

JPX WORKING PAPER

Impact of Tick Size Pilot Program on Trading Costs at Tokyo Stock Exchange



January 2015
Tokyo Stock Exchange, Inc.
Masafumi Kondo*

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1. Background

- ✓ Changed tick sizes for TOPIX100 constituents in January and July 2014 in Phases 1 and phase 2 of a pilot program, with Phase 3 scheduled for September 2015.
- ✓ First attempt at TSE on decimal pricing and changing tick sizes for only a certain group of issues.
- ✓ Narrower tick sizes were expected to lower trading costs for high-liquidity issues.

History of Tick Size Revisions at Tokyo Stock Exchange

Price (JPY)	1985/12/02	1998/04/13	2000/07/17	2008/07/22	2010/01/04	2014/01/14*	2014/07/22*		
Above Up to 1,000	1	1	1	1	1	1	0.1		
1,000 ~ 2,000	10	5	5	5	5		0.5		
2,000 ~ 3,000		10	10	10	10		1		
3,000 ~ 5,000		50	50	50	50		5		
5,000 ~ 10,000		100	100	100	100		10		
10,000 ~ 30,000	1,000	1,000	1,000	1,000	1,000	100	100		
30,000 ~ 50,000								500	500
50,000 ~ 100,000				10,000	10,000	10,000	10,000	1,000	1,000
100,000 ~ 300,000	10,000	10,000	10,000	10,000	10,000	1,000	1,000		
300,000 ~ 500,000								5,000	5,000
500,000 ~ 1 million				50,000	50,000	50,000	50,000	5,000	5,000
1 million ~ 3 million				100,000	100,000	100,000	100,000	10,000	10,000
3 million ~ 5 million									
5 million ~ 10 million									
10 million ~ 20 million									
20 million ~ 30 million									
30 million ~ 50 million									
50 million ~									

Note: Only TOPIX100 constituents

2.1 Outline of Analysis

- ✓ Analyzed trading cost of TOPIX100 constituents after tick size change based on Implementation Shortfall.
- ✓ Grouped TOPIX100 constituents by price bands based on tick size changes.
- ✓ Divided issues into test groups A, C, and D, and control groups B and E for the two phases.
- ✓ Compared changes in trading cost benchmarks of the groups during the one-month periods (20 business days) before and after the tick size changes based on FLEX Full market data.

Groups and Tick Sizes

Price (JPY)	Other Issues	TOPIX100 Constituents Phase 1 (2014/01/14)		TOPIX100 Constituents Phase 2 (2014/07/22)	
Above	1	1	Group B (62)	0.1	Group C (24)
Up to 1,000				0.5	Group D (56)
1,000 ~ 3,000	5	1	1		
3,000 ~ 5,000					
5,000 ~ 10,000					
10,000 ~ 30,000	10	5	Group A (38)	5	
30,000 ~ 50,000					
50,000 ~	100	10		10	

Note: Figures in parentheses indicate number of issues.

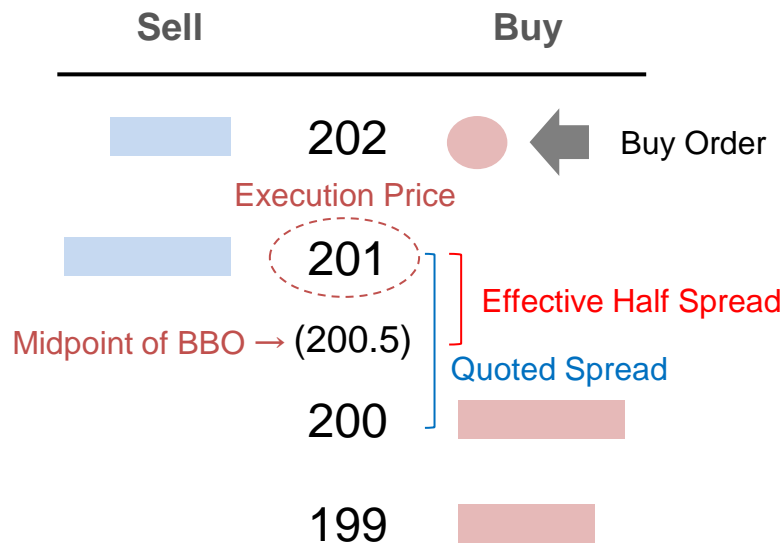
Implementation Shortfall Transaction Costs

Brokerage Costs	Fees, Commissions
Investment Costs	Delay Costs, Taxes
Trading Costs	Spread Costs Timing Costs Market Impact Costs
Other Costs	Opportunity Costs

Sugihara (2011) based on Kissell (2006)

2.2 Analysis 1 – Spread Costs

- ✓ Measured spread costs using quoted spread and effective half spread.
- ✓ Compared $\bar{q}s$, the average quoted spread qs^t , for each issue during each period. Quoted spread qs^t is defined as the difference between the best ask price P_{ba}^t and best bid price P_{bb}^t divided by the midpoint of BBO P_{mid}^t at each one-minute interval t .
- ✓ Calculated the volume weighted effective half spread es^d using execution volume Q_{exec}^i on each business day d , and compared \bar{es} , the average es^d , for each issue during each period. Effective half spread es^i is defined as the difference between the execution price P_{exec}^i and the midpoint of BBO just before execution P_{mid}^i divided by P_{mid}^i for each execution i in continuous trading.



$$qs^t = \frac{P_{ba}^t - P_{bb}^t}{P_{mid}^t}$$

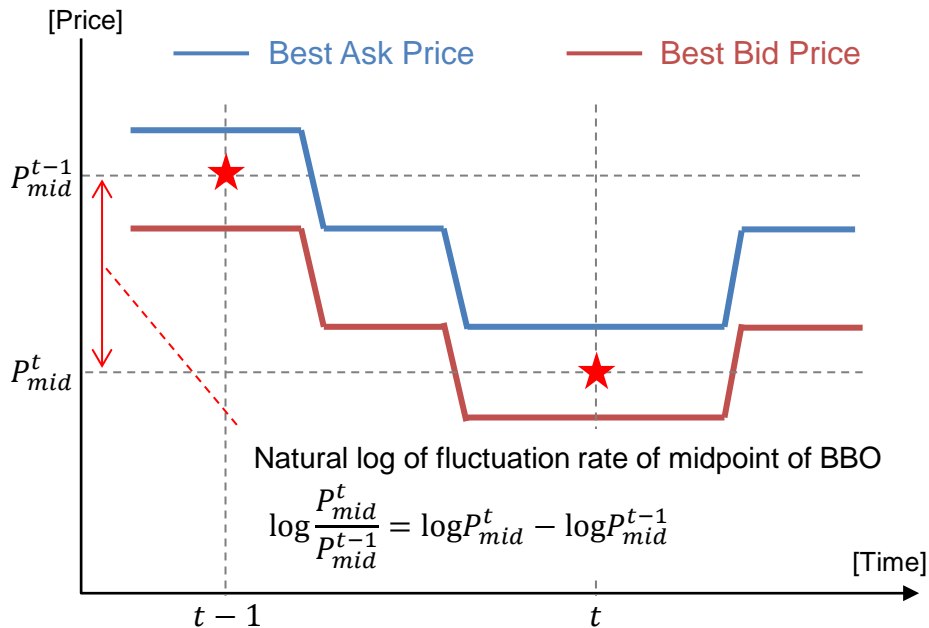
$$es^i = \frac{|P_{exec}^i - P_{mid}^i|}{P_{mid}^i}$$

