Working Group on Trading Rules Reference Materials

Tokyo Stock Exchange, Inc.

April 22, 2026

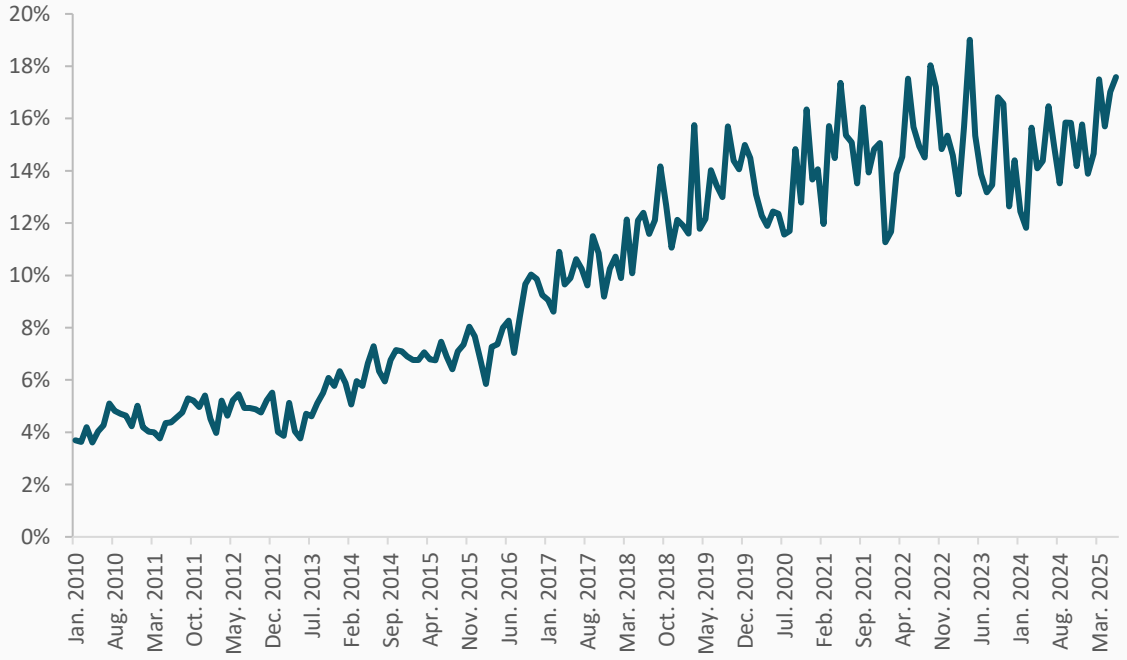
INDEX

Improving the Closing Auction Session

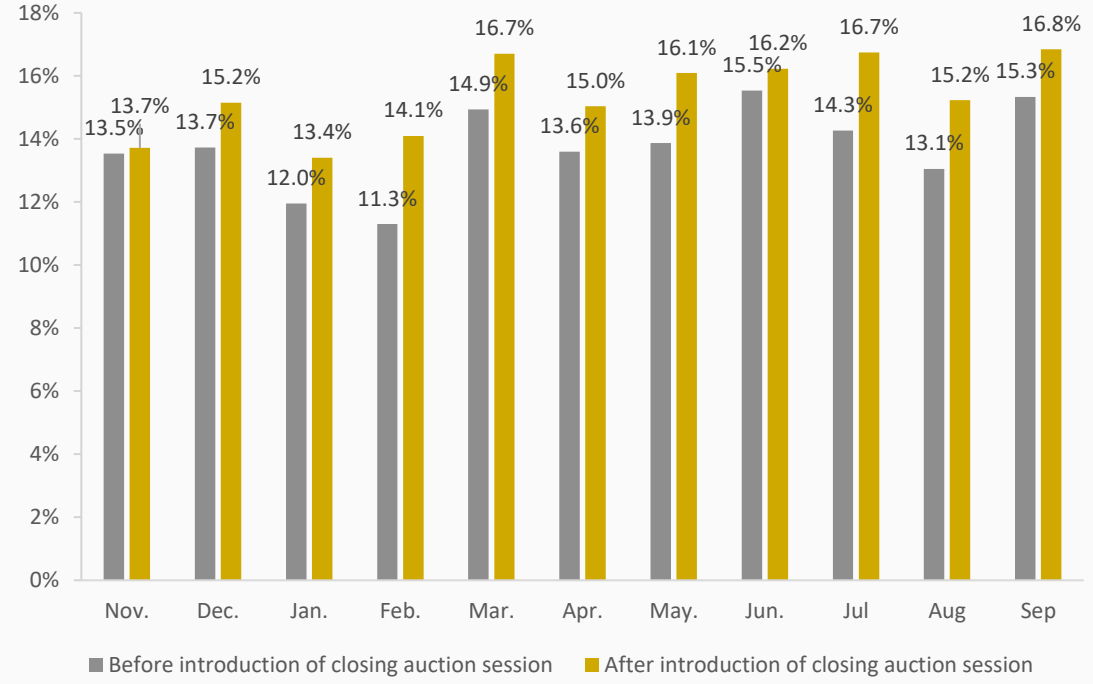
Trends in Trading Value Ratios at the Afternoon Close Itayose

- With the expansion of passive investing, trading volume at the afternoon close Itayose has been on a long-term upward trend.
- The proportion of trading volume occurring at the afternoon close Itayose since the introduction of the closing auction session has also been increasing year on year, creating an environment that makes it easier to participate in end-of-day trading.

Ratio of Value Traded at Afternoon Close Itayose (TSE 1st Section/Prime)



Ratio of Value Traded at Afternoon Close Itayose[1] (year-on-year)



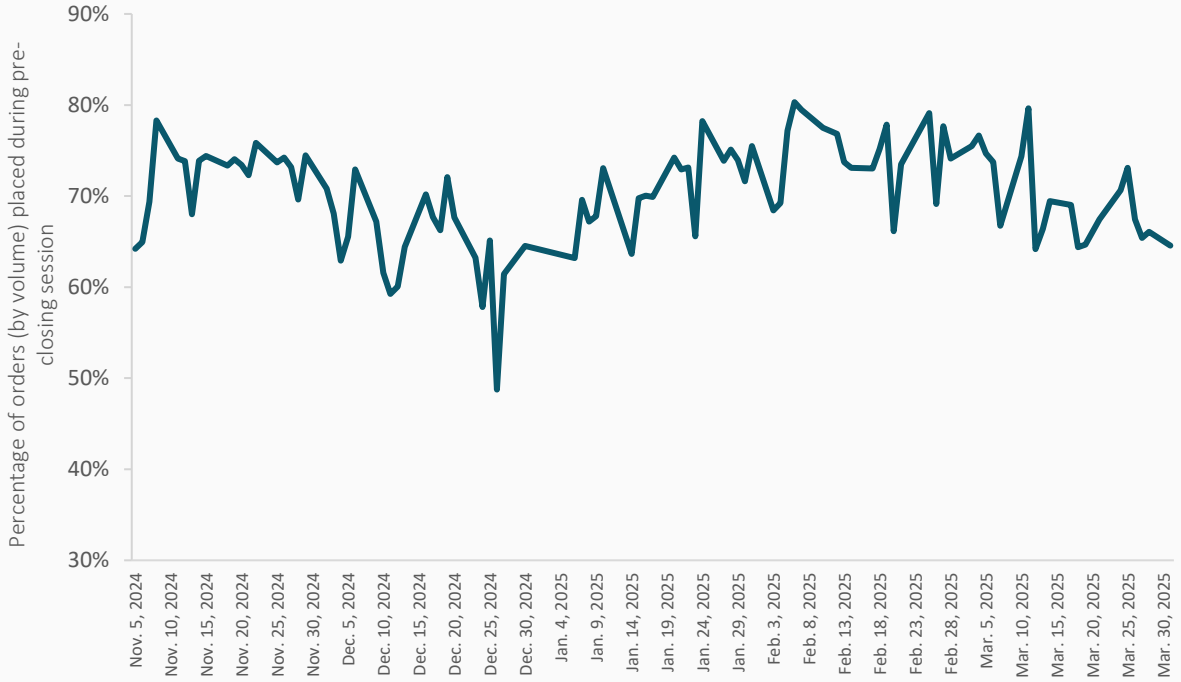
Source: Tokyo Stock Exchange

[1] Calculated by dividing the total trading value at the afternoon close Itayose of each business day by the total daily trading value for the entire Tokyo Stock Exchange market, and then using that figure to calculate the monthly average

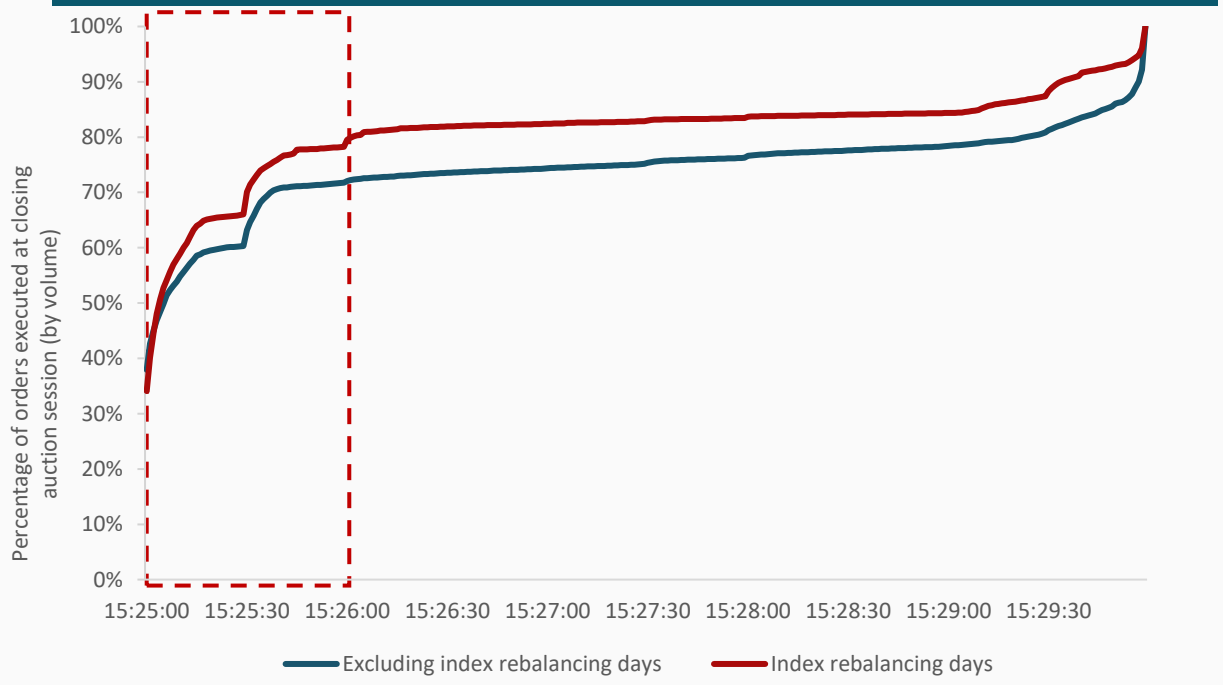
Time of Placement of Orders Executed at Closing Auction Session (Cumulative Total of Executed Orders)

- Approximately 70% of the orders executed in the closing auction session (based on order volume) were placed during the pre-closing session.
- Looking at the breakdown of the execution times for orders placed during the pre-closing session that were executed in the closing auction session, approximately 70% were placed within the first minute after the start, contributing to improved transparency.
- On index rebalancing days, orders are particularly concentrated immediately after the start of the pre-closing session, with orders accumulating from an earlier time.

