

**Prepared Testimony of Robert Battalio**  
**United States House Committee on Financial Services Hearing Entitled:**  
**“From Order to Execution: Ensuring Efficient and Transparent Equity Markets”**  
**May 20, 2026**

Let me begin by thanking Subcommittee Chair Ann Wagner, Ranking Member Brad Sherman, and members of the subcommittee for holding and inviting me to participate in this hearing. My name is Robert Battalio and I have written academic articles on U.S. financial markets for over thirty years. Much of my research agenda has studied how orders are executed in U.S. equity and equity options markets. I am currently a professor of finance in the Mendoza College of Business at the University of Notre Dame. I have also served as a visiting economist at Nasdaq, I have served on Nasdaq’s quality of markets committee, I have consulted for asset managers and market makers, and I have served as an expert witness on matters related to my research.

**The retail trading experience.**

The Securities Act Amendments of 1975 democratized trading in equity markets by eliminating fixed brokerage commissions and mandating that trades and quote updates be broadcast to market participants in real time. Eight years later, real-time quote updates and trades were aggregated by a Securities Information Processor (SIP) and rebroadcast to market participants. The real-time broadcast of quotes made it possible for market makers (now referred to as wholesalers) to purchase orders from retail brokers and promise to execute the orders at or within the National Best Bid and Offer (NBBO). The National Best Bid is the highest price that an investor can sell shares of stock while the National Best Offer is the lowest price at which an investor can buy shares of stock. Before wholesalers began purchasing and executing retail orders, it cost brokers about \$0.03/share to have orders executed on the floor of the New York Stock Exchange and it often took several minutes to get the orders executed.<sup>1</sup> After wholesalers began purchasing orders, brokers were paid around \$0.02/share to have their retail orders executed in several seconds.<sup>2</sup> The elimination of fixed commissions along with the transition of order execution from a cost center to a profit center led to the formation of online brokers like Charles Schwab, Ameritrade, and Scottsdale Securities who offered quick executions and commissions as low as \$9.00 per order.<sup>3</sup> Battalio, Jennings and Selway (2001) document that only one of the top 25 discount brokers operating in 1996, Trade Fast, did not accept payment for order flow and find that many of the brokers that accepted payment for order flow offered lower net trading costs than Trade Fast. This suggests that brokers used order flow payments to enhance execution quality and/or to lower commissions.

In June 2000, the SEC ordered U.S. equity exchanges to develop a plan to transition equity trading increments from \$0.0625 to \$0.01. Exchanges began implementing this plan in July 2000. One prominent academic study found that the width of the NBBO declined substantially after stocks began trading in

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<sup>1</sup> The Securities Act Amendments also made it possible for large investment banks such as Fidelity and Merrill Lynch reduce trading costs by internalizing orders on regional stock exchanges via affiliated specialists (e.g., exchange-based market makers). See Battalio, Robert, Jason Greene, and Robert Jennings, 1997. Do competing specialists and preferencing dealers affect market quality?, *Review of Financial Studies* 10, 969-993 and Battalio, Robert, Jason Greene, and Robert Jennings, 1998. Order flow distribution, bid-ask spreads, and liquidity costs: Merrill Lynch’s decision to cease routinely routing orders to regional stock exchanges, *Journal of Financial Intermediation* 7, 338-358.

<sup>2</sup> See Battalio, Robert, 1997. Third market broker-dealers: Cost competitors or cream skimmers?, *Journal of Finance*, 341-352.

<sup>3</sup> See Table 3 of Battalio, Robert, Robert Jennings, and Jamie Selway, 2001. The relationship among market-making revenue, payment for order flow, and trading costs for market orders, *Journal of Financial Services Research* 19, 39-56.

pennies.<sup>4</sup> Since wholesalers execute purchased orders at or within the NBBO, the substantial reduction in the quoted spread translated to a substantial reduction in retail trading costs.

