THE PRICE RESPONSE TO NIKKEI 225 STOCKS INDEX ADJUSTMENTS

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ABSTRACT

Using Nikkei 225 Index adjustment data, this study examines price response to changes in index composition. This study demonstrates that prices of stocks added to and deleted from the Nikkei 225 Index respectively fluctuate accordingly on the announcement day. These price trends then reverse during the post-announcement period. The results are consistent with the price pressure hypothesis. By classifying the composite stocks into two categories, this study finds that small-scale stocks exhibit larger price responses than large-scale stocks. In addition, the results show that newly added stocks with upward revised earnings forecasts earn more abnormal returns during the post-announcement period. The results shed more light on the information content associated index adjustments in the Japanese stock market.

JEL: G15；G32

KEYWORDS: Nikkei 225 Index, price responses, earnings forecast revision

INTRODUCTION

Numerous studies have examined the price responses of stocks to index adjustments. Harris and Gurel (1986), Shleifer (1986), Wurgler and Zhuravskaya (2002) and Chen et al. (2004, 2006) examined changes in composition of the S&P 500 Index. Some studies have focused on non-U.S. stock indices. For instance, Chakrabarti et al. (2005) applied a widely used set of country equity indices, the MSCI country indices, for 29 countries to the returns of stocks added to or removed from indices around the event dates. They found that stock returns and volumes exhibit an "Index effects" in international markets.

The Tokyo Stock Exchange is the largest stock exchange in South East Asia and the third largest in the world by market capitalization. However, little attention has focused on changes in the composition of the most broadly quoted Japanese stock index, the Nikkei 225 Index. Hanaeda and Serita (2003) examine large composite change in the Nikkei 225 Index that occurred on April, 2000. But, they only consider a single event change. Okada et al. (2006) used a large Nikkei 225 Index sample from 1991 through 2002 to investigate the stock price and volume behavior of firms around the time of their addition to the index. However, they did not consider the stock price and volume behavior of deleted firms. This study uses the composition changes in the Nikkei 225 Index to study the pricing effects.

Liu (2000) examined the effects of changes in the Nikkei 500 Index on stock prices and trading volume. He found significant price increases (decrease) for added (deleted) stocks with no post-event reversal (The event window is -15 to +15 days). Furthermore, Okada et al. (2006) used the Nikkei 225 Index to investigative the stock price and volume behavior of firms around their addition to the index. They found the stock prices of firms added to the Nikkei 225 increased on the announcement date, continue to increase until the day before the effective change date, and then decrease on and immediately after the change date. This occurred on average, approximately five business days between the announcement date and the actual change date. The Nikkei 225 and 500 Indices are price-weighted averages of 225 and 500 actively traded stocks on the first section of the Tokyo Stock Exchange. The reason that different studies have obtained different empirical results is unclear, but possibly may be due to the fact that the Nikkei 500 includes more small-cap stocks than the Nikkei 225. This study attempts to separate the added and deleted stocks into two types depending on market value. Next we examine which firm types exhibit larger price responses. Besides categorizing composite stocks into different market value segments, this study also classifies firms using analyst earnings forecasts to explore the price reactions of

upwards or downwards earnings forecast revisions of firms added to the Nikkei 225. For the firms deleted from the Nikkei 225 Index, the earnings forecast data is limited. Because of this data limitation, this study examines only earnings data of added firms.

The analytical results show that the price responses of stocks experiencing adjustments in the Nikkei 225 are consistent with the price pressure hypothesis. When classifying the characteristics of composite stocks into two categories, this study finds that small-scale stocks exhibit larger price responses than large-scale stocks. Moreover, added stocks with upwards earnings forecast revisions have abnormal returns than the added stocks with downwards earnings forecast revisions during the post-announcement period. This finding suggests that investors can profit by buying added stocks with upwards revision earnings forecasts.

The remainder of the article is organized as follows. Section 2 discusses the literature review. Section 3 describes the sample and methodology that I use. Section 4 presents and discusses the empirical results. Section 5 concludes the article.