Percentage of Orders Executed in the Closing Auction Session Placed During the Pre-closing Session



Time of Placement of Orders Executed in the Closing Auction Session (Cumulative)

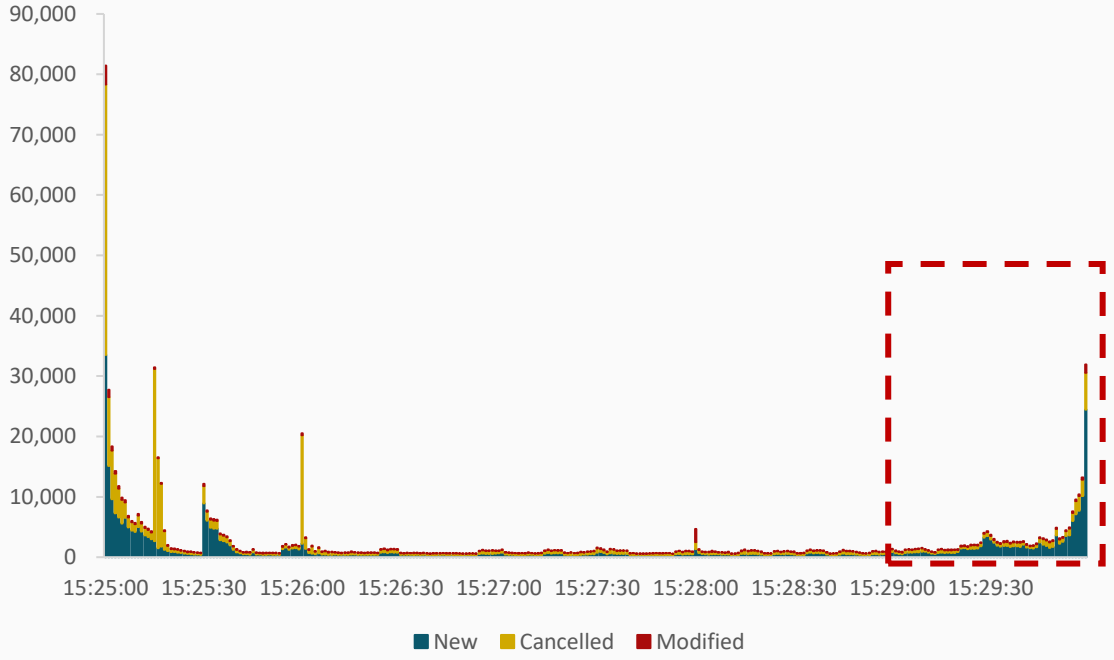


Source: Tokyo Stock Exchange
Coverage period: Nov. 5, 2024 – June 30, 2025

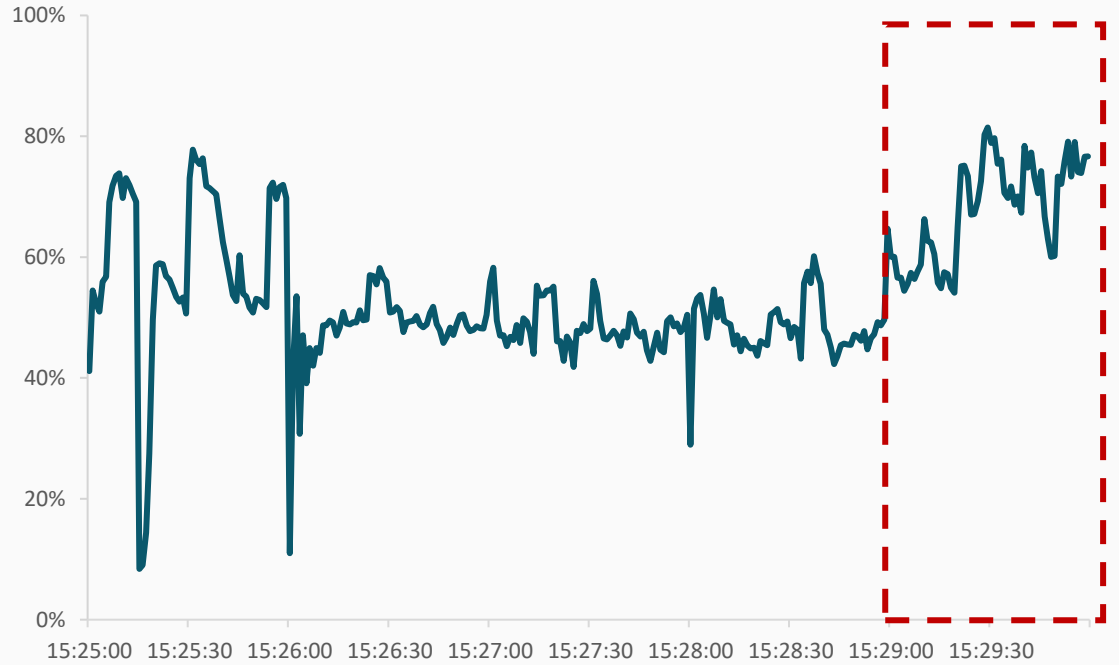
Trends in the Number of Orders and the Proportion of New Orders in the Closing Auction Session

- Looking at the trend in the number of orders during the five-minute closing auction session, orders tend to concentrate immediately after the start of the pre-closing session and just before the afternoon close Itayose.
- From 15:29:00 onward until the afternoon close Itayose, the ratio of modified and canceled orders tends to decrease, while the arrival of new orders may accelerate the convergence toward the closing price.

Number of Orders[1] During the Pre-closing Session



Proportion of New Orders



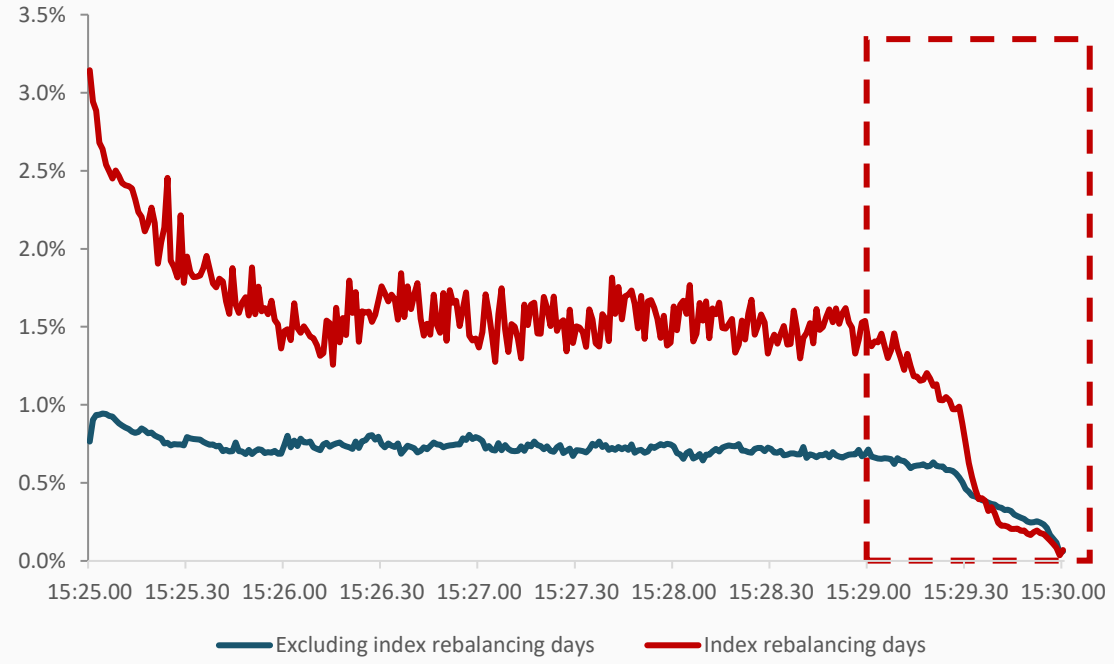
Source: Tokyo Stock Exchange (Data from November 5, 2024, to June 30, 2025)

[1] Number of new, cancelled, and modified orders

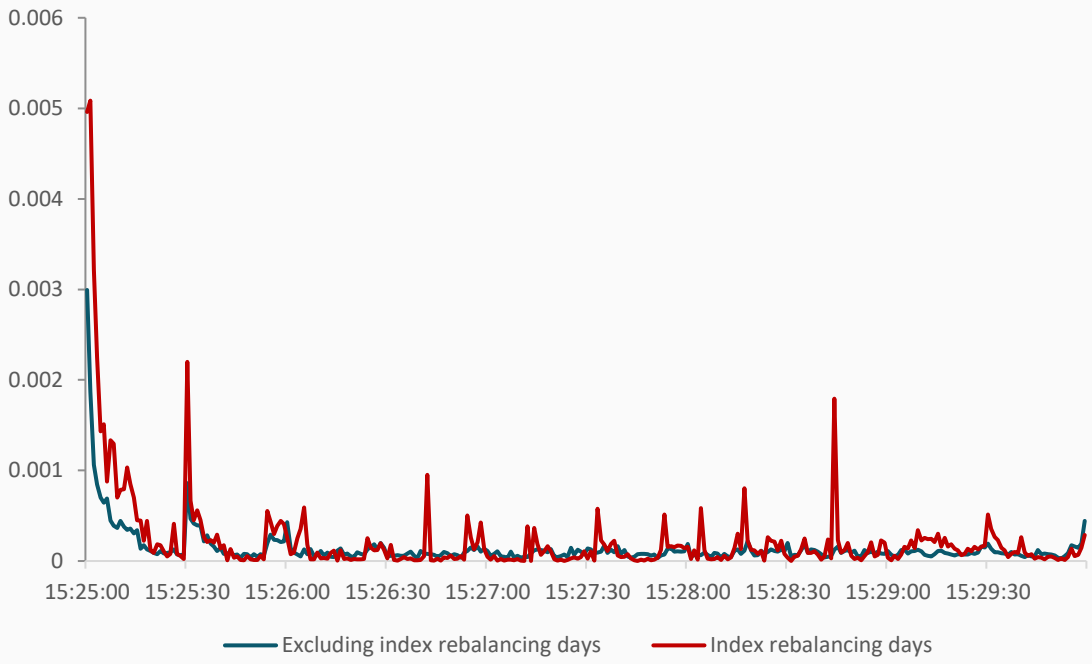
Price Formation and Volatility During the Pre-closing Session

- Looking at the deviation rate (absolute value) between the quote price during the pre-closing session and the closing price on days other than index rebalancing days, we can see that it fluctuated between 0.6% and 0.7% before converging toward the closing price after 15:29:00.
- Regarding the coefficient of variation on days other than index rebalancing days, it rises sharply immediately after the start of the pre-closing session, then rises slightly around 15:25:30 and 15:26:00, and begins to decline after 15:29:00 (with a slight rise just before 15:30).
- On index rebalancing days, the convergence toward the closing price after 15:29:00 is particularly pronounced.

Deviation Rate (Absolute Value) From the Closing Price[1]



Coefficient of Variation[2] During the Pre-closing Session



Source: Tokyo Stock Exchange (analysis covers TOPIX 100 constituent stocks. Data from November 5, 2024, to June 30, 2025)

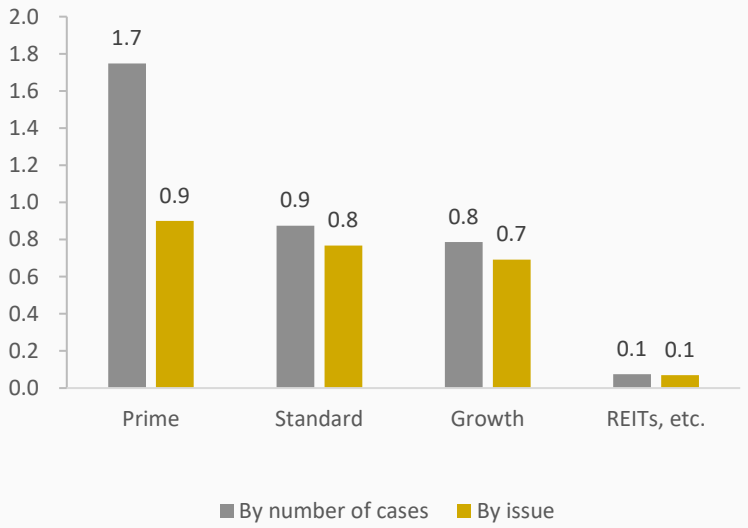
[1] The average Indicative Closing Price (ICP) is calculated every second, and the deviation rate (absolute value) between the ICP and the closing price is calculated.

[2] The standard deviation of the ICP is calculated every second and divided by the average ICP for each second. Since standard deviation is influenced by stock prices, the coefficient of variation is used instead.

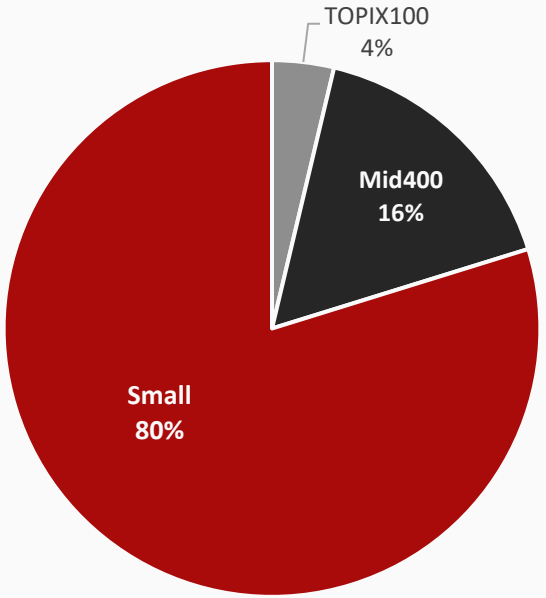
Sudden Price Fluctuations One Minute Before the Afternoon Close Itayose[1]

- We extracted stocks for which the indicative equilibrium price fluctuated by more than the renewal price interval (approximately 1.4–3%) due to order modifications or cancellations during the last one minute before the afternoon close Itayose.
- On a per-stock basis, this occurred about 2.5 times per day, with a relatively higher frequency among small-cap stocks with high volatility.
- Looking at the distribution by time of day, the cases were not concentrated just before the afternoon close Itayose, but rather spread throughout the trading session.