In November 2000, the SEC adopted SEC Rule 11Ac1-5 (now known as Rule 605 of Regulation NMS) to “improve public disclosure of order execution practices.”<sup>5</sup> More specifically, the rule required executing venues to produce monthly electronic reports that include uniform statistical measures of execution quality that can be used by market participants to evaluate where they should route their orders. An academic study published in 2006 found that trading venues that offered superior execution quality in one month increase their market share of trading volume in the next month.<sup>6</sup> Thus, the increased transparency associated with the passage of Rule 605 further enhanced the retail trading experience in US equity markets. Academic studies analyzing more recent data from the last five years present compelling evidence that (1) retail brokers monitor execution quality and allocate more order flow to wholesalers that provide superior execution quality;<sup>7</sup> (2) the largest wholesalers use their scale to provide retail investors with the lowest trading costs;<sup>8</sup> and (3) that the value of both price and size improvement provided by wholesalers to marketable orders in May 2022 is 650% greater than the value of price improvement documented in the mandatory Rule 605 execution quality reports.<sup>9</sup>

The SEC adopted amendments that increase the execution quality metrics produced in Rule 605 reports in April 2024.<sup>10</sup> The amendments also introduce execution quality reporting for odd lots (orders for less than 100 shares), which are typically placed by retail investors. Most importantly, amended Rule 605 mandates that retail brokers begin producing monthly execution quality reports in the fall of 2026. The increased transparency introduced by the amendments to SEC Rule 605 will allow retail investors, regulators, the press, and academics to more closely evaluate the relative execution quality offered by the different retail brokers.<sup>11</sup> If past research is an indication, I expect that competition for retail orders will become even more intense when the amended Rule 605 reports are made public and trading costs will fall even further.

Additional evidence regarding the relationship between competition, transparency, and the retail trading experience in U.S. equity markets occurred in October 2019, when several retail brokers joined Robinhood<sup>12</sup> and began offering commission-free trading. A recent academic study<sup>13</sup> finds little difference in the execution quality offered by these brokers and the amount payment that these brokers received for their orders. The authors interpret this evidence as suggesting that the retail brokers “Absorbed the cost of eliminating commissions in a competitive environment” and conclude their findings “support the brokerage industry’s claim that dropping commissions helped retail investors.”

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<sup>4</sup> See Bessembinder, Hendrick, 2003. Trade execution costs and market quality after decimalization, *Journal of Financial and Quantitative Research* 38, 747-777.

<sup>5</sup> See SEC Release No. 34-43084, Disclosure of order execution and routing practices, August 8, 2000.

<sup>6</sup> See Boehmer, Ekkehart, Robert Jennings, and Li Wei, 2007. Public disclosure and private decisions: Equity market execution quality and order routing, *Review of Financial Studies* 20, 315-358.

<sup>7</sup> See Ernst, Thomas, Andrey Malenko, Chester Spatt, and Jian Sun, 2026. What does best execution look like?, SSRN paper 6635238.

<sup>8</sup> See Dyhrberg, Anne Haubo, Andriy Shkilko, and Ingrid Werner, 2025. The retail execution quality landscape, *Journal of Financial Economics* 168.

<sup>9</sup> See Battalio, Robert and Robert Jennings, 2026. Wholesaler execution quality, *Management Science* 72, 3629-4567.

<sup>10</sup> See SEC Release 34-99679, Disclosure of Order Execution Information, April 15, 2024.

<sup>11</sup> As documented by Battalio, Jennings, and Selway (2001), retail brokers have different clienteles of investors, some being savvier than others. As a result, care must be taken when comparing the execution quality of two or more retail brokers if their clienteles are different. See Battalio, Robert, Robert Jennings, and Jamie Selway, 2001. The potential for clientele pricing when making markets in financial securities, *Journal of Financial Markets* 4, 85-112.

<sup>12</sup> Robinhood reduced commissions to \$0.00 in 2016.

<sup>13</sup> See Adams, Samuel, Connor Kasten, and Eric Kelley, 2024. How free is free? Retail trading costs with zero commissions, *Journal of Banking and Finance* 165.