LITERATURE REVIEW

The literature on the effects of price changes due to the addition and deletion of stocks to major stock indices is voluminous. Harris and Gurel (1986), Shleifer (1986), Dhillon and Johnson (1991), Wurgler and Zhuravskaya (2002) found strong price effects for S&P 500 inclusions. Kaul et al. (2000) and Okada et al. (2006) found similar effects on the Toronto Stock Exchange TSE 300 and Nikkei 225 indices.

Harris and Gurel (1986) found strong effects for S&P 500 inclusions, but unlike the permanent volume effect, the price effect is reversed over time. They therefore summarized that these effects are due to price pressure. Shu et al. (2004) found additions (deletions) to the MSCI free indices have a positive (negative) abnormal return in the run-up window from the announcement day up to one day before the change was implemented. This was followed by a significant reversal on the change day. Shankar and Miller (2006) found that firms added to the S&P 600 index experience a significant price increase at announcement. However, the price and volume effects are temporary and are fully reversed within 60 days. Okada et al. (2006) found the stock prices of firms to be added, rise on the announcement date, continue to rise until the day before the effective change date, and subsequently decline beginning on the change date. Hence their results also support the temporary price-pressure hypothesis.

On the other hand, Shleifer (1986) found permanent price changes and attributes them to the downward sloping demand curve for stocks and the fact that stocks are imperfect substitutes for one another. Wurgler and Zhuravskaya (2002) witnessed that stocks with no close substitutes experience a higher increase in returns on inclusion in the S&P 500 index. This finding corroborates evidence for the downward sloping demand curve view. Kaul et al. (2001) and Liu (2000) also reported results consistent with the downward sloping demand curve hypothesis based on the Toronto Stock Exchange 300 and Nikkei 500.

Jain (1987) and Dhillon and Johnson (1991) argued there may be an information effect in the inclusion or exclusion of stocks to a major index. Denis et al. (2003) also suggests that S&P Index inclusion is not an information-free event. The liquidity hypothesis suggests the price increase at index inclusion results from increased liquidity. Hedge and McDermott (2003) found there is a negative relationship between cumulative abnormal returns around the announcement and the percent change in the spread. The results show that when trading costs decrease because of liquidity stocks have higher returns.

Chen et al. (2004, 2006) studied the price effects of changes to the S&P 500 Index and witnessed an asymmetric price response. Consistent with prior work, they found a permanent price increase for firms added to the S&P 500 Index. However, they found that firms deleted from the index do not experience a permanent negative price effect. They argue that a possible reason for asymmetric price response effects arises from changes in investor awareness.

DATA AND METHODOLOGY DESCRIPTION

This study uses stocks either added to or removed from the Nikkei 225 Index to study the effects of index composition changes during the periods from September 1991 to March 2008. Table 1 lists these changes by year. Excluding insufficient price data during the event periods, the final samples comprised 88 firms added to and 51 firms deleted from the Nikkei 225 Index. Besides exploring price changes for the whole sample, this study also used the characteristics of composite stocks as a basis for dividing the sample firms into two categories. Category 1 separates composite stocks into large scale and small scale firms depending on their market capitalization. Category 2 classifies newly added firms based on analyst earnings forecasts into upwards and downwards earnings adjustment groups. To examine which firm types exhibit larger price changes effect. Earnings per share forecasts are obtained from the I/B/E/S database. The price and market value of Japanese stocks are obtained from DataStream. Information on announcement dates for the Nikkei 225 Index adjustment is obtained from the Nikkei Interactive website. This study uses the TOPIX index as the Japanese market index. Liu (2000) used TOPIX index as market index to investigate the price and trading volume effects of changes in the Nikkei 500. Okada et al. (2006) used the TOPIX index as a market index to study the stock price and volume behavior of firms around the time of their addition to the Nikkei 225 Index. This study follows the practices of using TOPIX as Japan market index.

An event study approach is applied in this study. Using the market model, the return of stock *i* on day *t*, denoted as R_{it} , is calculated as:

$$R_{it} = \alpha_i + \beta_i R_m + \varepsilon_{it} \qquad (1)$$

where R_{mt} is the return of the Japan market on day *t*. The parameters of the market model are estimated using an Ordinary Least Squares (OLS) regression.

