



JPX's recent challenges

Your Exchange of Choice

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Executive Officer Tokyo Stock Exchange

October 4, 2018

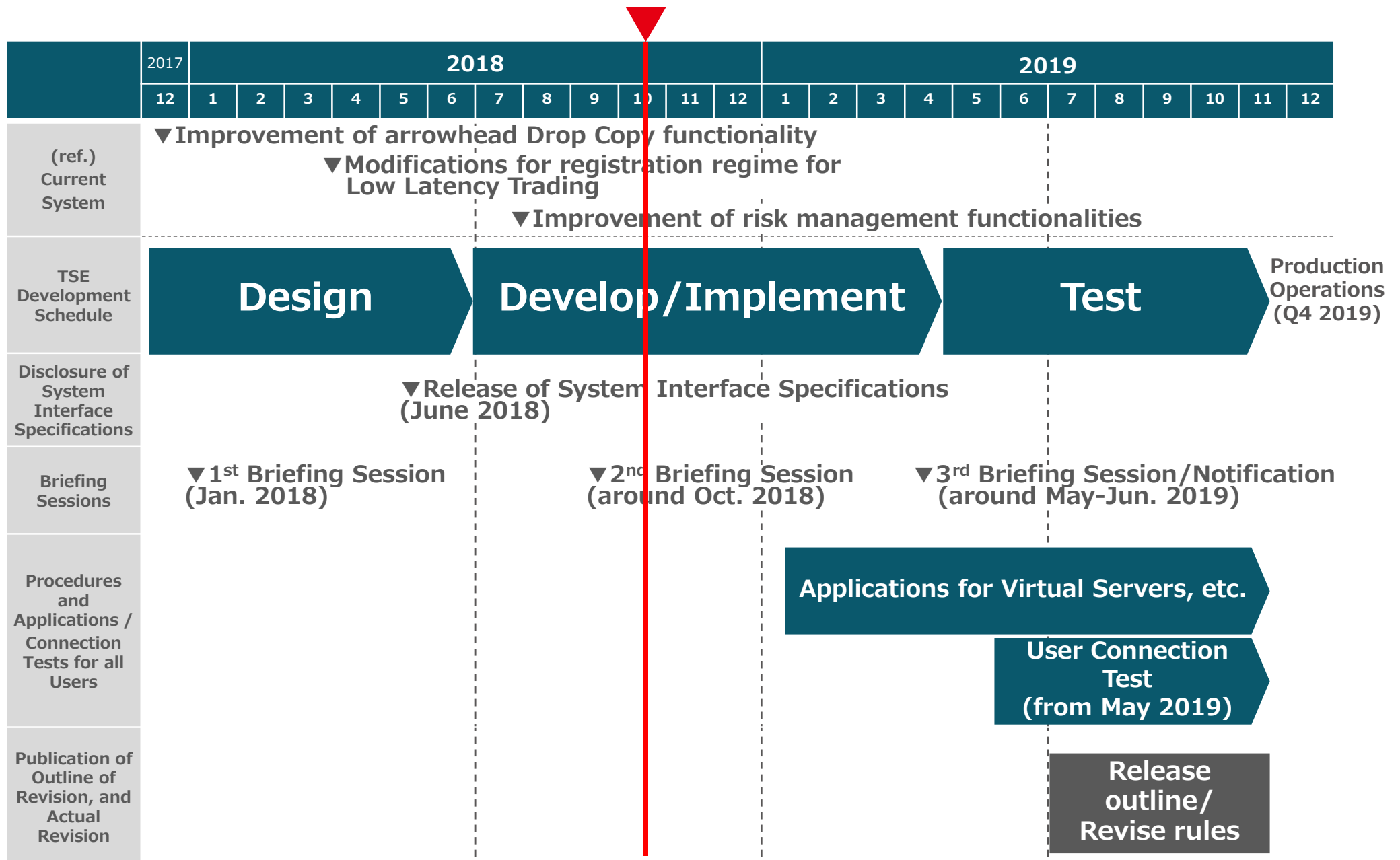
- 1. Stock Market Updates**
- 2. New Index " S&P/JPX Carbon Efficient Index"**
- 3. Situation after introduction of ETF market-making Scheme**
- 4. Derivatives Market Updates**



1. Stock Market Updates



Planned to replace arrowhead in Q4 2019



* The above schedule is tentative and may be subject to change.

Fundamental Principles

Constantly evolve to adapt to advances in information technology, algorithmic trading, and other changes in the environment for securities markets

Increasingly sophisticated and diverse investor needs for trading rules and execution services



Strengthen market functions by revising rules and enhancing trading services to accommodate changes in the market and regulatory environments and the needs of market users

Focus

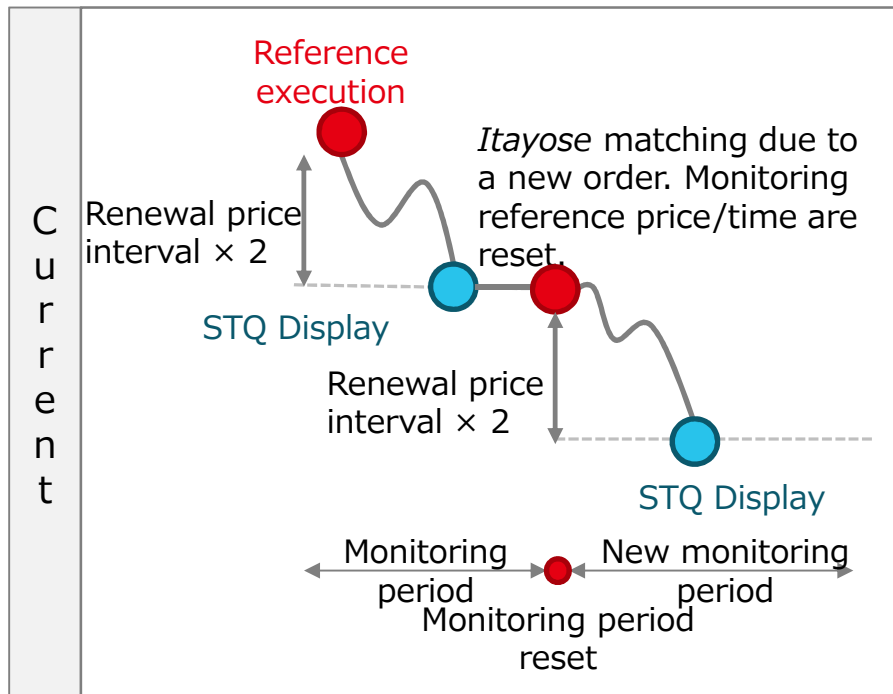
I Improvements to Trading Rules

- Revision of sequential trade quote
- Facilitating the formation of closing prices

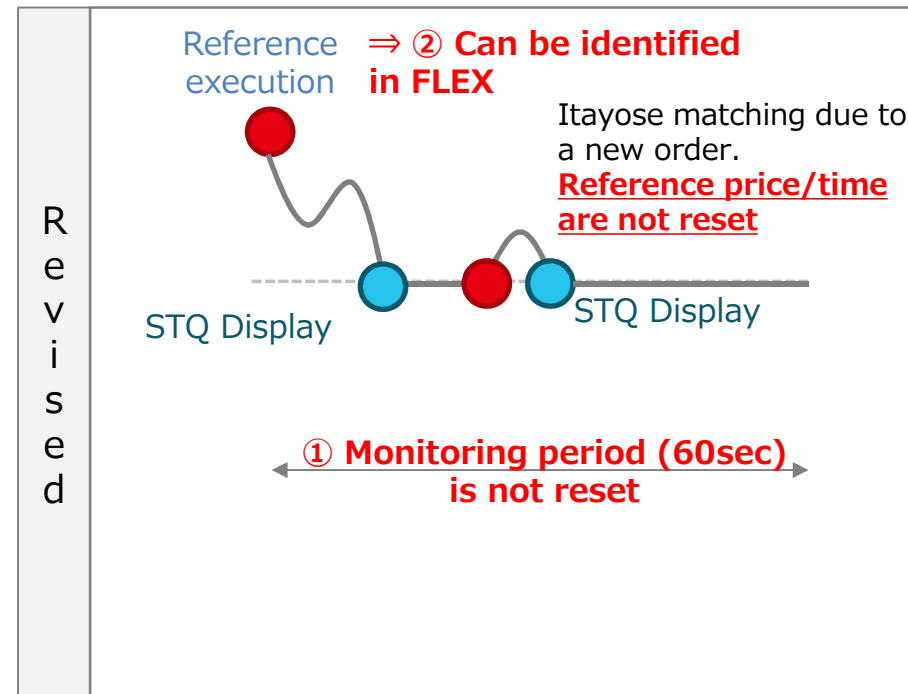
II Enhancement of System Functionalities

- Enhancement of risk management functionalities
- Improvement of environment for user tests
- Enhancement of Processing Capabilities

- To suppress sharp price moves, the Sequential Trade Quote (STQ) will be revised to prevent prices from moving beyond a certain range (2 x renewal price interval) from the reference execution price during the monitoring period (60sec).



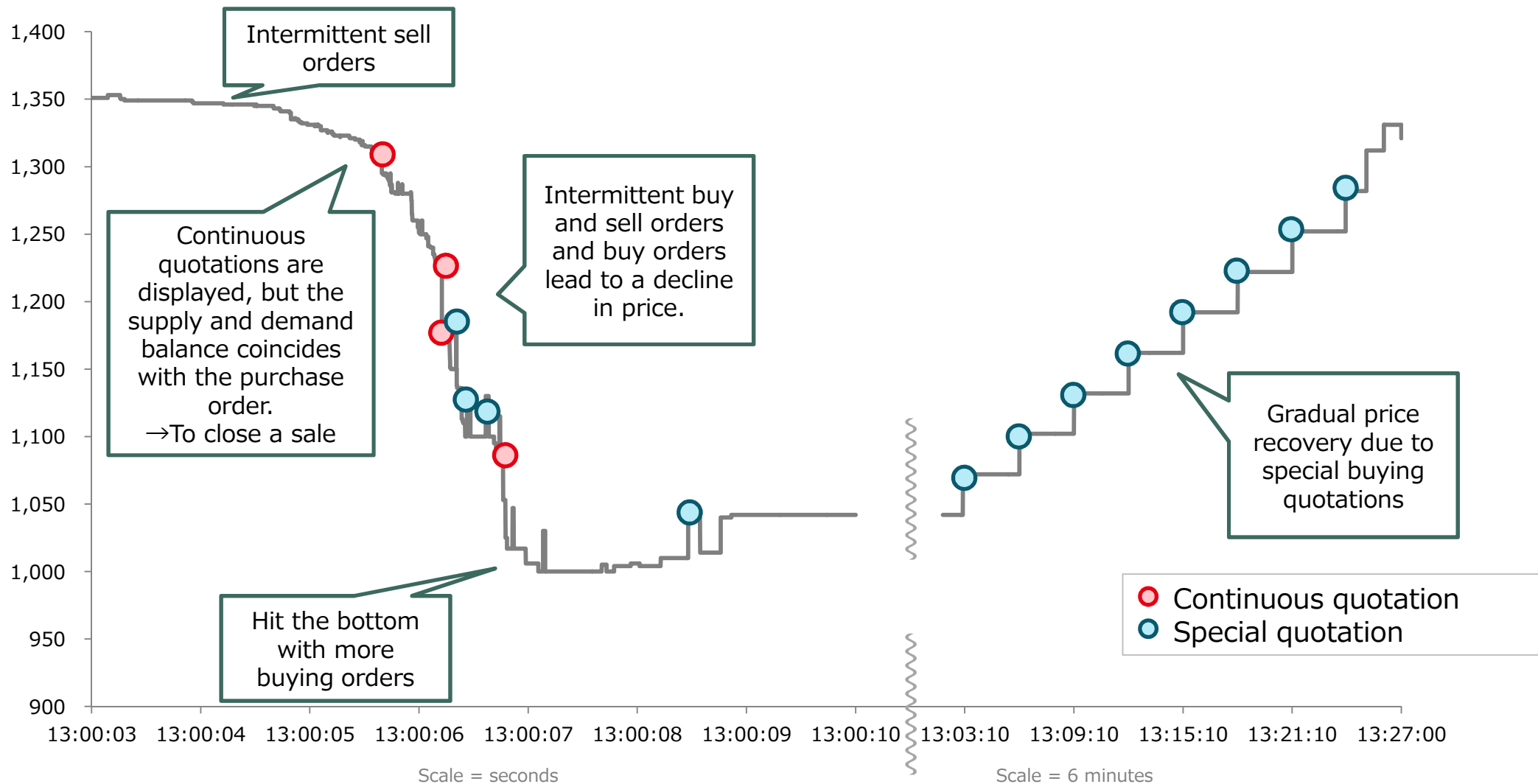
After an STQ is shown, if *Itayose* matching occurs due to a new counter order, the reference price is reset, and further executions can immediately occur beyond the price range for displaying the first STQ.



