recipients already pay for the NYSE American Integrated Feed. Specifically, the fees for the NYSE American Integrated Feed—which like the NYSE National Integrated Feed, includes top of book, depth of book, trades, and security status messages—consist of an Access Fee of $2,500 per month, a Professional User Fee (Per User) of $10 per month, a Non-Professional User Fee (Per User) of $2 per month, Non-Display Fees of $5,000 per month for each of Categories 1, 2 and 3, and a Redistribution Fee of $1,500 per month. NYSE American also charges a Non-Display Use Declaration Late Fee of $1,000 per month and a Multiple Data Feed Fee of $200 per month.[22]

In the Initial Proposal, the Exchange noted that each of the then-current subscribers to the NYSE National Integrated Feed would be impacted by the proposed rule change, and that the scope of the fee impact for each data recipient would depend on that data recipient's use of the data. The Exchange noted that,

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20 See Securities Exchange Act Release Nos. 76525 (November 25, 2015), 80 FR 75148 (December 1, 2015) (SR-NYSEMKT-2015-95) (Notice of filing and immediate effectiveness of proposed rule change to establish fees for NYSE MKT Integrated Feed), and 76975 (January 26, 2016), 81 FR 5139 (February 1, 2016) (SR-NYSEMKT-2016-11) (Notice of filing and immediate effectiveness of proposed rule change amending the fees for NYSE MKT Integrated Feed to add a Multiple Data Feed Fee).

21 See Cboe Global Markets, U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/.

22 See NYSE American LLC Equities Proprietary Market Data Fees at https://www.nyse.com/publicdocs/nyse/data/NYSE_American_Equities_Market_Data_Fee_Schedule.pdf.

based on current usage, at least 34 firms would be subject to Category 1 Non-Display Use fees, at least 14 firms would be subject to Category 2 Non-Display Use fees, and at least 10 firms would be subject to Category 3 Non-Display Use fees.

The Exchange further explained that, because the NYSE National Integrated Feed had not been previously been subject to fees, the Exchange did not know the full impact of the proposed fees on current data recipients because subscribers may choose to reduce or eliminate their use of data. The Exchange stated that it anticipated that there might be data recipients of the NYSE National Integrated Feed that subscribed only because it was free and might choose to discontinue using the product once the fees were implemented. The Exchange noted that a data recipient that chooses to discontinue the NYSE National Integrated Feed may also choose to shift order flow away from the Exchange, and that, given the current competitive environment, if data recipients were to both discontinue the product and shift order flow away from the Exchange, the Exchange would reevaluate the fees and potentially file a separate proposed rule change to amend its fees. The Exchange explained that in advance of implementing the proposed fees, however, the Exchange could not estimate with precision the impact of the proposed fees on the Exchange's transaction services business or the number of NYSE National Integrated Feed subscribers.

Since the Initial Proposal became publicly known on December 4, 2019, five subscribers to the NYSE National Integrated Feed product have canceled their subscriptions. In each instance, the subscriber told the Exchange that the reason for ending its subscription was the imminent imposition of fees. A sixth customer informed the Exchange that if the Exchange is permitted to impose the fees, the customer will cancel its subscription to the NYSE National Integrated Feed product and instead subscribe to the NYSE National BBO feed, which will remain available for free.

(b) Statutory Basis

The Exchange believes that the proposed rule change is consistent with the provisions of Section 6 of the Act,[23] in general, and Sections 6(b)(4) and 6(b)(5) of the Act,[24] in particular, in that it provides an equitable allocation of reasonable fees among users and recipients of the data and is not designed to permit unfair discrimination among customers, issuers, and brokers.

The Proposed Rule Change Is Reasonable

In adopting Regulation NMS, the Commission granted SROs and broker-dealers

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23 15 U.S.C. 78f(b).

24 15 U.S.C. 78f(b)(4), (5).

increased authority and flexibility to offer new and unique market data to the public. The Commission has repeatedly expressed its preference for competition over regulatory intervention in determining prices, products, and services in the securities markets. Specifically, in Regulation NMS, the Commission highlighted the importance of market forces in determining prices and SRO revenues, and also recognized that current regulation of the market system "has been remarkably successful in promoting market competition in its broader forms that are most important to investors and listed companies."[25]

With respect to market data, the decision of the United States Court of Appeals for the District of Columbia Circuit in NetCoalition v. SEC upheld the Commission's reliance on the existence of competitive market mechanisms to evaluate the reasonableness and fairness of fees for proprietary market data:

> In fact, the legislative history indicates that the Congress intended that the market system "evolve through the interplay of competitive forces as unnecessary regulatory restrictions are removed" and that the SEC wield its regulatory power "in those situations where competition may not be sufficient," such as in the creation of a "consolidated transactional reporting system."[26]

The court agreed with the Commission's conclusion that "Congress intended that 'competitive forces should dictate the services and practices that constitute the U.S. national market system for trading equity securities.'"[27]

In this competitive marketplace, the Exchange's executed trading volume has grown from 0% market share to nearly 2% market share in less than two years and the Exchange believes that it is reasonable to begin charging fees for the NYSE National Integrated Feed.

1. The Proposed Fees Are Constrained by Significant Competitive Forces

a. Exchange Market Data Is Sold in a Competitive Market

In 2018, Charles M. Jones, the Robert W. Lear Professor of Finance and Economics of the Columbia University School of Business, conducted an analysis of the market for equity market data in the United States. He canvassed the

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25 See Regulation NMS Adopting Release, 70 FR 37495, at 37499.

26 NetCoalition v. SEC, 615 F.3d 525, 535 (D.C. Cir. 2010) ("NetCoalition I") (quoting H.R. Rep. No. 94–229 at 92 (1975), as reprinted in 1975 U.S.C.C.A.N. 323).

27 Id. at 535.

demand for both consolidated and exchange proprietary market data products and the uses to which those products were put by market participants, and reported his conclusions in a paper annexed hereto.[28] Among other things, Professor Jones concluded that:

- "The market [for exchange market data] is characterized by robust competition: exchanges compete with each other in selling proprietary market data products. They also compete with consolidated data feeds and with data provided by alternative trading systems ('ATSs'). Barriers to entry are very low, so existing exchanges must also take into account competition from new entrants, who generally try to build market share [as NYSE National has done with its Integrated Feed] by offering their proprietary market data products for free for some period of time."[29]

- "Although there are regulatory requirements for some market participants to use consolidated data products, there is no requirement for market participants to purchase any proprietary market data product for regulatory purposes."[30]

- "There are a variety of data products, and consumers of equity market data choose among them based on their needs. Like most producers, exchanges offer a variety of market data products at different price levels. Advanced proprietary market data products provide greater value to those who subscribe. As in any other market, each potential subscriber takes the features and prices of available products into account in choosing what market data products to buy based on its business model."[31]

- "Exchange equity market data fees are a small cost for the industry overall: the data demonstrates that total exchange market data revenues are orders of magnitude smaller than (i) broker-dealer commissions, (ii) investment bank earnings from equity trading, and (iii) revenues earned by third-party vendors."[32]

- "For proprietary exchange data feeds, the main question is whether there is a competitive market for proprietary market data. More than 40 active exchanges and alternative trading systems compete vigorously in both the

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28 See Exhibit 3A, Charles M. Jones, Understanding the Market for U.S. Equity Market Data, August 31, 2018 (hereinafter "Jones Paper").

29 Id. at 2.

30 Id.

31 Id.

32 Id.

> market for order flow and in the market for market data. The two are closely linked: an exchange needs to consider the negative impact on its order flow if it raises the price of its market data. Furthermore, new entrants have been frequent over the past 10 years or so, and these venues often give market data away for free, [again, as NYSE National has done with its Integrated Feed] serving as a check on pricing by more established exchanges. These are all the standard hallmarks of a competitive market."[33]

Professor Jones' conclusions are consistent with the demonstration of the competitive constraints on the pricing of market data demonstrated by analysis of exchanges as platforms for market data and trading services, as shown below.

b. Exchanges that Offer Market Data and Trading Services Function as Two-Sided Platforms

An exchange may demonstrate that its fees are constrained by competitive forces by showing that the platform theory of competition applies. When the platform theory of competition applies, an exchange is not additionally required to demonstrate that there is a substitute for the specific market data product at issue, because the relevant question is whether a constraint on fees exists, not the specific mechanism of constraint.

As the United States Supreme Court recognized in Ohio v. American Express, platforms are firms that act as intermediaries between two or more sets of agents, and typically the choices made on one side of the platform affect the results on the other side of the platform via externalities, or "indirect network effects."[34] Externalities are linkages between the different sides of a platform such that one cannot understand pricing and competition for goods or services on one side of the platform in isolation; one must also account for the influence of the other sides. As the Supreme Court explained:

> To ensure sufficient participation, two-sided platforms must be sensitive to the prices that they charge each side. . . . Raising the price on side A risks losing participation on that side, which decreases the value of the platform to side B. If the participants on side B leave due to this loss in value, then the platform has even less value to side A—risking a feedback loop of declining demand. . . . Two-sided platforms therefore must take these indirect network effects into account before making a change in price on either side.[35]

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33 Id. at 39-40.

34 Ohio v. American Express, 138 S. Ct. 2274, 2280-81 (2018).

35 Id. at 2281.

The Exchange and its affiliated exchanges have long maintained that they function as platforms between consumers of market data and consumers of trading services. Proving the existence of linkages between the two sides of this platform requires an in-depth economic analysis of both public data and confidential exchange data about particular customers' trading activities and market data purchases. Exchanges, however, are prohibited from publicly sharing details about these specific customer activities and purchases. For example, pursuant to Exchange Rule 7.41, transactions executed on the Exchange are processed anonymously.

The Exchange and its affiliated exchanges have retained a third-party expert, Marc Rysman, Professor of Economics at Boston University, to analyze how platform economics applies to stock exchanges' sale of market data products and trading services, and to explain how this affects the assessment of competitive forces affecting the exchanges' data fees.[36] Professor Rysman was able to analyze exchange data that is not otherwise publicly available in a manner that is consistent with the exchanges' confidentiality obligations to its customers. As shown in his paper, Professor Rysman surveyed the existing economic literature analyzing stock exchanges as platforms between market data and trading activities, and explained the types of linkages between market data access and trading activities that must be present for an exchange to function as a platform. In addition, Professor Rysman undertook an empirical analysis of customers' trading activities within the NYSE group of exchanges in reaction to NYSE's introduction in 2015 of the NYSE Integrated Feed, a full order-by-order depth of book data product similar to the NYSE National Integrated Feed that is the subject of this fee filing.[37]

Professor Rysman's analysis of this confidential firm-level data shows that firms that purchased the NYSE Integrated Feed market data product after its introduction were more likely to route orders to NYSE as opposed to one of the other NYSE-affiliated exchanges, such as NYSE Arca or NYSE American.[38] Moreover, Professor Rysman shows that the same is true for firms that did not subscribe to the NYSE Integrated Feed: the introduction of the NYSE Integrated

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36 See Exhibit 3B, Marc Rysman, Stock Exchanges as Platforms for Data and Trading, December 2, 2019 (hereinafter "Rysman Paper"), ¶ 6.

37 See Securities Exchange Act Release Nos. 74128 (January 23, 2015), 80 FR 4951 (January 29, 2015) (SR-NYSE-2015-03) (Notice of filing and immediate effectiveness of proposed rule change to establish NYSE Integrated Feed) and 76485 (November 20, 2015), 80 FR 74158 (November 27, 2015) (SR-NYSE-2015-57) (Notice of filing and immediate effectiveness of proposed rule change to establish fees for the NYSE Integrated Feed).

38 Rysman Paper ¶¶ 80-90.

Feed led to more trading on NYSE (as opposed to other NYSE-affiliated exchanges) by firms that did not subscribe to the NYSE Integrated Feed.[39] This is the sort of externality that is a key characteristic of a platform market.[40]

From this empirical evidence, Professor Rysman concludes:

- "[D]ata is more valuable when it reflects more trading activity and more liquidity-providing orders. These linkages alone are enough to make platform economics necessary for understanding the pricing of market data."[41]

- "[L]inkages running in the opposite direction, from data to trading, are also very likely to exist. This is because market data from an exchange reduces uncertainty about the likelihood, price, or timing of execution for an order on that exchange. This reduction in uncertainty makes trading on that exchange more attractive for traders that subscribe to that exchange's market data. Increased trading by data subscribers, in turn, makes trading on the exchange in question more attractive for traders that do not subscribe to the exchange's market data."[42]

- The "mechanisms by which market data makes trading on an exchange more attractive for subscribers to market data . . . apply to a wide assortment of market data products, including BBO, order book, and full order-by-order depth of book data products at all exchanges."[43]

- "[E]mpirical evidence confirms that stock exchanges are platforms for data and trading."[44]

- "The platform nature of stock exchanges means that data fees cannot be analyzed in isolation, without accounting for the competitive dynamics in trading services."[45]

- "Competition is properly understood as being between platforms (i.e., stock exchanges) that balance the needs of consumers of data and

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39 Id. ¶¶ 91-93.

40 Id. ¶ 91.

41 Id. ¶ 95.

42 Id. ¶ 96.

43 Id.

44 Id. ¶ 97.

45 Id. ¶ 98.

traders."[46]

- "Data fees, data use, trading fees, and order flow are all interrelated."[47]

- "Competition for order flow can discipline the pricing of market data, and vice-versa."[48]

- "As with platforms generally, overall competition between exchanges will limit their overall profitability, not margins on any particular side of the platform."[49]

The Exchange has observed a similar correlation in connection with its offering of the NYSE National Integrated Feed. Since May 2018, when the Exchange re-launched trading, the number of subscribers of the NYSE National Integrated Feed grew from 12 to a high of 57. Over this same period, the Exchange has increased market share from 0% to nearly 2%. The Exchange therefore believes that its proposed fees for the NYSE National Integrated Feed are subject to platform-based competitive constraints on pricing.

c. Exchange Market Data Fees Are Constrained by the Availability of Substitute Platforms

Professor Rysman's conclusions that exchanges function as platforms for market data and transaction services mean that exchanges do not set fees for market data products without considering, and being constrained by, the effect the fees will have on the order-flow side of the platform. As the D.C. Circuit recognized in NetCoalition I, "[n]o one disputes that competition for order flow is fierce."[50] The court further noted that "no exchange possesses a monopoly, regulatory or otherwise, in the execution of order flow from broker dealers," and that an exchange "must compete vigorously for order flow to maintain its share of trading volume."[51]

Similarly, the Commission itself has recognized that the market for trading services in NMS stocks has become "more fragmented and competitive."[52] The

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46 Id.

47 Id.

48 Id.

49 Id. ¶ 100.

50 NetCoalition I, 615 F.3d at 544 (internal quotation omitted).

51 Id.

52 See Securities Exchange Act Release No. 51808, 84 FR 5202, 5253 (February 20, 2019) (File No. S7-05-18).

Commission's Division of Trading and Markets has also recognized that with so many "operating equities exchanges and dozens of ATSs, there is vigorous price competition among the U.S. equity markets and, as a result, [transaction] fees are tailored and frequently modified to attract particular types of order flow, some of which is highly fluid and price sensitive."[53] Indeed, today, equity trading is currently dispersed across 13 exchanges,[54] 31 alternative trading systems,[55] and numerous broker-dealer internalizers and wholesalers, all competing for order flow. Based on publicly-available information, no single exchange has more than 18% market share.[56]

Further, low barriers to entry mean that new exchanges may rapidly and inexpensively enter the market and offer additional substitute platforms to compete with the Exchange.[57] In addition to the 13 presently-existing exchanges, three new ones are expected to enter the market in 2020: Long Term Stock Exchange (LTSE), which has been approved as an equities exchange but is not yet operational;[58] Members Exchange (MEMX), which has recently filed its application to be approved as a registered equities exchange;[59] and Miami International Holdings (MIAX), which has announced its plan to introduce

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53 Commission Division of Trading and Markets, Memorandum to EMSAC, dated October 20, 2015, available here: https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf.

54 See Cboe Global Markets, U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/. See generally https://www.sec.gov/fast-answers/divisionsmarketregmrexchangesshtml.html.

55 See FINRA ATS Transparency Data, available at https://otctransparency.finra.org/otctransparency/AtsIssueData. A list of alternative trading systems registered with the Commission is available at https://www.sec.gov/foia/docs/atslist.htm.

56 See Cboe Global Markets U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/.

57 See Jones Paper at 10-11.

58 See Securities Exchange Act Release No. 85828 (May 10, 2019) (File No. 10-234) (Findings, Opinion, and Order of the Commission in the Matter of the Application of Long Term Stock Exchange, Inc. for Registration as a National Securities Exchange).

59 See Securities Exchange Act Release No. 87436 (October 31, 2019) (File No. 10-237) (Notice of filing of application of MEMX LLC for registration as a national securities exchange under Section 6 of the Act).

equities trading on an existing registered options exchange.[60]

Given Professor Rysman's conclusion that exchanges are platforms for market data and trading, this fierce competition for order flow on the trading side of the platform acts to constrain, or "discipline," the pricing of market data on the other side of the platform.[61] And due to the ready availability of substitutes and the low cost to move order flow to those substitute trading venues, an exchange setting market data fees that are not at competitive levels would expect to quickly lose business to alternative platforms with more attractive pricing.[62] Although the various exchanges may differ in their strategies for pricing their market data products and their transaction fees for trades—with some offering market data for free along with higher trading costs, and others charging more for market data and comparatively less for trading—the fact that exchanges are platforms ensures that no exchange makes pricing decisions for one side of its platform without considering, and being constrained by, the effects that price will have on the other side of the platform.

In sum, the fierce competition for order flow thus constrains any exchange from pricing its market data at a supracompetitive price, and constrains the Exchange here in setting its fees for the NYSE National Integrated Feed.

The proposed fees are therefore reasonable because in setting them, the Exchange is constrained by the availability of numerous substitute platforms offering market data products and trading. Such substitutes need not be identical, but only substantially similar to the product at hand.

More specifically, in setting fees for the NYSE National Integrated Feed, the Exchange is constrained by the fact that, if its pricing across the platform is unattractive to customers, customers have their pick of an increasing number of alternative platforms to use instead of the Exchange. The Exchange believes that it has considered all relevant factors and has not considered irrelevant factors in order to establish reasonable fees. The existence of numerous alternative platforms to the Exchange's platform ensures that the Exchange cannot set unreasonable market data fees without suffering the negative effects of that decision in the fiercely competitive market in which it operates as a platform.

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60 See Press Release of Miami International Holdings Inc., dated May 17, 2019, available here: https://www.miaxoptions.com/sites/default/files/press_release-files/MIAX_Press_Release_05172019.pdf.

61 Rysman Paper ¶ 98.

62 See Jones Paper at 11.

d. NYSE National Integrated Feed is an Optional Market Data Product

Subscribing to the NYSE National Integrated Feed is entirely optional. The Exchange is not required to make the NYSE National Integrated Feed available to any customers, nor is any customer required to purchase the NYSE National Integrated Feed. Unlike some other data products (*e.g.*, the consolidated quotation and last-sale information feeds) that firms are required to purchase in order to fulfil regulatory obligations,[63] a customer's decision whether to purchase the NYSE National Integrated Feed is entirely discretionary. Most firms that choose to subscribe to the NYSE National Integrated Feed do so for the primary goals of using it to increase their revenues, reduce their expenses, and in some instances to compete directly with the Exchange for order flow. Such firms are able to determine for themselves whether the NYSE National Integrated Feed is necessary for their business needs, and if so, whether or not it is attractively priced. If the NYSE National Integrated Feed does not provide sufficient value to firms based on the uses those firms may have for it, such firms may simply choose to conduct their business operations in ways that do not use the NYSE National Integrated Feed.[64] If they do not choose to use the NYSE National Integrated Feed, they could also choose not to direct order flow to the Exchange.

As noted above, the current subscribers to the NYSE National Integrated Feed began changing their behavior in response to the potential imposition of fees as set out in the Initial Proposal and herein. Since the Initial Proposal became publicly known on December 4, 2019, five subscribers to the NYSE National Integrated Feed product have canceled their subscriptions even before the fees go into effect. In each instance, the subscriber told the Exchange that the reason for ending its subscription was the imminent imposition of fees. These cancellations are evidence that subscribing to the NYSE National Integrated Feed is discretionary, that each customer makes the decision whether to subscribe based on its own analysis of the benefits and costs to itself, and that customers can and do make those decisions quickly based on reactions to fee changes.

But even if such firms determine that the fees for NYSE National Integrated Feed are too high, customers can access much of the same data on the NYSE National

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63 The Exchange notes that broker-dealers are not required to purchase proprietary market data to comply with their best execution obligations. See In the Matter of the Application of Securities Industry and Financial Markets Association for Review of Actions Taken by Self-Regulatory Organizations, Release Nos. 34-72182; AP-3-15350; AP-3-15351 (May 16, 2014). Similarly, there is no requirement in Regulation NMS or any other rule that proprietary data be utilized for order routing decisions, and some broker-dealers and ATSs have chosen not to do so.

64 See generally Jones Paper at 8, 10-11.

Integrated Feed for free by subscribing to the NYSE National BBO feed (which includes best-bid-and-offer information for NYSE National on a real-time basis) and NYSE National Trades (which includes last-sale information on a real-time basis), both of which are offered at no cost. NYSE National top-of-book quotation information and last-sale information is also available on the consolidated SIP feeds. In this way, the NYSE National BBO, NYSE National Trades, and SIP data products are all substitutes for a significant portion of the data available on the NYSE National Integrated Feed. Indeed, as already noted, after the Initial Proposal was made public, a sixth customer informed the Exchange that if the Exchange is permitted to impose the fees as proposed, the customer will drop its subscription to the NYSE National Integrated Feed product and instead subscribe to the NYSE National BBO feed, which will remain available for free. This is clear evidence that the availability of these substitute products constrains the Exchange's ability to charge supracompetitive prices for the NYSE National Integrated Feed.

The only content available on NYSE National Integrated Feed that is not available on these other products is the order-by-order look at the NYSE National book, which provides information about depth of book on the Exchange. The Exchange has been a vocal advocate for the creation of a "SIP Premium" product that would include depth-of-book information on the consolidated market data feeds.[65] Future products such as SIP Premium would include not only integrated depth-of-book information from NYSE National, but all other exchanges as well, and would further constrain the Exchange's ability to price NYSE National Integrated Feed at a supracompetitive price.

Further, in the case of products that are also redistributed through market data vendors such as Bloomberg and Refinitiv, the vendors themselves provide additional price discipline for proprietary data products because they control the primary means of access to certain end users. These vendors impose price discipline based upon their business models. For example, vendors that assess a surcharge on data they sell are able to refuse to offer proprietary products that their end users do not or will not purchase in sufficient numbers. Currently, only one vendor redistributes the NYSE National Integrated Feed. Even in the absence of fees for the NYSE National Integrated Feed, vendors have not elected to make available the NYSE National Integrated Feed and likely will not unless their customers request it, and customers will not elect to pay the proposed fees unless the NYSE National Integrated Feed can provide value by sufficiently increasing revenues or reducing costs in the customer's business in a manner that will offset the fees. All of these factors operate as constraints on pricing proprietary data products.

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65 See NYSE, "Stock Quotes and Trade Data: One Size Doesn't Fit All" (August 22, 2019), posted at https://www.nyse.com/equities-insights#20190822.

In setting the proposed fees for the NYSE National Integrated Feed, the Exchange considered the competitiveness of the market for proprietary data and all of the implications of that competition. The Exchange believes that it has considered all relevant factors and has not considered irrelevant factors in order to establish reasonable fees. The existence of alternatives to the Exchange's platform and the continued availability of the Exchange's separate data feeds for free ensure that the Exchange cannot set unreasonable fees when vendors and subscribers can elect these alternatives or choose not to purchase a specific proprietary data product if the attendant fees are not justified by the returns that any particular vendor or data recipient would achieve through the purchase.

2. The Proposed Fees Are Reasonable

The specific fees that the Exchange proposes for the NYSE National Integrated Feed are reasonable for the following additional reasons.

Overall. The Exchange believes that the proposed fees for the NYSE National Integrated Feed are reasonable because they represent not only the value of the data available from the NYSE National BBO and NYSE National Trades data feeds but also the value of receiving the data on an integrated basis. Receiving the data on an integrated basis provides greater efficiencies and reduced errors for vendors and subscribers that currently choose to integrate the data themselves after receiving it from the Exchange. Some vendors and subscribers may not have the technology or resources to integrate separate data feeds in a timely and/or efficient manner, and thus the integration feature of the product may be valuable to them.

The Exchange believes the proposed fees for the NYSE National Integrated Feed are also reasonable when compared to fees for comparable products, such as the NYSE American Integrated Feed.[66] Even though NYSE National's market share is several times higher than NYSE American's, the Exchange is proposing fees for the NYSE National Integrated Feed that are based on the existing fee structure and rates that data recipients already pay for the NYSE American Integrated Feed. The Exchange believes that adopting the same fee structure as its affiliated exchanges would reduce administrative burdens on NYSE National data subscribers that also currently subscribe to market data feeds from NYSE, NYSE Arca, or NYSE American.

Access Fee. The Exchange believes that is reasonable to charge access fees because of the value of the data to data recipients in their profit-generating activities. The Exchange believes that the proposed monthly Access Fee of $2,500 for the NYSE National Integrated Feed is reasonable because it is

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66 See NYSE American Integrated Feed, https://www.nyse.com/market-data/real-time/integrated-feed.

comparable to the monthly access fee for the NYSE American Integrated Feed, which is also $2,500.[67]

Redistribution Fees. The Exchange believes that it is reasonable to charge redistribution fees because vendors receive value from redistributing the data in their business products for their customers. The Exchange believes that charging a Redistribution Fee is reasonable because the vendors that would be charged such a fee profit by re-transmitting the Exchange's market data to their customers. This fee would be charged only once per month to each vendor account that redistributes the NYSE National Integrated Feed, regardless of the number of customers to which that vendor redistributes the data. Currently, there is only one vendor that redistributes the NYSE National Integrated Feed. Accordingly, this proposed fee would have limited impact. The Exchange believes the proposed monthly Redistribution Fee of $1,500 for the NYSE National Integrated Feed is reasonable because it is comparable to the monthly Redistribution Fee for NYSE American Integrated Feed, which is also $1,500, and the monthly External Distributor Fee for Nasdaq BX, Inc.'s ("Nasdaq BX") BX TotalView Product, which is also $1,500.[68]

User Fees. The Exchange believes that having separate Professional and Non-Professional User fees for the NYSE National Integrated Feed is reasonable because it will make the product more affordable and result in greater availability to Professional and Non-Professional Users. Setting a modest Non-Professional User fee is reasonable because it provides an additional method for Non-Professional Users to access the NYSE National Integrated Feed by providing the same data that is available to Professional Users. The proposed monthly Professional User Fee (Per User) of $10 and monthly Non-Professional User Fee (Per User) of $1 are reasonable because they are comparable to per user fees for the NYSE American Integrated Feed. The monthly Professional User Fee (Per User) for the NYSE American Integrated Feed is $10, and the monthly Non-Professional User Fee (Per User) for the NYSE American Integrated Feed is $2.[69]

Non-Display Use Fees. The Exchange believes the proposed Non-Display Use fees are reasonable, because they reflect the value of the data to the data recipients in their profit-generating activities and do not impose the burden of counting non-display devices.

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67 See NYSE American LLC Equities Proprietary Market Data Fees at https://www.nyse.com/publicdocs/nyse/data/NYSE_American_Equities_Market_Data_Fee_Schedule.pdf.

68 See Section 119(a) of Nasdaq BX Equity 7 Pricing Schedule.

69 See NYSE American LLC Equities Proprietary Market Data Fees at https://www.nyse.com/publicdocs/nyse/data/NYSE_American_Equities_Market_Data_Fee_Schedule.pdf.

The Exchange believes that the proposed Non-Display Use fees reflect the significant value of the non-display data use to data recipients, which purchase such data on an entirely voluntary basis. Non-display data can be used by data recipients for a wide variety of profit-generating purposes, including proprietary and agency trading and smart order routing, as well as by data recipients that operate order matching and execution platforms that compete directly with the Exchange for order flow. The data also can be used for a variety of non-trading purposes that indirectly support trading, such as risk management and compliance. Although some of these non-trading uses do not directly generate revenues, they can nonetheless substantially reduce a recipient's costs by automating such functions so that they can be carried out in a more efficient and accurate manner and reduce errors and labor costs, thereby benefiting recipients. The Exchange believes that charging for non-trading uses is reasonable because data recipients can derive substantial value from such uses, for example, by automating tasks so that can be performed more quickly and accurately and less expensively than if they were performed manually.

Previously, the non-display use data pricing policies of many exchanges required customers to count, and the exchanges to audit the count of, the number of non-display devices used by a customer. As non-display use grew more prevalent and varied, however, exchanges received an increasing number of complaints about the impracticality and administrative burden associated with that approach. In response, the Exchange and its affiliated exchanges developed a non-display use pricing structure that does not require non-display devices to be counted or those counts to be audited, and instead looks merely at the three following categories of potential use of non-display data: use of the data on the customer's own behalf (Category 1), use on behalf of clients (Category 2), and use to internally match buy and sell orders within an organization (Category 3).

The Exchange believes that it is reasonable to segment the fee for non-display use into these three categories. As noted above, the uses to which customers can put the NYSE National Integrated Feed are numerous and varied, and the Exchange believes that charging separate fees for these separate categories of use is reasonable because it reflects the actual value the customer derives from the data, based upon how many categories of use the customer makes of the data. Segmenting the fees for non-display data in this way avoids the unreasonable result of customers that make only limited non-display use of the data paying the same fees as customers that use the data for numerous different revenue-generating and cost-saving purposes.

The Exchange believes that the proposed fees of $5,000 per month for each of Categories 1, 2, and 3 is reasonable. These fees are comparable to the NYSE American Integrated Feed fees for non-display use for the different categories of

use, which is also $5,000 per category.[70] The Exchange believes that the proposed fees directly and appropriately reflect the significant value of using non-display data in a wide range of computer-automated functions relating to both trading and non-trading activities and that the number and range of these functions continue to grow through innovation and technology developments.

The Exchange also believes that, regarding Category 3 fees, it is reasonable to charge $5,000 per month for each trading platform on which the data recipient uses the Non-Display data, because such use of the data is directly in competition with the Exchange and the Exchange should be permitted to recoup some of its lost trading revenue by charging for the data that makes such competition possible. The Exchange believes that it is reasonable to cap such fees for Category 3 use at $15,000 per month per data recipient, because a higher monthly fee may potentially dissuade competitors from buying the NYSE National Integrated Feed for use by their trading platforms.

The proposed Non-Display Use fees for the NYSE National Integrated Feed are also reasonable because they take into account the extra value of receiving the data for Non-Display Use on an integrated basis. The Exchange believes that the proposed fees directly and appropriately reflect the significant value of using the NYSE National Integrated Feed on a non-display basis in a wide range of computer-automated functions relating to both trading and non-trading activities and that the number and range of these functions continue to grow through innovation and technology developments.[71]

Non-Display Use Declaration Late Fee. The Exchange believes that it is reasonable to require annual submissions of the Non-Display Use Declaration so that the Exchange will have current and accurate information about the use of the NYSE National Integrated Feed and can correctly assess fees for the uses of the NYSE National Integrated Feed. Requiring annual submissions of such declarations is reasonable because it also allows users to re-assess their own usage each year.

The Exchange believes that it is reasonable to impose a late fee in connection with the submission of the Non-Display Use Declaration. In order to correctly assess

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70 See id.

71 See also Exchange Act Release No. 69157, March 18, 2013, 78 FR 17946, 17949 (March 25, 2013) (SR-CTA/CQ-2013-01) ("[D]ata feeds have become more valuable, as recipients now use them to perform a far larger array of non-display functions. Some firms even base their business models on the incorporation of data feeds into black boxes and application programming interfaces that apply trading algorithms to the data, but that do not require widespread data access by the firm's employees. As a result, these firms pay little for data usage beyond access fees, yet their data access and usage is critical to their businesses.").

fees for the non-display use of the NYSE National Integrated Feed, the Exchange needs to have current and accurate information about the use of the NYSE National Integrated Feed. The failure of data recipients to submit the Non-Display Use Declaration on time leads to potentially incorrect billing and administrative burdens, including tracking and obtaining late Non-Display Use Declarations and correcting and following up on payments owed in connection with late Non-Display Use Declarations. The purpose of the late fee is to incent data recipients to submit the Non-Display Use Declaration promptly to avoid the administrative burdens associated with the late submission of Non-Display Use Declarations.

Multiple Data Feed Fee. The Exchange believes that it is reasonable to require data recipients to pay a modest additional fee for taking a data feed for a market data product in more than two locations, because such data recipients can derive substantial value from being able to consume the product in as many locations as they want. In addition, there are administrative burdens associated with tracking each location at which a data recipient receives the product. The Multiple Data Feed Fee is designed to encourage data recipients to better manage their requests for additional data feeds and to monitor their usage of data feeds. The proposed fee is designed to apply to data feeds received in more than two locations so that each data recipient can have one primary and one backup data location before having to pay a multiple data feed fee.

Fee Waiver for Federal Agencies. The Exchange believes the proposal to not charge the access fees, display fees for professional users, and non-display fees associated with its proprietary market data products to customers that are Federal agencies is reasonable because it is designed to facilitate federal government regulation without giving an undue advantage to one set of commercial users over another. The Exchange believes that it is reasonable to assess no fees to Federal agencies that subscribe to the Exchange's proprietary market data products because Federal agencies do not use the Exchange's proprietary market data for commercial gain, but only for regulatory purposes.

One-Month Free Trial. The Exchange believes the proposal to provide the NYSE National Integrated Free to new customers free-of-charge for their first subscription month is reasonable because it would allow vendors and subscribers to become familiar with the feed and determine whether it suits their needs without incurring fees. Making a new market data product available for free for a trial period is consistent with offerings of other exchanges. For example, Nasdaq BX offers new subscribers of BX TotalView a 30-day waiver of user fees.[72]

For all of the foregoing reasons, the Exchange believes that the proposed fees for the NYSE National Integrated Fee are reasonable.

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[72] See Section 123(a)(4) of Nasdaq BX's Equity 7 Pricing Schedule.

The Proposed Fees Are Equitably Allocated

The Exchange believes the proposed fees for the NYSE National Integrated Feed are allocated fairly and equitable among the various categories of users of the feed, and any differences among categories of users are justified.

Overall. The Exchange believes that the proposed fees are equitably allocated because they will apply to all data recipients that choose to subscribe to the NYSE National Integrated Feed. Any subscriber or vendor that chooses to subscribe to the NYSE National Integrated Feed is subject to the same Fee Schedule, regardless of what type of business they operate or the use they plan to make of the data feed. Subscribers and vendors may choose to continue to receive some or all of the data on the NYSE National Integrated Feed through the existing separate feeds for free, or they can choose to pay for the NYSE National Integrated Feed in order to receive integrated data, or they or they can choose a combination of the two approaches, thereby allowing each vendor or subscriber to choose the best business solution for itself.

Access Fee. The Exchange believes the proposed monthly Access Fee of $2,500 for the NYSE National Integrated Feed is equitably allocated because it would be charged on an equal basis to all data recipients that receive a data feed of the NYSE National Integrated Feed, regardless of what type of business they operate or the use they plan to make of the data feed.

Redistribution Fees. The Exchange believes the proposed monthly fee of $1,500 for redistributing the NYSE National Integrated Feed is equitably allocated because it would be charged on an equal basis to those vendors that choose to redistribute the feed.

User Fees. The Exchange believes that the fee structure differentiating Professional User fees ($10 per month per user) from Non-Professional User fees ($1 per month per user) for display device access to the NYSE National Integrated Feed is equitable. This structure has long been used by the Exchange to reduce the price of data to Non-Professional Users and make it more broadly available.[73] Offering the NYSE National Integrated Feed to Non-Professional Users with the same data as is available to Professional Users results in greater equity among data recipients. These user fees would be charged uniformly to all

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[73] See, e.g., Securities Exchange Act Release No. 59544 (March 9, 2009), 74 FR 11162 (March 16, 2009) (SR-NYSE-2008-131) (establishing the $15 Non-Professional User Fee (Per User) for NYSE OpenBook); Securities Exchange Act Release No. 20002, File No. S7-433 (July 22, 1983), 48 FR 34552 (July 29, 1983) (establishing Non-Professional fees for CTA data); NASDAQ BX Equity 7 Pricing Schedule, Section 123.

display devices that have access to the NYSE National Integrated Feed.

Non-Display Use Fees. The Exchange believes the proposed Non-Display Use fees are equitably allocated because they would require subscribers to pay fees only for the uses they actually make of the data. As noted above, non-display data can be used by data recipients for a wide variety of profit-generating purposes (including trading, risk management, and compliance) as well as purposes that do not directly generate revenues but nonetheless substantially reduce the recipient's costs by automating certain functions. The Exchange believes that it is equitable to charge non-display data subscribers a $5,000 fee for each category of use they make of such data—namely, using the data on their own behalf (Category 1), on behalf of their clients (Category 2), and to internally match buy and sell orders within an organization (Category 3)—because this fee structure results in subscribers with greater uses of the data paying higher fees, and subscribers with fewer uses of the data paying lower fees. This segmented fee structure is also equitable because no subscriber of non-display data would be charged a fee for a category of use in which it did not actually engage.

The Exchange also believes that, regarding Category 3 fees, it is equitable to charge $5,000 per month for each trading platform on which the data recipient uses the Non-Display data, because such use of the data is directly in competition with the Exchange and the Exchange should be permitted to recoup some of its lost trading revenue by charging for the data that makes such competition possible. The Exchange believes that it is equitable to cap such fees for Category 3 use at $15,000 per month per data recipient, because a higher monthly fee may potentially dissuade competitors from buying the NYSE National Integrated Feed for use by their trading platforms.

Non-Display Use Declaration Late Fee. The Exchange believes that the proposed fee of $1,000 per month for a late Non-Display Use Declaration is equitably allocated because it applies to any data recipient that pays an Access Fee for the NYSE National Integrated Feed but has failed to complete and submit a Non-Display Use Declaration. In addition, the Exchange believes that it is equitable to charge a late fee to subscribers who fail to timely submit their Non-Display Use Declarations because their failure to do so leads to potentially incorrect billing and administrative burdens on the part of the Exchange. The Exchange believes it is equitable to defray these administrative costs by imposing a late fee only on subscribers' whose declarations were late, as opposed to all subscribers.

Multiple Data Feed Fee. The Exchange believes that the $200 per month per location fee to data recipients taking the NYSE National Integrated Feed in more than two locations is equitable because it would apply to all such customers, regardless of what type of business they operate or the use they make of the data feed. In addition, the Exchange believes that it is equitable to charge a fee to subscribers for taking a data feed in more than two locations because there are administrative burdens on the part of the Exchange associated with tracking each

location at which a data recipient receives the product. The Exchange believes that it is equitable for it to defray these administrative costs by imposing a modest fee only on subscribers who seek to take the feed in more than two locations, as opposed to all subscribers.

Fee Waiver for Federal Agencies. The Exchange believes that the proposal to not charge the access fees, display fees for professional users, and non-display fees associated with its proprietary market data products to customers that are Federal agencies is equitable because it is designed to facilitate federal government regulation without giving an undue advantage to one set of commercial users over another. The Exchange believes that it is equitable to waive fees for Federal agencies that subscribe to the Exchange's proprietary market data products because Federal agencies do not use the Exchange's proprietary market data for commercial gain, but only for regulatory purposes.