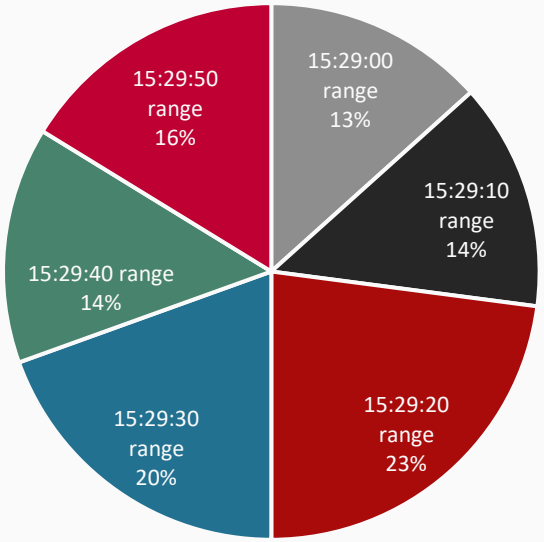
Number of Cases per Day by Market Segment



Composition by Index Category in Prime



Percentage of Cases by Time of Day



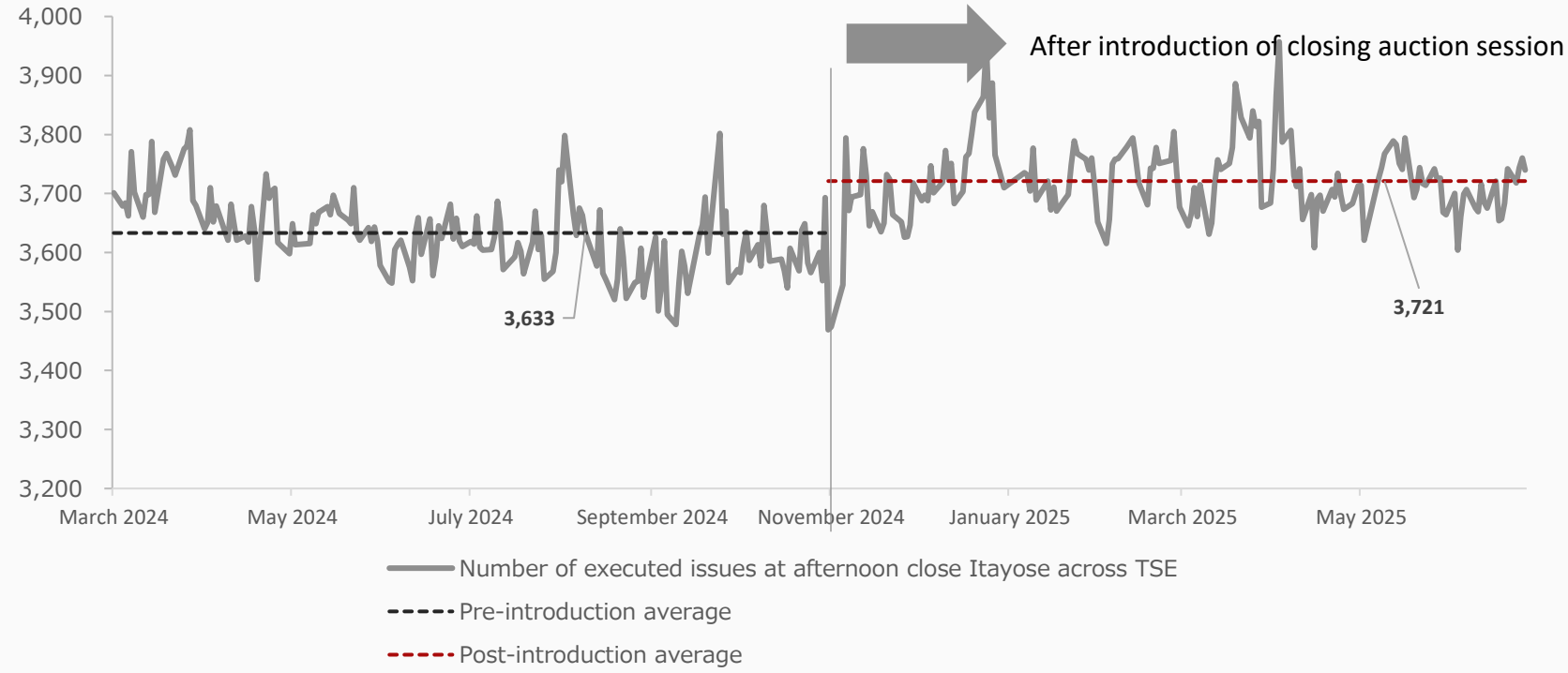
Source: Calculated by Tokyo Stock Exchange (data from November 5, 2024, to June 30, 2025)

[1] Excludes ETFs and ETNs

Trend in the Number of Executed Issues at the Afternoon Close Itayose

- Looking at the trend in the number of executed issues at the afternoon close Itayose, there was an increase of approximately 88 issues following the introduction of the closing auction session (while the number of issues for which trades are not executed beyond Zaraba decreased).
- Since there were only two more issues executed during the afternoon close Itayose due to special execution, it is believed that the impact of the closing auction session's introduction was significant.

Number of Executed Issues[2] at the Afternoon Close Itayose



Source: Tokyo Stock Exchange

[1] Pre-introduction: March 1, 2024–November 1, 2024; post-introduction: November 5, 2024–June 30, 2025

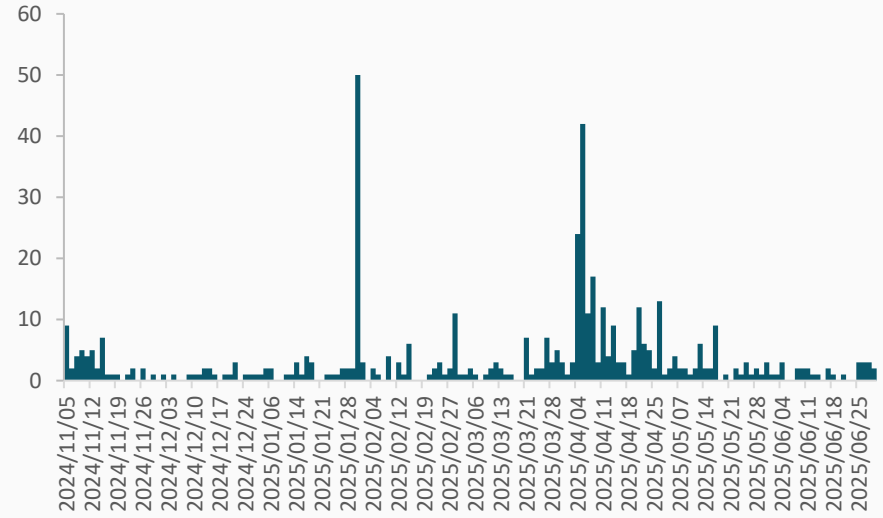
[2] Excluding issues listed on the TOKYO PRO Market

Introduction of Special Execution

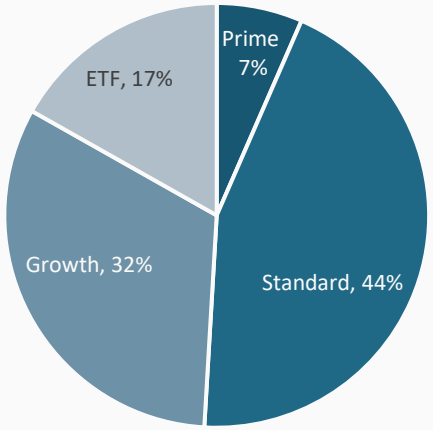
- We have introduced a special execution system that processes trades at the upper and lower limits of the executable price range in place, even when no matching occurs within said range.
- Special executions primarily occur with ETFs and small- and mid-cap stocks, averaging about two cases per day under normal conditions (though the number increases during market volatility, such as the sharp market fluctuations following the announcement of U.S. tariffs in April 2025).
- A comparison of the number of issues for which trades are not executed beyond Zaraba before and after the introduction of special execution shows a decrease, suggesting this is contributing to an increase in opportunities for a closing price to be established.

Number of Special Executions

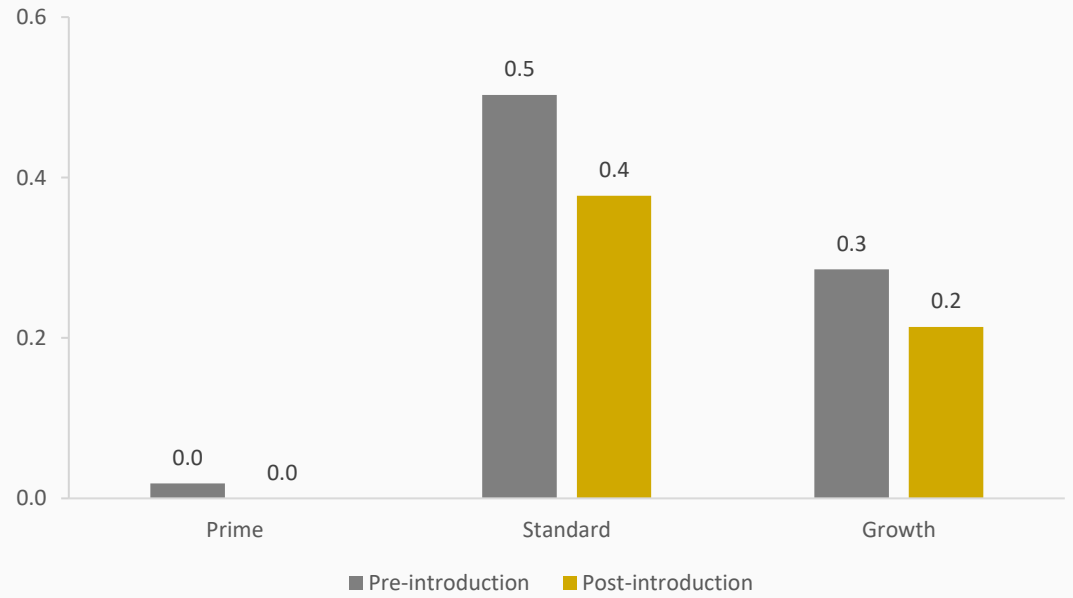
Number by day



Breakdown by attribute[1]



Issues for Which Trades are Not Executed Beyond Zaraba[2]



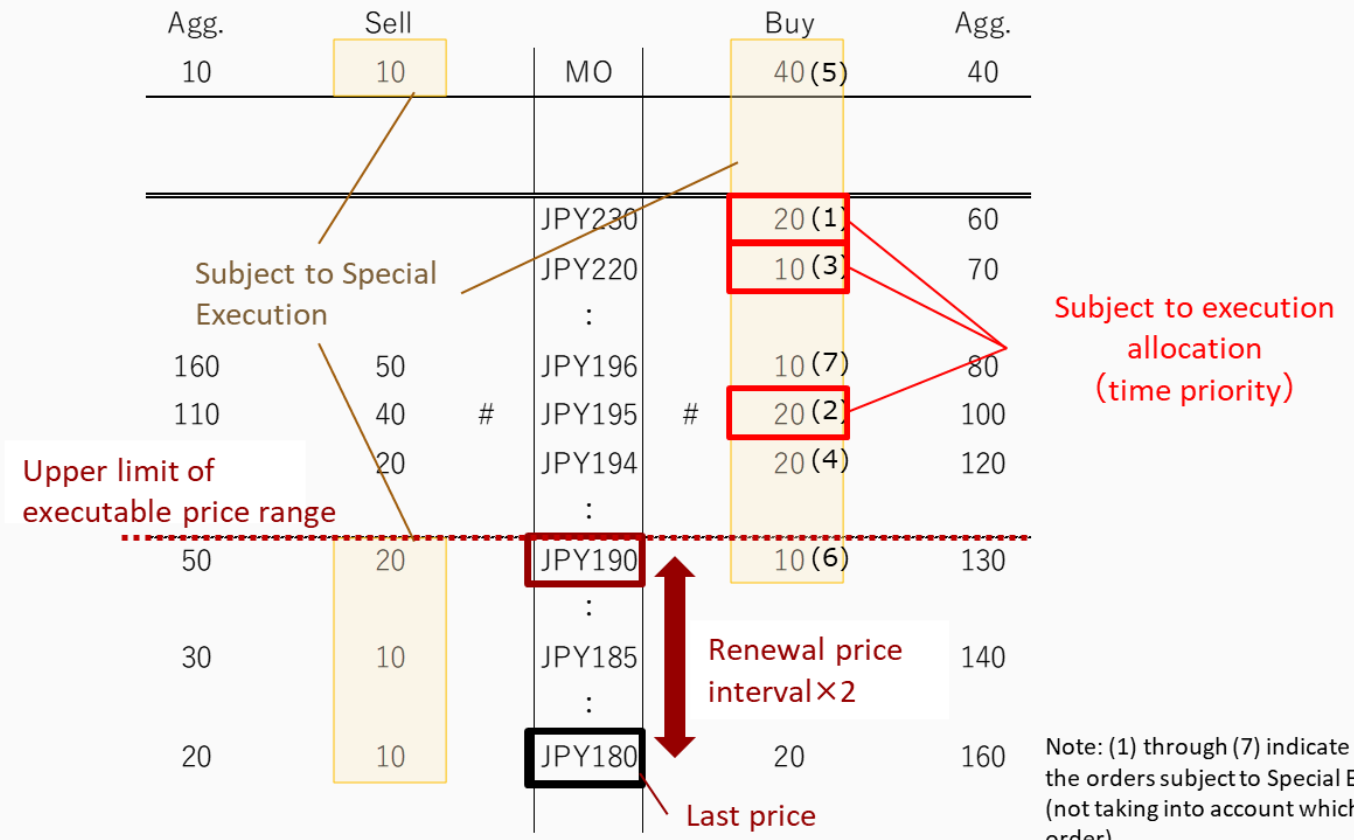
Source: Tokyo Stock Exchange

[1] Data from November 5, 2024, to June 30, 2025 (excluding January 30, 2025). The special executions carried out on January 30, 2025 were almost all on issues that were excluded from TOPIX in its constituent review.