Table 1：Changes in the Nikkei 225 Index, September 1991 to March 2008.

	Nikkei 225 Index
Year	# of Changes
1991	6
1992	4
1993	2
1994	0
1995	1
1996	2
1997	1
1998	2
1999	2
2000	38
2001	13
2002	12
2003	5
2004	4
2005	10
2006	4
2007	3
2008	3
Total	112

This table shows the changes of Nikkei 225 Index adjustment during the periods from September 1991 to March 2008.

These parameters are then used to calculate abnormal returns associated with the event examined. I choose an estimation period of -120 to -11 days and an event window of -10 to 30 days. The abnormal return of stock *i* on day *t*, is denoted as AR_{it} , and is calculated as:

$$AR_{it} = R_{it} - \hat{R}_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \tag{2}$$

where $\hat{R}_{it}$ the expected is return of stock *i* on day *t*. The mean abnormal return across the sample, denoted as MAR_t is defined as:

$$MAR_t = \sum_{i=1}^{N} \frac{AR_{it}}{N} \tag{3}$$

This study then computes the cumulative abnormal return (CAR_i) for stock *i* for various event windows from $t = j$ to $t = k$ as

$$CAR_i = \sum_{t=j}^{k} AR_{it} \tag{4}$$

The mean cumulative abnormal return (CAR) of *N* stocks is

$$CAR = \frac{\sum_{i=1}^{N} CAR_i}{N} \tag{5}$$

The corresponding *t-statistics* that measure whether the CAR is significantly different from zero is

$$t(CAR) = \frac{CAR}{\sqrt{\frac{Var(CAR_i)}{N}}}, \tag{6}$$

where $Var(CAR_i)$ is the variance of CAR_i among *N* stocks.

This study also uses a two-sample t-statistics to test whether different CARs in two subsamples are equal to each other. The t-statistics of two-sample mean cumulative abnormal return is as follows:

$$t = \frac{CAR_{S1} - CAR_{S2}}{\sqrt{\frac{S_{S1}^2}{N_{S1}} + \frac{S_{S2}^2}{N_{S2}}}}, \tag{7}$$

where S_1 is the subsample 1, S_2 is the subsample 2, $CAR_{S1}(CAR_{S2})$ is the CAR of subsample 1 (subsample 2), $S_{S1}^2(S_{S2}^2)$ is the variance of CAR_i in subsample 1 (subsample 2), and $N_{S1}(N_{S2})$ is the number of stocks in subsample 1 (subsample 2).

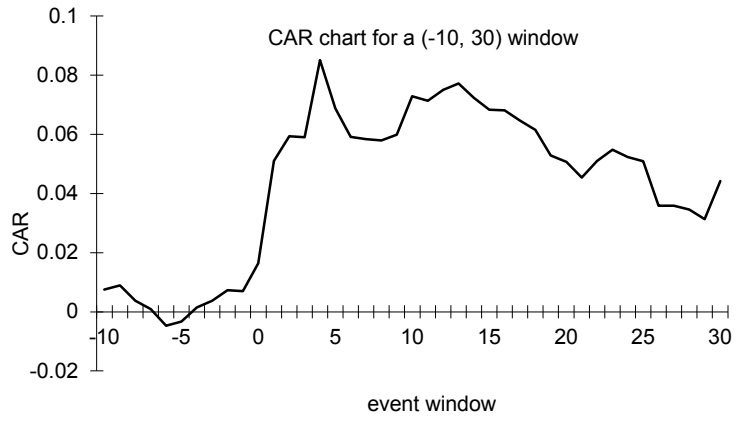
EMPIRICAL RESULTS

Price Responses Displayed by Stocks Added to the Nikkei 225

Mean abnormal returns (MAR) and mean cumulative abnormal returns (CAR) are listed in Table 2 (Panel A) and Table 3 (Panel A). Figure 1 shows the trend of mean cumulative abnormal returns for 88 added stocks in the event-period. This study first focuses on the price responses of added stocks as reported in Table 3 (Panel A) and makes three observations with respect to the abnormal returns. The first observation relates to the pre-announcement period abnormal returns. During the period from day -10 to day -1, the mean abnormal returns are not significantly different from 0. The second observation relates to the announcement day abnormal return. The mean abnormal return on the announcement day is 1.81%, which is significant at 1% level. This result is similar to those found in earlier studies.

