

April 16, 2026

Ms. Vanessa Countryman
Secretary
U.S. Securities and Exchange Commission
100 F Street, NE
Washington, DC 20549

Re: File Number 4-887; SEC Roundtable on Options Market Structure Reform

Dear Ms. Countryman:

Our names are Xing Huang and Christopher Schwarz.¹ As background, we run randomized control trial (RCT) trading experiments using our own personal money to perform research on current market structures. For example, our paper “The ‘Actual Retail Price’ of Equity Trades” includes results from 85,000 equity marketable trades across six brokers.² Its findings are cited in the new Order Disclosure Rule (34-99679).³

We authored a paper using a similar experimental design on options markets titled “Some Anonymous Trades Are More Equal than Others.”⁴ The original paper and our analysis within this comment are based on approximately 7,000 market and marketable limit orders of various trade sizes across two dozen of symbols at six different retail brokers from March to June 2024.^{5,6}

¹ Xing Huang is an Associate Professor of Finance at Cornell University. Christopher Schwarz is a Professor of Finance at the University of California, Irvine.

² “The ‘Actual Retail Price’ of Equity Trades,” Schwarz, Barber, Huang, Jorion, and Odean. *Journal of Finance*, 2025. Available at <https://onlinelibrary.wiley.com/doi/full/10.1111/jofi.13467>.

³ Available at <https://www.federalregister.gov/documents/2024/04/15/2024-05556/disclosure-of-order-execution-information>.

⁴ Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4951825

⁵ During our sample period from March to June 2024, marketable orders (i.e. market and marketable limit orders) represent 62% of executed retail volume across brokers in our sample, as inferred from payment for order flow data in Form 606(a) filings. Vanguard is excluded from this calculation because it does not receive payment for order flow and its volume cannot be inferred. Our calculation excludes the “other” category, as it could encompass any order type. We have also compared market and marketable limit orders at multiple brokers and found similar execution quality. Note that the “Summary” section of Form 606(a) reports severely *overstates* non-marketable limit order volume as those figures reflect orders submitted rather than orders executed and do not control for order size differences. These “Summary” section data were incorrectly applied to infer the importance of marketable trades in “CCMR Staff Report: Empirical Research on U.S. Retail Options Markets.” They also equally weight across our brokers rather than volume weight. Available at <https://capmktreg.org/wp-content/uploads/2025/06/CCMR-Staff-Report-Retail-Options-Market-Study-6.17.25.pdf>.

⁶ We have continued to trade, expanding our sample to more than 20,000 trades across now nine brokers. While we have not finished our full analyses of these additional trades, we have used them to evaluate specific issues such as

Based on our trading experiences, we have comments related to price execution disclosure, best execution duties, and improving execution quality of options trades.⁷ Before our comments, we will summarize the findings of our research.

Summary of Findings

Our research interest in the options market is due to its unique structure relative to equity markets and growing importance in the market. All options trades, due to clearinghouse requirements, are executed on exchanges. Since all identical trades on exchanges must be treated equally by rule⁸ and trades are anonymized before being passed from wholesalers to affiliated market makers,⁹ our prior was that all brokers would receive the same execution quality. The key findings of our research are in Table 9 of the paper, which we present below.

Execution at:	PFOF	PI	% Trades	PI	PI
	(¢/contr.)	(%NBBO)		(%NBBO)	(%NBBO)
		Overall	Auction	Auction	Auto-exec.
Vanguard	0.0	51.5	75.5	64.0	11.5
Fidelity	10.1	40.5	74.9	51.0	9.1
Schwab	45.7	33.2	69.0	44.4	7.9
TD Ameritrade	39.3	19.0	46.3	35.3	5.0
E*Trade	38.9	18.8	45.6	33.3	6.6
Robinhood ¹⁰	65.8	7.2	25.1	21.1	2.5
Corr. with PFOF:		-0.91	-0.83	-0.93	-0.91

the unbundling of multi-contract trades (see our comment letter on SR-NASDAQ-2025-103, available at <https://www.sec.gov/comments/sr-nasdaq-2025-103/srnasdaq2025103-717467-2246454.pdf>).

⁷ While options and equity markets differ in important respects, the spirit of many of these comments may apply to equity markets as well.