[2] Pre-introduction: November 1, 2023–June 28, 2024; post-introduction: November 5, 2024–June 30, 2025. Issues for which no closing price was available at the end of the afternoon session are not included in the calculations.

(Ref.) Processing via Special Execution

Example of Special Execution



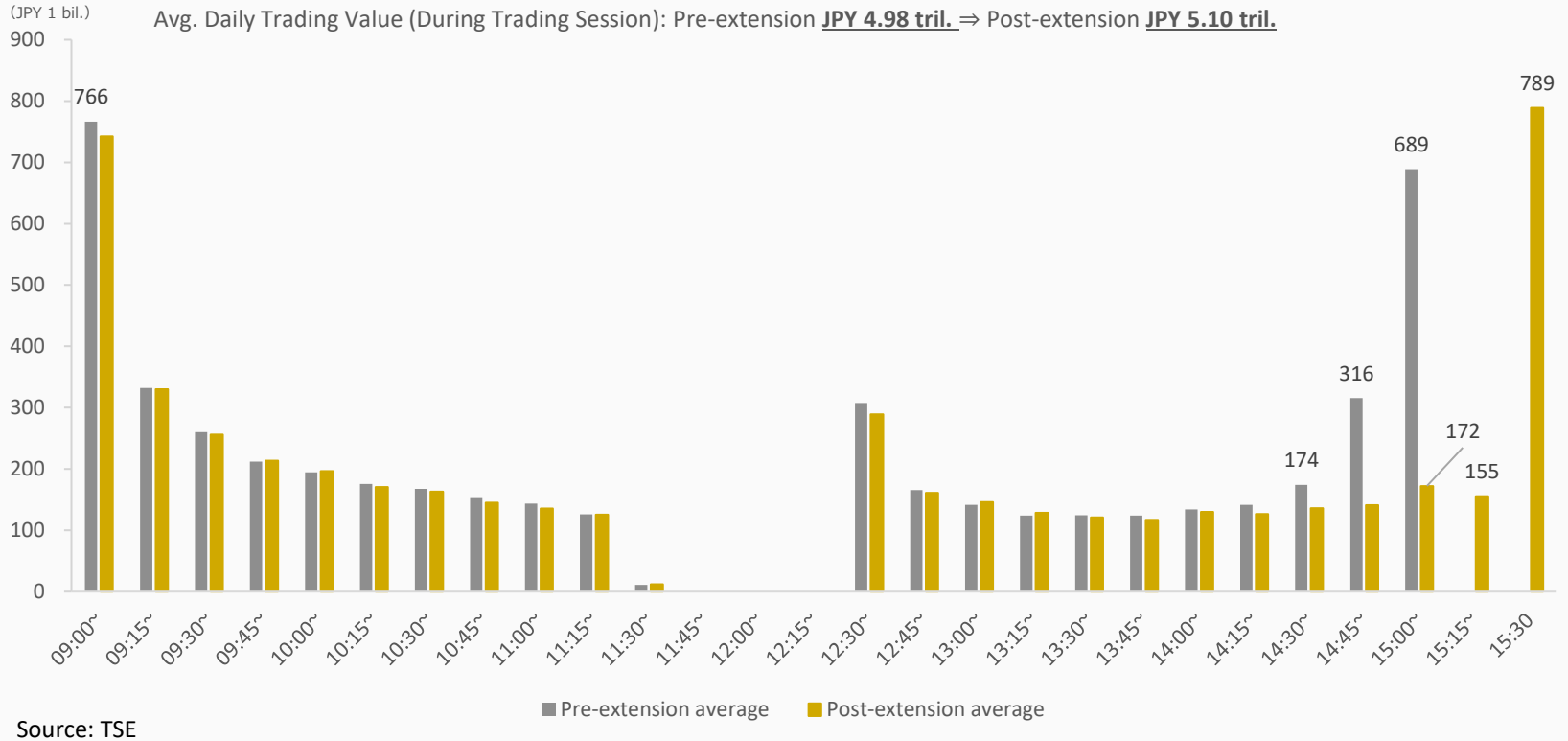
Note: (1) through (7) indicate the order in which the orders subject to Special Execution were placed (not taking into account which broker placed the order)

1. In the above case, the matching price at Itayose is JPY 195, which exceeds the upper limit of the executable price range (JPY 190)
2. Since there are both buy and sell orders that are eligible for special execution processing, **the execution price is set at JPY 190, which is the upper limit of the executable price range**, and the sell orders are allocated, 50 units at a time, in chronological order of the time they were placed.

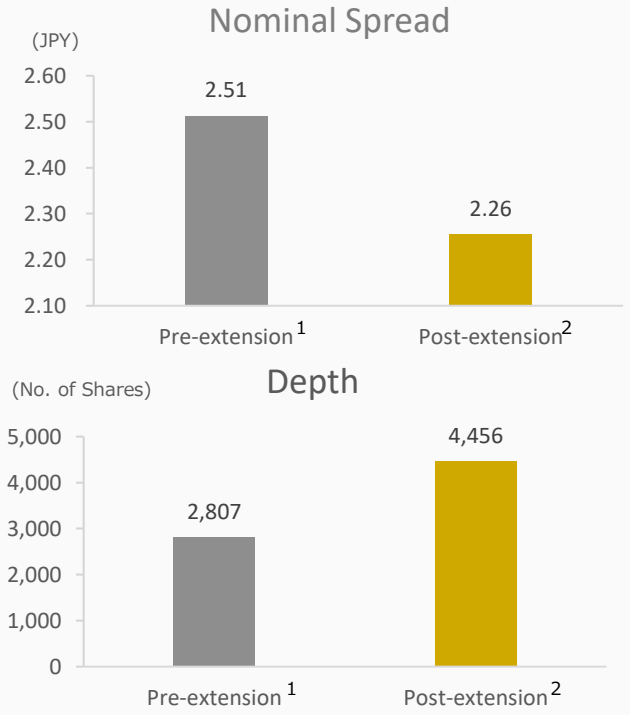
Benefits of Extended Trading Hours

- Extended trading hours contributed to the expansion of trading opportunities in response to events such as the U.S. presidential election and an increase in disclosures during the trading session.
- Even after 3:00 p.m., trading volume remained at around JPY 1 trillion, ensuring liquidity outside of the afternoon close Itayose.
- Although concerns were raised prior to the implementation of the new rules, such as about a decline in Zaraba liquidity, no such issues have been observed.

Trends in Trading Value



Liquidity Indicators (TOPIX 500 constituents)



Source: TSE

[1] Pre-extension: 2023/11/1-2024/6/28

[2] Post-extension: 2024/11/5-2025/6/30

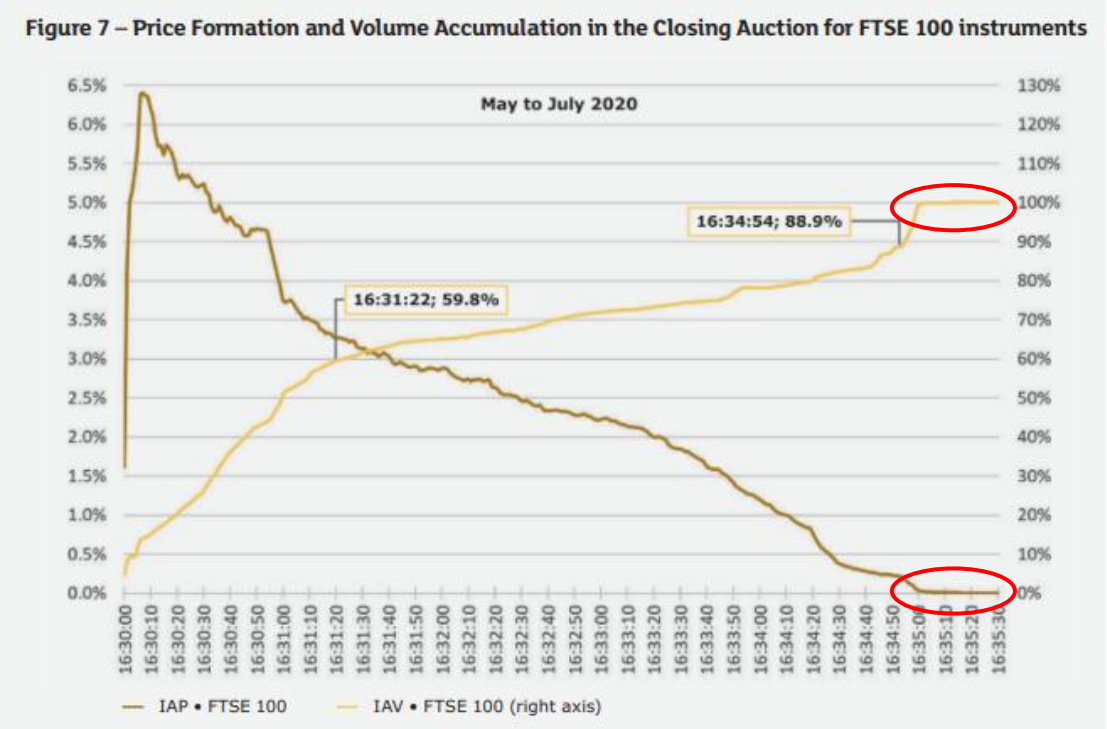
Examples of Random Closing in Overseas Markets (LSE/Euronext Paris)

- On the LSE and Euronext Paris, following the introduction of random closing, order accumulation occurred earlier than before, causing Indicative Equilibrium Prices (IEPs) and Indicative Equilibrium Volumes (IEVs) to converge toward the closing price sooner.

1. LSE

By 16:35, when the random closing period begins, IEPs/IEVs had largely converged to the closing price. During the final five seconds from 16:34:54 to 16:34:59, the deviation from the closing price decreased from 0.21% to 0.06%.

Figure 7 – Price Formation and Volume Accumulation in the Closing Auction for FTSE 100 instruments



Source: London Stock Exchange Trading Insights: Lifting the Lid on the Close (2021)

2. Euronext Paris

Saw a trend similar to LSE

Aggregate average change in TOPs and TOVs between 17:30:30 and 17:35:30[15]

CAC 40 shares, September 2018 excluding the day of 21/09

Source: Autorité des marchés financiers: Growing Importance of the Closing Auction in Share Trading Volumes (2021)

Research From Overseas on the Design of Closing Auction Session

- Random closing has a positive impact on trading volume, spreads, and closing price volatility in developed markets. (It is effective as an anti-gaming measure, and the reduced concern about gaming may contribute to increases in these indicators.)
- In highly regulated developed markets, concerns about gaming due to flexibility (i.e., the ability to modify or cancel orders during the pre-closing session) are limited. It has even been pointed out that flexibility improves price efficiency and reduces spreads and price reversals (spikes).

Research Objectives / Methodology

- A survey was conducted on 115 exchanges worldwide. The impact of closing auction sessions on the market and liquidity was analyzed for 45 exchanges (across 43 countries) that changed their closing price determination method (and cooperated with the survey) between 1996 and 2014, using trading data from 1996 to 2017.
- Additionally, the effects of the following four elements in the design of the closing auction session were measured:

(1) Randomization: Whether the Itayose is conducted at a random time
(2) Price Stabilization: Whether price regulations such as volatility extensions or price collars are implemented
(3) Flexibility: Whether order modifications or cancellations are allowed during the pre-closing session
(4) Transparency: Whether information such as IEPs/IEVs is disseminated

Conclusions (Effects of Closing Auction Session on Market and Liquidity)

Markets / Issues	Developed	Emerging
High liquidity	- Randomization and stabilization are effective. (Stabilization is less effective in markets with strict regulation, as price fluctuations are less likely to occur.) - Flexibility is perceived as “discretion” and does not support gaming. - Transparency leads to lower liquidity.	- Stabilization is most effective (direct regulation). - Randomization increases spreads and price volatility. - Flexibility poses no concerns for issues with high liquidity. - Transparency increases spreads and reduces overall trading volume.
Low liquidity	- Randomization, stabilization, and flexibility have positive effects. - Transparency reduces market quality.	- Stabilization is most effective (direct regulation). - Randomization increases spreads and price volatility. - Flexibility supports gaming in issues with low liquidity. - Transparency increases spreads and reduces overall trading volume.