The third observation relates to the post-announcement period abnormal returns. The results show the abnormal returns are still positive and significant from day 1 to day 4. However, after day 4, the added firms experience significant negative abnormal returns of -2.01%, with a *t*-value of -4.41 on day 5. The negative abnormal returns continue for several days. Also, Table 3 (Panel A) displays the mean cumulative abnormal returns for 88 added stocks fully reverses from day 2 to day 20. The manner is consistent with Harris and Gurel (1986) who examine the no-information assertion. The results suggest that the price response of added firms in the Nikkei 225 Index is consistent with the price pressure hypothesis. These results for the Nikkei 225 Index are similar to those of Harris and Gurel (1986), Shu et al. (2004) and Okada et al. (2006).

Figure 1： Mean Cumulative Abnormal Returns for Stocks Added to the Nikkei 225, 1991-2008



This figure shows the trend of mean cumulative abnormal returns for 88 stocks added to the Nikkei 225 in the event-period from 1991 to 2008.

Price Responses of Large-Scale and Small-Scale Stocks Added to the Nikkei 225

Next, this study divides the composite stocks into large-scale and small-scale depending on their market value, and examines whether the stock price responses of the two subsamples are the same. Table 4 shows the mean cumulative abnormal returns for 44 large-scale added stocks and 44 small-scale added stocks in various event periods. Figure 2 shows the trend of mean cumulative abnormal returns of the two subsamples of added stocks in the event-period. The dashed line represents the small-scale stocks and the solid line depicts the large-scale stocks. Large capitalization added stocks achieve a significant abnormal return of 2.73 % on the announcement day and significant CARs for the periods from day 1 to day 5, day -10 to day 15 and day -10 to day 30.

Table 2：The Price Responses of Stocks Added to or Deleted from the Nikkei 225 Index, 1991-2008.

Event	Panel A: Additions			Panel B: Deletions		
Day	#Obs	MAR	t(MAR)	#Obs	MAR	t(MAR)
-10	88	0.15%	0.498	51	-0.28%	-0.683
-9	88	0.12%	0.501	51	2.69%***	5.269
-8	88	0.39%	1.622	51	-0.78%***	-2.544
-7	88	0.32%	1.344	51	0.64%*	1.836
-6	88	0.02%	0.056	51	0.14%	0.447
-5	88	-0.32%	-1.677	51	-0.53%	-1.472
-4	88	0.29%	1.171	51	1.44%***	4.311
-3	88	-0.31%	-1.112	51	1.13%***	2.540
-2	88	0.31%	1.017	51	-0.44%	-0.796
-1	88	-0.15%	-0.641	51	-0.78%	-1.590
0	88	1.81%***	4.460	51	-13.13%***	-7.108
1	88	4.27%***	9.627	51	-14.13%**	-1.965
2	88	0.85%**	2.213	51	-4.10%***	-5.514
3	88	0.32%	0.738	51	-3.09%***	-3.599
4	88	1.99%***	3.442	51	4.20%***	4.761
5	88	-2.01%***	-4.411	51	0.86%	1.664
6	88	-0.79%***	-2.848	51	-0.88%**	-2.065
7	88	-0.31%	-1.232	51	-1.88%***	-3.732
8	88	0.31%	0.910	51	-0.39%	-0.902
9	88	-0.73%*	-1.893	51	2.33%***	4.150
10	88	0.12%	0.288	51	1.22%***	3.276
11	88	-0.25%	-0.836	51	0.36%	0.459
12	88	-0.19%	-0.770	51	-0.90%**	-2.244
13	88	0.16%	0.683	51	-2.93%***	-5.267
14	88	-0.32%	-1.289	51	1.25%***	2.458
15	88	-0.41%	-1.592	51	0.81%	1.580
16	88	0.12%	0.444	51	1.64%***	3.336
17	88	-0.03%	-0.117	51	1.20%***	3.779
18	88	-0.14%	-0.501	51	-0.44%	-1.015
19	88	-0.49%*	-1.936	51	-0.52%	-1.516
20	88	-0.38%	-1.542	51	-2.40%***	-6.268
21	88	0.07%	0.237	51	0.01%	0.027
22	88	0.66%**	2.062	51	-0.53%**	-2.250
23	88	0.31%	1.412	51	0.96%***	2.622
24	88	-0.23%	-0.827	51	-0.20%	-0.603
25	88	0.19%	0.683	51	0.51%	1.298
26	88	-0.49%*	-1.695	51	-0.72%***	-2.659
27	88	0.10%	0.449	51	-0.14%	-0.601
28	88	-0.42%*	-1.734	51	0.50%***	2.387
29	88	0.08%	0.323	51	1.67%***	3.723
30	88	0.54%**	2.190	51	0.46%	1.530