One-Month Free Trial. The Exchange believes the proposal to provide the NYSE National Integrated Feed to new customers free-of-charge for their first subscription month is equitable because it applies to any first-time subscriber, regardless of the use they plan to make of the feed. As proposed, any first-time subscriber of the NYSE National Integrated Feed would not be charged the Access Fee, Non-Display Fee, any applicable Professional and Non-Professional User Fee, and Redistribution Fee for one calendar month. The Exchange believes it is equitable to restrict the availability of this one-month free trial to customers that have not previously subscribed to the NYSE National Integrated Feed, since customers who are current or previous subscribers of the feed are already familiar with it and whether it suits their needs.

For all of the foregoing reasons, the Exchange believes that the proposed fees for the NYSE National Integrated Fee are equitably allocated.

The Proposed Fees Are Not Unfairly Discriminatory

The Exchange believes the proposed fees for the NYSE National Integrated Feed are not unfairly discriminatory because any differences in the application of the fees are based on meaningful distinctions between customers, and those meaningful distinctions are not unfairly discriminatory between customers.

Overall. The Exchange believes that the proposed fees are not unfairly discriminatory because they would apply to all data recipients that choose to subscribe to the NYSE National Integrated Feed. Any vendor or subscriber that chooses to subscribe to the NYSE National Integrated Feed is subject to the same Fee Schedule, regardless of what type of business they operate or the use they plan to make of the data feed. Vendors and subscribers may choose to continue to receive some or all of the data on the NYSE National Integrated Feed through the existing separate feeds for free, or they can choose to pay for the NYSE National Integrated Feed in order to receive integrated data, or they or they can choose a

combination of the two approaches, thereby allowing each vendor or subscriber to choose the best business solution for itself.

Access Fee. The Exchange believes the proposed monthly Access Fee of $2,500 for the NYSE National Integrated Feed is not unfairly discriminatory because it would be charged on an equal basis to all data recipients that receive a data feed of the NYSE National Integrated Feed, regardless of what type of business they operate or the use they plan to make of the data feed.

Redistribution Fees. The Exchange believes the proposed monthly fee of $1,500 for redistributing the NYSE National Integrated Feed is not unfairly discriminatory because it would be charged on an equal basis to those vendors that choose to redistribute the feed.

User Fees. The Exchange believes that the fee structure differentiating Professional User fees ($10 per month per user) from Non-Professional User fees ($1 per month per user) for display device access to the NYSE National Integrated Feed is not unfairly discriminatory. This structure has long been used by the Exchange to reduce the price of data to Non-Professional Users and make it more broadly available.[74] Offering the NYSE National Integrated Feed to Non-Professional Users with the same data as is available to Professional Users results in greater equity among data recipients. These user fees would be charged uniformly to all display devices that have access to the NYSE National Integrated Feed.

Non-Display Use Fees. The Exchange believes the proposed Non-Display Use fees are not unfairly discriminatory because they would require subscribers for non-display use to pay fees only for the categories of use they actually make of the data. As noted above, non-display data can be used by data recipients for a wide variety of profit-generating purposes (including trading, risk management, and compliance) as well as purposes that do not directly generate revenues but nonetheless substantially reduce the recipient's costs by automating certain functions. The Exchange believes that it is not unfairly discriminatory to charge non-display data subscribers a $5,000 fee for each category of use they make of such data—namely, using the data on their own behalf (Category 1), on behalf of their clients (Category 2), and to internally match buy and sell orders within an organization (Category 3)—because this fee structure results in subscribers with greater uses for the data paying higher fees, while subscribers with fewer uses of

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74 See e.g., Securities Exchange Act Release No. 59544 (March 9, 2009), 74 FR 11162 (March 16, 2009) (SR-NYSE-2008-131) (establishing the $15 Non-Professional User Fee (Per User) for NYSE OpenBook). See e.g., Securities Exchange Act Release No. 20002, File No. S7-433 (July 22, 1983), 48 FR 34552 (July 29, 1983) (establishing nonprofessional fees for CTA data); NASDAQ BX Equity 7 Pricing Schedule, Section 123.

the data pay lower fees. This segmented fee structure is not unfairly discriminatory because no subscriber of non-display data would be charged a fee for a category of use in which it did not actually engage.

The Exchange also believes that, regarding Category 3 fees, it is not unreasonably discriminatory to charge $5,000 per month for each trading platform on which the data recipient uses the Non-Display data, because such use of the data is directly in competition with the Exchange and the Exchange should be permitted to recoup some of its lost trading revenue by charging for the data that makes such competition possible. The Exchange believes that it is not unreasonably discriminatory to cap such fees for Category 3 use at $15,000 per month per data recipient, because a higher monthly fee may potentially dissuade competitors from buying the NYSE National Integrated Feed for use by their trading platforms.

Non-Display Use Declaration Late Fee. The Exchange believes that the proposed fee of $1,000 per month for a late Non-Display Use Declaration is not unfairly discriminatory because it applies to any data recipient that pays an Access Fee for the NYSE National Integrated Feed but has failed to complete and submit a Non-Display Use Declaration. In addition, the Exchange believes that it is not unfairly discriminatory to charge a late fee to subscribers who fail to timely submit their Non-Display Use Declarations because their failure to do so leads to potentially incorrect billing and administrative burdens on the part of the Exchange. Nor is it unfairly discriminatory for the Exchange to defray these administrative costs by imposing a late fee only on subscribers' whose declarations were late, as opposed to all subscribers.

Multiple Data Feed Fee. The Exchange believes that the $200 per month per location fee to data recipients taking the NYSE National Integrated Feed in more than two locations is not unfairly discriminatory because it would apply to all such customers, regardless of what type of business they operate or the use they make of the data feed. In addition, the Exchange believes that it is not unfairly discriminatory to charge a fee to subscribers for taking a data feed in more than two locations because there are administrative burdens on the part of the Exchange associated with tracking each location at which a data recipient receives the product. The Exchange believes that it is not unfairly discriminatory for it to defray these administrative costs by imposing a modest fee only on subscribers who seek to take the feed in more than two locations, as opposed to all subscribers.

Fee Waiver for Federal Agencies. The Exchange believes that the proposal to not charge the access fees, display fees for professional users, and non-display fees associated with its proprietary market data products to customers that are Federal agencies is not unreasonably discriminatory because it is designed to facilitate federal government regulation without giving an undue advantage to one set of commercial users over another. The Exchange believes that it is not unfairly

discriminatory to waive fees for Federal agencies that subscribe to the Exchange's proprietary market data products because Federal agencies do not use the Exchange's proprietary market data for commercial gain, but only for regulatory purposes.

One-Month Free Trial. The Exchange believes the proposal to provide the NYSE National Integrated Feed to new customers free-of-charge for their first subscription month is not unfairly discriminatory because it applies to any first-time subscriber, regardless of the use they plan to make of the feed. As proposed, any first-time subscriber of the NYSE National Integrated Feed would not be charged the Access Fee, Non-Display Fee, any applicable Professional and Non-Professional User Fee, and Redistribution Fee for one calendar month. The Exchange believes it is not unfairly discriminatory to restrict the availability of this one-month free trial to customers that have not previously subscribed to the NYSE National Integrated Feed, since customers who are current or previous subscribers of the feed are already familiar with it and whether it suits their needs.

For all of the foregoing reasons, the Exchange believes that the proposed fees for the NYSE National Integrated Fee are not unfairly discriminatory.

4. Self-Regulatory Organization's Statement on Burden on Competition

The Exchange does not believe that the proposed fees will impose any burden on competition that is not necessary or appropriate in furtherance of the purposes of the Act.

Intramarket Competition. The Exchange believes that the proposed fees do not put any market participants at a relative disadvantage compared to other market participants. As noted above, the proposed fee schedule would apply to all subscribers of the NYSE National Integrated Feed, and customers may not only choose whether to subscribe to the feed at all, but may tailor their subscriptions by choosing particular uses of the feed but not others (*e.g.*, Category 1 only versus all three categories; display device access only versus non-display use).

The Exchange also believes that the proposed fees neither favor nor penalize one or more categories of market participants in a manner that would impose an undue market on competition. As shown above, to the extent that particular proposed fees apply to only a subset of subscribers (*e.g.*, Category 2 fees apply only to those making non-display use on behalf of clients; late fees apply only to customers who fail to timely submit their declarations), those distinctions are not unfairly discriminatory and do unfairly burden one set of customers over another. To the contrary, by tailoring the proposed fees in this manner, the Exchange believes that it has eliminated the potential burden on competition that might result from unfairly asking subscribers to pay fees for services they did not use, or late fees they did not actually incur.

Intermarket Competition. The Exchange believes that the proposed fees do not impose a burden on competition or on other SROs that is not necessary or appropriate. As demonstrated above and in Professor Rysman's attached paper, exchanges are platforms for market data and trading. In setting the proposed fees, the Exchange was constrained by the availability of numerous substitute platforms also offering market data products and trading, and low barriers to entry mean new exchange platforms are frequently introduced. The fact that exchanges are platforms ensures that no exchange can make pricing decisions for one side of its platform without considering, and being constrained by, the effects that price will have on the other side of the platform. In setting fees for the NYSE National Integrated Feed, the Exchange is constrained by the fact that, if its pricing across the platform is unattractive to customers, customers will have its pick of an increasing number of alternative platforms to use instead of the Exchange. Given this intense competition between platforms, no one exchange's market data fees can impose an unnecessary burden on competition, and the Exchange's proposed fees do not do so here.

In addition, the Exchange believes that the proposed fees do not impose a burden on competition or on other exchanges that is not necessary or appropriate because of the availability of numerous substitute market data products. Many other exchanges offer proprietary data feeds like the NYSE National Integrated Feed, supplying depth of book order data, last sale data, security status updates, stock summary messages, and the exchange's best bid and offer at any given time, on a real-time basis. Because market data users can find suitable substitute feeds, an exchange that overprices its market data products stands a high risk that users may substitute another platform, in which case the platform would stand to lose both market data and trading fees. These competitive pressures ensure that no one exchange's market data fees can impose an unnecessary burden on competition, and the Exchange's proposed fees do not do so here.

5. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants or Others

The Exchange has neither solicited nor received written comments on the proposed rule change.

6. Extension of Time Period for Commission Action

Not applicable.

7. Basis for Summary Effectiveness Pursuant to Section 19(b)(3) or for Accelerated Effectiveness Pursuant to Section 19(b)(2)

The foregoing rule change is effective upon filing pursuant to Section

19(b)(3)(A)[75] of the Act and subparagraph (f)(2) of Rule 19b-4[76] thereunder because it establishes a due, fee, or other charge imposed by the Exchange. At any time within 60 days of the filing of such proposed rule change, the Commission summarily may temporarily suspend such rule change if it appears to the Commission that such action is necessary or appropriate in the public interest, for the protection of investors, or otherwise in furtherance of the purposes of the Act. If the Commission takes such action, the Commission shall institute proceedings under Section 19(b)(2)(B)[77] of the Act to determine whether the proposed rule change should be approved or disapproved.

8. Proposed Rule Change Based on Rules of Another Self-Regulatory Organization or of the Commission

Not applicable.

9. Security-Based Swap Submissions Filed Pursuant to Section 3C of the Act

Not applicable.

10. Advance Notices Filed Pursuant to Section 806(e) of the Payment, Clearing and Settlement Supervision Act

Not applicable.

11. Exhibits

Exhibit 1 – Form of Notice of Proposed Rule Change for Publication in the Federal Register

Exhibit 3A – Charles M. Jones, Understanding the Market for U.S. Equity Market Data, August 31, 2018

Exhibit 3B – Marc Rysman, Stock Exchanges as Platforms for Data and Trading, December 2, 2019

Exhibit 5 – Proposed Rule Change

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75 15 U.S.C. 78s(b)(3)(A).

76 17 CFR 240.19b-4(f)(2).

77 15 U.S.C. 78s(b)(2)(B).

EXHIBIT 1

SECURITIES AND EXCHANGE COMMISSION
(Release No. 34- ; File No. SR-NYSENAT-2020-05)

[Date]

Self-Regulatory Organizations; NYSE National, Inc.; Notice of Filing and Immediate Effectiveness of Proposed Rule Change to Establish Fees for the NYSE National Integrated Feed

Pursuant to Section 19(b)(1)[1] of the Securities Exchange Act of 1934 (the "Act")[2] and Rule 19b-4 thereunder,[3] notice is hereby given that, on February 3, 2020, NYSE National, Inc. ("NYSE National" or the "Exchange") filed with the Securities and Exchange Commission (the "Commission") the proposed rule change as described in Items I, II, and III below, which Items have been prepared by the self-regulatory organization. The Commission is publishing this notice to solicit comments on the proposed rule change from interested persons.

I. Self-Regulatory Organization's Statement of the Terms of Substance of the Proposed Rule Change

The Exchange proposes to establish fees for the NYSE National Integrated Feed. The proposed rule change is available on the Exchange's website at www.nyse.com, at the principal office of the Exchange, and at the Commission's Public Reference Room.

II. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

In its filing with the Commission, the self-regulatory organization included statements concerning the purpose of, and basis for, the proposed rule change and

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1 15 U.S.C.78s(b)(1).

2 15 U.S.C. 78a.

3 17 CFR 240.19b-4.

discussed any comments it received on the proposed rule change. The text of those statements may be examined at the places specified in Item IV below. The Exchange has prepared summaries, set forth in sections A, B, and C below, of the most significant parts of such statements.

A. Self-Regulatory Organization's Statement of the Purpose of, and the Statutory Basis for, the Proposed Rule Change

1. Purpose

The Exchange proposes to adopt the NYSE National Proprietary Market Data Fee Schedule ("Fee Schedule") and establish the fees for the NYSE National Integrated Feed that would be effective February 3, 2020.[4]

In summary, the NYSE National Integrated Feed is a NYSE National-only market data feed that provides vendors and subscribers on a real-time basis with a unified view of events, in sequence, as they appear on the NYSE National matching engine. The NYSE National Integrated Feed includes depth-of-book order data, last sale data, security status updates (*e.g.*, trade corrections and trading halts), and stock summary messages. Because the NYSE National Integrated Feed has a unified view of events, in sequence, it also includes information about the Exchange's best bid or offer at any given time.

The Exchange currently does not charge any fees for the NYSE National Integrated Feed market data product.[5]

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4 The proposed rule change establishing the NYSE National Integrated Feed was immediately effective on May 31, 2018. See Securities Exchange Act Release No. 83350 (May 31, 2018), 83 FR 26332 (June 6, 2018) (SR-NYSENAT-2018-09) ("NYSE National Integrated Feed Product Filing"). The NYSE National Integrated Feed Product Filing also established the NYSE National BBO and NYSE National Trades market data feeds.

5 The Exchange also currently does not charge any fees for the NYSE National BBO and NYSE National Trades market data products and proposes to adopt rule

The Exchange initially filed to introduce fees for the NYSE National Integrated Feed on December 4, 2019 (the "Initial Proposal").[6] Pursuant to the Initial Proposal, the fees would not be implemented until February 3, 2020. The Initial Proposal was published in the Federal Register and two comment letters were submitted in response. The Initial Proposal was temporarily suspended pursuant to a Suspension Order (the "Initial Suspension Order").[7] The Initial Suspension Order also instituted proceedings to determine whether to approve or disapprove the Initial Proposal.

Background

The Commission has repeatedly expressed its preference for competition over regulatory intervention in determining prices, products, and services in the securities markets. In Regulation NMS, the Commission highlighted the importance of market forces in determining prices and SRO revenues, and also recognized that current regulation of the market system "has been remarkably successful in promoting market competition in its broader forms that are most important to investors and listed companies."[8]

As the Commission itself recognized, the market for trading services in NMS

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text on the Fee Schedule to reflect that there are no fees charged for NYSE National BBO and NYSE National Trades market data products.

6 See Securities Exchange Act Release No. 87797 (December 18, 2019), 84 FR 71025 (December 26, 2019).

7 See Securities Exchange Act Release No. 88109 (January 31, 2020) (SR-NYSENAT-2019-13) ("Initial Suspension Order").

8 See Securities Exchange Act Release No. 51808 (June 9, 2005), 70 FR 37495, 37499 (June 29, 2005) (S7-10-04) (Final Rule) ("Regulation NMS Adopting Release").

stocks has become "more fragmented and competitive."[9] Equity trading is currently dispersed across 13 exchanges,[10] 31 alternative trading systems,[11] and numerous broker-dealer internalizers and wholesalers, all competing for order flow. Based on publicly-available information, no single exchange has more than 18% market share (whether including or excluding auction volume).[12]

The recent growth of NYSE National's market share demonstrates this competitive marketplace. Between February 2017 and mid-May 2018, NYSE National was non-operational, and therefore had 0% of market share. On May 21, 2018, NYSE National re-launched on its current platform as an affiliated exchange of New York Stock Exchange, LLC ("NYSE"), NYSE Arca, Inc. ("NYSE Arca, Inc."), and NYSE American LLC ("NYSE American"). Within four months, NYSE National began regularly executing 1% of consolidated trading volume. By August 2019, NYSE National began executing approximately 1.5% of consolidated trading volume on a more regular basis. By October 2019, the Exchange had 1.9% market share of executed volume of equity trades.[13]

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9 See Securities Exchange Act Release No. 51808, 84 FR 5202, 5253 (February 20, 2019) (File No. S7-05-18) (Transaction Fee Pilot for NMS Stocks Final Rule) ("Transaction Fee Pilot").

10 See Cboe Global Markets, U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/. See generally https://www.sec.gov/fast-answers/divisionsmarketregmrexchangesshtml.html.

11 *See* FINRA ATS Transparency Data, *available at* https://otctransparency.finra.org/otctransparency/AtsIssueData. A list of alternative trading systems registered with the Commission is *available at* https://www.sec.gov/foia/docs/atslist.htm.

12 See Cboe Global Markets, U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/.

13 See id.

As NYSE National's transaction market share has increased, so has the value of its market data. For example, in May 2018, when NYSE National re-launched trading operations, the Exchange had 12 customers for its NYSE National Integrated Feed. As NYSE National's market share has increased, the number of subscribers of the NYSE National Integrated Feed has steadily increased and as of November 2019, the Exchange had 57 customers that subscribed to the NYSE National Integrated Feed. In November 2019, customers of the NYSE National Integrated Feed accounted for over 99% of the executed trade volume on the Exchange.

On December 4, 2019, the Exchange filed the Initial Proposal to introduce fees for the NYSE National Integrated Feed, effective February 3, 2020. The Exchange explained in the Initial Proposal that it filed its proposed rule change early, in December 2019, because the Exchange believed it was appropriate to provide market participants with early notice of the proposed changes, so that they could begin determining whether the value of the NYSE National Integrated Feed to their businesses is such that they would choose to continue using the product once it was no longer provided for free. The Exchange explained that it believes that market participants should have the opportunity to begin such determinations before the Exchange begins charging fees.

Since the date of the Initial Proposal and before the proposed fees went into effect, five subscribers to the NYSE National Integrated Feed product (i.e., nearly nine percent of the prior subscriber base) have canceled their subscriptions. In each instance, the subscriber told the Exchange that its reason for cancelling its subscription was the imminent imposition of fees. A sixth customer informed the Exchange that if the Exchange is permitted to impose the fees, the customer will cancel its subscription to the

NYSE National Integrated Feed product and instead subscribe to the NYSE National BBO feed, which will remain available for free. These six lost subscribers constitute 10.5 percent of the prior subscriber base.

Proposed NYSE National Integrated Feed Fees

To reflect the value of NYSE National's market data, as correlated to the Exchange's increased transaction volume market share, the Exchange proposes to establish the fees listed below for the NYSE National Integrated Feed, operative on February 3, 2020. The Exchange proposes to charge fees for the same categories of market data use as its affiliated exchanges (namely, NYSE, NYSE Arca, and NYSE American) currently charge. The Exchange believes that adopting the same fee structure as its affiliated exchanges would reduce administrative burdens on NYSE National market data subscribers that also currently subscribe to market data feeds from NYSE, NYSE Arca, or NYSE American.

1. Access Fee. For the receipt of access to the NYSE National Integrated Feed, the Exchange proposes to charge $2,500 per month. This proposed Access Fee would be charged to any data recipient that receives a data feed of the NYSE National Integrated Feed. Data recipients that only use display devices to view NYSE National Integrated Feed market data and do not separately receive a data feed would not be charged an Access Fee. The proposed Access Fee is charged only once per firm.

2. Redistribution Fee. For redistribution of the NYSE National Integrated Feed, the Exchange proposes to establish a fee of $1,500 per month. The proposed Redistribution Fee would be charged to any Redistributors of the NYSE

National Integrated Feed, which is defined to mean a vendor or any person that provides a real-time NYSE National market data product externally to a data recipient that is not its affiliate or wholly-owned subsidiary, or to any system that an external data recipient uses, irrespective of the means of transmission or access. The proposed Redistribution Fee is charged only once per Redistributor account.

3. User Fees. The Exchange proposes to charge a Professional User Fee (Per User) of $10 per month and a Non-Professional User Fee (Per User) of $1 per month. These user fees would apply to each display device that has access to the NYSE National Integrated Feed.

4. Non-Display Use Fees. The Exchange proposes to establish non-display fees for the NYSE National Integrated Feed that are based on the non-display use categories charged by NYSE, NYSE Arca, NYSE American, the Consolidated Tape Association, and the UTP Plan for non-display use.[14] Non-display use

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[14] See Endnote 1 to the NYSE Proprietary Market Data Fees, available here: https://www.nyse.com/publicdocs/nyse/data/NYSE_Market_Data_Fee_Schedule.pdf; Endnote 1 to the NYSE Arca Equites Proprietary Market Data Fees, available here: https://www.nyse.com/publicdocs/nyse/data/NYSE_Arca_Equities_Fee_Schedule.pdf; Endnote 1 to the NYSE American LLC Equities Proprietary Market Data Fees, available here: https://www.nyse.com/publicdocs/nyse/data/NYSE_American_Equities_Market_Data_Fee_Schedule.pdf; Endnote 8 to the Schedule of Market Data Charges for the Consolidated Tape Association, available here: https://www.ctaplan.com/publicdocs/ctaplan/notifications/trader-update/Schedule%20Of%20Market%20Data%20Charges%20-%20January%201,%202015.pdf; and Non-Display Usage Fees as set forth in the UTP Plan Fee Schedule and Non-Display Policy, available here: http://utpplan.com/DOC/Datapolicies.pdf. See, e.g., Securities Exchange Act Release Nos. 69278 (April 2, 2013), 78 FR 20973 (April 8, 2013) (SR-NYSE-2013-25) and 72923 (Aug. 26, 2014), 79 FR 52079 (Sept. 2, 2014) (SR-NYSE-

would mean accessing, processing, or consuming the NYSE National Integrated Feed, delivered directly or through a Redistributor, for a purpose other than in support of a data recipient's display or further internal or external redistribution ("Non-Display Use"). Non-Display Use would include trading uses such as high frequency or algorithmic trading as well as any trading in any asset class, automated order or quote generation and/or order pegging, price referencing for algorithmic trading or smart order routing, operations control programs, investment analysis, order verification, surveillance programs, risk management, compliance, and portfolio management.

The Exchange proposes three categories of Non-Display Use of the NYSE National Integrated Feed and related fees applicable to each category. One, two, or three categories of Non-Display Use may apply to a data recipient.

- As proposed, the Category 1 Fee would be $5,000 per month and would apply when a data recipient's Non-Display Use of the NYSE National Integrated Feed is on its own behalf, not on behalf of its clients.
- As proposed, Category 2 Fees would be $5,000 per month and would apply to a data recipient's Non-Display Use of the NYSE National Integrated Feed on behalf of its clients.
- As proposed, Category 3 Fees would be $5,000 per month and would apply to a data recipient's Non-Display Use of the NYSE National Integrated Feed for the purpose of internally matching buy and sell orders within an organization, including matching customer orders for a data

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2014-43).

recipient's own behalf and/or on behalf of its clients. This category would apply to Non-Display Use in trading platforms, such as, but not restricted to, alternative trading systems ("ATSs"), broker crossing networks, broker crossing systems not filed as ATSs, dark pools, multilateral trading facilities, exchanges and systematic internalization systems. A data recipient will be charged $5,000 per month for each platform on which it uses the Non-Display data internally to match buy and sell orders, up to a cap of $15,000 per month; even if the data recipient uses the NYSE National Integrated Feed for more than three platforms, it will not pay more than $15,000 for such Category 3 use per month.

The Exchange proposes to adopt the description of the three non-display use categories in the Fee Schedule in proposed endnote 1 on the Fee Schedule.[15] Data recipients that receive the NYSE National Integrated Feed for Non-Display Use would be required to complete and submit a Non-Display Use Declaration before they would be authorized to receive the feed. A firm subject to Category 3 Fees would be required to identify each platform that uses the NYSE National Integrated Feed for a Category 3 Non-Display Use basis, such as ATSs and broker crossing systems not registered as ATSs, as part of the Non-Display Use Declaration.

5. Non-Display Use Declaration Late Fee. Data recipients that receive the NYSE National Integrated Feed for Non-Display Use would be required to complete and submit a Non-Display Use Declaration before they would be

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15 See Fee Schedule, proposed endnote 1.

authorized to receive the feed. NYSE National Integrated Feed data recipients would be required to submit, by December 31 of each year, the Non-Display Use Declaration. The requirement to submit a Non-Display Use Declaration would apply to all real-time NYSE National data feed product recipients. The Exchange proposes to charge a Non-Display Use Declaration Late Fee of $1,000 per month to any data recipient that pays an Access Fee for the NYSE National Integrated Feed that has failed to timely complete and submit a Non-Display Use Declaration. Specifically, with respect to the Non-Display Use Declaration due by December 31 of each year, the Non-Display Use Declaration Late Fee would apply to data recipients that fail to complete and submit the Non-Display Use Declaration by the December 31 due date, and would apply beginning January 1 and for each month thereafter until the data recipient has completed and submitted the annual Non-Display Use Declaration.

The proposed Non-Display Use Declaration Late Fee would be set forth in endnote 2 on the Fee Schedule. Proposed endnote 2 would provide that a data recipient that pays an Access Fee and that fails to timely complete and submit a Non-Display Use Declaration must pay the Non-Display Use Declaration Late Fee.[16] Proposed endnote 2 to the Fee Schedule would also provide that the annual Non-Display Use Declaration would be due by December 31 of each year. Finally, proposed endnote 2 would provide that the Non-Display Use Declaration Late Fee would apply to data recipients that fail to complete and submit the annual Non-Display Use Declaration by the December 31 due date, and would

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16 See Fee Schedule, proposed endnote 2.

apply beginning January 1 of each year and for each month thereafter until the data recipient has completed and submitted the annual Non-Display Use Declaration.

In addition, if a data recipient's use of the NYSE National Integrated Feed data changes at any time after the data recipient submits a Non-Display Use Declaration, the data recipient must inform the Exchange of the change by completing and submitting at the time of the change an updated declaration reflecting the change of use.

6. Multiple Data Feed Fee. The Exchange proposes to establish a monthly fee, the "Multiple Data Feed Fee," that would apply to data recipients that take a data feed for a market data product in more than two locations. Data recipients taking the NYSE National Integrated Feed in more than two locations would be charged $200 per additional location per month. No new reporting would be required.[17]

7. Fee Waiver for Federal Agencies. The Exchange proposes to adopt rule text in the Fee Schedule with respect to Federal agencies that subscribe to the NYSE National Integrated Feed. The proposed rule would provide that market data fees would not apply to any Federal agency for their use of NYSE National real-time proprietary market data products. The term "Federal agency" as used in the Fee Schedule would include all Federal agencies subject to the Federal

[17] Data vendors currently report a unique Vendor Account Number for each location at which they provide a data feed to a data recipient. The Exchange considers each Vendor Account Number a location. For example, if a data recipient has five Vendor Account Numbers, representing five locations, for the receipt of the NYSE National Integrated Feed product, that data recipient will pay the Multiple Data Feed fee with respect to three of the five locations.

Acquisition Regulation (FAR),[18] as well as any Federal agency not subject to FAR that has promulgated its own procurement rules.[19] More specifically, the Exchange proposes to specify that access fees, professional user fees and non-display fees would not apply to Federal agencies for those products to which those fees apply.[20] The proposed fee waiver is designed to allow the Exchange to provide Federal agencies with NYSE National real-time proprietary market data products at no cost in support of Federal agencies' regulatory responsibilities. With the adoption of the proposed fee waiver, the Exchange is not waiving any other contractual rights, and all Federal agencies that subscribe to NYSE National real-time proprietary market data products will be required to execute the appropriate subscriber agreement, which includes, among other things, provisions against the redistribution of data.

8. One-Month Free Trial. Finally, the Exchange proposes a one-month free trial for any firm that subscribes to a particular NYSE National market data product for the first time. As proposed, a first-time subscriber would be any firm that has not previously subscribed to a particular NYSE National market data

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18 FAR is the principal set of rules governing the process by which the U.S. federal government purchases goods and services.

19 See 48 CFR 2.101. FAR defines "Federal agency" as "any executive agency or any independent establishment in the legislative or judicial branch of the Government (except the Senate, the House of Representatives, the Architect of the Capitol, and any activities under the Architect's direction)." "Executive agency" is defined as "an executive department, a military department, or any independent establishment within the meaning of 5 U.S.C. 101, 102, and 104(1), respectively, and any wholly owned Government corporation within the meaning of 31 U.S.C. 9101."

20 Currently, pursuant to this proposed rule change, the NYSE National Integrated Feed is the only product to which fees would apply.

product listed on the Fee Schedule. As proposed, a first-time subscriber of a particular NYSE National market data product would not be charged the Access Fee, Non-Display Fee, any applicable Professional and Non-Professional User Fee, and Redistribution Fee for that product for one calendar month. For example, a firm that currently subscribes to NYSE National BBO for free would be eligible to receive a free one-month trial of the NYSE National Integrated Feed, whether in a display-only format or for non-display use. On the other hand, if a firm pays an Access Fee and receives the NYSE National Integrated Feed for non-display use, it would not be eligible to receive a free one-month trial of the NYSE National Integrated Feed in a display-only format (or vice-versa). The proposed free trial would be for the first full calendar month following the date a subscriber is approved to receive trial access to the particular NYSE National market data product. The Exchange would provide the one-month free trial for each particular product to each subscriber once.

The Exchange believes that providing a one-month free trial to NYSE National market data products listed on the Fee Schedule would enable potential subscribers to determine whether a particular NYSE National market data product provides value to their business models before fully committing to expend development and implementation costs related to the receipt of that product, and is intended to encourage increased use of the Exchange's market data products by defraying some of the development and implementation costs subscribers would ordinarily have to expend before using a product.

Application of Proposed Fees

The Exchange is not required to make the NYSE National Integrated Feed available or to offer any specific pricing alternatives to any customers, nor is any firm required to purchase the NYSE National Integrated Feed. Firms that choose to purchase the NYSE National Integrated Feed do so for the primary goals of using it to increase their revenues, reduce their expenses, and in some instances to compete directly with the Exchange (including for order flow). Those firms are able to determine for themselves whether or not the NYSE National Integrated Feed or any other similar products are attractively priced.

The Exchange produces and disseminates the NYSE National Integrated Feed as part of its market data offerings to support its transaction execution services. Since May 2018, when NYSE National relaunched trading, the Exchange has observed a direct correlation between the steady increase of subscribers to the NYSE National Integrated Feed and the increase in the Exchange's transaction market share volume over the same period.

Based on the reported usage of the NYSE National Integrated Feed, the Exchange believes that its data subscribers use the order-by-order detail information available in this market data product to make trading decisions that directly benefit the transaction services that the Exchange offers. Specifically, in the period before the Initial Proposal was published, subscribers of the NYSE National Integrated Feed represented firms that provided over 99% of the Exchange's executed transaction volume. More than half of the feed's subscribers overall (*i.e.*, 34 of 57) reported "Category 1" non-display use of the NYSE National Integrated Feed, which means that they used the data for trading on their

own behalf. This figure confirms that a substantial portion of the NYSE National Integrated Feed's subscribers analyzed whether it was in their business interest to use the feed for their own trading, and concluded that it was.

The Exchange determined the level of the fees to charge for the NYSE National Integrated Feed based on the value of the Exchange's transaction services. As noted above, over an 18-month period, NYSE National has grown from 0% to nearly 2% market share of consolidated trading volume. During that same period, the Exchange has had a steady increase in the number of subscribers to the NYSE National Integrated feed.

The proposed fee structure is not novel as it is based on the fee structure currently in place for the NYSE American Integrated Feed.[21] Both NYSE American and NYSE National trade all NMS Stocks. As noted above, in October 2019, NYSE National had 1.9% market share; for that same month, NYSE American had 0.29% market share.[22] Even though NYSE National's market share is several times higher than NYSE American's, the Exchange is proposing fees for the NYSE National Integrated Feed that are based on the existing fee structure and rates that data recipients already pay for the NYSE American Integrated Feed. Specifically, the fees for the NYSE American Integrated Feed—which like the NYSE National Integrated Feed, includes top of book, depth of book, trades, and security status messages—consist of an Access Fee of $2,500

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21 See Securities Exchange Act Release Nos. 76525 (November 25, 2015), 80 FR 75148 (December 1, 2015) (SR-NYSEMKT-2015-95) (Notice of filing and immediate effectiveness of proposed rule change to establish fees for NYSE MKT Integrated Feed), and 76975 (January 26, 2016), 81 FR 5139 (February 1, 2016) (SR-NYSEMKT-2016-11) (Notice of filing and immediate effectiveness of proposed rule change amending the fees for NYSE MKT Integrated Feed to add a Multiple Data Feed Fee).

22 See Cboe Global Markets, U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/.

per month, a Professional User Fee (Per User) of $10 per month, a Non-Professional User Fee (Per User) of $2 per month, Non-Display Fees of $5,000 per month for each of Categories 1, 2 and 3, and a Redistribution Fee of $1,500 per month. NYSE American also charges a Non-Display Use Declaration Late Fee of $1,000 per month and a Multiple Data Feed Fee of $200 per month.[23]

In the Initial Proposal, the Exchange noted that each of the then-current subscribers to the NYSE National Integrated Feed would be impacted by the proposed rule change, and that the scope of the fee impact for each data recipient would depend on that data recipient's use of the data. The Exchange noted that, based on current usage, at least 34 firms would be subject to Category 1 Non-Display Use fees, at least 14 firms would be subject to Category 2 Non-Display Use fees, and at least 10 firms would be subject to Category 3 Non-Display Use fees.

The Exchange further explained that, because the NYSE National Integrated Feed had not been previously been subject to fees, the Exchange did not know the full impact of the proposed fees on current data recipients because subscribers may choose to reduce or eliminate their use of data. The Exchange stated that it anticipated that there might be data recipients of the NYSE National Integrated Feed that subscribed only because it was free and might choose to discontinue using the product once the fees were implemented. The Exchange noted that a data recipient that chooses to discontinue the NYSE National Integrated Feed may also choose to shift order flow away from the Exchange, and that, given the current competitive environment, if data recipients were to both discontinue the

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[23] See NYSE American LLC Equities Proprietary Market Data Fees at https://www.nyse.com/publicdocs/nyse/data/NYSE_American_Equities_Market_Data_Fee_Schedule.pdf.

product and shift order flow away from the Exchange, the Exchange would reevaluate the fees and potentially file a separate proposed rule change to amend its fees. The Exchange explained that in advance of implementing the proposed fees, however, the Exchange could not estimate with precision the impact of the proposed fees on the Exchange's transaction services business or the number of NYSE National Integrated Feed subscribers.

Since the Initial Proposal became publicly known on December 4, 2019, five subscribers to the NYSE National Integrated Feed product have canceled their subscriptions. In each instance, the subscriber told the Exchange that the reason for ending its subscription was the imminent imposition of fees. A sixth customer informed the Exchange that if the Exchange is permitted to impose the fees, the customer will cancel its subscription to the NYSE National Integrated Feed product and instead subscribe to the NYSE National BBO feed, which will remain available for free.

2. Statutory Basis

The Exchange believes that the proposed rule change is consistent with the provisions of Section 6 of the Act,[24] in general, and Sections 6(b)(4) and 6(b)(5) of the Act,[25] in particular, in that it provides an equitable allocation of reasonable fees among users and recipients of the data and is not designed to permit unfair discrimination among customers, issuers, and brokers.

The Proposed Rule Change Is Reasonable

In adopting Regulation NMS, the Commission granted SROs and broker-dealers increased authority and flexibility to offer new and unique market data to the public. The

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24 15 U.S.C. 78f(b).

25 15 U.S.C. 78f(b)(4), (5).

Commission has repeatedly expressed its preference for competition over regulatory intervention in determining prices, products, and services in the securities markets. Specifically, in Regulation NMS, the Commission highlighted the importance of market forces in determining prices and SRO revenues, and also recognized that current regulation of the market system "has been remarkably successful in promoting market competition in its broader forms that are most important to investors and listed companies."[26]

With respect to market data, the decision of the United States Court of Appeals for the District of Columbia Circuit in NetCoalition v. SEC upheld the Commission's reliance on the existence of competitive market mechanisms to evaluate the reasonableness and fairness of fees for proprietary market data:

> In fact, the legislative history indicates that the Congress intended that the market system "evolve through the interplay of competitive forces as unnecessary regulatory restrictions are removed" and that the SEC wield its regulatory power "in those situations where competition may not be sufficient," such as in the creation of a "consolidated transactional reporting system."[27]

The court agreed with the Commission's conclusion that "Congress intended that 'competitive forces should dictate the services and practices that constitute the U.S. national market system for trading equity securities.'"[28]

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26 See Regulation NMS Adopting Release, 70 FR 37495, at 37499.

27 NetCoalition v. SEC, 615 F.3d 525, 535 (D.C. Cir. 2010) ("NetCoalition I") (quoting H.R. Rep. No. 94–229 at 92 (1975), as reprinted in 1975 U.S.C.C.A.N. 323).

28 Id. at 535.

In this competitive marketplace, the Exchange's executed trading volume has grown from 0% market share to nearly 2% market share in less than two years and the Exchange believes that it is reasonable to begin charging fees for the NYSE National Integrated Feed.

1. The Proposed Fees Are Constrained by Significant Competitive Forces

a. Exchange Market Data Is Sold in a Competitive Market

In 2018, Charles M. Jones, the Robert W. Lear Professor of Finance and Economics of the Columbia University School of Business, conducted an analysis of the market for equity market data in the United States. He canvassed the demand for both consolidated and exchange proprietary market data products and the uses to which those products were put by market participants, and reported his conclusions in a paper annexed hereto.[29] Among other things, Professor Jones concluded that:

- "The market [for exchange market data] is characterized by robust competition: exchanges compete with each other in selling proprietary market data products. They also compete with consolidated data feeds and with data provided by alternative trading systems ('ATSs'). Barriers to entry are very low, so existing exchanges must also take into account competition from new entrants, who generally try to build market share [as NYSE National has done with its Integrated Feed] by offering their proprietary market data products for free for some period of time."[30]

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29 See Exhibit 3A, Charles M. Jones, Understanding the Market for U.S. Equity Market Data, August 31, 2018 (hereinafter "Jones Paper").

