

A Study on the Effect of Resizing Tick Size on Stock Prices Using the Event Study Method

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Abstract

We analyzed the abnormal return (AR) and cumulative abnormal return (CAR) of tick resizing on the Tokyo Stock Exchange in 2014. Tick size is the unit by which price of a stock changes in the stock market. In our study, Phase 1 (P1) was marked for a price range higher than 3001 yen, and Phase 2 (P2) for a price range of 5000 yen or less. AR is the actual return minus the return when the tick size is not changed. CAR is the cumulative value of AR. As a result, in P1, CAR was positive and significant for many days, while in P2, it was negative and had many significant days. In addition, to analyze the difference between P1 and P2, the price range was divided, and the same analysis was repeated. CAR showed no significant negative or positive days in the common price range of 3001 to 5000 yen. However, CAR showed many positive days in the price range higher than 5001 yen in P1 and many negative days in the price range below 3000 yen in P2. These results suggest that the impact of tick resizing may vary significantly depending on the price range.

Keywords: tick size reduction, abnormal return, cumulative abnormal return, Tokyo Stock Exchange

1 Introduction

The Tokyo Stock Exchange (TSE) implemented tick resizing in 2014. Tick size refers to the amount by which price change occurs when an investor orders stock. The TSE reduced the tick size so that orders can be placed in finer increments. This was done only for some TOPIX 100 company stocks. The first reduction was applied if the price of the stock was more than 3,000 yen, and the second reduction was applied if the price of the stock was less than or equal to 5,000 yen. The first reduction in tick size was called Phase 1 (P1), and the second Phase 2 (P2), which was implemented on January 14, 2014 and July 22, 2014, respectively. There were two objectives to this. The first was to achieve price efficiency and the second was to improve liquidity. Price efficiency represents a state in which all the information available in the market is

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reflected in the price. Liquidity implies that investors can buy and sell stocks in the market instantly at no additional cost. However, resizing the tick size also affects returns. There are several reasons for this. First, a smaller tick size means that the price unit for determining returns is also narrower. That is, when the subdivision width is discrete, the profit amount is determined by this unit. When tick size is reduced, the subdivision width also reduces, which in turn reduces returns. Likewise, improving liquidity lowers the transaction cost, which is the cost of buying and selling stocks, which again affects returns. Further, there is also the so-called illiquidity premium (also known as the liquidity premium), [3] wherein investors want higher returns on stocks that are difficult to buy or sell in the market (so-called illiquid stocks).

We conducted an event study analysis of the impacts of resizing tick size in the TSE. Event study analyzes how company-related events affect stock prices or corporate value. In practice, the impact is analyzed by calculating abnormal returns (AR) and cumulative abnormal returns (CAR). AR represent the degree of difference between the expected return and the actual return in the market. This shows how the event impacts the value of the company. CAR represents the cumulative value of AR. This study therefore proposes a method by which it is possible to analyze how resizing tick size impacts the value of stocks in the financial markets.

2 Literature Review

There are various studies on tick size reduction, most of which analyze liquidity. According to Ahn, Cai, Chan, and Hamao, there was no increase in trading volume on the TSE in 1998 [1]. Chakravarty, Wood, and Van Ness confirmed a reduction in spreads and depths [4]. Lau and McNish also confirmed a reduction in spread during the 1994 resizing of tick size at the Stock Exchange of Singapore [9]. Ronen and Weaver confirmed a decrease in volatility and spread at the American Stock Exchange in 1997, but could not confirm a decrease in depth [14]. Xiao and Yamamoto confirmed a decrease in depth on the TSE in 2014 [16].

In research on AR, Graham, Michaely, and Roberts confirmed an increase in AR at the 2014 NYSE [8]. Chou, Lee, and Chen confirmed a decrease in AR in the 1997 and 2001 New York Stock Exchange [5]. In Al-Yahyaee, AR decreased in the Muscat Securities Market [2]. Pachare and Rainer analyzed the impact of the Tick Size Pilot announcement rather than the actual resizing of tick size, but it was shown to have no impact [13]. We measured AR and CAR in actual tick resizing. Thus, there are two main contributions. One is that it targets the 2014 TSE (auction-type market adopted in many markets). Two, we obtained one factor that is different from results of previous studies.

Maruyama, Tabata, and Hosoda also conducted a similar research [11]. However, although they are analyzing how tick resizing affected AR, they have not been able to analyze the factors underlying the difference in P1 and P2 results. However, we made some speculations about the cause by splitting the stocks by price range.

3 AR and CAR

Suppose an event occurs in the securities market, and as a result, it affects the value and stock price of the company. In such a case, in addition to the originally obtained return, an additional return from the event is obtained. AR represents this added return and is estimated by the formula below.

$$AR_{nt} = r_{nt} - \widehat{r}_{nt}, \quad (1)$$

where, AR_{nt} represents the AR of stock n on day t , r_{nt} represents the actual logarithmic return of stock n on day t , and \widehat{r}_{nt} represents the predicted value of return of stock n on day t .

In addition, CAR represents the total AR from day t_1 to day t . It is estimated by the following formula.

$$CAR_{nt} = \sum_{\tau=t_1}^t AR_{n\tau}, \quad (2)$$

Here, CAR_{nt} represents the CAR of stock n on day t , and AR_{nt} represents the AR of stock n on day t .

4 Data and Method

4.1 Data

As sample stocks, only stocks that meet some conditions were selected. We included 100 TOPIX stocks in the target price range for tick size resizing. This is because tick resizing can happen only for some stocks. Another condition is that there must be at least one transaction. If the price is less than 100 yen or more than 30,000 yen, it is excluded. These conditions are established to exclude stocks of different natures when analyzed. The conditions are in accordance with Ahn, Cai, Chan, and Hamao [1]. The number of stocks was 38 in P1 and 83 in P2. We set 2 months as the window for parameter estimation (44 business days from October 11, 2013, to December 13, 2013 in P1, and 43 business days from April 21, 2014, to June 23, 2014, in P2). We also set 2 months as the event window for calculating AR (35 business days from December 16, 2013, to February 10, 2014, in P1 and 40 business days from June 24, 2014, to August 19, 2014, in P2). This follows Maruyama, Tabata, and Hosoda [11]. The data were obtained from Datastream.

4.2 Method

First, we calculate the AR. Although there are various calculation methods such as CAPM [10] [12] [15] and 3 Factor model [7], we follow Dyckman, Philbrick, and Stephan, and use the Market Model [6]. We use the estimation period data for estimation. The Market Model is denoted by the following equation.

$$\widehat{r}_{nt} = \widehat{\beta}_0 + \widehat{\beta}_1 r_{mt}, \quad (3)$$

where r_{mt} is the market return (we use TOPIX and Nikkei 225) and $\widehat{\beta}_0$ and $\widehat{\beta}_1$ are the coefficients.

Next, we calculate the CAR based on the obtained AR. We use the first day of the event window as t_1 . Then, on each day, we perform a t-test to see if the mean is equal to 0.

We perform the same analysis as above for each price range. P1 refers to stocks in the price range of 3001 yen to 5000 yen and stocks in the price range of 5001 yen or more; P2 refers to stocks in the price range of 3,000 yen or less, and stocks in the price range of 3001 to 5000 yen. At this

Table 1: Result of AR and CAR in P1 (all stocks) [11].