⁸ Under Section 6 of the National Securities Act, “The rules of the exchange are [...] not designed to permit unfair discrimination between customers, issuers, brokers, or dealers.” See for instance <https://www.nyse.com/publicdocs/nyse/regulation/nyse/sea34.pdf>.

⁹ These anonymity rules are strictly enforced. For example, the Wall Street Journal (November 2, 2022) reported that a wholesaler had been caught “signaling” incoming retail trades to its affiliated market maker, which is in violation of exchange rules and led to a FINRA action. See <https://www.wsj.com/articles/high-speed-trader-simplex-warned-about-potentially-abusive-options-strategy-11667391891>.

¹⁰ Robinhood, using their entire order flow, reports their price improvement is 9.3% on an equally weighted basis for the symbols we traded and 12.5% for their entire order flow. However, even using these data, the rank order of our brokers would not change. See “Evaluating Broker Execution Quality with a Trading Experiment: A Critique of “Some Anonymous Options Trades Are More Equal Than Others.” Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5399225.

In summary, trade execution varied across our six brokers by almost the entire quoted spread (89%). Wholesalers can create differential pricing because, although they remove customer information prior to handing the trade off to their affiliated market maker, they provide trade instructions. Specifically, they specify the percentage of price improvement (PIM) auctions for each broker as well as the starting price of those auctions. These two instructions create 90% of the differential pricing we observe.¹¹

We identified that variation in payment for order flow (PFOF) accounts for a large share of the variations in execution quality across brokers, with a highly negative correlation between price improvement and PFOF (-0.91). This relationship is consistent across multiple sources of variations in execution quality: PFOF is negatively correlated with the frequency of using auctions, as well as with price improvement within auto-execution and auction executed trades. This differs from what we find for equities where PFOF explains very little of the variations in the price execution across brokers (Schwarz et al., 2025). In addition, toxicity differences across brokers, which was one possible driver of execution differences in equities, explains very little of the differential pricing in options.

Price Execution Disclosure

The first item listed in the Securities and Exchange Commission (SEC)'s mission is "Protecting Investors," which is specified to mean that "... everyone should be treated fairly and have access to certain facts about investments and those who sell them."¹² Retail investors do not have access to one of the most important facts about options trades: their expected and actual trading costs. This lack of information likely leads investors to misperceive their total trading costs and to misjudge relative trading costs across brokers, which the SEC has alerted investors to pay attention to.

Specifically, in the SEC's *Staff Report on Equity and Options Market Structure Conditions in Early 2021*, the commission noted that "investors should be mindful of how their orders are handled, including the difference between 'free' and 'no commissions.'" However, even 'mindful' retail options traders currently would find it difficult to determine how much their options trades actually cost without considerable effort and sophistication.

¹¹ In our approximately 7,000 trades, 10% of differential pricing across brokers was through auto-execution trades. Price improvement was obtained by wholesalers posting our trades via limit orders at prices within the current NBBO spread. These trades were interacted with and executed at the limit price resulting in price improvement.

¹² See <https://www.sec.gov/about/mission>.

As noted by Commissioner Uyeda, prior to Rule 605 for equities which was first adopted in 2000, publicly available information on execution quality was “sparse.”¹³ Options markets are currently operating in the pre-Rule 605 world. To our knowledge, the price improvement statistics provided in our paper are the only publicly available data on brokers’ options price execution. No broker voluntarily provides any information on its options price execution, as most do for equity trades. While traders could attempt to track the National Best Bid and Offer (NBBO) of their trades and calculate trading costs themselves, this method would be difficult, tedious, and require a significant number of trades to understand execution quality.

Price execution quality has become much more important since most brokers went commission free in 2019. Several brokers now also offer no per-contract options fees, making price execution the only determinant of trading costs for investors.¹⁴ Brokers that offer no fee options trading tend to receive high payment for order flow, which based on our research, tend to deliver worse execution prices. Thus, the cost of trading has shifted from commissions and fees (visible, paid at trade) to PFOF-related execution costs (hidden in the spread, deducted from fill quality).