$$es^d = \frac{\sum_{i=1}^n (es^i \times Q_{exec}^i)}{\sum_{i=1}^n Q_{exec}^i}$$

Note: In the calculation of es^i , execution i is defined as all simultaneous executions due to a single order. For executions striding more than a single price level, volume weighted execution price is used for P_{exec}^i and total execution volume (sum of execution volumes at each price level) is used for Q_{exec}^i .

2.3 Analysis 2 – Timing Costs

- ✓ Measured timing costs using intraday volatility σ^d , defined as the standard deviation of the natural logarithm of the fluctuation rate of the midpoint of BBO at each one- and ten-minute time interval t on each business day d .
- ✓ Calculated σ_1^d and σ_{10}^d at one- and ten-minute intervals respectively, and compared $\bar{\sigma}_1$ and $\bar{\sigma}_{10}$, the respective averages of σ_1^d and σ_{10}^d , for each issue during each period.
- ✓ Calculated variance ratio vr^d using σ_1^d and σ_{10}^d , and compared \bar{vr} , the average vr^d , for each issue during each period.



$$\mu = \frac{1}{N} \sum_{t=1}^N (\log P_{mid}^t - \log P_{mid}^{t-1})$$

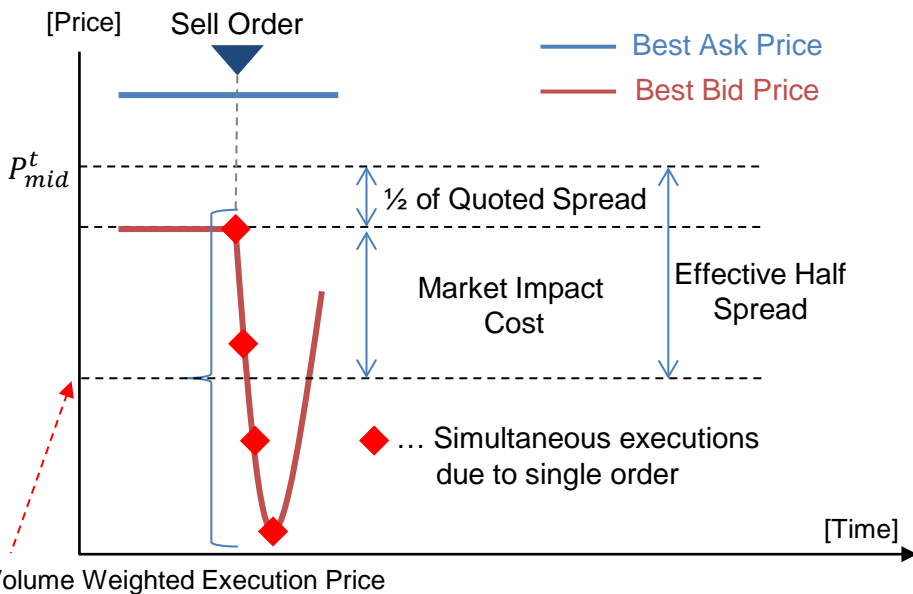
$$(\sigma^d)^2 = \frac{1}{N} \sum_{t=1}^N (\log P_{mid}^t - \log P_{mid}^{t-1} - \mu)^2$$

$$vr^d = \frac{(\sigma_{10}^d)^2}{10 \times (\sigma_1^d)^2}$$

Note: Based on TSE's five-hour trading day (i.e., 300 minutes), for σ_1^d , $t=300$ and for σ_{10}^d , $t=30$.

2.4 Analysis 3 – Market Impact Costs

- ✓ Measured market impact using the virtual effective half spread cost to compare changes in trading cost for executing equal volume orders before and after tick size change.
- ✓ Calculated the effective half spread es_{50}^t , the virtual effective half spread caused by immediate execution of market orders at Q_{50} , the 50th percentile of execution volume for each issue in continuous trading during the period before tick size change, based on order book information, at one-minute intervals.
- ✓ Compared \overline{es}_{50} , the average of es_{50}^t , for each issue during each period. Similarly for \overline{es}_{90} and \overline{es}_{99} .



$$Q_{50} = \sum_{x=1}^k Q_{ask,x}^t + \alpha^t = \sum_{y=1}^l Q_{bid,y}^t + \beta^t$$

$(Q_{ask,k+1}^t > \alpha^t \geq 0, Q_{bid,l+1}^t > \beta^t \geq 0)$

$$es_{50}^t = \frac{1}{2} (es_{50,buy}^t + es_{50,sell}^t)$$

$$= \frac{1}{2} \left(\frac{\{\sum_{x=1}^k (P_{ask,x}^t \times Q_{ask,x}^t) + P_{ask,k+1}^t \times \alpha^t\} / Q_{50} - P_{mid}^t}{P_{mid}^t} + \frac{P_{mid}^t - \{\sum_{y=1}^l (P_{bid,y}^t \times Q_{bid,y}^t) + P_{bid,l+1}^t \times \beta^t\} / Q_{50}}{P_{mid}^t} \right)$$

Note1: In the calculation of percentile volumes, simultaneous executions at multiple price levels due to a single order are regarded as one execution and the sum of the execution volumes at each price level is used.

Note2: es_{50}^t is the average of $es_{50,buy}^t$ and $es_{50,sell}^t$, respectively the virtual effective half spreads for market buy and sell orders.

Note3: $(P_{ask,1}^t, Q_{ask,1}^t), (P_{ask,2}^t, Q_{ask,2}^t), (P_{ask,3}^t, Q_{ask,3}^t) \dots$ are quoted ask prices and volumes from the midpoint of BBO at t , $(P_{bid,1}^t, Q_{bid,1}^t), (P_{bid,2}^t, Q_{bid,2}^t), (P_{bid,3}^t, Q_{bid,3}^t) \dots$ are for bids.

