U.S. Securities and Exchange Commission
Division of Trading and Markets

Trade-Through Roundtable Supporting Data

Staff of the Office of Analytics and Research, Division of Trading & Markets[1]

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[1] This research note is published in the authors' official capacities as staff of the Division of Trading and Markets, but does not necessarily reflect the views of the Commission, the Commissioners, or other members of the staff.

1. Background

Rule 611 of Regulation NMS[2] promotes intermarket price protection by restricting “trade-throughs” – the execution of trades on one venue at prices that are inferior to publicly displayed quotations on another venue.

In a 2015 memorandum to the U.S. Securities and Exchange Commission’s (“SEC”) Equity Market Structure Advisory Committee,[3] the Division of Trading and Markets (“Division”) highlighted that “the SEC emphasized that intermarket price protection was designed to promote national market system objectives in two primary ways:

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

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

As the Division highlighted in 2015, “[t]he SEC has often noted that one of the primary challenges in its oversight of the national market system is to facilitate an appropriately balanced market structure that promotes competition among markets, while minimizing the potentially adverse effects of fragmentation.”[4] This research note provides quantitative data to further the discussion of Rule 611’s role in the equity market and a corresponding trade-through prohibition’s role in the options markets.

[2] 17 CFR 242.611.

[3] *See* Memorandum on Rule 611 of Regulation NMS from the Division of Trading and Markets to the Equity Market Structure Advisory Committee (“2015 Memorandum”) (Apr. 30, 2015), *available at:* **https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf**.

[4] *See* 2015 Memorandum, p.5.

2. Equities Overview

Rule 611 requires a trading center to implement policies and procedures that are reasonably designed to prevent the purchase or sale of an NMS stock during regular trading hours at a price that is lower than a protected bid or higher than a protected offer, without an applicable exception. Such a purchase or sale is referred, in Regulation NMS, as a "trade-through"[5]. This analysis quantifies the occurrence of trade-throughs across different times of day and for different lot sizes, for corporate stocks and ETPs. The analysis compares the incidence of trade-throughs during regular market hours, when Rule 611 is in effect, with trading outside of market hours, when Rule 611 does not apply. It also compares the incidence of trade-throughs for lots of 100 shares or greater and odd lots of less than 100 shares.

2.1 Data Highlights

The following tables provide the number of trades for each trading session based on the security type (corporate or ETP), the spread at the time of the trade, and the lot size of the transaction. Among other things, the data shows that:

1. The total trade-through rate without the one second look back for all sessions is less than 2.5% for both corporate stocks and ETPs.
2. The trade-through rate drops to .6% or less for all trading sessions when accounting for the one second look back.
3. The trade-through rate for round lots drops to .06% for Corporates during regular trading hours but remains at levels similar to the other sessions for odd lots.

[5] 17 CFR 242.600(b)(105). For ease of exposition, this note also refers to such a trade outside of regular trading hours as a "trade-through," even though the definition in Regulation NMS is limited to regular trading hours. Similarly, this note refers to such a trade for orders of less than a round lot as a "trade-through," even though the definitions of "protected bid" and "protected offer" in Regulation NMS are limited to round lots. See also Division of Trading and Markets, Responses to Frequently Asked Questions Concerning Rule 611 and Rule 610 of Regulation NMS, Question 7.03, available at: **https://www.sec.gov/divisions/marketreg/nmsfaq610-11.htm** (stating that Rule 611 does not apply to odd lot orders).

2.1.1 Corporate Stocks

Table 1							
Corporates, Regular Trading	Spreads						
	>=0, <=.01	>.01, <=.02	>.02, <=.03	>.03, <=.04	>.04	Total	Total, One Second Delay
Total Trades	1,166,862,725	389,424,161	224,478,653	164,666,976	1,291,441,664	3,236,874,179	3,236,874,179
Total Round Lot Trades	582,449,452	135,628,485	69,912,611	50,321,717	288,956,018	1,127,268,283	1,127,268,283
Total Odd Lot Trades	584,413,273	253,795,676	154,566,042	114,345,259	1,002,485,646	2,109,605,896	2,109,605,896
Total Trade Throughs	27,574,465	7,772,009	4,768,810	3,265,238	19,908,796	63,289,318	9,345,221
Round Lot Trade Throughs	13,024,203	2,301,208	1,237,016	777,506	2,916,463	20,256,396	722,882
Odd Lot Trade Throughs	14,550,262	5,470,801	3,531,794	2,487,732	16,992,333	43,032,922	8,622,339
Total Trade Throughs/Total Trades	2.36%	2.00%	2.12%	1.98%	1.54%	1.96%	0.29%
Round Lot Trade Throughs/ Total Round Lot Trades	2.24%	1.70%	1.77%	1.55%	1.01%	1.80%	0.06%
Odd Lot Trade Throughs/ Total Odd Lots	2.49%	2.16%	2.28%	2.18%	1.70%	2.04%	0.41%

Table 2							
Corporates, Pre-market	Spreads						
	>=0, <=.01	>.01, <=.02	>.02, <=.03	>.03, <=.04	>.04	Total	Total, One Second Delay
Total Trades	17,173,125	2,728,572	1,767,737	1,360,356	11,769,403	34,799,193	34,799,193
Total Round Lot Trades	10,060,546	1,041,730	577,509	407,489	2,313,704	14,400,978	14,400,978
Total Odd Lot Trades	7,112,579	1,686,842	1,190,228	952,867	9,455,699	20,398,215	20,398,215
Total Trade Throughs	459,400	48,654	31,081	23,297	141,759	704,191	172,564
Round Lot Trade Throughs	279,184	17,728	9,972	7,000	31,281	345,165	84,789
Odd Lot Trade Throughs	180,216	30,926	21,109	16,297	110,478	359,026	87,775
Total Trade Throughs/Total Trades	2.68%	1.78%	1.76%	1.71%	1.20%	2.02%	0.50%
Round Lot Trade Throughs/ Total Round Lot Trades	2.78%	1.70%	1.73%	1.72%	1.35%	2.40%	0.59%
Odd Lot Trade Throughs/ Total Odd Lots	2.53%	1.83%	1.77%	1.71%	1.17%	1.76%	0.43%

Table 3							
Corporates, After Hours	Spreads						
	>=0, <=.01	>.01, <=.02	>.02, <=.03	>.03, <=.04	>.04	Total	Total, One Second Delay
Total Trades	11,460,731	4,164,418	2,804,832	2,168,531	22,468,985	43,067,497	43,067,497
Total Round Lot Trades	6,150,022	1,575,910	918,540	653,406	4,621,325	13,919,203	13,919,203
Total Odd Lot Trades	5,310,709	2,588,508	1,886,292	1,515,125	17,847,660	29,148,294	29,148,294
Total Trade Throughs	249,933	61,069	43,042	34,742	375,327	764,113	173,590
Round Lot Trade Throughs	132,340	19,856	12,108	8,991	77,576	250,871	71,426
Odd Lot Trade Throughs	117,593	41,213	30,934	25,751	297,751	513,242	102,164
Total Trade Throughs/Total Trades	2.18%	1.47%	1.53%	1.60%	1.67%	1.77%	0.40%
Round Lot Trade Throughs/ Total Round Lot Trades	2.15%	1.26%	1.32%	1.38%	1.68%	1.80%	0.51%
Odd Lot Trade Throughs/ Total Odd Lots	2.21%	1.59%	1.64%	1.70%	1.67%	1.76%	0.35%