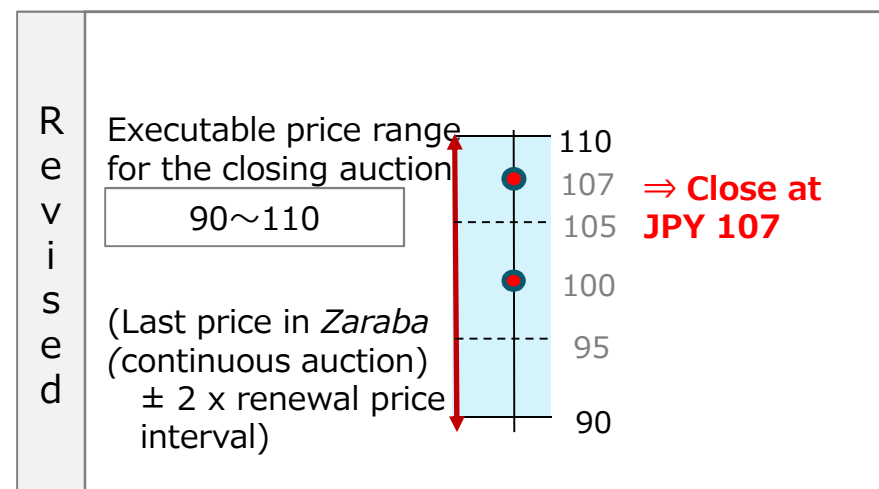
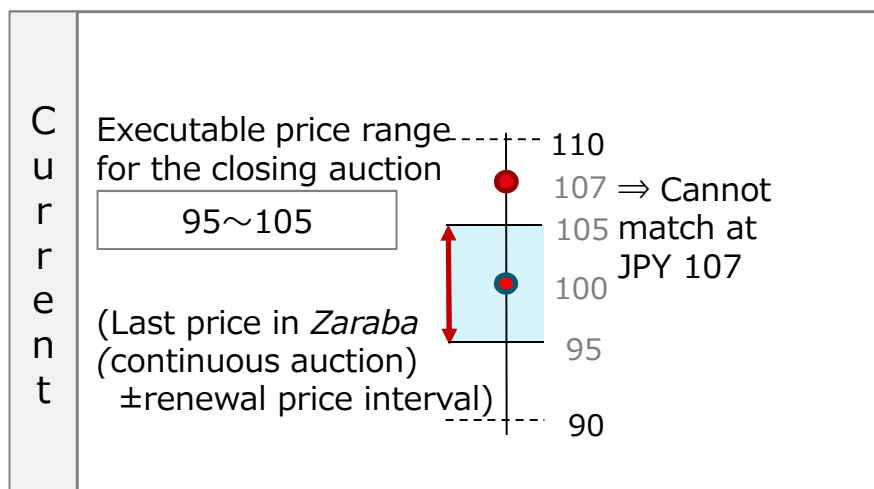
After an STQ is shown, even if *Itayose* matching occurs due to a new counter order, the STQ display price will continue to be the up/down limit for further executions during the 60sec monitoring period.

Example of Sudden Price Fluctuations

- A mechanism (special quotation and continuous quotation) to prevent sudden price fluctuations has been put into operation, but transactions have been completed within a short period of time because the supply-demand balance has coincided with the supply-demand balance by buying and selling orders as well as sell orders.

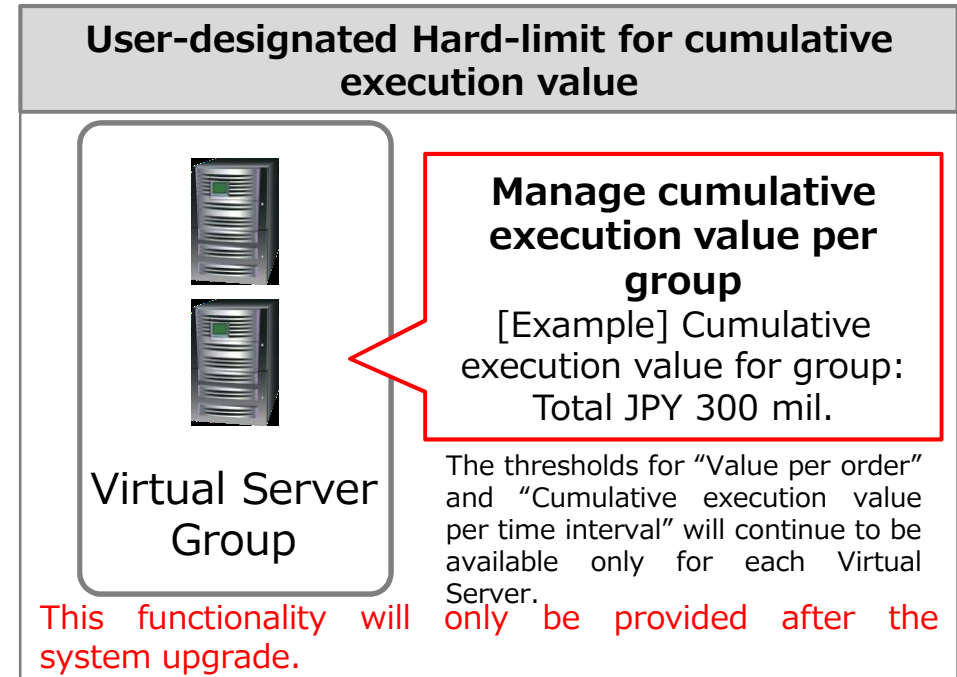
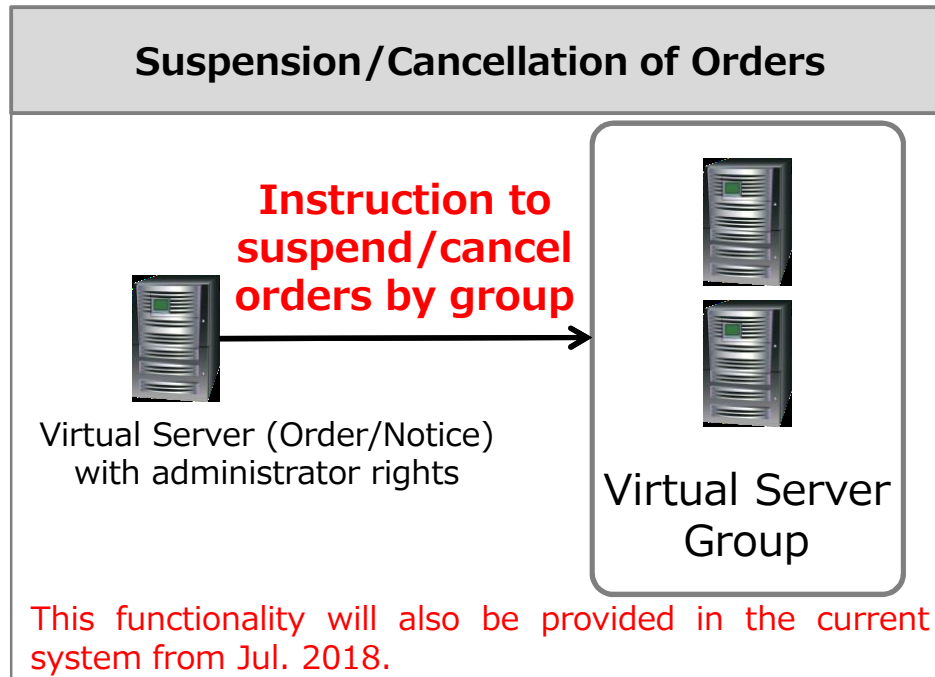


- Due to demand for execution at closing auctions, to facilitate the formation of closing prices, for the closing auction of the afternoon session, TSE will broaden the executable price range to twice the renewable price interval from the last price.
- To prevent sharp price moves near the closing auction, the revised STQ will apply alongside this revised mechanism for the closing price.



Enhancement of System Functionalities① Enhancement of Risk Management

- Trading participants will be able to use Suspension/Cancellation of Orders and User-designated Hard-limit for cumulative execution value for each preset Virtual Server group.



Enhancement of System Functionalities② for User Tests

Improvement of Environment

- To facilitate user system development, improve convenience for User Tests by providing more opportunities for testing on weekdays.

#	Item	Current Weekday Test	Weekday Test after Upgrade
1	Test Availability	Basically, 3 days/week	Basically, all weekdays (except maintenance days)
2	Daily Test Schedule	General schedule (For arrowhead User Online period. For details, please refer to "Connectivity Test User Guide".) ① 7:30 – 17:00 (about twice/week) *Same session schedule as production environment ② 2:15 – 21:30 (about once/week)	Basically provide ② as shown on the left, and provide ① once/week.
3	Test Services (arrowhead/ToSTNeT)	<ul style="list-style-type: none"> All functions available Eligible issues: TSE (including test issues), FSE issues 	<ul style="list-style-type: none"> All functions available Eligible issues: TSE (including test issues), FSE issues (up to 300 issues in total)
4	Test Services (MAINS)	<ul style="list-style-type: none"> All information except high-speed indices (*For Issue Information, index/statistics data, distribute once/week) 	<ul style="list-style-type: none"> All information except high-speed indices (*For Issue Information, index/statistics data, distribute once/week) Fewer FLEX multicast groups due to fewer eligible issues.