30 Id. at 2.

- "Although there are regulatory requirements for some market participants to use consolidated data products, there is no requirement for market participants to purchase any proprietary market data product for regulatory purposes."[31]
- "There are a variety of data products, and consumers of equity market data choose among them based on their needs. Like most producers, exchanges offer a variety of market data products at different price levels. Advanced proprietary market data products provide greater value to those who subscribe. As in any other market, each potential subscriber takes the features and prices of available products into account in choosing what market data products to buy based on its business model."[32]
- "Exchange equity market data fees are a small cost for the industry overall: the data demonstrates that total exchange market data revenues are orders of magnitude smaller than (i) broker-dealer commissions, (ii) investment bank earnings from equity trading, and (iii) revenues earned by third-party vendors."[33]
- "For proprietary exchange data feeds, the main question is whether there is a competitive market for proprietary market data. More than 40 active exchanges and alternative trading systems compete vigorously in both the market for order flow and in the market for market data. The two are closely linked: an exchange needs to consider the negative impact on its

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31 Id.

32 Id.

33 Id.

> order flow if it raises the price of its market data. Furthermore, new entrants have been frequent over the past 10 years or so, and these venues often give market data away for free, [again, as NYSE National has done with its Integrated Feed] serving as a check on pricing by more established exchanges. These are all the standard hallmarks of a competitive market."[34]

Professor Jones' conclusions are consistent with the demonstration of the competitive constraints on the pricing of market data demonstrated by analysis of exchanges as platforms for market data and trading services, as shown below.

b. Exchanges that Offer Market Data and Trading Services Function as Two-Sided Platforms

An exchange may demonstrate that its fees are constrained by competitive forces by showing that the platform theory of competition applies. When the platform theory of competition applies, an exchange is not additionally required to demonstrate that there is a substitute for the specific market data product at issue, because the relevant question is whether a constraint on fees exists, not the specific mechanism of constraint.

As the United States Supreme Court recognized in Ohio v. American Express, platforms are firms that act as intermediaries between two or more sets of agents, and typically the choices made on one side of the platform affect the results on the other side of the platform via externalities, or "indirect network effects."[35] Externalities are linkages between the different sides of a platform such that one cannot understand pricing and competition for goods or services on one side of the platform in isolation; one must

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34 Id. at 39-40.

35 Ohio v. American Express, 138 S. Ct. 2274, 2280-81 (2018).

also account for the influence of the other sides. As the Supreme Court explained:

> To ensure sufficient participation, two-sided platforms must be sensitive to the prices that they charge each side. . . . Raising the price on side A risks losing participation on that side, which decreases the value of the platform to side B. If the participants on side B leave due to this loss in value, then the platform has even less value to side A—risking a feedback loop of declining demand. . . . Two-sided platforms therefore must take these indirect network effects into account before making a change in price on either side.[36]

The Exchange and its affiliated exchanges have long maintained that they function as platforms between consumers of market data and consumers of trading services. Proving the existence of linkages between the two sides of this platform requires an in-depth economic analysis of both public data and confidential exchange data about particular customers' trading activities and market data purchases. Exchanges, however, are prohibited from publicly sharing details about these specific customer activities and purchases. For example, pursuant to Exchange Rule 7.41, transactions executed on the Exchange are processed anonymously.

The Exchange and its affiliated exchanges have retained a third-party expert, Marc Rysman, Professor of Economics at Boston University, to analyze how platform economics applies to stock exchanges' sale of market data products and trading services, and to explain how this affects the assessment of competitive forces affecting the

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[36] Id. at 2281.

exchanges' data fees.[37] Professor Rysman was able to analyze exchange data that is not otherwise publicly available in a manner that is consistent with the exchanges' confidentiality obligations to its customers. As shown in his paper, Professor Rysman surveyed the existing economic literature analyzing stock exchanges as platforms between market data and trading activities, and explained the types of linkages between market data access and trading activities that must be present for an exchange to function as a platform. In addition, Professor Rysman undertook an empirical analysis of customers' trading activities within the NYSE group of exchanges in reaction to NYSE's introduction in 2015 of the NYSE Integrated Feed, a full order-by-order depth of book data product similar to the NYSE National Integrated Feed that is the subject of this fee filing.[38]

Professor Rysman's analysis of this confidential firm-level data shows that firms that purchased the NYSE Integrated Feed market data product after its introduction were more likely to route orders to NYSE as opposed to one of the other NYSE-affiliated exchanges, such as NYSE Arca or NYSE American.[39] Moreover, Professor Rysman shows that the same is true for firms that did not subscribe to the NYSE Integrated Feed: the introduction of the NYSE Integrated Feed led to more trading on NYSE (as opposed to other NYSE-affiliated exchanges) by firms that did not subscribe to the NYSE

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37 See Exhibit 3B, Marc Rysman, Stock Exchanges as Platforms for Data and Trading, December 2, 2019 (hereinafter "Rysman Paper"), ¶ 6.

38 See Securities Exchange Act Release Nos. 74128 (January 23, 2015), 80 FR 4951 (January 29, 2015) (SR-NYSE-2015-03) (Notice of filing and immediate effectiveness of proposed rule change to establish NYSE Integrated Feed) and 76485 (November 20, 2015), 80 FR 74158 (November 27, 2015) (SR-NYSE-2015-57) (Notice of filing and immediate effectiveness of proposed rule change to establish fees for the NYSE Integrated Feed).

39 Rysman Paper ¶¶ 80-90.

Integrated Feed.[40] This is the sort of externality that is a key characteristic of a platform market.[41]

From this empirical evidence, Professor Rysman concludes:

- "[D]ata is more valuable when it reflects more trading activity and more liquidity-providing orders. These linkages alone are enough to make platform economics necessary for understanding the pricing of market data."[42]
- "[L]inkages running in the opposite direction, from data to trading, are also very likely to exist. This is because market data from an exchange reduces uncertainty about the likelihood, price, or timing of execution for an order on that exchange. This reduction in uncertainty makes trading on that exchange more attractive for traders that subscribe to that exchange's market data. Increased trading by data subscribers, in turn, makes trading on the exchange in question more attractive for traders that do not subscribe to the exchange's market data."[43]
- The "mechanisms by which market data makes trading on an exchange more attractive for subscribers to market data . . . apply to a wide assortment of market data products, including BBO, order book, and full order-by-order depth of book data products at all exchanges."[44]

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40 Id. ¶¶ 91-93.

41 Id. ¶ 91.

42 Id. ¶ 95.

43 Id. ¶ 96.

44 Id.

- "[E]mpirical evidence confirms that stock exchanges are platforms for data and trading."[45]
- "The platform nature of stock exchanges means that data fees cannot be analyzed in isolation, without accounting for the competitive dynamics in trading services."[46]
- "Competition is properly understood as being between platforms (i.e., stock exchanges) that balance the needs of consumers of data and traders."[47]
- "Data fees, data use, trading fees, and order flow are all interrelated."[48]
- "Competition for order flow can discipline the pricing of market data, and vice-versa."[49]
- "As with platforms generally, overall competition between exchanges will limit their overall profitability, not margins on any particular side of the platform."[50]

The Exchange has observed a similar correlation in connection with its offering of the NYSE National Integrated Feed. Since May 2018, when the Exchange re-launched trading, the number of subscribers of the NYSE National Integrated Feed grew from 12 to a high of 57. Over this same period, the Exchange has increased market share from

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45 Id. ¶ 97.

46 Id. ¶ 98.

47 Id.

48 Id.

49 Id.

50 Id. ¶ 100.

0% to nearly 2%. The Exchange therefore believes that its proposed fees for the NYSE National Integrated Feed are subject to platform-based competitive constraints on pricing.

c. Exchange Market Data Fees Are Constrained by the Availability of Substitute Platforms

Professor Rysman's conclusions that exchanges function as platforms for market data and transaction services mean that exchanges do not set fees for market data products without considering, and being constrained by, the effect the fees will have on the order-flow side of the platform. As the D.C. Circuit recognized in NetCoalition I, "[n]o one disputes that competition for order flow is fierce."[51] The court further noted that "no exchange possesses a monopoly, regulatory or otherwise, in the execution of order flow from broker dealers," and that an exchange "must compete vigorously for order flow to maintain its share of trading volume."[52]

Similarly, the Commission itself has recognized that the market for trading services in NMS stocks has become "more fragmented and competitive."[53] The Commission's Division of Trading and Markets has also recognized that with so many "operating equities exchanges and dozens of ATSs, there is vigorous price competition among the U.S. equity markets and, as a result, [transaction] fees are tailored and frequently modified to attract particular types of order flow, some of which is highly fluid and price sensitive."[54] Indeed, today, equity trading is currently dispersed across 13

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51 NetCoalition I, 615 F.3d at 544 (internal quotation omitted).

52 Id.

53 See Securities Exchange Act Release No. 51808, 84 FR 5202, 5253 (February 20, 2019) (File No. S7-05-18).

54 Commission Division of Trading and Markets, Memorandum to EMSAC, dated October 20, 2015, available here: https://www.sec.gov/spotlight/emsac/memo-maker-taker-fees-on-equities-exchanges.pdf.

exchanges,[55] 31 alternative trading systems,[56] and numerous broker-dealer internalizers and wholesalers, all competing for order flow. Based on publicly-available information, no single exchange has more than 18% market share.[57]

Further, low barriers to entry mean that new exchanges may rapidly and inexpensively enter the market and offer additional substitute platforms to compete with the Exchange.[58] In addition to the 13 presently-existing exchanges, three new ones are expected to enter the market in 2020: Long Term Stock Exchange (LTSE), which has been approved as an equities exchange but is not yet operational;[59] Members Exchange (MEMX), which has recently filed its application to be approved as a registered equities exchange;[60] and Miami International Holdings (MIAX), which has announced its plan to introduce equities trading on an existing registered options exchange.[61]

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55 See Cboe Global Markets, U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/. See generally https://www.sec.gov/fast-answers/divisionsmarketregmrexchangesshtml.html.

56 *See* FINRA ATS Transparency Data, *available at* https://otctransparency.finra.org/otctransparency/AtsIssueData. A list of alternative trading systems registered with the Commission is *available at* https://www.sec.gov/foia/docs/atslist.htm.

57 See Cboe Global Markets U.S. Equities Market Volume Summary, available at http://markets.cboe.com/us/equities/market_share/.

58 See Jones Paper at 10-11.

59 See Securities Exchange Act Release No. 85828 (May 10, 2019) (File No. 10-234) (Findings, Opinion, and Order of the Commission in the Matter of the Application of Long Term Stock Exchange, Inc. for Registration as a National Securities Exchange).

60 See Securities Exchange Act Release No. 87436 (October 31, 2019) (File No. 10-237) (Notice of filing of application of MEMX LLC for registration as a national securities exchange under Section 6 of the Act).

61 See Press Release of Miami International Holdings Inc., dated May 17, 2019, available here: https://www.miaxoptions.com/sites/default/files/press_release-files/MIAX_Press_Release_05172019.pdf.

Given Professor Rysman's conclusion that exchanges are platforms for market data and trading, this fierce competition for order flow on the trading side of the platform acts to constrain, or "discipline," the pricing of market data on the other side of the platform.[62] And due to the ready availability of substitutes and the low cost to move order flow to those substitute trading venues, an exchange setting market data fees that are not at competitive levels would expect to quickly lose business to alternative platforms with more attractive pricing.[63] Although the various exchanges may differ in their strategies for pricing their market data products and their transaction fees for trades—with some offering market data for free along with higher trading costs, and others charging more for market data and comparatively less for trading—the fact that exchanges are platforms ensures that no exchange makes pricing decisions for one side of its platform without considering, and being constrained by, the effects that price will have on the other side of the platform.

In sum, the fierce competition for order flow thus constrains any exchange from pricing its market data at a supracompetitive price, and constrains the Exchange here in setting its fees for the NYSE National Integrated Feed.

The proposed fees are therefore reasonable because in setting them, the Exchange is constrained by the availability of numerous substitute platforms offering market data products and trading. Such substitutes need not be identical, but only substantially similar to the product at hand.

More specifically, in setting fees for the NYSE National Integrated Feed, the Exchange is constrained by the fact that, if its pricing across the platform is unattractive

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62 Rysman Paper ¶ 98.

63 See Jones Paper at 11.

to customers, customers have their pick of an increasing number of alternative platforms to use instead of the Exchange. The Exchange believes that it has considered all relevant factors and has not considered irrelevant factors in order to establish reasonable fees. The existence of numerous alternative platforms to the Exchange's platform ensures that the Exchange cannot set unreasonable market data fees without suffering the negative effects of that decision in the fiercely competitive market in which it operates as a platform.

d. NYSE National Integrated Feed is an Optional Market Data Product

Subscribing to the NYSE National Integrated Feed is entirely optional. The Exchange is not required to make the NYSE National Integrated Feed available to any customers, nor is any customer required to purchase the NYSE National Integrated Feed. Unlike some other data products (*e.g.*, the consolidated quotation and last-sale information feeds) that firms are required to purchase in order to fulfil regulatory obligations,[64] a customer's decision whether to purchase the NYSE National Integrated Feed is entirely discretionary. Most firms that choose to subscribe to the NYSE National Integrated Feed do so for the primary goals of using it to increase their revenues, reduce their expenses, and in some instances to compete directly with the Exchange for order flow. Such firms are able to determine for themselves whether the NYSE National

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64 The Exchange notes that broker-dealers are not required to purchase proprietary market data to comply with their best execution obligations. See In the Matter of the Application of Securities Industry and Financial Markets Association for Review of Actions Taken by Self-Regulatory Organizations, Release Nos. 34-72182; AP-3-15350; AP-3-15351 (May 16, 2014). Similarly, there is no requirement in Regulation NMS or any other rule that proprietary data be utilized for order routing decisions, and some broker-dealers and ATSs have chosen not to do so.

Integrated Feed is necessary for their business needs, and if so, whether or not it is attractively priced. If the NYSE National Integrated Feed does not provide sufficient value to firms based on the uses those firms may have for it, such firms may simply choose to conduct their business operations in ways that do not use the NYSE National Integrated Feed.[65] If they do not choose to use the NYSE National Integrated Feed, they could also choose not to direct order flow to the Exchange.

As noted above, the current subscribers to the NYSE National Integrated Feed began changing their behavior in response to the potential imposition of fees as set out in the Initial Proposal and herein. Since the Initial Proposal became publicly known on December 4, 2019, five subscribers to the NYSE National Integrated Feed product have canceled their subscriptions even before the fees go into effect. In each instance, the subscriber told the Exchange that the reason for ending its subscription was the imminent imposition of fees. These cancellations are evidence that subscribing to the NYSE National Integrated Feed is discretionary, that each customer makes the decision whether to subscribe based on its own analysis of the benefits and costs to itself, and that customers can and do make those decisions quickly based on reactions to fee changes.

But even if such firms determine that the fees for NYSE National Integrated Feed are too high, customers can access much of the same data on the NYSE National Integrated Feed for free by subscribing to the NYSE National BBO feed (which includes best-bid-and-offer information for NYSE National on a real-time basis) and NYSE National Trades (which includes last-sale information on a real-time basis), both of which are offered at no cost. NYSE National top-of-book quotation information and last-sale

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65 See generally Jones Paper at 8, 10-11.

information is also available on the consolidated SIP feeds. In this way, the NYSE National BBO, NYSE National Trades, and SIP data products are all substitutes for a significant portion of the data available on the NYSE National Integrated Feed. Indeed, as already noted, after the Initial Proposal was made public, a sixth customer informed the Exchange that if the Exchange is permitted to impose the fees as proposed, the customer will drop its subscription to the NYSE National Integrated Feed product and instead subscribe to the NYSE National BBO feed, which will remain available for free. This is clear evidence that the availability of these substitute products constrains the Exchange's ability to charge supracompetitive prices for the NYSE National Integrated Feed.

The only content available on NYSE National Integrated Feed that is not available on these other products is the order-by-order look at the NYSE National book, which provides information about depth of book on the Exchange. The Exchange has been a vocal advocate for the creation of a "SIP Premium" product that would include depth-of-book information on the consolidated market data feeds.[66] Future products such as SIP Premium would include not only integrated depth-of-book information from NYSE National, but all other exchanges as well, and would further constrain the Exchange's ability to price NYSE National Integrated Feed at a supracompetitive price.

Further, in the case of products that are also redistributed through market data vendors such as Bloomberg and Refinitiv, the vendors themselves provide additional price discipline for proprietary data products because they control the primary means of access to certain end users. These vendors impose price discipline based upon their

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66 See NYSE, "Stock Quotes and Trade Data: One Size Doesn't Fit All" (August 22, 2019), posted at https://www.nyse.com/equities-insights#20190822.

business models. For example, vendors that assess a surcharge on data they sell are able to refuse to offer proprietary products that their end users do not or will not purchase in sufficient numbers. Currently, only one vendor redistributes the NYSE National Integrated Feed. Even in the absence of fees for the NYSE National Integrated Feed, vendors have not elected to make available the NYSE National Integrated Feed and likely will not unless their customers request it, and customers will not elect to pay the proposed fees unless the NYSE National Integrated Feed can provide value by sufficiently increasing revenues or reducing costs in the customer's business in a manner that will offset the fees. All of these factors operate as constraints on pricing proprietary data products.

In setting the proposed fees for the NYSE National Integrated Feed, the Exchange considered the competitiveness of the market for proprietary data and all of the implications of that competition. The Exchange believes that it has considered all relevant factors and has not considered irrelevant factors in order to establish reasonable fees. The existence of alternatives to the Exchange's platform and the continued availability of the Exchange's separate data feeds for free ensure that the Exchange cannot set unreasonable fees when vendors and subscribers can elect these alternatives or choose not to purchase a specific proprietary data product if the attendant fees are not justified by the returns that any particular vendor or data recipient would achieve through the purchase.

2. The Proposed Fees Are Reasonable

The specific fees that the Exchange proposes for the NYSE National Integrated Feed are reasonable for the following additional reasons.

Overall. The Exchange believes that the proposed fees for the NYSE National Integrated Feed are reasonable because they represent not only the value of the data available from the NYSE National BBO and NYSE National Trades data feeds but also the value of receiving the data on an integrated basis. Receiving the data on an integrated basis provides greater efficiencies and reduced errors for vendors and subscribers that currently choose to integrate the data themselves after receiving it from the Exchange. Some vendors and subscribers may not have the technology or resources to integrate separate data feeds in a timely and/or efficient manner, and thus the integration feature of the product may be valuable to them.

The Exchange believes the proposed fees for the NYSE National Integrated Feed are also reasonable when compared to fees for comparable products, such as the NYSE American Integrated Feed.[67] Even though NYSE National's market share is several times higher than NYSE American's, the Exchange is proposing fees for the NYSE National Integrated Feed that are based on the existing fee structure and rates that data recipients already pay for the NYSE American Integrated Feed. The Exchange believes that adopting the same fee structure as its affiliated exchanges would reduce administrative burdens on NYSE National data subscribers that also currently subscribe to market data feeds from NYSE, NYSE Arca, or NYSE American.

Access Fee. The Exchange believes that is reasonable to charge access fees because of the value of the data to data recipients in their profit-generating activities. The Exchange believes that the proposed monthly Access Fee of $2,500 for the NYSE National Integrated Feed is reasonable because it is comparable to the monthly access fee

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67 See NYSE American Integrated Feed, https://www.nyse.com/market-data/real-time/integrated-feed.

for the NYSE American Integrated Feed, which is also $2,500.[68]

Redistribution Fees. The Exchange believes that it is reasonable to charge redistribution fees because vendors receive value from redistributing the data in their business products for their customers. The Exchange believes that charging a Redistribution Fee is reasonable because the vendors that would be charged such a fee profit by re-transmitting the Exchange's market data to their customers. This fee would be charged only once per month to each vendor account that redistributes the NYSE National Integrated Feed, regardless of the number of customers to which that vendor redistributes the data. Currently, there is only one vendor that redistributes the NYSE National Integrated Feed. Accordingly, this proposed fee would have limited impact. The Exchange believes the proposed monthly Redistribution Fee of $1,500 for the NYSE National Integrated Feed is reasonable because it is comparable to the monthly Redistribution Fee for NYSE American Integrated Feed, which is also $1,500, and the monthly External Distributor Fee for Nasdaq BX, Inc.'s ("Nasdaq BX") BX TotalView Product, which is also $1,500.[69]

User Fees. The Exchange believes that having separate Professional and Non-Professional User fees for the NYSE National Integrated Feed is reasonable because it will make the product more affordable and result in greater availability to Professional and Non-Professional Users. Setting a modest Non-Professional User fee is reasonable because it provides an additional method for Non-Professional Users to access the NYSE National Integrated Feed by providing the same data that is available to Professional

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68 See NYSE American LLC Equities Proprietary Market Data Fees at https://www.nyse.com/publicdocs/nyse/data/NYSE_American_Equities_Market_Data_Fee_Schedule.pdf.

69 See Section 119(a) of Nasdaq BX Equity 7 Pricing Schedule.

Users. The proposed monthly Professional User Fee (Per User) of $10 and monthly Non-Professional User Fee (Per User) of $1 are reasonable because they are comparable to per user fees for the NYSE American Integrated Feed. The monthly Professional User Fee (Per User) for the NYSE American Integrated Feed is $10, and the monthly Non-Professional User Fee (Per User) for the NYSE American Integrated Feed is $2.[70]

Non-Display Use Fees. The Exchange believes the proposed Non-Display Use fees are reasonable, because they reflect the value of the data to the data recipients in their profit-generating activities and do not impose the burden of counting non-display devices.

The Exchange believes that the proposed Non-Display Use fees reflect the significant value of the non-display data use to data recipients, which purchase such data on an entirely voluntary basis. Non-display data can be used by data recipients for a wide variety of profit-generating purposes, including proprietary and agency trading and smart order routing, as well as by data recipients that operate order matching and execution platforms that compete directly with the Exchange for order flow. The data also can be used for a variety of non-trading purposes that indirectly support trading, such as risk management and compliance. Although some of these non-trading uses do not directly generate revenues, they can nonetheless substantially reduce a recipient's costs by automating such functions so that they can be carried out in a more efficient and accurate manner and reduce errors and labor costs, thereby benefiting recipients. The Exchange believes that charging for non-trading uses is reasonable because data recipients can

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70 See NYSE American LLC Equities Proprietary Market Data Fees at https://www.nyse.com/publicdocs/nyse/data/NYSE_American_Equities_Market_Data_Fee_Schedule.pdf.

derive substantial value from such uses, for example, by automating tasks so that can be performed more quickly and accurately and less expensively than if they were performed manually.

Previously, the non-display use data pricing policies of many exchanges required customers to count, and the exchanges to audit the count of, the number of non-display devices used by a customer. As non-display use grew more prevalent and varied, however, exchanges received an increasing number of complaints about the impracticality and administrative burden associated with that approach. In response, the Exchange and its affiliated exchanges developed a non-display use pricing structure that does not require non-display devices to be counted or those counts to be audited, and instead looks merely at the three following categories of potential use of non-display data: use of the data on the customer's own behalf (Category 1), use on behalf of clients (Category 2), and use to internally match buy and sell orders within an organization (Category 3).

The Exchange believes that it is reasonable to segment the fee for non-display use into these three categories. As noted above, the uses to which customers can put the NYSE National Integrated Feed are numerous and varied, and the Exchange believes that charging separate fees for these separate categories of use is reasonable because it reflects the actual value the customer derives from the data, based upon how many categories of use the customer makes of the data. Segmenting the fees for non-display data in this way avoids the unreasonable result of customers that make only limited non-display use of the data paying the same fees as customers that use the data for numerous different revenue-generating and cost-saving purposes.

The Exchange believes that the proposed fees of $5,000 per month for each of Categories 1, 2, and 3 is reasonable. These fees are comparable to the NYSE American Integrated Feed fees for non-display use for the different categories of use, which is also $5,000 per category.[71] The Exchange believes that the proposed fees directly and appropriately reflect the significant value of using non-display data in a wide range of computer-automated functions relating to both trading and non-trading activities and that the number and range of these functions continue to grow through innovation and technology developments.

The Exchange also believes that, regarding Category 3 fees, it is reasonable to charge $5,000 per month for each trading platform on which the data recipient uses the Non-Display data, because such use of the data is directly in competition with the Exchange and the Exchange should be permitted to recoup some of its lost trading revenue by charging for the data that makes such competition possible. The Exchange believes that it is reasonable to cap such fees for Category 3 use at $15,000 per month per data recipient, because a higher monthly fee may potentially dissuade competitors from buying the NYSE National Integrated Feed for use by their trading platforms.

The proposed Non-Display Use fees for the NYSE National Integrated Feed are also reasonable because they take into account the extra value of receiving the data for Non-Display Use on an integrated basis. The Exchange believes that the proposed fees directly and appropriately reflect the significant value of using the NYSE National Integrated Feed on a non-display basis in a wide range of computer-automated functions relating to both trading and non-trading activities and that the number and range of these

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71 See id.

functions continue to grow through innovation and technology developments.[72]

Non-Display Use Declaration Late Fee. The Exchange believes that it is reasonable to require annual submissions of the Non-Display Use Declaration so that the Exchange will have current and accurate information about the use of the NYSE National Integrated Feed and can correctly assess fees for the uses of the NYSE National Integrated Feed. Requiring annual submissions of such declarations is reasonable because it also allows users to re-assess their own usage each year.

The Exchange believes that it is reasonable to impose a late fee in connection with the submission of the Non-Display Use Declaration. In order to correctly assess fees for the non-display use of the NYSE National Integrated Feed, the Exchange needs to have current and accurate information about the use of the NYSE National Integrated Feed. The failure of data recipients to submit the Non-Display Use Declaration on time leads to potentially incorrect billing and administrative burdens, including tracking and obtaining late Non-Display Use Declarations and correcting and following up on payments owed in connection with late Non-Display Use Declarations. The purpose of the late fee is to incent data recipients to submit the Non-Display Use Declaration promptly to avoid the administrative burdens associated with the late submission of Non-Display Use Declarations.

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[72] See also Exchange Act Release No. 69157, March 18, 2013, 78 FR 17946, 17949 (March 25, 2013) (SR-CTA/CQ-2013-01) ("[D]ata feeds have become more valuable, as recipients now use them to perform a far larger array of non-display functions. Some firms even base their business models on the incorporation of data feeds into black boxes and application programming interfaces that apply trading algorithms to the data, but that do not require widespread data access by the firm's employees. As a result, these firms pay little for data usage beyond access fees, yet their data access and usage is critical to their businesses.").

Multiple Data Feed Fee. The Exchange believes that it is reasonable to require data recipients to pay a modest additional fee for taking a data feed for a market data product in more than two locations, because such data recipients can derive substantial value from being able to consume the product in as many locations as they want. In addition, there are administrative burdens associated with tracking each location at which a data recipient receives the product. The Multiple Data Feed Fee is designed to encourage data recipients to better manage their requests for additional data feeds and to monitor their usage of data feeds. The proposed fee is designed to apply to data feeds received in more than two locations so that each data recipient can have one primary and one backup data location before having to pay a multiple data feed fee.

Fee Waiver for Federal Agencies. The Exchange believes the proposal to not charge the access fees, display fees for professional users, and non-display fees associated with its proprietary market data products to customers that are Federal agencies is reasonable because it is designed to facilitate federal government regulation without giving an undue advantage to one set of commercial users over another. The Exchange believes that it is reasonable to assess no fees to Federal agencies that subscribe to the Exchange's proprietary market data products because Federal agencies do not use the Exchange's proprietary market data for commercial gain, but only for regulatory purposes.

One-Month Free Trial. The Exchange believes the proposal to provide the NYSE National Integrated Free to new customers free-of-charge for their first subscription month is reasonable because it would allow vendors and subscribers to become familiar with the feed and determine whether it suits their needs without incurring fees. Making a

new market data product available for free for a trial period is consistent with offerings of other exchanges. For example, Nasdaq BX offers new subscribers of BX TotalView a 30-day waiver of user fees.[73]

For all of the foregoing reasons, the Exchange believes that the proposed fees for the NYSE National Integrated Fee are reasonable.

The Proposed Fees Are Equitably Allocated

The Exchange believes the proposed fees for the NYSE National Integrated Feed are allocated fairly and equitable among the various categories of users of the feed, and any differences among categories of users are justified.

Overall. The Exchange believes that the proposed fees are equitably allocated because they will apply to all data recipients that choose to subscribe to the NYSE National Integrated Feed. Any subscriber or vendor that chooses to subscribe to the NYSE National Integrated Feed is subject to the same Fee Schedule, regardless of what type of business they operate or the use they plan to make of the data feed. Subscribers and vendors may choose to continue to receive some or all of the data on the NYSE National Integrated Feed through the existing separate feeds for free, or they can choose to pay for the NYSE National Integrated Feed in order to receive integrated data, or they or they can choose a combination of the two approaches, thereby allowing each vendor or subscriber to choose the best business solution for itself.

Access Fee. The Exchange believes the proposed monthly Access Fee of $2,500 for the NYSE National Integrated Feed is equitably allocated because it would be charged on an equal basis to all data recipients that receive a data feed of the NYSE

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[73] See Section 123(a)(4) of Nasdaq BX's Equity 7 Pricing Schedule.

National Integrated Feed, regardless of what type of business they operate or the use they plan to make of the data feed.

Redistribution Fees. The Exchange believes the proposed monthly fee of $1,500 for redistributing the NYSE National Integrated Feed is equitably allocated because it would be charged on an equal basis to those vendors that choose to redistribute the feed.

User Fees. The Exchange believes that the fee structure differentiating Professional User fees ($10 per month per user) from Non-Professional User fees ($1 per month per user) for display device access to the NYSE National Integrated Feed is equitable. This structure has long been used by the Exchange to reduce the price of data to Non-Professional Users and make it more broadly available.[74] Offering the NYSE National Integrated Feed to Non-Professional Users with the same data as is available to Professional Users results in greater equity among data recipients. These user fees would be charged uniformly to all display devices that have access to the NYSE National Integrated Feed.

Non-Display Use Fees. The Exchange believes the proposed Non-Display Use fees are equitably allocated because they would require subscribers to pay fees only for the uses they actually make of the data. As noted above, non-display data can be used by data recipients for a wide variety of profit-generating purposes (including trading, risk management, and compliance) as well as purposes that do not directly generate revenues but nonetheless substantially reduce the recipient's costs by automating certain functions.

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[74] See, e.g., Securities Exchange Act Release No. 59544 (March 9, 2009), 74 FR 11162 (March 16, 2009) (SR-NYSE-2008-131) (establishing the $15 Non-Professional User Fee (Per User) for NYSE OpenBook); Securities Exchange Act Release No. 20002, File No. S7-433 (July 22, 1983), 48 FR 34552 (July 29, 1983) (establishing Non-Professional fees for CTA data); NASDAQ BX Equity 7 Pricing Schedule, Section 123.

The Exchange believes that it is equitable to charge non-display data subscribers a $5,000 fee for each category of use they make of such data—namely, using the data on their own behalf (Category 1), on behalf of their clients (Category 2), and to internally match buy and sell orders within an organization (Category 3)—because this fee structure results in subscribers with greater uses of the data paying higher fees, and subscribers with fewer uses of the data paying lower fees. This segmented fee structure is also equitable because no subscriber of non-display data would be charged a fee for a category of use in which it did not actually engage.

The Exchange also believes that, regarding Category 3 fees, it is equitable to charge $5,000 per month for each trading platform on which the data recipient uses the Non-Display data, because such use of the data is directly in competition with the Exchange and the Exchange should be permitted to recoup some of its lost trading revenue by charging for the data that makes such competition possible. The Exchange believes that it is equitable to cap such fees for Category 3 use at $15,000 per month per data recipient, because a higher monthly fee may potentially dissuade competitors from buying the NYSE National Integrated Feed for use by their trading platforms.

Non-Display Use Declaration Late Fee. The Exchange believes that the proposed fee of $1,000 per month for a late Non-Display Use Declaration is equitably allocated because it applies to any data recipient that pays an Access Fee for the NYSE National Integrated Feed but has failed to complete and submit a Non-Display Use Declaration. In addition, the Exchange believes that it is equitable to charge a late fee to subscribers who fail to timely submit their Non-Display Use Declarations because their failure to do so leads to potentially incorrect billing and administrative burdens on the part of the

Exchange. The Exchange believes it is equitable to defray these administrative costs by imposing a late fee only on subscribers' whose declarations were late, as opposed to all subscribers.

Multiple Data Feed Fee. The Exchange believes that the $200 per month per location fee to data recipients taking the NYSE National Integrated Feed in more than two locations is equitable because it would apply to all such customers, regardless of what type of business they operate or the use they make of the data feed. In addition, the Exchange believes that it is equitable to charge a fee to subscribers for taking a data feed in more than two locations because there are administrative burdens on the part of the Exchange associated with tracking each location at which a data recipient receives the product. The Exchange believes that it is equitable for it to defray these administrative costs by imposing a modest fee only on subscribers who seek to take the feed in more than two locations, as opposed to all subscribers.

Fee Waiver for Federal Agencies. The Exchange believes that the proposal to not charge the access fees, display fees for professional users, and non-display fees associated with its proprietary market data products to customers that are Federal agencies is equitable because it is designed to facilitate federal government regulation without giving an undue advantage to one set of commercial users over another. The Exchange believes that it is equitable to waive fees for Federal agencies that subscribe to the Exchange's proprietary market data products because Federal agencies do not use the Exchange's proprietary market data for commercial gain, but only for regulatory purposes.

One-Month Free Trial. The Exchange believes the proposal to provide the NYSE National Integrated Feed to new customers free-of-charge for their first subscription month is equitable because it applies to any first-time subscriber, regardless of the use they plan to make of the feed. As proposed, any first-time subscriber of the NYSE National Integrated Feed would not be charged the Access Fee, Non-Display Fee, any applicable Professional and Non-Professional User Fee, and Redistribution Fee for one calendar month. The Exchange believes it is equitable to restrict the availability of this one-month free trial to customers that have not previously subscribed to the NYSE National Integrated Feed, since customers who are current or previous subscribers of the feed are already familiar with it and whether it suits their needs.

For all of the foregoing reasons, the Exchange believes that the proposed fees for the NYSE National Integrated Fee are equitably allocated.

The Proposed Fees Are Not Unfairly Discriminatory

The Exchange believes the proposed fees for the NYSE National Integrated Feed are not unfairly discriminatory because any differences in the application of the fees are based on meaningful distinctions between customers, and those meaningful distinctions are not unfairly discriminatory between customers.

Overall. The Exchange believes that the proposed fees are not unfairly discriminatory because they would apply to all data recipients that choose to subscribe to the NYSE National Integrated Feed. Any vendor or subscriber that chooses to subscribe to the NYSE National Integrated Feed is subject to the same Fee Schedule, regardless of what type of business they operate or the use they plan to make of the data feed. Vendors and subscribers may choose to continue to receive some or all of the data on the NYSE

National Integrated Feed through the existing separate feeds for free, or they can choose to pay for the NYSE National Integrated Feed in order to receive integrated data, or they or they can choose a combination of the two approaches, thereby allowing each vendor or subscriber to choose the best business solution for itself.

Access Fee. The Exchange believes the proposed monthly Access Fee of $2,500 for the NYSE National Integrated Feed is not unfairly discriminatory because it would be charged on an equal basis to all data recipients that receive a data feed of the NYSE National Integrated Feed, regardless of what type of business they operate or the use they plan to make of the data feed.

Redistribution Fees. The Exchange believes the proposed monthly fee of $1,500 for redistributing the NYSE National Integrated Feed is not unfairly discriminatory because it would be charged on an equal basis to those vendors that choose to redistribute the feed.

User Fees. The Exchange believes that the fee structure differentiating Professional User fees ($10 per month per user) from Non-Professional User fees ($1 per month per user) for display device access to the NYSE National Integrated Feed is not unfairly discriminatory. This structure has long been used by the Exchange to reduce the price of data to Non-Professional Users and make it more broadly available.[75] Offering the NYSE National Integrated Feed to Non-Professional Users with the same data as is available to Professional Users results in greater equity among data recipients. These

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[75] See e.g., Securities Exchange Act Release No. 59544 (March 9, 2009), 74 FR 11162 (March 16, 2009) (SR-NYSE-2008-131) (establishing the $15 Non-Professional User Fee (Per User) for NYSE OpenBook). See e.g., Securities Exchange Act Release No. 20002, File No. S7-433 (July 22, 1983), 48 FR 34552 (July 29, 1983) (establishing nonprofessional fees for CTA data); NASDAQ BX Equity 7 Pricing Schedule, Section 123.

user fees would be charged uniformly to all display devices that have access to the NYSE National Integrated Feed.

Non-Display Use Fees. The Exchange believes the proposed Non-Display Use fees are not unfairly discriminatory because they would require subscribers for non-display use to pay fees only for the categories of use they actually make of the data. As noted above, non-display data can be used by data recipients for a wide variety of profit-generating purposes (including trading, risk management, and compliance) as well as purposes that do not directly generate revenues but nonetheless substantially reduce the recipient's costs by automating certain functions. The Exchange believes that it is not unfairly discriminatory to charge non-display data subscribers a $5,000 fee for each category of use they make of such data—namely, using the data on their own behalf (Category 1), on behalf of their clients (Category 2), and to internally match buy and sell orders within an organization (Category 3)—because this fee structure results in subscribers with greater uses for the data paying higher fees, while subscribers with fewer uses of the data pay lower fees. This segmented fee structure is not unfairly discriminatory because no subscriber of non-display data would be charged a fee for a category of use in which it did not actually engage.

The Exchange also believes that, regarding Category 3 fees, it is not unreasonably discriminatory to charge $5,000 per month for each trading platform on which the data recipient uses the Non-Display data, because such use of the data is directly in competition with the Exchange and the Exchange should be permitted to recoup some of its lost trading revenue by charging for the data that makes such competition possible. The Exchange believes that it is not unreasonably discriminatory to cap such fees for

Category 3 use at $15,000 per month per data recipient, because a higher monthly fee may potentially dissuade competitors from buying the NYSE National Integrated Feed for use by their trading platforms.

Non-Display Use Declaration Late Fee. The Exchange believes that the proposed fee of $1,000 per month for a late Non-Display Use Declaration is not unfairly discriminatory because it applies to any data recipient that pays an Access Fee for the NYSE National Integrated Feed but has failed to complete and submit a Non-Display Use Declaration. In addition, the Exchange believes that it is not unfairly discriminatory to charge a late fee to subscribers who fail to timely submit their Non-Display Use Declarations because their failure to do so leads to potentially incorrect billing and administrative burdens on the part of the Exchange. Nor is it unfairly discriminatory for the Exchange to defray these administrative costs by imposing a late fee only on subscribers' whose declarations were late, as opposed to all subscribers.

Multiple Data Feed Fee. The Exchange believes that the $200 per month per location fee to data recipients taking the NYSE National Integrated Feed in more than two locations is not unfairly discriminatory because it would apply to all such customers, regardless of what type of business they operate or the use they make of the data feed. In addition, the Exchange believes that it is not unfairly discriminatory to charge a fee to subscribers for taking a data feed in more than two locations because there are administrative burdens on the part of the Exchange associated with tracking each location at which a data recipient receives the product. The Exchange believes that it is not unfairly discriminatory for it to defray these administrative costs by imposing a modest fee only on subscribers who seek to take the feed in more than two locations, as opposed

to all subscribers.