2.1.2 ETPs

Table 4							
ETPs, Regular Trading	Spreads						
	>=0, <=.01	>.01, <=.02	>.02, <=.03	>.03, <=.04	>.04	Total	Total, One Second Delay
Total Trades	357,454,804	58,193,813	32,008,060	22,509,899	77,431,687	547,598,263	547,598,263
Total Round Lot Trades	182,244,975	22,392,566	10,304,950	7,000,115	22,729,475	244,672,081	244,672,081
Total Odd Lot Trades	175,209,829	35,801,247	21,703,110	15,509,784	54,702,212	302,926,182	302,926,182
Total Trade Throughs	6,747,357	1,187,365	793,450	510,282	1,349,350	10,587,804	943,321
Round Lot Trade Throughs	3,192,438	382,815	212,432	128,092	305,144	4,220,921	185,166
Odd Lot Trade Throughs	3,554,919	804,550	581,018	382,190	1,044,206	6,366,883	758,155
Total Trade Throughs/Total Trades	1.89%	2.04%	2.48%	2.27%	1.74%	1.93%	0.12%
Round Lot Trade Throughs/ Total Round Lot Trades	1.75%	1.71%	2.06%	1.83%	1.34%	1.73%	0.08%
Odd Lot Trade Throughs/ Total Odd Lots	2.03%	2.25%	2.68%	2.46%	1.91%	2.10%	0.25%

Table 5							
ETPs, Pre-market	Spreads						
	>=0, <=.01	>.01, <=.02	>.02, <=.03	>.03, <=.04	>.04	Total	Total, One Second Delay
Total Trades	4,115,261	912,411	539,977	439,699	2,288,050	8,295,398	8,295,398
Total Round Lot Trades	1,835,381	365,769	184,691	135,357	562,751	3,083,949	3,083,949
Total Odd Lot Trades	2,279,880	546,642	355,286	304,342	1,725,299	5,211,449	5,211,449
Total Trade Throughs	61,682	13,796	10,312	8,439	43,429	137,658	37,311
Round Lot Trade Throughs	29,554	5,078	3,716	2,765	11,432	52,545	16,907
Odd Lot Trade Throughs	32,128	8,718	6,596	5,674	31,997	85,113	20,404
Total Trade Throughs/Total Trades	1.50%	1.51%	1.91%	1.92%	1.90%	1.66%	0.45%
Round Lot Trade Throughs/ Total Round Lot Trades	1.61%	1.39%	2.01%	2.04%	2.03%	1.70%	0.55%
Odd Lot Trade Throughs/ Total Odd Lots	1.41%	1.59%	1.86%	1.86%	1.85%	1.63%	0.39%

Table 6							
ETPs, After Hours	Spreads						
	>=0, <=.01	>.01, <=.02	>.02, <=.03	>.03, <=.04	>.04	Total	Total, One Second Delay
Total Trades	5,653,448	1,416,644	859,331	619,924	4,935,404	13,484,751	13,484,751
Total Round Lot Trades	2,235,981	469,261	252,162	166,089	870,373	3,993,866	3,993,866
Total Odd Lot Trades	3,417,467	947,383	607,169	453,835	4,065,031	9,490,885	9,490,885
Total Trade Throughs	98,398	30,684	21,222	15,203	92,934	258,441	80,682
Round Lot Trade Throughs	35,519	8,351	5,374	3,704	16,281	69,229	23,320
Odd Lot Trade Throughs	62,879	22,333	15,848	11,499	76,653	189,212	57,362
Total Trade Throughs/Total Trades	1.74%	2.17%	2.47%	2.45%	1.88%	1.92%	0.60%
Round Lot Trade Throughs/ Total Round Lot Trades	1.59%	1.78%	2.13%	2.23%	1.87%	1.73%	0.58%
Odd Lot Trade Throughs/ Total Odd Lots	1.84%	2.36%	2.61%	2.53%	1.89%	1.99%	0.60%

2.2 Methodology

This summary is based on the consolidated equity data feeds for the second quarter of 2025, for all NMS stocks that appear on any day in the NYSE Daily TAQ Master file during the period that are designated with a Security Type with code “A” for corporate stocks and with a code “ETF” or “ETN” for ETPs.

This analysis counts as a "trade-through" any trade with a trade price greater than the national best offer (NBO) or less than the national best bid (NBB). An odd lot trade is any trade with a quantity of less than 100 shares.

Rule 611 contains nine exceptions to its prohibition on trade-throughs, including for transactions that were not a "regular way" contract, transactions during crossed markets, or transactions that were the execution of orders identified as intermarket sweep orders.[6] This analysis is consistent with some/most of these exclusions, but does not follow each of them. In particular, it does not exclude trade-throughs during system failures and trade-throughs that are single-priced opening/reopening/closing transactions. It does exclude trade-throughs that are not "regular way" contracts, trade-throughs during crossed markets and trade-throughs that are "stopped orders". Intermarket Sweep Orders (ISOs) and trades executed at benchmark prices rather than current quoted prices (such as volume-weighted average price ("VWAP") transactions and other types of average price transactions) were also excluded from this analysis.

This analysis covers three intraday sessions: pre-market, regular and after hours. For each security, "pre-market" is defined as 8:30am ET until the end of the opening auction on the primary listing exchange. "Regular" is defined as the period from the end of the opening auction until the end of the closing auction. "After hours" is defined as the end of the closing auction until 8:00pm ET.

[6] *See* 17 CFR 242.611(b)(1)-(9).

3. Broker-Dealers Trading Equities on Exchanges

3.1 Overview

Rule 611 has long raised concerns that it may increase market complexity and connectivity costs of market participants.[7] As Division staff stated in 2015, "[t]here is a direct link between trade-through restrictions and potentially greater fragmentation among lit venues…[i]ncreased fragmentation among lit venues can cause market participants to incur higher connectivity costs, as well as generally add to the complexity of monitoring quotes and routing orders."[8]

To contribute to discussion about fragmentation, complexity, and connectivity costs, this note provides data, for the second quarter of 2025, about the proportion of broker-dealers (BDs) that trade directly on equity exchanges or that route to exchanges via other BDs. It also provides an overview of the volume of NMS stock that is routed to other BDs for execution on an exchange, compared with the volume on exchanges that originates from and is executed by a single BD. While this data does not provide information about the costs of either accessing exchanges via another BD or connecting directly to exchanges, it provides an overall view of how market participants balance the complex task of routing and executing orders across the sixteen currently-operating equity exchanges.

3.2 Discussion

In the second quarter of 2025, 1,124 BDs either originated at least one order for at least one share of an NMS stock that was eventually executed by another BD, acted as the executing BD on exchange in at least one trade for least one share of an NMS stock, or themselves executed at least one trade for at least one share of an NMS stock. Of these BDs, 762 originated orders[9] but did not execute trades either off-exchange or on-exchange, 350 originated orders and executed trades (either off-exchange or on-exchange), and 12 executed trades but did not originate any orders.[10]

In the second quarter, 1,087 BDs originated orders that were eventually executed on an exchange, 223 BDs were executing BDs for trades on exchange of at least one share. Of these 223 BDs, only 22 executed orders on all sixteen national securities exchanges. Several of these BDs were affiliates within larger corporate groups, and some were exchange routing brokers. 44 BDs were the executing BD on more than ten exchanges. At the other end of the spectrum, 88 BDs were the executing BD on only a single exchange.

Figure 3.1 shows the number of BDs that were active on exchanges during the quarter. To protect the anonymity of individual exchanges, they were grouped into four tiers based on the number of

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[7] *See* 2015 Memorandum, p.15

[8] *Id.*

[9] These orders were eventually executed by other BDs, but not by the BDs that originated the orders.