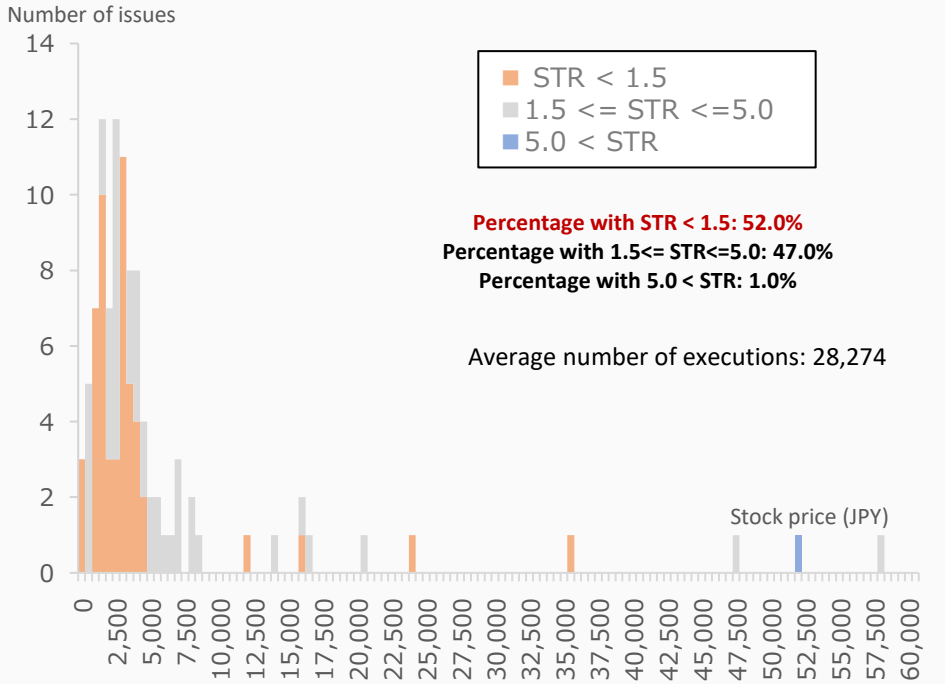
Source: Prepared by TSE based on “How should we ring the closing bell? Determining optimal closing auction design” (Dyhrberg, A. H., Foley, S., Felez-Viñas, E., & Putniņš, T. J. (2022))

Further Optimization of Tick Sizes

STR[1] Distribution for TOPIX 100 and TOPIX Mid400

- More than half of TOPIX 100 constituents have an STR below 1.5. For issues with ultra-high liquidity, even the current tick size specified in the TOPIX 500 tick size table is considered too large.
- For TOPIX Mid400 constituents, over 80% of issues have an STR within the generally appropriate range of 1.5 to 5.0; however, some issues have an STR exceeding 5.0.

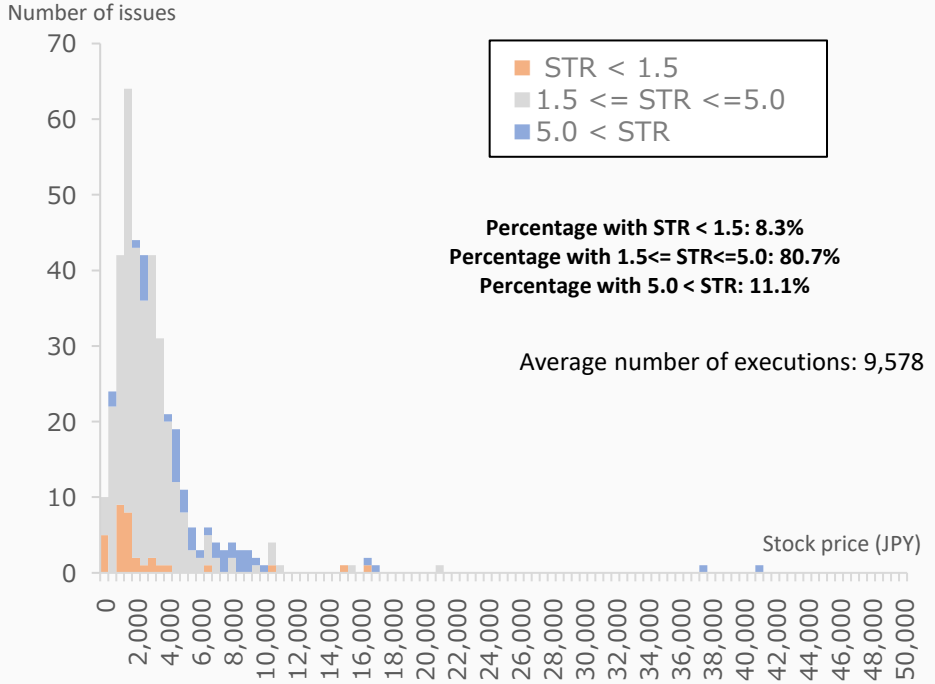
STR Distribution (TOPIX 100)



Percentage with STR < 1.5: 52.0%
Percentage with 1.5<= STR<=5.0: 47.0%
Percentage with 5.0 < STR: 1.0%

Average number of executions: 28,274

STR Distribution (TOPIX Mid400 Overall)



Percentage with STR < 1.5: 8.3%
Percentage with 1.5<= STR<=5.0: 80.7%
Percentage with 5.0 < STR: 11.1%

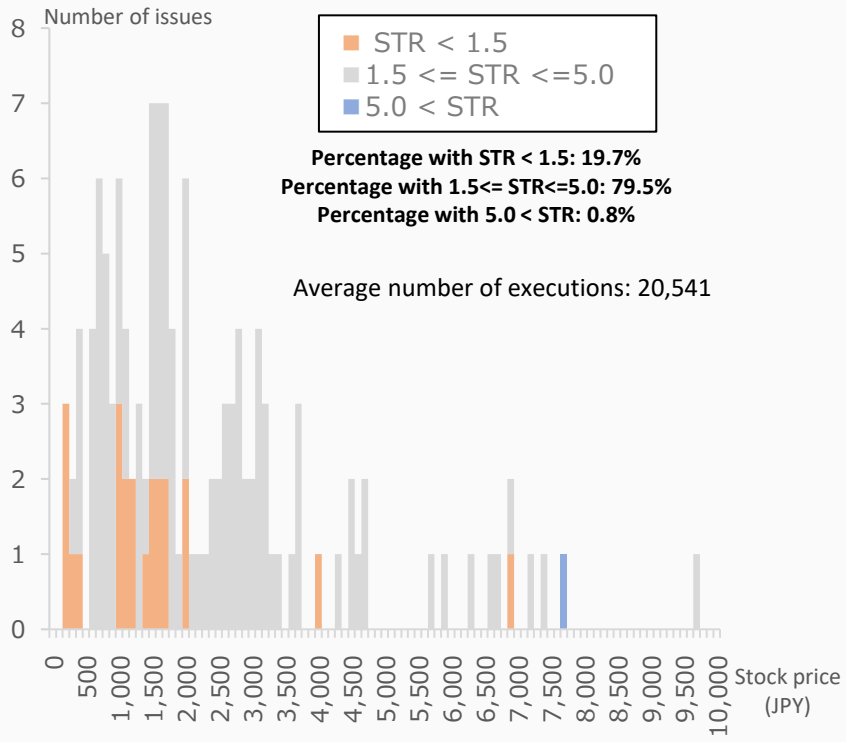
Average number of executions: 9,578

Source: Prepared by TSE based on Bloomberg data (Data period: Average values for the 21 business days from June 2 to June 30, 2025)
[1]STR stands for spread-to-tick ratio. This indicates how many ticks make up the BBO spread by dividing the nominal spread (best ask price minus best bid price) by the tick size. Under MiFID II in the EU, tick sizes are set with reference to the STR.

STR Distribution by Liquidity for TOPIX Mid400 Constituents

- When examining the STR distribution by liquidity for TOPIX Mid400 constituents, it can be observed that some issues that are TOPIX Mid400 constituents but have low liquidity have an STR of 5.0 or higher, meaning that the current tick size is too small.

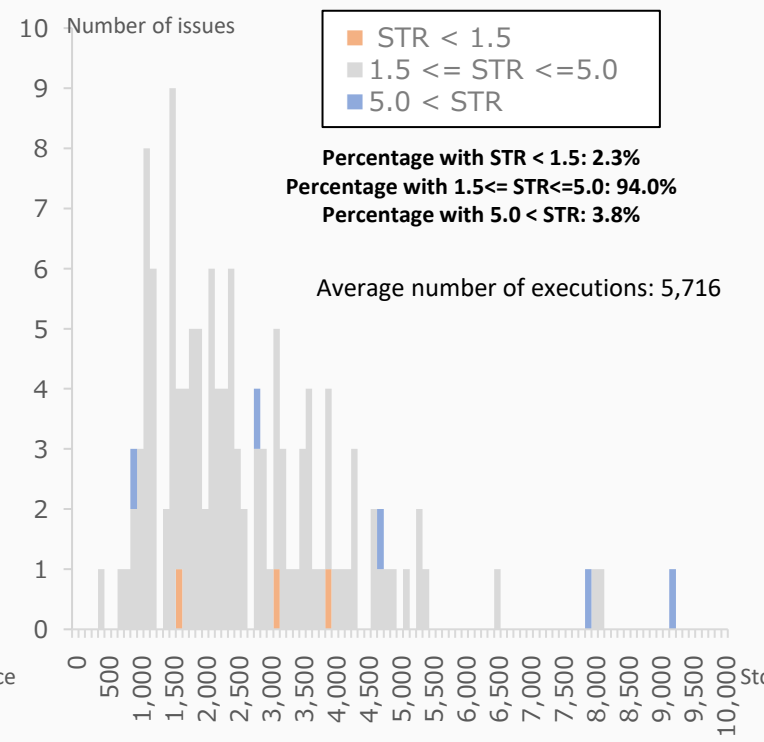
STR Distribution (high liquidity[1])



Percentage with STR < 1.5: 19.7%
Percentage with 1.5<= STR<=5.0: 79.5%
Percentage with 5.0 < STR: 0.8%

Average number of executions: 20,541

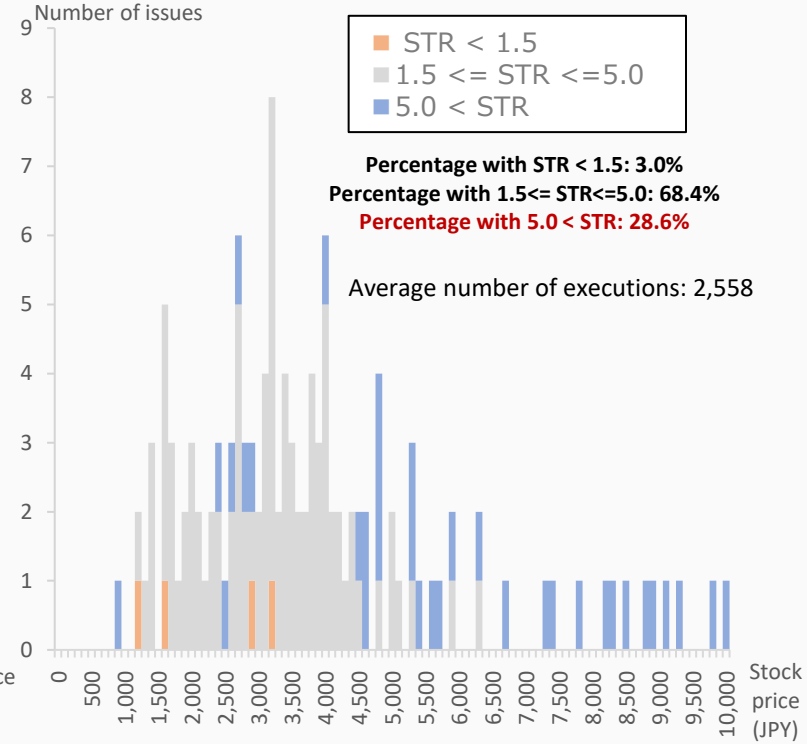
STR Distribution (medium liquidity[1])



Percentage with STR < 1.5: 2.3%
Percentage with 1.5<= STR<=5.0: 94.0%
Percentage with 5.0 < STR: 3.8%

Average number of executions: 5,716

STR Distribution (low liquidity[1])



Percentage with STR < 1.5: 3.0%
Percentage with 1.5<= STR<=5.0: 68.4%
Percentage with 5.0 < STR: 28.6%

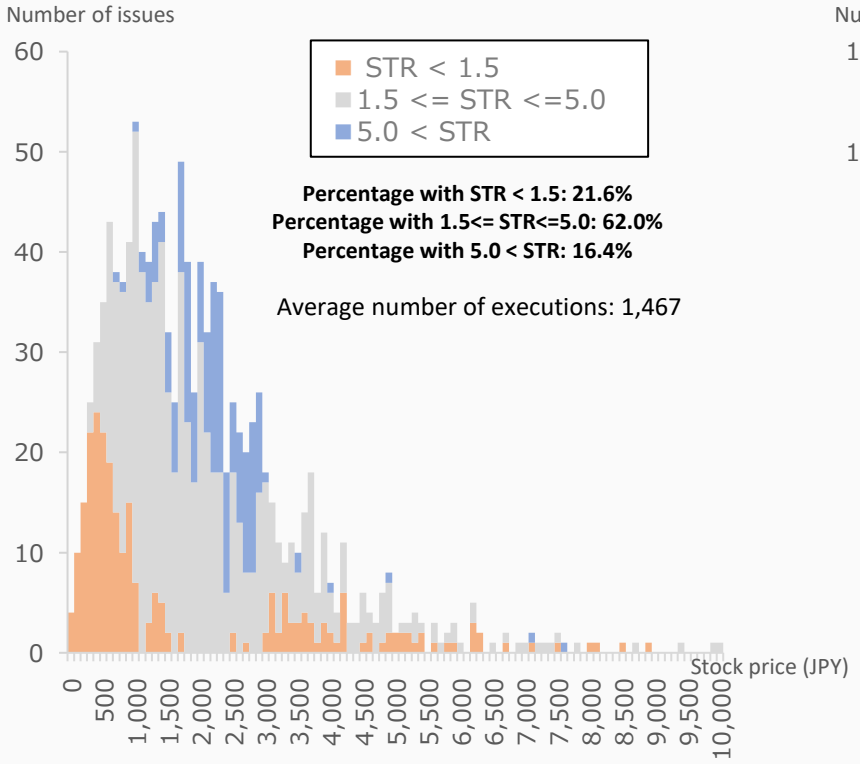
Average number of executions: 2,558

Source: Prepared by TSE based on Bloomberg data (Data period: Average values for the 21 business days from June 2 to June 30, 2025)
[1] Liquidity is classified based on the number of executions.