Fee Waiver for Federal Agencies. The Exchange believes that the proposal to not charge the access fees, display fees for professional users, and non-display fees associated with its proprietary market data products to customers that are Federal agencies is not unreasonably discriminatory because it is designed to facilitate federal government regulation without giving an undue advantage to one set of commercial users over another. The Exchange believes that it is not unfairly discriminatory to waive fees for Federal agencies that subscribe to the Exchange's proprietary market data products because Federal agencies do not use the Exchange's proprietary market data for commercial gain, but only for regulatory purposes.

One-Month Free Trial. The Exchange believes the proposal to provide the NYSE National Integrated Feed to new customers free-of-charge for their first subscription month is not unfairly discriminatory because it applies to any first-time subscriber, regardless of the use they plan to make of the feed. As proposed, any first-time subscriber of the NYSE National Integrated Feed would not be charged the Access Fee, Non-Display Fee, any applicable Professional and Non-Professional User Fee, and Redistribution Fee for one calendar month. The Exchange believes it is not unfairly discriminatory to restrict the availability of this one-month free trial to customers that have not previously subscribed to the NYSE National Integrated Feed, since customers who are current or previous subscribers of the feed are already familiar with it and whether it suits their needs.

For all of the foregoing reasons, the Exchange believes that the proposed fees for the NYSE National Integrated Fee are not unfairly discriminatory.

B. Self-Regulatory Organization's Statement on Burden on Competition

The Exchange does not believe that the proposed fees will impose any burden on competition that is not necessary or appropriate in furtherance of the purposes of the Act.

Intramarket Competition. The Exchange believes that the proposed fees do not put any market participants at a relative disadvantage compared to other market participants. As noted above, the proposed fee schedule would apply to all subscribers of the NYSE National Integrated Feed, and customers may not only choose whether to subscribe to the feed at all, but may tailor their subscriptions by choosing particular uses of the feed but not others (*e.g.*, Category 1 only versus all three categories; display device access only versus non-display use).

The Exchange also believes that the proposed fees neither favor nor penalize one or more categories of market participants in a manner that would impose an undue market on competition. As shown above, to the extent that particular proposed fees apply to only a subset of subscribers (*e.g.*, Category 2 fees apply only to those making non-display use on behalf of clients; late fees apply only to customers who fail to timely submit their declarations), those distinctions are not unfairly discriminatory and do unfairly burden one set of customers over another. To the contrary, by tailoring the proposed fees in this manner, the Exchange believes that it has eliminated the potential burden on competition that might result from unfairly asking subscribers to pay fees for services they did not use, or late fees they did not actually incur.

Intermarket Competition. The Exchange believes that the proposed fees do not impose a burden on competition or on other SROs that is not necessary or appropriate. As demonstrated above and in Professor Rysman’s attached paper, exchanges are

platforms for market data and trading. In setting the proposed fees, the Exchange was constrained by the availability of numerous substitute platforms also offering market data products and trading, and low barriers to entry mean new exchange platforms are frequently introduced. The fact that exchanges are platforms ensures that no exchange can make pricing decisions for one side of its platform without considering, and being constrained by, the effects that price will have on the other side of the platform. In setting fees for the NYSE National Integrated Feed, the Exchange is constrained by the fact that, if its pricing across the platform is unattractive to customers, customers will have its pick of an increasing number of alternative platforms to use instead of the Exchange. Given this intense competition between platforms, no one exchange's market data fees can impose an unnecessary burden on competition, and the Exchange's proposed fees do not do so here.

In addition, the Exchange believes that the proposed fees do not impose a burden on competition or on other exchanges that is not necessary or appropriate because of the availability of numerous substitute market data products. Many other exchanges offer proprietary data feeds like the NYSE National Integrated Feed, supplying depth of book order data, last sale data, security status updates, stock summary messages, and the exchange's best bid and offer at any given time, on a real-time basis. Because market data users can find suitable substitute feeds, an exchange that overprices its market data products stands a high risk that users may substitute another platform, in which case the platform would stand to lose both market data and trading fees. These competitive pressures ensure that no one exchange's market data fees can impose an unnecessary burden on competition, and the Exchange's proposed fees do not do so here.

C. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants, or Others

No written comments were solicited or received with respect to the proposed rule change.

III. Date of Effectiveness of the Proposed Rule Change and Timing for Commission Action

The foregoing rule change is effective upon filing pursuant to Section 19(b)(3)(A)[76] of the Act and subparagraph (f)(2) of Rule 19b-4[77] thereunder, because it establishes a due, fee, or other charge imposed by the Exchange.

At any time within 60 days of the filing of such proposed rule change, the Commission summarily may temporarily suspend such rule change if it appears to the Commission that such action is necessary or appropriate in the public interest, for the protection of investors, or otherwise in furtherance of the purposes of the Act. If the Commission takes such action, the Commission shall institute proceedings under Section 19(b)(2)(B)[78] of the Act to determine whether the proposed rule change should be approved or disapproved.

IV. Solicitation of Comments

Interested persons are invited to submit written data, views, and arguments concerning the foregoing, including whether the proposed rule change is consistent with the Act. Comments may be submitted by any of the following methods:

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76 15 U.S.C. 78s(b)(3)(A).

77 17 CFR 240.19b-4(f)(2).

78 15 U.S.C. 78s(b)(2)(B).

Electronic comments:

- Use the Commission's Internet comment form (http://www.sec.gov/rules/sro.shtml); or
- Send an e-mail to rule-comments@sec.gov. Please include File Number SR-NYSENAT-2020-05 on the subject line.

Paper comments:

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

All submissions should refer to File Number SR-NYSENAT-2020-05. This file number should be included on the subject line if e-mail is used. To help the Commission process and review your comments more efficiently, please use only one method. The Commission will post all comments on the Commission's Internet website (http://www.sec.gov/rules/sro.shtml). Copies of the submission, all subsequent amendments, all written statements with respect to the proposed rule change that are filed with the Commission, and all written communications relating to the proposed rule change between the Commission and any person, other than those that may be withheld from the public in accordance with the provisions of 5 U.S.C. 552, will be 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 10:00 a.m. and 3:00 p.m. Copies of the filing also will be available for inspection and copying at the principal office of the Exchange. All comments received will be posted without change; the Commission does not edit personal identifying information from submissions. 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. All submissions should refer to File Number SR-NYSENAT-2020-05 and should be submitted on or before [insert date 21 days from publication in the Federal Register].

For the Commission, by the Division of Trading and Markets, pursuant to delegated authority.[79]

Eduardo A. Aleman
Deputy Secretary

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79 17 CFR 200.30-3(a)(12).

Understanding the Market for U.S. Equity Market Data

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[1] Robert W. Lear Professor of Finance and Economics, Columbia Business School. I am solely responsible for the contents of this paper. I thank Larry Glosten, Frank Hatheway, Terry Hendershott, Stewart Mayhew, Jonathan Sokobin, and Chester Spatt for helpful discussions on these topics. I currently serve on FINRA's Economic Advisory Committee and on Nasdaq's Quality of Markets Committee, and I served as Visiting Economist at the New York Stock Exchange ("NYSE") in 2002–2003. The NYSE provided financial support for this research.

I. Executive Summary

A stock exchange facilitates share trading, in large part by developing computer systems, rules, and processes that allow buyers and sellers to submit orders, trade with each other, and determine a market price for shares listed on those exchanges. In the current market environment, this results in a vast amount of data, which market participants of all types rely on to make investment and trading decisions. Exchanges provide some of this market data to market participants at prices that vary depending on the type of data as well as how the data is used.

This paper provides an analysis of the market for equity market data in the United States. Unlike other data sources, U.S. equity market data is highly regulated by the Securities and Exchange Commission ("SEC"), and recently the SEC has been lobbied by entities arguing that exchanges charge too much. These entities have written comment letters and filed a number of proceedings with the SEC in an effort to reduce the prices of equity market data.

To determine whether these criticisms are valid, this paper provides an economic examination of market data, how it is used, and how it is regulated. This paper also presents data on market data prices and revenues and places them in context. Some of the data is newly public and is analyzed for the first time in this paper. Based on my review and analysis of this data, I show the following:

- Equity market data has value to the consumers of that data because it reflects the price discovery created by exchanges. Data consumers buy this aggregated data not to view their own orders and trades but rather to see the overall state of the orders and trades in a market. Market data products have seen substantial innovation over time, and the ability

to sell exchange proprietary market data products (as well as competition among trading venues) provides exchanges with incentives to continue to innovate.

- Using a variety of metrics, I find that exchange market data revenues are modest and stable over time.
- Exchange equity market data fees are a small cost for the industry overall: the data demonstrates that total exchange market data revenues are orders of magnitude smaller than (i) broker-dealer commissions, (ii) investment bank earnings from equity trading, and (iii) revenues earned by third-party vendors.
- The market is characterized by robust competition: exchanges compete with each other in selling proprietary market data products. They also compete with consolidated data feeds (discussed later in the paper) and with data provided by alternative trading systems ("ATSs"). Barriers to entry are very low, so existing exchanges must also take into account competition from new entrants, who generally try to build market share by offering their proprietary market data products for free for some period of time.
- Although there are regulatory requirements for some market participants to use consolidated data products, there is no requirement for market participants to purchase any proprietary market data product for regulatory purposes.
- There are a variety of data products, and consumers of equity market data choose among them based on their needs. Like most producers, exchanges offer a variety of market data products at different price levels. Advanced proprietary market data products provide greater value to those who subscribe. As in any other market, each potential subscriber takes the features and prices of available products into account in choosing what market data products to buy based on its business model.

- Although the market for U.S. equity market data is highly regulated, the regulatory arrangements have allowed a competitive market for data to operate effectively. This regulatory structure has allowed the development of a large suite of data products with a wide variety of features at differing price levels, and the resulting unparalleled transparency concerning stock trading activity is likely one of the reasons that U.S. equity market quality is the best in the world.

Section II of this paper details some of the ways that market participants use equity market data, and Section III provides a brief introduction to equity market data products.[2] Section IV discusses the basic economic features of the market for equity market data products. Section V discusses the regulation of equity market data, and Section VI discusses the pricing of equity market data, in particular the evolution of pricing over time and the revenue it actually generates for exchanges (a topic about which there seems to be significant confusion).

II. Introduction: The Many Uses of Equity Market Data

This paper provides an introduction and analysis of the market for stock market data in the United States. Dissemination of market data by U.S. stock exchanges is regulated by the SEC. However, there are several different kinds of equity market data, and this market data is sold and regulated in a variety of ways. A better understanding of the market for market data is

[2] Because understanding the current regulatory framework is a key part of understanding the overall market for market data, the Appendix provides some historical context and an overview of the National Market System ("NMS") that underlies the current regulatory framework in the United States.

essential for every market participant, as well as regulators, policy-makers, and academics with an interest in equity markets.

What does a modern stock exchange do? One of its most important roles is to facilitate the trading of shares in publicly listed companies. Today a stock exchange develops and operates sophisticated technology, sets up rules, and puts together a set of trading processes that allow buyers and sellers to learn about the level of trading interest, to submit orders, and to transact with each other. Aggregated together, market participants' buy and sell orders contribute to "price discovery," which is simply the determination of a market price for the shares. Of course, that market price varies from day to day, and even from second to second, because buyers and sellers regularly arrive, depart, or revise the prices and quantities that they are willing to trade.

Bringing together these potential buyers and sellers to engage in price discovery results in a large amount of market data: data on the willingness of traders to buy or sell before transactions take place, and data on transactions that result from the matching of buyers and sellers. This market data is disseminated to market participants through a variety of mechanisms, and it provides information about prices, trading activity, and liquidity in markets.

Equity market data is used in a wide variety of ways. Market participants include institutional money managers, arbitrageurs, hedgers, market makers, operators of other trading venues (such as dark pools), high-frequency traders, individual investors, and others. The market data available to all of these market participants, and the ways in which they respond to the data they receive, form the core of the price discovery process.

Market data obviously informs decisions about whether and what to trade. After a decision to trade has been made, market data enables traders and their brokers to evaluate key

dimensions of current market conditions that inform order submission strategy—the choice of how much and how quickly to trade, whether to place an offer or to hit an existing bid, whether to route an order to one trading venue versus another, and so on. The existence of real-time quote data gives market participants information about the likely prices and quantities available in the market before they make their trading decisions.[3]

Market data is not just used by traders: after orders have been routed, market data is used by exchanges and other trading venues (such as dark pools) to ensure the executions in those "unlit" venues occur at or within the current National Best Bid and Offer ("NBBO"), which is generally required by SEC rules. Other trading venues use current market quotes from the exchanges as a benchmark for determining execution prices.[4]

Market prices are also used by investors and investment managers to monitor the value of individual positions and portfolios, and by brokers as they monitor customer positions and enforce margin requirements. Real-time market data feeds are used to provide intraday updating of market indices and intraday indicative values for exchange-traded funds, a key component of the index arbitrage process that helps keep index futures and equity prices in line. Real-time

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[3] In this context, the kinds of market data likely to be useful may vary depending on the nature of the trader and the business it conducts. For most orders from retail customers, the "top-of-book" data available from the consolidated feeds is likely sufficient to provide all information such a trader needs to make a trading decision. For institutional investors using computerized trading algorithms, additional information available in "depth-of-book" feeds may be helpful in some circumstances. For high-frequency traders and others following highly time-sensitive strategies, having a low latency data feed will be important. For others, latency may be less important.

[4] Midpoint crossing networks, for example, typically allow buyers and sellers to match and transact at the NBBO midpoint, the price at the time of matching that is midway between the national best bid price across all registered exchanges and the analogous national best offer price. Wholesalers make similar use of the NBBO, because they often promise broker-dealers that they will provide price improvement compared to the NBBO on retail order flow that is routed to the wholesalers for execution.

equity market data feeds into option markets, as options market makers generally provide bid and offer prices on options based on the current share price level.

Historical databases of intraday trading and quoting activity are also used by a number of market participants. Historical market data is used to compute execution quality metrics such as effective spreads, price improvement, and speed of execution—metrics that may be used to evaluate market quality at different trading centers or at different times.[5] Historical data can be used by traders to back-test trading strategies before putting them into operation and by brokers to help optimize their order routing strategies and to evaluate their compliance with best execution obligations. Historical data has been used extensively by the academic community to address a wide range of research topics, and by the SEC, the Financial Industry Regulatory Authority ("FINRA"), and the exchanges to evaluate the impact of rules and changes in market structure. Historical data is also used in the context of regulatory investigations, enforcement actions, and FINRA arbitrations.

Given all of these uses for equity market data, and given the wide range of people and entities with an interest in equity market data, it is unsurprising that a regulatory framework has developed around market data. In addition, regulators focus on market data because researchers have generally found that the availability of information about current bids and offers (called "pre-trade transparency"), and timely reporting of equity market trades (called "post-trade

[5] For example, trading venues are required to disclose certain market quality metrics under Rule 605.

transparency"), are both important contributors to market quality.[6] Thus, understanding the current regulatory framework is a key part of understanding the overall market for market data.

III. Equity Market Data Products in the United States

Thousands of publicly traded companies are listed on U.S. equity exchanges that are part of the NMS for trading. There are two main categories of market data products for NMS stocks. Consolidated feeds combine trade and quote data from each trading venue, while each individual exchange offers proprietary market data products that provide additional information about activity at that particular trading venue.[7]

Consolidated feeds provide real-time reporting of all trades in NMS stocks. Consolidated feeds also provide time-stamped "top-of-book" quotes for all NMS stocks, consisting of each exchange's best (highest) bid price and quantity and its best (lowest) offer price and quantity. This allows market participants to know the NBBO available in the market at any point in time. The consolidated feed is managed by a Securities Information Processor ("SIP"), so consolidated data is sometimes referred to as "SIP data."

Exchanges have also developed various market data products that they sell directly to subscribers. These generally differ from the SIP feeds. Data products sold by the exchanges include data feeds containing trades and quotes, orders at prices other than the best bid and offer

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[6] Papers that measure the market quality effects of pre-trade transparency in the equity markets include Hendershott and Jones (2005) and Boehmer, Saar, and Yu (2005). The salutary market quality effects of increased post-trade transparency in the U.S. corporate bond markets are documented by Bessembinder, Maxwell, and Venkataraman (2006), Edwards, Harris, and Piwowar (2007), and Goldstein, Hotchkiss, and Sirri (2007).

[7] Consolidated feeds are administered by the UTP and CTA Plans, which are described in more detail in the Appendix.

(which is typically referred to as "depth-of-book" information), and messages related to price discovery around the opening and closing auctions.

Different market data products offered by the exchanges are designed for different types of market participants with different needs. Some market participants find that the consolidated feeds serve their needs; these participants have little or no need to purchase data directly from exchanges. Institutional brokers and proprietary trading desks may subscribe to some or all exchanges' depth-of-book data feeds as inputs to their order routing algorithms or to help them work large orders. For example, an executing broker might break up a large order into smaller pieces submitted to multiple venues. Depth-of-book feeds could help that broker decide which venues should get the orders and the prices at which it should submit each order. These feeds would also help the broker readjust the pricing or venue for those orders based on evolving market conditions.[8]

IV. The Economics of the Provision of Equity Market Data by Exchanges

Market data is valuable to subscribers, and this is the basis for a market in equity market data. By developing systems and processes that bring together buyers and sellers, exchanges and other trading venues help create and produce market prices. These market prices, and the resulting market data, are only valuable because the exchanges provide the aggregating and matching services that create them.[9] To see this concretely, consider for a moment the fact that

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[8] Please see the Appendix for a more detailed discussion of consolidated feeds, proprietary market data products, and the development over time of the underlying regulatory framework.

[9] See, for example, J. Harold Mulherin, Jeffrey M. Netter, and James A. Overdahl, "Prices Are Property: The Organization of Financial Exchanges from a Transaction Cost Perspective," *Journal of Law and Economics* 34 (1991), pp. 591–644.

individual equity market participants are welcome to sell data concerning their own orders and transactions. This does not occur in practice, mainly because there is little value in such disaggregated data. Market data products have value precisely because they aggregate the orders of many market participants and report more than just a small subset of the transactions that result from matching buyers and sellers. To put it another way, market participants are not buying back their own data when they buy market data. What has value, and what they pay for, is to see the entire market: the actionable orders and transactions involving *other* market participants that have been accepted by an exchange.

Market data is a product of an exchange, but it has also been an important driver of exchange innovation. For example, in the early 2000s, the Island Electronic Communications Network ("ECN") operated a very fast matching engine and distributed a state-of-the-art order-level data feed to market participants. The simplicity, completeness, and speed of the so-called ITCH data feed helped the Island ECN to build market share as it competed with Nasdaq and other established trading venues. When Nasdaq acquired Island's successor Inet in 2005, Nasdaq adopted much of Inet's technology, including the ITCH data feed, in part because market participants valued Inet's matching technology and the associated market data. In fact, the NYSE later developed a similar order-level data feed, in part as a competitive response to the ITCH data feed and to similar feeds being offered by most other exchanges. More generally, the ability to sell market data, as well as the competition among trading venues that has been explicitly encouraged by the SEC, provides incentives for exchanges to innovate in ways that market data consumers value.

Speaking of innovation, it is also important to note that the provision of market data by exchanges is a natural outgrowth of the automation of equity trading. Automated market data

feeds have substituted for manual information flow via humans. Twenty years ago, a large broker-dealer would need dozens of employees scattered around the floor of the NYSE, and those employees would still provide a fraction of the information that is currently provided in a single NYSE data feed.[10] Even the most expensive exchange data feed is cheaper than the average salary and bonus paid to a New York City employee in the securities industry.[11]

Like most producers, stock exchanges offer a variety of market data products at different price levels. The simplest, most basic products are offered at the lowest prices. For example, consolidated data that is more than 15 minutes old can be easily found on financial websites, because consolidated feed subscribers face no restrictions on the redistribution of these older prices. Financial websites also provide a considerable amount of real-time data at no charge to their users. For example, Google and Yahoo Finance provide real-time last-sale information on all U.S. equities. This real-time information may be sufficient for many investors to make trading decisions.

Comprehensive real-time data comes from the consolidated feed at a cost. The consolidated feed contains a great deal of data that characterizes the essential elements of the national market: the most recent transaction prices from all trading venues, and the best bid and offered prices and quantities at each exchange.

More advanced market data products are offered at higher prices, reflecting their greater value to market participants with specific needs based on how they choose to trade. Exchange order-level data feeds are particularly valuable to active proprietary traders and to users of

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[10] See, for example, Ian Domowitz and Benn Steil, "Automation, Trading Costs, and the Structure of the Securities Trading Industry" (working paper, 1997).

[11] The Office of the New York State Comptroller reported that the 2016 average salary and bonus for an employee in New York City working in the securities industry was $375,300. https://www.osc.state.ny.us/osdc/rpt6-2018.pdf.

algorithms designed to trade large amounts of stock over periods of time. But exchanges must price proprietary products with care, because overpricing can cause them to lose order flow, and the value of proprietary products is constrained by the existence of the consolidated feeds. For many market participants, exchanges that sell proprietary market data products must compete with the SIPs, because SIP data includes a large subset of each exchange's proprietary data and aggregates together all of the exchanges and other trading venues, thereby reducing the value of any single exchange's proprietary data.

Also, like most producers, stock exchanges face substantial competition from existing rivals and potential new entrants. Currently, there are 13 cash equity exchanges and over 30 ATSs in the United States, with many new entrants in the exchange space over the past 20 years.[12] For example, Cboe, which is now one of the larger U.S. equity exchange operators, manages four exchanges that were previously operated by Bats and Direct Edge. Bats was founded in 2005, and the Direct Edge ECN began in 2007. In addition, a new exchange IEX was just approved in 2016. This competition, and the potential for new entrants, ensures that prices for market data are set in a competitive market.

In fact, one of the important ways that new entrants can compete is by offering free market data. For example, IEX offers real-time depth-of-book and last sale information to subscribers at no cost. Similarly, Bats offered free depth-of-book data for the first several years of its existence, and Arca also offered its depth-of-book data for free for a significant period of time. Exchanges that do sell market data must also consider the effects on their market share of trading. Market participants will decline to purchase market data that is overpriced, and market

[12] FINRA's April 23, 2018 weekly report of ATS trading volume identifies 32 active ATSs.

participants who stop buying an exchange's market data may also decide to route their order flow to other venues. Overpriced market data is not in either side's interest. More generally, institutional investors, broker-dealers, and other professional users of market data are well-situated to advance their own interests in their interactions with exchanges (for example by choosing to divert order flow from exchanges with proprietary data they deem too expensive).

Seen this way, the market for market data is quite similar to the segmented markets for many other products. As an analogy, consider the market for new automobiles. A basic new car (such as the Honda Fit or the Ford Fiesta) can be purchased in the United States for less than $20,000. Such a vehicle is likely to be fairly small, with a modest number of features, and provides reliable transportation for a small number of passengers. However, such a car provides a great deal of functionality for a relatively low price, and many buyers find that it meets their needs and opt for this choice. For those with an even lower willingness to pay, there are also used cars available at considerably lower prices.

At the higher end of the market, there are automobiles that sell for over $60,000, such as the BMW 7 series or a Cadillac CTS sedan. These are typically more powerful vehicles with many more features, and these vehicles appeal to buyers with a different set of requirements. Virtually every potential buyer would prefer the higher-end vehicle, but given the price differential, only some buyers—those with the desire for the top-of-the-line performance or features and a willingness to pay the higher price—ultimately choose this particular option.

Still other would-be buyers decide they do not need to purchase a car at all; instead, they might walk or take public transit to satisfy their transportation needs. Analogous investors would make use of free or very low-cost market data alternatives for their investing information needs.

Moreover, there are several different vehicle manufacturers—Ford, GM, Chrysler, Honda, Toyota, BMW, and so on—competing on price, performance, features, styling, and many other dimensions. Most individual buyers purchase just one vehicle at a time. Others, including rental car fleets, acquire many cars from many different manufacturers simultaneously.

Finally, as is the case in equity markets, there are a few entities with business models that require them to purchase a car from each manufacturer. For example, reviewers such as Consumer Reports must purchase vehicles from each well-known manufacturer in order to provide comprehensive reviews, comparisons, and recommendations. It is more expensive for Consumer Reports to purchase a complete range of luxury sedans to review that car class.[13] However, Consumer Reports does not petition the government to lower luxury sedan prices; in fact, it would probably be embarrassed to do so. It realizes that in a competitive market such as this one, the government does not set car prices but allows the market to operate freely. At the same time, car manufacturers dare not set the price of a luxury sedan too high, because they risk causing buyers to consider an alternative make instead, and even Consumer Reports might decide there is no reason to test the overpriced vehicle that few readers are likely to seriously consider.

V. Market Data and Regulation

For both SIP and proprietary data products, every change in a pricing schedule must be filed publicly with the SEC, and the SEC has the authority to take action to disapprove those fees. Moreover, neither the SIPs nor exchanges can charge fees other than those contained in

[13] See https://www.consumerreports.org/cars-how-consumer-reports-tests-cars/.

their SEC filings. For example, this means that exchanges cannot negotiate different deals with different market data subscribers. In contrast, the prices charged by third-party vendors for market data–related services are unregulated and are not published.

The SEC discussed issues related to equity market data in a 1999 concept release. The SEC stated that Congress "intended to rely on competitive forces to the greatest extent possible to shape the national market system," but also suggested that Congress believed market forces might not be sufficient to spur the development of a consolidated feed (as opposed to proprietary feeds), and empowered the SEC to ensure "that the essential mechanisms of an integrated secondary trading system are put in place as rapidly as possible."[14] At least historically, more attention has been paid to SIP data pricing than to proprietary data pricing, likely because brokers need access to the consolidated feed in order to meet certain regulatory obligations. In particular, under Rule 603(c) of Reg NMS, which is sometimes referred to as the Vendor Display Rule, the SEC staff has made clear that broker-dealers must provide a consolidated display of market data when they are providing equity quotation information to customers.[15] Brokers can choose to satisfy the Vendor Display Rule by paying a minuscule $0.0075 per query to provide a snapshot of the consolidated feed.

A particularly weak argument is that the consolidated feed should be priced based solely on the costs of the SIPs. First, costs should include all of the operating costs the National Market

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[14] See SEC Release No. 34-42208.

[15] FINRA Regulatory Notice 15-52, December 2015.

System incurs in facilitating equity transactions, not just the costs specific to the SIPs. In addition, from an economic perspective, a regulated product should be priced to maximize social welfare, which means that prices should reflect the product's overall value, not just all of the costs associated with its production.[16] In the case of market data, the consolidated feed has considerable value to its subscribers along myriad dimensions. Some of this value reflects the public good aspects of the consolidated feed. For example, as described above, some subscribers are midpoint crossing networks that use the resulting prices as the basis for matching buyers and sellers on their networks. Other than relatively small SIP fees (less any rebates from Trade Reporting Facility ("TRF") prints), these networks bear none of the costs of the consolidated price discovery process on which their business models depend. In regulating the pricing of the consolidated feeds, the SEC appropriately and holistically should consider the overall value of the market data being created.

From a regulatory standpoint, proprietary data feeds are fundamentally different from consolidated data feeds. First, there is no regulatory mandate that exchanges sell proprietary data at all. In fact, for many years prior to 2001, depth-of-book data for NYSE-listed stocks was not generally available outside of the specialist's post. Second, depth-of-book data is not necessary or helpful for many types of market participants. For example, according to a 2014 article, only 3.3% of all trades take place outside the NBBO, where depth-of-book information would be

[16] See, for example, Paul L. Joskow and Nancy L. Rose, "The effects of Economic Regulation," in *Handbook of Industrial Organization*, Vol. 2, edited by R. Schmalensee and R. Willig (Elsevier, 1989).

particularly useful.[17] This explains why some market participants do not subscribe to proprietary data feeds at all, and among those who do subscribe, a significant portion subscribe to feeds from some but not all of the exchanges.[18] Although some have argued that depth-of-book data is necessary for a broker to comply with its best execution obligation, the SEC has stated that this is not the case.[19]

VI. Market Data Pricing and Revenues

A. Pricing Structure

Exchange market data fees, including fees for consolidated data distributed by the NMS Plans[20] and fees for exchange proprietary data, are subject to oversight by the SEC, and all fee changes are submitted as rule changes to the SEC and are published on the SEC's website. The level of transparency regarding exchange equity market data prices is thus extremely high.

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[17] Craig W. Holden and Stacey Jacobsen, "Liquidity Measurement Problems in Fast, Competitive Markets: Expensive and Cheap Solutions," Journal of Finance 69, no. 4 (2014), p. 1759.

[18] Initial Decision Release No. 1015, SEC Administrative Proceeding File No. 3-15350, June 1, 2016.

[19] SEC Release 34-59039, pp. 41–42, 75–76. FINRA indicated to its members in November 2015 that "a firm that regularly accesses proprietary data feeds … 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 FINRA Regulatory Notice 15-46, p. 13. However, that FINRA notice does not suggest that firms that do not already subscribe to proprietary feeds for their own internal use would need to start doing so as a result of the notice.

[20] Please see the Appendix for a more detailed discussion on the NMS Plans.

1. Consolidated Data Fees

Both the CTA and UTP Plans administer their own fee schedules, and in general the fee schedules do not change frequently.[21] There are two types of fees: access fees and use fees.

- *Access Fees*: Direct access fees apply for direct connections to the SIP, whereas indirect access fees are charged when data is supplied via a third-party vendor.
- *Use Fees*: Use fees are divided between "display" fees (e.g., "eyeball" usage by a market participant) and "non-display" data (e.g., automated use of the data, such as using the data as an input to an order routing or algorithmic trading system).
    - Display fees are charged per subscriber, with separate rates for professionals and non-professionals.[22] Alternatively, users can elect to pay a per-query fee, at a rate of $0.0075, subject to caps based on the number of queries for non-professionals.
    - Non-display fees are charged based on how the data is used. There are three categories of non-display uses: using data to match buy and sell orders (such as in an electronic trading system or dark pool), using data on behalf of a subscriber's customers, or using data for a subscriber's own purposes (such as its own proprietary trading). Each type of usage is charged for separately.

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[21] For example, the CTA Plan from 1987 to 2013 had a fee structure based on 14 pricing tiers. In 2013, CTA updated and simplified the structure to four tiers. See SEC Release No. 34-70010.

[22] Users are assumed to be professional unless they meet specific criteria, namely, they are individuals who are not securities professionals and are using the data for personal reasons. Both CTA and UTP Plans charge a monthly rate of $1 for non-professionals, but for the most part non-professionals do not even pay this modest amount directly, because their brokers usually bear that cost. For professional users of display devices, Tapes B and C charge a flat rate per professional user, while Tape A uses a four-tier system with reduced rates based on the number of professional users.

The fee structures also include various other fees, such as redistribution fees (which are charged to firms that retransmit the data externally) and television ticker display fees (which are tiered based on the number of households that have access). The main types of fees are summarized in Table 1.

2. Exchange Proprietary Data Fees

The exchanges structure their proprietary market data fees in a similar way.[23] For each of the various products offered by the exchanges, the exchanges charge access fees, usage fees, and redistribution fees. Exchanges also apply the same designations for professional and non-professional users, and display and non-display distinctions also apply.

Once they have been put in place, prices for exchange proprietary data products have generally remained stable over time.

For example, NYSE's OpenBook is a proprietary data product that provides frequent snapshots of the entire NYSE order book. It was initially offered in 2002 at a fixed access fee of $5,000 per month plus a variable fee based on the number of subscribers. The access fee has not changed since inception of the product, and the subscriber fee changed only once, in 2004, from $50 to $60 for professional users; the non-professional subscriber fee ($15/month) has not

[23] Although exchanges' fee schedules are structurally similar, there are nuanced differences between the exchanges. For example, Cboe Global Markets and Nasdaq differentiate between internal and external distribution, whereas NYSE just charges a redistribution fee on top of an access fee. Nasdaq in some cases charges different fees for Nasdaq-, NYSE-, and Amex-listed issues. See, for example, https://nasdaqtrader.com/Trader.aspx?id=DPUSdata, https://markets.cboe.com/us/equities/membership/pricing/ and https://www.nyse.com/publicdocs/nyse/data/NYSE_Market_Data_Pricing.pdf.

Summary of Selected Consolidated Market Data Fees by Tape

	Tape A	Tape B	Tape C
Access Fees			
Direct Access	$3,000	$2,000	$2,500
Indirect Access	$2,000	$1,000	$500
Usage Fees			
Display Only			
Professional	$19 – $45/Subscriber	$23/Subscriber	$24/Subscriber
Non-Professional*	$1/Subscriber	$1/Subscriber	$1/Subscriber
Per Query*	$0.0075 per Query	$0.0075 per Query	$0.0075 per Query
Non-Display			
For ETS or ATS	$4,000	$2,000	$3,500
Customer Use	$4,000	$2,000	$3,500
Firm Use	$4,000	$2,000	$3,500
Redistribution Fees			
Real Time	$1,000	$1,000	$1,000

Source: CTA Network A Fee Schedule, January 2015; CTA Network B Fee Schedule, January 2015; UTP Plan Network C Fee Schedule, February 2018

Note: All fees are monthly, and are fixed unless indicated otherwise. This table does not represent the complete list of fees charged by the Networks, but does represent the main fee categories. In some cases different fee types are combined for simplicity in comparison, including separate fees for quotes and trades.

*Non-professional and per query fees are typically paid by an end-user's broker, and not by the end-user.

changed at all.[24] In 2013, the NYSE started charging a flat fee for all of a subscriber's internal non-display devices instead of requiring subscribers to report the number of non-display devices used.[25] Since its inception in 2002, the OpenBook product has been enhanced significantly in terms of speed and volume of data.

ArcaBook is a similar proprietary data product that provides information on the entire NYSE Arca order book. ArcaBook was free for many years (up until 2009), and it now has a fee schedule that is similar to OpenBook's, but with lower fee levels. The ArcaBook access fee is currently $2,000/month, the professional user display fee is $60/month, and the non-professional user display fee is $10/month. There are also redistribution and non-display fees for ArcaBook. Since it became available, the ArcaBook product has been enhanced significantly in terms of speed and volume of data. Nasdaq and Cboe proprietary data product pricing follows a similar pattern.

Exchange market data fee schedules are publicly available, so it is possible to estimate the total costs that would be incurred for proprietary data by various types of market participants. Consider the following hypothetical examples of data costs for different types of firms that subscribe to different packages of data for different uses:[26]

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[24] SEC Release No. 34-45138.

[25] SEC Release No. 34-69278. In 2009, recognizing that subscribers were incorporating data feeds into their own computer systems, the NYSE changed its unit of count to redefine a subscriber as a unique individual device that receives data, which also introduced the concept of non-display use and required users to report the number of non-display devices. This was introduced as a pilot rule change in 2009 and made permanent in 2010. SEC Release Nos. 34-62038 and 34-59198. In addition, subscribers were able to use managed non-display services as a lower priced option for non-display usage when non-display fees were introduced; managed non-display services were discontinued in 2016.

[26] The following examples are calculated based on current market data fee schedules. See https://www.nyse.com/publicdocs/nyse/data/NYSE_Market_Data_Pricing.pdf, https://www.nasdaqtrader.com/Trader.aspx?id=DPUSdata#tv, and http://cdn.batstrading.com/resources/membership/US_Market_Data_Product_Price_List.pdf.

- A broker-dealer with no automated use of the data might choose to display on user screens the Nasdaq products Nasdaq TotalView, BX TotalView, and PSX TotalView, for a total cost of $156 per month per device. If the same broker-dealer took all three NYSE integrated feeds (NYSE, NYSE American, and NYSE Arca), that would add an additional $140 per month per device. Taking all of Cboe's feeds would add an additional $100 per device per month. In practice, such a firm might subscribe to data from only a small subset of exchanges, which could lower its cost per device by a considerable amount from the figures above.
- A purely proprietary trading firm with no external customers and fewer than 100 display devices might spend $59,000 per month for NYSE data, $59,950 per month for Nasdaq data, and $32,500 per month for Cboe data.[27]
- Finally, a global investment bank with a wide range of trading activities might choose to subscribe to all of NYSE Group's proprietary integrated data feeds and the similar feeds for Nasdaq and Cboe. If such a firm were to use these feeds to display limit order books, provide trading algorithms to its institutional investor clients, and support an affiliated dark pool, its total fees would be on the order of $100,800 per month for NYSE data, $127,720 for Nasdaq data, and $37,000 for

[27] Assumes firm takes all three NYSE Group integrated feeds, all three Nasdaq TotalView products, and all four Cboe Depth products for 75 display-only devices and for non-display use in one non-display category. For BX and PSX, assumes 250 non-display subscribers at $55 and $50 per subscriber.

Cboe data.[28] This is an insignificant cost for these types of investment banks, which measure their annual equity trading revenues in billions of dollars.[29]

Note that I do not have any data on market data charges incurred by individual firms, so these examples are all hypothetical based on exchange fee schedules and assumptions about how market participants choose to use equity market data products. The examples are intended to show the broad range of possible choices and how the costs of market data can be affected by those choices. Market participants choose what business models and trading strategies they pursue and what types of and how much market data to purchase, and those business decisions ultimately determine each market participant's equity market data costs.

B. Consolidated Data Revenues and Allocations

The fees collected by the CTA and UTP Plans for sales of consolidated data, after certain expenses, are distributed back to the Plans' participant exchanges and FINRA. The plan participants can then pass these revenues on to other market participants. For example, some exchanges historically have shared market revenues with specialist firms or other exchange members who routed order flow to the exchanges. FINRA also has a program for rebating market data revenue back to those FINRA members who reported the off-exchange trades. Thus, the ultimate allocation of market data revenue is broader than just the plan participants, and

[28] Assumes firm takes all three NYSE Group integrated feeds, all three Nasdaq TotalView products, and all four Cboe Depth products for 120 display-only devices and for non-display use in two non-display categories. For BX and PSX, assumes 250 non-display subscribers at $55 and $50 per subscriber.

[29] Later in the paper, I estimate total 2015 equity trading revenue of $47.9 billion for the nine largest investment banks, or an average of $5.32 billion in equity trading revenues per firm. The $3.2 million annual data cost from this example is approximately 0.06% of this average revenue figure.

recipients of consolidated market data revenue include broker-dealers who operate dark pools or otherwise execute trades as off-exchange market makers.

Prior to 2007, CTA revenues were allocated in proportion to the number of trades reported by each exchange. The SEC established a new revenue allocation formula in 2005 when it adopted Reg NMS. The new formula, which went into effect on April 1, 2007, first allocates revenues across stocks in proportion to the square root of dollar volume, then within each stock allocates 25% of the revenue to plan participants in proportion to the participant's number of trades, 25% in proportion to the participant's share volume, and 50% in proportion to a measure of how often the exchange is offering liquidity in that stock at the NBBO.[30]

Although the fee schedules described in the previous section have always been public, financial information about the CTA and UTP Plans, including the total amount of fees collected and revenue distributed to participants, has historically not been in the public record, with a few isolated exceptions.[31]

This changed in March 2018, when the CTA and UTP Plans disclosed historical information about the annual revenue distributed to participants going back to 2007, including a decomposition of these distributions for the trade and quote components of the allocation formula. However, it is important to note that this data does not disclose how individual participants share tape revenues with broker-dealers and others. Thus, this data set shows the maximum revenue per participant, not necessarily the amount each participant keeps for itself. In this section, I provide an analysis of this new data set.