[10] In effect, these BDs were routing destinations for other BDs. For the most part, these BDs were exchange routing brokers.

different BDs that executed at least one order on their platforms.[11] The table also shows the ranges for the numbers of BDs that were liquidity takers (Taking BDs), and it shows the ranges of BDs that added liquidity (Adding BDs) during the quarter. The last column shows the range of the number of BDs that were members of exchanges during the quarter.

Exchange Tiers[12]

Exchange Tier	Group	Range of # Executing BDs	Range of # Taking BDs	Range of # of Adding BDs	Range of # Member BDs
Tier 1	Exchanges 1-4	82 - 172	81-170	72-153	112-269
Tier 2	Exchanges 5-8	70 - 82	70-82	57-72	99-106
Tier 3	Exchanges 9-12	50 - 56	50-56	36-52	59-83
Tier 4	Exchanges 13-16	24 - 45	24-45	10-36	25-150

Source: Q2 2025 Consolidated Audit Trail data and https://files.catnmsplan.com/firm-data/IMID_Daily_List.txt

Figure 3.1

The preceding data indicates that the majority of BDs access exchange liquidity in NMS stocks via other BDs. Similarly, the data shows that the majority of BDs that trade on exchange do not trade on all exchanges.

However, as reflected in **Table 3.1** and **Table 3.2** below, approximately three-quarters of on-exchange volume[13] was handled by BDs that originated and were the executing BD for the same orders[14]. This also holds true for the executed orders that removed liquidity (Liquidity Taken below) and for the executed orders that added liquidity (Liquidity Added below).

[11] These tiers do not necessarily reflect the trading volume of these exchanges during the quarter. Additionally, a ranking of exchanges by number of executing BDs does not necessarily align with a ranking of exchanges by number of members, which is presented in the last column in the table.

[12] Since each exchange has a different number of executing BDs and a different number of the member BDs, for a set of exchanges belonging to a particular tier, the range represents the minimum and the maximum numbers of executing and member BDs across the entire tier.

[13] This measure of volume includes both the buy-side and the sell-side volumes, therefore doubling the volume reported to the equity SIPs.

[14] The majority of the volume executed on exchange was not routed through other BDs prior to execution, but rather was sent directly to an exchange by the originating BDs.

Table 3.1: Proportions of Executed Volume, Liquidity Taken, and Liquidity Added On-Exchange by BDs That Were Both the Originating and Executing BD for the Executed Order, Q2 2025

Type	Volume (Proportion of Total Volume)	Liquidity Taken (Proportion of Total Taken)	Liquidity Added (Proportion of Total Added)
Shares	815 billion (72%)	346 billion (70%)	344 billion (71%)
Notional	$44,752 billion (82%)	$19,109 billion (85%)	$17,409 billion (78%)

Table 3.2: Proportions of Executed Volume, Liquidity Taken, and Liquidity Added On-Exchange by BDs Not Originating the Executed Orders, Q2 2025

Type	Volume (Proportion of Total Volume)	Liquidity Taken (Proportion of Total Taken)	Liquidity Added (Proportion of Total Added)
Shares	315 billion (28%)	146 billion (30%)	144 billion (29%)
Notional	$9,769 billion (18%)	$3,358 billion (15%)	$4,831 billion (22%)

3.3 Methodology

Data was aggregated from the Consolidated Audit Trail records for NMS stocks for the second quarter of 2025. For each trade executed during the quarter, both on-exchange and off-exchange, staff used CAT's Lifecyle ID to link executions with the originating order. The analysis includes orders for NMS stocks that were executed on the same or following trading day. The analysis excludes executions that were not, due to incomplete CAT lifecycles, traceable to their originating orders. Daily exchange membership data is publicly available at **https://files.catnmsplan.com/firm-data/IMID_Daily_List.txt**, with each day's data retained within CAT as reference data.

4. Displayed Liquidity Measures for NMS Stocks

4.1 Purpose

When it adopted Regulation NMS, the SEC stated that one of the primary goals of intermarket price protection was to promote displayed liquidity.[15] The purpose of this section is to empirically describe two aspects of displayed liquidity among NMS stocks during the time period commencing at the start of January 2015 and concluding at the end of June 2025.

4.2 Data

Two data sets were used for this analysis. Both data sets were derived from publicly available Securities Information Processor ("SIP") quote messages and their National Best Bid and Offer ("NBBO") appendages. To be included in the analysis a message must have been in-force during, or while straddling, regular market hours. The first data set enclosed SIP messages obtained from SEC MIDAS and the second data set enclosed SIP messages obtained from FINRA CAT. The messages were organized into a time series of updates to keep track of each Best Bid and Offer ("BBO"), including its round lot size, as it entered and exited the NBBO. The series was used to compute time weighted averages for 1) the number of round lots, and 2) the number of BBOs that occurred contemporaneously with the NBBO at matching prices. Descriptive statistics of these two measures of liquidity are what follows below.

4.3 Descriptive statistics

For each of the two time-weighted liquidity measures, number of round-lots and number of BBOs, four figures are presented showing different organizations of the same data. The first figure is a daily empirical cumulative distribution function ("ECDF") time series. The second figure is a daily inter-quartile range ("IQR") time series. The third and fourth figures are comparing first and last dates enclosed by analysis, 2015-01-02 and 2025-06-30, with a pair of ECDFs and histograms, respectively.

The ECDF is used to show the percentage of NMS stocks at or below a particular value of the liquidity measure. ECDFs are presented in two ways. In the first figure, a daily EDCF time series, time is on the x-axis, the percentage of NMS stocks is on the y-axis, and the liquidity measure is on the z-axis, represented by the color gradient and computed over discrete bins of the liquidity measure. In the third figure, a comparison of two single-day ECDFs, the liquidity measure is on the x-axis in log-scale, the percentage of NMS stocks is on the y-axis, and the ECDF is computed over the continuous form of the liquidity measure, although the ticks on the x-axis line up with the discrete bins used in the daily ECDF time series in the first figure.

The IQR shows the distribution of the middle 50% of the liquidity measure. The IQR is bounded below by the 1st quartile and above by the 3rd quartile.

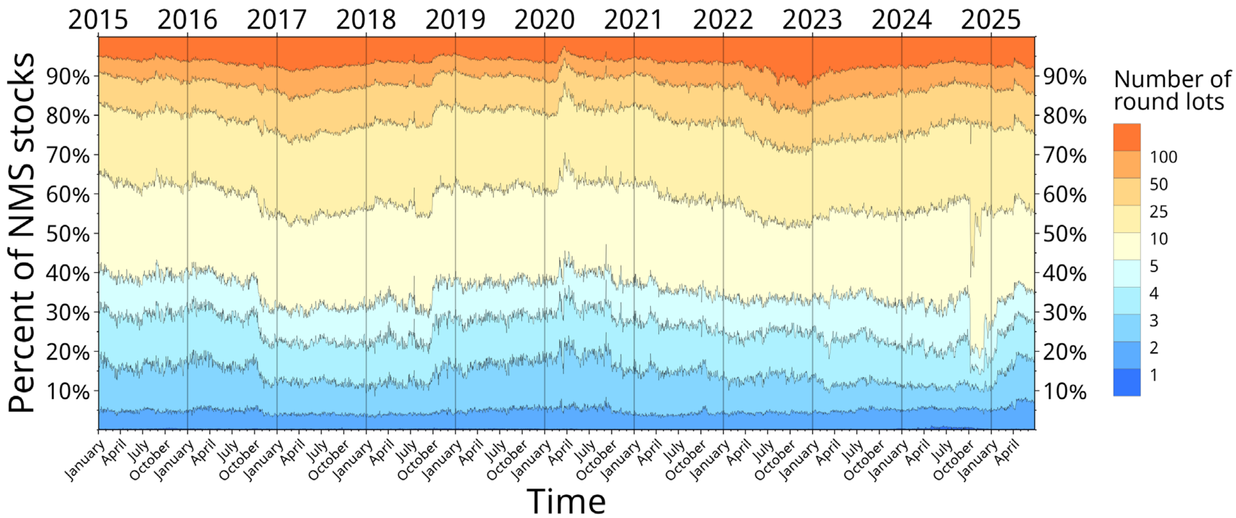
[15] *See* Regulation NMS Adopting Release, Securities Exchange Act Release No. 51808 (June 6, 2005), 70 FR 37496, 37516-17 (June 29, 2005). *See also* 2015 Memorandum, p.6.