Date	AR				CAR			
	TOPIX		Nikkei 225		TOPIX		Nikkei 225	
	Mean	SD	t-value	p-value	Mean	SD	t-value	p-value
2013/12/16	0.001	0.010	0.324	0.748	0.000	0.010	-0.110	0.913
2013/12/17	0.000	0.010	-0.268	0.790	0.001	0.010	0.913	0.367
2013/12/18	0.002	0.009	1.628	0.112	0.003	0.009	1.655	0.106
2013/12/19	0.004	0.013	1.738	0.091	0.001	0.013	0.438	0.664
2013/12/20	0.003	0.013	1.582	0.122	0.002	0.013	0.866	0.392
2013/12/24	0.002	0.011	1.246	0.220	-0.002	0.010	-1.170	0.250
2013/12/25	0.002	0.008	1.443	0.260	-0.004	0.009	-2.594	0.014 *
2013/12/26	-0.005	0.012	-2.257	0.030 *	0.006	0.011	3.036	0.004 **
2013/12/27	-0.003	0.015	-1.183	0.244	0.006	0.014	2.654	0.012 **
2013/12/30	-0.005	0.008	-3.462	0.001 **	0.000	0.007	0.300	0.766
2014/1/6	0.000	0.015	-0.070	0.945	0.010	0.014	4.495	0.000 ***
2014/1/7	0.000	0.010	-0.058	0.954	-0.003	0.010	-1.550	0.130
2014/1/8	0.001	0.020	0.281	0.780	0.005	0.020	1.500	0.142
2014/1/9	-0.002	0.011	-1.310	0.198	0.002	0.011	1.035	0.307
2014/1/10	-0.002	0.012	-1.113	0.273	-0.002	0.012	-1.068	0.292
2014/1/14	0.001	0.011	0.771	0.445	0.002	0.011	0.932	0.357
2014/1/15	0.003	0.013	1.411	0.167	0.005	0.012	2.406	0.021 *
2014/1/16	0.000	0.011	-0.119	0.906	0.003	0.010	1.785	0.082
2014/1/17	-0.003	0.011	-1.632	0.107	0.000	0.011	0.164	0.871
2014/1/20	-0.003	0.013	-1.544	0.131	-0.001	0.013	-0.622	0.538
2014/1/21	0.000	0.010	0.217	0.830	-0.005	0.010	-3.323	0.002 **
2014/1/22	0.000	0.010	0.225	0.823	0.002	0.010	1.446	0.156
2014/1/23	0.002	0.014	1.092	0.282	-0.001	0.014	-0.471	0.641
2014/1/24	0.004	0.020	1.084	0.286	0.000	0.020	-0.009	0.993
2014/1/27	0.003	0.014	1.363	0.181	-0.007	0.013	-3.441	0.001 ***
2014/1/28	0.000	0.013	-0.198	0.844	-0.003	0.013	-1.478	0.148
2014/1/29	-0.002	0.014	-0.925	0.361	0.005	0.013	2.146	0.038 *
2014/1/30	0.004	0.017	1.283	0.207	-0.004	0.017	-1.574	0.124
2014/1/31	0.004	0.028	0.776	0.443	0.006	0.028	1.224	0.229
2014/2/5	0.006	0.019	1.908	0.064	0.001	0.019	0.154	0.878
2014/2/4	0.007	0.024	1.829	0.075	-0.011	0.022	-3.147	0.003 **
2014/2/5	-0.005	0.024	-1.189	0.242	0.008	0.023	2.054	0.047 *
2014/2/6	-0.007	0.015	-2.662	0.011 *	-0.005	0.016	-2.086	0.044 *
2014/2/7	-0.003	0.014	-1.281	0.208	0.005	0.013	2.265	0.029 *
2014/2/10	0.002	0.015	0.991	0.328	0.002	0.015	0.970	0.338

Note: SD is an abbreviation for standard deviation. *** is significant at the 0.001 level, ** is significant at the 0.01 level, * is significant at the 0.05 level, and . is significant at the 0.1 level.

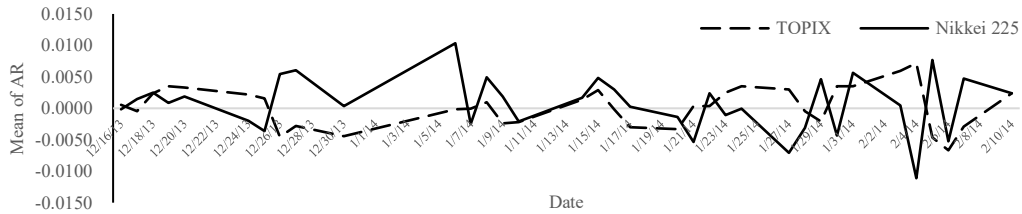


Figure 1: Movement of AR in P1 (all stocks) [11].

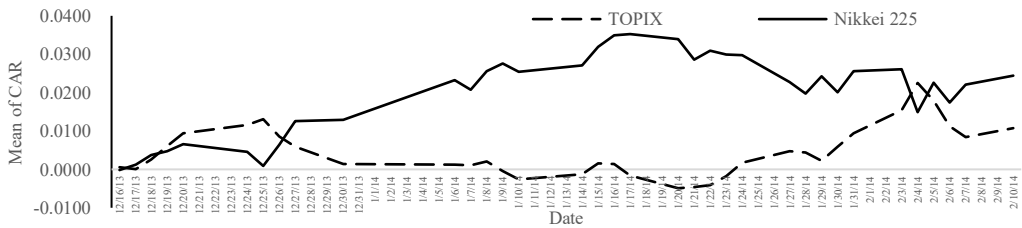


Figure 2: Movement of CAR in P1 (all stocks) [11].

time, we target only those stocks whose prices are all included in the price range during the target period. This makes it possible to analyze the difference in the impact of P1 and P2 price ranges separately.

5 Results

In P1, the results are as shown in Table 1, and the fluctuations over time are as shown in Figures 1 and 2. When we use TOPIX, the number of days when AR took a positive and significant value was 3 days and a negative and significant value was 3 days. CAR took a positive and significant value for 3 days, and a negative and significant value for 0 days. In addition, when we use Nikkei

Table 2: Result of AR and CAR in P2 (all stocks) [11].

Date	AR				CAR				
	Mean	SD	t-value	p-value	Mean	SD	t-value	p-value	
2014/6/24	0.000	0.009	-0.467	0.642	-0.001	0.009	-0.688	0.493	
2014/6/25	0.000	0.008	0.407	0.685	0.000	0.008	-0.062	0.951	
2014/6/26	-0.001	0.009	-1.204	0.232	-0.002	0.009	-2.155	0.034	
2014/6/27	-0.001	0.009	-0.486	0.628	0.003	0.009	2.901	0.005	
2014/6/30	-0.003	0.008	-3.048	0.003	**	0.000	0.007	0.204	0.839
2014/7/1	0.000	0.008	0.331	0.741	0.001	0.008	0.959	0.340	
2014/7/2	0.000	0.010	0.129	0.898	0.001	0.010	0.615	0.541	
2014/7/3	0.000	0.010	-0.308	0.759	-0.001	0.010	-1.244	0.217	
2014/7/4	0.000	0.008	-0.343	0.733	-0.001	0.008	-0.903	0.369	
2014/7/7	0.000	0.009	-0.101	0.920	-0.002	0.009	-1.550	0.125	
2014/7/8	-0.002	0.009	-1.507	0.136	-0.002	0.009	-1.661	0.100	
2014/7/9	0.001	0.009	1.135	0.260	-0.002	0.009	-2.364	0.020	
2014/7/10	0.000	0.007	-0.040	0.968	-0.005	0.006	-6.589	0.000	
2014/7/11	0.000	0.009	-0.421	0.675	-0.001	0.009	-1.240	0.219	
2014/7/14	-0.001	0.009	-0.502	0.617	-0.001	0.009	-0.616	0.539	
2014/7/15	0.002	0.008	1.895	0.062	0.002	0.008	2.134	0.036	
2014/7/16	-0.001	0.008	-0.561	0.576	0.000	0.008	-0.353	0.725	
2014/7/17	0.000	0.007	0.465	0.643	0.000	0.007	0.134	0.894	
2014/7/18	-0.001	0.007	-1.499	0.138	-0.001	0.007	-1.167	0.247	
2014/7/22	-0.001	0.010	-1.245	0.217	-0.001	0.010	-1.332	0.187	
2014/7/23	0.001	0.008	0.810	0.421	0.000	0.008	0.271	0.787	
2014/7/24	0.000	0.010	-0.020	0.984	0.000	0.010	-0.104	0.917	
2014/7/25	-0.002	0.008	-1.766	0.081	-0.003	0.008	-3.416	0.001	
2014/7/28	0.001	0.011	0.742	0.460	0.000	0.011	-0.065	0.949	
2014/7/29	0.000	0.010	-0.037	0.971	-0.002	0.010	-2.033	0.045	
2014/7/30	-0.001	0.012	-0.667	0.507	-0.002	0.012	-1.241	0.218	
2014/7/31	-0.001	0.012	-0.805	0.423	-0.002	0.012	-1.853	0.067	
2014/8/1	0.001	0.015	0.359	0.721	-0.001	0.015	-0.476	0.635	
2014/8/4	0.000	0.013	0.264	0.793	-0.001	0.013	-1.030	0.306	
2014/8/5	-0.001	0.011	-0.559	0.578	-0.002	0.011	-2.022	0.046	
2014/8/6	0.000	0.014	-0.141	0.888	-0.001	0.013	-0.869	0.388	
2014/8/7	-0.002	0.011	-1.384	0.170	-0.001	0.011	-0.908	0.367	
2014/8/8	-0.002	0.015	-0.904	0.369	0.000	0.015	0.158	0.875	
2014/8/11	0.004	0.014	2.536	0.013	*	0.002	0.014	1.499	0.138
2014/8/12	0.000	0.007	0.378	0.707	0.002	0.007	2.627	0.010	
2014/8/13	0.001	0.008	1.135	0.260	0.001	0.008	1.007	0.317	
2014/8/14	0.001	0.008	0.721	0.473	0.001	0.008	0.913	0.364	
2014/8/15	-0.001	0.008	-0.529	0.598	-0.001	0.008	-1.279	0.204	
2014/8/18	-0.001	0.007	-1.508	0.135	-0.002	0.007	-2.034	0.045	
2014/8/19	0.001	0.008	0.914	0.363	0.000	0.008	0.073	0.942	