Finally, the introduction of fractional share trading by retail brokers like Interactive Brokers and Robinhood in 2019 and Fidelity and Charles Schwab in 2020 further democratized access to U.S. equity markets by allowing retail investors to invest in stocks regardless of their price levels.

Overall, I would argue that as a result of the increased competition and transparency in U.S. equity markets that began fifty years ago with the passage of the Security Act Amendments of 1975, retail investors have never had it better. The evidence is conclusive!

### **Is Rule 611 of Regulation NMS (the trade through rule) needed in today's markets?**

Institutions and their brokers seek to minimize trading costs. All else equal, it makes no sense for them to avoid taking liquidity at a better price. In other words, it makes no sense for them to trade through economically meaningful liquidity. The extension of Rule 605 execution quality reporting to brokers means that any broker that systematically avoids taking liquidity at the lowest cost will incur/report higher trading costs. Prior research suggests that investors will avoid brokers with inflated trading costs as reported by Rule 605 reports.<sup>14</sup> Moreover, trading through better displayed prices creates problems with the customer service desks of brokers. As a result, brokers review trades at the end of every day (with the help of firms like S3) and demand that executing venues adjust the prices of orders that could have interacted with cheaper liquidity.

Perhaps more importantly, brokers and executing venues use proprietary feeds to create their view of the market and identify the venue(s) with the cheapest liquidity. These proprietary feeds allow market participants to observe quote updates and trades faster than those who rely on the SIP broadcast. Additionally, trades and quotes observed in proprietary feeds are properly sequenced. Thus, regulators seeking to evaluate compliance with the trade through rule cannot use SIP data, which is archived in the New York Stock Exchange's Trade and Quote (TAQ) database, to measure trade throughs because latencies cause trades and quote updates to be broadcast and recorded out of sequence.<sup>15</sup> Rather, they require executing venues to take snapshots of their view of the market when executing orders and use these data to evaluate compliance with the trade through rule. Robert Jennings and I wrote a comment letter on Fidelity's behalf against the passage of 611 in which we provided evidence that the use of TAQ data to estimate trade throughs is problematic.<sup>16</sup> And, we didn't even know at the time that TAQ data has a look-ahead bias!

The current crypto market highlights the ability of retail brokers to obtain executions that are at or within the best quotes posted on exchanges without the need of a formal rule similar to Rule 611. Tom Ernst and his coauthors analyze the execution quality of approximately \$550 billion in crypto trades executed by a retail broker between 2020 and 2024.<sup>17</sup> Consistent with the numerous analyses of retail execution quality in equity and equity option markets, the authors estimate that these orders receive between \$38 million and \$74 million in price improvement per year relative to the best prices posted on crypto exchanges.

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<sup>14</sup> See Boehmer, Ekkehart, Robert Jennings, and Li Wei, 2007. Public disclosure and private decisions: Equity market execution quality and order routing, *Review of Financial Studies* 20, 315-358.

<sup>15</sup> Battalio, et al. (2026) present evidence that the TAQ dataset reports trades and quotes sequentially out of order. This happens because trades and quote changes are clustered but recorded with differential latency, partly because of geography. Consequently, quote changes after, and in response to, a trade are regularly reported before the trade, creating a look-ahead bias (e.g., the quotes that are matched to a trade will contain information that happened after the trade). This bias creates the illusion appearance of trade-throughs when there are none. It can also create the perception that a market is locked or crossed when it is not. See Battalio, Robert, Craig Holden, Matthew Pierson, John Shim, and Jun Wu, 2026. Latency and the look-ahead bias in trade and quote data, SSRN paper #5907665.

<sup>16</sup> See <https://www.sec.gov/files/rules/proposed/s71004/edroiter032805.pdf>.

<sup>17</sup> See Ernst, Thomas, Bryan Routledge, Chester Spatt, and Ariel Zetlin-Jones, 2026. Dark crypto, University of Maryland working paper.