The current situation in the options market has an analogous relation to what happened in the mutual fund industry. As reported in the SEC’s 2000 *Report on Mutual Fund Fees and Expenses*, the mutual fund industry shifted from salient front-load fees (visible, paid at trade) to 12b-1 fees for marketing (hidden in the expense ratio, deducted from assets).¹⁵ Academic research showed that investors paid far more attention to salient front loads while ignoring the 12b-1 marketing fees included in the expense ratios.¹⁶ In fact, research showed a *positive* relation between investor flows and 12b-1 fees since those fees were used to market funds.

Over the last 25 years, the SEC and Government Accountability Office (GAO) have worked to make these fees more salient to investors, starting with fee disclosure changes back in 2004 where funds were required to disclose dollar-amount expenses.¹⁷ Most recently, the 2022’s Investment Company Act Release No. 33-11106 required concise shareholder reports that highlighted total fees paid in dollars.

¹³ “Statement on Rule Amendments Regarding Disclosure of Order Execution Information” by Commission Uyeda, March 6, 2024. Available at <https://www.sec.gov/newsroom/speeches-statements/uyeda-statement-order-execution-quality-030624>

¹⁴ One no-fee, no-commission broker even “rebates” part of their payment for order flow, meaning that from retail traders’ perspective, they are visibly *paid* to trade.

¹⁵ SEC Division of Investment Management, *Report on Mutual Fund Fees and Expenses* (Dec. 2000). Available at <https://www.sec.gov/news/studies/feestudy.htm>.

¹⁶ “Out of Sight, Out of Mind: The Effects of Expenses on Mutual Fund Flows” by Barber, Odean, and Zheng, *Journal of Business*, 2005. Available at <https://www.jstor.org/stable/10.1086/497042?seq=1>.

¹⁷ GAO, *Mutual Funds: Additional Disclosures Could Increase Transparency of Fees and Other Practices*, GAO-04-317T (Jan. 27, 2004) and SEC, *Shareholder Reports and Quarterly Portfolio Disclosure* (Final Rule, Feb. 2004).

In summary, based on the Commission's belief that "sunlight is the best disinfectant,"¹⁸ we suggest the following disclosure changes to the options market to bring it in line with disclosure requirements in equity trading markets and other retail investor environments:

1. As suggested in our paper, the options market is in desperate need of a rule similar to the new Order Disclosure Rule, which will go into effect in August 2026.
2. Brokers should provide an ex-ante total estimated cost trades, including any commissions, fees, and estimated price execution costs in dollars, displayed proximately on the trade summary screen where traders submit their orders.

Ex-ante trading costs could be estimated in a number of methods including but not limited to multiplying the half spread by an estimate of the broker's recent price execution. This estimate could be based on the broker's own records or other available disclosures (e.g., 605 filings), and could range from the broker's overall execution quality to more granular symbol-level or spread-level or symbol-and-spread-level data as available and precisely estimated.

For example, if a broker has no commissions, no fees, and 10% price improvement (effective over quoted spread (E/Q) of 0.8)¹⁹, on a five-cent spread trade, it would quote expected trading costs of \$2.00 per contract.²⁰ For another broker with no commissions, \$1.00 fee per contract, and 50% price improvement (E/Q of 0), it would quote an expected cost of \$1.00.

3. After execution, brokers should provide trade confirmations as well as daily and monthly statements that include the actual total cost in dollars for each trade and aggregated across all trading activity.²¹

¹⁸ Payment for Order Flow Final Rule (Oct. 27, 1994), Release No. 34-34902, 59 FR 55006 (Nov. 2, 1994).

¹⁹ The relation between price improvement (PI) as a percentage of NBBO spread and E/Q is $\frac{E}{Q} = 100\% - 2 \times PI$.

²⁰ Unlike equities where a buy transaction may not result in a sell for many years, traders will sell before expiration unless many retail traders are taking delivery (which seems unlikely) or the option becomes worthless. In other words, a buy transaction either results in a total loss or a sell transaction, the latter of which will result in additional transaction costs. The Commission should factor this into disclosure requirements. One broker seems to protect themselves from lost revenue in the event of a total loss. That broker charges approximately double the standard fees on its buy transactions while advertising no fees on a sell transaction. This is likely profit maximizing since this ensures fees for both sides of the transaction even in the case the option expires worthless.