Note: *** is significant at the 0.001 level, ** is significant at the 0.01 level, * is significant at the 0.05 level, and . is significant at the 0.1 level.

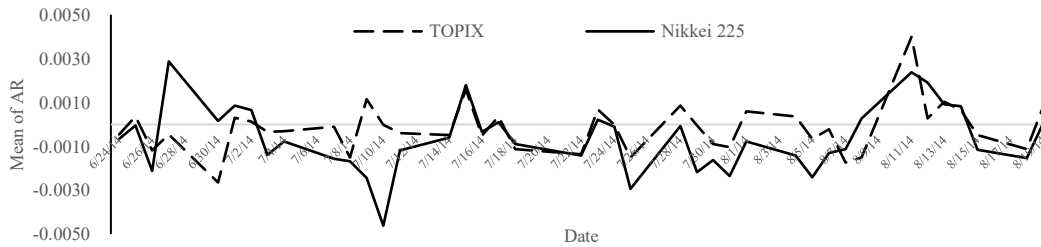


Figure 3: Movement of AR in P2 (all stocks) [11].

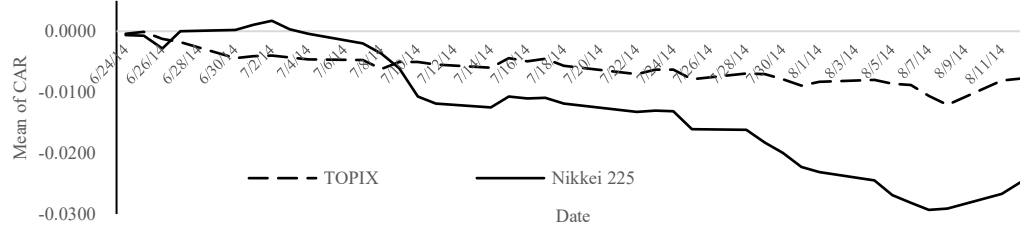


Figure 4: Movement of CAR in P2 (all stocks) [11].

225, AR took a positive and significant value for 8 days and a negative and significant value for 5 days. CAR took a positive and significant value for 18 days and a negative and significant value for 0 days. In P2, the results are as shown in Table 2, and the fluctuations are as shown in Figures 3 and 4. When we use TOPIX, AR took a positive and significant value for 2 days and a negative and significant value for 2 days. CAR took a positive and significant value for 0 days and a negative and significant value for 2 days. Further, when we use Nikkei 225, AR took a positive and significant value for 3 days and a negative and significant value for 9 days. CAR took a positive and significant value for 0 days and a negative and significant value for 28 days.

Table 3: Result of AR in P1 (from 3001 yen to 5000 yen and higher than 5001 yen)

Date	From 3001 yen to 5000 yen				Higher than 5001 yen													
	TOPIX		Nikkei 225		TOPIX		Nikkei 225											
	mean	SD	t-value	p-value	mean	SD	t-value	p-value										
2013/12/16	-0.002	0.009	-0.702	0.493	-0.002	0.009	-1.013	0.327	0.000	0.010	-0.148	0.884	-0.001	0.009	-0.418	0.683		
2013/12/17	-0.003	0.008	-1.274	0.222	-0.001	0.008	-0.431	0.673	0.001	0.012	0.199	0.845	-0.003	0.012	-0.795	0.442		
2013/12/18	0.001	0.007	0.757	0.461	0.002	0.007	0.826	0.422	0.002	0.007	1.180	0.261	0.003	0.008	1.168	0.265		
2013/12/19	0.001	0.013	0.286	0.778	-0.001	0.014	-0.395	0.698	0.005	0.014	1.261	0.231	0.002	0.014	0.549	0.593		
2013/12/20	0.000	0.010	-0.031	0.976	-0.001	0.010	-0.570	0.577	0.007	0.014	1.727	0.110	0.005	0.014	1.310	0.215		
2013/12/24	0.000	0.010	-0.185	0.855	-0.004	0.010	-1.718	0.106	0.004	0.012	1.075	0.304	-0.001	0.012	-0.193	0.850		
2013/12/23	0.004	0.010	1.720	0.106	0.000	0.010	-0.087	0.932	-0.001	0.007	-0.572	0.578	-0.006	0.006	-3.628	0.003		
2013/12/26	-0.002	0.013	-0.491	0.631	0.007	0.013	2.166	0.047	*	-0.006	0.011	-2.059	0.062	0.004	0.010	1.415	0.182	
2013/12/27	-0.001	0.009	-0.282	0.782	0.007	0.009	3.317	0.005	**	-0.005	0.009	-1.972	0.072	0.004	0.007	2.209	0.047	
2013/12/30	-0.004	0.008	-1.911	0.075	0.000	0.008	0.202	0.843	-0.003	0.008	-1.253	0.234	0.002	0.007	1.040	0.319		
2014/1/6	-0.002	0.015	-0.611	0.551	0.007	0.015	1.840	0.086	0.003	0.017	0.652	0.527	0.014	0.015	3.322	0.006		
2014/1/7	-0.001	0.008	-0.420	0.680	-0.003	0.008	-1.492	0.156	-0.003	0.011	-0.909	0.381	-0.005	0.011	-1.735	0.108		
2014/1/8	-0.002	0.018	-0.391	0.702	0.002	0.018	0.413	0.685	0.005	0.028	0.666	0.518	0.009	0.028	1.193	0.256		
2014/1/9	-0.001	0.015	-0.278	0.783	0.003	0.015	0.754	0.462	-0.003	0.010	-1.319	0.212	0.001	0.009	0.357	0.727		
2014/1/10	-0.003	0.008	-1.638	0.122	-0.003	0.008	-1.601	0.130	-0.001	0.017	-0.182	0.859	-0.001	0.017	-0.162	0.874		
2014/1/14	0.003	0.012	1.078	0.298	0.003	0.012	1.177	0.258	-0.001	0.009	-0.393	0.701	-0.001	0.010	-0.213	0.835		
2014/1/15	0.004	0.012	1.360	0.194	0.006	0.013	1.879	0.080	0.003	0.016	0.567	0.581	0.005	0.016	1.048	0.315		
2014/1/16	0.002	0.010	0.902	0.381	0.005	0.010	2.090	0.054	-0.002	0.010	-0.867	0.403	0.001	0.010	0.314	0.759		
2014/1/17	-0.001	0.012	-0.387	0.704	0.002	0.012	0.588	0.565	-0.008	0.012	-2.508	0.028	*	-0.005	0.012	-1.428	0.179	
2014/1/20	-0.003	0.009	-1.486	0.158	-0.002	0.009	-0.726	0.479	-0.002	0.020	-0.307	0.764	0.000	0.020	-0.069	0.954		
2014/1/21	0.001	0.006	0.565	0.581	-0.004	0.007	-2.482	0.025	*	0.000	0.013	-0.088	0.931	-0.006	0.013	-1.727	0.110	
2014/1/22	-0.003	0.008	-1.404	0.181	-0.001	0.008	-0.550	0.591	0.004	0.012	1.025	0.326	0.006	0.012	1.622	0.131		
2014/1/23	0.000	0.011	0.156	0.878	-0.003	0.010	-1.037	0.316	0.000	0.009	0.147	0.886	-0.003	0.008	-1.492	0.161		
2014/1/24	-0.002	0.008	-0.935	0.365	-0.005	0.008	-2.505	0.024	*	0.001	0.008	0.625	0.544	-0.002	0.008	-0.952	0.360	
2014/1/27	0.001	0.012	0.303	0.766	-0.008	0.012	-2.762	0.015	*	0.003	0.014	0.863	0.405	-0.007	0.012	-2.175	0.050	
2014/1/28	-0.003	0.011	-1.034	0.318	-0.005	0.011	-1.895	0.078	0.002	0.015	0.536	0.602	-0.001	0.015	-0.135	0.895		
2014/1/29	-0.001	0.017	-0.134	0.895	0.005	0.016	1.333	0.202	-0.002	0.011	-0.601	0.559	0.005	0.010	1.860	0.088		
2014/1/30	0.002	0.013	0.530	0.604	-0.005	0.013	-1.612	0.128	0.006	0.020	1.148	0.273	-0.002	0.020	-0.317	0.757		
2014/1/31	-0.003	0.026	-0.442	0.665	-0.001	0.026	-0.165	0.871	-0.003	0.008	-1.317	0.212	-0.001	0.008	-0.348	0.734		
2014/2/3	0.001	0.014	0.309	0.761	-0.004	0.014	-1.055	0.308	0.012	0.021	2.007	0.068	0.006	0.021	1.061	0.309		
2014/2/4	0.006	0.024	0.943	0.360	-0.011	0.023	-1.912	0.075	0.004	0.024	0.619	0.548	-0.015	0.021	-2.511	0.027		
2014/2/5	-0.006	0.016	-1.456	0.166	0.005	0.016	1.323	0.206	-0.006	0.028	-0.750	0.468	0.007	0.027	0.918	0.377		
2014/2/6	-0.009	0.013	-2.899	0.011	*	-0.008	0.013	-2.483	0.025	*	-0.008	0.014	-1.609	0.134	-0.005	0.014	-1.344	0.237
2014/2/7	0.001	0.012	0.163	0.873	0.007	0.012	2.525	0.023	*	-0.008	0.016	-1.701	0.115	0.004	0.015	0.013	0.990	
2014/2/10	0.004	0.013	1.272	0.223	0.004	0.013	1.281	0.220	0.006	0.016	1.427	0.179	0.006	0.016	1.381	0.193		