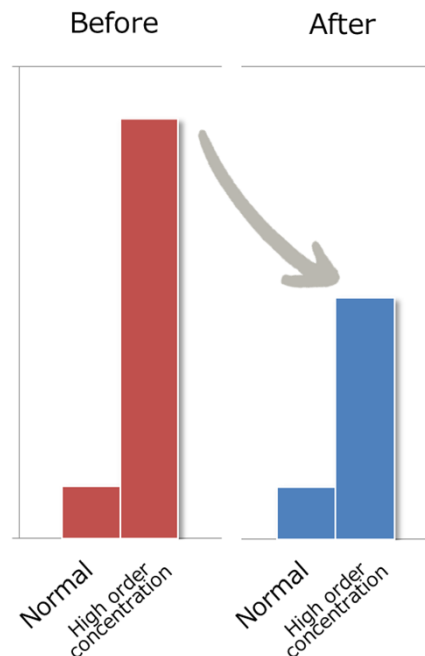
* The above content is tentative. Details will be provided in the 2nd Briefing Session.

[Others]

- After upgrade, Weekday Test will continue to be provided for functional confirmation. Testing related to capacity, etc. will be provided in Holiday Test in the production environment.
- Details on matters including the use of dedicated environment for User Connection Test and fee structure for Agreement on Using Test Environment will be provided in the 2nd Briefing Session.

- To alleviate the tendency toward slower response times during periods of high order concentration, enhance the throughput for order acceptance and executions.

Response times during periods of high order concentration



Alongside enhancing the throughput for order acceptance and execution, we will also enhance the FLEX service performance. Standard (WB) is planned to have similar throughput as FLEX Full (WB).

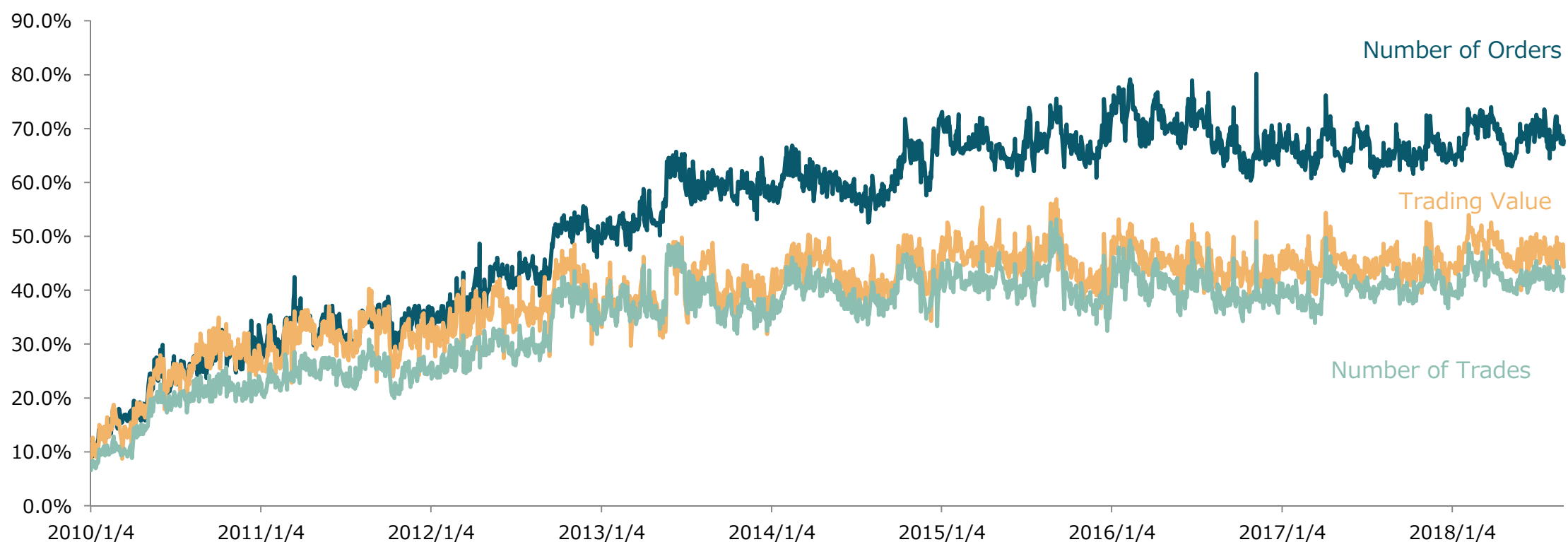
- * Response time per order is expected to be maintained at a similar level.
- * Processing capacity (maximum number of orders per second) will remain unchanged from the current system (320 mil. orders).
- * Information regarding processing capabilities will be available through FAQ and other means.

Status of high-speed transactions

- The presence of high-speed transactions is increasing as IT technology advances and transaction methods become more sophisticated. More efforts are required to ascertain the status of high-speed transactions and to ensure market stability in order to avoid the impact of unforeseen circumstances on the market as a whole.

Collocation ratio

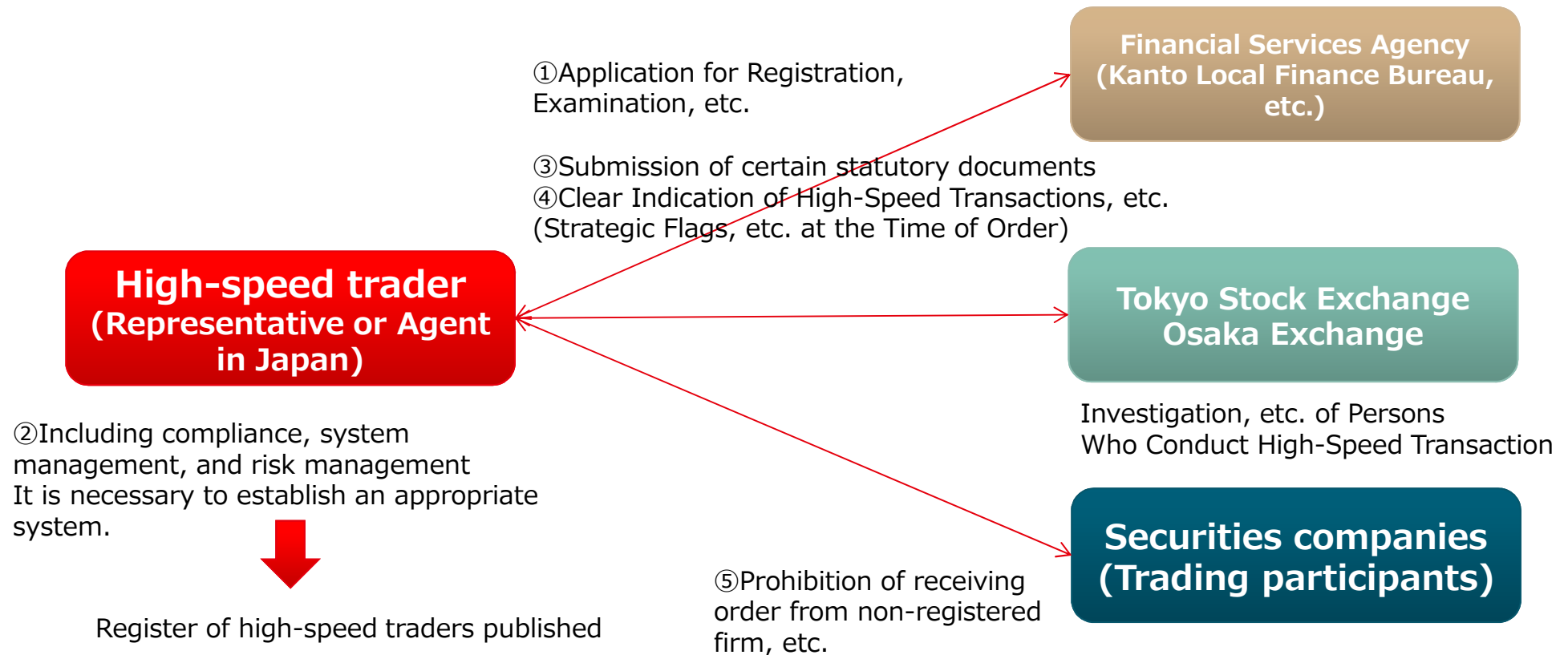
※ Collocation ratio is different from the ratio of high-speed transactions because there are various uses such as improving availability taking into account



Source: Tokyo Stock Exchange

Introduction of HFT registration system

- The registration system for high-speed traders was introduced in April this year.
- A system has been developed to provide for registration of high-speed traders with the authorities, establishment of a business management system, appropriate system management, and clarification of high-speed trades at the time of order placement.



2. New Index

“ S&P/JPX Carbon Efficient Index”



- **GPIF Selected the Index as a New Environmental Index on September 25.**

Index Name	S&P/JPX Carbon Efficient Index
Co-index Developer	S&P Dow Jones Indices (S&P DJI) Tokyo Stock Exchange
Benchmark	TOPIX
Base Date	March 20 th . 2009
Base Value	100 points
Denomination	JPY and USD
Carbon-to-Revenue Footprint	Expressed as tons of carbon dioxide equivalent (CO ₂ e), divided by annual revenues
Environmental Data Provider	Trucost
Controversies Monitoring	RepRisk Index (RRI) provided by RepRisk.

Constituents Screening Process and Weighting

Eligible Universe

The constituents of the underlying index "TOPIX"

Non-existing constituents of the S&P/JPX Carbon Efficient Index as of the rebalancing reference date are subject to a liquidity screen of YEN ¥50 million based on their three-month median daily value traded.

<Criteria 1>

All companies certified as a 'High Non-Disclosing Carbon Emitter' are excluded.

<Criteria 2>

All companies reported by RepRisk to violate the RRI indicator threshold of 75 are excluded.

Constituent Weighting

1st Step Disclosure Status

Companies are further divided into those that have been identified by Trucost as having sufficiently disclosed their carbon emissions and those that have not.

2nd Step Decile Classification

Decile thresholds are determined for each GICS® industry group based on the carbon-to-revenue footprints of companies in the S&P Global LargeMidCap. Using these thresholds, every company in the eligible universe is then classified, into its 'S&P Carbon Global Standard' decile.

3rd Step Industry Group Classification.