4.3.1 Number of round lots displayed at the NBB

Expressed as a time weighted average during regular market hours.

4.3.1.1 Highlights

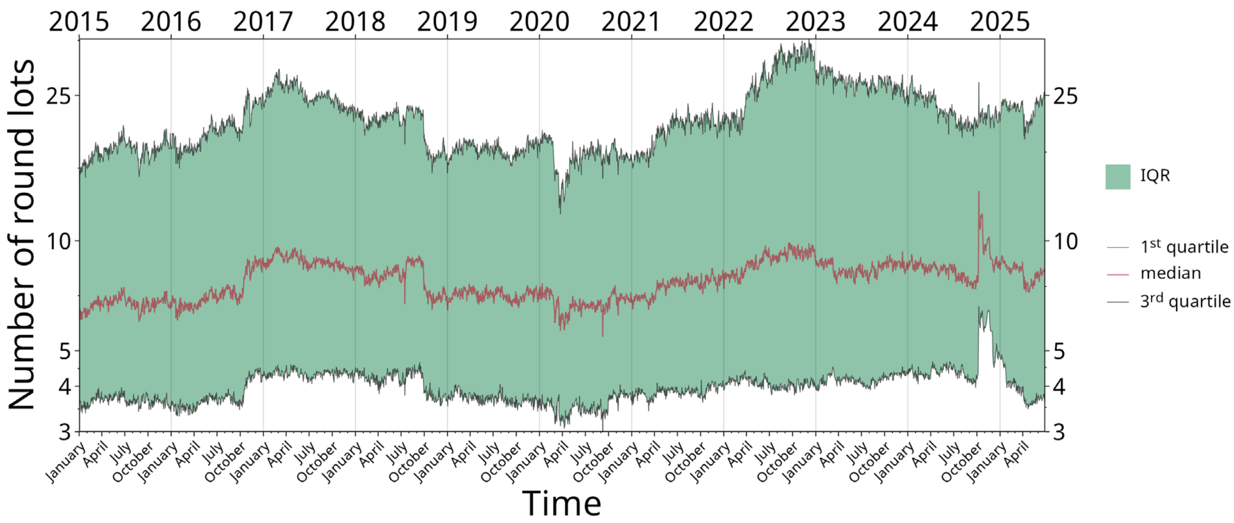
- The percent of NMS stocks having 3 or fewer round lots at the NBB remained relatively constant, at around 20%, over the time period commencing at the start of 2015 and concluding at the end of June 2025.
- The percent of NMS stocks having more than 25 round lots at the NBB increased from approximately 15% to 25% over the 2015 to 2025 time period.
- Median number of round lots at the NBB increased from 6 to 8 over the same time period.



Daily ECDF over discrete bins of the continuous liquidity measure.

Liquidity measure = number of round lots.
Source: SIP.
Data starting 2015-01-02 and ending 2025-06-30.

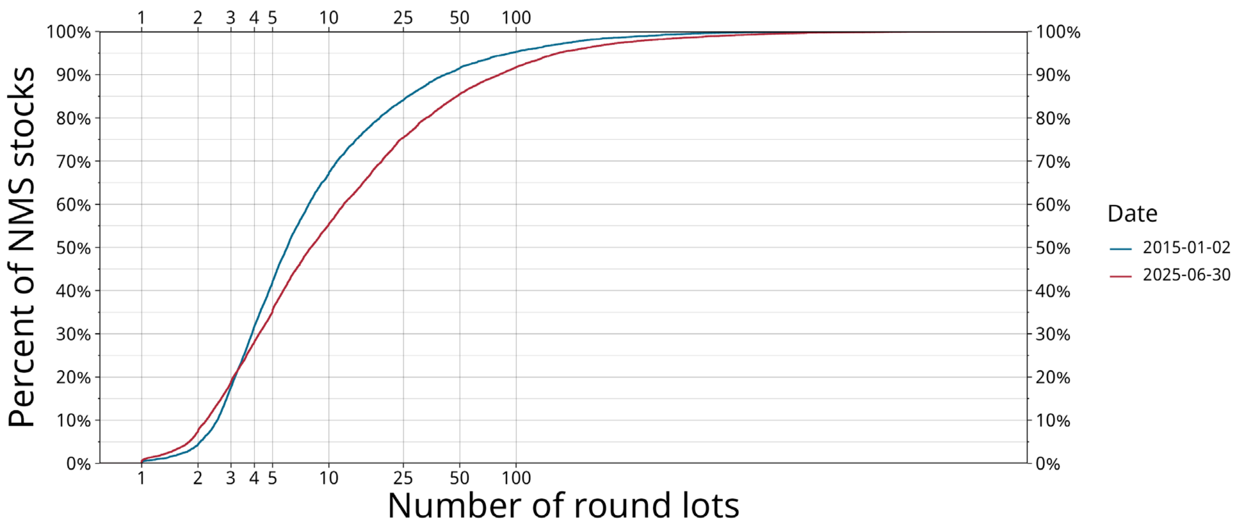
Figure 4.1



Daily IQR.

Liquidity measure = number of round lots.
Source: SIP.
Data starting 2015-01-02 and ending 2025-06-30.

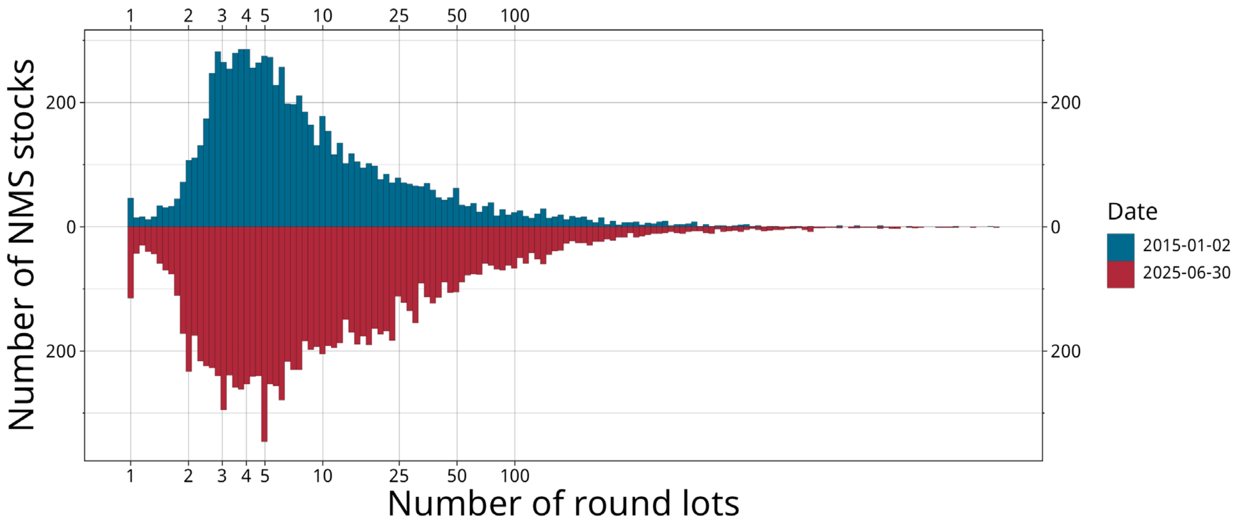
Figure 4.2



Pair of single-day ECDFs.