Note: ** is significant at the 0.01 level, * is significant at the 0.05 level, and . is significant at the 0.1 level.

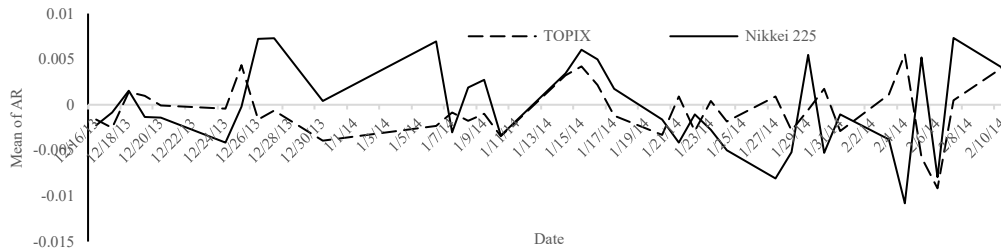


Figure 5: Movement of AR in P1 (from 3001 yen to 5000 yen)

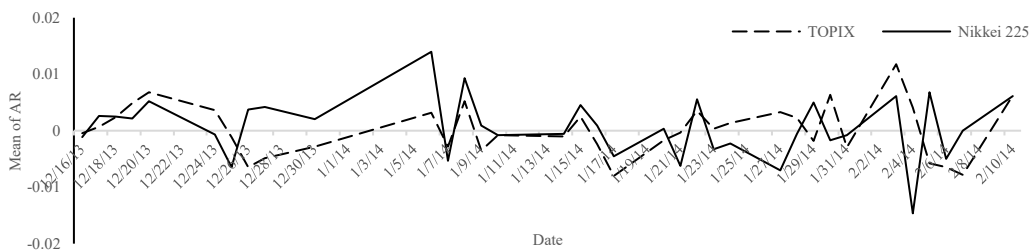


Figure 6: Movement of AR in P1 (than 5001 yen)

Next, the price range was divided. In P1, the results are as shown in Tables 3 and 4, and the time fluctuations are as shown in Figures 5, 6, 7, and 8. The number of stocks were 16 from 3001 to 5000 yen, and 13 higher than 5001 yen. When we use TOPIX for the price range of 3001 to 5000 yen, AR took a positive and significant value for 0 days and a negative and significant value for 2 days. CAR took a positive and significant value for 0 days and a negative and significant value for 0 day. When we use Nikkei 225, AR took a positive and significant value for 6 days and a negative and significant value for 6 days. CAR took a positive and significant value for 0 days and a negative and significant value for 0 days as well. When we use TOPIX for the price range higher than 5001 yen, AR took a positive and significant value for 1 day and a

negative and significant value for 3 days. CAR took a positive and significant value for 0 days and a negative and significant value for 0 days. When we use Nikkei 225, AR took a positive and

Table 4: Result of CAR in P1 (from 3001 yen to 5000 yen and higher than 5001 yen)