²¹ Some brokers present execution quality to customers in terms of 'price improvement,' the amount saved relative to the NBBO, rather than the total cost of the trade. This is analogous to a receipt that shows only the discount from the list price rather than the amount paid. A trade that receives 10% price improvement of NBBO spread still costs the investor 80% of the half-spread.

These changes will help investors understand the total costs of their trades in absolute terms as well as make proper comparisons of total trading costs across brokers.^{22,23}

Best Execution Duties

Investors' misperception of trading costs stems not only from the lack of salient execution cost information, but also from a reasonable but potentially incorrect belief that "best execution" duties ensure they are receiving the best possible price, a disconnect between what many retail investors likely believe and what regulations actually require.

Our own experience illustrates this potential disconnect. The price execution differences for equity trades found in our paper "The 'Actual Retail Price' of Equity Trades" were discovered by accident during a test of a retail trading identification algorithm. When we first discovered the differences across brokers, we asked a FINRA employee, "How can six brokers give six different prices and that be consistent with best execution?" The person's response was that the rule was "broad" and that every broker could "build their own mousetrap" to evaluate execution. For example, one could argue execution quality involves factors beyond price, such as fill speed and fill rate. However, our data show that these characteristics are largely homogenous across brokers, which would be expected given that most retail brokers route to the same set of wholesalers. The primary dimension on which execution quality varies across brokers is price.²⁴

This disconnect appears widespread. When the paper was first made public, many parties, including one broker in our sample and employees of financial regulators, initially attributed the differences to latency. Our data confirmed that these differences are systematic pricing variations across brokers.

In general, the term "best execution" itself likely leads many retail investors to believe they are receiving the best possible price, and therefore, that all brokers will deliver similar price execution regardless of where they trade. This presumption is likely even stronger in the options

²² Prior research discusses the behavioral research on why investors under-estimate costs when expressed as percentages hence our focus on dollar disclosures. See SEC Investor Advisory Committee, *Recommendation on Mutual Fund Fee Disclosure* (April 2016), <https://www.sec.gov/spotlight/investor-advisory-committee-2012/recommendation-mf-fee-disclosure-041916.pdf>

²³ We are not advocating for one broker business model over the other, similar to how both the front-load and 12b-1 fee mutual fund business models continued to exist. Our argument is that the disclosure and saliency of all trading costs should be equal.

²⁴ There are numerous recent academic studies examining order routing decisions by brokers. See "The Retail Execution Quality Landscape" by Dylrberg, Shkilko, and Werner, *Journal of Financial Economics*, 2025. Available at <https://www.sciencedirect.com/science/article/pii/S0304405X25000595>. "What Does Best Execution Look Like?" by Ernst, Malenko, Spatt, and Sun, 2025. Available at <https://microstructure.exchange/papers/BrokerRouting.pdf>, and "Many Facets of Best Execution: Order Routing and Competition in Retail Trading" by Huang, Jorion, Lee, and Schwarz, 2026. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4609895.

markets, since option trades are required to be executed on exchanges where orders are anonymized before execution. Yet we find that price execution across the six brokers in our sample almost varies by the entire spread (0.89 E/Q).

Two aspects of the current regulatory framework for “Best Execution” are particularly difficult to reconcile with our findings. The first is in FINRA Rule 5310(a)(1), which states the following (with our emphasis):

In any transaction for or with a customer or a customer of another broker-dealer, a member and persons associated with a member shall use reasonable diligence to ascertain the *best market* for the subject security and *buy or sell in such market* so that the resultant price to the customer is as favorable as possible under prevailing *market conditions*.

The rule says find the best market and trade there. These brokers use the same wholesalers (or a subset of) who execute on the same exchanges. By any plain reading, the brokers are in the same market. Yet prices vary by nearly the full spread. Either "best market" means something different from what a plain reading suggests, or the standard for compliance is so broad as to be largely ineffective.

Second, FINRA Regulatory Notice 21-23 (June 2021) states (with our emphasis):

In other words, order routing firms and firms receiving customer orders from other firms for handling and execution must regularly evaluate whether reliable, superior prices are readily accessible for the customer orders they handle, and these *firms may not negotiate the terms of order routing arrangements for those customer orders in a manner that reduces the price improvement opportunities that otherwise would be available to those customer orders absent payment for order flow*.