Liquidity measure = number of round lots.
Source: SIP.
Data from 2015-01-02 and 2025-06-30.

Figure 4.3



Pair of single-day histograms.

Liquidity measure = number of round lots.
Source: SIP.
Data from 2015-01-02 and 2025-06-30.

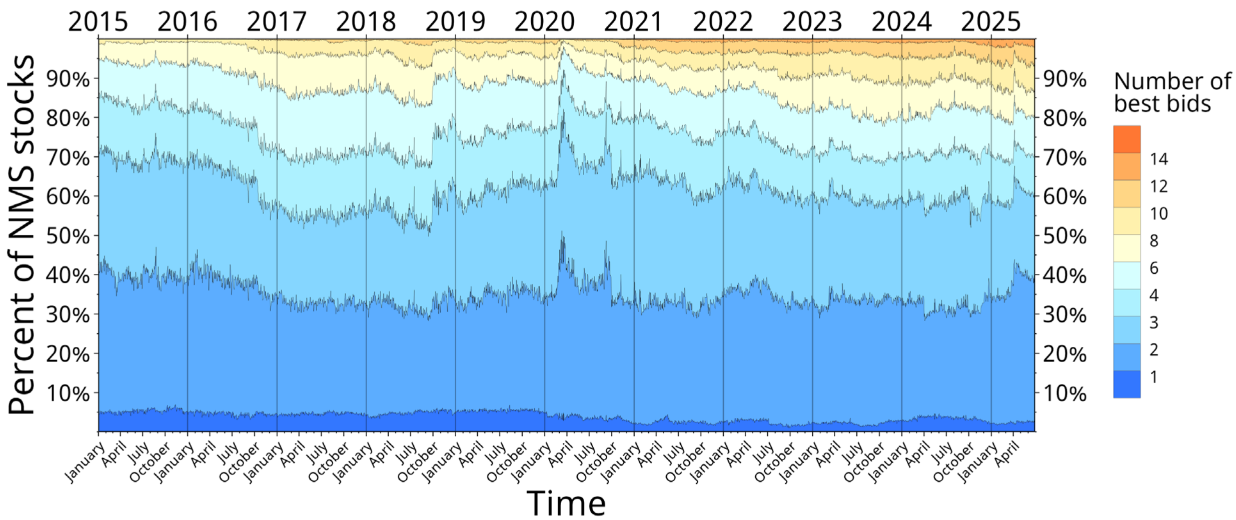
Figure 4.4

4.3.2 Number of best bids at the NBB

Expressed as a time weighted average during regular market hours.

4.3.2.1 Highlights

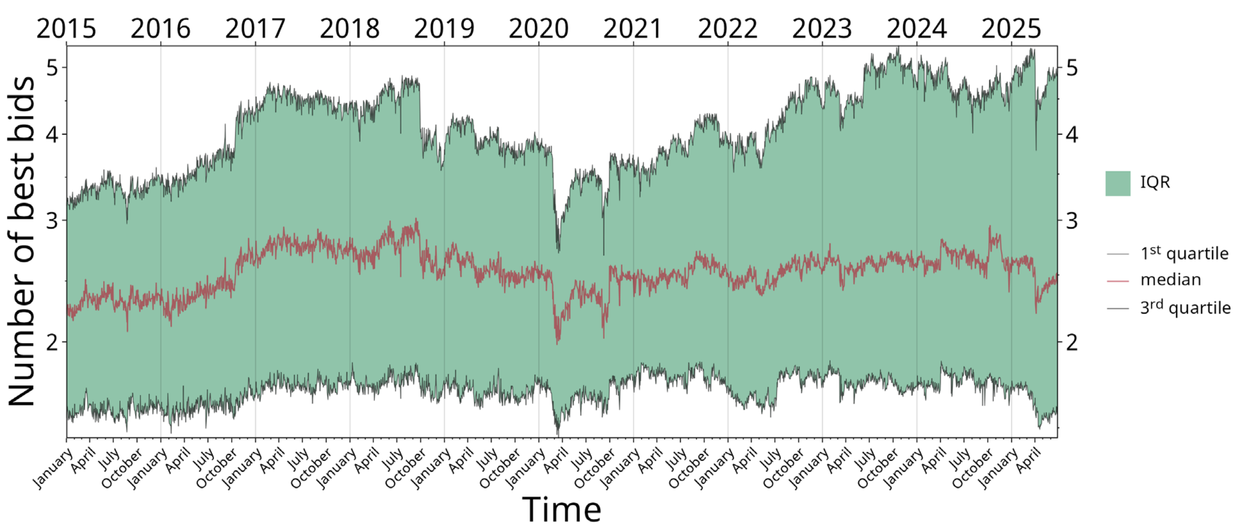
- The percent of NMS stocks having 2 or fewer best bids at the NBB remained relatively constant, at around 40%, over the time period commencing at the start of 2015 and concluding at the end of June 2025.
- The percent of NMS stocks having more than 6 best bids at the NBB increased from 5% at the start of 2015 to 20% by the end of June 2025. Over that same time period the number of exchanges increased from 11 to 16.
- The 25th percentile fluctuated but remained relatively unchanged over the 2015 to 2025 time period.
- The median and 75th percentile increased over the same time period.



Daily ECDF over discrete bins of the continuous liquidity measure.

Liquidity measure = number of best bids.
Source: SIP.
Data starting 2015-01-02 and ending 2025-06-30.

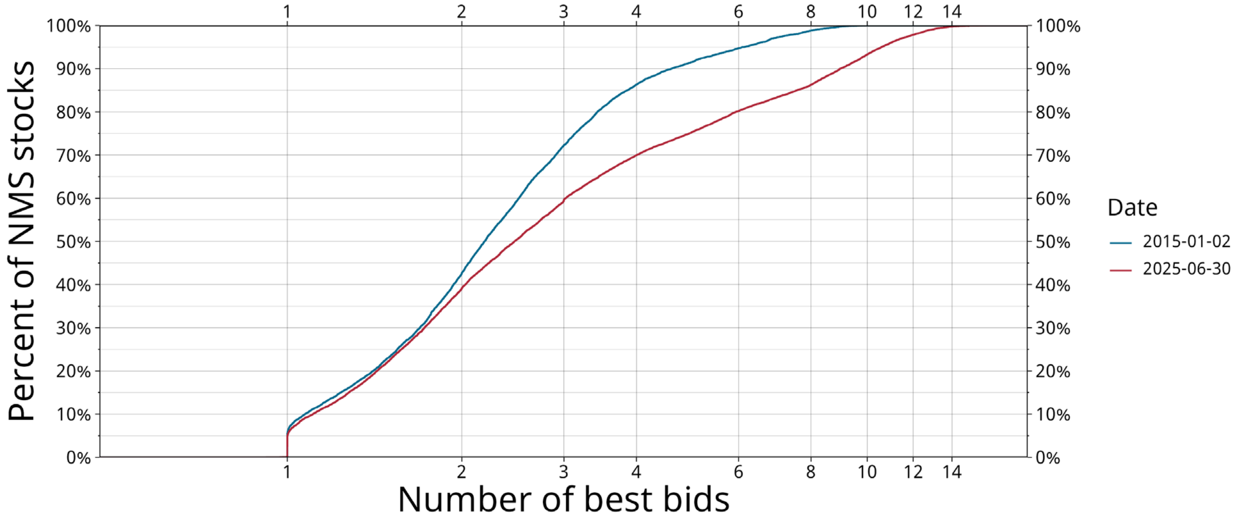
Figure 4.5



Daily IQR.