Date	From 3001yen to 5000 yen								Higher than 5001 yen							
	TOPIX				Nikkei 225				TOPIX				Nikkei 225			
	mean	SD	t-value	p-value	mean	SD	t-value	p-value	mean	SD	t-value	p-value	mean	SD	t-value	p-value
2013/12/16	-0.002	0.009	-0.702	0.493	-0.002	0.009	-1.313	0.327	0.000	0.010	-0.148	0.884	-0.001	0.009	-0.418	0.683
2013/12/17	-0.004	0.012	-1.416	0.177	-0.003	0.012	-1.071	0.301	0.000	0.018	0.052	0.960	0.001	0.017	0.303	0.767
2013/12/18	-0.003	0.014	-0.797	0.438	-0.002	0.014	-0.461	0.651	0.003	0.020	0.484	0.637	0.004	0.020	0.720	0.485
2013/12/19	-0.002	0.025	-0.288	0.777	-0.003	0.025	-0.470	0.645	0.008	0.030	0.927	0.372	0.006	0.030	0.744	0.471
2013/12/20	-0.002	0.029	-0.256	0.801	-0.004	0.029	-0.596	0.560	0.014	0.035	1.467	0.168	0.011	0.036	1.142	0.276
2013/12/24	-0.002	0.033	-0.280	0.783	-0.009	0.033	-1.022	0.323	0.018	0.039	1.654	0.124	0.011	0.040	0.975	0.349
2013/12/25	0.002	0.036	0.222	0.828	-0.009	0.037	-0.949	0.358	0.017	0.038	1.597	0.136	0.004	0.038	0.403	0.694
2013/12/26	0.000	0.035	0.045	0.965	-0.002	0.035	-0.172	0.866	0.010	0.039	0.960	0.356	0.008	0.039	0.734	0.477
2013/12/27	0.000	0.037	-0.026	0.979	0.006	0.037	0.624	0.542	0.005	0.038	0.519	0.613	0.012	0.038	1.176	0.262
2013/12/30	-0.004	0.039	-0.427	0.675	0.006	0.039	0.631	0.538	0.003	0.039	0.235	0.818	0.014	0.038	1.361	0.198
2014/1/6	-0.007	0.043	-0.610	0.551	0.013	0.042	1.242	0.233	0.006	0.047	0.434	0.672	0.028	0.044	2.339	0.037
2014/1/7	-0.007	0.044	-0.667	0.515	0.010	0.044	0.924	0.370	0.003	0.048	0.216	0.833	0.023	0.045	1.862	0.087
2014/1/8	-0.009	0.058	-0.627	0.540	0.012	0.058	0.825	0.422	0.008	0.067	0.431	0.674	0.032	0.064	1.816	0.094
2014/1/9	-0.010	0.064	-0.635	0.535	0.015	0.063	0.927	0.399	0.005	0.066	0.200	0.807	0.033	0.061	1.974	0.072
2014/1/10	-0.014	0.061	-0.894	0.385	0.011	0.060	0.753	0.463	0.004	0.076	0.174	0.865	0.032	0.072	1.633	0.128
2014/1/14	-0.010	0.061	-0.678	0.508	0.015	0.060	0.981	0.342	0.003	0.073	0.134	0.896	0.032	0.067	1.705	0.114
2014/1/15	-0.006	0.069	-0.357	0.726	0.021	0.069	1.213	0.244	0.005	0.072	0.261	0.799	0.036	0.066	1.983	0.071
2014/1/16	-0.004	0.068	-0.234	0.818	0.026	0.068	1.528	0.147	0.003	0.073	0.139	0.891	0.037	0.066	2.046	0.063
2014/1/17	-0.005	0.076	-0.274	0.788	0.028	0.075	1.478	0.160	-0.005	0.071	-0.265	0.796	0.033	0.063	1.879	0.085
2014/1/20	-0.009	0.073	-0.455	0.656	0.026	0.073	1.416	0.177	-0.007	0.065	-0.383	0.708	0.033	0.057	2.089	0.059
2014/1/21	-0.008	0.073	-0.414	0.684	0.022	0.072	1.210	0.245	-0.007	0.062	-0.415	0.685	0.027	0.056	1.726	0.110
2014/1/22	-0.010	0.073	-0.573	0.575	0.021	0.071	1.165	0.262	-0.004	0.061	-0.218	0.831	0.032	0.053	2.193	0.049
2014/1/23	-0.010	0.078	-0.519	0.612	0.018	0.076	0.952	0.356	-0.003	0.056	-0.215	0.834	0.029	0.050	2.105	0.057
2014/1/24	-0.012	0.081	-0.588	0.565	0.013	0.078	0.662	0.518	-0.002	0.056	-0.127	0.901	0.027	0.050	1.954	0.074
2014/1/27	-0.011	0.079	-0.555	0.587	0.005	0.077	0.252	0.804	0.001	0.053	0.090	0.930	0.020	0.050	1.430	0.178
2014/1/28	-0.014	0.086	-0.642	0.531	0.000	0.084	-0.016	0.987	0.004	0.050	0.255	0.803	0.019	0.048	1.449	0.173
2014/1/29	-0.014	0.096	-0.598	0.559	0.005	0.094	0.219	0.830	0.002	0.054	0.112	0.912	0.024	0.051	1.742	0.107
2014/1/30	-0.013	0.097	-0.522	0.609	0.000	0.095	-0.007	0.995	0.008	0.059	0.489	0.634	0.023	0.058	1.412	0.183
2014/1/31	-0.016	0.091	-0.686	0.503	-0.001	0.088	-0.057	0.956	0.005	0.059	0.311	0.761	0.022	0.058	1.369	0.196
2014/2/3	-0.014	0.099	-0.584	0.568	-0.005	0.096	-0.211	0.836	0.017	0.068	0.892	0.390	0.028	0.068	1.479	0.165
2014/2/4	-0.009	0.086	-0.414	0.685	-0.016	0.084	-0.759	0.460	0.021	0.068	1.118	0.285	0.013	0.069	0.700	0.497
2014/2/5	-0.015	0.093	-0.625	0.541	-0.011	0.090	-0.472	0.644	0.015	0.065	0.838	0.419	0.020	0.067	1.089	0.297
2014/2/6	-0.024	0.086	-1.106	0.286	-0.019	0.083	-0.899	0.383	0.009	0.064	0.492	0.632	0.015	0.066	0.830	0.423
2014/2/7	-0.023	0.089	-1.048	0.311	-0.011	0.085	-0.531	0.604	0.001	0.066	0.056	0.956	0.015	0.066	0.830	0.423
2014/2/10	-0.019	0.085	-0.904	0.380	-0.007	0.082	-0.355	0.728	0.007	0.059	0.440	0.668	0.021	0.059	1.307	0.216

Note: * is significant at the 0.05 level, and . is significant at the 0.1 level.

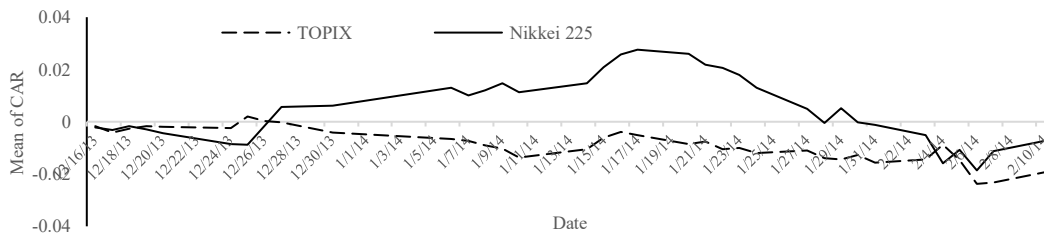


Figure 7: Movement of CAR in P1 (from 3001 yen to 5000 yen)

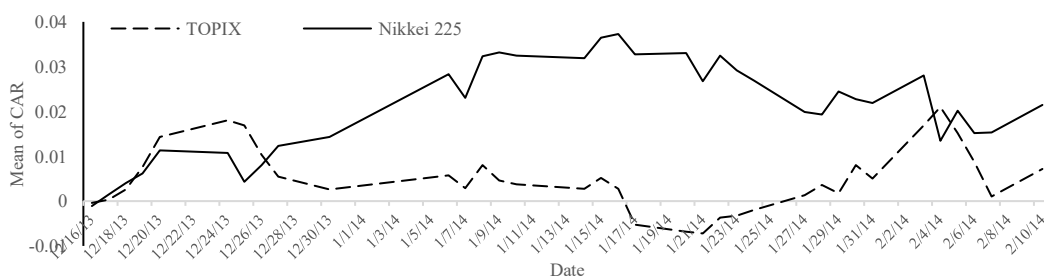


Figure 8: Movement of CAR in P1 (than 5001 yen)

significant value for 3 days and a negative and significant value for 3 days. CAR took a positive and significant value for 11 days and a negative and significant value for 0 days.

Similarly, in P2, the results are as shown in Tables 5 and 6, and the time fluctuations are as shown in Figures 9, 10, 11, and 12. The number of stocks was 53 stocks for 3000 yen or less and 18 stocks for 3001 to 5000 yen. When we use TOPIX for the price range of 3000 yen or less, the AR took a positive and significant value for 1 day and a negative and significant value for 3 days. CAR took a positive and significant value for 0 days and a negative and significant value for 23

days. When we use Nikkei 225, AR took a positive and significant value for 2 days and a negative and significant value for 10 days. CAR took a positive and significant value for 0 days and a negative and significant value for 32 days. When TOPIX was used for the price range of

Table 5: Result of AR in P2 (lower than 3000 yen and from 3001 yen to 5000 yen)