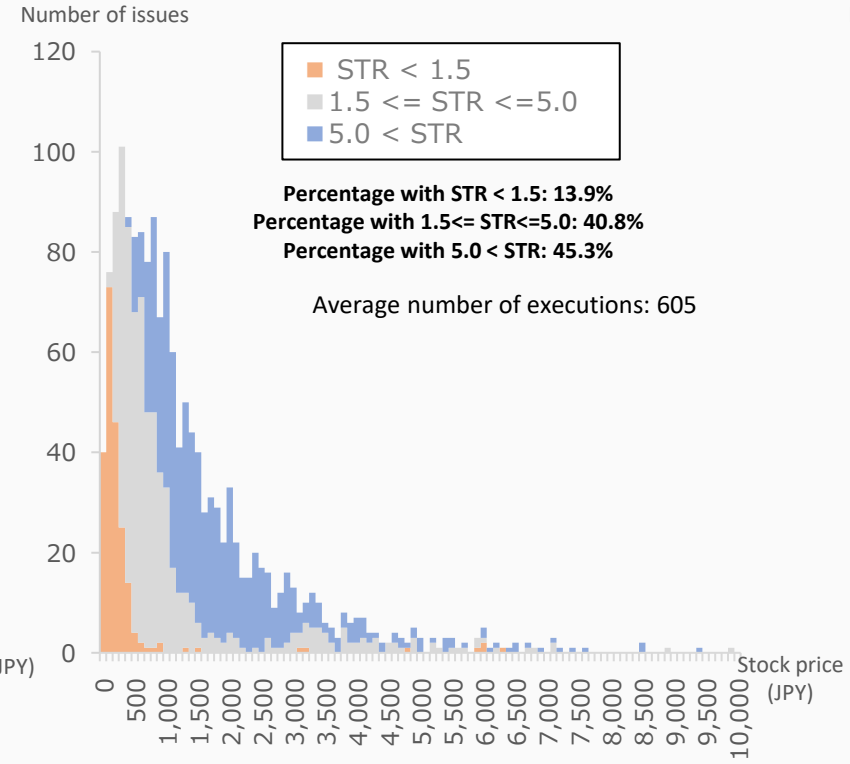
STR Distribution for TOPIX Small and the Standard and Growth Markets

- Among groups of issues where relatively large tick sizes are established, some tick sizes are found to be either too large or too small.

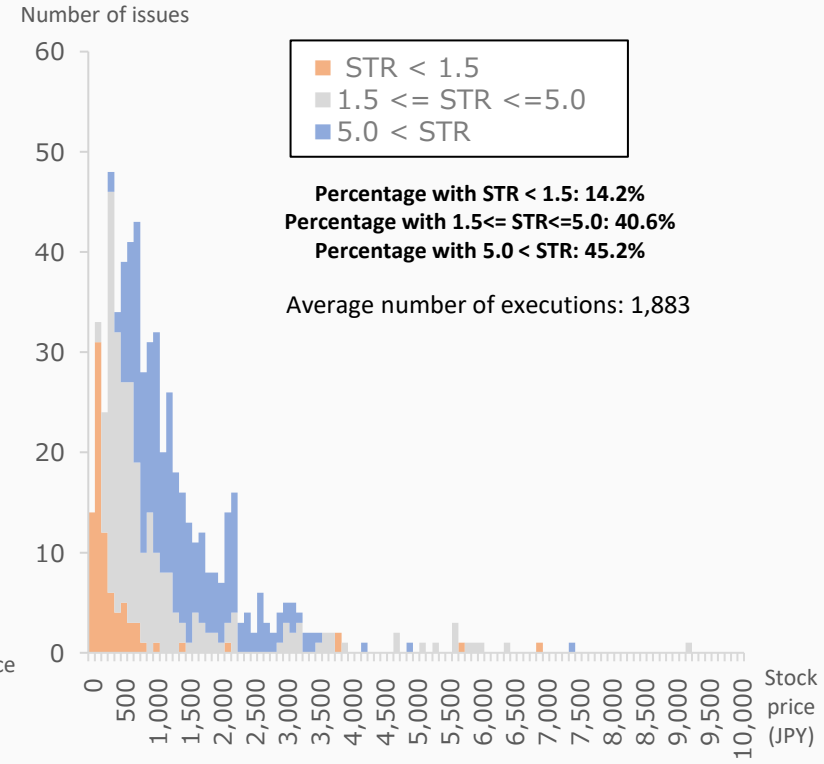
STR Distribution (TOPIX Small)



STR Distribution (Standard)



STR Distribution (Growth)

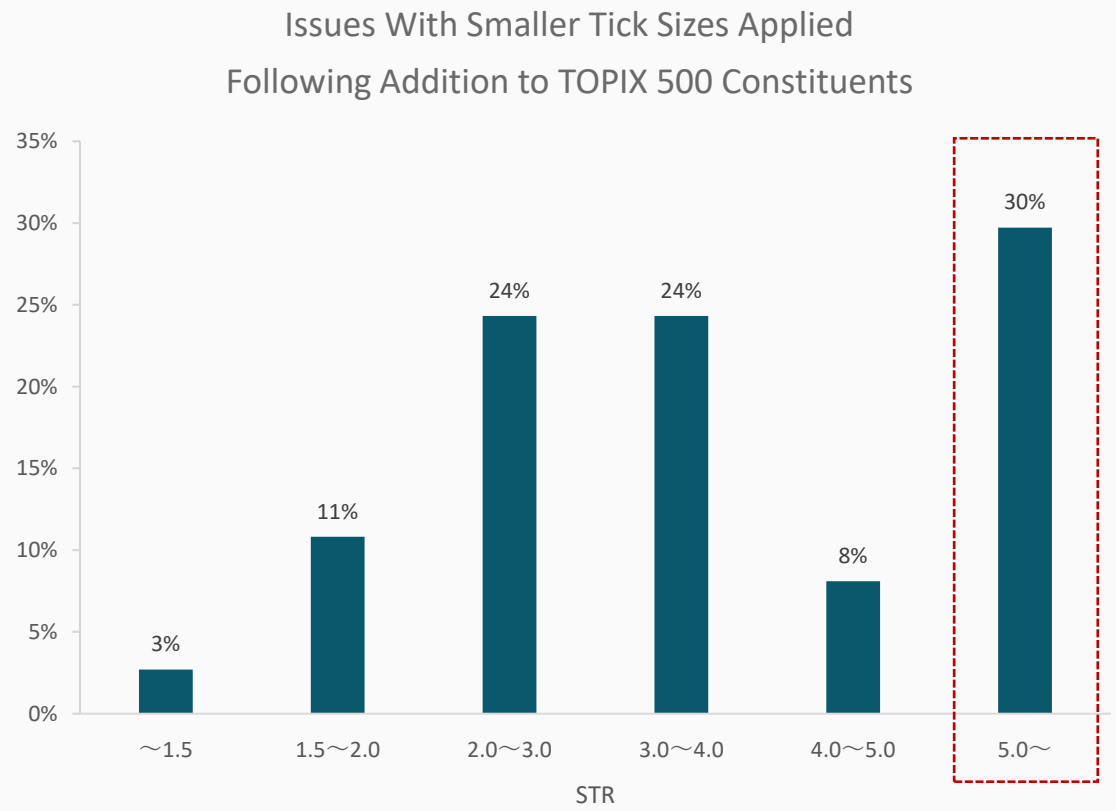


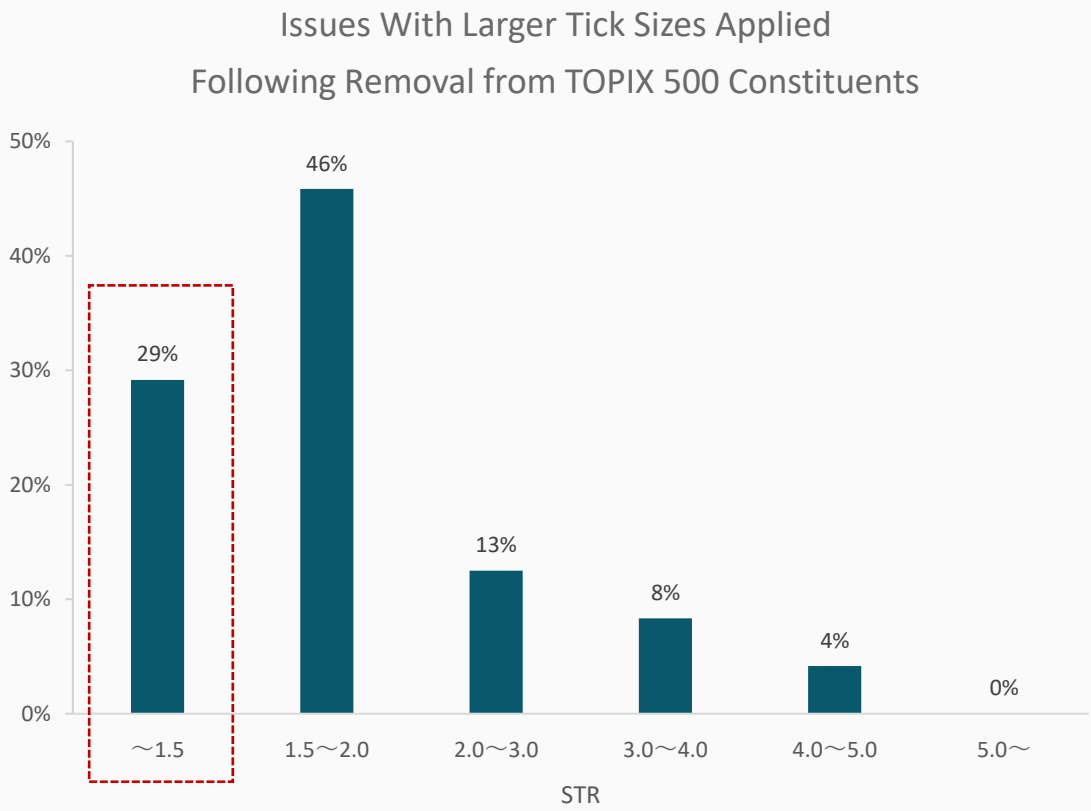
Source: Prepared by TSE based on Bloomberg data (Data period: Average values for the 21 business days from June 2 to June 30, 2025)

Status of STR Before and After Tick Size Table Changes Under the Current System

- We measured post-change STRs for 61 TOPIX 500 issues which were subject to a tick size table change after a periodic review (from 2023 to 2025).
- Approximately 30% of issues for which the tick size table was changed due to the current system, i.e., because of a change in index constituency, have an inappropriate STR.

STR Distribution After Tick Size Table Changes:*





* Median value for the 40 days after the tick size table change

Tick Size Table Regulations in the US and Europe

- U.S.: Except for penny stocks (those with prices below USD 1), all issues are quoted in increments of USD 0.01 regardless of price.
  - ➢ From November 2026, for issues priced at USD 1 or more, the tick size will be changed to either USD 0.01 or USD 0.005 based on the Time Weighted Average Quoted Spread (TWAQS).

- Europe: Multiple tick size tables are established according to liquidity indicators (average daily number of trades).

U.S.