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[30] SEC Release No. 34-51808.

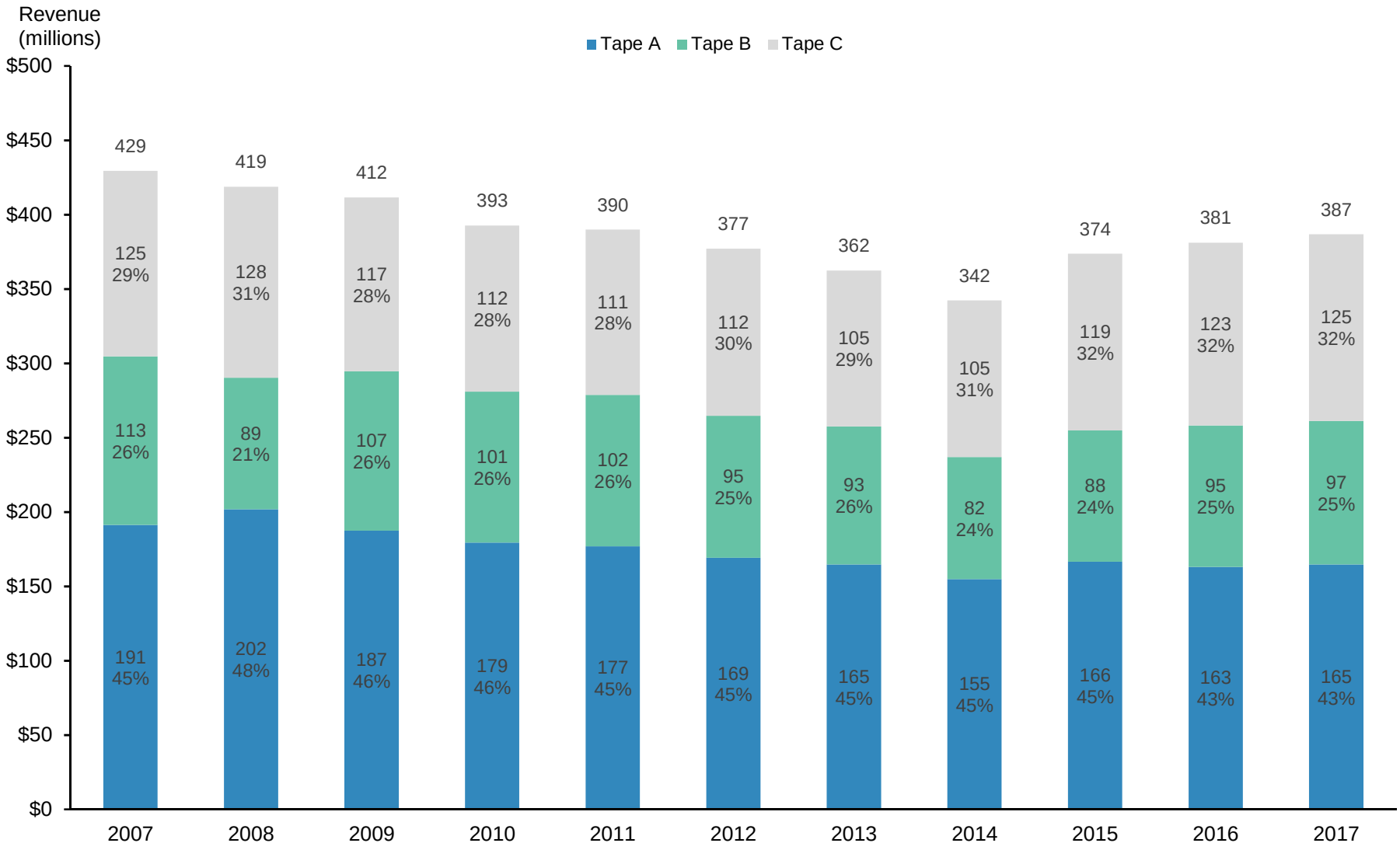
[31] SEC Release Nos. 34-49325, 34-51808, and 34-61358.

Using the new data released by CTA and UTP, Figure 1 summarizes the aggregate amount of data revenues distributed to plan participants each year from 2007 to 2017, broken down by Tape A, Tape B, and Tape C. As the chart indicates, there has been some fluctuation over the years, but no growth in revenues over time. Total consolidated revenues distributed in 2017 were $387 million, which is 10% lower than they were in 2007, even without adjusting for inflation. After adjusting for inflation using the CPI-U, consolidated revenues distributed declined by more than 23% over the 10 years ending in 2017. On average over the period from 2007 to 2017, distributed revenues were $175 million per year for Tape A, $97 million per year for Tape B, and $117 million per year for Tape C. On a yearly basis, Tape A constituted between 43% and 48% of total revenues, Tape B constituted between 21% and 26% of total revenues, and Tape C constituted between 28% and 32% of total revenues.

Table 2 shows that consolidated revenues are a small and declining fraction of overall exchange revenues. For example, in 2008 equity SIP revenues were 4% of total NYSE Euronext revenues. By 2017 this percentage had declined to 2% of total parent company revenue. For Nasdaq, consolidated data revenues were 4% of total revenues in 2008, declining to 3% of total revenues in 2017.

Figures 2–4 summarize how the allocation of market data revenues across plan participants has evolved over time for Tapes A, B, and C. Figure 2 shows revenue allocations for Tape A (securities with primary listing on the NYSE). It shows a pattern over time consistent with the well-known increase in fragmentation of volume across trading venues after Reg NMS. Tape A revenues earned by NYSE exchanges have declined since 2007, while Tape A revenues have increased for the Nasdaq exchanges, the Bats/Direct Edge exchanges (acquired by Cboe Global Markets in 2017), and FINRA.

Annual Consolidated (SIP) Equity Market Data Revenue by Tape



Source: UTP Plan Revenue Disclosure Q42017: Trade & Quote Revenue Distributed to Participants; CTA Financial Disclosure on 3/1/18: Tape A Trade & Quote Revenue Distributed to Participants; CTA Financial Disclosure on 3/1/18: Tape B Trade & Quote Revenue Distributed to Participants

Market Data Contributions to Total Exchange Revenue Are Stable Over Time

(NYSE Euronext and ICE, in millions)

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
NYSE Euronext											
Total Revenues	[A]	$4,702	$4,684	$4,425	$4,552	$3,749	$3,797				
Market Data Revenues	[B]	$428	$403	$373	$371	$348	$353				
US Equity SIP Revenues	[C]	$168	$145	$142	$131	$112	$104				
Other*	[B - C]	$260	$258	$231	$240	$236	$250				
Percentage of Total Revenues											
Market Data Revenues	[B / A]	9%	9%	8%	8%	9%	9%				
US Equity SIP Revenues	[C / A]	4%	3%	3%	3%	3%	3%				
*Other**	[(B - C) / A]	6%	6%	5%	5%	6%	7%				
ICE											
Total Revenues	[A]							$4,352	$4,682	$5,958	$5,834
Market Data Revenues	[B]							$446	$470	$535	$556
US Equity SIP Revenues	[C]							$96	$108	$108	$104
Other*	[B - C]							$350	$362	$427	$452
Percentage of Total Revenues											
Market Data Revenues	[B / A]							10%	10%	9%	10%
US Equity SIP Revenues	[C / A]							2%	2%	2%	2%
*Other**	[(B - C) / A]							8%	8%	7%	8%

Source: NYSE Euronext 10-K filing [2008–2012]; NYSE Euronext 10-Q filing [Q3 2013, Q1 through Q3 revenue is extrapolated in order to make the values comparable to the other revenues in the table]; Intercontinental Exchange 10-K filing [2014–2017; CTA Financial Disclosure on 3/1/18: Tape A Trade & Quote Revenue Distributed to Participants, Tape B Trade & Quote Revenue Distributed to Participants; UTP Plan Revenue Disclosure Q42017: Trade & Quote Revenue Distributed to Participants

*The "Other" category includes all revenues associated with market data excluding US Equity SIP data. This includes all proprietary market data for all geographic areas, and includes data from options, futures, indices, and others.

Note: Market Data Revenues represent revenues associated with all asset classes across all geographies. NYSE Euronext Total Revenues and Market Data Revenues from 2008 to 2012 include Euronext revenues after the merger with NYSE on April 4, 2007. For 2013, revenues are calculated by extrapolating Q1 through Q3 data from NYSE Euronext to annual estimates, due to Intercontinental Exchange acquiring NYSE Euronext in November 2013. US Equity SIP Revenues are compiled using recently reported data from CTA and UTP Plans. NYSE Euronext and ICE include tape revenues from New York Stock Exchange, NYSE Amex (starting in 2008), and NYSE Arca.

Market Data Contributions to Total Exchange Revenue Are Stable Over Time

(Nasdaq and Bats, in millions)

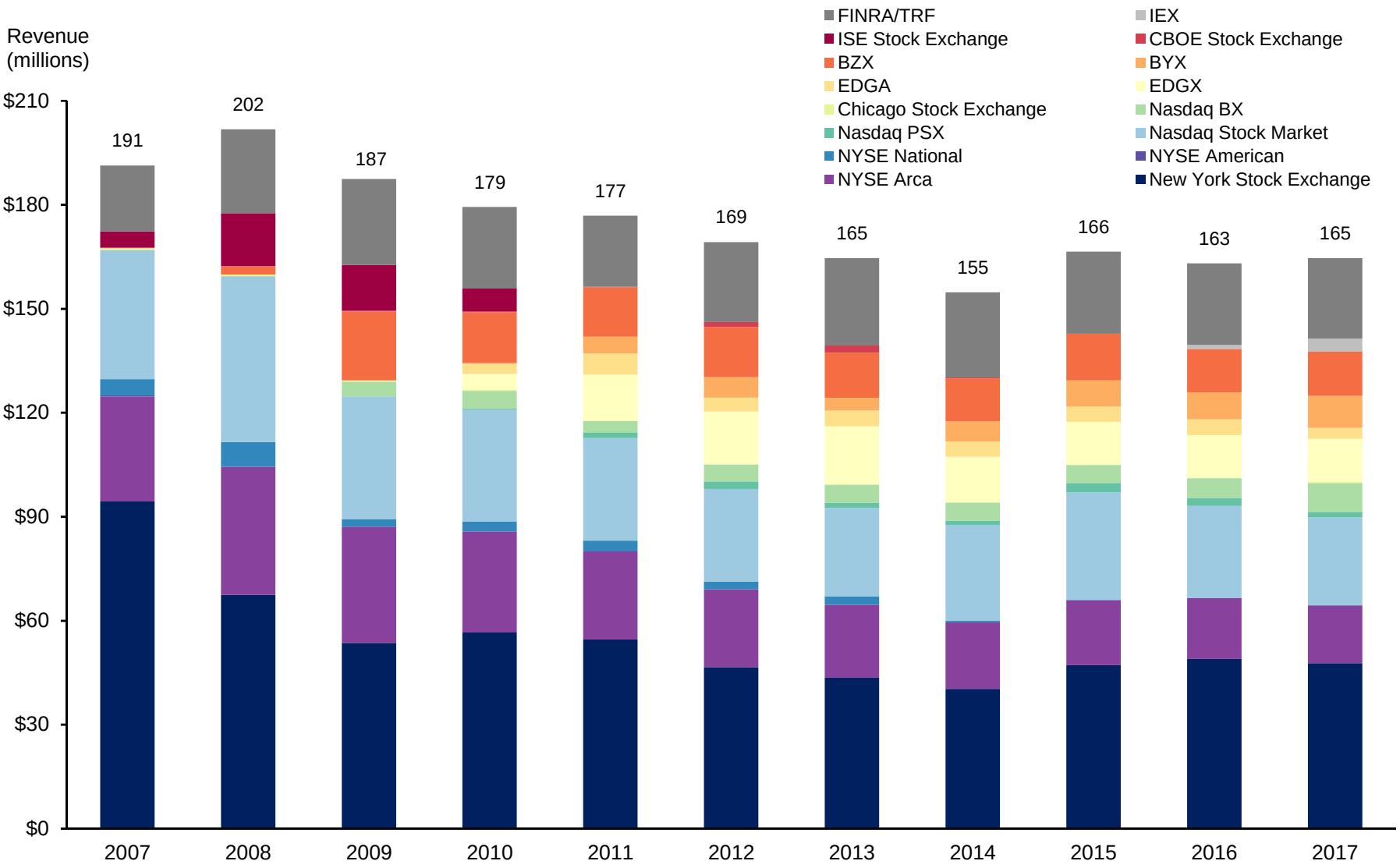
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Nasdaq											
Total Revenues	[A]	$3,650	$3,410	$3,191	$3,438	$3,120	$3,211	$3,500	$3,403	$3,705	$3,965
Market Data Revenues	[B]	$330	$325	$313	$333	$337	$362	$384	$399	$427	$454
US Equity SIP Revenues	[C]	$135	$114	$105	$100	$100	$92	$93	$102	$102	$107
Other*	[B - C]	$195	$211	$208	$233	$237	$270	$291	$297	$325	$347
Percentage of Total Revenues											
Market Data Revenues	[B / A]	9%	10%	10%	10%	11%	11%	11%	12%	12%	11%
US Equity SIP Revenues	[C / A]	4%	3%	3%	3%	3%	3%	3%	3%	3%	3%
*Other**	[(B - C) / A]	5%	6%	7%	7%	8%	8%	8%	9%	9%	9%
Bats											
Total Revenues	[A]								$1,779	$1,869	$2,229
Market Data Revenues	[B]								$131	$146	$165
US Equity SIP Revenues	[C]								$100	$103	$100
Other*	[B - C]								$31	$43	$65
Percentage of Total Revenues											
Market Data Revenues	[B / A]								7%	8%	7%
US Equity SIP Revenues	[C / A]								6%	5%	4%
*Other**	[(B - C) / A]								2%	2%	3%

Source: Nasdaq 10-K filing [2007–2017]; BATS Global Markets 10-Q Filing [Q3 2016]; BATS Global Markets Press Release [Q4 2016]; CBOE 10-K filing [2017]; CTA Financial Disclosure on 3/1/18: Tape A Trade & Quote Revenue Distributed to Participants, Tape B Trade & Quote Revenue Distributed to Participants; UTP Plan Revenue Disclosure Q42017: Trade & Quote Revenue Distributed to Participants

*The "Other" category includes all revenues associated with market data excluding US Equity SIP data. This includes all proprietary market data for all geographic areas, and includes data from options, futures, indices, and others.

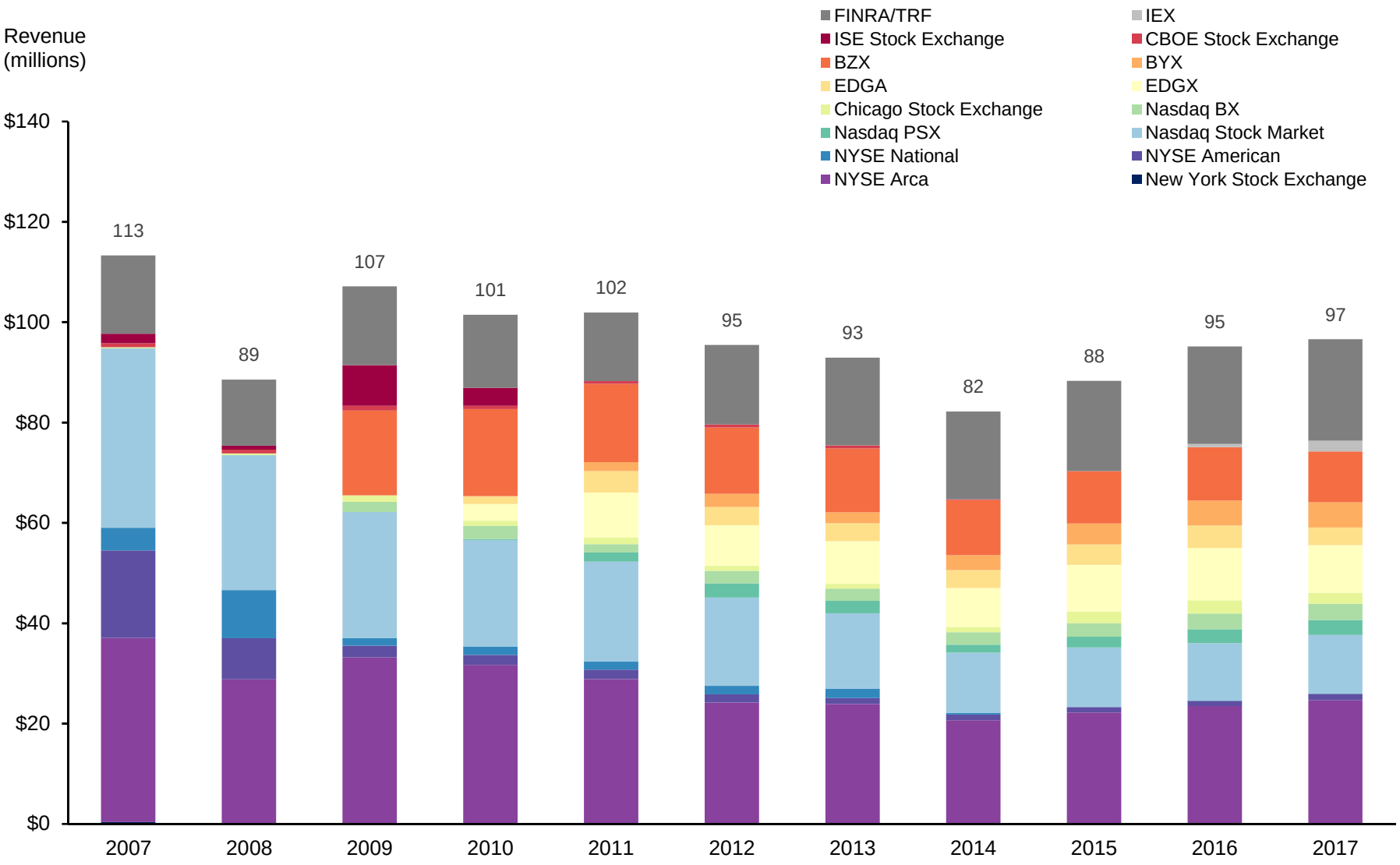
Note: Market Data Revenues represent revenues associated with all asset classes across all geographies. Bats Total Revenues and Market Data Revenues for 2015 and 2016 are calculated by combining nine months of financial reporting ending September 30 from the Bats Global Markets, Inc. 10-Q filed November 8, 2016 and three months of financial reporting ending December 31 from the Bats Global Markets, Inc. February 9, 2017 Press Release. Bats Total Revenues for 2017 are populated from the Cboe Global Markets, Inc. 10-K filed February 22, 2018. US Equity SIP Revenues are compiled using recently reported data from CTA and UTP Plans. Nasdaq includes tape revenues from Nasdaq, Nasdaq BX (starting in 2009), and Nasdaq PSX (starting in 2008). Bats includes tape revenue from BZX, BYX, EDGA, and EDGX.

Annual Consolidated (SIP) Equity Market Data Revenue: Tape A



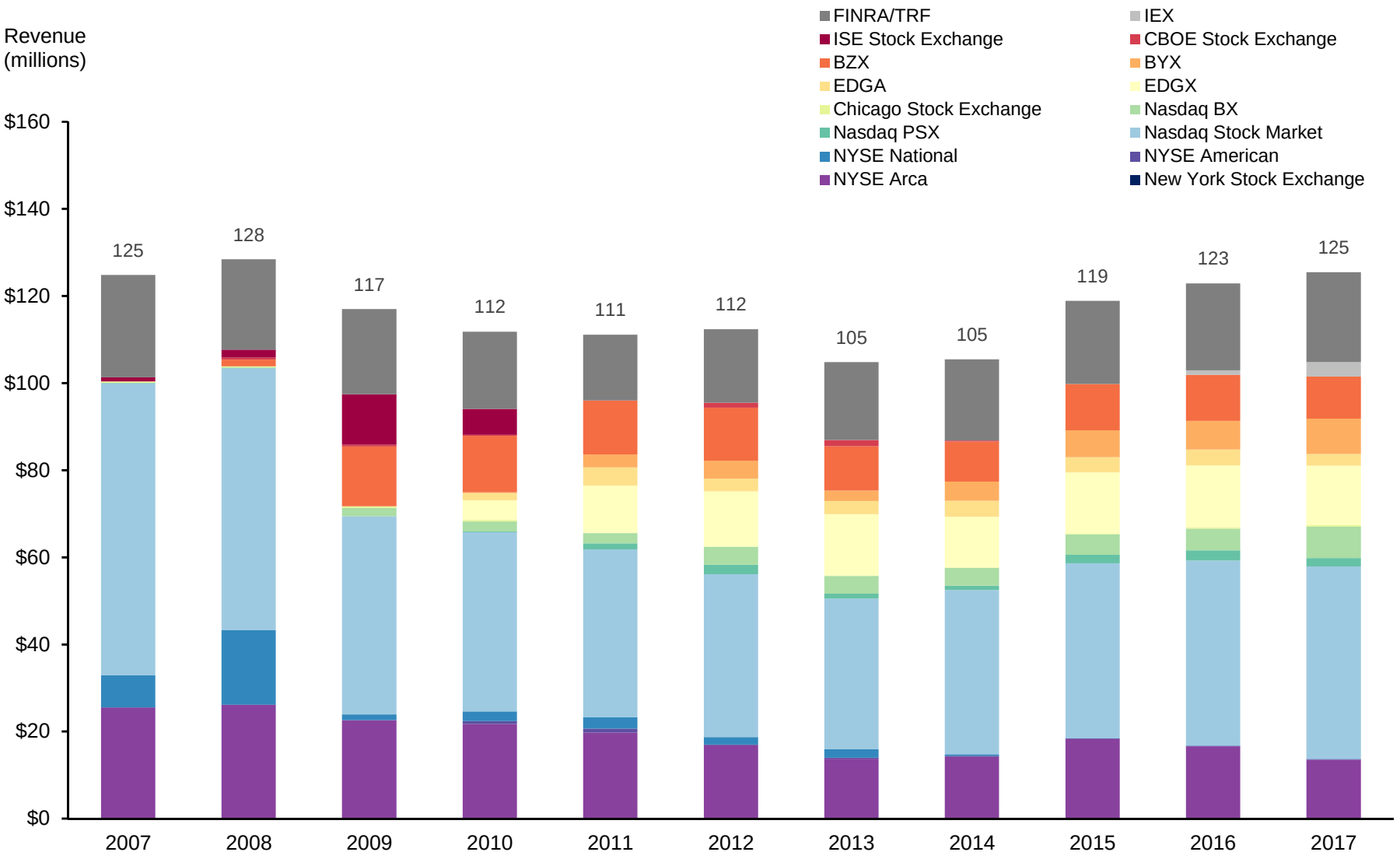
Source: CTA Financial Disclosure on 3/1/18: Tape A Trade & Quote Revenue Distributed to Participants

Annual Consolidated (SIP) Equity Market Data Revenue: Tape B



Source: CTA Financial Disclosure on 3/1/18: Tape B Trade & Quote Revenue Distributed to Participants

Annual Consolidated (SIP) Equity Market Data Revenue: Tape C



Source: UTP Plan Revenue Disclosure Q42017: Trade & Quote Revenue Distributed to Participants

Figure 3 shows the evolution of revenue allocation for Tape B (securities with primary listing on exchanges other than NYSE or Nasdaq). In 2007, a significant portion of Tape B revenues was earned by NYSE Arca and the American Stock Exchange. The combined Tape B revenue for current NYSE exchanges has decreased since then, as have Tape B revenues for the three current Nasdaq exchanges. Bats/Direct Edge exchanges and FINRA have gained market share over this interval and have seen an increase in Tape B revenues since 2007.

Figure 4 provides a similar chart for Tape C, which consists of securities with primary listing on Nasdaq. In 2007, Tape C revenue was mostly shared by Nasdaq, NYSE Arca, and FINRA. Since that time, the revenue earned by the Nasdaq exchanges has decreased, offset by increases in revenues by the Bats/Direct Edge exchanges and FINRA.

The data released by CTA and UTP also provides a breakdown between revenue distributed for the quote and trade components of the allocation formula. Based on the allocation formula that became effective in 2007, 50% of distributed revenues is allocated based on trading activity (number of trades and number of shares) and 50% based on quoting activity. Thus, across the entire industry, the amount of revenues distributed from the quote component equals the amount distributed from the trade component.

However, FINRA is not often used as a channel for displaying quotes, so its revenues are derived almost exclusively from trades.[32] Consequently, FINRA's share of the overall market revenues, reflected in the charts above, does not reflect its market share of trade reports. For example, in 2017, FINRA captured 16.6% of all consolidated market data revenue and 33.2% of

[32] When market participants use FINRA's Alternative Display Facility ("ADF") for quoting, FINRA does earn quote credit. In recent years, however, FINRA has not received any allocation of quote revenue. FINRA's share of quote revenue across all networks was approximately 2.14% in 2014, 0.14% in 2015, and zero in 2016 and 2017.

the trade revenue. Because the exchanges are competing with FINRA for trade revenue but not for quote revenues, the exchanges derive more than half their SIP revenues from the quote component. This is an important distinction, because it reflects the value of a key aspect of the price discovery process.

In summary, Figures 2–4 show that while total consolidated revenues distributed have stayed roughly constant since 2007, primary listing exchanges NYSE, Nasdaq, and AMEX/NYSE American have experienced reduced allocations, in large part due to new trading venue entrants. New ECNs would successfully capture market share in trading and then become registered exchanges through mergers or through exchange registration. This happened with Archipelago in the early 2000s, which gained access to tape revenue by affiliating with and then acquiring the Pacific Stock Exchange (although in this case the NYSE Group ultimately recaptured that portion of the market data allocation when it acquired Arca Ex in 2006). This happened again with the development of the Bats ECN, which became a registered exchange in 2008 and launched a second exchange in 2010, and two Direct Edge ECNs, which became registered exchanges in 2010.

Off-exchange trading also provides a significant source of competition for consolidated market data revenues. FINRA's competing TRFs—the FINRA/Nasdaq TRF and the FINRA/NYSE TRF—pass through the majority of their market data revenue from the CTA and UTP Plans to broker-dealer market centers that report trades to the TRFs. ATSs and broker-dealers trading as principal (including internalizers and wholesale purchasers of retail order flow) report their trades in this way. Thus, it is not just exchanges that receive revenue from consolidated feeds, but also dark pools, ATSs, and internalizers (who collectively receive tens of

millions of dollars annually in market data revenue rebates).[33] In fact, the total dollar amount of market data distributed to FINRA members who report off-exchange trades to a TRF has increased over time as the off-exchange share of trading has increased.

Market data rebates to broker-dealers reporting off-exchange trades serve two important disciplining roles. First, they effectively reduce the net amounts that off-exchange market centers pay for market data. Second, these rebates create an additional form of competition. In competing vigorously for order flow, exchanges can and do recognize that they must offer a trading product that is attractively priced relative to an alternative that may include market data rebates.

C. Exchange Market Data Revenues

Exchanges receive equity market data revenue from the sale of proprietary data and from the sale of SIP data. Although the exchanges do not provide itemized details of their exchange market data revenues, total market data revenues (which include market data revenues from securities exchanges and other sources as well) are reported in the financial disclosures of exchanges' parent companies. These disclosures indicate that total market data revenue is a small portion of overall reported revenue, and has remained roughly constant over time as a percentage of those total revenues.

Table 2 provides data on total market data revenues (across all asset classes and all geographies) of exchange groups as a percentage of total revenues over time for the three major ownership groups, as reflected in their financial disclosures. Market data revenue reported by

[33] In 2017, the TRFs collected over $64 million in revenues from Tapes A, B, and C. According to FINRA Rule 7610B, 85% or more of revenues are shared with FINRA members whose market share is at least 0.1%. See http://finra.complinet.com/en/display/display_main.html?rbid=2403&element_id=7355.

ICE (and its predecessor NYSE Euronext), which includes market data for equity and non-equity products, both inside and outside the United States, has remained between 8% and 10% of total revenue from 2008 to 2017. Likewise, Nasdaq's market data revenue has remained between 9% and 12% over the same time period. For Bats, market data revenue accounted for 7% to 8% of revenues from 2015 to 2017.

From these financial disclosures, it is also possible to place a strong upper bound on the revenues from the sale of equity securities exchange proprietary data. Table 2 also shows that proprietary data accounts for at most $65 million of 2017 revenue at Bats, which is 3% of its overall revenue that year. For Bats, it is clear that proprietary data is a significantly smaller source of revenue compared to consolidated data. For NYSE and Nasdaq, equity securities exchange proprietary data revenues have been discussed in recent earnings calls. During the 3Q17 ICE earnings call, for example, ICE management stated that "the sales of NYSE real-time equity data products [i.e., proprietary market data products] are expected to be less than $90 million in annual revenue to us and their growth has been relatively stagnant. These products account for approximately 2% of ICE's annual revenue." For the same quarter, Nasdaq provided a slide in its earnings presentation noting that U.S. equity proprietary depth products generated $101 million in trailing 12-month revenue, compared to $120 million for its share of consolidated data fees. Thus, it appears that for all three major U.S. stock exchange groups, proprietary equity market data actually provides less revenue to these firms than consolidated data.

D. Third-Party Vendors

Industry research reports, such as those by Burton-Taylor and Atradia,[34] provide detailed information about the costs of market data and related services to investors. For example, Burton-Taylor reports that in 2016, the total revenue earned by third-party vendors for market data–related services was over $12 billion.[35] To put this number into perspective, this is over 10 times as much revenue as all the major exchanges combined earned for both proprietary and consolidated data during the same period. Exchange market data revenues across all asset classes and geographies (which is much more than market data revenue from just U.S. equity markets) total about $1.1 billion in 2016—a small fraction of the over $12 billion paid by market participants for real-time and trading data–related services during that time period.[36]

E. Market Data Revenues as a Friction in Investment Performance

Retail and other equity investors might look at these market data revenues and conclude that they are significant costs that could contribute to higher brokerage commissions, greater mutual fund fees, and other drags on an investor's overall investment performance. However,

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[34] Burton-Taylor provides an annual report called "Financial Market Data/Analysis: Global Share & Segment Sizing." Atradia published a research study in August 2010 called "The Cost of Access to Real Time Pre & Post Trade Order Book Data in Europe."

[35] "Financial Market Data/Analysis: Global Share & Segment Sizing," Burton-Taylor, 2017, p. 139. Note that this figure does not include exchange market data fees, and only includes fees paid to vendors themselves, denoted as "Real-Time & Trading Data."

[36] Note that these three exchange groups operate a variety of financial markets, including options markets, futures markets, and others. Their financial statements do not separately break out U.S. equity market data fees, so the 2016 total U.S. *equity* market data fees are below $1.108 billion, and probably substantially so. Similarly, the $12.465 billion revenue number for third-party vendors applies to all financial markets, not just U.S. equity markets.

the data does not bear this out: the aggregate cost of equity market data is very tiny compared to the amounts invested in the stock market.

To see this, consider the $1.1 billion of revenue reported by the three major exchange groups under the market data category (which includes all asset classes and geographies) in 2016 relative to the overall size of the U.S. equity market, which was $30.15 trillion at the end of 2016.[37] Recall that this figure applies to all financial assets and jurisdictions where NYSE, Nasdaq, and Cboe operate, so it overstates U.S. equity market data revenue (likely by a substantial amount), whereas the size figure for the U.S. equity market is in fact limited to U.S. equities. Even so, this market data revenue figure represents less than 0.004% of the market capitalization of U.S. stocks, and the true ratio is probably substantially lower than 0.004% considering that the market data revenue figure (the numerator) includes data revenues from non-U.S. and non-equities markets. Equity market data has considerable value, as noted above, but even if its cost were considered as a simple drag on investment performance, the cost of equity market data would subtract far less than one basis point from overall investor performance each year.

This figure is also minimal compared to other standard sources of "drag" in investment performance: the overall amount charged in commissions, fees charged by investment managers, and so on. For example, I collected data on commissions charged by the retail brokerage sector. Together, the six firms in the Bloomberg Intelligence U.S. Retail Brokerage Competitive Peers Index reported $10.0 billion in commission and related revenue in 2016. These firms alone take about 10 times as much in commissions from the subset of investors who use them as all market

[37] Center for Research in Security Prices (CRSP) database total value of listed equity securities as of December 30, 2016.

data generates from *all* market participants. By making this comparison, I do not mean to suggest that these brokerage firms have inappropriate commission levels. In fact, these broker-dealers also seem to engage in robust competition for customers, constantly improving their technological infrastructures and service delivery, while providing value in the form of equity transactions in return for small fees. My only point in drawing these comparisons is that market data costs are quite modest in comparison to other costs incurred by equity market participants.

Exchange market data costs are also small relative to overall broker-dealer equity trading revenues. For example, in the first nine months of 2015 the nine largest investment banks earned a total of $35.9 billion from their equities trading operations.[38] This amounts to an annualized total of $47.9 billion, assuming that the banks generated revenues at the same rate.[39] In contrast, in 2015 the total market data revenue earned by NYSE, Nasdaq, and Cboe (for all asset classes and geographies) was $1.1 billion. Thus, total exchange market data revenues were less than 2.3% of equities trading revenues for just these nine investment banks. Since the numerator includes non-equity market data revenue, and the denominator includes only nine firms, this 2.3% percentage overstates (and probably substantially so) the fraction of equity trading revenues spent on equity market data by broker-dealers in aggregate. In short, exchange equity market data is a very small cost for the securities industry overall.

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[38] Christina Rexrode, "The New Kid on the Stock-Trading Block: Citigroup," *Wall Street Journal*, January 10, 2016.

[39] This value is calculated by dividing the reported values of equities trading revenue found in the *Wall Street Journal* article by 0.75 to estimate annual revenue. Although each of the banks does not report a separate value for equities trading revenue in their financial statements, the extrapolated number appears to be in the right ballpark based on relevant reported categories.

VII. Conclusion

The data on equity market data revenues is clear. Revenues from the consolidated feed are modest, totaling $387 million in 2017. These revenues are lower than they were 10 years ago, while the consolidated feed has gotten considerably faster. Scaled by the over 1.5 trillion U.S. shares that changed hands in 2017, consolidated feed revenues amount to at most two hundredths of a cent per traded share. Exchanges are selling their own proprietary market data, but their overall market data revenues are relatively small, and they have remained approximately constant as a percentage of overall exchange revenues. Finally, market data revenues are small compared to some of the other costs that market participants face. Third-party vendors have overall real-time and trading data revenues that are over 10 times exchange market data revenues. Broker-dealer commission revenue is similarly much larger than exchange market data revenue. When aggregated together, annual exchange market data revenues are at most 0.4 basis points of the U.S. equity market capitalization, so they are truly a rounding error when it comes to calculating overall investment performance.

The economics of equity market data are also clear. Market data is clearly valuable to a wide variety of market participants for a wide variety of reasons, and basic economic principles dictate that the producers of that market data should be compensated for that value, which the existing regulatory system accomplishes. Although most broker-dealers are required to subscribe to it, consolidated market data also has public good aspects, and like other public goods, consolidated market data might be underpriced without regulatory oversight. The SEC is capable of taking into account all of these considerations.

For proprietary exchange data feeds, the main question is whether there is a competitive market for proprietary market data. More than 40 active exchanges and alternative trading

systems compete vigorously in both the market for order flow and in the market for market data. The two are closely linked: an exchange needs to consider the negative impact on its order flow if it raises the price of its market data. Furthermore, new entrants have been frequent over the past 10 years or so, and these venues often give market data away for free, serving as a check on pricing by more established exchanges. These are all the standard hallmarks of a competitive market.

Appendix — More Details on Market Data

There is a long history of stock exchanges and vendors selling market data. After stock ticker technology was introduced in 1867, ticker companies sold access to equity market data. For example, New York Quotation Co. and Gold and Stock Telegraph both disseminated quotation data from the NYSE. New York Quotation Co. became owned and controlled by the NYSE in 1890, and was given the exclusive right to provide equity market data to NYSE members.[40]

The modern era of equity market data began with the overhaul of securities market regulation in the early 1970s. This was a time of intense legislative and regulatory action, including a focus on the fragmentation of trading across primary exchanges, regional exchanges, and third-market (off-exchange) trading. A series of studies, reports, and hearings involving the SEC, the exchanges, advisory committees, and congressional committees culminated in a new regulatory framework built around the core principles of the legislatively mandated National Market System.[41]

An important component of this new regulatory framework was the development of a system for channeling trade and quote data from each trading venue into consolidated feeds. This was accomplished by creating joint industry plans ("NMS Plans"),[42] including the

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[40] For a description of the mechanics of how the tickers worked in the early twentieth century, see Sereno Pratt "The Work of Wall Street," (1912), pp. 182–184.

[41] See Section 11(a) of the Securities Exchange Act of 1934. For a detailed summary of the regulatory activity at that time, see Robert Colby et al., "The National Market System: A Selective Outline of Significant Events," 1985.

[42] An NMS Plan is a consortium of self-regulatory organizations (including registered securities exchanges and FINRA) that come together as "participants" under the plan's governing documents as a mechanism for coordinating compliance with a particular regulatory mandate. The plans themselves are advised by various committees of market participants and are governed by committees made up of the plan members.

Consolidated Tape Association Plan, the Consolidated Quotation Plan, and the UTP Plan, described below.

Interestingly, consolidated equity market data is not mandated in many other jurisdictions around the world. For example, many European stocks are traded on multiple stock exchanges in the European Union, but each stock exchange there distributes its data as it sees fit and is not required to channel trade and quote data into consolidated feeds. In these jurisdictions, third-party vendors are typically the consolidators, aggregating individual exchange feeds together for use by market participants.

A. Consolidated Data

1. National Market System Plans

Under the U.S. regulatory framework developed in the early 1970s, certain trade and quote data must be disseminated through consolidated data feeds administered by NMS Plans regulated by the SEC.[43] Market participants, media outlets, and others subscribe to the consolidated data feeds to obtain data on current market quotes and trade reports. The NMS Plans collect fees from sales of consolidated data and distribute the revenues, net of certain expenses, back to the plan participants. Since 2007, revenues have been allocated among participants based on a formula established by the SEC in connection with the adoption of Reg

[43] This requirement is laid out in Rule 603(b) (17 CRF 242.603(b)).

NMS.[44] In some cases, NMS Plan participants then pass a portion of these revenues on to other market participants through rebate programs.[45]

The two organizations responsible for overseeing the dissemination and sales of consolidated data for U.S. equity markets are the Consolidated Tape Association ("CTA") and the UTP Plan.[46] They oversee the process under which trade and quote information is collected from the NMS Plan participants, consolidated, and disseminated to subscribers.

The CTA oversees the operations of the Consolidated Tape System ("CTS"), launched in 1974, and the Consolidated Quote System ("CQS"), launched in 1978.[47] The members or "participants" of the CTA Plan and CQ Plan include every registered stock exchange and FINRA.[48] (See Appendix Table A).

Trade and quote data for securities with a primary listing on the NYSE are distributed through CTA's Network A (also known as Tape A), and trade and quote data for securities with primary listing on another non-Nasdaq exchange are distributed through CTA's Network B (Tape B).[49] Historically, Network B consisted of securities listed on the American Stock Exchange (now known as NYSE American). After Archipelago Exchange became part of the

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[44] For a description of the current formula, see SEC Release No. 34-51808.