Date	lower than 3000 yen								From 3001 yen to 5000 yen										
	TOPIX				Nikkei 225				TOPIX				Nikkei 225						
	mean	SD	t-value	p-value	mean	SD	t-value	p-value	mean	SD	t-value	p-value	mean	SD	t-value	p-value			
2014/6/24	-0.001	0.009	-0.847	0.401	-0.001	0.009	-1.030	0.308	0.001	0.007	0.618	0.545	0.001	0.007	0.494	0.628			
2014/6/25	-0.001	0.007	-0.854	0.397	-0.001	0.007	-1.312	0.195	0.003	0.009	1.637	0.120	0.003	0.009	1.441	0.168			
2014/6/26	-0.001	0.008	-0.795	0.430	-0.002	0.008	-1.602	0.115	-0.003	0.010	-1.243	0.231	-0.004	0.009	-1.696	0.108			
2014/6/27	0.000	0.008	-0.412	0.682	0.003	0.008	2.451	0.018	* -0.001	0.010	-0.453	0.656	0.002	0.011	0.914	0.374			
2014/6/30	-0.002	0.008	-2.108	0.040	*	0.000	0.008	0.367	0.715	-0.003	0.006	-2.181	0.044	*	0.000	0.006	-0.758	0.800	
2014/7/1	0.001	0.008	0.945	0.349	0.002	0.008	1.487	0.143	-0.002	0.007	-0.894	0.384	-0.001	0.007	-0.572	0.575			
2014/7/2	-0.001	0.008	-0.710	0.481	0.000	0.008	-0.249	0.804	0.000	0.010	0.100	0.922	0.001	0.010	0.318	0.754			
2014/7/3	-0.001	0.011	-0.738	0.464	-0.002	0.011	-1.444	0.155	0.001	0.009	0.428	0.674	0.000	0.009	-0.055	0.957			
2014/7/4	-0.002	-1.455	0.152	-0.002	0.008	-1.895	0.064	0.002	0.009	0.935	0.363	0.001	0.009	0.701	0.493				
2014/7/7	0.000	0.011	-0.287	0.775	-0.002	0.010	-1.345	0.184	0.001	0.007	0.588	0.591	-0.001	0.006	-0.424	0.677			
2014/7/8	-0.002	0.009	-1.793	0.079	-0.002	0.009	-1.947	0.057	0.000	0.005	-0.019	0.985	0.000	0.005	-0.152	0.881			
2014/7/9	0.001	0.010	0.441	0.661	-0.003	0.009	-2.351	0.023	*	0.004	0.008	2.327	0.033	*	0.001	0.009	0.418	0.681	
2014/7/10	0.000	0.006	-0.555	0.581	-0.005	0.006	-5.973	0.000	***	0.001	0.006	1.063	0.302	-0.003	0.005	-2.490	0.023	*	
2014/7/11	-0.002	0.008	-1.712	0.093	-0.003	0.008	-2.429	0.019	**	0.003	0.009	1.492	0.154	0.003	0.010	1.103	0.285		
2014/7/14	-0.001	0.009	-0.446	0.657	-0.001	0.009	-0.500	0.619	0.000	0.008	0.251	0.805	0.000	0.008	0.180	0.859			
2014/7/15	0.000	0.007	0.044	0.965	0.000	0.007	0.315	0.754	0.004	0.009	2.089	0.052	0.005	0.009	2.155	0.046	*		
2014/7/16	-0.001	0.009	-0.991	0.493	-0.001	0.009	-0.545	0.588	0.002	0.006	1.203	0.245	0.002	0.006	1.320	0.204			
2014/7/17	0.001	0.007	1.070	0.289	0.001	0.007	0.783	0.437	-0.002	0.008	-0.946	0.358	-0.002	0.008	-1.086	0.293			
2014/7/18	-0.001	0.007	-0.754	0.454	-0.001	0.007	-0.571	0.570	-0.001	0.006	-0.819	0.424	-0.001	0.006	-0.642	0.530			
2014/7/22	-0.002	0.010	-1.263	0.212	-0.002	0.010	-1.306	0.197	-0.004	0.008	-2.062	0.055	-0.004	0.008	-2.120	0.049	*		
2014/7/23	0.001	0.008	0.938	0.353	0.001	0.008	0.486	0.629	-0.002	0.006	-1.529	0.145	-0.003	0.006	-1.853	0.081			
2014/7/24	0.001	0.009	0.773	0.443	0.001	0.009	0.677	0.501	-0.001	0.008	-0.362	0.722	-0.001	0.008	-0.409	0.688			
2014/7/25	-0.001	0.008	-1.247	0.218	-0.003	0.008	-2.419	0.019	*	-0.002	0.005	-2.235	0.039	*	-0.004	0.005	-3.420	0.003	**
2014/7/28	0.002	0.011	1.490	0.142	0.002	0.011	0.877	0.384	-0.001	0.009	-0.340	0.738	-0.002	0.008	-0.824	0.421			
2014/7/29	-0.001	0.010	-1.107	0.274	-0.004	0.010	-2.706	0.009	**	0.001	0.008	0.316	0.756	-0.002	0.008	-0.812	0.428		
2014/7/30	-0.002	0.011	-1.193	0.238	-0.003	0.011	-1.703	0.095	0.006	0.012	1.910	0.073	0.005	0.013	1.643	0.119			
2014/7/31	-0.001	0.011	-0.343	0.733	-0.002	0.011	-1.256	0.215	-0.002	0.014	-0.747	0.465	-0.004	0.013	-1.184	0.253			
2014/8/1	0.001	0.016	0.377	0.708	-0.001	0.016	-0.293	0.771	0.000	0.015	0.067	0.947	-0.001	0.015	-0.329	0.746			
2014/8/4	0.002	0.013	0.975	0.334	0.000	0.013	-0.024	0.981	-0.002	0.012	-0.624	0.541	-0.004	0.012	-1.244	0.230			
2014/8/5	-0.001	0.012	-0.745	0.460	-0.003	0.012	-1.865	0.068	0.001	0.010	0.635	0.534	0.000	0.009	-0.139	0.891			
2014/8/6	0.001	0.016	0.424	0.674	0.000	0.016	-0.118	0.907	-0.001	0.007	-0.871	0.396	-0.002	0.007	-1.552	0.139			
2014/8/7	-0.001	0.012	-0.922	0.361	-0.001	0.012	-0.538	0.593	-0.002	0.007	-1.314	0.206	-0.002	0.007	-0.969	0.346			
2014/8/8	0.000	0.015	-0.128	0.899	0.001	0.015	0.621	0.538	0.000	0.010	0.014	0.989	0.002	0.011	0.733	0.474			
2014/8/11	0.005	0.014	2.434	0.018	*	0.003	0.014	1.633	0.108	-0.001	0.015	-0.152	0.881	-0.002	0.015	-0.610	0.550		
2014/8/12	0.000	0.007	0.331	0.742	0.002	0.006	2.180	0.034	*	0.001	0.006	0.375	0.712	0.002	0.006	1.555	0.138		
2014/8/13	0.001	0.008	0.880	0.383	0.001	0.008	0.780	0.439	0.001	0.009	0.392	0.700	0.001	0.009	0.333	0.743			
2014/8/14	0.000	0.007	0.046	0.964	0.000	0.007	0.255	0.799	0.002	0.009	0.688	0.501	0.002	0.009	0.773	0.450			
2014/8/15	-0.001	0.009	-0.929	0.357	-0.002	0.009	-1.494	0.141	0.002	0.006	1.124	0.277	0.001	0.006	0.681	0.505			
2014/8/18	-0.001	0.006	-1.493	0.141	-0.002	0.006	-1.990	0.052	0.001	0.008	0.577	0.571	0.001	0.008	0.368	0.717			
2014/8/19	0.001	0.009	0.478	0.635	0.000	0.009	-0.091	0.928	0.002	0.006	1.317	0.205	0.001	0.005	0.750	0.463			

Note: *** is significant at the 0.001 level, ** is significant at the 0.01 level, * is significant at the 0.05 level, and . is significant at the 0.1 level.