Stock Price (or Above)	(Below)	(Tick Size)
	1.00	0.0001
1.00		0.01

(Unit: USD)

Effective from November 2026

Stock Price (or Above)	(Below)	(TWQAS)	(Tick Size)
	1.00		0.0001
1.00		Under 0.015	0.005
1.00		Above 0.015	0.01

(Unit: USD)

Europe

Stock Price	Liquidity Indicators (Average Daily Number of Trades)						
Or Above	Below	0-10 times	10-80 times	80-600 times	600-2,000 times	2,000-9,000 times	9,000 times-
	0.1	0.0005	0.0002	0.0001	0.0001	0.0001	0.0001
0.1	0.2	0.001	0.0005	0.0002	0.0001	0.0001	0.0001
0.2	0.5	0.002	0.001	0.0005	0.0002	0.0001	0.0001
0.5	1	0.005	0.002	0.001	0.0005	0.0002	0.0001
1	2	0.01	0.005	0.002	0.001	0.0005	0.0002
2	5	0.02	0.01	0.005	0.002	0.001	0.0005
5	10	0.05	0.02	0.01	0.005	0.002	0.001
10	20	0.1	0.05	0.02	0.01	0.005	0.002
20	50	0.2	0.1	0.05	0.02	0.01	0.005
50	100	0.5	0.2	0.1	0.05	0.02	0.01
100	200	1	0.5	0.2	0.1	0.05	0.02
200	500	2	1	0.5	0.2	0.1	0.05
500	1,000	5	2	1	0.5	0.2	0.1
1,000	2,000	10	5	2	1	0.5	0.2
(omit)	(omit)	(omit)	(omit)	(omit)	(omit)	(omit)	(omit)

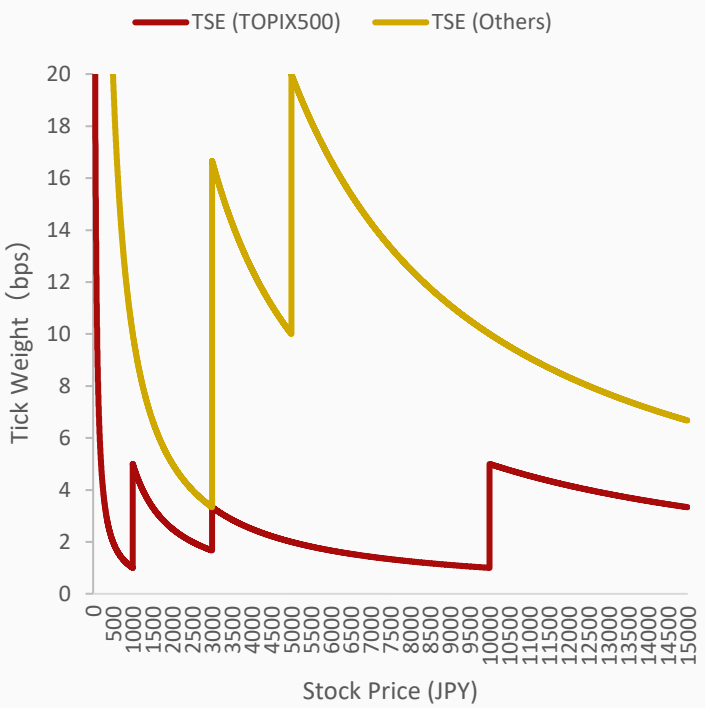
(Higher price ranges are not listed above, but the same treatment applies.) (Unit: Local currency)

Notes:
- U.S.: Rule 612 of Regulation NMS
- Europe: The tables are set out under the RTS pursuant to Article 49 (3) of MiFID.

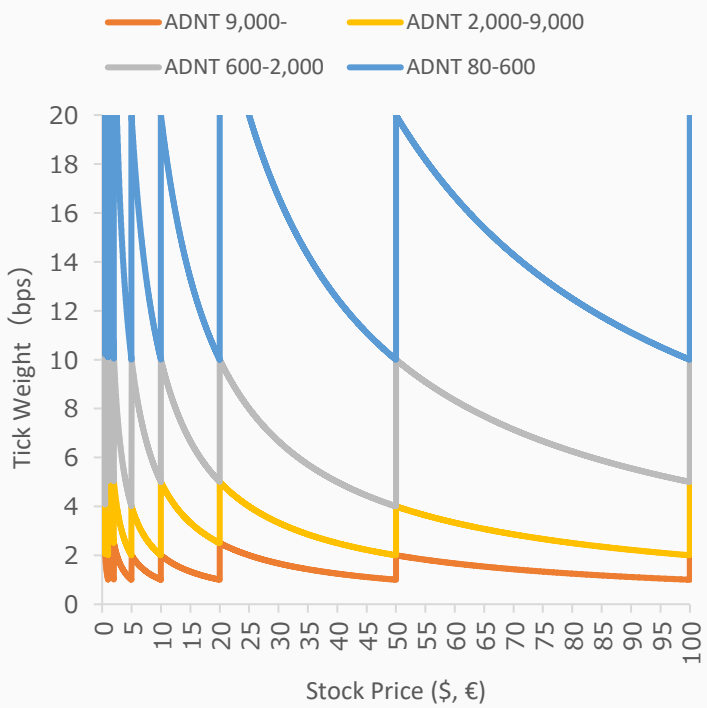
Comparison of Tick Weights (Tick Size ÷ Stock Price)

- When comparing the tick weights (tick size ÷ stock price) of TSE with those of Europe, the variation in tick weights is relatively large.

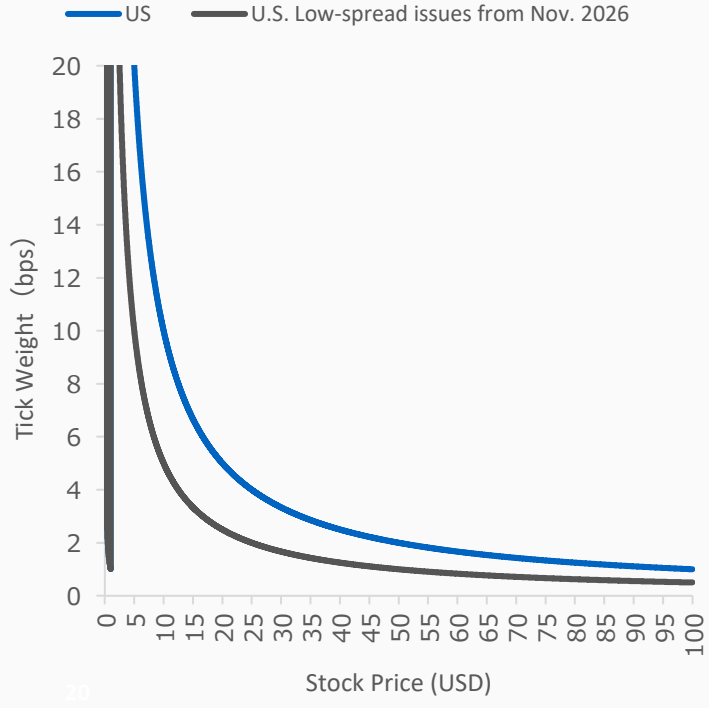
Japan



Europe



U.S.



Source: Prepared by TSE

Comparison of Number of Executions and Trading Volume as Liquidity Indicators

- We made a number of comparisons to determine whether number of executions or trading volume is preferable as a liquidity indicator when using STR as the benchmark.[1]
- The results show that the number of executions has a stronger connection to STR than trading volume.

	Number of executions		Trading volume		Results
	Mean	Median	Mean	Median	
(1) Simple correlation with STR (correlation coefficient)	0.0686	0.0600	0.0705	0.0637	**Trading volume shows stronger correlation.**
(2) Comparison of explanatory power (R^2) using simple regression	0.1083	0.0532	0.1041	0.0496	**Number of executions shows stronger correlation.**

	Probability that only the number of executions was statistically significant	Probability that only the trading volume was statistically significant	Probability that both were statistically significant	Results
(3) Inclusive regression	0.0359	0.0265	0.0872	**Number of executions shows stronger correlation.**

	Mean	Median
(4) ΔR^2 (Additional information from adding trading volume)	0.0727	0.0339

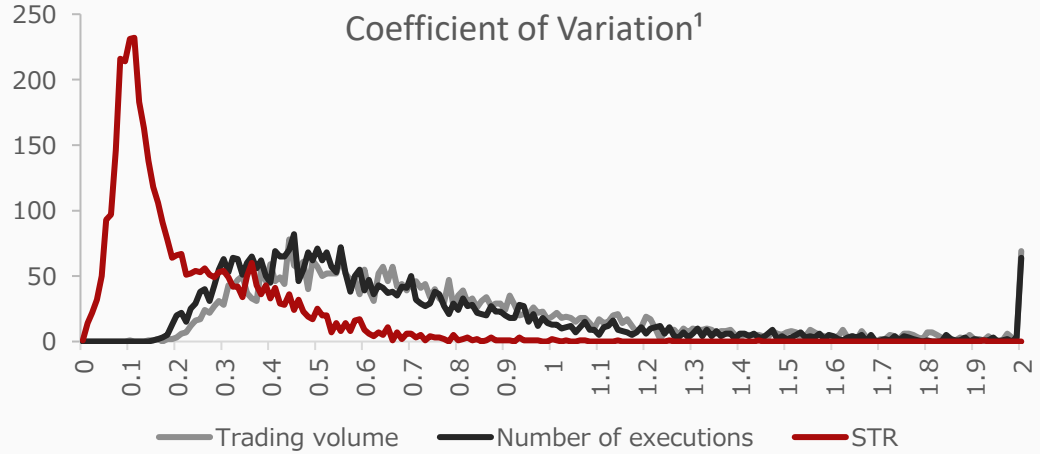
	Number of executions only	Trading volume only	Both simultaneously	Results
(5) Fixed effects model applied to STR using number of executions, trading volume, and both	Within R^2 = 0.0014 (about three times that of trading volume)	Within R^2 = 0.0005	Within R^2 = 0.0015 (almost the same as number of executions only)	**Number of executions shows stronger correlation.**
	Coefficient: Not significant, but t-value is larger than that for trading volume	Coefficient: Not significant	Coefficient: Not significant	**-Trading volume provides almost no additional information. -Trading volume does not have a structural connection to STR.**
	Sign: Negative (theoretically consistent)	Sign: Negative (but not statistically significant)	Sign for trading volume reversed to positive	

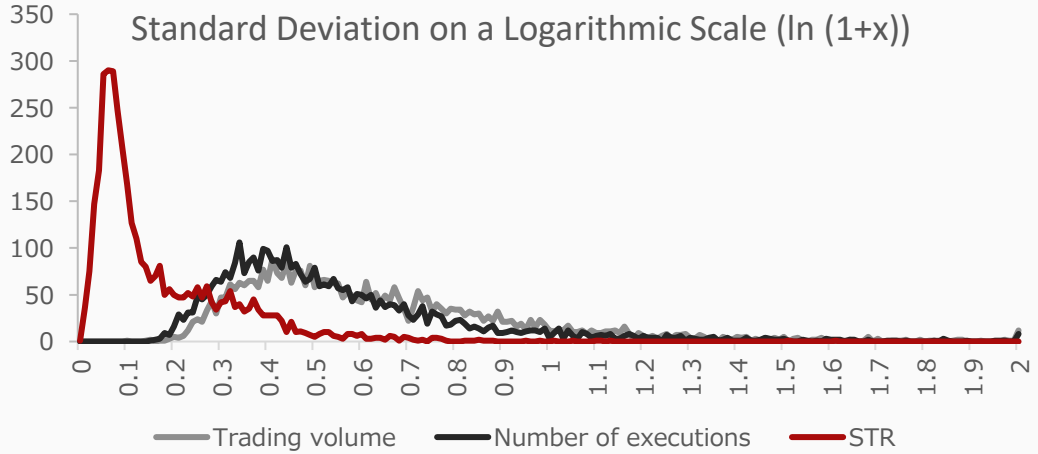
Source: TSE (created based on data from August 2025)

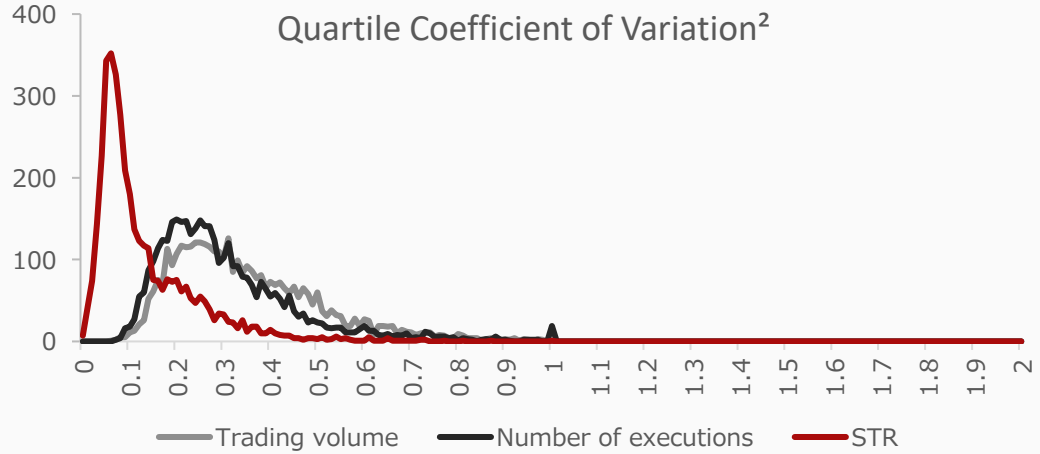
[1] The mean and median values in the table are calculated across all issues with data available during the target period (to exclude issue-specific factors).