Liquidity measure = number of best bids.
Source: SIP.
Data starting 2015-01-02 and ending 2025-06-30.

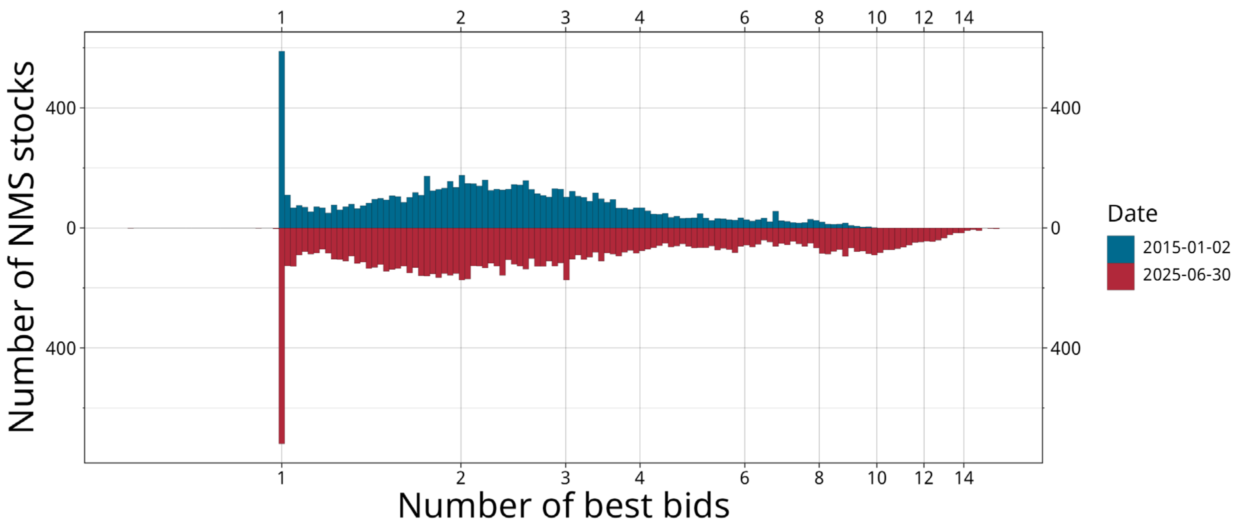
Figure 4.6



Pair of single-day ECDFs.

Liquidity measure = number of best bids.
Source: SIP.
Data from 2015-01-02 and 2025-06-30.

Figure 4.7



Pair of single-day histograms.

Liquidity measure = number of best bids.
Source: SIP.
Data from 2015-01-02 and 2025-06-30.

Figure 4.8

5. Options Overview

The options section of this research note describes the incidence of trade-throughs across the options market. To provide a broader context for this data, the note first provides a brief overview of key changes in options market structure history related to the introduction of trade-through protections, then discusses the incidence of trade-throughs in options markets over time and then describes contemporaneous changes in options market volume and market fragmentation.

5.1 Discussion

The options markets operate under the Options Order Protection and Locked/Crossed Markets Plan,[16] which is the corresponding regulatory regime to the equity markets' Rule 611.

The Options Plan requires each plan participant to establish, maintain, and enforce written policies and procedures as approved by the SEC that are reasonably designed to prevent trade-throughs.[17] The Options Plan also provides that, if a Participant relies on an exception, it would be required to establish, maintain, and enforce written policies and procedures reasonably designed to assure compliance with the terms of the exception. The exceptions in the Options Plan broadly correspond to those found in Regulation NMS,[18] with a few additional exceptions for options-specific scenarios.[19] The Options Plan also addresses locked and crossed markets. The requirements in the Options Plan relating to locked and crossed markets are virtually identical to those applicable to market centers for NMS stock under Regulation NMS.[20]

One nuance to the options markets is that Rule 610(c) of Regulation NMS[21] does not apply to options. In equities, access fees are capped by Rule 610(c) of Regulation NMS[22] at 30 mils or $0.30 per 100 shares. Options access fees vary across the exchanges and corporate families and these

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[16] *See* Securities Exchange Act Release No. 60405 (July 30, 2009), 74 FR 39362 (Aug. 6, 2009) ("Options Plan").

[17] In the Options Plan, a "trade-through" is defined as a transaction in an option series, either as principal or agent, at a price that is lower than a Protected Bid or higher than a Protected Offer. *See id.*

[18] 17 CFR 242.611(b).

[19] Specifically, stopped orders and price improvement auction related scenarios.

[20] 17 CFR 242.610(d).

[21] 17 CFR 242.610(c). The SEC adopted changes to Rule 610, which will further reduce the access fee caps in NMS stocks from 30 mils to 10 mils. *See* Securities Exchange Act Release No. 101070 (Sept. 18, 2024), 89 FR 81620 (Oct. 8, 2024) (stating that "[t]he amendments to Rule 610 will reduce the level of the access fee caps. For protected quotations and other best bids and offers in NMS stocks priced at $1.00 or more, the access fee cap will be $0.001 per share. For protected quotations and other best bids and offers in NMS stocks priced less than $1.00, the access fee cap will be 0.1 percent of the quotation price per share.").

[22] 17 CFR 242.610(c).

access fees are often higher[23] than equity access fees both in nominal terms and as a percentage of the per-unit dollar value. For options, the average dollar price per contract[24] is ~$400 ($4 average option price x option multiplier of 100) versus the average equity price[25] of one round-lot of ~$5300 ($53 average price per share x 100), thus the percentage of the transaction price that access fees account for in options is relatively larger than in equities.

5.2 The Growth of US Options Markets

The period included in this study saw unprecedented growth in both the scale and prominence of the options markets in the US. As shown below, US options markets have had two distinct periods of rapid growth from 2000 to 2009 (“Linkage Era”), and then again from 2019 to present (“Zero Commission Era”). In between these two periods of growth was a period of relatively flat growth in options market volumes from 2009 to 2019 (“Consolidator Era”).