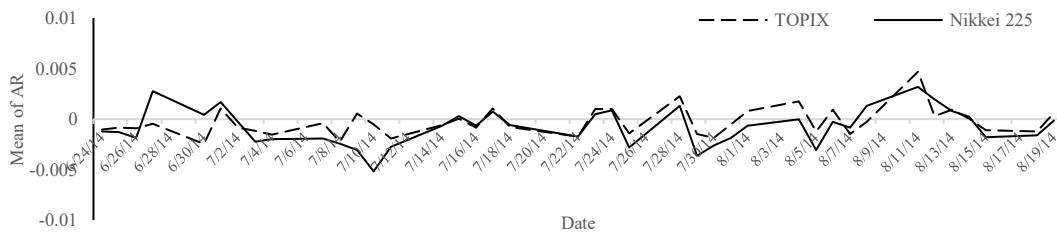


Figure 9: Movement of AR in P2 (less 3000 yen)

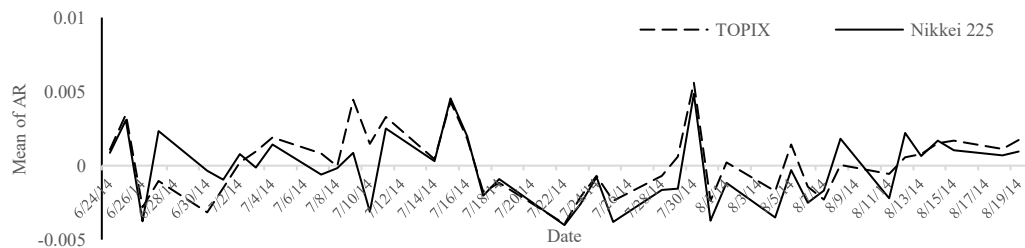


Figure 10: Movement of AR in P2 (from 3001 yen to 5000 yen)

3001 to 5000 yen, AR took a positive and significant value for 3 days and a negative and significant value for 3 days as well. CAR took a positive and significant value for 0 days and a negative and significant value for 0 days. When we use Nikkei 225, AR took a positive and

significant value for 1 day and a negative and significant value for 4 days. CAR took a positive and significant value for 0 days and a negative and significant value for 0 days.

6 Discussions

Table 6: Result of CAR in P2 (lower than 3000 yen and from 3001 yen to 5000 yen)

Date	lower than 3000 yen								From 3001 yen to 5000 yen									
	TOPIX		Nikkei 225		TOPIX		Nikkei 225		TOPIX		Nikkei 225		TOPIX		Nikkei 225			
	mean	SD	t-value	p-value	mean	SD	t-value	p-value	mean	SD	t-value	p-value	mean	SD	t-value	p-value		
2014/6/24	-0.001	0.009	-0.847	0.401	-0.001	0.009	-1.030	0.308	0.001	0.007	0.618	0.545	0.001	0.007	0.494	0.628		
2014/6/25	-0.002	0.010	-1.347	0.184	-0.003	0.010	-1.831	0.073	0.005	0.014	1.355	0.193	0.004	0.014	1.167	0.259		
2014/6/26	-0.003	0.014	-1.474	0.147	-0.004	0.014	-2.336	0.023	**	0.002	0.020	0.352	0.729	0.000	0.020	0.033	0.974	
2014/6/27	-0.003	0.017	-1.407	0.165	-0.002	0.017	-0.683	0.498	0.001	0.027	-0.103	0.919	0.002	0.028	0.380	0.708		
2014/6/30	-0.006	0.018	-2.293	0.026	*	-0.001	0.018	-0.470	0.641	-0.003	0.027	-0.395	0.698	0.002	0.028	0.327	0.747	
2014/7/1	-0.005	0.017	-1.959	0.056	.	0.001	0.017	0.237	0.814	-0.004	0.026	-0.662	0.517	0.001	0.026	0.189	0.852	
2014/7/2	-0.005	0.020	-2.014	0.049	*	0.000	0.020	0.100	0.920	-0.004	0.027	-0.585	0.567	0.002	0.028	0.295	0.771	
2014/7/5	-0.007	0.023	-2.057	0.045	*	-0.002	0.023	-0.611	0.544	-0.003	0.032	-0.383	0.707	0.002	0.032	0.241	0.812	
2014/7/4	-0.008	0.028	-2.126	0.038	*	-0.004	0.028	-1.032	0.307	-0.001	0.034	-0.118	0.907	0.003	0.034	0.401	0.694	
2014/7/7	-0.008	0.029	-2.118	0.039	*	-0.006	0.029	-1.455	0.152	0.000	0.036	-0.012	0.991	0.003	0.036	0.306	0.763	
2014/7/8	-0.011	0.032	-2.454	0.017	*	-0.008	0.032	-1.893	0.064	0.000	0.036	-0.015	0.988	0.002	0.036	0.287	0.777	
2014/7/9	-0.010	0.035	-2.099	0.041	*	-0.011	0.035	-2.354	0.022	*	0.004	0.037	0.503	0.621	0.003	0.036	0.382	0.707
2014/7/10	-0.011	0.038	-2.053	0.045	*	-0.017	0.037	-3.211	0.002	**	0.006	0.040	0.616	0.546	0.000	0.039	0.019	0.985
2014/7/11	-0.013	0.038	-2.381	0.021	*	-0.019	0.038	-3.669	0.001	**	0.009	0.039	0.995	0.334	0.003	0.039	0.295	0.771
2014/7/14	-0.013	0.041	-2.307	0.025	*	-0.020	0.041	-3.507	0.001	**	0.010	0.042	0.975	0.343	0.003	0.042	0.308	0.762
2014/7/15	-0.013	0.041	-2.301	0.025	*	-0.020	0.041	-3.462	0.001	**	0.014	0.043	1.375	0.187	0.008	0.043	0.752	0.463
2014/7/16	-0.014	0.046	-2.210	0.032	*	-0.020	0.046	-3.222	0.002	**	0.016	0.043	1.550	0.140	0.010	0.043	0.949	0.356
2014/7/17	-0.013	0.048	-1.940	0.058	.	-0.019	0.048	-2.943	0.005	**	0.014	0.045	1.328	0.202	0.008	0.044	0.720	0.481
2014/7/18	-0.014	0.050	-1.964	0.055	.	-0.020	0.050	-2.896	0.006	**	0.013	0.047	1.155	0.264	0.007	0.046	0.604	0.554
2014/7/22	-0.015	0.051	-2.180	0.034	*	-0.022	0.051	-3.091	0.003	**	0.009	0.049	0.760	0.458	0.003	0.049	0.225	0.825
2014/7/23	-0.014	0.052	-1.989	0.052	.	-0.021	0.053	-2.946	0.005	**	0.007	0.049	0.581	0.569	0.000	0.049	0.000	1.000
2014/7/24	-0.013	0.055	-1.768	0.083	.	-0.020	0.055	-2.700	0.009	**	0.006	0.050	0.508	0.620	-0.001	0.050	-0.067	0.947
2014/7/25	-0.015	0.057	-1.902	0.063	.	-0.023	0.057	-2.982	0.004	**	0.004	0.051	0.299	0.769	-0.005	0.051	-0.384	0.706
2014/7/28	-0.012	0.056	-1.614	0.113	.	-0.022	0.056	-2.815	0.007	**	0.003	0.056	0.220	0.828	-0.006	0.056	-0.475	0.641
2014/7/29	-0.014	0.059	-1.730	0.090	.	-0.025	0.059	-3.142	0.003	**	0.004	0.061	0.245	0.809	-0.008	0.060	-0.549	0.590
2014/7/30	-0.016	0.062	-1.864	0.068	.	-0.028	0.062	-3.317	0.002	**	0.009	0.062	0.625	0.540	-0.003	0.062	-0.204	0.841
2014/7/31	-0.016	0.059	-2.002	0.051	*	-0.030	0.059	-3.683	0.001	**	0.007	0.062	0.464	0.649	-0.007	0.061	-0.467	0.646
2014/8/1	-0.016	0.066	-1.705	0.094	.	-0.031	0.066	-3.388	0.001	**	0.007	0.067	0.444	0.662	-0.008	0.065	-0.507	0.618
2014/8/4	-0.014	0.071	-1.407	0.165	.	-0.031	0.071	-3.159	0.003	**	0.005	0.072	0.310	0.761	-0.011	0.071	-0.678	0.507
2014/8/5	-0.015	0.076	-1.440	0.156	.	-0.034	0.075	-3.265	0.002	**	0.007	0.075	0.376	0.712	-0.012	0.074	-0.667	0.514
2014/8/6	-0.014	0.077	-1.328	0.190	.	-0.034	0.076	-3.237	0.002	**	0.005	0.077	0.290	0.775	-0.014	0.075	-0.795	0.438
2014/8/7	-0.016	0.080	-1.421	0.161	.	-0.035	0.079	-3.208	0.002	**	0.003	0.077	0.164	0.872	-0.016	0.075	-0.893	0.384
2014/8/8	-0.016	0.082	-1.397	0.168	.	-0.033	0.082	-2.988	0.004	**	0.003	0.082	0.155	0.878	-0.014	0.080	-0.744	0.467
2014/8/11	-0.011	0.080	-1.014	0.315	.	-0.030	0.079	-2.791	0.007	**	0.002	0.082	0.126	0.901	-0.016	0.081	-0.846	0.409
2014/8/12	-0.011	0.080	-0.978	0.333	.	-0.028	0.080	-2.582	0.013	*	0.003	0.084	0.153	0.880	-0.014	0.083	-0.714	0.485
2014/8/13	-0.010	0.081	-0.885	0.380	.	-0.028	0.081	-2.477	0.017	*	0.004	0.085	0.189	0.852	-0.013	0.084	-0.670	0.512
2014/8/14	-0.010	0.082	-0.879	0.384	.	-0.027	0.081	-2.445	0.018	*	0.005	0.087	0.260	0.798	-0.012	0.086	-0.570	0.576
2014/8/15	-0.011	0.086	-0.929	0.357	.	-0.029	0.086	-2.474	0.017	*	0.007	0.083	0.360	0.724	-0.011	0.082	-0.545	0.593
2014/8/18	-0.012	0.088	-1.009	0.318	.	-0.031	0.088	-2.552	0.014	*	0.008	0.087	0.395	0.698	-0.010	0.087	-0.482	0.636
2014/8/19	-0.012	0.091	-0.930	0.356	.	-0.031	0.090	-2.484	0.016	*	0.010	0.085	0.491	0.630	-0.009	0.085	-0.447	0.661