*This table shows the mean abnormal returns (MAR) around the announcement date for 88 stocks added to and 51 stocks deleted from the Nikkei 225 Index in 1991- 2008. Day 0 denotes the announcement day. ***, **, and* indicate significant at 1, 5 and 10 percent levels respectively.*

Small capitalization added stocks also show a significant positive abnormal return on the announcement

day, but of a lower magnitude (0.88%). CARs of small capitalization stocks are positive and significant in the other five event periods. The two-sample t-statistics indicate a significantly different on the announcement day. In other event periods, the CARs for small-scale added stocks are bigger than those of large-scale stocks, although they are not statistically significant. The results show that small-scale added stocks seem to have larger price responses. Figure 2 illustrates that the trend of mean cumulative abnormal returns for the large-scale added stocks closely resemble those of the whole added sample.

Tables 3： Mean Cumulative Abnormal Returns from Day 2 to Day T for Stocks Added to or Deleted from the Nikkei 225 Index, 1991- 2008.

Day 2 to	Panel A: Additions			Panel B: Deletions		
Day T	CAR	t-value	p-value	CAR	t-value	p-value
2	0.85%**	2.213	0.030	-4.10%***	-5.514	0.000
3	1.17%*	1.881	0.063	-7.18%***	-5.794	0.000
4	3.16%***	3.494	0.001	-2.98%***	-3.668	0.001
5	1.16%	1.464	0.147	-2.12%*	-1.986	0.053
6	0.37%	0.510	0.611	-3.01%**	-2.509	0.015
7	0.06%	0.073	0.942	-4.89%***	-3.294	0.002
8	0.37%	0.432	0.667	-5.28%***	-3.072	0.003
9	-0.36%	-0.379	0.706	-2.95%**	-2.057	0.045
10	-0.24%	-0.250	0.803	-1.73%	-1.335	0.188
11	-0.49%	-0.510	0.612	-1.38%	-0.961	0.341
12	-0.69%	-0.686	0.495	-2.28%	-1.426	0.160
13	-0.52%	-0.502	0.617	-5.20%***	-3.046	0.004
14	-0.84%	-0.819	0.415	-3.95%**	-2.167	0.035
15	-1.25%	-1.207	0.231	-3.15%	-1.662	0.103
16	-1.13%	-1.043	0.300	-1.51%	-0.875	0.386
17	-1.16%	-1.029	0.306	-0.31%	-0.180	0.858
18	-1.30%	-1.135	0.259	-0.76%	-0.420	0.676
19	-1.79%	-1.501	0.137	-1.28%	-0.690	0.494
20	-2.18%*	-1.742	0.085	-3.68%*	-1.958	0.056
21	-2.11%*	-1.671	0.098	-3.67%*	-1.929	0.059
22	-1.45%	-1.113	0.269	-4.21%**	-2.174	0.034
23	-1.14%	-0.855	0.395	-3.25%	-1.568	0.123
24	-1.37%	-1.009	0.316	-3.45%	-1.577	0.121
25	-1.18%	-0.828	0.410	-2.94%	-1.353	0.182
26	-1.67%	-1.185	0.239	-3.66%	-1.618	0.112
27	-1.57%	-1.110	0.270	-3.79%*	-1.738	0.088
28	-1.99%	-1.361	0.177	-3.29%	-1.506	0.138
29	-1.91%	-1.307	0.195	-1.62%	-0.746	0.459
30	-1.37%	-0.935	0.353	-1.16%	-0.516	0.608