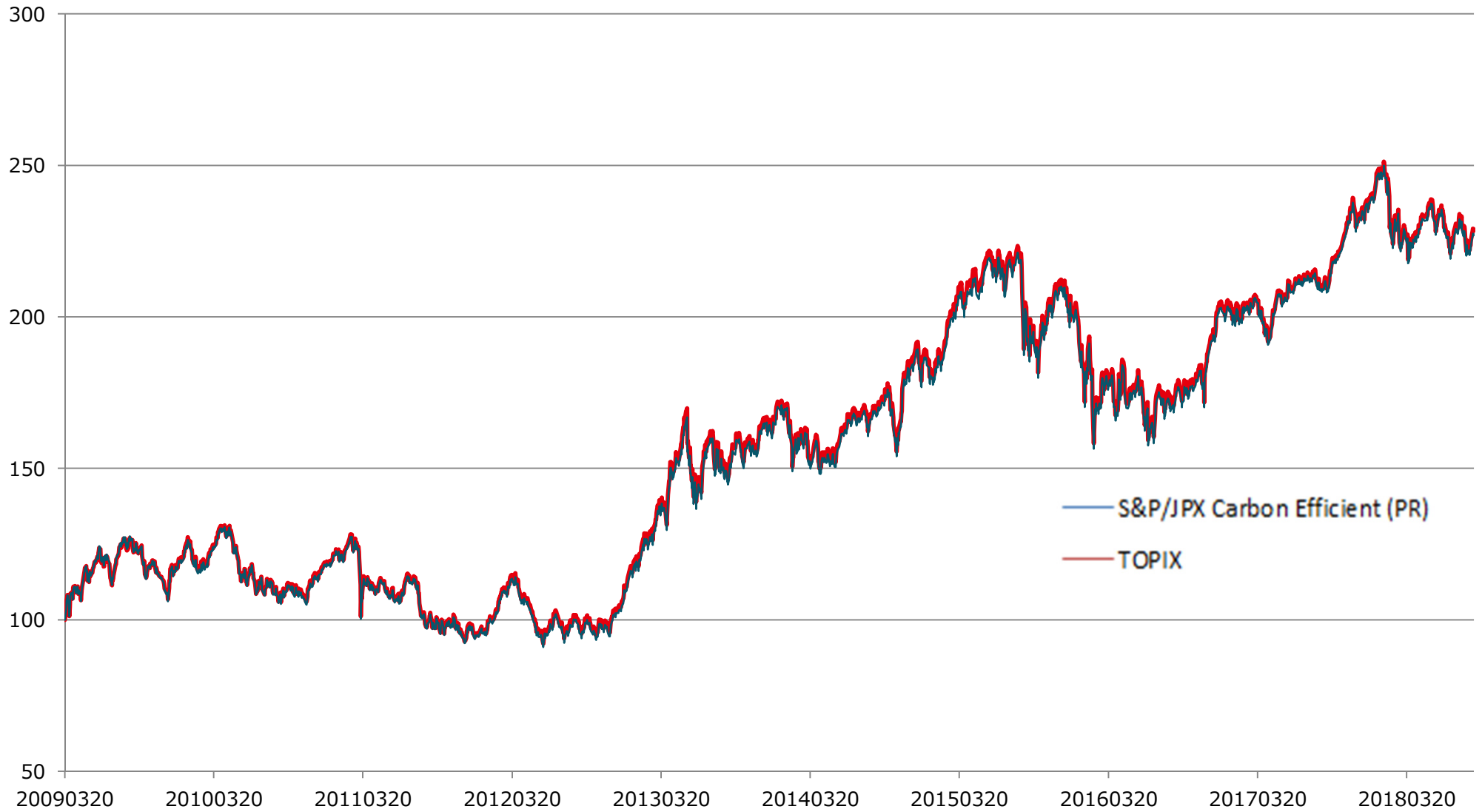
Each industry group is identified as high, mid or low impact. This classification is based on the range of carbon-to-revenue footprints across the companies within that industry group in the S&P Global LargeMidCap. The range for each industry group is calculated as the spread between its first and last decile threshold.

The index seeks to maintain the respective GICS® industry group weights of the underlying index as of the rebalancing reference date.

Weight Adjustment Table

			Industry Group Impact Factor		
			Low x0.5	Mid x1	High x3
Decile Classification	Disclose Status	Decile Weight Adjustment	Carbon Weight Adjustment		
1st Decile	Disclosed	40%	20%	40%	120%
	Non-disclosed	30%	15%	30%	90%
2nd Decile	Disclosed	30%	15%	30%	90%
	Non-disclosed	20%	10%	20%	60%
3rd Decile	Disclosed	20%	10%	20%	60%
	Non-disclosed	10%	5%	10%	30%
Other	Disclosed	10%	5%	10%	30%
	Non-disclosed	0%	0%	0%	0%
8th Decile	Disclosed	0%	0%	0%	0%
	Non-disclosed	-10%	-5%	-10%	-30%
9th Decile	Disclosed	-10%	-5%	-10%	-30%
	Non-disclosed	-20%	-10%	-20%	-60%
10th Decile	Disclosed	-20%	-10%	-20%	-60%
	Non-disclosed	-30%	-15%	-30%	-90%

Performance



3. Situation after introduction of ETF market-making Scheme

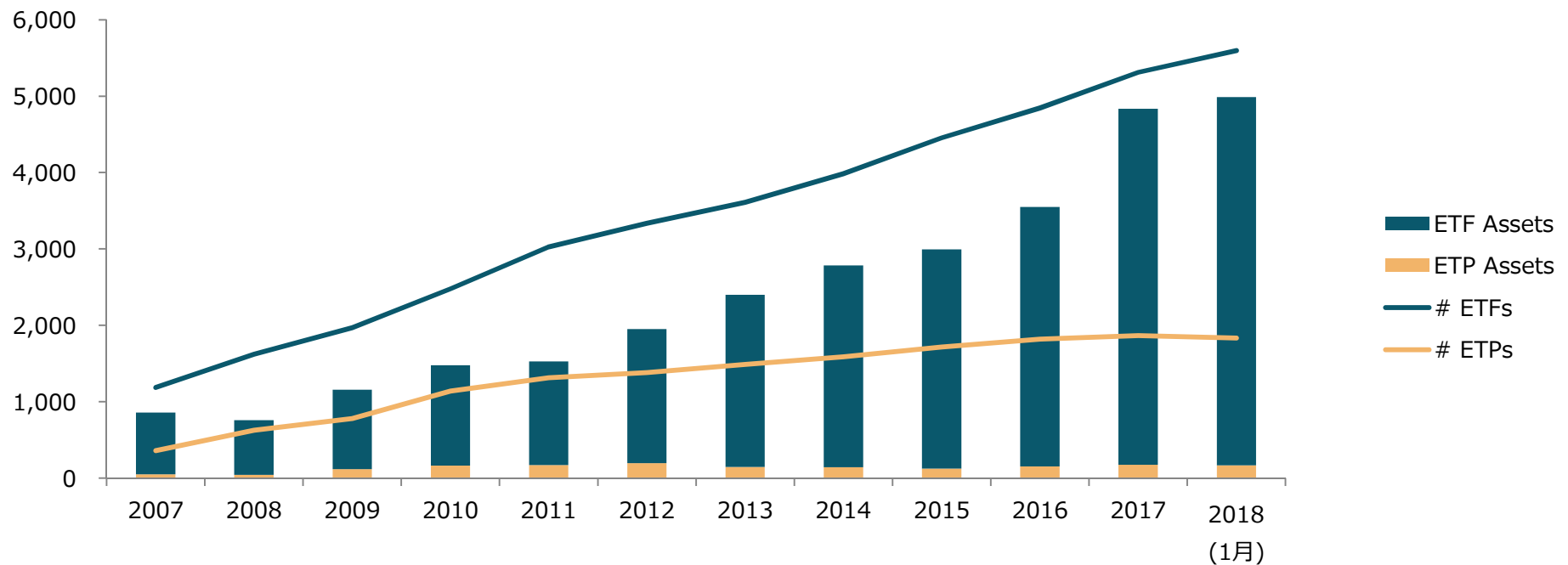


Current state of the global ETF market

- The use of ETFs has increased significantly worldwide. The \$5 trillion mark is exceeded.
- It is expected that this will expand in the future as passivity advances.

(10Billions of dollars)

AUM and Number of ETFs Worldwide

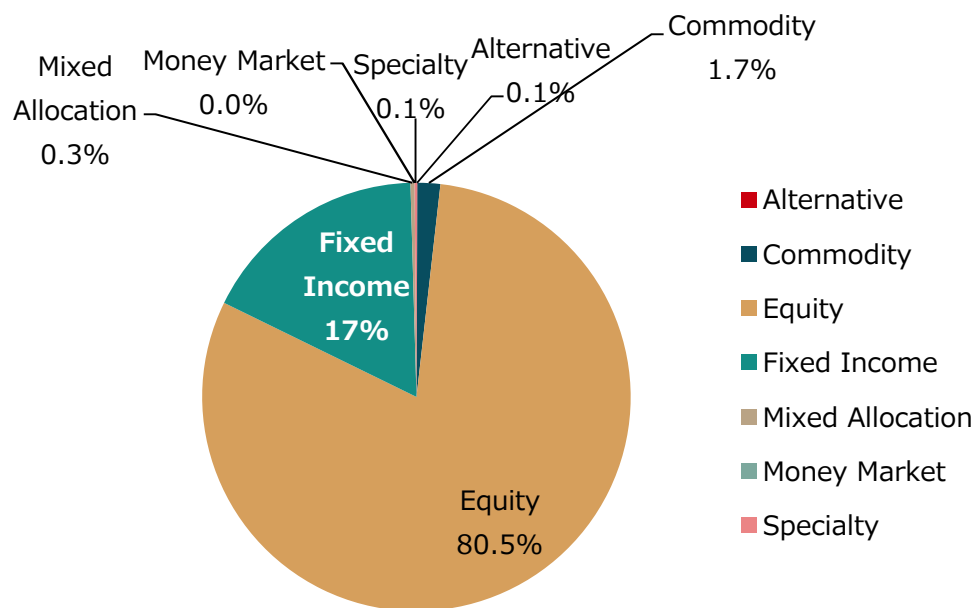


Source : ETFGI

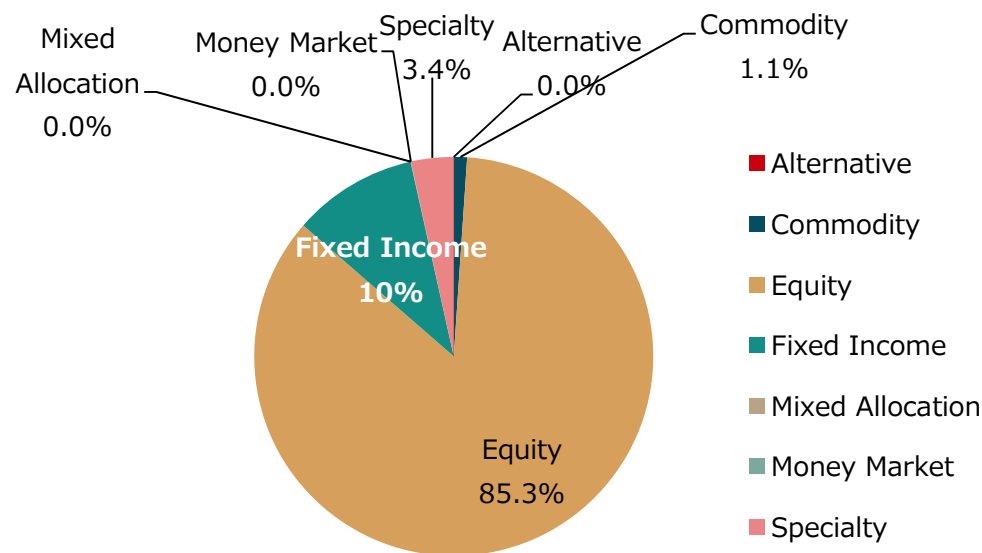
States in United States (AUM/ADV by Asset Class)

- Fixed Income products account for about 20% of AUM, although equities are the mainstay
- Investment abroad also accounts for a certain proportion

AUM by asset class



Average Daily Trading Value by asset class



(Million USD)	US	Other	Total
Alternative	570	2,553	3,123
Commodity	6,795	59,991	62,786
Equity	2,188,928	767,227	2,956,155
Fixed Income	569,487	66,596	636,083
Mixed Allocation	6,980	3,971	10,861
Money Market	18	0	18
Specialty	3,896	1,407	5,304
Total	2,728,159	897,745	3,674,328

(Million USD)	US	Other	Total
Alternative	3	11	14
Commodity	691	1,445	2,136
Equity	55,443	15,392	70,835
Fixed Income	6,579	748	7,327
Mixed Allocation	26	15	41
Money Market	0	0	0
Specialty	2,237	61	2,298
Total	64,979	17,672	82,651

Source: Bloomberg. As of September 7, 2018. Average daily trading value is six months. VIX, etc. are classified as Specialty.