[45] For a description of the history of market data rebate programs, see Cecilia Caglio and Stewart Mayhew, "Equity Trading and the Allocation of Market Data Revenue," *Journal of Banking & Finance* 62 (2016), pp. 97–111.

[46] More information about these plans, including governing documents, is available on their websites, www.ctaplan.com and www.utpplan.com. For information about the NMS Plan tasked with overseeing collection and distribution of data in the options market, see www.opradata.com.

[47] For governing documents, see the Consolidated Tape Association Plan and the Consolidated Quotation Plan ("CQ Plan").

[48] As of March 2018, there are 16 participants: New York Stock Exchange, NYSE Arca, NYSE American, NYSE National, Nasdaq Stock Market, Nasdaq BX, NASDAQ PSX, ISE Stock Exchange, CBOE Stock Exchange, BZX Equities, BYX Equities, EDGA Equities, EDGX Equities, the Chicago Stock Exchange, the Investors' Exchange, and FINRA.

[49] Note that it is the primary listing venue, not the trade or quote venue, that determines the reporting network. Thus, trades and quotes on securities with a primary listing on the NYSE are distributed through Network A, even if the trade or quote occurred on another exchange.

NYSE Group in 2006, NYSE Arca became a popular listing venue for exchange-traded funds and structured products. More recently, Cboe's BZX exchange has adopted a similar listing strategy, and as of 2018, Network B includes securities with primary listings on NYSE Arca, NYSE American, and BZX. When the CTA was developed in the early 1970s, FINRA's predecessor, the National Association of Securities Dealers, operated a nascent system called NASDAQ for dealers to post quotes for stocks not listed on any exchange. The data distributed by the CTA did not include these stocks. The UTP Plan was developed to oversee the dissemination and sales of market data for stocks listed on Nasdaq, through a data channel known as Network C (Tape C).[50] Today, trade and quote data for securities with a primary listing on the Nasdaq exchange are distributed through Network C.

The 1975 regulatory framework also created the concept of a Securities Information Processor, or SIP, an entity registered with the SEC that is responsible for handling the mechanics of disseminating consolidated market data.[51] Accordingly, consolidated data is sometimes referred to as "SIP data." The SIP for the CTA is the Securities Industry Automation Corporation ("SIAC"), now a subsidiary of NYSE Group, and the SIP for the UTP Plan is Nasdaq.

2. Trade and Quote Data

The CTA and UTP Plans govern the collection and initial distribution of consolidated market data. Subscribers (including third-party vendors) to the consolidated data feeds have

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[50] Note that the CTA and UTP feeds do not provide trade or quote data for securities that are quoted on the OTC Markets (formerly known as the "Pink Sheets") or FINRA's OTC Bulletin Board. Market data feeds are available for such stocks from OTC Markets, but these are not considered NMS Securities, and OTC market data distribution is not governed by an NMS Plan. See www.otcmarkets.com.

[51] See Section 11(a) of the Securities Exchange Act of 1934.

contractual limitations on their ability to redistribute consolidated market data for a period of 15 minutes. Data more than 15 minutes old is considered "historical data" and subscribers, including third-party vendors, can use that data as they wish, including redistributing or reselling the data without any payments to the CTA and UTP Plans. Databases of historical consolidated trade and quote data are widely used by market participants, academics, and regulators for research purposes and forensic analysis, in the form of the NYSE's TAQ database and analogous products sold by other vendors such as Thomson Reuters Tick History.

Trade data in the consolidated feed includes the ticker symbol, time stamp, execution price, number of shares executed, information about the reporting venue, and various condition codes indicating special circumstances. Trades must be reported regardless of whether they are executed on an exchange, executed on an ATS (i.e., a dark pool or ECN), or executed by an internalizer (a broker that fills a client's order using its own inventory) or wholesale market maker. Prior to October 31, 2013, trades for fewer than 100 shares (known as odd-lot trades) were not reportable.[52]

Trades executed on an exchange are reported with an exchange identifier. Trades executed off-exchange are reported to FINRA, typically through a Trade Reporting Facility, or TRF. These trades are identified on the consolidated feed as having been reported through a TRF, but the execution venue is not identified.[53] Thus, it is possible to identify which trades were executed off-exchange, but not whether the off-exchange trades were internalized, routed to a wholesaler, or executed on an ATS or dark pool.

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[52] SEC Release Nos. 34-70793 and 34-70794.

[53] SEC Release No. 34-61358.

Quote data included in the consolidated feed includes time-stamped "top-of-book" quotes from each exchange, including exchange best (lowest) offer price, number of round lots available at the best offer, best (highest) bid price, number of round lots available at the best bid, and various condition codes indicating special circumstances. The consolidated feed also contains quotes displayed by off-exchange market makers or ATSs on FINRA's ADF and information about market conditions such as limit up/limit down events and trading halts.

B. Exchange Proprietary Market Data Products

Exchanges have also developed various market data products that they sell directly to subscribers. These data products generally differ from the SIP feeds. Data products sold by the exchanges include data feeds containing trades and quotes, depth-of-book information, and messages related to price discovery around the opening and closing auctions. Other data products sold by the exchanges include historical trade, quote, and order book data at all price levels, daily data summarizing trading activity by security, and reference data including information about securities, corporate actions, and indices.

Different market data products offered by the exchanges are designed for different types of market participants with different needs:

- Some market participants find that the consolidated feeds are sufficient; these participants have little or no need to purchase data directly from exchanges.
- Institutional brokers and proprietary trading desks may subscribe to some or all exchanges' depth-of-book data feeds as inputs to their order routing algorithms or to help them work large orders. For example, an executing broker might break up a large order into smaller pieces submitted to multiple venues. Depth-of-book feeds could help that broker decide which venues to send the orders to and the prices at

which it should submit each order. These feeds would also help the broker readjust the pricing or venue for those orders based on evolving market conditions. For this purpose, "level data," which summarizes the total amount of liquidity displayed at each price, may be sufficient.

- Other market participants, such as high-frequency trading firms, may be implementing market making operations or other trading strategies that rely on having low-latency access to order book information, or more granular information about the orders in an exchange's book. For these market participants, the exchanges offer proprietary feeds with order-level data.
- Finally, some market participants may be interested in back-testing trading strategies or order submission strategies, for which highly granular historical data products can be useful.

1. Exchange Trade and Quote Feeds

Prior to 2005, SEC rules prohibited exchanges from distributing trade reports through channels other than the consolidated feed.[54] The reforms adopted as part of Reg NMS in 2005 permitted exchanges to distribute trade reports through direct feeds, and more generally provided a regulatory framework for all sales of data through direct feeds.[55] Shortly after Reg NMS was adopted, there was an increase in the use of proprietary data feeds by market participants to get access to trades and top-of-book quote information faster than they could get it through SIPs. As

[54] See SEC Rules 11Aa3-1(c)(2) and 11Aa3-1(c)(3), which were rescinded with the passage of Reg NMS in 2005 (see SEC Final Rule Release No. 34-51808).

[55] See Rule 603 of Reg NMS. For a discussion of this change, see SEC Release No. 34-49325.

described below, SIP latencies have decreased substantially in recent years due to technological improvements.

When it proposed and adopted Rule 603, the SEC stated that the rule meant that exchanges are prohibited from distributing data through direct channels "on a more timely basis" than they make the same data available to the SIPs. The SEC also clarified explicitly that this does not mean that an exchange must delay dissemination of its direct feeds in an attempt to synchronize the arrival of the feeds to end users. Rather, the SEC interprets Rule 603 as prohibiting an exchange from "transmitting data to a vendor or user any sooner than it transmits the data to a Network processor."[56] There is no rule governing the timing of when any data purchaser receives data.

In the last decade, there have been dramatic improvements in the latency for both quotes and trades. In February 2018, for example, the average latency for quotes reported through the SIPs was 0.09 milliseconds for Tape A and Tape B securities and 0.017 milliseconds for Tape C securities. These quote latencies represent a significant reduction since the first quarter of 2010, when the average latency was 4.04 milliseconds for Tape A and Tape B securities and 5.42 milliseconds for Tape C securities. There have been similar improvements in trade-reporting times. The average latency for trades reported through the SIPs fell from 6.46 milliseconds in the first quarter of 2010 to 0.15 milliseconds in February 2018 for Tape A and Tape B securities, and from 6.06 milliseconds to 0.017 milliseconds for Tape C securities over the same period.[57]

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[56] SEC Release No. 34-51808, pp. 269–271.

[57] "Key Operating Metrics of Tape A&B U.S. Equities Securities Information Processor (CTA SIP)," *Consolidated Tape Association*, Q4 2017; "UTP Q1 2018 - February TAPE C QUOTE METRICS," *Unlisted Trading Privileges*, February 2018; U.S. Equities Securities Information Processor (UTP SIP) Key Quarterly Operating Metrics of Tape C," *Unlisted Trading Privileges*, Q4 2015.

2. Depth of Book Data

The market data products sold directly by exchanges include real-time limit order book information. Although SIP data contains quotes displaying the number of shares available at each exchange's best bid and offer (top-of-book quotes), the direct data feeds available from exchanges include "depth-of-book" information about displayed liquidity at other price levels below the exchange's best bid and above the exchange's best offer.

Some depth-of-book data products include only aggregate information about the number of shares available at each price point, whereas others provide more granular information on individual orders. Some depth-of-book products provide an updated view of the limit order book at fixed time intervals, whereas others are updated in event time.

Historically, limit order book information for NYSE-listed stocks was available only at the specialist's post on the floor of the exchange. The introduction of NYSE's OpenBook in 2002 was the first time that market participants off the trading floor could see the number of shares available in the NYSE's order book at price levels outside the NYSE's best bid and offer quotes.

When it was originally launched, OpenBook was distributed only through third-party vendors, included the aggregate number of shares available at each bid and offer price provided, and was updated every 10 seconds.[58] Over time, the OpenBook product has improved markedly both in terms of speed and granularity. Today, NYSE offers OpenBook Aggregated, a feed similar to the original OpenBook product but updated every second, and OpenBook Ultra, which is updated with every limit order event in real time.

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[58] SEC Release No. 34-45138.

For Nasdaq stocks, market data feeds summarizing the top-of-book liquidity (Level 1) and quotes from individual dealers at all prices (Level 2) have long been available to market participants. Level 2 quotes first became broadly available to public market participants with the development of the Nasdaq Quotation Dissemination Service in 1983.[59] Currently, Nasdaq's main depth-of-book product is TotalView, which shows full depth at each price level for any security that can be traded at Nasdaq. TotalView also shows odd-lot orders, as well as order imbalance information for opening and closing auctions each day, for IPOs, and for the reopening of trading after trading halts.

Cboe has similar real-time product offerings which include top-of-book and depth-of-book data for the BZX, BYX, EDGA, and EDGX exchanges. Customers can purchase trade and quote data, last sale data, or a composite product that offers both, along with aggregated depth-of-book data. Cboe also offers historical market data for its quote, trade, and depth products.

C. Third-Party Vendors

Market data is widely available from third-party vendors. These vendors provide integrated access to a wide variety of services to assist their clients in their trading activities. The vendors' services include access to the real-time market data that SIPs and exchanges provide, as well as reference and valuation data, analytics, news, independent research, and trading platforms. Investment professionals rely on the technology from third-party vendors to not only access market data, but to interact with it and to trade. There is a large market for these services, and they generate substantial revenues. As detailed elsewhere in the paper, the revenues generated by third-party vendors from selling their services are an order of magnitude

[59] SEC Release No. 34-79863.

larger than the revenues generated by SIPs and exchanges through sales of consolidated and proprietary data.

CTA and UTP Plan Participants

Participant	Predecessors	Reporting Code
New York Stock Exchange		N
NYSE Arca	Pacific Exchange/Archipelago Exchange (–2006)	P
NYSE American	American Stock Exchange (–2008); NYSE Alternext US/NYSE Amex/NYSE MKT (2008–2017)	A
NYSE National	Cincinnati Stock Exchange (–2003); National Stock Exchange (2003–2011)	C
Nasdaq Stock Market		T/Q
Nasdaq BX	Boston Stock Exchange (–2008)	B
Nasdaq PSX	Philadelphia Stock Exchange (–2008)	X
BZX	BATS Z/Bats BZX (2005–2017)	Z
BYX	BATS Y/Bats BYX (2005–2017)	Y
EDGA	EDGA/Bats EDGA (1998–2017)	J
EDGX	EDGX/Bats EDGX (1998–2017)	K
Chicago Stock Exchange	Midwest Stock Exchange (–1993)	M
The Investors Exchange		V
FINRA	NASD (–2007)	D

Source: CQ Plan - Composite as of May 3, 2018; CTA Plan - Composite as of May 3, 2018; UTP Plan Effective as of January 9, 2018; SEC Self-Regulatory Organization Rulemaking Website: https://www.sec.gov/rules/sro.shtml

Note: Participants currently receiving Plan revenues are included. The list of predecessors is not exhaustive. The Chicago Board Options Exchange (Cboe) and the International Securities Exchange (ISE) are also listed as participants in the CTA and UTP Plans. Cboe and ISE are active options exchanges. At one time they operated stock exchanges, known as the Cboe Stock Exchange and the ISE Stock Exchange, respectively, but these exchanges are no longer operational: Cboe Stock Exchange has not generated any market data revenues since 2014, and ISE Stock Exchange has not generated any market data revenues since 2010.

Stock Exchanges as Platforms for Data and Trading

Professor Marc Rysman, Ph.D.

December 2, 2019

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1. QUALIFICATIONS AND ASSIGNMENT

1. My name is Marc Rysman and I am a Professor of Economics at Boston University, where I teach courses on industrial organization, econometrics, antitrust, and regulation. I received my Ph.D. in Economics from the University of Wisconsin at Madison in 1999. My research focuses on industrial organization and competition, and the related issues of antitrust and regulation. I have investigated a variety of industries, including telecommunication, Yellow Pages directories, payment cards, and consumer electronics.

2. From 2009 to 2018, I was a Visiting Scholar at the Federal Reserve Bank of Boston. I have been a Visiting Associate Professor at MIT (2007–2008), a Visiting Scholar at Harvard University (2003–2004, 2014–2015), a Visiting Fellow at Northwestern University (2003), and a Visiting Scholar at the Federal Reserve Bank of Minneapolis (2003).

3. I have won numerous teaching and research awards, including the Neu Family Award for Teaching Excellence in Economics (2006 and 2012), Networks, Electronic Commerce and Telecommunications (NET) Institute Grants (2003, 2005, and 2009), National Science Foundation Grants (2001, 2004, 2006, and 2009), and the Christensen Award in Empirical Economics (1997, with Phil Haile).

4. I have published numerous articles in top peer-reviewed journals in the field of Economics, including in *Journal of Industrial Economics*, *International Journal of Industrial Organization*, *RAND Journal of Economics*, *American Economic Review*, *Journal of Political Economy*, *Review of Economic Studies*, and the *Journal of Economic Perspectives*. I am an Editor of the *RAND Journal of Economics*.

5. The economics of platforms have been a central focus of my research and consulting work. I have published several peer-reviewed articles in this area, and I was commissioned to write the *Journal of Economic Perspectives* article on "The Economics of Two-Sided Markets." During my ten years as a visiting scholar at the Federal Reserve Bank of Boston, I have specialized in the economics of payment networks. I was asked by the Federal Communications Commission to write a white paper on the business data services market, which has many important platform elements.

6. I have been asked by the New York Stock Exchange Group ("NYSE Group") to analyze how platform economics applies to stock exchanges' sale of market data products and trading services and to explain how this affects the assessment of competitive forces affecting its data fees. NYSE Group provided financial support for this research. I was assisted in my analysis by staff of Cornerstone Research, who worked under my direction.

2. EXECUTIVE SUMMARY

7. Platforms are firms that act as intermediaries between two or more sets of agents. Typically, the choices of one set of agents affect the payoffs to the other set(s) of agents via *externalities*. For example, credit cards are more valuable to cardholders when many merchants accept them, and credit card acceptance has greater benefits for merchants when there are many cardholders. These linkages between the different "sides" of a platform mean that one cannot understand pricing and competition for goods or services provided on one side of the platform in isolation, without accounting for the influence of the other side(s).

8. Stock exchanges are classic examples of platform companies. In fact, there are multiple senses in which exchanges are platforms. In this paper, I focus on exchanges as platforms between consumers of market data and consumers of trading services.

9. Stock exchanges offer several types of market data products, including best bid and offer ("BBO"), order book, and full order-by-order depth of book. BBO data report the highest price at which there is buying interest on the exchange (the best bid) and lowest price at which there selling interest (the best offer). Order book depth data reports information about the aggregate share quantity and number of buy orders available at prices equal to or lower than the best bid and sell orders at prices equal to or higher than the best offer. Full order-by-order depth of book data provide a more granular, order-by-order view of changes to the exchange's order book.

10. Traders' choices about where to trade affect the value of these data products. Trading activity and order book depth enhances the informational content of the data; the best bid and offer change more frequently and there are more orders beyond the top of the book. The effect of trading activity on the value of data is one set of linkages between "sides" of the market that make stock exchanges platforms for data and trading.

11. This paper focuses on the externality that runs in the reverse direction, from data purchases to trading. As traders buy more market data from a particular exchange, the overall volume of trading on that exchange can increase. This is because traders use market data to make order routing decisions (among other uses). That is, the information in market data is an input to traders' decisions about where to send their orders. Market data can enter these decisions in a variety of ways, but a common theme is that market data reduces uncertainty about the price, likelihood, or timing of execution for an order. By reducing the uncertainties around order execution on an exchange, market data makes trading on that exchange more attractive to traders.

12. Data purchases also have externalities or indirect effects on traders that do not purchase data. For instance, increased trading by traders that purchase data from an exchange generates more liquidity on that exchange, creating value for traders that do not purchase data. These externalities further confirm that stock exchanges are platforms between consumers of market data and consumers of trading services.

13. I confirm the existence and relevance of these linkages between market data and trading through an empirical analysis of the introduction of a new data product for the New York Stock Exchange ("NYSE") in early 2015: the NYSE integrated feed ("NYSE IF"), a full order-by-order depth of book product. I show that the introduction of NYSE IF led to an increase in the proportion of total U.S. equities trading that took place on NYSE of 1.0 percentage point; that was an increase of 8.6% over NYSE's pre-NYSE IF launch proportion of total trading of 11.6%.

14. Using data on firm-level data purchases and trading obtained from NYSE Group, I was further able to test for the direct and indirect effects of access to NYSE IF that characterize platform markets. This firm-level data covers only trading at NYSE, NYSE Arca, NYSE National, and NYSE MKT/American ("NYSE Group Exchanges").[1] Because of this data limitation, I cannot study the shift of firms' overall (i.e., at all trading venues) trading toward NYSE that followed the introduction of NYSE IF as I do in the exchange-level analysis. Rather, I study the impact of the introduction of NYSE IF on two outcomes. First, I look at the proportion of firms' trading on NYSE Group Exchanges that took place on NYSE. This measures shifts in the mix of trading within NYSE Group Exchanges – I test whether gaining access to NYSE IF makes trading on NYSE more attractive relative to other NYSE Group Exchanges, such as NYSE Arca. Second, I look at firms' total trading volume (measured by the number of shares traded) on NYSE.

15. I find that access to NYSE IF led firms to increase the proportion of their trading on NYSE Group Exchanges that took place on NYSE by between 4.4 and 7.5 percentage points. Estimates of the effect of subscribing to NYSE IF on the total number of shares that firms traded on NYSE are less precise and indicate an increase of 17.7% to 40.4%. Firms that did not subscribe to NYSE IF increased the proportion of their trading on NYSE Group Exchanges that took place on NYSE by 2.7 percentage points. These results are consistent with access to NYSE IF having both a direct effect on subscribers and an indirect effect on non-subscribers through externalities – that is, it is consistent with NYSE being a platform for data and trading.

[1] The data does not cover the NYSE Chicago exchange.

16. The platform nature of stock exchanges has important implications for public policy towards exchanges. For instance, it means that data fees cannot be analyzed in isolation, without accounting for the competitive dynamics in trading services. Competition is properly understood as being between platforms (i.e., stock exchanges) that balance the needs of consumers of data and consumers of trading services. Competition between platforms can be consistent with prices that deviate from marginal costs on one or both sides of the market, and often does not lead to prices that reflect costs in the way that traditional models of competition predict. But such platform competition would discipline stock exchanges' overall pricing and profitability.

3. THE ECONOMICS OF PLATFORM COMPETITION

17. The economics of platforms focuses on firms that act as *intermediaries* between two or more sets of agents.[2] Common examples of platform firms are Internet search engines, which bring together consumers and content providers (often advertisers), and payment card networks, which facilitate interactions between consumers and retailers. Media companies, such as newspapers, are platforms for interactions between consumers and advertisers even though consumers may primarily use the newspaper for information other than advertising.

18. Typically, a feature of a platform firm is that the choices of one set of agents affect the payoffs to the other set of agents. For instance, when many merchants sign up to accept a payment card, the card becomes more valuable to a consumer. In this sense, there is an *externality* that runs from one side of the platform to the other, and often in both directions.

19. In theory, not all firms are platform firms. For instance, consider a grocery store that buys food from a manufacturer and then retails the food to consumers. The manufacturer is paid when the food is delivered to the grocery store, so it does not matter to the manufacturer whether any consumers ever buy the food or not – the manufacturer collects its wholesale price regardless. There is no interaction between consumers and manufacturers. However, in practice, grocery stores may have buy-back provisions that force manufacturers to buy back some product if it does not sell, or a grocer and manufacturer may develop a long-term relationship with explicit or tacit agreements that increase the value of their relationship. These factors would make the manufacturer care about how many consumers use the grocery store, generating linkages between the grocery store's interactions with manufacturer and shoppers that are best understood through the lens of platform economics.

20. In this sense, almost every firm has some elements of a platform to it. My view is that it is not generally useful to try to distinguish whether firms are platforms or not, as we can most often find platform elements in a firm. The more interesting question is how important platform issues are in understanding a particular firm's activities. The answer may change based on what question we ask. For instance, car manufacturers can be interpreted as platforms between dealers and consumers, as dealers value consumers that are interested in their cars and consumers value dealers that deliver cars. Understanding the platform nature of a car manufacturer may reasonably be ignored when studying some issues, such as

[2] The discussion in this section draws from Rysman, Marc. 2009. "The Economics of Two-Sided Markets." *Journal of Economic Perspectives* 23(3): 125–143.

innovation to meet fuel economy standards, but might be important for other issues, such as understanding contracts with dealers.

21. The "sides" of the market served by platforms need not be distinct sets of agents, such as merchants and cardholders or advertisers and newspaper readers. For example, sports card conventions are two-sided platforms that bring together enthusiasts to buy and sell sports cards.[3] Some participants pay an entrance fee whereas some, the dealers, pay a table fee, which allows them to set up a table at the convention. We can think of the convention as a platform that brings together these participants. While we might think of dealers as the "sellers" and regular entrants as the "buyers," in practice, both sets of agents buy, sell, and trade cards with each other. Some participants may substitute between being a dealer and non-dealer based on the convention fees.

22. Stock exchanges are classic examples of platform companies. In fact, there are multiple senses in which exchanges are platforms: Some studies reference stock exchanges' role in bringing together buyers and sellers of shares[4] or providers and takers of liquidity.[5] In this paper, I explain that exchanges are platforms between consumers of market data and consumers of trading services and I present empirical evidence to support this conclusion and confirm the importance of these linkages.

23. Understanding competition in platform markets requires an analysis of how prices to all sides of the market are interrelated. For example, even if competition between platforms is intense and overall profits are low, it could be that prices are relatively high on one side of

[3] Jin, Ginger Zhe, and Marc Rysman. 2015. "Platform Pricing at Sports Card Conventions." *The Journal of Industrial Economics* 63(4): 704-735.

[4] Although market participants may be willing to switch between being a buyer and seller of a given security as the price changes, within any trade, an exchange is matching a buyer to a seller. In general, sellers prefer markets with many buyers and buyers prefer markets with many sellers, which generates a platform dynamic. *See*, Evans, David S. and Richard Schmalensee. 2011. "The Industrial Organization of Markets with Two-Sided Platforms." In *Platform Economics: Essays on Multi-Sided Businesses*, edited by David S. Evans, Competition Policy International, p. 5 ("Exchanges have two groups of customers, who can generally be considered "buyers" and "sellers." The exchange helps buyers and sellers search for feasible contracts—that is where the buyer and seller could enter into a mutually advantageous trade.").

[5] U.S. stock exchanges are organized as central limit order books, in which traders post offers to buy or sell at a particular price. Traders that post non-marketable limit orders (i.e., buy/sell limit orders with a limit price below/above current interest on the opposite side) are referred to as *providers* of liquidity. Traders that take those offers by submitting market orders (to buy/sell at the best available price) or marketable limit orders (where the buy/sell limit price is at or above/below current interest on the other side) are *takers* of liquidity. A provider of liquidity may be either a buyer or seller of the stock (and similarly for liquidity takers). *See*, Evans, David S. and Richard Schmalensee. 2011. "The Industrial Organization of Markets with Two-Sided Platforms." In *Platform Economics: Essays on Multi-Sided Businesses*, edited by David S. Evans, Competition Policy International, p. 5 ("In organized exchanges such as the New York Stock Exchange, it is often more useful to think of the two sides as liquidity providers—specialists or market-makers who quote prices to both buyers and sellers and thus bring liquidity to the market—and liquidity consumers—ordinary customers who accept liquidity providers' offers."); Foucault, Thierry, Ohad Kadan, and Eugene Kandel. 2013. "Liquidity Cycles and Make/Take Fees in Electronic Markets." *The Journal of Finance*, 68(1): 299-341, p. 300 ("Our model is designed to analyze the determinants of this rate when market monitoring is costly. It features a trading platform with two types of traders: 'market makers,' who post quotes, and 'market takers,' who hit quotes.").

the market and low or even negative on the other side. In such a situation, analyzing competition on one side of the market in isolation can lead to incorrect conclusions. For instance, sports card conventions typically charge much higher fees to dealers than to regular participants. An analyst focusing only on table fees at sports card conventions might conclude that convention organizers have market power, whereas an analyst considering both sides might conclude that the convention organizers do not have market power. Policy decisions based on overly narrow analyses can have unintended consequences; for example, regulating table fees could lead to reduced benefits such as free parking or “door prizes” (i.e. gifts for attendees) for non-dealer enthusiasts.

4. STOCK EXCHANGES ARE PLATFORMS FOR INTERACTIONS BETWEEN CONSUMERS OF MARKET DATA AND CONSUMERS OF TRADING SERVICES

24. In this section, I discuss exchanges as platforms for interactions between consumers of data and consumers of trading services. In fact, many firms that consume data do so in order to trade, so they are naturally on "both sides" of this platform. Platform economics still applies to cases like this, just as platform economics helps us understand platforms like eBay where sellers also purchase from other vendors. What is critical is that access to data affects trading volumes by attracting both traders that do and do not purchase data and, conversely, that trading activity by traders that do not purchase data affects the value of market data. I go through these points in detail below.

25. In Section 4.1, I give an overview of market data products offered by stock exchanges. Section 4.2 describes how data is used by traders to make order routing decisions and, specifically, why market data for a particular exchange would make trading on that exchange more attractive. Section 4.3.1 describes how trading makes data more valuable and explains that these externalities make stock exchanges platforms for data and trading. Section 4.3.2 describes externalities running in the opposite direction, from data to trading that reinforce the conclusion that stock exchanges are platforms for data and trading. This discussion draws on the ideas developed in Section 4.2. Finally, Section 4.4 reviews academic studies that present empirical evidence regarding whether access to market data for a given exchange makes trading on that exchange more attractive.

26. Throughout this paper, when I refer to firms or traders, I mean firms or traders that place orders and trade directly on stock exchanges (or other trading venues). These traders that interact directly with exchanges are specialized proprietary trading or market making firms, investment banks, and brokers that trade on behalf of their clients. Institutional and retail investors do not trade directly on exchanges – only registered broker-dealers can be members of exchanges, and only exchange members can trade directly on exchanges.[6] Institutional investors trade through brokers who route their trades to various trading centers and do not typically have direct control (or even real-time visibility) into where their orders are routed and executed. Marketable retail orders that come, for example, through an

[6] Securities Exchange Act of 1934, Section 3(a)(2)(A) ("The term 'member' when used with respect to a national securities exchange means (i) any natural person permitted to effect transactions on the floor of the exchange without the services of another person acting as broker, (ii) any registered broker or dealer with which such a natural person is associated, (iii) any registered broker or dealer permitted to designate as a representative such a natural person, and (iv) any other registered broker or dealer which agrees to be regulated by such exchange and with respect to which the exchange undertakes to enforce compliance with the provisions of this chapter, the rules and regulations thereunder, and its own rules. For purposes of sections 78f(b)(1), 78f(b)(4), 78f(b)(6), 78f(b)(7), 78f(d), 78q(d), 78s(d), 78s(e), 78s(g), 78s(h), and 78u of this title, the term "member" when used with respect to a national securities exchange also means, to the extent of the rules of the exchange specified by the Commission, any person required by the Commission to comply with such rules pursuant to section 78f(f) of this title.").

online retail broker, are generally routed to over-the-counter ("OTC") market makers – broker-dealers that offer liquidity primarily in a principle capacity and execute trades off the public exchanges.[7]

4.1. Overview of market data

27. Market data is often divided into two categories: core (securities information processor ("SIP") or consolidated feed) data and non-core (or proprietary) data.[8]

28. Consolidated feed data are assembled by the SIPs, which aggregate data from all exchanges to provide (1) last sale reports, including the price and amount of the latest sale of a security and the exchange where it took place; and (2) best bid and best offer (also known as *top of book*) price quote information across all exchanges.[9] The best bid and offer information reported by the SIPs is limited to "round lots," which for most stocks means orders for blocks with multiples of 100 shares;[10] the consolidated feeds do not report "odd lot" quotes of less than 100 shares.[11] SIP data services collect the required data from each stock exchange and distribute it to subscribers for a fee. By regulation, exchanges must supply the necessary data to the SIP no later than they distribute the data to their proprietary data customers.[12] Among other uses, brokers access the consolidated feed in order to comply with Rule 603(c) of Regulation NMS, known as the Vendor Display Rule, which requires broker-dealers, in a context in which a trading or order-routing decision can

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[7] "Concept Release on Equity Market Structure," U.S. Securities and Exchange Commission, Release No. 34-61358, January 14, 2010, pp. 20–21; O'Hara, Maureen. 2015. "High Frequency Market Microstructure." *Journal of Financial Economics*, 116(2): 257-270, p. 260 ("A large fraction of US retail trades are either directly internalized or delivered via purchased order flow agreements to broker-dealer firms."); "SEC Rule 606 Report, Percentages of Total Non-Directed Orders Routed to Individual Market Venues, Third Quarter 2019" TD Ameritrade, https://www.tdameritrade.com/retail-en_us/resources/pdf/AMTD2054.pdf, accessed November 15, 2019 (showing that non-directed orders were routed to Citadel Execution Services, Virtu Americas LLC, G1 Execution Services, and UBS Securities LLC); "Report on Routing Customer Orders for Quarter Ending June 30, 2019," Charles Schwab, https://www.schwab.com/public/schwab/nn/legal_compliance/important_notices/order_routing.html, accessed November 15, 2019 (showing that 99% of non-directed orders were routed to Citadel Execution Services, VIRTU, G1X, UBS Securities LLC, and Two Sigma).

[8] "Self-Regulatory Organizations; NYSE Arca, Inc.; Order Setting Aside Action by Delegated Authority and Approving Proposed Rule Change Relating to NYSE Arca Data," Securities Act Release No. 34-59039, December 2, 2008, p. 4.

[9] "Self-Regulatory Organizations; NYSE Arca, Inc.; Order Setting Aside Action by Delegated Authority and Approving Proposed Rule Change Relating to NYSE Arca Data," Securities Act Release No. 34-59039, December 2, 2008, pp. 42–43.

[10] In some cases, exchanges apply alternative definitions of round lots. *See*, e.g., "Rule 55. Unit of Trading—Stocks and Bonds," NYSE, https://nyseguide.srorules.com/rules/document?treeNodeId=csh-da-filter!WKUS-TAL-DOCS-PHC-%7B4A07B716-0F73-46CC-BAC2-43EB20902159%7D--WKUS_TAL_5665%23teid-134, accessed November 27, 2019.

[11] "Concept Release on Equity Market Structure," U.S. Securities and Exchange Commission, Release No. 34-61358, January 14, 2010, p. 63. As of December 2013, the SIP does report odd lot trades. *See*, "Consolidated Tape Association; Order Approving the Eighteenth Substantive Amendment to the Second Restatement of the CTA Plan," U.S. Securities and Exchange Commission, Release No. 34-70794, October 31, 2013.

[12] "Dissemination of Quotations in NMS Securities," 17 CFR § 242.602 (2014).

be implemented, to provide a consolidated display of market data when they are providing equity quotation or trade information to customers.[13]

29. Proprietary data products, in contrast, are offered by individual exchanges and contain data about only that exchange, not about the market as a whole. Exchanges offer a variety of proprietary data products, some of which provide only top of book data while others provide varying levels of depth-of-book information:

a. Best bid or offer ("BBO"): Shows the best prices available at the exchange, and the quantities available at these prices. This provides the same data as the SIP, but only for the single exchange in question.

b. Order book: Shows quantities available at each price level at and beyond the top of the book. NYSE Group offers this type of data through its OpenBook products for NYSE and American exchanges and as ArcaBook for NYSE Arca.[14] NYSE's order book products include information on odd lot orders.

c. Full order-by-order depth of book: Shows order book information along with detailed information about the nature of each adjustment to the order book. That is, it provides data on each trade, new order, order cancelation, or order modification, providing additional detail about movements in the order book. NYSE Group Exchanges offer this data through their Integrated Feed products.

d. Order imbalance: Information about aggregate quantities and prices submitted during auction periods.

e. Trade data: Reports all transactions executed on the exchange. This information is also reported in the SIP.

30. Different market participants may use proprietary data for a number of purposes, including:

[13] "Providing Stock Quotations to Customers," FINRA Regulatory Notice 15-52, December 2015, p. 1, https://www.finra.org/sites/default/files/Regulatory-Notice-15-52.pdf, accessed November 15, 2019 ("FINRA is issuing this Notice to remind firms and registered representatives of their obligations under Rule 603(c) of Regulation NMS (Vendor Display Rule) when providing quotation information to customers. The SEC staff recently made clear its view that if a registered representative provides a quotation to a customer that can be used to assess the current market or the quality of trade execution, reliance on non-consolidated market information as the source of that quotation would not be consistent with the Vendor Display Rule. In light of the SEC staff's statements, firms should review whether they are in compliance with the requirement in the Vendor Display Rule that broker-dealers provide a consolidated display of market data when they are providing quotation information to customers.").

[14] NYSE National and NYSE Chicago do not offer an order book only data product. They do, however, offer a full order-by-order depth of book product, Integrated Feed, which contains order book information.

a. To inform investment decisions by enhancing their understanding of liquidity and likely price movements.

b. To inform order routing decisions by enabling them to assess the likelihood of execution at various venues.

c. To enable the operation of trading platforms (dark pools or alternative trading systems ("ATS")).

31. Some market participants have argued that they must purchase the most sophisticated and complete data feeds from all exchanges in order to be competitive. For example, Doug Cifu, co-founder and chief executive officer of Virtu Financial, has remarked that: "Without proprietary data feeds, there's not a firm today, either as a market maker or an institutional agency broker or prop trading firm that can exist. It's just that simple."[15]

32. However, other market participants believe that proprietary data feeds are not necessary for their business models. Jeff Brown, Senior Vice President and Head of Schwab Office of Legislative and Regulatory Affairs at Charles Schwab asserted that "one of the questions we've looked at is, you know, if they use a SIP for pricing or do they use the direct feeds for pricing, does that impact our clients' execution? And so we've studied that. And the result is that it's an insignificant difference between the use of them, which is odd because we've heard so much about how, you know, the direct feeds are necessary for execution."[16]

33. NYSE's data confirms that not all market participants need all data. Table 1 shows the percentage of firms that purchased each combination of data products from NYSE in December 2018. It also reports the proportion of trading volume on NYSE that these firms account for. Notably, 20.4% of firms that traded on NYSE during that month did not purchase data specific to NYSE.[17] The most common choice was for firms to purchase only OpenBook data (49.5% of firms), but such firms accounted for only 9.4% of trading volume. In contrast, the most active firms purchased all three types of data (BBO, OpenBook, and

[15] "Roundtable on Market Data Products, Market Access Services, and Their Associated Fees," U.S. Securities and Exchange Commission, October 25, 2018, p. 58. Mehmet Kinak, global head of systematic trading and market structure at T. Rowe Price made a similar remark: "[A]s far as brokers having a choice of whether or not they can use the SIP or direct feeds, that doesn't exist. There is no choice there. If a broker is routing using SIP data, they are not routing my flow." Similarly, Simon Emrich, head of market structure strategies at Norges Bank Investment Management, claimed that "brokers can't really be competitive for our sort of trading just using the SIP. They need to have the full depth of book. We depend on them to slice up our orders and trade them over time. We need them to have a full view of the market, not just the top of the book." *See*,"Roundtable on Market Data Products, Market Access Services, and Their Associated Fees," U.S. Securities and Exchange Commission, October 25, 2018, pp. 65, 136.

[16] "Roundtable on Market Data Products, Market Access Services, and their Associated Fees," U.S. Securities and Exchange Commission, October 25, 2018, p. 170.

[17] Note that I cannot rule out that firms that traded on NYSE and did not purchase data were trading on behalf of a firm that did purchase data. However, some of the firms in question are proprietary trading firms, and would not typically be routing other firms' orders.

Integrated Feed) – just 8.7% of firms that traded on NYSE fall into this category, but those firms accounted for 34.4% of trading volume.[18]

34. But these are not the only buyers of NYSE data: there are hundreds of firms that do not trade directly on NYSE but purchase its market data products. Those firms are not reflected in the figures reported in Table 1. These firms may use NYSE data for a variety of purposes, including to develop trading strategies or to operate a dark pool or ATS. These firms may also trade on NYSE through brokers – it is theoretically possible that the firms that do not purchase the data are simply executing orders under the direction of clients who do purchase it. However, our empirical work identifies significant differences in behavior between these groups (see Section 5.2).

TABLE 1
Data Purchases by Firms Trading on NYSE in December 2018

Subscriptions	Proportion of Firms	Proportion of Volume
BBO Only	0.0%	0.0%
OpenBook Only	49.5%	9.4%
Integrated Feed Only	2.9%	3.3%
BBO and OpenBook	7.8%	23.7%
BBO and Integrated Feed	0.0%	0.0%
OpenBook and Integrated Feed	10.7%	27.6%
OpenBook, Integrated Feed, and BBO	8.7%	34.4%
None	20.4%	1.6%

Source: NYSE

Note: Proportion of firms who subscribed to each combination of data products is calculated as the number of firms that traded on NYSE/NYSE Arca and subscribed to that unique combination of data products for NYSE/NYSE Arca in December 2018 divided by the total number of firms that traded on NYSE/NYSE Arca in December 2018. Proportion of volume is calculated as the total combined number of shares traded by firms that subscribed to that unique combination of data products for NYSE/NYSE Arca in December 2018 divided by the total number of shares traded on NYSE/NYSE Arca in December 2018.