3.1 Result 1 – Spread Costs

- ✓ Both quoted spread and effective half spread decreased in the test groups.
- ✓ No significant change in quoted spread for some Group D issues (see bottom right chart on P14).
- ✓ Effective half spread in test groups were roughly ½ of the quoted spread even after tick size change, that is, market impact costs of actual executions in test groups did not increase.

Changes in Quoted Spread and Effective Half Spread

	Before	After	% Change	t-statistic
Panel A: Quoted Spread ($\bar{q}\bar{s}$) (bps)				
Phase 1				
Group A (changed)	14.48	5.96	-56.52%	16.412***
Group B (unchanged)	12.52	12.50	+0.09%	–
Phase 2				
Group C (changed from 1 to 0.1)	19.27	4.80	-71.94%	25.758***
Group D (changed from 1 to 0.5)	6.44	4.90	-22.67%	9.423***
Group E (unchanged)	5.25	5.07	-1.37%	–
Panel B: Effective Half Spread ($\bar{e}\bar{s}$) (bps)				
Phase 1				
Group A (changed)	7.06	2.71	-58.26%	17.765***
Group B (unchanged)	6.19	6.21	+0.76%	–
Phase 2				
Group C (changed from 1 to 0.1)	9.74	2.27	-73.94%	28.603***
Group D (changed from 1 to 0.5)	3.12	2.28	-24.68%	10.036***
Group E (unchanged)	2.28	2.27	+1.53%	–

90% reduction

50% reduction

closer to reduction rate

more effective

approx. ½ of quoted spread

Note1: Figures indicate the average of the results for each issue in each group.

Note2: t-statistics are obtained using a two-tailed t-test symmetric about zero of the difference in % change between test groups and control groups.

*, ** and *** indicate 10%, 5% and 1% significance levels respectively.

3.1 Result 1 – Spread Costs

- ✓ Value-based effective half spread, or the difference between the actual execution value and the virtual execution value using the midpoint of BBO as the execution price, means the spread cost actually borne by investors.
- ✓ Total spread cost reduction since Phase 1 was JPY 556 million, and total value-based effective half spread decreased by 3.76bps, which is equal to JPY 397 million on a daily basis (JPY 99.2 billion on an annual basis) based on ADV of TOPIX100 constituents.

Changes in Value-Based Effective Half Spread

	Effective Half Spread (JPY 100 mil.)			Ratio to Trading Value (bps)		
	Before	After	Change	Before	After	Change
Phase 1						
All TOPIX100 constituents	7.04	5.85	-1.20	5.55	4.17	-1.38
Group A (changed)	3.53	1.46	-2.07	5.37	2.08	-3.29
Group B (unchanged)	3.52	4.39	+0.87	5.73	6.25	+0.52
Phase 2						
All TOPIX100 constituents	2.93	1.48	-1.45	3.54	1.79	-1.75
Group C (changed from 1 to 0.1)	1.62	0.37	-1.25	8.31	1.91	-6.39
Group D (changed from 1 to 0.5)	0.95	0.72	-0.24	2.37	1.82	-0.54
Group E (unchanged)	0.35	0.39	+0.04	1.53	1.63	+0.10

(Note) Includes the impact of changes in market conditions in the periods subject to analysis

Note1: Value-based effective half spread is calculated by multiplying execution volume by the difference between the execution price and the midpoint of BBO.

Note2: ADV of TOPIX100 constituents from 2013/10/31 to 2014/10/30 is calculated to be JPY 1,057 billion.

Note3: Figures are daily averages of total value-based effective half spread in each group.

Note4: Ratio for trading value is calculated by dividing total value-based effective half spread by total trading value in each group.

3.2 Result 2 – Timing Costs

- ✓ One-minute volatility decreased at 1% significance level for Groups A and C, but ten-minute volatility decreased at 5% significance level only for Group A.
- ✓ Narrowing tick sizes seems to reduce shorter term intraday volatility.
- ✓ No significant change for Group D, possibly due to relatively less significant tick size reduction.

Changes in Intraday Volatility

	Before	After	% Change	t-statistic
Panel A: One-Minute Volatility ($\bar{\sigma}_1$) (bps)				
Phase 1				
Group A (changed)	6.64	7.63	+15.41%	6.420***
Group B (unchanged)	6.32	8.63	+37.78%	–
Phase 2				
Group C (changed from 1 to 0.1)	5.86	5.55	-5.14%	4.259***
Group D (changed from 1 to 0.5)	5.08	5.25	+4.56%	1.023
Group E (unchanged)	4.86	5.21	+7.38%	–
Panel B: Ten-Minute Volatility ($\bar{\sigma}_{10}$) (bps)				
Phase 1				
Group A (changed)	17.33	22.04	+27.15%	2.179**
Group B (unchanged)	17.17	23.00	+35.97%	–
Phase 2				
Group C (changed from 1 to 0.1)	14.68	15.98	+10.07%	0.399
Group D (changed from 1 to 0.5)	13.45	14.69	+10.65%	0.345
Group E (unchanged)	13.31	14.84	+11.85%	–

The market was highly volatile after Phase 1, resulting in increased volatility for both groups. However, it was smaller for Group A.

Note1: Figures indicate the average of the results for each issue in each group.