To summarize, it is not clear that in 2008 U.S. equity markets needed a rule to ensure market participants did not trade through aggressively priced limit orders. The empirical evidence suggests that competitive and reputational incentives already induce most market participants to avoid economically meaningful trade-throughs. Thus, Rule 611 is not needed in today's financial markets.

### **Do we need Rule 603 of Regulation NMS (the Vendor Display Rule)?**

A recent paper provides convincing evidence that the TAQ database, which archives the trades and quote updates broadcast to U.S. equity market participants by the SIP, records events sequentially out of order. This happens because trades and quote changes are clustered but recorded with differential latency, partly because of geography. Consequently, quote changes after, and in response to, a trade are regularly reported before the trade, creating a look-ahead bias (e.g., the quotes that are matched to a trade will contain information that happened after the trade). This can create the appearance of trade-throughs and locked and crossed markets. results in locked and crossed markets. It can also result in biased estimates of trading costs and price impact. Fortunately, in addition to recording the time that trades and quote updates are received by the SIP, it also records the time that these events happened on exchanges and other trading venues. As a result, consumers of the SIP data can reconstruct the correct sequence of trades in quotes using this 'participant' timestamp with a minimal delay.

The Security Act Amendments of 1975 took away the NYSE's property rights to the trade prices and quotes produced by the NYSE.<sup>18</sup> In recognition of this, the SEC allowed the SIP to charge market participants for access to real time trade and quote information. This revenue is passed back to the exchanges on which trades and quotes are produced. I leave it to market participants to discuss whether the rates that the SIPs charge for this information are appropriate.

The Security Act Amendments of 1975 democratized trading. It seems reasonable to require brokers to display SIP information when investors place orders. A recently published academic paper studies a sample of all retail trades executed by one or more wholesalers in May 2022 and finds that the median (95<sup>th</sup> percentile) marketable order executes in 7 microseconds (65 microseconds).<sup>19</sup> For context, there are one million microseconds in one second and Wikipedia reports that the average human eye blink takes 350,000 microseconds. The speed with which the retail orders coupled with the fact that 83% of the sample of retail trades execute *within* the order receipt time NBBO that investors observe when placing their orders clearly builds confidence in US markets. Thus, there is value to retaining Rule 603.

### **Are symbols that trade in U.S equity markets tick-constrained?**

Most of the retail orders routed to wholesalers are executed off exchange. As a result, institutions and professional traders generate most of the trading volume on exchanges. Nearly every exchange operating in today's equity and equity options markets operate as electronic limit order books. These exchanges are currently allowed to charge up to \$0.0030 per share when investors take liquidity. Some exchanges charge less than the maximum amount and a few actually offer a rebate to investors when they demand liquidity! These fees are not incorporated into exchange quotes, so the actual all-in execution price is different than the displayed price that investors trade at.

The SEC measures the width of the security's time-weighted average gross NBBO and classifies the security as tick size constrained if the average time-weighted gross spread width is equal to or less than

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<sup>18</sup> See Mulherin, J. H., J. M. Netter, and J. A. Overdahl, 1991. Prices are property: The organization of financial exchanges from a transaction cost perspective, *Journal of Law and Economics*, 591-644.

<sup>19</sup> See Battalio, Robert and Robert Jennings, 2026. Wholesaler execution quality, *Management Science* 72, 3629-4567.

\$0.0150.<sup>20</sup> However, given that three exchanges frequently charge negative access fees (e.g., liquidity rebates), the width of the net NBBO can be less than \$0.0100. In January 2024, Nasdaq's BX exchange charged an access fee of negative \$0.0017 per share, the CBOE's EDGA exchange charged an access fee of negative \$0.0014 per share, and the CBOE's BYZ exchange charged an access fee of negative \$0.0020 per share. Thus, if the *net* National Best Bid and the *net* National Best Offer were both set by quotes on BYX, the width of the net NBBO would be \$0.0060 even though the width of the gross NBBO would be \$0.0100.