*This table shows the mean cumulative abnormal returns from day 2 to day T for stocks added to or deleted from the Nikkei 225 Index in 1991-2008. Mean cumulative abnormal returns(CAR) from day 2 to day T for 88 stocks added to and 51 stocks deleted from the Nikkei 225 Index in 1991- 2008, ***, **, and* indicate significant at 1,5 and 10 percent levels respectively.*

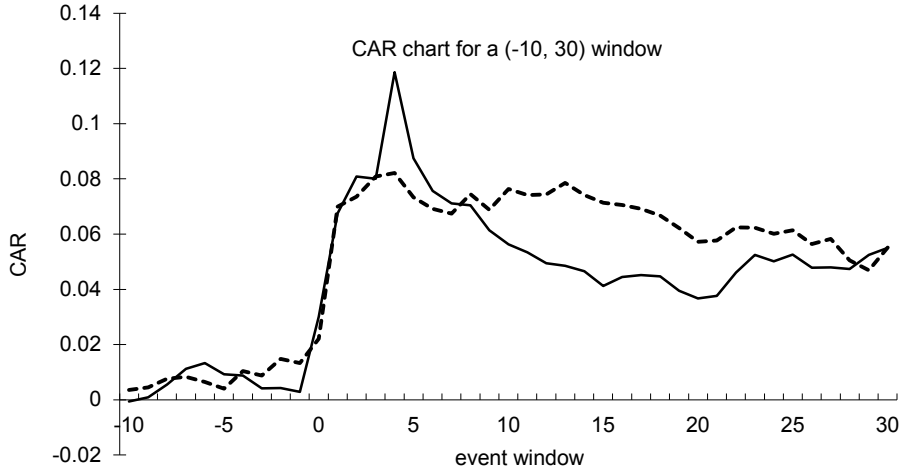
Price Responses of Upwards and Downwards Revisions of Earnings Forecasts for Stocks Added to the Nikkei 225

Sixty-one stocks were added to the index during the study period for which analysts had made earnings

forecasts. Stocks for which insufficient price data exists during the event periods are excluded. The final sample comprises 59 stocks from the Nikkei 225 Index for which analysts have made earnings forecasts. This study calculates changes in earnings forecasts for the stocks by subtracting the pre-announcement earnings forecast from the post-announcement earnings forecast. To compute the pre-announcement and post- announcement median EPS forecasts of an Index inclusion for a given company, the event window is four months prior to the announcement month of an Index inclusion and four months following to the announcement month of an Index inclusion. For each individual analyst, this study uses the pre-announcement EPS forecast, which is closest to the announcement month of an Index inclusion. From these individual analysts' forecasts, the median pre-announcement EPS forecast is determined. To calculate the post-announcement EPS forecast, for each continuing analyst, this study uses the first post-announcement EPS forecast of an index inclusion. From these individual analysts' forecasts, the median post-announcement EPS forecast is determined. This study calculates the forecast changes by subtracting the pre-announcement EPS forecast from the post-announcement EPS forecast. If the value is larger than or equal to zero the stock is assigned to the upwards revision of earnings forecast group. If the value is less than zero, it is assigned to the downwards revision of earnings forecast group.

Table 5 shows the mean cumulative abnormal returns for 29 upwards earnings forecast revision stocks and 30 downwards earnings forecast revision stocks during various event periods. Figure 3 shows the trend of the mean cumulative abnormal returns for the two subsamples of added stocks during the event-period. The dashed line represents downwards earnings forecast revision stocks and the solid line represents upwards earnings forecast revision stocks. Downwards revised earnings forecast stocks earn a significant abnormal return of 1.11 % on the announcement day. Companies undergoing upwards earnings forecast revisions also show a significant positive return on the announcement day, but with a lower magnitude (0.95%). The CARs for the other four event periods are all positive and significant. The two-sample t-statistics indicate the difference in CARs between upwards and downwards earnings forecast revision stocks. The CARs for the upwards earnings forecast revision stocks are considerably greater than those for the downwards earnings forecast revision stocks for the event periods, day 1 to day 10 and day 1 to day 15. Investors can benefit by purchasing upwards earnings forecast revision stocks.