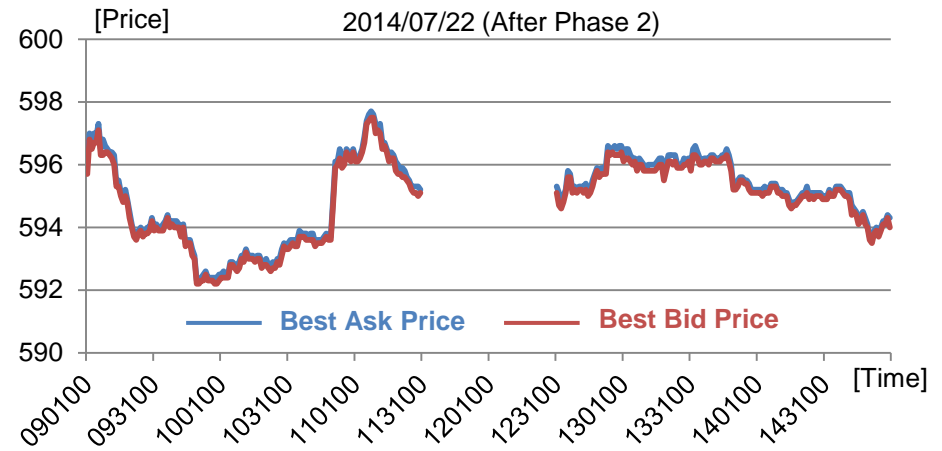
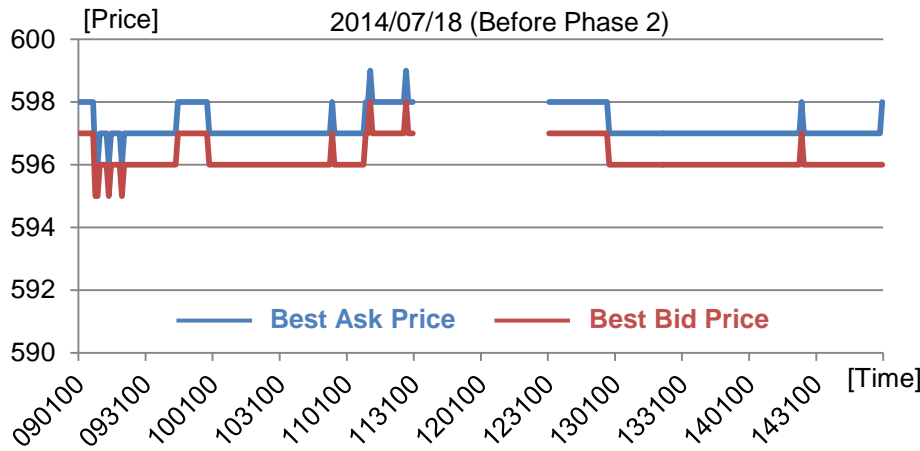
Note2: t-statistics are obtained using a two-tailed t-test, symmetric about zero, of the difference in % change between test groups and control groups.

*, ** and *** indicate 10%, 5% and 1% significance levels respectively.

3.2 Result 2 – Timing Costs

- ✓ Reduced intraday volatility in shorter time frames after tick size change due to BBO price moving at smaller tick sizes.
- ✓ For test groups, variance ratio approached one with large reductions in short-term intraday volatility.

Example of Changes in Intraday BBO Price Movement



Note1: BBO price movement every minute in Mitsubishi UFJ Financial Group (code: 8306).
 Note2: Time indicated in HHMMSS.

Changes in Variance Ratio

	Variance Ratio \bar{vr}		$ 1 - vr $	
	Before	After	Before	After
Phase 1				
Group A (changed)	0.82	0.91	0.21	0.15
Group B (unchanged)	0.86	0.84	0.18	0.20
Phase 2				
Group C (changed from 1 to 0.1)	0.79	0.91	0.22	0.17
Group D (changed from 1 to 0.5)	0.83	0.88	0.20	0.18
Group E (unchanged)	0.87	0.89	0.18	0.17

Variance ratio in test groups approached one.
 → Price movement is closer to random walk.

Note1: Figures indicate the average of the results for each issue in each group.
 Note2: $|1 - vr|$ is the average of the absolute value of difference between vr^d and one.

3.3 Result 3 – Market Impact Costs

- ✓ Execution size, or volume of each execution, decreased with larger executed order size.
- ✓ This may have been due to order slicing to reduce market impact after tick size change.

Changes in Execution Size

	Before	After	% Change	t-statistic
Panel A: Execution size: 50 th percentile (shares)				
Phase 1				
Group A (changed)	264	227	-17.33%	5.816***
Group B (unchanged)	908	898	-1.82%	–
Phase 2				
Group C (changed from 1 to 0.1)	1,426	1,130	-20.19%	3.648***
Group D (changed from 1 to 0.5)	405	364	-12.60%	6.908***
Group E (unchanged)	123	127	+2.89%	–
Panel B: Execution size: 90 th percentile (shares)				
Phase 1				
Group A (changed)	1,905	995	-45.54%	16.086***
Group B (unchanged)	7,108	7,826	3.45%	–
Phase 2				
Group C (changed from 1 to 0.1)	13,073	7,029	-47.03%	5.967***
Group D (changed from 1 to 0.5)	2,331	1,776	-23.82%	12.183***
Group E (unchanged)	563	585	+4.00%	–
Panel C: Execution size: 99 th percentile (shares)				
Phase 1				
Group A (changed)	8,891	3,172	-57.19%	15.509***
Group B (unchanged)	42,547	48,682	+0.16%	–
Phase 2				
Group C (changed from 1 to 0.1)	90,883	31,470	-68.07%	16.609***
Group D (changed from 1 to 0.5)	9,025	6,227	-27.03%	10.050***
Group E (unchanged)	1,876	2,005	+7.59%	–

Analysis on the next page was conducted using these figures for each issue.

small reduction

large reduction

Note1: In the calculation of percentile of execution size, simultaneous executions at multiple price levels due to a single order are regarded as one execution and the total of the execution volumes at each price level is used.

Note2: Figures indicate the average of the results for each issue in each group.

Note3: t-statistics are obtained using a two-tailed t-test, symmetric about zero, of the difference in % change between test groups and control groups.

*, ** and *** indicate 10%, 5% and 1% significance levels respectively.

3.3 Result 3 – Market Impact Costs

- ✓ \bar{es}_{50} and \bar{es}_{90} decreased at the 1% significance level in test groups, reducing trading costs.
- ✓ No significant change in \bar{es}_{99} , with increased market impact cost offsetting narrower quoted spread.

Changes in Virtual Effective Half Spread

	Before	After	% Change	t-statistic
Panel A: Effective half spread at 50 th percentile of execution size before tick size change (\bar{es}_{50}) (bps)				
Phase 1				
Group A (changed)	7.24	3.05	-55.66%	16.398***
Group B (unchanged)	6.27	6.27	+0.21%	–
Phase 2				
Group C (changed from 1 to 0.1)	9.64	2.47	-71.02%	24.917***
Group D (changed from 1 to 0.5)	3.23	2.49	-21.53%	8.890***
Group E (unchanged)	2.63	2.54	-1.35%	–
Panel B: Effective half spread at 90 th percentile of execution size before tick size change (\bar{es}_{90}) (bps)				
Phase 1				
Group A (changed)	7.60	4.62	-37.89%	13.139***
Group B (unchanged)	6.69	6.81	+2.60%	–
Phase 2				
Group C (changed from 1 to 0.1)	9.82	3.68	-57.35%	15.677***
Group D (changed from 1 to 0.5)	3.61	3.15	-11.39%	4.067***
Group E (unchanged)	3.11	2.98	-2.57%	–
Panel C: Effective half spread at 99 th percentile of execution size before tick size change (\bar{es}_{99}) (bps)				
Phase 1				
Group A (changed)	9.34	9.77	+4.00%	1.554
Group B (unchanged)	8.55	9.17	+8.57%	–
Phase 2				
Group C (changed from 1 to 0.1)	11.12	8.61	-15.96%	2.053**
Group D (changed from 1 to 0.5)	5.27	5.22	-0.20%	-2.751***
Group E (unchanged)	4.65	4.35	-5.73%	–