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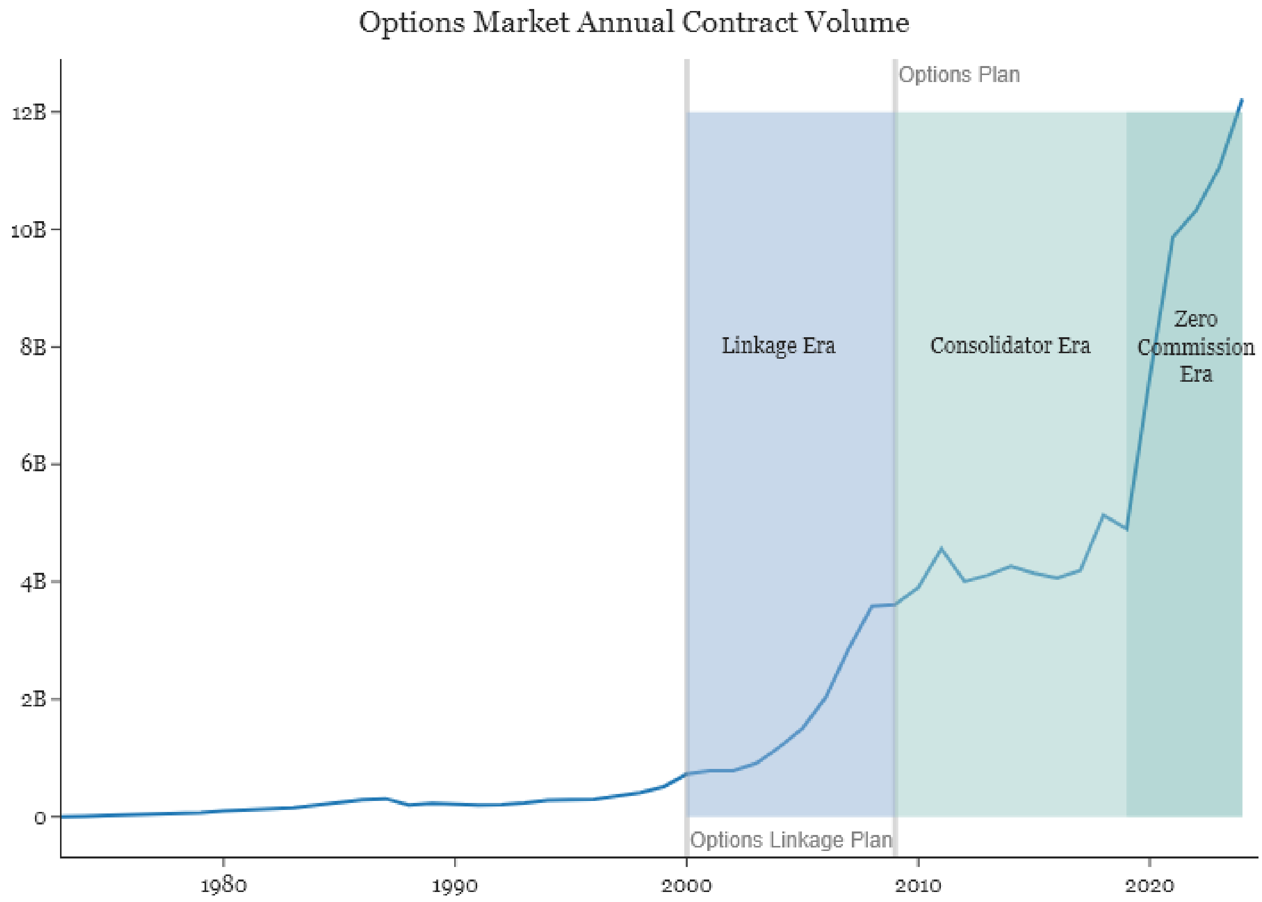
[23] Access fees in options can reach as high as $1.25 per contract. *See* The Nasdaq Stock Market LLC Rules, Options 7 Pricing Schedule, *available at:* **https://listingcenter.nasdaq.com/rulebook/nasdaq/rules/Nasdaq%20Options%207**

[24] *See* Cboe, U.S. Options Market Volume Summary (last accessed July 25, 2025), *available at*: **https://www.cboe.com/us/options/market_statistics/**.

[25] *See id.*



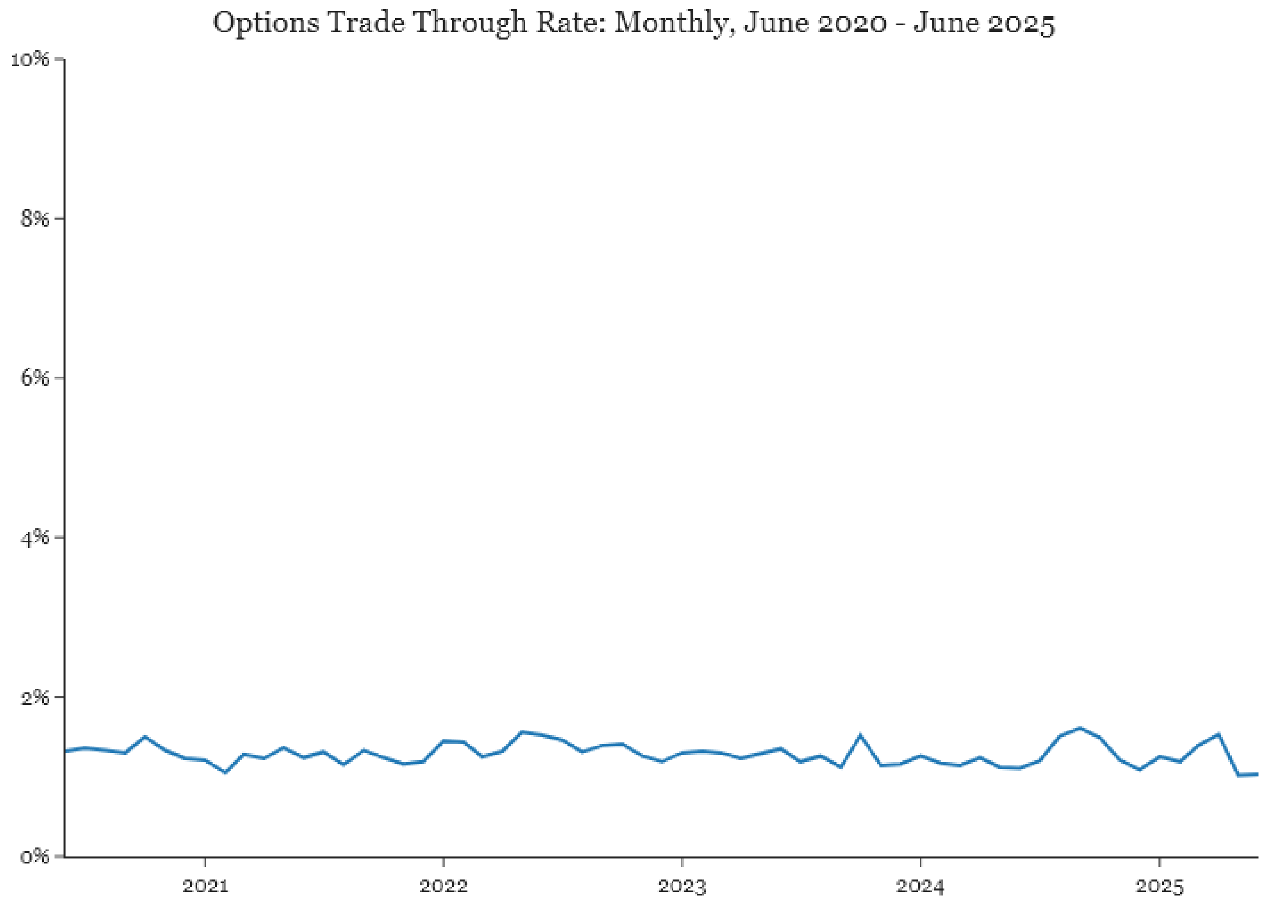
Source: OCC

Following the Options Plan approval in 2009, the US options market experienced a milder steady growth period for nearly a decade. In 2010 the annual contract volume of the US options market was ~4B contracts which had increased to ~5B by 2018 (+32%).

This period included a few key options market structure changes, including increasing market fragmentation and an increasing reliance on the consolidator model/payment for order flow.