Figure 2： Mean Cumulative Abnormal Returns for Large-Scale and Small-Scale Stocks Added to the Nikkei 225, 1991- 2008.



This figure shows the trend of mean cumulative abnormal returns for 44 large-scale added stocks and 44 small-scale added stocks in the event-period. The dashed line represents the small-scale stocks and the solid line depicts the large-scale stocks.

Price Responses Displayed by Stocks Deleted from the Nikkei 225

Sufficient price data is available to conduct analysis for 51 stocks deleted from the Nikkei 225 Index.

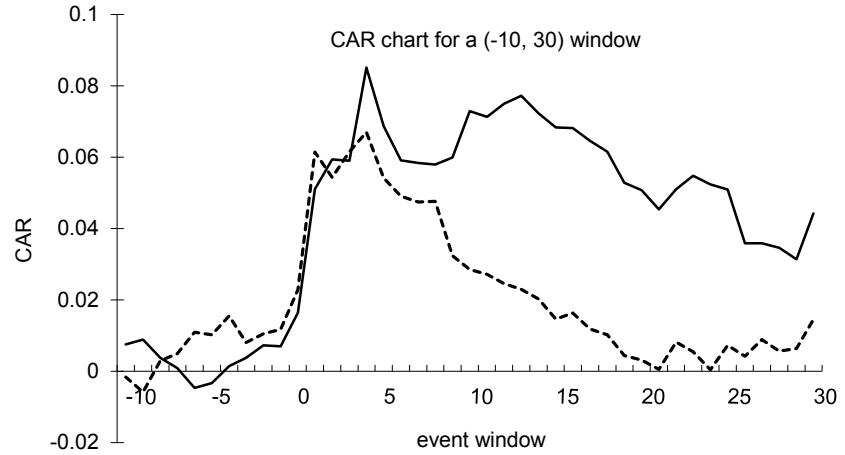
Table 2 (Panel B) and Table 3 (Panel B) list the results for the deletions sample. Figure 4 shows the trend of the mean cumulative abnormal returns of deleted stocks during the event-period. This study makes three observations. First, the abnormal returns during the pre-announcement period are significantly positive at the 1% and 10% levels on four days (day -9, -7, -4, -3), providing no evidence of market anticipation.

Table 4： Analysis of CARs of Category 1: Large-scale and Small-scale Stocks Added to the Nikkei 225 Index, 1991- 2008.

Event Period									
		1	2	3	4	5	6	7	8
Subsample	N	-10 to -1	0	1 to 5	1 to 10	1 to 15	1 to 30	-10 to 15	-10 to 30
Large-scale	44	0.28%	2.73%***	5.73%***	2.62%	1.11%	2.49%	4.12%*	5.5%**
		(0.19)	(3.96)	(3.74)	(1.56)	(0.70)	(1.15)	(1.93)	(2.01)
Small-scale	44	1.33%	0.88%**	5.12%***	5.43%***	4.93%***	3.31%	7.14%***	5.52%**
		(1.28)	(2.30)	(3.97)	(3.46)	(2.90)	(1.43)	(3.36)	(1.97)
Pairwise t-test									
Difference		-1.05%	1.85%**	0.61%	-2.81%	-3.82%	-0.82%	-3.02%	-0.02%
p-value		0.562	0.022	0.761	0.225	0.102	0.796	0.319	0.997

*This table reports market-adjusted mean cumulative abnormal returns (CARs). The CARs are calculated in various events periods for "Large-scale" and "Small-scale" added stocks from 1991 to 2008. Each cell reports the average CAR for the respective event periods. Day 0 denotes the announcement day. T statistics are reported in parentheses. ***, **, and* indicate significant at 1, 5 and 10 percent levels respectively.*

Figure 3： Mean Cumulative Abnormal Returns for Upwards and Downwards Earnings Forecast Revision Stocks Added to the Nikkei 225, 1991- 2008.