significant reduction

no significant change

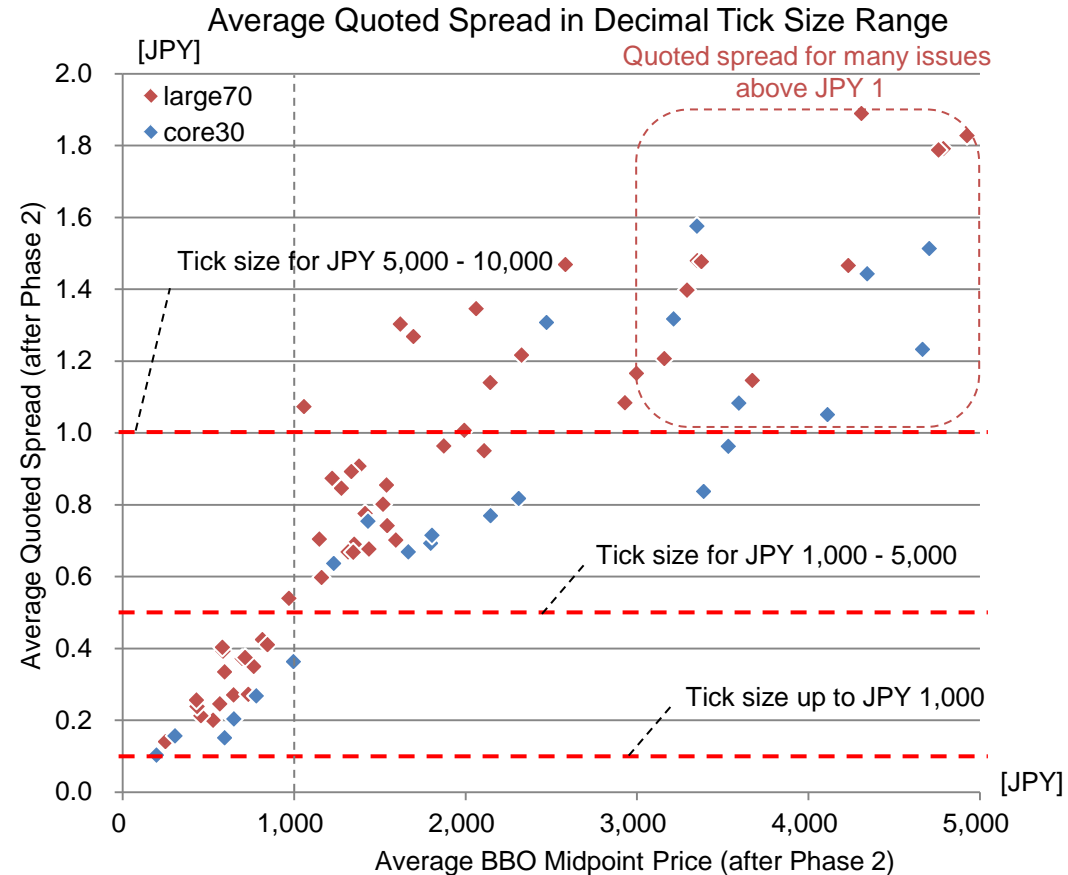
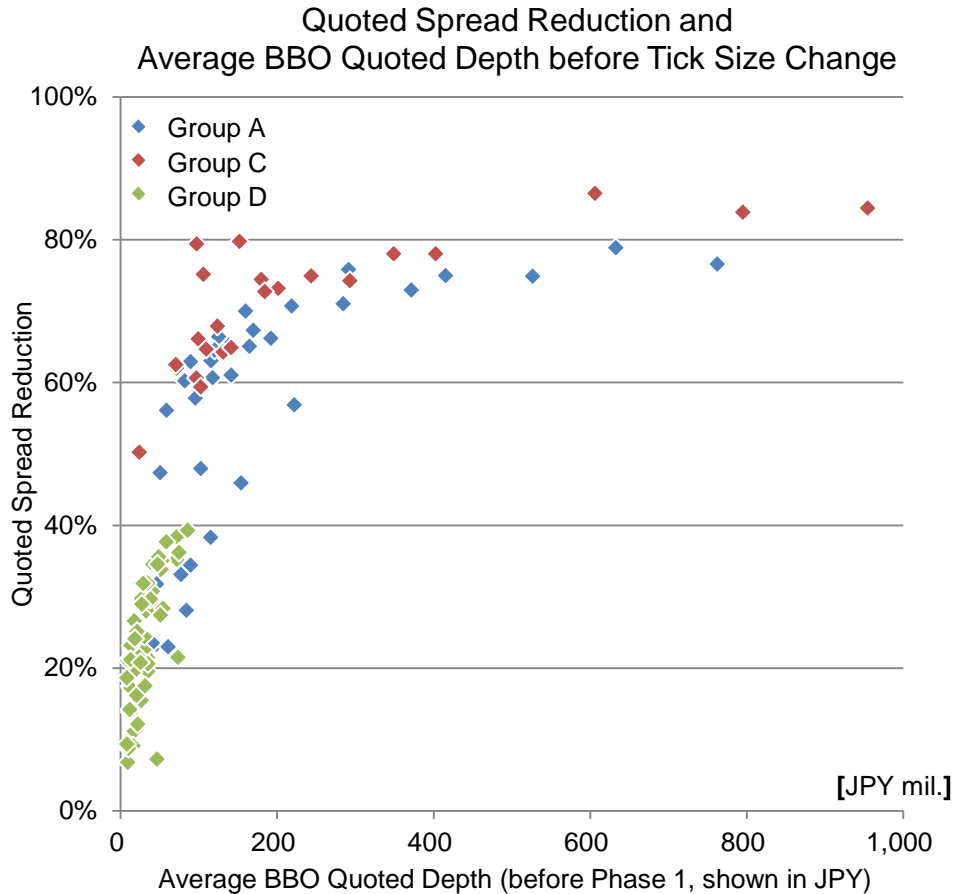
Note1: Figures indicate the average of the results for each issue in each group.

Note2: t-statistics are obtained using a two-tailed t-test, symmetric about zero, of the difference in % change between test groups and control groups.

*, ** and *** indicate 10%, 5% and 1% significance levels respectively.