Note: *** is significant at the 0.001 level, ** is significant at the 0.01 level, * is significant at the 0.05 level, and . is significant at the 0.1 level.

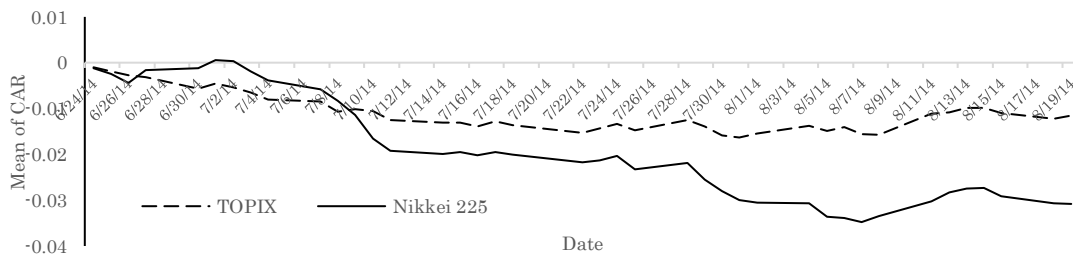


Figure 11: Movement of CAR in P2 (less than 3000 yen)

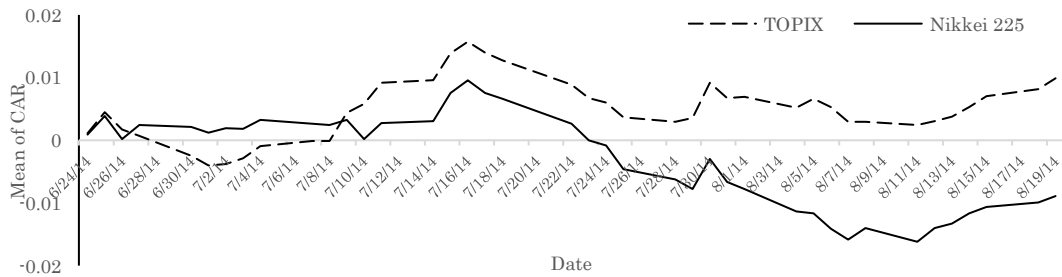


Figure 12: Movement of CAR in P2 (from 3001 yen to 5000 yen)

We analyzed AR and CAR for all stocks when the price range was divided. At that time, we analyzed the case using TOPIX and Nikkei 225 as market returns. Table 7 summarizes the results. In P1, for all stocks, in the case of TOPIX, the number of days when AR was positive and significant was found to be equal to the number of days when AR was negative and significant; in the case of Nikkei 225, the number of positive days was higher. CAR showed more positive days in both TOPIX and Nikkei 225. In P2, in the case of TOPIX, the number of days when AR

Table 7: Summary of Results.

	price range (yen)		P1				P2			
			TOPIX		Nikkei 225		TOPIX		Nikkei 225	
	above	up to	+	-	+	-	+	-	+	-
AR	all stocks		3	3	8	5	2	2	3	9
	0	3000					1	3	2	10
	3001	5000	0	2	6	6	3	3	1	4
	5001	-	1	3	3	3				
CAR	all stocks		3	0	18	0	0	2	0	28
	0	3000					0	23	0	32
	3001	5000	0	0	0	0	0	0	0	0
	5001	-	0	0	11	0				

Note: The numbers in the table represent the number of days the mean was significant. In addition, + indicates that the average value is significant when the value is positive, and - indicates that the average value is significant when the value is negative.

was positive and significant was equal to the number of days when AR was negative and significant; in Nikkei 225, there were more negative days. CAR showed more negative days for both. From these results, it may be inferred that resizing tick size had different impacts on P1 and P2. That is, there was a positive impact on P1 and a negative impact on P2. One reason for this could be that the target price ranges are different in P1 and P2.

Next, the price range was divided. P1 and P2 have the same price of 3001 to 5000 yen, and if in P1 the price is higher than 5001 yen and in P2 the price is lower than 3000 yen, the same results hold good.

Regarding the price range of 3001 to 5000 yen, in P1, in the case of TOPIX, there were more days with negative AR, and in Nikkei 225, the number of positive and significant days was equal to the number of negative and significant days. For CAR, it was 0 days for both TOPIX and Nikkei 225. In P2, in the case of TOPIX, the number of positive and significant days was equal to the number of negative and significant days, and in Nikkei 225, the number of days with negative AR was higher. For CAR, it was 0 days for both TOPIX and Nikkei 225. From these results, the difference between the number of days that were significant between plus and minus was 3 days at the most, and in many cases, there was almost no difference. These results suggest that there is no difference in the impact of resizing the tick size between P1 and P2, and that the difference between the positive and negative impacts and the degree of the difference are not large. In particular, for CAR, both minus and plus were 0 days. This suggests that there would be no impact in the long term.

When in P1 the price range was higher than 5001 yen, in the case of TOPIX, the number of days with negative AR was higher, and in the case of Nikkei 225, the number of positive and significant days was equal to the number of negative and significant days. Regarding CAR, in

the case of TOPIX, the number of positive and negative significant days was 0, and in the case of Nikkei 225, the number of positive and significant days was much higher. These results show that, when one day is used as a unit, the number of days in which a value that fluctuates significantly in a specific direction of plus or minus appears is small, it has a positive impact on corporate value in the long run. This suggests that tick resizing is effective in the high price range.

In the case of P2 of 3000 yen or less, AR was more negative in both TOPIX and Nikkei 225, especially in Nikkei 225. For CAR, both TOPIX and Nikkei 225 had much more negative and significant days. These results show that when one day is used as a unit, price fluctuates significantly in a specific negative direction, which has a negative impact on corporate value even in the long run. This suggests that tick resizing does not produce the desired results at low prices.

7 Conclusion

We conducted an AR and CAR analysis of tick resizing that was implemented in the TSE in 2014. In addition, when we conducted the analysis, we divided the price range and performed the same verification. This is because the target price range is different between P1 and P2. As a result, different results were obtained for P1 and P2. In P1, CAR was positive, while in P2 it was negative.

Further, in terms of the divided price range, in the price range of 3001 to 5000 yen, which is the common part, there was not much difference in the results between P1 and P2, and the number of significant CAR days was 0 in both. In P1, when price range was higher than 5001 yen, CAR had many positive days and a desirable impact in the long run. However, in the case of P2 of 3000 yen or less, CAR was negative for many days, which was an undesired result.

These results indicate that tick size should not be small for any stock, but that it is necessary to select the target stock. In such a case, the price range can be one condition. For future research, we would like to create a theoretical model of tick size and verify whether there are any other factors that affect it.

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