35. Firms obtain market data from NYSE by subscribing for a monthly fee.[19] Among firms that traded on NYSE in December 2018, the median bill for NYSE market data was $1,320. If we limit attention to firms that traded on NYSE and paid for NYSE data, the median data

[18] The patterns are also similar for NYSE Arca, NYSE National and NYSE American, though National does not offer an order book only product. *See*, "NYSE Exchange Data: Real-Time Data," NYSE, https://www.nyse.com/market-data/real-time, accessed November 15, 2019.

[19] Users pay an access fee as well as several use-related fees. Fee levels are publicly available. See, "Market Data Pricing," NYSE, January 1, 2018, https://www.nyse.com/publicdocs/nyse/data/NYSE_Market_Data_Pricing.pdf, accessed November 15, 2019.

bill was $5,580. There is considerable variation in the data fees paid, with the firm at the 95th percentile among those both trading on NYSE and purchasing NYSE data paying $81,350.

36. Stock exchanges make different choices regarding if and how much to charge customers for market data. It is common for new stock exchanges or exchanges focused on increasing their share of trading to offer their data free of charge. Established stock exchanges typically charge for their data, as the NASDAQ exchanges, the CBOE exchanges, and most NYSE Group Exchanges do.[20] Stock exchanges may choose to transition from a no-fee model to one where they charge for their data as NYSE Arca did in 2009 and the BATS exchanges (BZX and BYX) did in 2013.[21] Pricing strategies such as these are natural outcomes in platform markets, where building a base of users on all "sides" of the market is crucial for a platform's viability. For example, the independent Yellow Pages publisher "Yellow Book" had a policy of offering advertising for free in the first year it entered a new city.[22] Yellow Book did this to increase the number of advertisers that appeared in their books, since having more advertisers would, in turn, drive more consumers to use its books.

4.2. How market data affects order routing decisions

37. Before turning to platform issues, I provide some simple examples of how investors use data and why they would be willing to pay for it. As these examples show, market data from an exchange can reduce uncertainty about the likelihood, price, or timing of execution for an order on that exchange. Such reductions in uncertainty can encourage traders to route their orders to that exchange. I provide three examples that highlight different ways in which market data can reduce uncertainty for traders. After going through these examples, I explain two additional ways in which access to market data reduces uncertainty and may thereby drive order flow to an exchange.

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[20] "Market Data Pricing," NYSE, January 1, 2018, p. 19, https://www.nyse.com/publicdocs/nyse/data/NYSE_Market_Data_Pricing.pdf, accessed November 15, 2019; "Price List – U.S. Equities," NasdaqTrader.com, https://www.nasdaqtrader.com/Trader.aspx?id=DPUSdata#tv, accessed November 15, 2019; "Cboe Data Services, Market Data Product Price List," Cboe, July 25, 2018, http://cdn.batstrading.com/resources/membership/US_Market_Data_Product_Price_List.pdf, accessed November 15, 2019.

[21] "Self-Regulatory Organizations: Notice of Filing and Immediate Effectiveness of Proposed Rule Change by NYSE Arca, Inc. Relating to Fees for NYSE Arca Depth-of-Book Data," Securities Exchange Act Release No. 34-63291, November 9, 2010, pp. 7–8; John McCrank, "BATS Exchanges To Start Charging for Market Data," Reuters, April 18, 2013; "Self-Regulatory Organizations; BATS Exchange, Inc.; Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Impose Fees for Market Data," Securities Exchange Act Release No. 34-69936, July 3, 2013, pp. 1–25.

[22] Rysman, Marc. 2009. "The Economics of Two-Sided Markets." *Journal of Economic Perspectives* 23(3): 125–143, p. 131.

4.2.1. Example 1: Uncertainty regarding execution of large orders on a single exchange

38. This simple example illustrates how seeing the limit order book can reduce uncertainty regarding likely execution prices for market orders.

39. An investor wishes to purchase 200 shares of a particular stock immediately. The consolidated feed is showing 100 shares available on exchange A at $20.00. No other exchange is quoting an offer. Also, there is a limit sell order for 100 shares at $20.10 on exchange A.

40. If the investor sees only the consolidated feed, the investor would not see the limit order at $20.10 and would face uncertainty regarding the ultimate purchase price that would result from submitting a market order for 200 shares. If the entire order book were visible, the investor would be able to see that its second 100 shares would be executed at $20.10, for a total weighted average price of $20.05.

4.2.2. Example 2: Uncertainty regarding execution of large orders with two exchanges

41. For the second example, suppose that there are two exchanges A and B, and their sell limit orders are as follows: A1 100 shares for $20.00; A2 100 shares for $20.02; B1 100 shares for $20.04; B2 100 shares for $20.10.

42. A buyer is looking to buy 200 shares immediately. Assuming it subscribed to a consolidated feed, the buyer would see the top of the book at each exchange: 100 shares for $20.00 on Exchange A and 100 shares for $20.04 on Exchange B.

43. The buyer could consider the following three options: (1) route a market order for 200 shares to Exchange A; (2) route simultaneous orders for 100 shares to Exchange A and 100 shares to Exchange B; (3) route an order for 100 shares to Exchange A and wait to see how prices reported in the consolidated feed evolve before submitting its order for the second 100 shares.

44. Abstracting from the time required to process and route orders and from high-frequency changes in quoted prices, all three options would result in execution at a volume-weighted average price of $20.01. The “order protection rule” (also known as the “no trade-through” rule) stipulated by Regulation NMS prevents an exchange from executing an order at a price less favourable to the trader than what is available at the top of the book at other

exchanges.[23] Under option 1, Exchange A will execute the trader's order for 200 shares immediately, as both $20.00 and $20.02 are better prices than what is available at Exchange B. Under option 2, Exchange A will execute the trader's order for 100 shares immediately and Exchange B will try to access Exchange A's top of book as observed at the time of order receipt. This will result in Exchange B sending an order to Exchange A priced at either $20.00 or $20.02, depending on whether Exchange A has already executed the trader's first order and updated its quote. If the Exchange B order is priced at $20.00 and goes unexecuted Exchange B will likely wait to observe Exchange A's refreshed quote, resulting in Exchange B routing to Exchange A again, this time at $20.02, and receiving a fill at that price. Under option 3, Exchange A would execute the first order for 100 shares at $20.00 and then the trader would send a second order to Exchange A to be executed at $20.02 after seeing Exchange A's quote updated to $20.02. Under any of these scenarios, the trader faces the same sort of ex-ante uncertainty as it did in example 1 above: at the moment it submits its first order, it would not be sure what price it will receive for its second 100 shares.

45. The equivalence between the three options above falls apart when we acknowledge that processing and routing an order takes some (very small) amount of time (*routing delay*) and that available quoted prices could change during that span. Option 1, where the trader sends a market order for 200 shares to Exchange A, has the best chance of being executed at the best prices currently available. Options 2 and 3, however, require additional time before the order for the second 100 shares reaches Exchange A as either Exchange B checks for prices available on other exchanges and routes the order to Exchange A (under option 2) or the trader observes the evolution of quotes at the top of the book and sends a second marketable order to Exchange A (under option 3). In either case, order A2 may be re-priced or cancelled during the routing delay and lead the trader to miss out on the possibility of trading its second 100 shares at $20.02.

46. The prevalence of non-routable order types offered by exchanges confirms that some market participants are concerned about both reducing execution uncertainty and

[23] "Concept Release on Equity Market Structure," U.S. Securities and Exchange Commission, Release No. 34-61358, January 14, 2010, pp. 26–27 ("Another important type of linkage in the current market structure is the protection against trade-throughs provided by Rule 611 of Regulation NMS. A trade-through is the execution of a trade at a price inferior to a protected quotation for an NMS stock. A protected quotation … must be an automated quotation that is the best bid or best offer of an exchange or FINRA. Importantly, Rule 611 applies to all trading centers, not just those that display protected quotations. Trading center is defined broadly in Rule 600(b)(78) to include, among others, all exchanges, all ATSs (including ECNs and dark pools), all OTC market makers, and any other broker-dealer that executes orders internally, whether as agent or principal…. Rule 611 also helps promote linkages among trading centers by encouraging them, when they do not have available trading interest at the best price, to route marketable orders to a trading center that is displaying the best price. Although Rule 611 does not directly require such routing services (a trading center can, for example, cancel and return an order when it does not have the best price), competitive factors have led many trading centers to offer routing services to their customers.").

minimizing the impact of routing delay. For example, an ISO limit order may be used to ensure immediate execution of the specified amount at its limit price or better as long as there are resting limit orders that it can be matched to, regardless of whether a more favorable price is advertised at another exchange.[24] A primary reason a trader would use an ISO limit order (and assume responsibility for compliance with Regulation NMS's order protection rule) is to get immediate execution rather than endure the delay and uncertainty associated with having the exchange survey other exchanges for better prices. In total, non-routable order types accounted for 68.3% of matched non-auction volume on NYSE in October 2019.[25]

4.2.3. Example 3: Uncertainty regarding execution of "odd lot" orders

47. The third example highlights uncertainty around the execution of small orders (i.e., odd lot orders, typically those less than 100 shares). One limitation of the SIP is that it reports the best bids and offers available at each exchange for "round lots" – that is, quotes to buy or sell blocks with multiples of 100 shares of a given security.[26] According to the SEC's MIDAS tool, odd lot trades accounted for over 46% of trades and 14% of exchange trading volume in NMS stocks in Q3 2019.[27]

48. Suppose the orders reported by the SIP are as in example 2, except that Exchange B also has an odd lot offer for 50 shares at $19.99. Consider a situation where the trader wishes to buy 45 shares immediately. With only the SIP data, the trader would likely send a market order to Exchange A to be executed at the best offer price available of $20.00. If the trader subscribed to an order book or full order-by-order depth of book data for Exchange B (or both exchanges), it would send his order to Exchange B to be executed at the more favorable price of $19.99.

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[24] "NYSE Arca Pillar Order Types and Modifiers," NYSE, https://www.nyse.com/publicdocs/nyse/markets/nyse-arca/NYSE_Arca_Order_Suite.xlsx, accessed November 27, 2019. The term ISO limit order encompasses IOC ISO and Day ISO order types.

[25] "NYSE Tape A - Order Type Usage (Percentage of Matched Volume)," NYSE, 2019, https://www.nyse.com/publicdocs/nyse/markets/nyse/NYSE-Order-Type-Usage.pdf, accessed November 25.

[26] "Concept Release on Equity Market Structure," U.S. Securities and Exchange Commission, Release No. 34-61358, January 14, 2010, p. 63. In some cases, exchanges apply alternative definitions of round lots. *See*, e.g., "Rule 55. Unit of Trading—Stocks and Bonds," NYSE, https://nyseguide.srorules.com/rules/document?treeNodeId=csh-da-filter!WKUS-TAL-DOCS-PHC-%7B4A07B716-0F73-46CC-BAC2-43EB20902159%7D--WKUS_TAL_5665%23teid-134, accessed November 27, 2019.

[27] "Market Information Data and Analytics System (MIDAS); Market Structure; Market Activity Overview," U.S. Securities and Exchange Commission, https://www.sec.gov/marketstructure/datavis/ma_overview.html#.XdxfbehKiUk, accessed November 25.

4.2.4. Uncertainty regarding the timeliness of market information

49. My examples so far assume that a trader can perfectly observe the state of the market at the top of the order book, and thus my examples highlight the value to some traders of subscribing to order book data. Why might a trader subscribe to a BBO service, when the SIP provides the same information? In practice, there is always some amount of time that passes between activity on a stock exchange and when investors can observe that activity in their data feeds (i.e. after the market update has been received, processed, and redistributed by the SIP or after an individual firm has received and processed the update via exchange proprietary feeds), and between when a trader places an order and when an order reaches an exchange. In that amount of time, the state of the market can change, which can change the economics of some orders. Thus, obtaining data more quickly can be valuable for some trading strategies as it can reduce uncertainty regarding the "current" state of the market. While exchanges provide data to the SIP no later than they do to their BBO subscribers, the time involved in processing and redistributing the data to generate the SIP data feed means that unconsolidated data from a single exchange may reach subscribers more quickly. That is a primary reason why some traders subscribe to BBO feeds.[28]

4.2.5. Uncertainty regarding the likelihood of execution of non-marketable orders

50. For an actively traded stock, there are typically several orders at each price in an order book. On most U.S. exchanges, orders at the same displayed price on the same exchange are executed in the order that they arrive.[29] Information about the amount offered and the relative sequence of orders at each level of an order book, provided by full order-by-order depth of book data products, can help a trader that seeks to optimize or understand its order queue placement.[30]

51. The detailed information provided by full order-by-order depth of book data enables traders to infer where their orders would be in the queues. Furthermore, traders can analyze

[28] Jones, Charles M. 2018. "Understanding the Market for U.S. Equity Market Data." Working Paper, p. 46 ("Shortly after Reg NMS was adopted, there was an increase in the use of proprietary data feeds by market participants to get access to trades and top-of-book quote information faster than they could get it through SIPs."); "A Financial System That Creates Economic Opportunities: Capital Markets," U.S. Department of the Treasury, 2017, p. 63 ("Many HFT firms rely on these proprietary data feeds to inform their trading, in part by consolidating information from exchanges' proprietary feeds faster than it can be delivered by the SIP.")

[29] While most markets execute non-marketable limit orders with the same limit price in the order they arrive, NYSE enforces a different priority rule whereby multiple orders at the same price point may share executions. An order's place on the electronic order book queue is nonetheless relevant for the likelihood and timing of execution. *See*, "Parity & Priority," NYSE, https://www.nyse.com/publicdocs/nyse/markets/nyse/Parity_and_Priority_Fact_Sheet.pdf, accessed November 15, 2019.

[30] Moallemi, Ciamac C. and Kai Yuan. 2017. "A Model for Queue Position Valuation in a Limit Order Book." Working Paper, Columbia Business School, p. 3 ("In practice, certain classes of market participants expend significant effort trying to take obtain better queue positions in the limit order book.").

the behavior of orders with different characteristics to better predict how long other participants' orders might be available. Thus, the detailed order book data reduces uncertainty regarding the likelihood of execution and makes it more likely that the trader would submit non-marketable orders at the exchange(s) for which it has visibility.

4.3. Linkages between access to market data and order routing decisions make stock exchanges platforms for data and trading

52. For the reasons outlined in Section 4.2, I expect that, on average, a trader with a data subscription from a particular exchange will be more likely to trade on that exchange. Having data from an exchange reduces uncertainty regarding orders sent to that exchange and, on average, should make trading on that exchange more profitable. Thus, I expect that traders that subscribe to data from a particular exchange trade more often on that exchange than they would if they did not subscribe to that exchange's data, both in the sense of allocating a higher share of their trades to the exchange and in the sense of being willing to trade more often overall.

53. Platform markets are characterized by *externalities* that run from one side of the platform to the other, and often in both directions (see Section 3). In the case of stock exchanges, externalities exist running from trading to data and vice-versa. In Section 4.3.1, I describe how trading activity and liquidity on a particular exchange affect the value of data from that exchange. In Section 4.3.2, I describe externalities running in the opposite direction, from data to trading. The first link in this chain are the direct effects of subscribing to data from an exchange on subscribers' trading activity on that exchange that I describe in detail in Section 4.2. This increase in trading activity makes trading on that exchange more attractive to traders that *do not* subscribe to its data.

4.3.1. Increased trading activity and liquidity on an exchange increase the value of data from that exchange

54. First, I discuss the effect of trading on the value of data. An exchange with a deep order book provides more data than one with little liquidity available on its order book. Trading and limit orders provide the information in which purchasers of data are interested, such as transaction volume, price movements, and the set of limit orders below the top of the book that allow traders to make better predictions about how new trades will cause the market to shift. Limit orders simultaneously generate both market liquidity and market data.

Naturally, this value spills across firms. That is, firms that place orders on a stock exchange create value for *other firms* that purchase data.[31]

55. In this sense, traders create value for data consumers, a form of externality that makes stock exchanges platforms between consumers of market data and consumers of trading services. Typically, economists define a firm as a platform if it mediates externalities in at least one direction, and in some cases, platform effects are very strong even with a single direction of externality.[32] However, it is still interesting to consider whether an externality running in the other direction exists, that is from data consumption to trading activity, in order to assess the strength of the platform features of this market.

4.3.2. Increased consumption of data from an exchange makes trading on that exchange more attractive

56. Data consumption can make trading more valuable. As a general rule, traders prefer exchanges with more liquidity and trading activity. Even under Regulation NMS's order protection rule, where trades are routed across exchanges to find the best available price, routing orders to an exchange with a deep order book and significant trading activity is more likely to yield execution at better prices for marketable orders and is more likely to lead to execution for non-marketable orders. Some reasons for this are:

a. Active exchanges are more likely to provide the best prices and thus minimize routing delay, which exposes traders to potential price changes (see Section 4.2.2).

b. Marketable orders are more likely to be executed at prices better than the best bids and offers reported by the SIP as a more active exchange is more likely to have resting odd lot orders or non-displayed orders that are not advertised on the SIP (see Section 4.2.3).

c. Conversely, non-marketable odd lot orders are observed only by traders that subscribe to proprietary data (and thus are not considered by exchanges when evaluating whether a trade price complies with Regulation

[31] Brief Amicus Curiae, By Consent, Of Better Markets, Inc. In Support of Respondent, *New York Stock Exchange LLC, et al. v. Securities and Exchange Commission*, October 11, 2019, p. 14 ("the value of that information depends on the number of orders that are routed to the exchange—the more orders routed to the exchange, the more valuable that exchange's information becomes.")

[32] For example, newspapers are a canonical example of a two-sided market, providing a platform for communication from advertisers to consumers. Advertising space is worth more to advertisers when more consumers read the newspaper. But consumers may be indifferent to advertiser participation on the platform (or even assign it a negative value). *See*, Rochet, Jean-Charles and Jean Tirole. 2003. "Platform Competition in Two-Sided Markets." *Journal of the European Economic Association* 1(4): 990-1029.

NMS's order protection rule), so exchanges with more data subscribers are more attractive to traders placing odd lot orders.

d. Non-displayed non-marketable orders, in which a trader instructs the exchange not to advertise its order and which are not reported to the SIPs or proprietary data,[33] are more likely to be executed on an active exchange where traders seeking immediate execution route marketable orders more frequently. In particular, I understand that non-displayed orders at the mid-point of the consolidated best bid and offer reported by the SIP are often used by institutional investors and their agents, who may not subscribe to proprietary market data products or may otherwise not use data-intensive trading strategies. According to the SEC's MIDAS tool, non-displayed limit orders, including mid-point orders, accounted for over 14% of trades and 15% of exchange trading volume in NMS stocks in Q3 2019.[34]

57. For the reasons outlined in Section 4.2 (and as is shown empirically in Section 5.2), sales of data subscriptions can lead data consumers to trade more often on an exchange, leading to increased liquidity on the exchange, which makes trading on that exchange more valuable even to traders that do not purchase data.

58. We could hypothesize reasons why this chain of causality would not hold. For instance, although more volume and liquidity is desirable by itself, traders without data subscriptions may perceive a disadvantage in trading with informed traders and prefer to go elsewhere. We cannot be sure which factors will be more important in practice. Because of this, it is important to check empirically whether we observe outcomes that support my hypothesis about the platform nature of data provision. I provide new empirical evidence of this relationship in Section 5. However, I first review existing empirical evidence regarding whether access to market data for a given exchange makes trading on that exchange more attractive.

[33] "Concept Release on Equity Market Structure," U.S. Securities and Exchange Commission, Release No. 34-61358, January 14, 2010, p. 23 ("[T]he Commission's rules do not require the display of a customer limit order if the customer does not wish the order to be displayed. Customers have the freedom to display or not display depending on their trading objectives.").

[34] "Market Information Data and Analytics System (MIDAS); Market Structure; Market Activity Overview," U.S. Securities and Exchange Commission, https://www.sec.gov/marketstructure/datavis/ma_overview.html#.XdxfbehKiUk, accessed November 25, 2019.

4.4. Existing research supports the view that access to market data increases trading activity

59. Existing research documents a relationship between market data and trading activity. The studies described below analyze discrete changes in access to market data and document the consequences of these changes on trading activity and other measures of market quality. In particular, they find evidence that increased availability of market data for a given exchange increases trading activity on that exchange.

60. A particularly clear empirical case study documenting the relationship between the availability of market data and trading activity is the Island ECN's decision in September 2002 to "go dark" by ceasing to display its limit order book for three exchange-traded funds ("ETFs").[35] That is, Island went from publicly displaying its full order book in real time on its website to not displaying any orders, even to its subscribers (i.e., firms authorized to trade on Island). Island opted to "go dark" to avoid complying with the obligations, imposed by Regulation ATS, to display its quotes on the national market system and route orders to other exchanges if better prices were available there (and receive orders from other exchanges). According to Island, this would have prevented it from "maintain[ing] the system performance our subscribers expect."[36]

61. Hendershott and Jones (2005) document that trading volume on the Island ECN dropped following its "going dark," but that a considerable amount of trading activity continued to take place on Island. Specifically, Island's share of trading volume for the three affected ETFs dropped from 36%, 36%, and 21% to 16%, 22%, and 12%, respectively.[37] This shows that access to market data affects trading decisions; in this case, lack of access to order book data led traders to shift roughly half of the trading that had been taking place on Island to other exchanges. It also shows that some traders, at least, did not consider access to market data to be essential for trading as they continued to execute trades on Island after it went dark for these ETFs. Hendershott and Jones (2005) also find that effective spreads for these ETFs increased on Island and decreased on other exchanges after Island went dark.

62. Notably, Hendershott and Jones (2005) find that the mix of traders at Island changed after it went dark, with a greater proportion of liquidity traders, who they interpret as relatively uninformed, switching to other exchanges while a greater proportion of informed

[35] This description is based on Hendershott, Terrence, and Charles M. Jones. 2005. "Island Goes Dark: Transparency, Fragmentation, and Regulation." *The Review of Financial Studies* 18(3): 743-793.

[36] Email from Island ECN to subscribers, September 19, 2002. Cited in Hendershott, Terrence, and Charles M. Jones. 2005. "Island Goes Dark: Transparency, Fragmentation, and Regulation." *The Review of Financial Studies* 18(3): 743-793, p. 751.

[37] Hendershott, Terrence, and Charles M. Jones. 2005. "Island Goes Dark: Transparency, Fragmentation, and Regulation." *The Review of Financial Studies* 18(3): 743-793, Table 1.

traders continued to trade on Island. This further strengthens the conclusion that different traders value access to market data differently, and adapt their trading behavior differently to changes in its availability.

63. The introduction of NYSE's OpenBook product in January 2002 is another helpful case study.[38] OpenBook allowed subscribers to see aggregate volume available at each level of NYSE's order book, for a fee. Boehmer et al. (2005) find that the introduction of OpenBook affected trading strategies. In particular, volume shifted from floor brokers to NYSE's electronic limit order book as traders' "new ability to see depth in the book seems to make self-management of the trading process more attractive" relative to delegation to floor brokers.[39] While the authors did not analyze the effect on trading volume on NYSE relative to other exchanges, this is consistent with the hypothesis that access to OpenBook made trading on NYSE's electronic limit order book more attractive as order book information reduced uncertainty about the likelihood, price, or timing of execution. The introduction of OpenBook also affected traders' strategies: limit orders were placed and canceled more frequently, and were smaller on average, after OpenBook became available. Boehmer et al. (2005) also find that market quality improved: liquidity increased and the price impact of trades decreased.

[38] Boehmer, Ekkehart, Gideon Saar, and Lei Yu. 2005. "Lifting the Veil: An Analysis of Pre-Trade Transparency at the NYSE." *The Journal of Finance* 60(2): 783-815.

[39] Boehmer, Ekkehart, Gideon Saar, and Lei Yu. 2005. "Lifting the Veil: An Analysis of Pre-Trade Transparency at the NYSE." *The Journal of Finance* 60(2): 783-815, p. 796.

5. EMPIRICAL EVIDENCE THAT ACCESS TO MARKET DATA INCREASES TRADING ACTIVITY

64. I now turn to newly-developed empirical evidence about the link between market data and trading activity following the launch of a new market data product for NYSE. NYSE Group introduced a full order-by-order depth of book data product for the NYSE ("NYSE Integrated Feed" or "NYSE IF") in early 2015. As described in Section 4.1 above, NYSE IF offers an order-by-order view of the evolution of NYSE's order book. Users can thus determine the number and type of orders that make up the order book and where their own limit orders would be in the electronic order book queue at a given level of the order book. Firms use this information to better predict the likelihood that their marketable orders will be executed on NYSE at their desired prices. Firms also use NYSE IF to make strategic order routing decisions for their liquidity-providing limit orders.

65. NYSE IF's launch gave firms access to new data about activity on NYSE that, in principle, would lead firms to increase the amount of trading they did on NYSE. The resulting increase in trading volumes on NYSE, in turn, would have attracted additional volume from other market participants without access to NYSE IF. As I show below, there is robust evidence that this was indeed the case and that the magnitude of the effect was large.

66. The first firms to subscribe to NYSE IF started doing so in April 2015.[40] As shown in Figure 1, take-up of NYSE IF was gradual. Four firms started subscribing to NYSE IF in April 2015. That rose gradually to 22 firms in December 2015 and stabilized between 24 and 27 firms thereafter. The proportion of trading volume on NYSE by firms subscribing to NYSE IF increased in tandem with the number of firms subscribing, starting at 4.4% in April 2015 and rising to 45.9% in December 2015. The proportion of trading volume at NYSE accounted for by NYSE IF subscribers continued to grow until stabilizing at levels between 62% and 66% in mid-2017.

67. I understand from conversations with NYSE Group staff that both the timing of the launch of NYSE IF and the differences in adoption dates across firms were idiosyncratic and not driven by other factors related to trading activity on NYSE. NYSE was the last major exchange to introduce a full order-by-order depth of book product – NYSE Arca offered such a product since at least 2013. The gradual uptake of NYSE IF was related in part to logistical issues related to setting up access.

68. A variety of firms subscribed to NYSE IF, including:

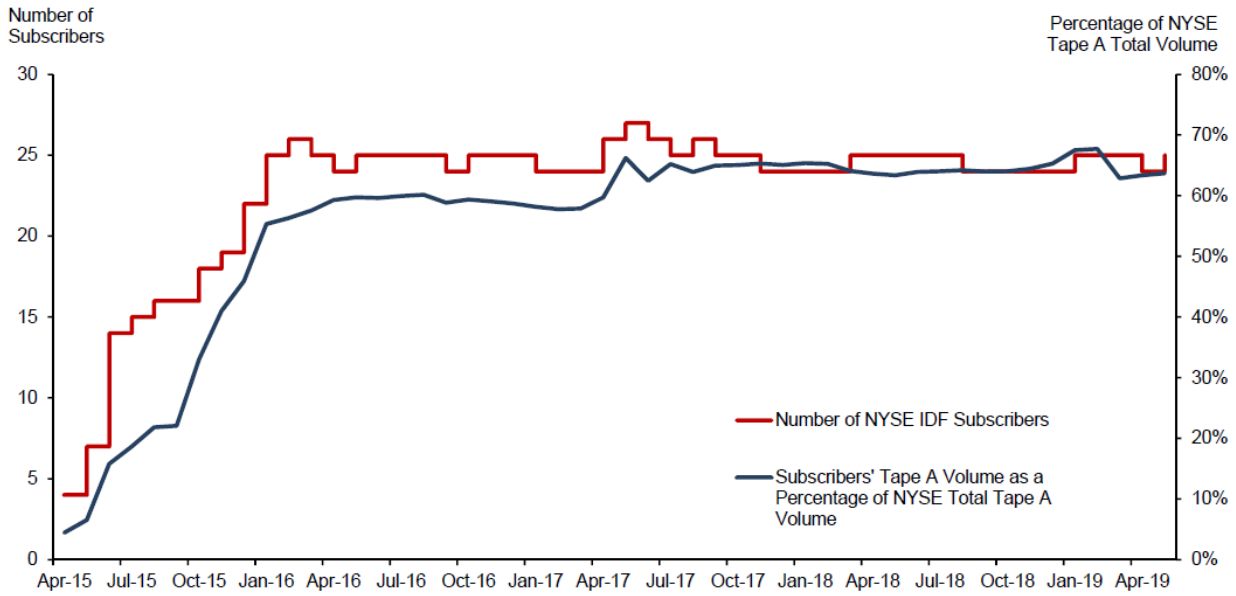
[40] I classify a firm as subscribing to NYSE IF in a given month if NYSE reports any fees relating to NYSE IF during the month in question. Reported fees may be $0 during trial periods – firms charged $0 fees for NYSE IF are also considered to be subscribed to NYSE IF.

a. Proprietary trading firms and market makers trading for their own account.

b. Brokers that act as agents, executing trades on behalf of their clients.

c. Multi-use firms acting as brokers for their clients, as proprietary traders managing the risk positions of their trading desks, and that also use market data to run dark pools or ATS. Investment banks are the most common examples of multi-use firms.

FIGURE 1
Number of Subscribers to NYSE IF and Proportion of Total Trading on NYSE Accounted for by NYSE IF Subscribers, April 2015 to May 2019



Source: NYSE

Note: The first firms to subscribe to NYSE IF and trade on NYSE started doing so in April 2015. Tape A refers to NYSE-listed stocks. Trading on NYSE was limited to Tape A stocks until April 2018. Subscribers' Tape A Volume as a Percentage of NYSE Total Tape A Volume is calculated as the total combined number of Tape A shares traded on NYSE by firms that subscribed to NYSE IF in a given month divided by the total number of Tape A shares traded on NYSE in that month.

69. Of the 31 firms that subscribed to NYSE IF at some point in time between its launch in April 2015 and May 2019 (when my data ends) and traded on NYSE, 11 were proprietary traders or market makers, 11 were multi-use firms, and 9 were a mix of other data use categories.[41]

[41] Five firms that traded on a NYSE Group Exchange but not on NYSE also subscribed to NYSE IF, as did 39 firms that did not trade directly on any NYSE Group exchange. These firms may have traded on NYSE through intermediaries, but this cannot be observed in the data.

70. Specific examples illustrate how access to NYSE IF increased firms' trading on NYSE. A large proprietary trading firm that began subscribing to NYSE IF in June 2015 markedly increased the proportion of its trading on NYSE (as a percentage of its total trading on NYSE Group Exchanges for which I have this information)[42] from 49.3% during the two years leading up to its adoption of NYSE IF to 54.8% during the 24 months following its adoption. The number of shares it traded on NYSE increased by 30.1% between those same time periods.

71. Similarly, an order routing firm related to a large stock exchange provides an example of a very different type of firm that nonetheless reacted similarly to access to NYSE IF. The firm began subscribing to NYSE IF in August 2015. NYSE accounted for 71.6% of its trades on NYSE Group Exchanges during the two years leading up to its adoption of NYSE IF. In the 24 months following this event, the share of its trading volume on NYSE Group Exchanges that went to NYSE increased to 83.1%.

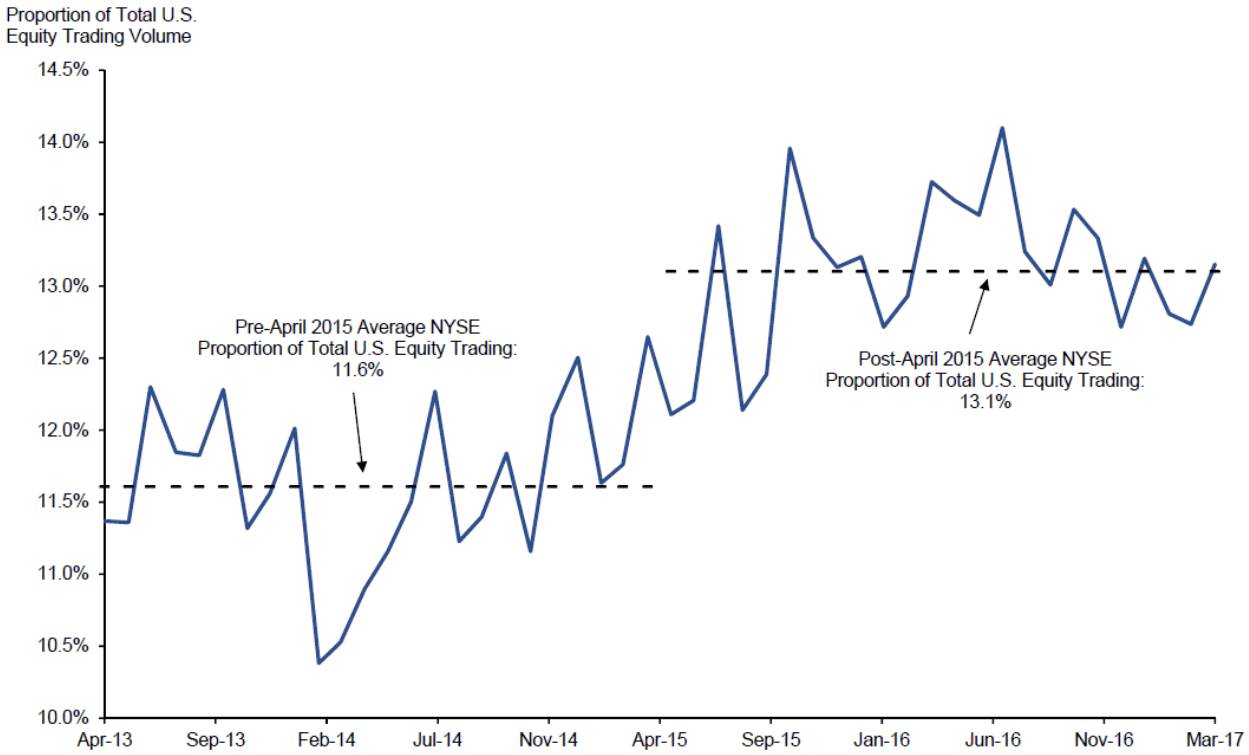
5.1. The introduction of NYSE IF increased the proportion of trading taking place on NYSE

72. The launch of NYSE IF in April 2015 had a substantial impact on NYSE's share of total U.S. equities trading. Trading on NYSE accounted for 11.6% of total U.S. equities trading, on average, during the 24 months leading up to the launch of NYSE IF. As shown in Figure 2, NYSE's share of overall U.S. equities trading increased gradually following the introduction of NYSE IF in April 2015, approaching 14.0% in September 2015 and stabilizing at levels between 12.7% and 14.1% thereafter. NYSE accounted for 13.1% of total U.S. equities volume during the 24 months following the launch of NYSE IF, an increase of 1.5 percentage points over the pre-NYSE IF period.[43]

[42] The firm-level data available to me covers trading only on NYSE Group Exchanges (NYSE, NYSE Arca, NYSE National, and NYSE MKT/American). *See* Section 5.2.

[43] Analyzing trading on NYSE as a proportion of trading on public exchanges in the U.S. yields very similar results for both the qualitative analysis shown in Figure 2 and the regression analysis shown in Table 2.

FIGURE 2
Proportion of U.S. Equities Trading Volume on NYSE Before and After Launch of NYSE IF, April 2013 to March 2017



Source: NYSE

Note: The first firms to subscribe to NYSE IF and trade on NYSE started doing so in April 2015.

73. Regression analysis confirms that the introduction of NYSE IF led to an increase in the proportion of trades executed on NYSE. Table 2 presents results from four regression specifications. The coefficient of interest, which measures the impact of the introduction of NYSE IF, is labeled "Introduction of NYSE Integrated Feed (April 2015)". In all four specifications, this coefficient is positive and statistically significant at the 95% confidence level (indicated by two or three asterisks).[44]

74. The first specification does not control for any potentially confounding factors – the coefficient of interest in specification 1 is 0.015, indicating an increase of 1.5 percentage points in the proportion of trading accounted for by NYSE. This corresponds to the increase in averages shown in Figure 2.

[44] This assessment of statistical significance relies on Newey-West standard errors, which allow for autocorrelation and heteroscedasticity, reported in Table 2. I also computed conventional and heteroscedasticity-robust (White) standard errors. My conclusions are the same under these alternatives.

75. Specifications 2–4 in Table 2 control for other potentially confounding factors:

a. Time trends: Time trends unrelated to the introduction of NYSE IF could affect the proportion of trading accounted for by NYSE. For example, the proliferation of dark pools and ATS could generate a downward trend in the proportion of trading at NYSE. In the specifications shown, the time trend is allowed to be a quadratic curve, not just a straight line.

b. Market Structure: Changes in the competitive landscape could affect the proportion of trading at NYSE. I identified four relevant events during the time period analyzed: NYSE started trading stocks whose primary listing was not on NYSE (referred to as Tape B and C stocks, as opposed to Tape A stocks which are listed on NYSE) in April 2018; IEX became a public exchange in August 2016; CBOE Stock Exchange went offline in May 2014; and NSX/NYSE National went offline during two windows between June 2014 and November 2015 and between February 2017 and April 2018.

c. Trading Volumes: Total trading volumes may be a proxy for market conditions that may favor (or hinder) trading on NYSE. Specification 2 controls for total U.S. equities trading (in logarithms); specification 3 controls for trading on public exchanges and on ATSs or dark pools separately (also in logarithms); and specification 4 controls for the proportion of trading that goes through public exchanges as opposed to dark pools or ATSs.

76. Controlling for these factors reduces the estimated effect of introducing NYSE IF to 1.0 percentage point (specifications 2–4).[45]

77. All of the measures of the impact of introducing NYSE IF are economically significant. An increase of 1.5 percentage points in NYSE's share of trading amounts to 12.9% of NYSE's pre-launch mean of 11.6%. The lowest estimate shown, 1.0 percentage point, is 8.6% higher than the pre-launch mean. A very rough calculation of the impact of such a change on NYSE Group's revenues confirms that it is economically significant: an 8.6% increase in trading on NYSE would have translated to roughly $11.5 million in additional revenue from net transactions fees in 2016.[46]

[45] Inclusion of a lagged dependent variable (here, the percentage of U.S. equities trading that took place on NYSE the previous month) as a regressor does not qualitatively alter the results. Coefficients on the lagged dependent variable term are not statistically significant in any of the specifications shown in Table 2.

[46] Absent the increase due to the launch of NYSE IF, trading volume on NYSE would have been 246.2 billion shares (the actual volume traded on NYSE in 2016) divided by 1.086, or approximately 226.7 billion shares in 2016. The

TABLE 2
Regression Estimates of Impact of NYSE IF on Trading on NYSE

	Dependent Variable			
	Proportion of NYSE Trading Volume			
Independent Variable	**(1)**	**(2)**	**(3)**	**(4)**
Introduction of NYSE Integrated Feed (April 2015)	0.015***	0.010**	0.010**	0.010**
	(0.002)	(0.004)	(0.004)	(0.004)
Introduction of NYSE Tape B-C (April 2018)	0.001	-0.006	-0.008	-0.006
	(0.002)	(0.004)	(0.005)	(0.005)
Time Trend		-0.00001	0.0001	-0.0001
		(0.0003)	(0.0003)	(0.0003)
Time Trend Squared		0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
NSX/National Active		0.004**	0.005***	0.004**
		(0.002)	(0.002)	(0.002)
IEX Active		-0.005*	-0.004*	-0.003
		(0.002)	(0.002)	(0.002)
CBOE Active		-0.007	-0.006	-0.007
		(0.005)	(0.004)	(0.005)
Total U.S. Equity Volume Traded (log)		-0.008		
		(0.007)		
U.S. Equity Volume Traded on Public Exchanges (log)			0.022	
			(0.014)	
U.S. Equity Volume Traded on ATS or Dark Pools (log)			-0.040**	
			(0.019)	
Proportion of Total U.S. Equity Volume Traded on Public Exchanges				0.043
				(0.058)
Constant	0.116***	0.321*	0.541**	0.090**
	(0.001)	(0.170)	(0.209)	(0.037)
Observations	78	78	78	78
R^2	0.600	0.650	0.667	0.645

Source: NYSE

Note: Asterisks denote statistical significance at the 99% (***), 95% (**), and 90% (*) confidence levels. Newey-West standard errors (lag = 3) are shown in parentheses. The regressions are estimated using data covering the 78-month period from January 2013 through June 2019.