3.3 Result 4 – Changes in Spread Costs by Issues

- ✓ Larger quoted Spread reduction effect with greater BBO quoted depth.
- ✓ Average quoted spread for issues in the JPY 3,000-5,000 price band was generally above JPY 1, the next larger tick size.

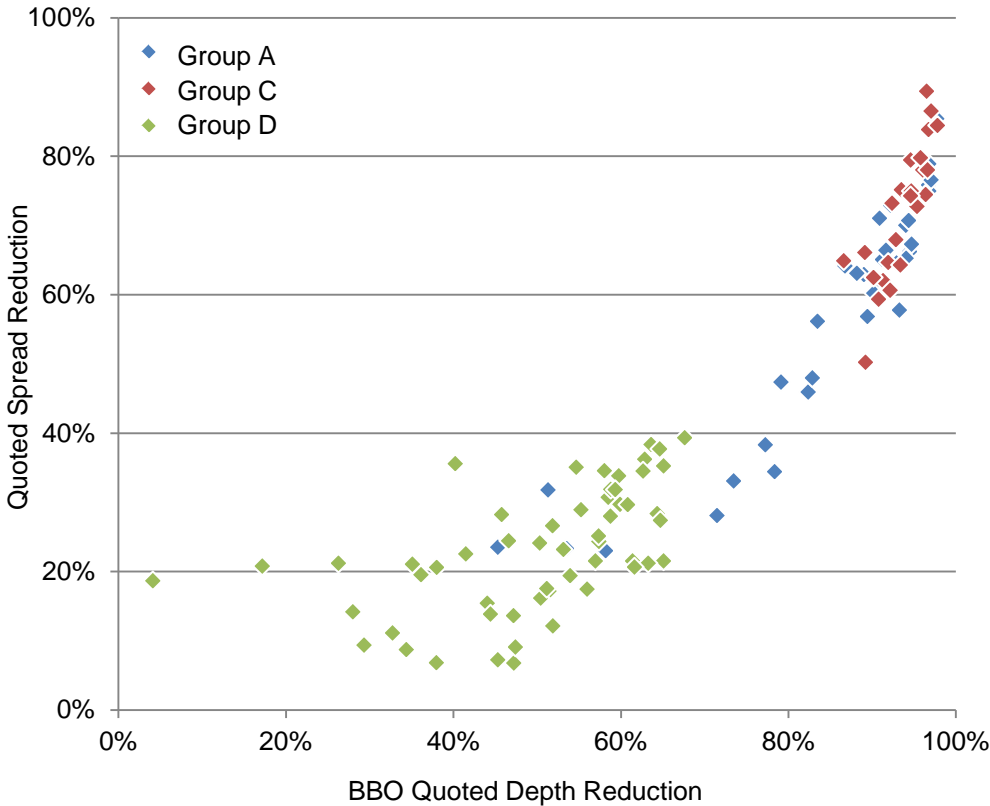


Note1: Average BBO quoted depth is the average value calculated by multiplying the total amount of quoted shares in BBO by the BBO midpoint price every minute.
 Note2: Average BBO midpoint price is calculated based on BBO midpoint prices observed every minute.

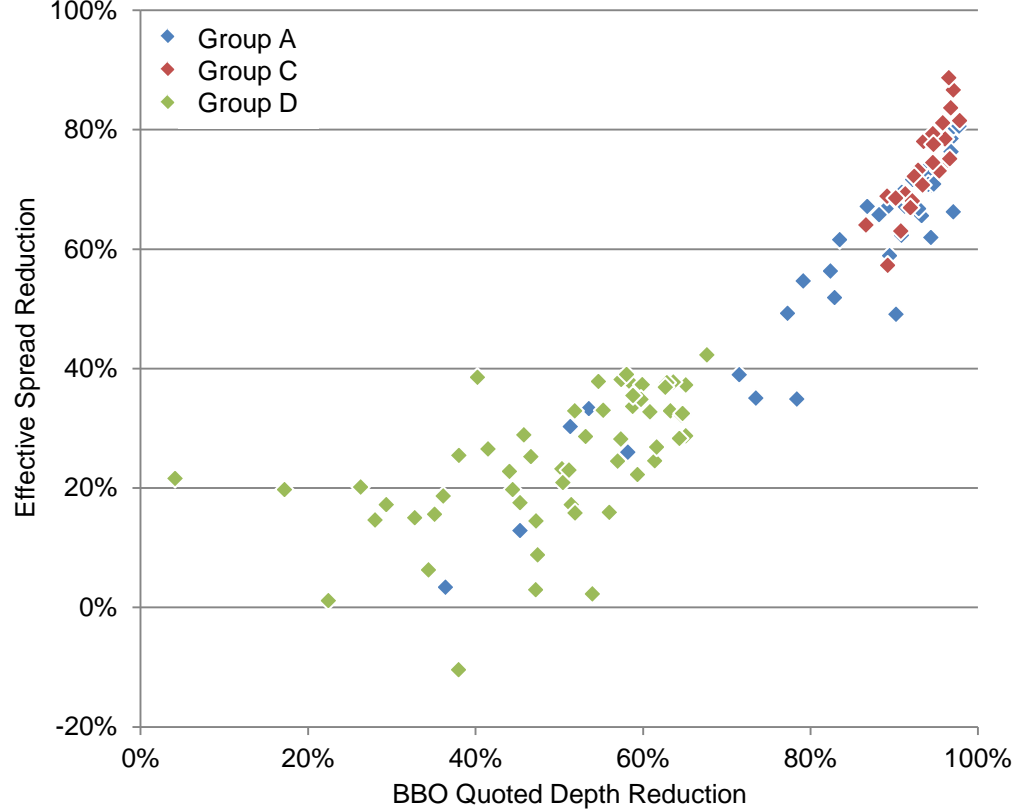
3.3 Result 4 – Changes in Spread Costs by Issues

- ✓ Issues with large BBO quoted depth reductions showed significant decrease in quoted spread, leading to concerns that increased market impact would negatively impact trading cost.
- ✓ However, such negative impact was not observed since the effective spread also decreased significantly for such issues.

Comparison of Quoted Spread Reduction and BBO Quoted Depth Reduction



Comparison of Effective Spread Reduction and BBO Quoted Depth Reduction



4. Conclusion

- ✓ Both quoted spread and effective spread decreased, and total value-based effective half spread in all TOPIX100 constituents was reduced by 3.76bps, which is equal to JPY 397 million on a daily basis.
- ✓ Reduction in intraday volatility at one-minute intervals was statistically significant.
- ✓ Increased market impact cost did not negatively impact effective spread even for extremely large-sized orders.

The results show that trading cost in TOPIX100 constituents decreased.