Reason for expansion of ETF Market

- The market is expected to expand as ETFs are selected for four main reasons

Advantages of ETFs

Easy	<ul style="list-style-type: none">• Be executed like shares• Same order-settlement process for any product
Liquidity/ Speed to execution	<ul style="list-style-type: none">• Can price immediately• Be liquid enough to fill large orders• Most processes are computerized
Market access/ Product assortment	<ul style="list-style-type: none">• Easy access to corporate bonds and products that are not easily accessible even by institutional investors• Provide products suitable for investment purposes
Low commissions and low execution costs	<ul style="list-style-type: none">• Lower execution costs• Low commissions compared with other products

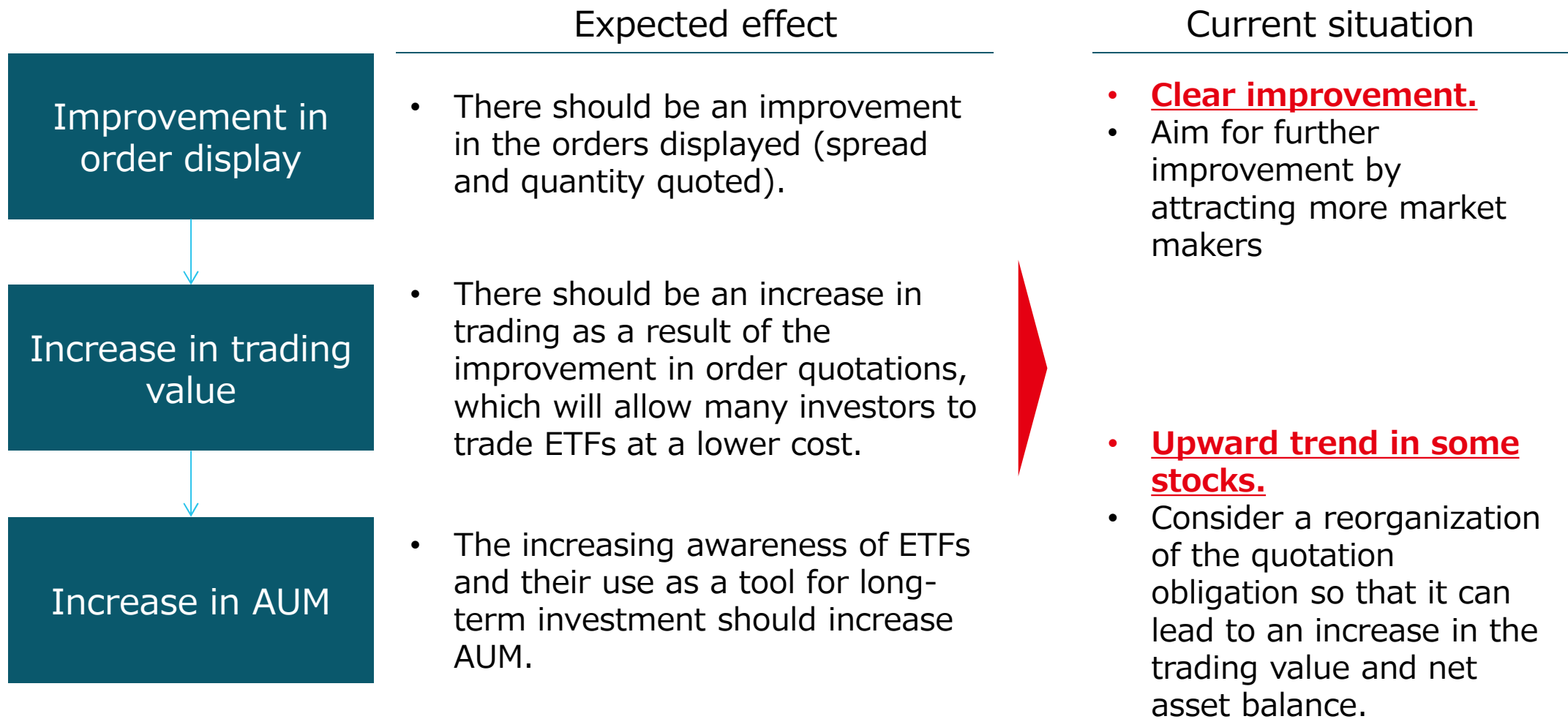
The ETF Market Making Scheme Has Begun!

- The TSE launched the ETF Market Making Scheme on July 2.
- Currently, 5 market makers are providing liquidity for **108 ETFs**.

Market makers	<ul style="list-style-type: none"> ● Nomura Securities ● Mitsubishi UFJ Morgan Stanley Securities ● Flow Traders ● Optiver ● Vivienne Court Trading 	
Outline of the scheme	Obligation	<ol style="list-style-type: none"> ① 30 or more ETFs (20 or more low-liquidity ETFs) ② Spread: 20 bps (TOPIX, etc.)-50 bps (foreign ETFs) ③ Volume: JPY 5 mil. (foreign ETFs) to JPY 30 mil. (TOPIX, etc.) ④ Quote display time: 80% or more of continuous session
	Incentive	<ul style="list-style-type: none"> ● Reduction/exemption of fees according to transaction value, number of orders, etc.
ETFs with Market Makers	<ul style="list-style-type: none"> ● As liquidity has tended to concentrate in ETFs linked to the major Japanese stock indexes, the program focuses on ETFs linked to a wider variety of indexes & assets. Participants are specifically required to make markets in lower-liquidity ETFs. ● The introduction of the scheme enables ETFs to be better utilized as a tool for long-term/diversified investment. <ul style="list-style-type: none"> ※ 20 market-based ETFs, 24 industry ETFs, 6 size-based ETFs, 22 thematic ETFs, 10 fixed income ETFs, 9 foreign equity ETFs, 11 domestic and foreign REIT ETFs, 3 commodity ETFs and others are eligible. 	

Details of the scheme are available on the TSE website.

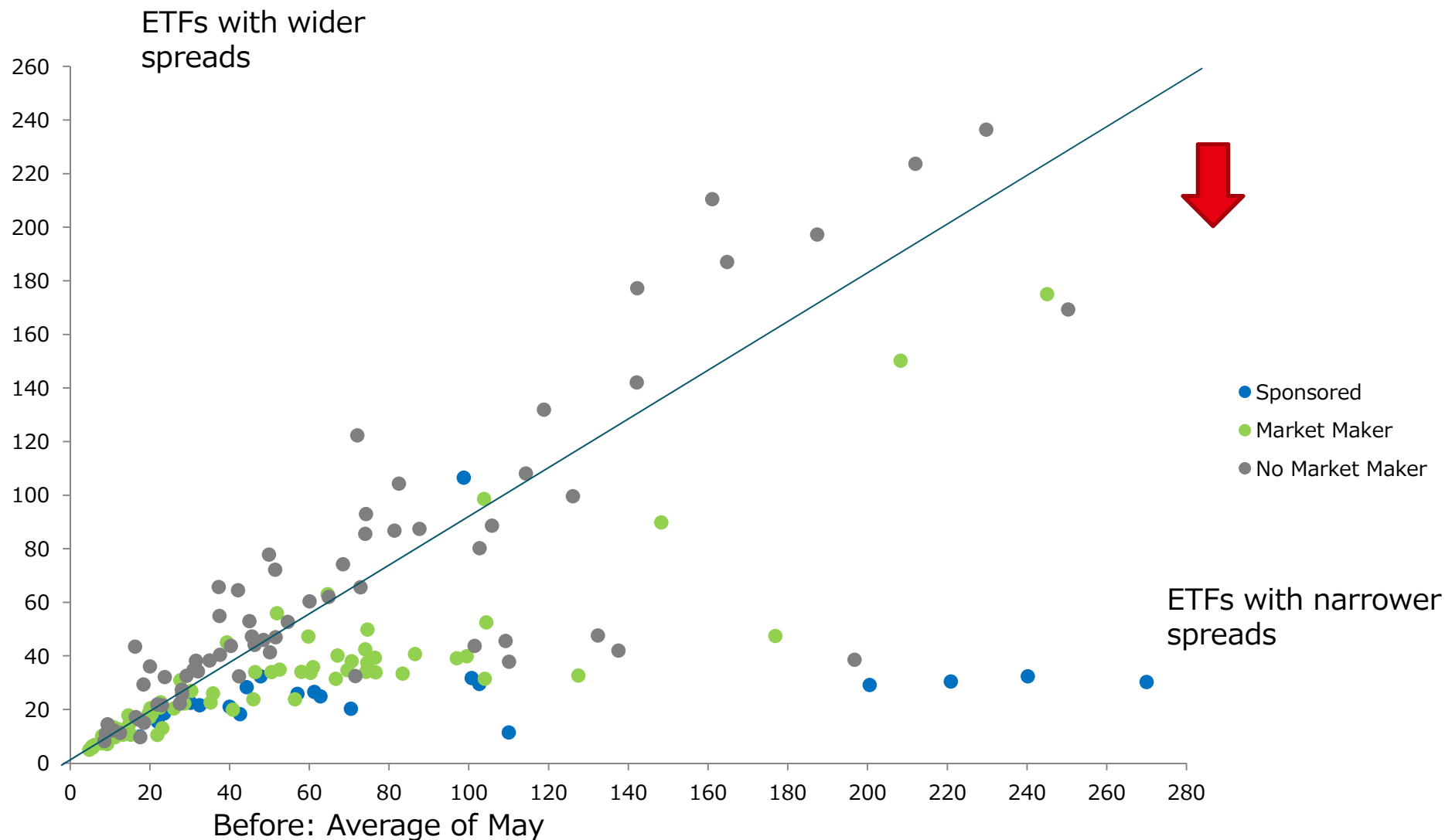
- It is expected that the introduction of this system will improve quote and lead to increase in trading value/AUM
- There has been a clear improvement in quotes
- Will continue to make improvements through system revisions and other measures in the future



Improvement in Order Display

- The spreads of many ETFs with market makers are clearly shrinking.
- Spreads decreased in 77 of 97 ETFs. *4 ETFs were newly listed in July and cannot be compared.