5.3 Incidence of Trade-Throughs

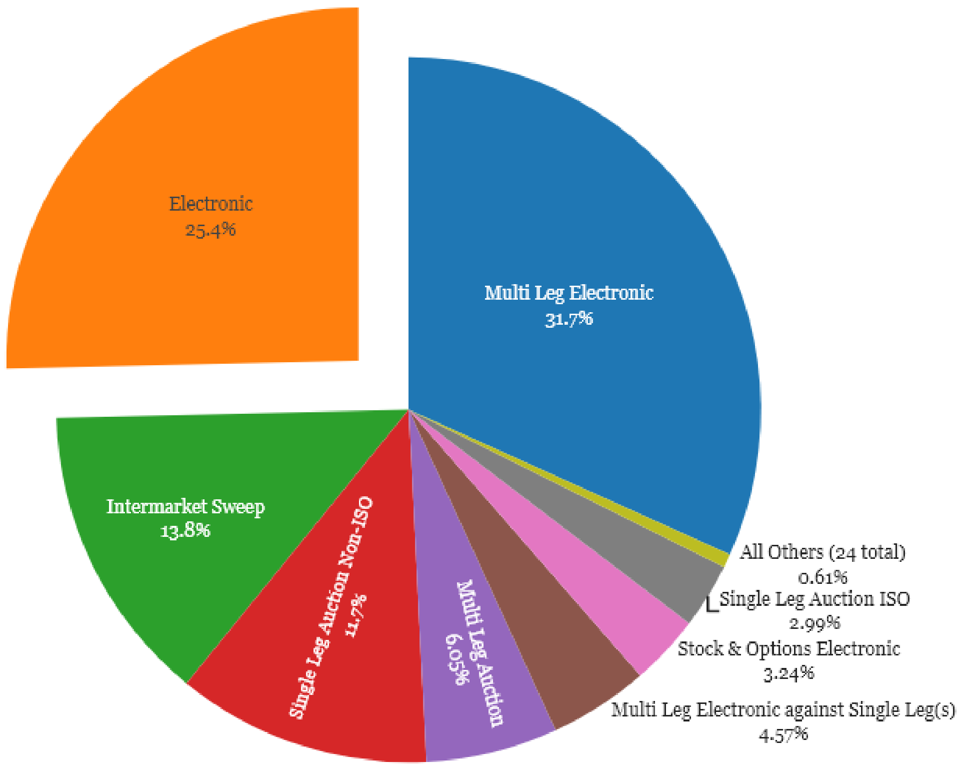
The rate at which options trades were executed outside the prevailing Options Price Reporting Authority ("OPRA") NBBO has remained relatively stable at 1.1% to 1.6% over the 5-year period from June 2020 to June 2025.



Source: OPRA

A review of the execution types[26] found that the majority of trades through the NBBO had sale condition code indicating that they were executed pursuant to a trade through exception. Only 25.4% of the instances were identified as electronic, with no clear indication that they were executed pursuant to an exception.

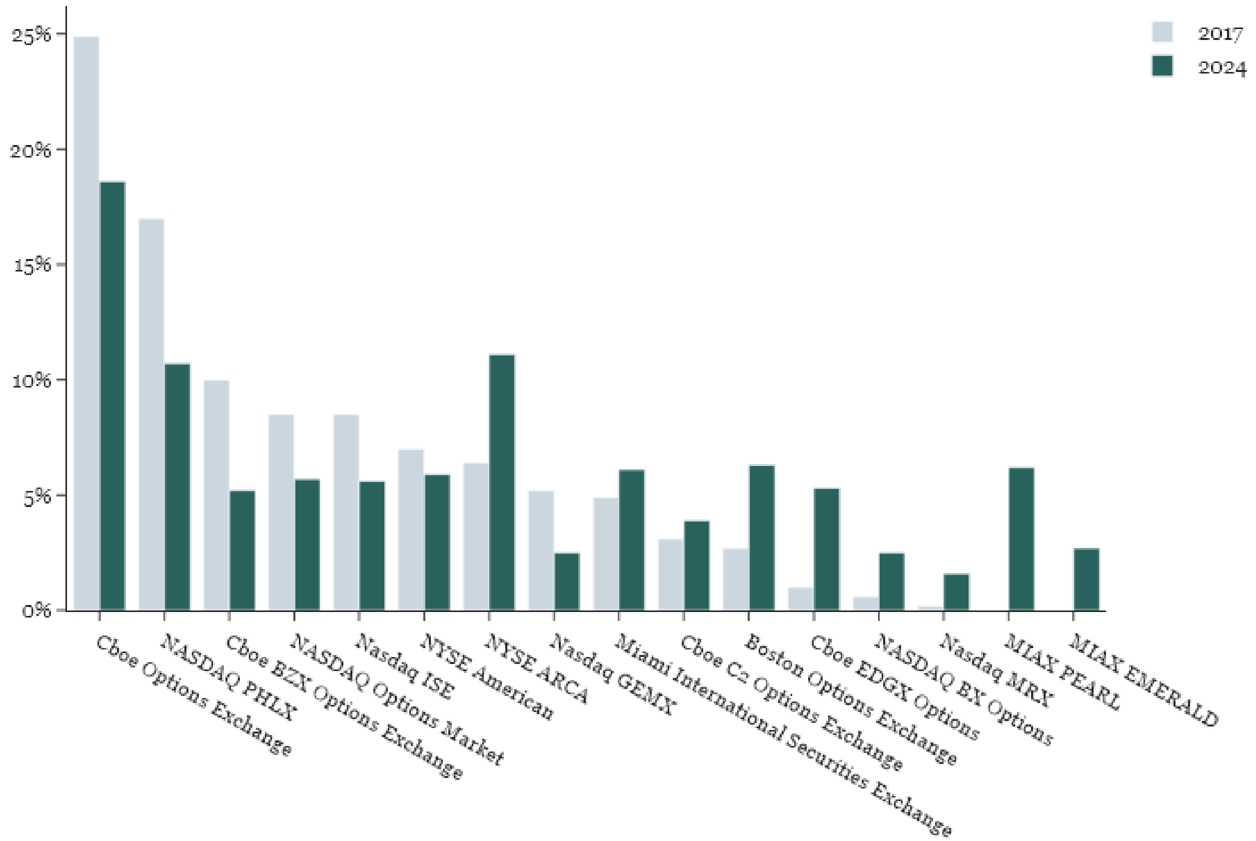
[26] Based on the sale condition code applied by the reporting exchange to OPRA.



Source: OPRA

5.4 Fragmentation of Trading

Another material change in the options markets since the implementation of the Options Plan has been an increase in the fragmentation of trading across options exchanges. As shown below, in 2012 options trading was concentrated in the top 5 exchanges which collectively had over 70% market share. By 2024, options trading was more widely disbursed among the exchanges with no exchange over 20% market share and 15 venues with greater than 1% market share.



Source: OPRA

5.5 Methodology

The core data set used in this section was OPRA trade data from January 1st, 2012 to December 31st, 2024. Specific sections are based on smaller time range of OPRA data from January 2017, or June 2020 to December 2024, due to the differing storage and access methods internally. Additional data sources included OCC data for historical data.

5.5.1 Exclusions

Underlying symbols that were either identified as a test symbol based on indications in TAQ Master, or gleaned from exchange publications of test symbols were removed from the dataset. A small number of underlying symbols which existed at the beginning of the Review Period but that were delisted prior to July 2017 were also excluded as the TAQ Master entries prior to this date did not include the necessary indication of the Security Type. For symbols that existed prior to July 2017 and continued to be listed after July 2017 these Security Type values were backfilled.[27]

[27] The backfilling logic utilized a combination of the ticker symbol, CUSIP and Effective Date to account for recycled symbols and/or Security Type changes due to corporate action.