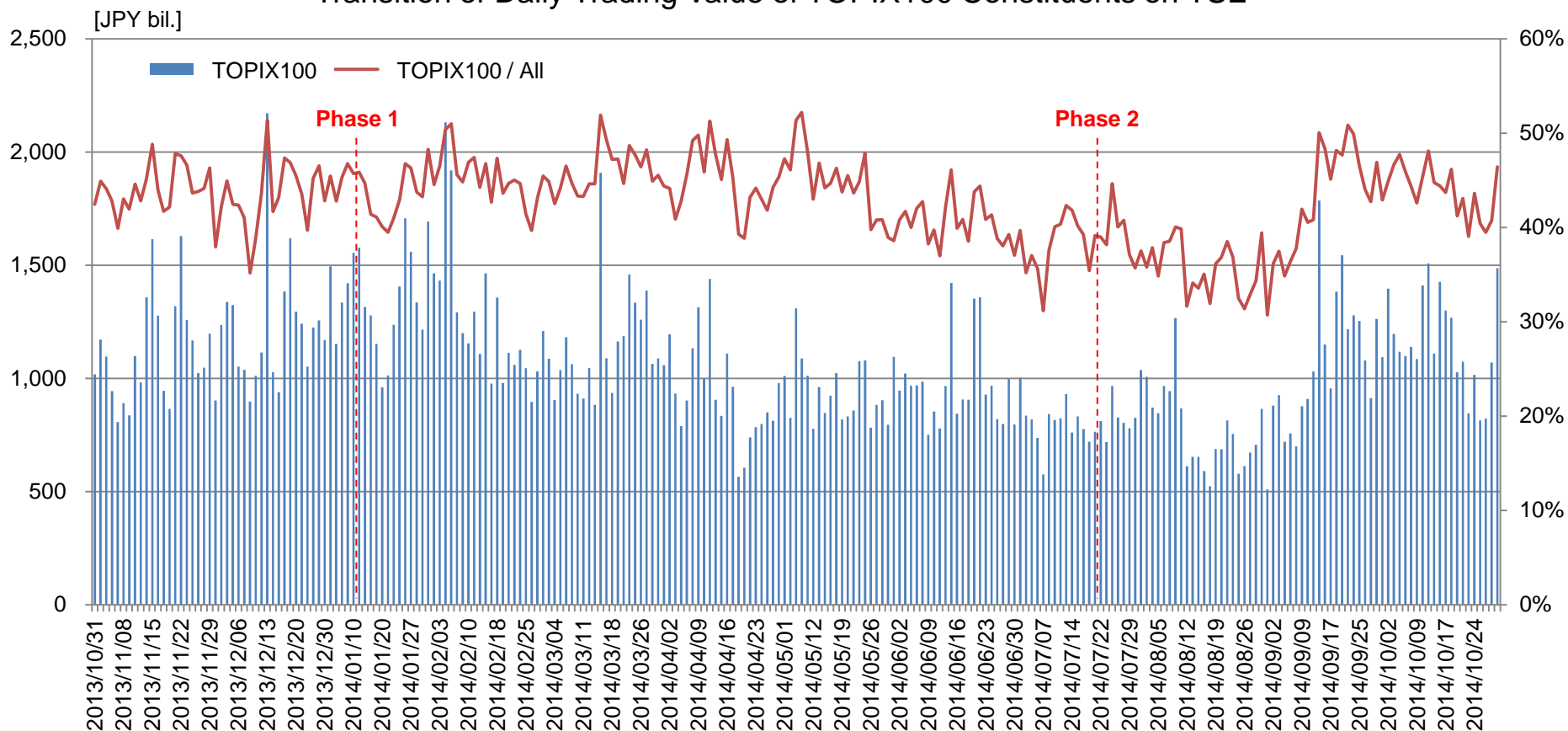
Findings

- Since a correlation was observed between the quoted spread reductions and BBO quoted depth before tick size change, smaller tick size is not expected to reduce quoted spread for issues that do not have sufficient liquidity.
- Based on the BBO quoted depth reductions in TOPIX100 constituents from Phases 1 and 2, narrowing the tick sizes further is not likely to result in further reductions in trading cost.
- With regard to the optimal tick size, considerations should be made to broaden the tick sizes for price ranges where the quoted spread was generally larger than the next larger tick size.

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【Appendix】 Trading Value of TOPIX100 Constituents