An alternative measure of tick size constrained could focus on the percentage of time that the width of the gross NBBO is a penny and an inverted exchange (e.g., an exchange that offers negative access fees) is at both the National Best Bid and the National Best Offer. In other words, one could measure the percentage of the trading day that the width of a symbol's net NBBO is less than \$0.0100 and is agnostic as to the width of the symbol's net NBBO when it exceeds \$0.0100. To arrive at a threshold level that would indicate a symbol is tick-constrained, regulators and market participants come to a consensus or a financial economist could write a compelling theoretical model. Conversely, one could compute the symbol's average time-weighted width of the net NBBO during the month. This measure summarizes the entirety of a symbol's net spread widths throughout the month. Robert Jennings, Jun Wu, and I estimated the width of the net time weighted NBBO for each symbol in TAQ in January 2024. We found that only 16 symbols have an average time weighted net spread that is less than \$0.01. The average time weighted net spread for GSY was the lowest at \$0.0092. Whether or not \$0.01 is the correct threshold to use to evaluate whether symbols are tick-constrained is something that we leave to regulators, market participants, and/or financial economists to determine.

To summarize, I think the methodology used to identify tick-constrained symbols captures many symbols that are not tick constrained. Using a threshold of \$0.01 to evaluate net spread widths, my coauthors and I identify 16 tick-constrained symbols in January 2024. Assuming this is a reasonable threshold, should regulators have a different tick size for 16 symbols?

### **Do regulators need to set access fee caps via Rule 610 in modern financial markets?**

The results in several academic papers find that, on average, marketable orders are routed to exchanges based on net price.<sup>21</sup> That is, institutional investors and other professional market participants rank each exchange whose quote is equal to the best quote based on their access fee. All else equal, marketable orders are then routed to exchanges based on who has the best net price. Retail orders are routed to wholesalers by their brokers, who use the same routing logic as institutions when sourcing external liquidity. As described earlier, the existence of sub-penny access fees implies that the net NBBO will be quoted in sub-pennies (e.g., the third and/or fourth decimals of the quoted prices are non-zero).

I believe that an exchange's quote should be grossed up or down by the amount of the exchange's access fee. This would formalize what is already happening in markets and would increase transparency and reduce the complexity of U.S. equity markets since the demanders of liquidity would know the exact price at which their orders will execute.<sup>22</sup> I note that grossing exchange quotes by their access fee will not alter the tick

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<sup>20</sup> See "SEC revises tick size, access fees, and round-lot definition and takes steps to disseminate odd lot and other priced orders," published on katten.com on September 23, 2024 and accessed on May 15, 2026.

<sup>21</sup> See Battalio, Robert, Shane Corwin, and Robert Jennings, 2016. Can brokers have it all? On the relation between make-take fees and limit order execution quality, *Journal of Finance* 71, 2139-2238.

<sup>22</sup> Since exchanges do not typically pass all of the access fee back to passive investors when their orders execute, the price at which passive orders execute will be different than the net prices displayed to market participants. Institutional investors and professional traders typically consider the different access fees and pass through rates on different exchanges when deciding where to route their limit orders.

size on the exchange – it will still move in increments of \$0.0100. Only the sub-penny on which the grid anchors will be affected. So, an exchange that charges an access fee of \$0.0030 per share and a gross best bid and offer of \$10.00 to \$10.01 would have a net best bid and offer of \$9.9970 to \$10.0130. Further note that if this venue chose to have an access fee of \$0.50 per share, the exchange best bid and offer would become \$9.50 to \$10.50. So, by incorporating the access fee into exchange quotes and removing the cap on access fees, the minimum net tick size would be determined collectively by the different access fees charged by exchanges.

To summarize, access fees should be incorporated into exchange quotes and the cap on access fees should be eliminated.

Thank you for this opportunity to testify.

**Acknowledgements.**

Much of my testimony relies on the results of research conducted over the past thirty years, the preponderance of which is coauthored. I would not be here today without them. I also thank Robert Jennings, John Shim, and Jun Wu for their comments on prior drafts. All errors are my own.