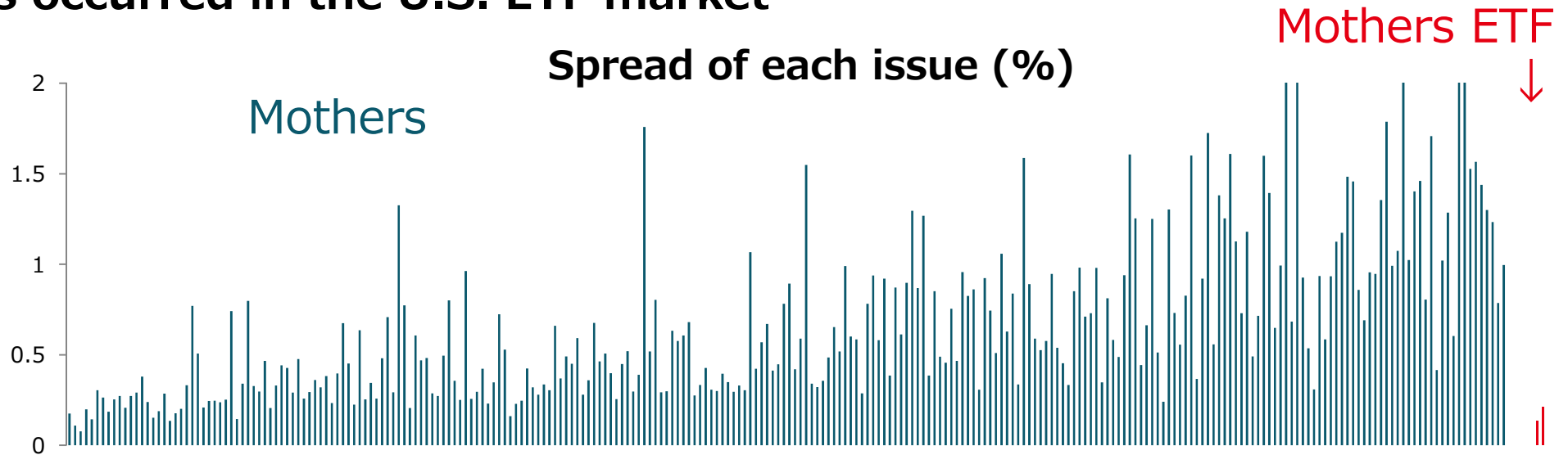
Status of the spread (bps)



Source: TSE

Spread relative to underlying asset (Mothers)

- For Mothers, the spread is tighter for ETFs, except for the top stocks.
- To a "lower ETF execution cost than the underlying asset" situation as occurred in the U.S. ETF market



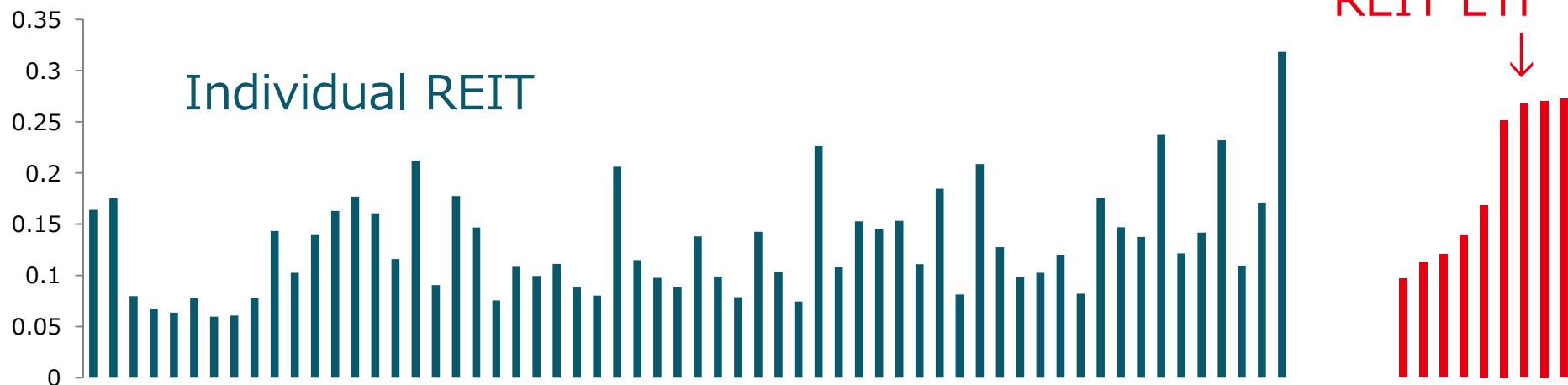
	Name	Spread (%)
4385	Mercalli	0.175
4565	Sosei Group	0.110
2121	Mixi	0.077
4592	SunBio	0.198
7779	CYBERDYNE	0.144
	Average(Simple average)	0.674
	Average (Weighted Average)	0.350
1563	Mothers Core Listed Investment Trusts	0.135
2516	TSE Mothers ETF	0.210

Source: Bloomberg. Value design(3960) & dream vision(3185) are excluded from the constituents because spreads are not measurable. The 10-day average spread as of August 31 is used. Individual stocks rank by weight in the TSE Mothers Index.

Spread relative to underlying asset (REIT)

- Similar circumstances occur in REIT and REIT ETFs

Spread of each issue (%)



Name	Spread (%)
8951 Nippon Building Fund Inc.	0.164
8952 Japan Real Estate Investment Corporation	0.175
3462 Nomura Real Estate Master Fund Investment Corporation	0.080
8960 United Urban Investment Corporation	0.068
8953 Japan Retail Fund Investment Corporation	0.064
Average(Simple average)	0.131
Average (Weighted Average)	0.120
1343 NEXT FUNDS TSE REIT Index-Linked Listed Investment Trusts	0.097
1476 IShares J REIT ETF	0.112
1345 Listed index fund J-REIT (Tokyo Stock Exchange REIT Index) bimonthly distribution type	0.121

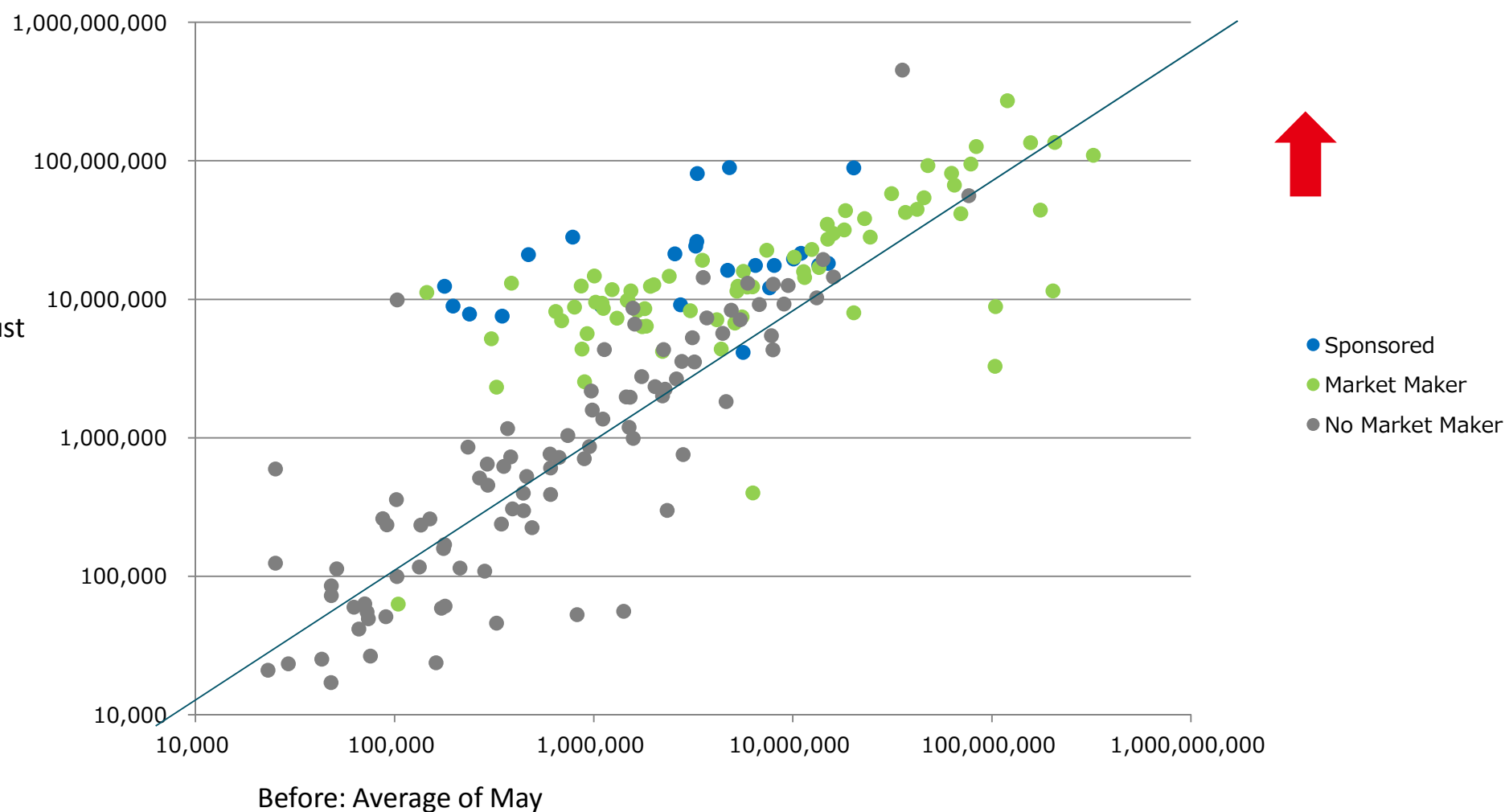
Source: Bloomberg.

The 10-day average spread as of August 31 is used. The stocks listed on the TSE REIT Index are listed in descending order of weight.

Improved Depth

- There is a clear increase in order quantity at BBO for several ETFs.
- Especially, order quantity at BBO of mid-small ETFs are significantly increased.

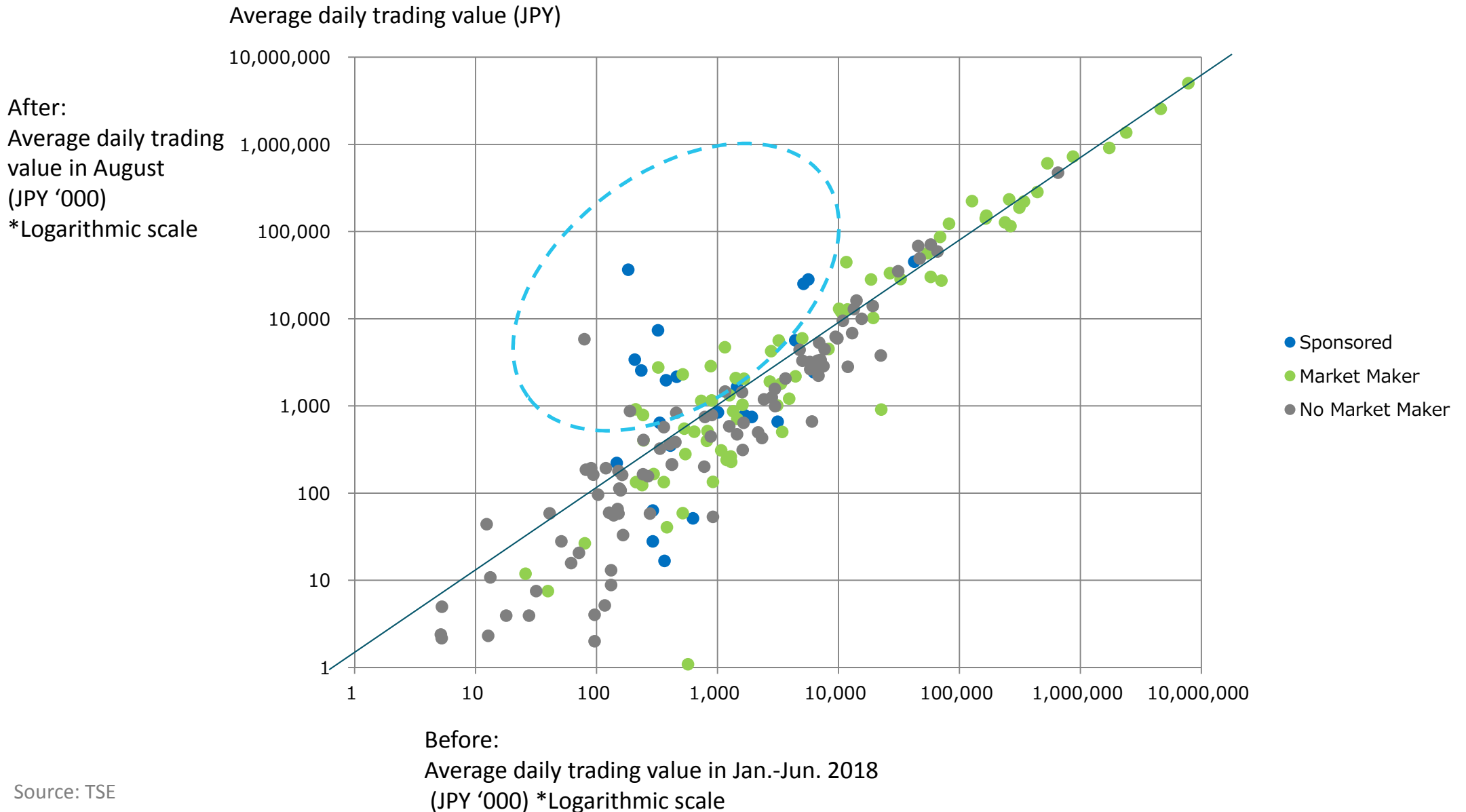
Average order quantity at the best price (JPY)



Source: TSE

Increase in Trading Value

- The overall trend is somewhat difficult to see, but the trading value of several ETFs has in fact increased.