Transition of Daily Trading Value of TOPIX100 Constituents on TSE

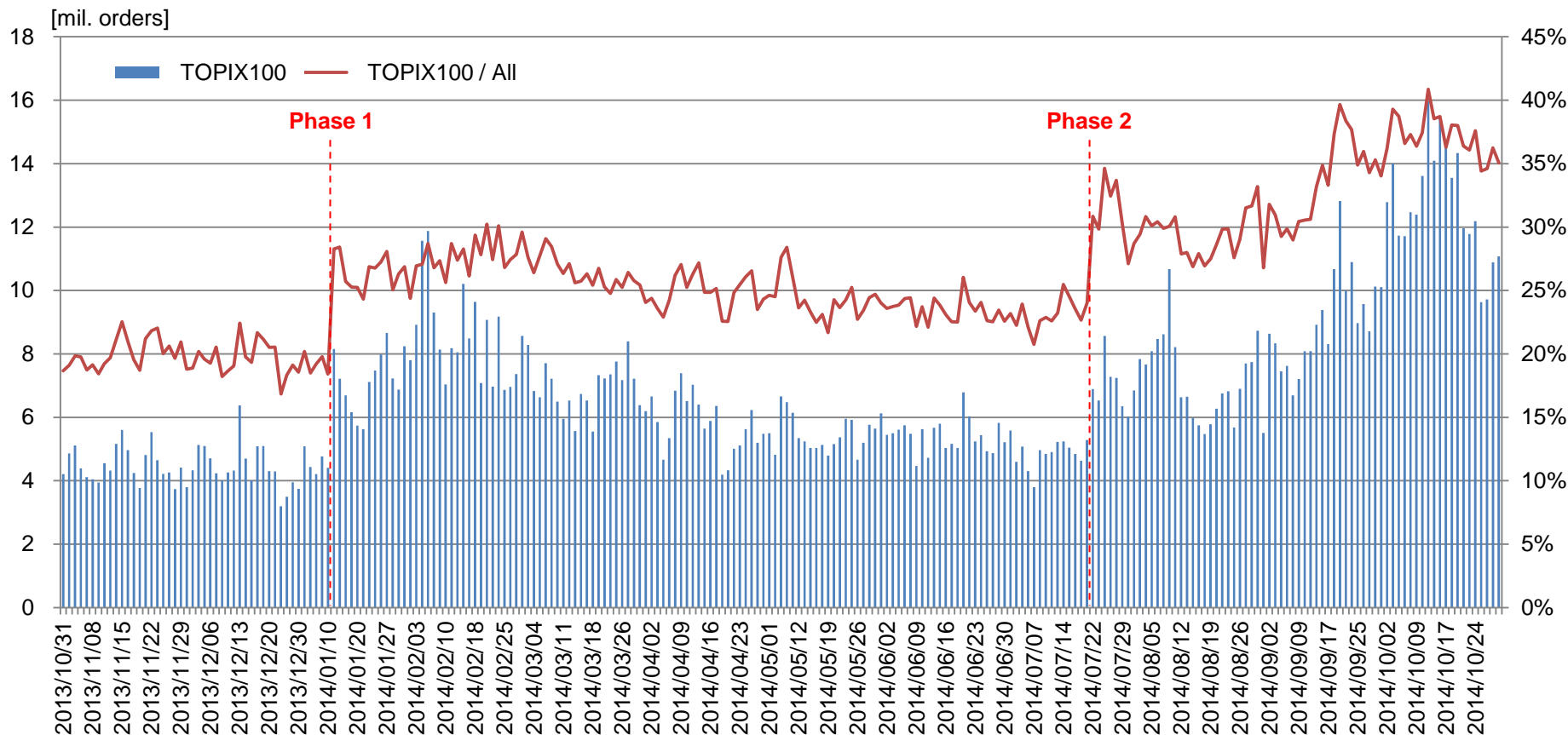


Note1: During this period (2013/10/31 to 2014/10/30) there was no change in the constituents of TOPIX100.

Note2: Line chart indicates ratio of overall auction equity trading on TSE.

[Appendix] Number of Orders in TOPIX100 Constituents

Transition of Number of Orders in TOPIX100 Constituents on TSE



Note1: During this period (2013/10/31 to 2014/10/30) there was no change in the constituents of TOPIX100.

Note2: Line chart indicates ratio of overall auction equity trading on TSE.

[Appendix] TOPIX100 Constituents

... Core30 ... Large70

No.	Code	Name	Price	No.	Code	Name	Price	No.	Code	Name	Price	No.	Code	Name	Price
1	8411	Mizuho FG	200	26	8267	AEON CO.,	1,157	51	9064	YAMATO HOLDINGS	2,096	76	6988	NITTO DENKO	4,646
2	9202	ANA HOLDINGS	246	27	7752	RICOH	1,163	52	1925	DAIWA HOUSE	2,131	77	4502	Takeda	4,670
3	5401	Nippon Steel	304	28	6752	Panasonic	1,193	53	8058	Mitsubishi	2,149	78	6902	DENSO	4,701
4	9532	OSAKA GAS	438	29	9502	Chubu Electric Power	1,236	54	8725	MS&AD Insurance	2,305	79	9021	JR West	4,722
5	4188	Mitsubishi Chemical	443	30	8795	T&D Holdings	1,262	55	6301	KOMATSU	2,317	80	6971	KYOCERA	4,868
6	8309	Sumitomo Mitsui Trust	453	31	8001	ITOCHU	1,298	56	8802	Mitsubishi Estate	2,575	81	7203	TOYOTA	6,006
7	6502	TOSHIBA	470	32	6503	Mitsubishi Electric	1,299	57	8630	NKSJ Holdings	2,606	82	9433	KDDI	6,167
8	5020	JX Holdings	538	33	6326	KUBOTA	1,351	58	4901	FUJIFILM Holdings	2,874	83	9735	SECOM	6,182
9	8308	Resona Holdings	573	34	8053	SUMITOMO	1,358	59	7270	Fuji Heavy Industries	2,891	84	4063	Shin-Etsu	6,197
10	8332	The Bank of Yokohama	586	35	4503	Astellas Pharma	1,382	60	1963	JGC	3,052	85	8113	UNICHARM	6,359
11	5201	Asahi Glass	593	36	1928	Sekisui House	1,400	61	2502	Asahi Group	3,144	86	6594	NIDEC	6,577
12	9531	TOKYO GAS	595	37	8750	The Dai-ichi Life	1,413	62	4578	Otsuka	3,234	87	6367	DAIKIN	6,719
13	8306	Mitsubishi UFJ FG	598	38	2503	Kirin Holdings	1,436	63	8766	Tokio Marine	3,253	88	9432	NTT	6,734
14	7011	Mitsubishi Heavy	648	39	5802	Sumitomo Electric	1,480	64	7269	SUZUKI MOTOR	3,280	89	8035	Tokyo Electron	7,026
15	8604	Nomura Holdings	659	40	7731	NIKON	1,535	65	7741	HOYA	3,389	90	9984	SoftBank	7,654
16	7202	ISUZU MOTORS	672	41	2802	Ajinomoto Co.,	1,551	66	7751	CANON	3,390	91	9020	JR East	8,548
17	3402	TORAY INDUSTRIES	684	42	1605	INPEX	1,569	67	8801	Mitsui Fudosan	3,416	92	6981	MURATA	9,708
18	8002	Marubeni	729	43	8591	ORIX	1,616	68	7267	HONDA	3,569	93	1878	DAITO TRUST	12,010
19	6501	Hitachi	756	44	8031	MITSUI & CO.,	1,645	69	2914	JAPAN TOBACCO	3,703	94	7974	Nintendo	12,495
20	6702	FUJITSU	782	45	6758	SONY	1,680	70	5108	BRIDGESTONE	3,803	95	9022	JR Central	15,355
21	3407	ASAHI KASEI	787	46	5713	Sumitomo Metal Mining	1,713	71	8316	Sumitomo Mitsui FG	4,066	96	6954	FANUC	17,150
22	8601	Daiwa Securities	835	47	9437	NTT DOCOMO	1,790	72	4452	Kao Corp	4,208	97	4661	ORIENTAL LAND	18,870
23	7201	NISSAN MOTOR	987	48	4568	DAIICHI SANKYO	1,869	73	4523	Eisai	4,216	98	6273	SMC CORP	27,055
24	9503	The Kansai Electric	1,015	49	4911	Shiseido	1,998	74	8830	Sumitomo R&D	4,248	99	9983	FAST RETAILING	32,355
25	7912	Dai Nippon Printing	1,047	50	5411	JFE Holdings	2,076	75	3382	Seven & I HD	4,363	100	6861	KEYENCE	43,100

Note: Constituents during 2013/10/31 to 2014/10/30.

Price ... Base price on 2014/07/22 (beginning of Phase 2)