5.2. Evidence at the firm-level confirms that access to NYSE IF led to increased trading on NYSE

78. Data at the firm-level further confirm that access to NYSE IF made it more likely that firms would route orders to NYSE. The dataset contains monthly data on purchases of data

difference between actual trading volume in 2016 and my estimate of what trading volume would have been absent the launch of NYSE IF is 19.5 billion shares. The average net transaction fee per share traded on NYSE in 2016 was $0.000592. Multiplying this net transaction fee by the 19.5 billion affected shares yields $11.5 million.

products and on trading on NYSE Group Exchanges (NYSE, NYSE Arca, NYSE National, and NYSE MKT/American[47]) from January 2013 to May 2019.[48] This information is provided for all 167 firms that traded on NYSE during this period.[49]

79. Because this firm-level dataset is limited to trading on NYSE Group Exchanges, I cannot study the shift of firms' overall (i.e., on all trading venues) trading toward NYSE that followed the introduction of NYSE IF as I do in the exchange-level analysis. Rather, I study the impact of the introduction of NYSE IF on two outcomes. First, I look at the proportion of firms' trading on NYSE Group Exchanges that took place on NYSE. This measures shifts in the mix of trading at NYSE Group Exchanges – I hypothesize that gaining access to NYSE IF makes trading on NYSE more attractive relative to other NYSE Group Exchanges, such as NYSE Arca. Second, I look at firms' total trading volume on NYSE (measured by the number of shares traded).

80. Firms that adopted NYSE IF were more likely than those that did not to increase the proportion of their trading (among NYSE Group Exchanges) on NYSE. Figure 3 shows the distribution of changes in NYSE IF-adopting firms' proportion of trading on NYSE from the 24 months before adopting NYSE IF to the 24 months after adopting it (red bars). It also shows the distribution of changes in the proportion of trading on NYSE from the 24 months before NYSE IF's launch (in April 2015) to the 24 months after among firms that did not subscribe to NYSE IF (non-adopting firms; blue bars). Areas where red and blue bars overlap are shown in purple.

81. While reactions by specific firms to the availability of NYSE IF vary widely, it is evident that the distribution of red bars is to the right of the distribution of blue bars, meaning that NYSE IF adopters increased their proportion of trading more than non-adopters. Indeed, 22 of 28 adopters that traded on NYSE in both the 24 months before and the 24 months after adoption increased their proportion of trading on NYSE following their adoption of NYSE IF; most (16) of these firms increased their proportion of their trading on NYSE by between

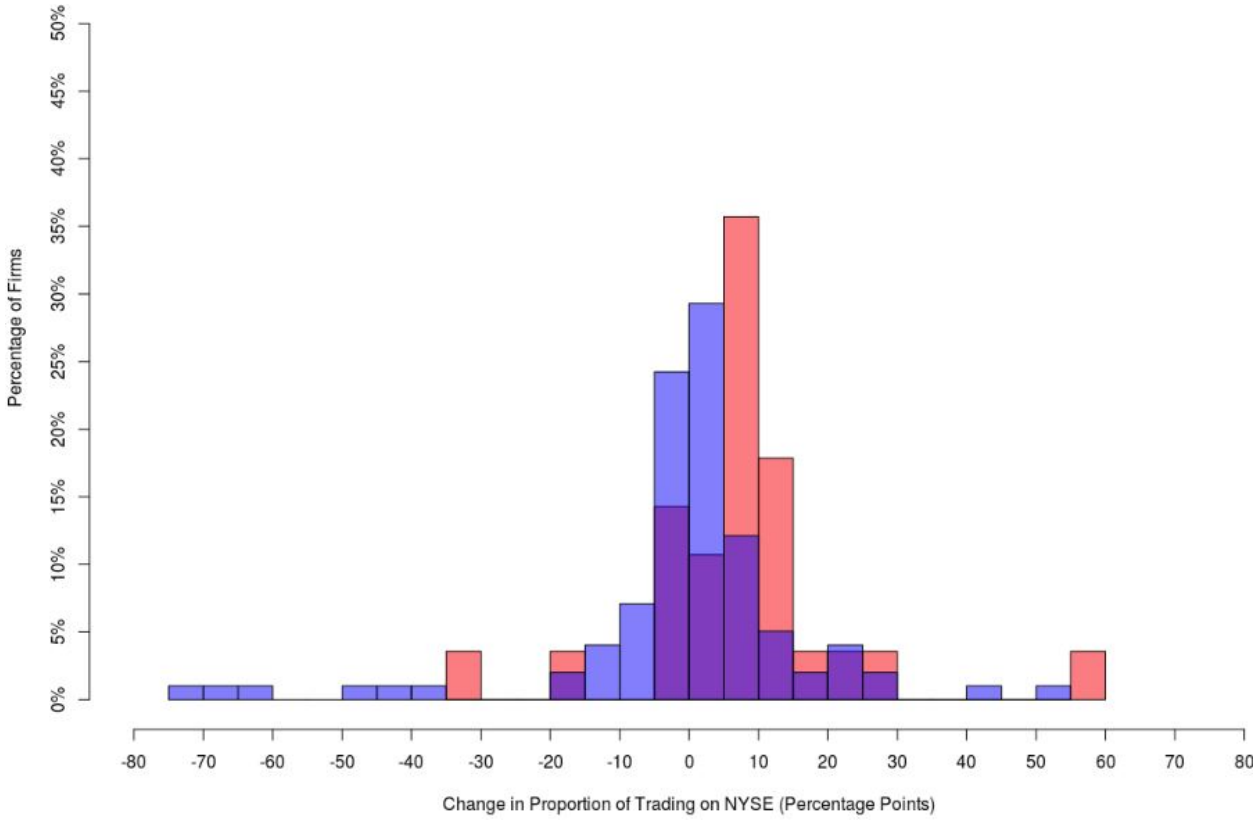
[47] NYSE MKT became NYSE American in July 2017.

[48] Separate datasets were provided by NYSE. I then merged the datasets to enable this analysis. Merging required grouping of firm names that, in some cases, were recorded differently in each dataset. I also grouped together accounts for subsidiaries of the same parent company. Both merging across datasets and grouping related subsidiaries required manual review of firm names.

[49] Note that data on trading identifies only the firm placing orders on NYSE Group Exchanges and not their clients who they may be trading on behalf of. As discussed in Section 4.1 above, some of these clients may have subscribed to NYSE IF and may have instructed their brokers on what trading venue to route their orders to. This feature of the data could lead to artificially low estimates of the effect of NYSE IF as some trading that I classify as unaffected by access to NYSE IF may have in fact been affected. This data issue is less likely to affect the regressions that are estimated on the subset of firms that traded directly on NYSE and subscribed to NYSE IF (see Tables 3 and 4).

5 and 20 percentage points.[50] More than half (56 out of 99) of non-adopters that traded on NYSE during both the 24 months before and the 24 months after the launch of NYSE IF increased their proportion of trading on NYSE after April 2015.[51]

FIGURE 3
Distribution of Changes in the Proportion of Trading on NYSE Following Adoption (Adopting Firms) or Launch (Non-Adopting Firms) of NYSE IF



Source: NYSE

Note: Changes in the proportion of trading for firms that subscribed to NYSE IF at some point in time (adopting firms) calculated as total shares traded on NYSE during the 24 months from the first month in which the firm subscribed to NYSE IF divided by the total number of shares traded on all four NYSE Group Exchanges during the same period minus total shares traded on NYSE during the 24 months prior to the first month in which the firm subscribed to NYSE IF divided by the total number of shares traded on all four NYSE Group Exchanges during the same period. Changes in the proportion of trading for firms that did not subscribe to NYSE IF at any point in time (non-adopting firms) are calculated as total shares traded on NYSE between April 2015 and March 2017 divided by the total number of shares traded on all four NYSE Group Exchanges during the same period minus total shares traded on NYSE between April 2013 and March 2015 divided by the total number of shares traded on all four NYSE Group Exchanges during the same period. Only firms reporting trading in both comparison periods are shown.

[50] Three firms subscribed to NYSE IF from the first month they appear in the trading data. I do not account for these firms in these statistics as there is no meaningful comparison period prior to adoption for them.

[51] These statistics cover 127 firms. A total of 167 firms traded on NYSE during the period covered by the data; 37 non-adopters did not trade during either the 24 months leading to the launch of NYSE IF, the 24 months following the launch of NYSE IF, or both. Three adopters did not trade on NYSE in the 24 months before their adoption.

82. While the distribution of blue bars is to the left of the red bars, it is centered to the right of 0%, indicating that most non-adopters also increased their proportion of trading on NYSE following the launch of NYSE IF. This is consistent with the launch of NYSE IF having positive externalities on firms that did not subscribe to it, as one would expect in a platform.

83. The distribution of changes in the total number of shares traded on NYSE shows a similar, if more varied, pattern of volume increases and decreases (see Figure 4).[52] The distribution of red bars (adopters) is to the right of the distribution of blue bars (non-adopters). NYSE IF adopters were more likely to increase their total volume of trading on NYSE (18 of 28 adopter firms did so) than non-adopters (35 of 99 non-adopter firms did so). Among the adopters that increased their total trading on NYSE, 13 did so by more than 20%.

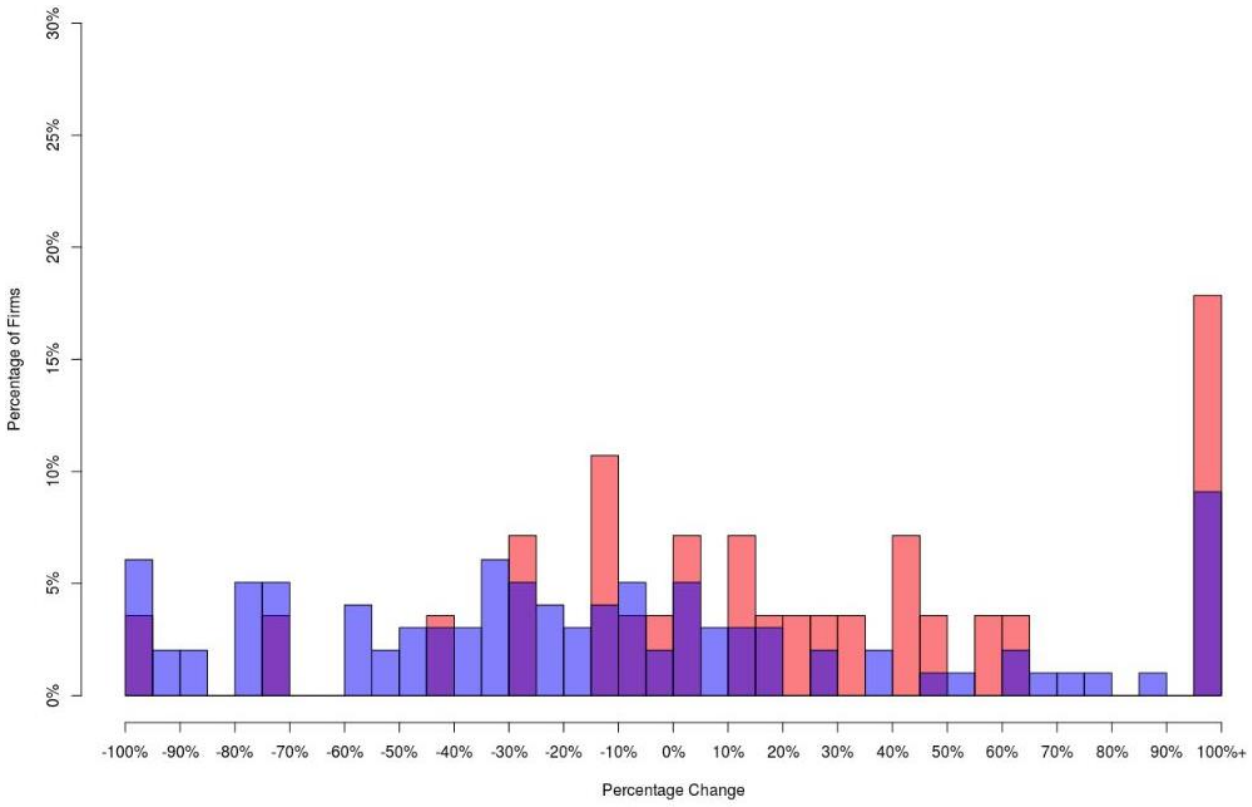
84. Regression results confirm that firms increased their trading on NYSE after gaining access to NYSE IF.[53] To make this determination, I estimate several "fixed effects" regression models. Fixed effects regression models account for the effect of all (observable and unobservable) time-invariant firm characteristics on the variable of interest (here, trading on NYSE) by including regressors or independent variables that mark observations related to each firm. Fixed effects estimators are sometimes referred to as "within" estimators because they reflect only variation within each firm's trading, not variation across firms. Due to their ability to account for unobservable firm characteristics that could otherwise contaminate regression estimates, fixed effects regressions are widely used to more reliably estimate causal relationships between variables of interest.[54]

[52] The large bars at 100% and over reflects the 5 NYSE IF adopters and the 9 firms that did not adopt NYSE IF whose trading volume on NYSE increased by 100% or more.

[53] While NYSE IF includes order imbalance information, its potential effects on continuous market trading are clearer than on auction volume. Estimating the regressions presented in Tables 3–5 while excluding auction volume from all measures of volume yields similar results.

[54] Wooldridge, Jeffrey M. 2010. *Econometric Analysis of Cross Section and Panel Data*. Cambridge: MIT Press, Section 10.5.

FIGURE 4
Distribution of Percentage Changes in the Number of Shares Traded on NYSE Following Adoption (Adopting Firms) or Launch (Non-Adopting Firms) of NYSE IF



Source: NYSE

Note: Percentage changes for firms that subscribed to NYSE IF at some point in time (adopting firms) calculated as total number of shares traded on NYSE during the 24 months from the first month in which the firm subscribed to NYSE IF divided by the total number of shares traded on NYSE during the 24 months prior to that month, minus one. Percentage changes for firms that did not subscribe to NYSE IF at any point in time (non-adopting firms) calculated as total number of shares traded on NYSE between April 2015 and March 2017 divided by the total number of shares traded on NYSE between April 2013 and March 2015 minus one. Only firms reporting trading in both comparison periods are shown.

85. I also control for firm-specific time trends in the outcome of interest: the proportion of trading (among NYSE Group Exchanges) on NYSE for the regressions in Table 3 or the total number of shares traded on NYSE for the regressions in Table 4. The use of firm-specific time trends avoids the potential for spurious results driven by differences in pre-existing trends rather than by the adoption of NYSE IF. For example, if firms whose trading on NYSE was increasing prior to the launch of NYSE IF were more likely to subscribe to NYSE IF, an estimate of the impact that failed to account for these pre-existing trends could overestimate the effect of NYSE IF.

86. The regressions in Table 3 estimate the relationship between the proportion of firms' trading (on NYSE Group Exchanges) that goes to NYSE and various regressors, including

"Subscribed to NYSE IF". The estimated coefficients for the variable of interest, "Subscribed to NYSE IF", are all positive, indicating that subscribing to NYSE IF increases the proportion of firms' trading on NYSE. Five of the six reported coefficients of interest are statistically significant at the 95% confidence level, as indicated by two or three asterisks.[55]

87. The regressions in Table 3, Panel A estimate the relationship between the proportion of firms' trading (on NYSE Group Exchanges) that goes to NYSE and various regressors, including "Subscribed to NYSE IF", on a dataset containing all firms that traded on NYSE and covering January 2013 to May 2019 (the period for which I have data).[56] These regressions use trading activity by firms not subscribing to NYSE IF to control for market-wide shifts in activity on NYSE in each month while using changes in firms' status as NYSE IF subscribers to identify the effect of subscribing to NYSE IF relative to these market-wide shifts. As such, these regressions exploit variation between adopters and non-adopters as well as in the timing of adopters' subscriptions to NYSE IF. Specification 1 controls only for firm characteristics and firm-specific time trends and estimates that subscribing to NYSE IF increases a firm's proportion of trading on NYSE by 7.2 percentage points. Specification 2 controls for changes in market structure due to the entry and exit of various public exchanges during the period analyzed. Controlling for these factors does not change the estimated effect of subscribing to NYSE IF.

88. Specification 3 controls for factors that vary across time (but not across firms) in a flexible and robust way by adding "Month-Year Fixed Effects". These additional fixed effects account for the influence of any factors (observed or unobserved) that may affect the proportion of trading on NYSE but do not vary across firms. An example could be volatility in the prices of shares for companies listed on NYSE relative to those listed at other exchanges. "Month-Year Fixed Effects" also capture the effect of changes in market structure such as the entry and exit of competing exchanges, so that controls for these events need not be included.[57] This specification estimates that subscribing to NYSE IF increases a firm's proportion of trading on NYSE by 4.4 percentage points. The large number of regressors that

[55] Statistical significance is assessed using standard errors clustered at the firm level to account for possible heteroscedasticity and serial correlation within firms. While this is common practice, it is a conservative approach and methodologies for inference in these settings are evolving. For instance, some recent research argues that clustered standard errors are used more often than is appropriate. *See*, Abadie, Alberto, Susan Athey, Guido W. Imbens, and Jeffrey Wooldridge. 2017. "When Should You Adjust Standard Errors for Clustering?" National Bureau of Economic Research Working Paper 24003. For this reason, I also make a note of the statistical significance of some estimates when using conventional standard errors.

[56] "Subscribed to NYSE IF" is equal to one if the firm subscribed to NYSE IF during the month in question and equal to zero otherwise. I classify a firm as subscribing to NYSE IF in a given month if NYSE reports any fees relating to NYSE IF during the month in question.

[57] Indeed, such controls cannot be included in this regression specification as they would be redundant or "collinear" with the "Month-Year Fixed Effects". Coefficients cannot be estimated for perfectly collinear variables within a single regression as such variables reflect the same variation in the data. *See*, Wooldridge, Jeffery. M. 2010. *Introductory Econometrics: A Modern Approach*. Fourth Edition. Mason, OH: South-Western Cengage Learning, p. 85.

are required to estimate this model limits its statistical power, and the estimated effect of subscribing to NYSE IF is not statistically significant at conventional levels.[58]

TABLE 3
Regression Estimates of Impact of NYSE IF Subscription on the Proportion of Firms' Trading on NYSE

	Panel A: All Firms			Panel B: NYSE IF Adopters		
Independent Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Subscribed to NYSE IF	0.072***	0.072***	0.044	0.072**	0.075***	0.063**
	(0.027)	(0.027)	(0.029)	(0.027)	(0.027)	(0.030)
NSX/National Active		-0.002			-0.016*	
		(0.006)			(0.008)	
IEX Active		0.030***			0.033**	
		(0.009)			(0.013)	
CBOE Active		-0.002			-0.028	
		(0.014)			(0.021)	
Firm Fixed Effects	Y	Y	Y	Y	Y	Y
Firm-Specific Time Trends	Y	Y	Y	Y	Y	Y
Month-Year Fixed Effects	N	N	Y	N	N	Y
Observations	9,670	9,670	9,670	2,202	2,202	2,202
Number of Firms	167	167	167	31	31	31
R^2	0.482	0.485	0.501	0.454	0.472	0.508

Source: NYSE

Note: Asterisks denote statistical significance at the 99% (***), 95% (**), and 90% (*) confidence levels. Standard errors clustered at the firm level are shown in parentheses. The regressions are estimated using data covering the 77-month period from January 2013 through May 2019.

89. Table 3, Panel B presents results for the same regressions in Panel A, but estimated on a dataset consisting only of firms that subscribed to NYSE IF at some point in time. Thus, these estimates make use of variation in the timing of adopters' subscriptions to NYSE IF but does not leverage comparisons between firms that subscribed to NYSE IF and those that did not. As such, the analysis in Panel B confirms that the results in Panel A are not driven by unaccounted for differences between firms that subscribed to NYSE IF and those that did not. The specifications in Panel B estimate that subscribing to NYSE IF increases a firm's proportion of trading on NYSE by between 6.3 and 7.5 percentage points. The coefficients of interest are statistically significant at the 95% confidence level in all three specifications.

[58] The estimated effect is, however, statistically significant when using conventional standard errors rather than standard errors that are clustered by firm.

90. The regressions in Table 4 estimate the relationship between the number of shares each firm traded on NYSE and various regressors, including "Subscribed to NYSE IF". I use the logarithm of the number of shares traded, which makes the interpretation of coefficients and comparisons across traders of different sizes easier than if I used the level of those variables. The specifications mirror those in Table 3. In addition to the regressors used in Table 3, specifications 2–3 and 5–6 use a variable controlling for firms' trading volume on other NYSE Group Exchanges (i.e., on NYSE Arca, NYSE National, and NYSE MKT/American). Adding the control variable "Volume on Other NYSE Exchanges" helps us distinguish between overall increases in trading volume and increases in trading volume specifically on NYSE. As in Table 3, Panel A presents results for models estimated with data for all firms that traded on NYSE while Panel B presents results for models estimated using data only for firms that subscribed to NYSE IF at some point in time. All six estimates of the effect of subscribing to NYSE IF on firms' volume of trading on NYSE are positive, with estimates ranging from 17.7% (specification 3) to 40.4% (specification 5).[59] Shifts in overall trading volume on NYSE are more dispersed than changes in the proportion of trading on NYSE, as can be seen by inspecting Figures 3 and 4. This is reflected in the fact that only one of the six coefficients (specification 5) is statistically significant at the 95% confidence level while three others are statistically significant at the 90% confidence level (specifications 1, 2, and 4).[60]

[59] Per specification 3, a change from zero to one in "Subscribed to NYSE IF" will lead to a change in $100 \times (e^{0.163} - 1)\% = 17.7\%$. For specification 5, the estimated impact is $100 \times (e^{0.339} - 1)\% = 40.4\%$.

[60] It is worth noting, however, that all six coefficients are statistically significant at the 95% confidence level when using conventional standard errors rather than standard errors clustered by firm.

TABLE 4
Regression Estimates of Impact of NYSE IF Subscription on the Volume of Firms' Trading on NYSE

	Panel A: All Firms			Panel B: NYSE IF Adopters		
Independent Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Subscribed to NYSE IF	0.294*	0.287*	0.163	0.294*	0.339**	0.240
	(0.159)	(0.156)	(0.160)	(0.161)	(0.154)	(0.164)
NSX/National Active		0.058**			-0.021	
		(0.029)			(0.062)	
IEX Active		0.044			-0.057	
		(0.062)			(0.084)	
CBOE Active		-0.169***			-0.127	
		(0.064)			(0.096)	
Volume on Other NYSE Exchanges (log)		0.105***	0.101***		0.501***	0.472**
		(0.028)	(0.030)		(0.164)	(0.191)
Firm Fixed Effects	Y	Y	Y	Y	Y	Y
Firm-Specific Time Trends	Y	Y	Y	Y	Y	Y
Month-Year Fixed Effects	N	N	Y	N	N	Y
Observations	9,129	8,251	8,251	2,067	2,067	2,067
Number of Firms	167	165	165	31	31	31
R^2	0.372	0.420	0.446	0.382	0.453	0.477

Source: NYSE

Note: Asterisks denote statistical significance at the 99% (***), 95% (**), and 90% (*) confidence levels. Standard errors clustered at the firm level are shown in parentheses. The number of observations varies across specifications as observations reporting zeroes for variables in logarithms are dropped. The regressions are estimated using data covering the 77-month period from January 2013 through May 2019.

91. As mentioned above, a key characteristic of platform markets is that increased participation on one side (market data) generates benefits for the other side (trading). In particular, we would expect access to NYSE IF to lead to more trading on NYSE *by firms that did not subscribe to NYSE IF*. To test this hypothesis, I estimate fixed effects regressions of the proportion of trading on NYSE (among NYSE Group Exchanges) and of total trading volume on NYSE by each firm on a dataset restricted to firms that did not subscribe to NYSE IF. The regressor of interest in these regressions is a variable marking the time period following the launch of NYSE IF (the same variable of interest used in the exchange-level regressions shown in Table 2). Because this regressor coincides with a specific time period (i.e., it does not vary across firms), I cannot use "Month-Year Fixed Effects" as I did in specifications 3 and 6 of Tables 3 and 4. Instead, I control for potential time trends and changes in market structure. I also do not use firm-specific time trends in these specifications because identification does not come from comparisons between firms

that subscribe to NYSE IF at a point in time and those that do not – none of the firms in this analysis subscribed to NYSE IF.

92. The regression results confirm that firms that did not subscribe to NYSE IF nonetheless increased their trading on NYSE following the launch of NYSE IF. The coefficient of interest in specification 2 in Table 5 is 0.027 (statistically significant at the 95% confidence level), indicating that the launch of NYSE IF led firms that did not adopt NYSE IF to do 2.7 percentage points more of their trading on NYSE Group Exchanges on NYSE. Specification 4 indicates that the launch of NYSE IF led firms to increase their total trading volume on NYSE by 13.2% though, as in Table 4, the coefficient is imprecisely estimated and is not statistically significant at conventional levels.[61] The magnitudes of these increases are not directly comparable to those in Tables 3 and 4: the estimates in Tables 3 and 4 measure increases in trading on NYSE by firms adopting NYSE IF above and beyond any overall increase in trading on NYSE. The results in Table 5 show that there was an increase in trading on NYSE following the launch of NYSE IF among firms that did not subscribe to NYSE IF.

[61] The launch of NYSE IF in April 2015 led to a change in $100 \times (e^{0.124} - 1)\% = 13.2\%$ increase in firms' trading volume on NYSE. The coefficient is statistically significant at the 95% confidence level when using conventional standard errors.

TABLE 5
Regression Estimates of Impact of Launch of NYSE IF on Firms' Trading on NYSE and not Subscribing to NYSE IF

	Dependent Variable			
	Panel A: Proportion of NYSE Trading Volume		Panel B: NYSE Trading Volume (log)	
Independent Variable	(1)	(2)	(3)	(4)
Introduction of NYSE Integrated Feed (April 2015)	0.045**	0.027**	-0.302***	0.124
	(0.020)	(0.013)	(0.089)	(0.081)
Time Trend		0.001		-0.017**
		(0.001)		(0.007)
Time Trend Squared		-0.00001		0.0001
		(0.00001)		(0.0001)
NSX/National Active		0.003		0.042
		(0.008)		(0.036)
IEX Active		0.037***		0.217***
		(0.012)		(0.082)
CBOE Active		0.032**		-0.079
		(0.013)		(0.064)
Volume on Other NYSE Exchanges (log)				0.143***
				(0.032)
Firm Fixed Effects	Y	Y	Y	Y
Firm-Specific Time Trends	N	N	N	N
Month-Year Fixed Effects	N	N	N	N
Observations	7,468	7,468	7,062	6,184
Number of Firms	136	136	136	134
R^2	0.020	0.030	0.022	0.080

Source: NYSE

Note: Asterisks denote statistical significance at the 99% (***), 95% (**), and 90% (*) confidence levels. Standard errors clustered at the firm level are shown in parentheses. The number of observations varies across specifications as observations reporting zeroes for variables in logarithms are dropped. The regressions are estimated using data covering the 77-month period from January 2013 through May 2019.

93. Overall, the empirical evidence I have described paints a remarkably consistent story that confirms that NYSE acts as a platform for data and trading. The introduction of NYSE IF led to increased trading activity by the firms adopting it (Tables 3 and 4). As is expected in a platform market, this also attracted additional trading by firms that did not subscribe to NYSE IF (Table 5). These firm-level results are mirrored in my exchange-level analysis of trading volumes on NYSE, which increased as a proportion of total U.S. equities trading following the launch of NYSE IF (Table 2).

6. IMPLICATIONS OF PLATFORM THEORY FOR THE ANALYSIS OF MARKET DATA FEES

94. I have presented both qualitative and empirical evidence that leads me to conclude that stock exchanges are platforms for trading and data. My new empirical results focus on the introduction of a particular data product. In combination with the basic mechanisms that I understand to be at work and the existing related literature, my conclusion is not specific to a particular exchange or a particular data product. Rather, it is broadly applicable to any exchange that offers both trading services and market data.

95. As I explain in Section 4.3.1, data is more valuable when it reflects more trading activity and more liquidity-providing orders. These linkages alone are enough to make platform economics necessary for understanding the pricing of market data.

96. As I explain in Section 4.3.2, linkages running in the opposite direction, from data to trading, are also very likely to exist. This is because market data from an exchange reduces uncertainty about the likelihood, price, or timing of execution for an order on that exchange. This reduction in uncertainty makes trading on that exchange more attractive for traders that subscribe to that exchange's market data. Increased trading by data subscribers, in turn, makes trading on the exchange in question more attractive for traders that do not subscribe to the exchange's market data. I explain some of the specific mechanisms by which market data makes trading on an exchange more attractive for subscribers to market data in Sections 4.2.1–4.2.5. These mechanisms apply to a wide assortment of market data products, including BBO, order book, and full order-by-order depth of book data products at all exchanges.

97. I also present empirical evidence that linkages running from data to trading exist and are economically meaningful. In Section 4.4, I survey existing academic research that relates to this question. In Section 5, I develop new empirical evidence that confirms the existence and importance of these linkages. In particular, I analyze the impacts of the introduction of a new data product: NYSE IF. I selected this test case not because I anticipated that this particular data product would generate particularly strong effects on trading, but because (a) the introduction of NYSE IF generated a clear change in the data available to traders whose effects can be measured empirically and (b) because I had the data required to do the analysis. I find that the introduction of NYSE IF attracted more trading to NYSE by both subscribers and non-subscribers to NYSE IF. That is, the empirical evidence confirms that stock exchanges are platforms for data and trading.

98. The platform nature of stock exchanges means that data fees cannot be analyzed in isolation, without accounting for the competitive dynamics in trading services. Competition

is properly understood as being between platforms (i.e., stock exchanges) that balance the needs of consumers of data and traders. Data fees, data use, trading fees, and order flow are all interrelated. Competition for order flow can discipline the pricing of market data, and vice-versa. Regulating the level of market data fees could have consequences for pricing and activity on the trading side of the market, and vice-versa.

99. While an assessment of the degree of competition between U.S. stock exchanges (and other trading venues for U.S. equities) is beyond the scope of this paper, it is worth noting that academics, the SEC, and the courts seem to agree that competition for order flow is "fierce."[62] For example, a recent academic article refers to trading fees as "perfectly competitive."[63] Regulators have also noted competition in the provision of data. In 2011, the DOJ stated that exchanges "compete head to head to offer real-time equity data products. These data products include the best bid and offer of every exchange and information on each equity trade, including the last sale."[64]

100. Intense competition among stock exchanges would lower the overall level of prices for data and trading, but its effect on a particular side of the market will balance the demands of data users and traders.[65] In particular, a high price-cost margin on one side of the market (for example, market data) does not imply that an exchange has market power.[66] Just as competition between credit card issuers may result in high merchant fees and high cardholder rewards, it is possible that increased competition between stock exchanges could lead to higher (or lower) data fees and lower (or higher) trading fees. As with platforms generally, overall competition between exchanges will limit their overall profitability, not margins on any particular side of the platform.[67]

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[62] *NetCoalition I*, 615 F.3d at 539 (quoting 2008 ArcaBook Approval Order, 73 Fed. Reg. at 74,782).

[63] Budish, Eric, Robin S. Lee, and John J. Shim. 2019. "Will the Market Fix the Market? A Theory of Stock Exchange Competition and Innovation." National Bureau of Economic Research Working Paper 25855. *See also*, Colliard, Jean-Edouard, and Thierry Foucault. 2012. "Trading Fees and Efficiency in Limit Order Markets." *The Review of Financial Studies* 25(11): 3389-3421, p. 3390 ("competition among markets has triggered a sharp decline in trading fees.").

[64] U.S. Department of Justice Press Release, "Assistant Attorney General Christine Varney Holds Conference Call Regarding NASDAQ OMX Group Inc. and Intercontinental Exchange Inc. Abandoning Their Bid for NYSE Euronext," May 16, 2011.

[65] Wright, Julian. 2004. "One-Sided Logic in Two-Sided Markets." *Review of Network Economics*, 3(1): 44-64, p. 49 ("competition will generally lower the total (or average) level of prices charged").

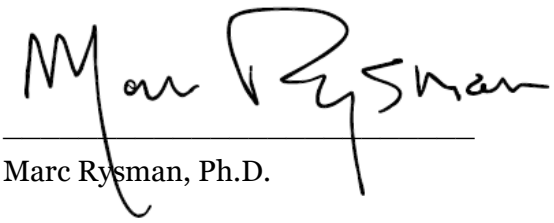
[66] Wright, Julian. 2004. "One-Sided Logic in Two-Sided Markets." *Review of Network Economics*, 3(1): 44-64, p. 47 ("A related fallacy arises from another basic principle of economics that can be misapplied to two-sided markets – the idea that competition should reduce prices to cost. Clearly, it is not true that competition, even perfect competition, will necessarily drive the price charged to each type of user to cost. As noted above, competition between nightclubs may result in men being charged above cost and women below cost. The observation that men are charged above cost does not, therefore, imply anything about the market power of the nightclub.").

[67] Wright, Julian. 2004. "One-Sided Logic in Two-Sided Markets." *Review of Network Economics*, 3(1): 44-64, p. 49 ("competition will generally lower the total (or average) level of prices charged").

101. While the effects of competition on prices on any particular side of the market are ambiguous in general, some theoretical models of platform competition suggest that competition between exchanges should keep data fees "low." One classic model of two-sided markets finds that increased competition between platforms can lead to lower prices on one side of the market (such as trading) but not affect prices on the other side (such as data).[68] However, follow-on research shows that increased competition on one side of the market will lead to lower prices on the other side of the market if prices are constrained on the side where competition intensified.[69] That is because when price on the side where competition intensified is constrained, attracting agents on the other side becomes the most effective way to compete. Constrained prices on the trading side might be a realistic description of exchanges, as setting trading fees that reward traders on net (e.g., with aggregate maker rebates that are larger than aggregate taker fees) could lead to a so-called money pump, where traders extract unlimited amounts of trading rebates from exchanges. Recent research argues that the money-pump constraint is binding for exchanges.[70]

102. Finally, evaluating stock exchanges' overall profitability using accounting measures, as some have suggested,[71] may not yield reliable assessments of competitive constraints. Accounting measures are known to be poor reflections of economic concepts such as marginal cost and, therefore, can generate misleading diagnoses of competitive conditions.[72]

Executed December 2, 2019



Marc Rysman, Ph.D.

[68] Armstrong, Mark. 2006. "Competition in two-sided markets." *The RAND Journal of Economics*, *37*(3): 668-691.

[69] Armstrong, Mark and Julian Wright. 2007. "Two-Sided Markets, Competitive Bottlenecks and Exclusive Contracts." *Economic Theory*, *32*(2): 353-380; Gomes, Renato. 2014. "Optimal Auction Design in Two-Sided Markets." *The RAND Journal of Economics*, *45*(2): 248-272; Jin, Ginger Zhe, and Marc Rysman. 2015. "Platform Pricing at Sports Card Conventions." *The Journal of Industrial Economics* 63(4): 704-735.

[70] Budish, Eric, Robin S. Lee, and John J. Shim. 2019. "Will the Market Fix the Market? A Theory of Stock Exchange Competition and Innovation." National Bureau of Economic Research Working Paper 25855, p. 26.

[71] "Guidance on SRO Filings Relating to Fees," Securities and Exchange Commission, May 21, 2019, p. 6.

[72] Fisher, Franklin and John McGowan. 1983. "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits." *American Economic Review*, 73(1): 82-97; Baker, Jonathan B. and Timothy F. Bresnahan. 2008. "Economic Evidence in Antitrust: Defining Markets and Measuring Market Power." In *Handbook of Antitrust Economics*, edited by Paolo Buccirossi, Cambridge, MA: The MIT Press, 1–42, p. 19 ("The Lerner Index can be difficult to measure because of well-known problems in the measurement of marginal cost. These include conceptual difficulties in relating accounting measures to economic concepts. For example, accountants define cost categories for audit purposes that do not necessarily track economist's concepts; that present difficulties in the accounting treatment of depreciation, that may not capture opportunity costs in accounting data, and that show average variable costs not equal to marginal cost where the marginal cost curve is not horizontal. Indeed the academic literature in empirical industrial organization economics commonly treats the level of marginal cost as unobservable even when some of its determinants, like input prices and scale, can be observed.").

EXHIBIT 5

Additions underlined
Deletions [bracketed]

NYSE National Proprietary Market Data Fees

As of February 3, 2020, unless otherwise noted

NYSE National BBO - No Fees

NYSE National Trades - No Fees

NYSE National Integrated Feed

Access Fee:	$2,500/month
Redistribution Fee:	$1,500/month
Professional User Fee (Per User):	$10/month
Non-Professional User Fee (Per User):	$1/month
Non-Display Fee[1]	
Category 1:	$5,000/month
Category 2:	$5,000/month
Category 3:	$5,000/month, capped at $15,000
Non-Display Declaration Late Fee:	$1,000/month[2]
Multiple Data Feed Fee:	$200/month[3]

General

Access fees, professional user fees and non-display fees do not apply to Federal agencies that subscribe to the Products listed on this schedule that include such fees.

First-time subscribers are eligible for a free trial by contacting the Exchange and will not be charged the Access Fee, Non-Display Fee, any applicable Professional and Non-Professional User Fee, and Redistribution Fee for one calendar month for each of the Products listed on this Fee Schedule. A first-time subscriber would be any firm that has not previously subscribed to a particular Product. The free trial would be for the first full calendar month following the date a subscriber is approved to receive trial access to

NYSE National market data. The Exchange will provide the one-month free trial for each particular product to each subscriber once.

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[1] Category 1 Fees apply when a data recipient's Non-Display Use of real-time market data is on its own behalf as opposed to use on behalf of its clients. Category 2 Fees apply when a data recipient's Non-Display Use of real-time market data is on behalf of its clients as opposed to use on its own behalf. Category 3 Fees apply when a data recipient's Non-Display Use of real-time market data is for the purpose of internally matching buy and sell orders within an organization, including matching customer orders on a data recipient's own behalf and/or on behalf of its clients.

[2] A data recipient that is paying the Access Fee and that fails to timely complete and submit a Non-Display Use Declaration must pay the Non-Display Declaration Late Fee. The Non-Display Use Declaration is due by December 31 of each year. The Non-Display Declaration Late Fee applies to data recipients that fail to complete and submit the annual Non-Display Use Declaration by the December 31 due date, and applies beginning January 1 and for each month thereafter until the data recipient has completed and submitted the annual Non-Display Use Declaration.

[3] The Multiple Data Feed Fee applies to data recipients that take a data feed for a market data product in more than two locations, and applies, with respect to each market data product, to each location, beyond the first two locations, where a data recipient receives a data feed.