Source: TSE

Trading Value (Ranking)

- Some of illiquid ETFs have increased their trading value with the introduction of the system.

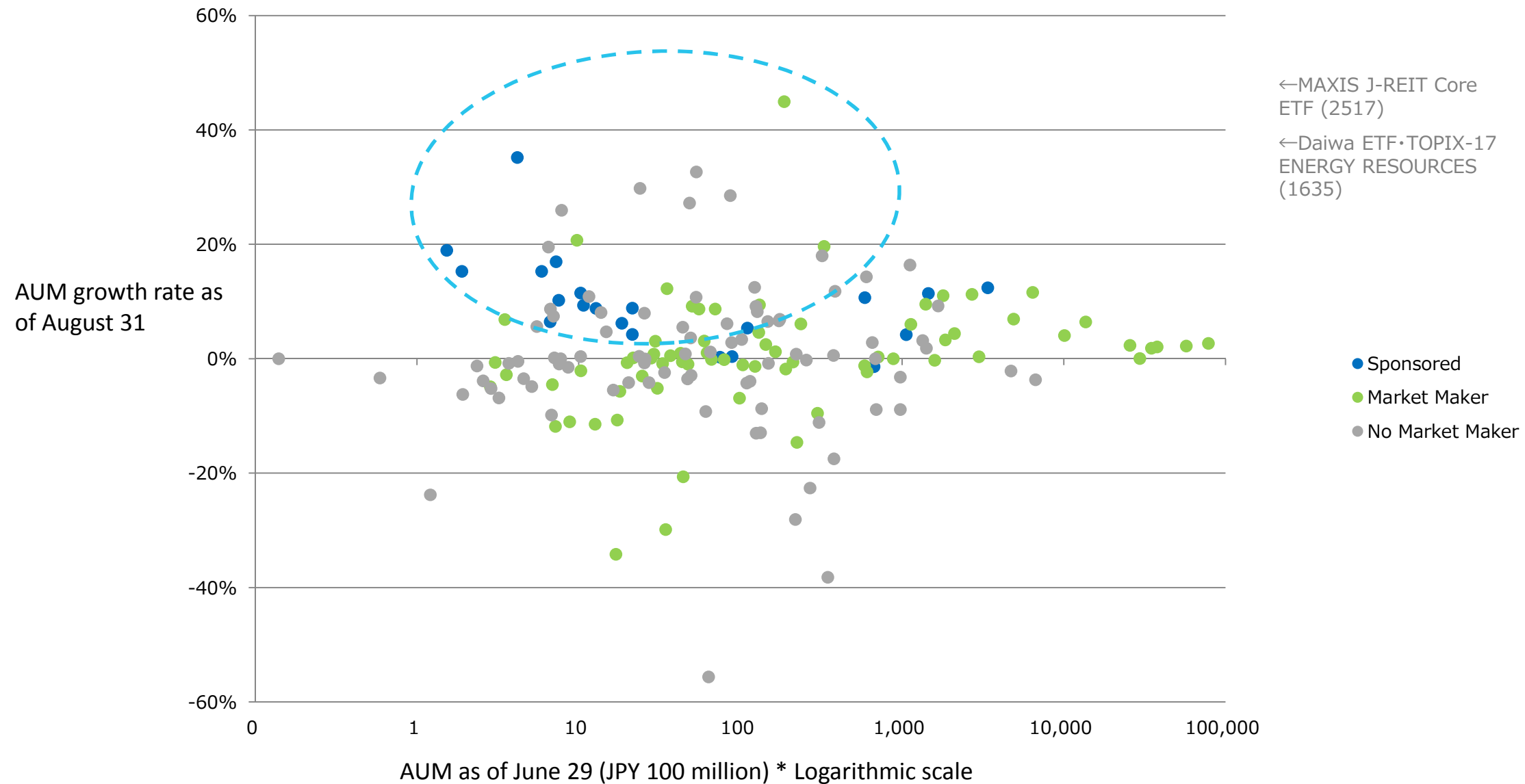
ETFs with a high rate of increase in trading value

Code	Name	Category	Asset manager	Daily Average Trading Value (Jan.-Jun. 2018)		Daily Average Trading Value (Jul.-Aug. 2018)
1474	One ETF JPX Nikkei 400	Japanese stocks by market	Asset Management One	183,196		28,291,043
1490	Listed index fund MSCI Japanese stocks with low dividends Volatility (β -Hedging)	Enhanced	Nikko Asset Management Co., Ltd.	515,786		11,744,109
1652	Daiwa Listed Investment Trusts-MSCI Japanese Equity Female Activity Index (WIN)	Japanese Stocks by Theme	Daiwa Asset Management	207,026		2,731,943
1635	Daiwa Listed Investment Trust TOPIX-17 Energy Investments Source	Japanese stock (by industry)	Daiwa Asset Management	322,190		3,849,239
1399	Listed index fund MSCI Japanese stocks with low dividends Volatility	Japanese Stocks by Theme	Nikko Asset Management Co., Ltd.	324,224		2,704,008

Source: TSE

Increase in AUM

- While no clear trend has emerged as of yet, the AUM of some ETFs has increased.



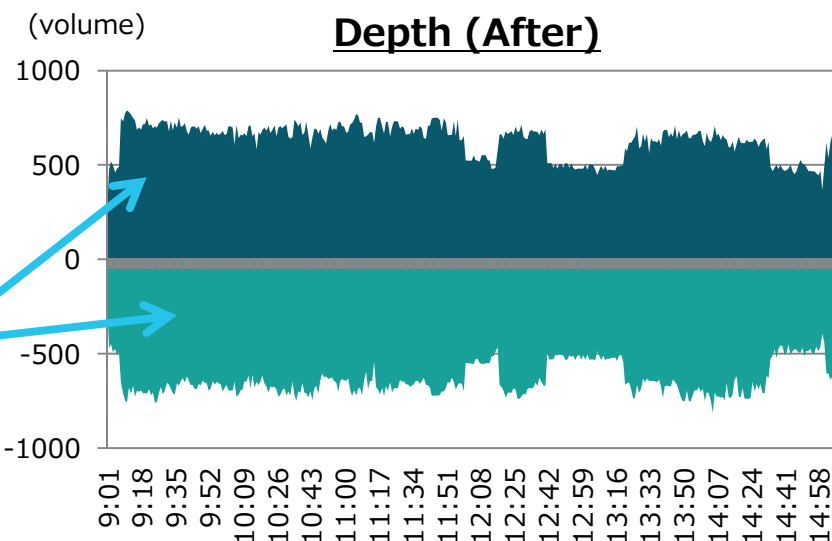
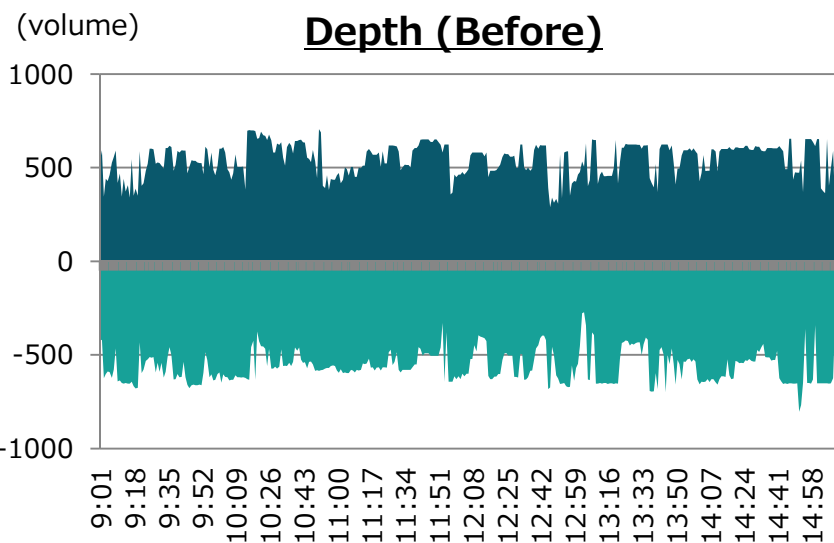
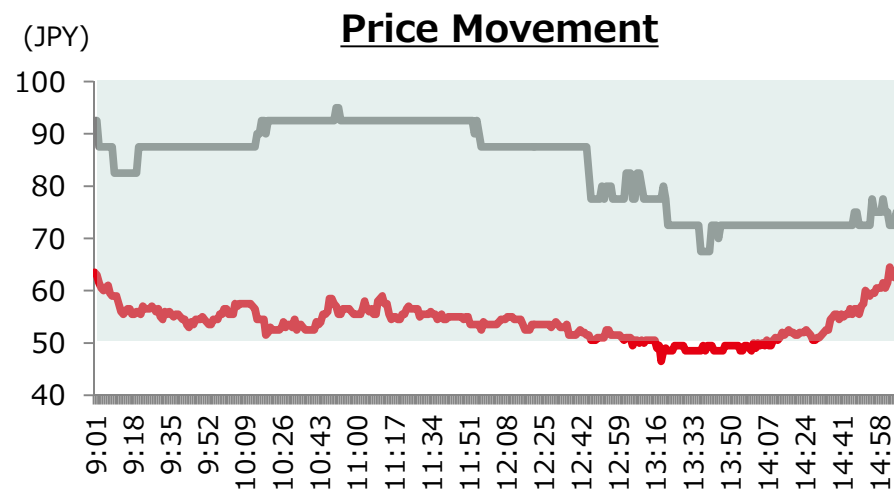
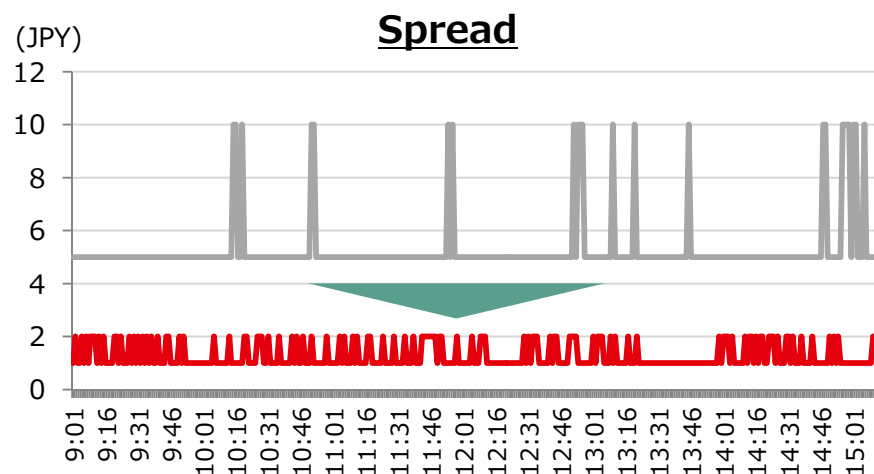
Source: Bloomberg

4. Derivatives Updates



Nikkei 225 Options Revision of tick size and effect

- On July 17, 2018, tick size of Nikkei 225 options with a premium of over ¥50 and up to ¥100 was reduced from 5 yen to 1 yen.
- Through this review, market participants' convenience was improved, such as optimization of pricing and improvement of execution costs, and liquidity of the Nikkei 225 Options Market was improved.