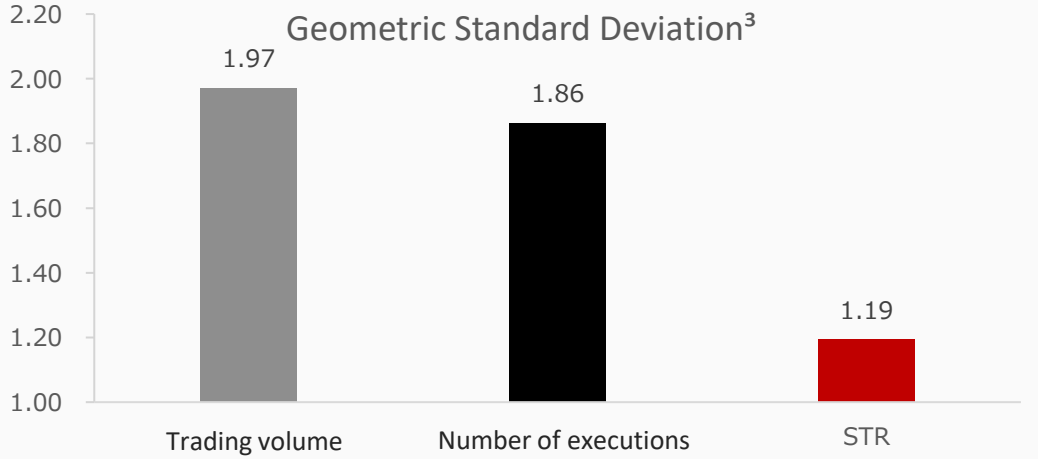
Stability of Liquidity Indicators

- Several methods were used to assess the stability of liquidity indicators. STR was found to be the most stable, followed by number of executions and trading volume.
- When examining the geometric standard deviation, daily fluctuations (1σ) were approximately 97% for trading volume, 86% for number of executions, and 19% for STR.









Source: TSE (Created based on data for August 2025 covering 3,848 issues with ADV of at least JPY 1 million, excluding ETFs/ETNs)

[1] Calculated as standard deviation divided by mean value

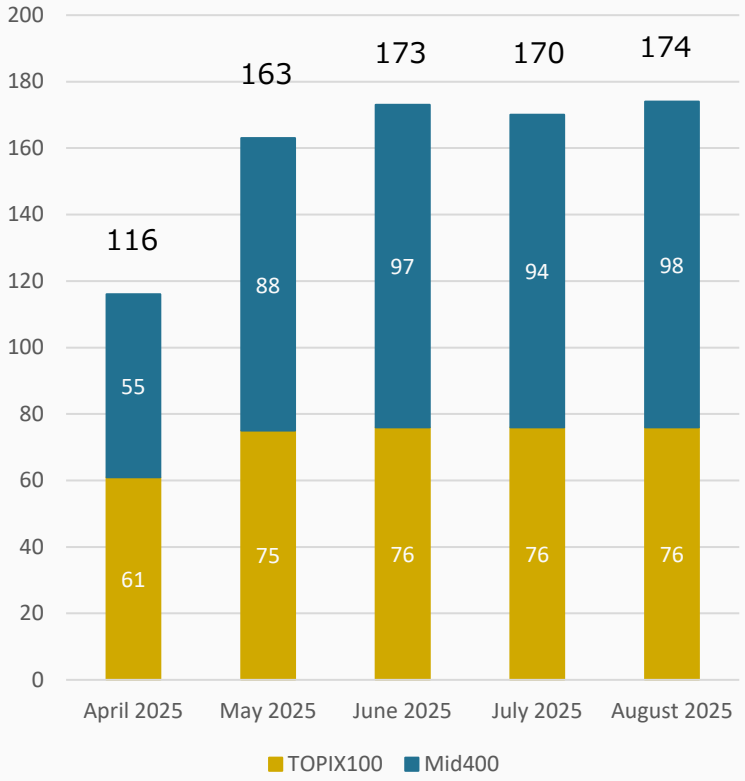
[2] Calculated with $\frac{(Q3-Q1)}{(Q3+Q1)}$ using Q3 (third quartile) and Q1 (first quartile) for each issue

[3] Calculated with $exp\left(SD\left(ln(1+x)\right)\right)$ using the standard deviation on a logarithmic scale

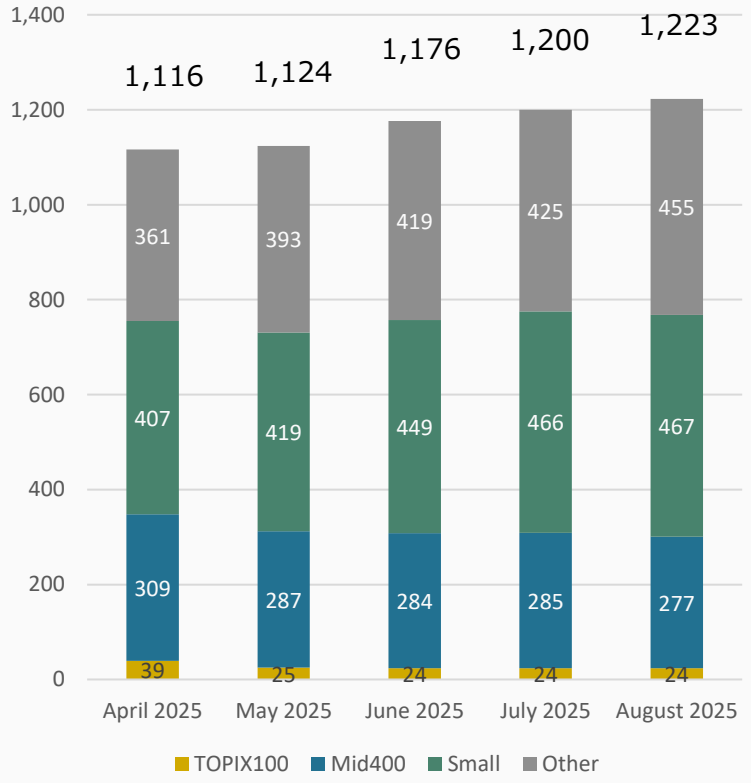
Estimated Number of Issues to Which Each Tick Size Table Will Apply (Monthly)

- We estimated the number of issues, from the current tick size tables, to which each new tick size table will apply each month using the monthly median STRs.*
- While STRs were higher (there were fewer issues in the tick size table A) in April 2025 due to increased volatility from sharp price movements, the number of issues remained generally stable across months.

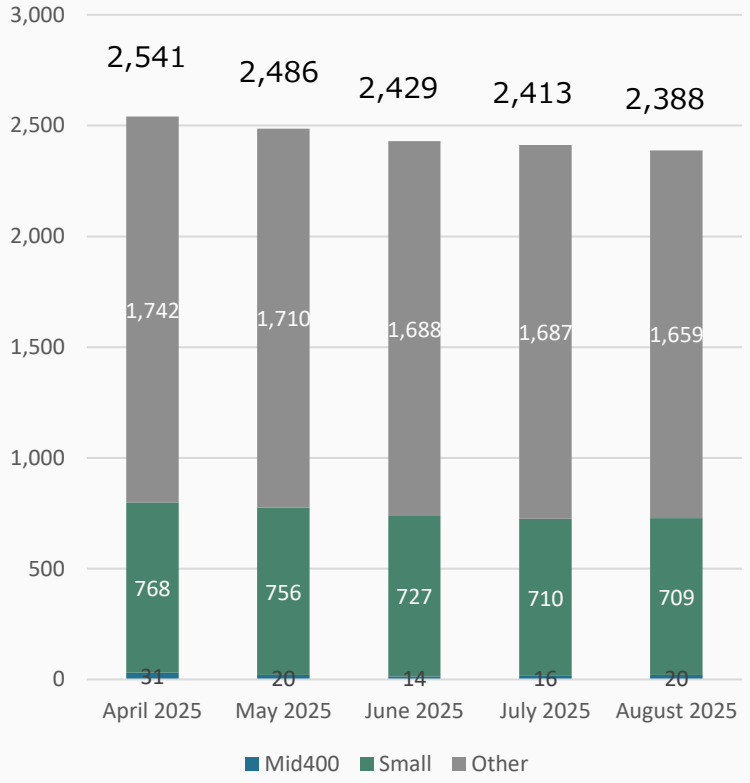
Tick Size Table A (Ultra-High Liquidity)



Tick Size Table B (High Liquidity)



Tick Size Table C (Medium Liquidity)



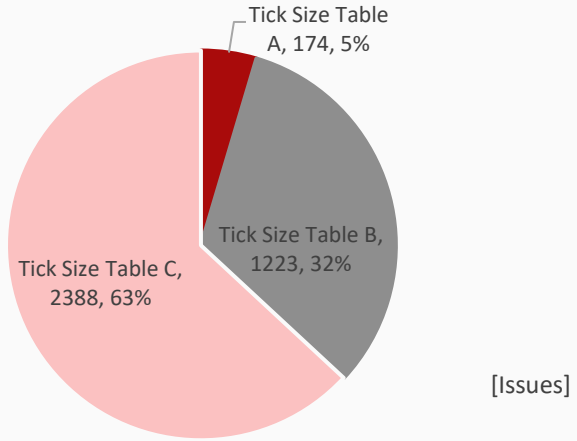
* Excluding ETFs, ETNs, etc. The estimation is based on the following assumptions:
- The tick size table A consists of issues to which the TOPIX 500 tick size table applies whose STR is 1.5 or less
- The tick size table B consists of issues to which the TOPIX 500 tick size table applies whose STR is more than 1.5 up to 5.0, and issues under other tick size tables whose STR is 1.5 or less
- The tick size table C consists of issues to which the TOPIX 500 tick size table applies whose STR is more than 5.0, and issues under other tick size tables whose STR is greater than 1.5.

Number of Issues and Tick Size Changes by Index Category

- For the results as of August 2025 described on the previous page, the number of issues and tick size changes for each index category are shown below:

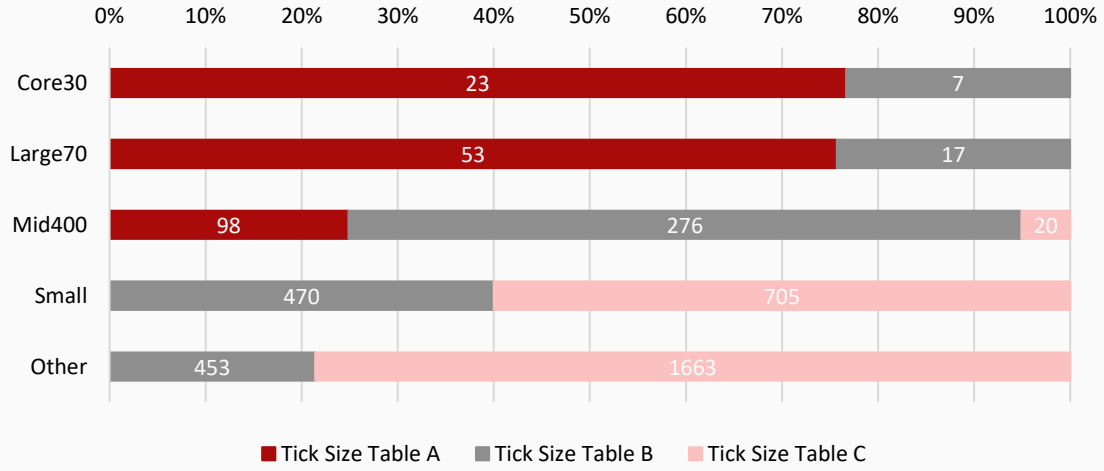
New Tick Size Tables

Breakdown (all issues)

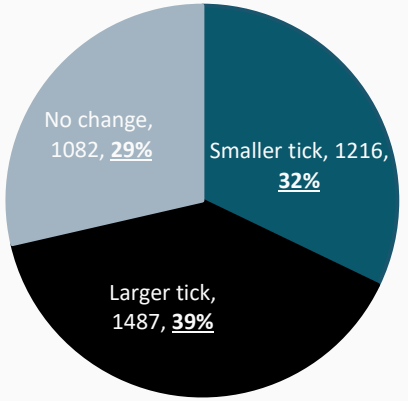


[Issues]

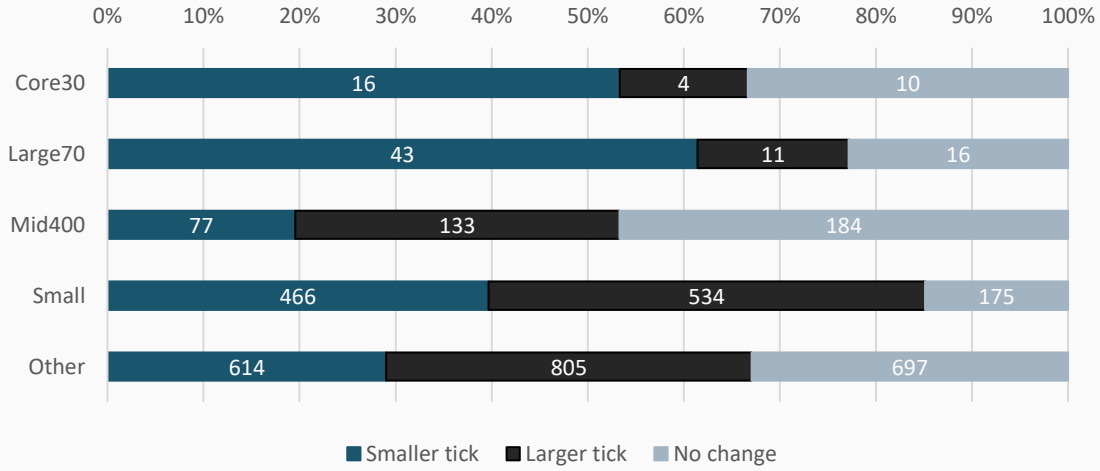
Breakdown (by index category)



New Tick Sizes (Compared to End of August 2025)



[Issues]



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