Based on a straightforward interpretation of this statement, investors do not need to evaluate differences in PFOF as brokers are not allowed to negotiate PFOF rates that would impact price execution relative to firms that charge no PFOF.²⁵ Yet, as we mentioned before, our findings show a strong negative relation between PFOF and price execution in the options market.

²⁵ Based on statements in brokers’ Rule 606(a) filings, there are various ways brokers attempt to comply or dismiss this notice. Some brokers appear to believe the negotiated tradeoff between PFOF and price execution has to be explicit. For example, one broker states “<Broker> does not negotiate ... nor does <Broker> negotiate a tradeoff between payment and price improvement/execution quality.” Other brokers simply state they believe there is not a tradeoff between PFOF and price improvement, which makes this notice not applicable. Specifically, one broker states “<Broker> believes that the receipt of payment in the form of a portion of the spread earned by non-exchange third party market centers does not interfere with <Broker>’s pursuit of best execution or the price improvement

In summary, there appears to be a large gap between the common sense meaning of best execution, a plain language reading of the requirements, and how those duties are currently fulfilled by broker-dealers. Brokers seemingly execute trades within the same market and are instructed not to allow PFOF to impact price execution. However, our brokers have execution that varies by almost the entire spread and whose differences are highly correlated with differences in PFOF.

The only rule that has a clear, objectively measurable standard is NMS's Rule 611 (i.e. the Order Protection Rule) in that all brokers' trades execute at NBBO or better. Importantly, the Commission has recently discussed eliminating this rule.²⁶ Eliminating this enforceable floor while best execution duties remain vaguely and broadly defined could leave retail investors with no lower bound protection on price execution quality.

In our opinion, the Commission should either strengthen best execution duties to ensure broker-dealers provide execution quality consistent with the apparent meaning of the rules, or make clear to retail investors that they bear the responsibility of comparing execution quality across brokers themselves.

Improving Price Execution Quality

Given our brokers' trades are all executed on the same exchanges and yet we receive economically meaningful different execution across brokers, an important source of competition in price execution quality for retail traders occurs at the *broker* level. Wholesalers compete for order flow from brokers by offering better price execution. This competition allows retail customers to receive better than NBBO pricing. Otherwise, wholesalers could simply provide zero price improvement on a broker's trades and still comply with Rule 611.

While proposed changes to market structure may improve actual price execution, one straightforward way to improve price execution for retail customers is to remove impediments that lead some brokers to deliver low price improvement. Based on our findings, PFOF is likely one of those impediments. Since the brokers currently delivering price execution at the lower end have a majority of options trading market share, improving their execution quality would substantially benefit overall investor welfare.

Finally, any changes to market structure should ensure that brokers can receive high levels of price improvement. In other words, exchange reforms that fail to improve execution at low-price

obtained on customer orders." In both cases, these brokers face no effective constraint on PFOF levels beyond compliance with Rule 611, i.e. execution at NBBO or better.

²⁶ The SEC held a roundtable to discuss Rule 611's elimination in September 2025. See <https://www.sec.gov/newsroom/meetings-events/roundtable-trade-through-prohibitions>.

improvement brokers while degrading execution at high-price improvement brokers would reduce overall investor welfare. For example, if all trades continue to be executed on exchanges but auctions are eliminated, that may lead to more homogenous pricing across brokers, but could erode the high levels of price improvement our best brokers currently deliver. More generally, any proposed reform should be evaluated against the full distribution of execution quality across brokers, not simply the average.

Summary

As noted in the announcement, retail option trading has exploded since 2020. Changes to the pattern day trading rule as well as the continued push for low-premium, short-duration contracts will likely continue to fuel growth in this market. Using 606(a) data, we estimate retail trading totaled more than eight billion contracts in 2025, representing tens of billions of dollars in aggregate quoted spread and billions more in fees. Given that we find execution costs vary by nearly the full quoted spread across brokers, the potential for excess trading costs is substantial: hundreds of millions or even billions of dollars *per year*. New rules and regulations related to disclosure, best execution duties, and reducing impediments to better execution are paramount to protecting these investors.

Sincerely,

Signed by:

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Xing Huang and Christopher Schwarz