* Nikkei 225 Options (Aug. 2018 JPY 21,250) before and after the revision date

- **Primary Market Makers of Nikkei 225 Options**

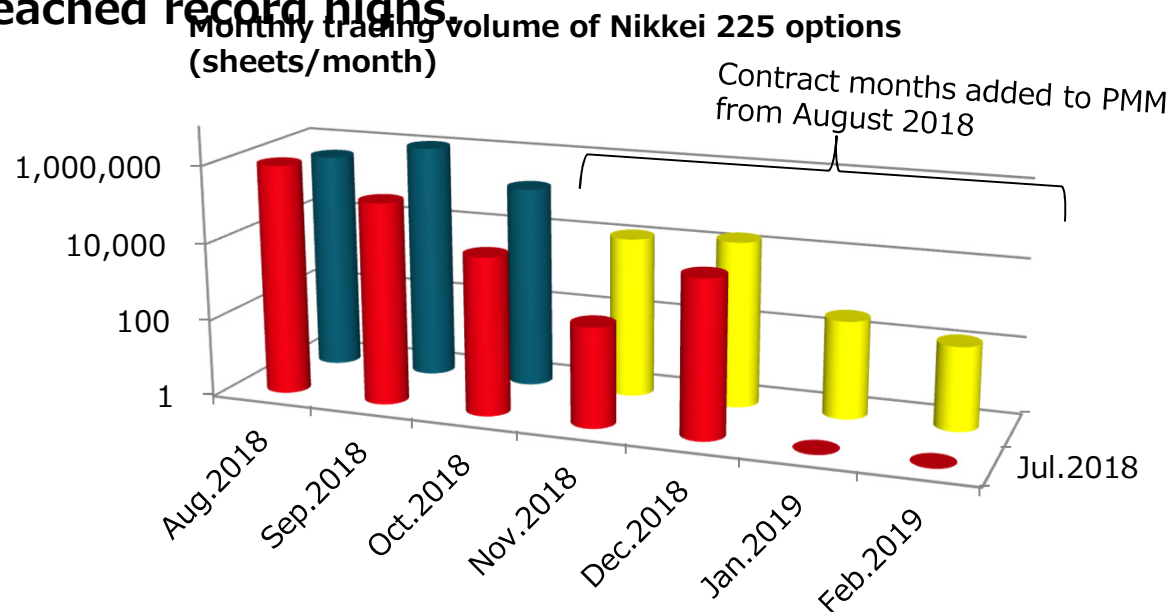
From August 2018, the third to sixth contract months were added to the months subject to quotation by primary market makers.

⇒ Trading volume of far months on the screen has been increasing since the same month.

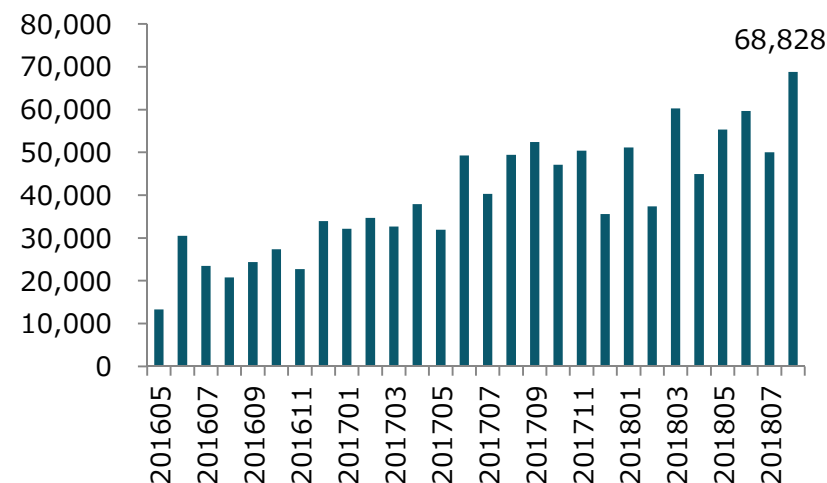
- **Trading of Nikkei 225 Weekly Options**

Trading volume has increased as a short-term risk hedge against market fluctuations

⇒ In August 2018, in response to market fluctuations stemming from the U.S.-China trade issue and the Turkish problem, daily(Aug. 16) and monthly transaction volume reached record highs.



Nikkei 225 Weekly Options Trading Volume (Including Outstanding Options) (May 2016-August 2018) (contracts/month)



Introduction of Flexible Options

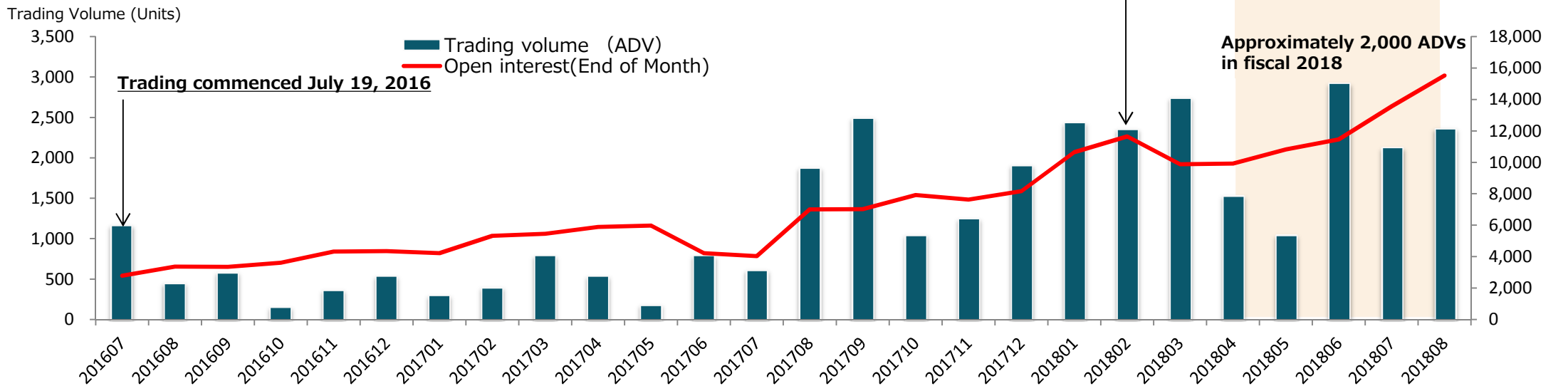
- Products that combine the flexibility in terms and creation of OTC transactions with the stability, transparency, and convenience of exchange transactions
- Introduced on June 25, 2018. Tradable off-screen (J-NET).

	Normal options	Flexible options	OTC options
Underlying	Index: Nikkei 225, TOPIX, JPX-Nikkei 400 229 individual securities	Index: In addition to the left column, TSE REIT Index and Banking Index Individual Stocks: Left	Not limited
Maturity	SQ only (2nd Friday of each month)	Freely creation on a daily basis	Freely creation on a daily basis
Strike price	Predetermined increment ※Nikkei 225: 125 yen increment	Freely creation by decimal point	Freely available for creation
Final settlement	Index: SQ Settlement Individual stock: delivery in kind	Index: SQ Settlement/Closing Settlement Individual stock: spot delivery/closing price settlement	Freely available for creation
Counterparty Risk	Central clearing in JSCC Have no counterparty risk	Central clearing in JSCC Have no counterparty risk	Avoid counterparty risk
Margin	Calculated SPAN as listed	Calculated SPAN as listed (Offset with standard options)	Subject to new margin requirements (Relative Margin Payment/Receipt)
Trading Contract	Exchange-traded contract (Exchange Rules + Account creation Agreement)	Exchange-traded contract (Exchange Rules + Account creation Agreement)	ISDA Contracts (in English)
Settlement price	The exchange and JSCC calculate and publish the results on a daily basis.	The exchange and JSCC calculate and publish the results on a daily basis.	N/A

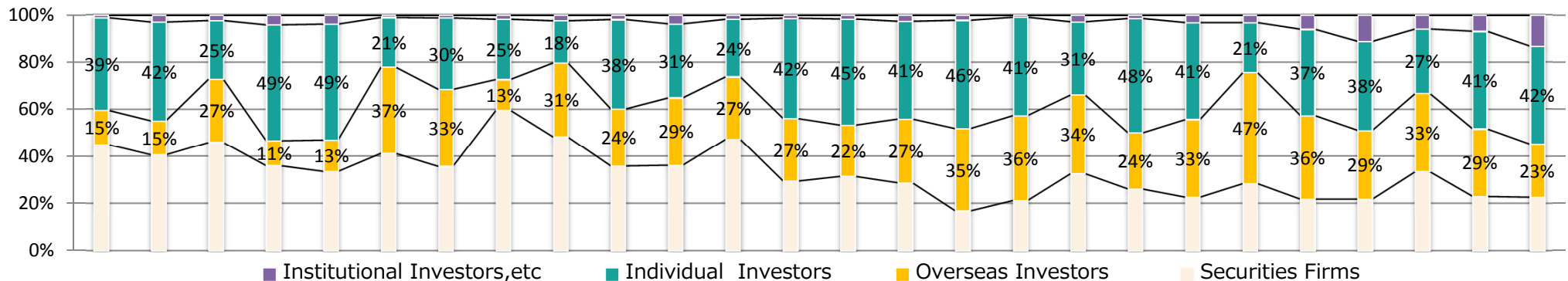
TSE Mothers Index Futures-From Start to Present

- The TSE Mothers Index futures market, which began trading in July 2016, has increased both in volume and open interest in the past two years. In February 2018, the TSE Mothers ETF, which was established based on futures, was listed, and the flow of institutional investors via ETFs was expanded.
- The flow of domestic investors was the majority at the start of trading, but in recent years, the ratio of overseas investors has diversified to 30-40%.

Trading volume and open interest



Changes in the percentage of investors





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