This figure shows the trend of the mean cumulative abnormal returns for 29 upwards earnings forecast revision stocks and 30 downwards earnings forecast revision stocks during the event-period from 1991 to 2008. The white line represents downwards earnings forecast revision stocks and the black line represents upwards earnings forecast revision stocks.

Second, as with added stocks, a growing announcement reaction, albeit negative, is observed to deleted stocks on the announcement day. The abnormal return is -13.13% which is significantly negative at the 1% level. Third, abnormal returns during the post-announcement period are still significantly negative from days 1 to day 3. However, after day 3, the deleted firms experience a significantly positive abnormal return of 4.20% with a t-value of 4.761 on day 4. Abnormal returns are sometimes positive and sometimes

negative during the post-event period. The mean cumulative abnormal return for 51 deleted stocks is not significantly reversed in the event period. But from day 2 to day 48, it is fully reversal. The result suggests that the price response of deleted firms in the Nikkei 225 Index is consistent with the price pressure hypothesis. This study has confirmed the price behavior of firms deleted from the Nikkei 225 Index that are not reported in the study of Okada et al. (2006).

Table 5： Analysis of CARs of Category 2: Upwards and Downwards Earnings Forecast Revision Stocks Added to the Nikkei 225 Index, 1991-2008.

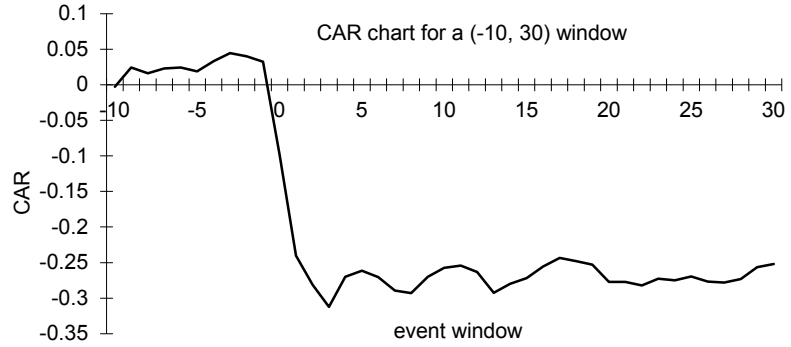
Event Period									
		1	2	3	4	5	6	7	8
Subsample	N	-10 to -1	0	1 to 5	1 to 10	1 to 15	1 to 30	-10 to 15	-10 to 30
Up	29	0.70%	0.95%**	5.23%***	5.65%***	5.19%***	2.78%	6.83%***	4.42%
		(0.67)	(2.28)	(3.40)	(3.78)	(2.74)	(1.15)	(2.93)	(1.54)
Down	30	1.17%	1.11%**	3.13%	0.56%	-0.80%	-0.80%	1.46%	1.45%
		(0.72)	(2.07)	(1.66)	(0.23)	(-0.34)	(-0.27)	(0.52)	(0.39)
					Pairwise t-test				
Difference		-0.47%	-0.16%	2.10%	5.09%*	5.99%*	3.58%	5.37%	2.97%
p-value		0.807	0.807	0.393	0.081	0.055	0.368	0.150	0.530

*This table reports market-adjusted mean cumulative abnormal returns (CARs). The CARs are calculated in various event periods for "Upwards" earnings forecast revision and "Downwards" earnings forecast revision added stocks from 1991 to 2008. Each cell reports the average CAR for the respective event periods. Day 0 denotes the announcement day. T statistics are reported in parentheses. ***, **, and* indicate significant at 1, 5 and 10 percent levels respectively.*

Price Responses of Large-Scale and Small-Scale Stocks Deleted from Nikkei 225

There are 51 deleted stocks in Nikkei 225 Index for which sufficient price data is available to examine the price change responses. This study classifies 26 stocks as large-scale deleted stocks and 25 as small-scale deleted stocks. Table 6 shows the mean cumulative abnormal returns for large-scale deleted stocks and small-scale deleted stocks in various event periods. Figure 5 shows the trend of mean cumulative abnormal returns for the two subsamples of deleted stocks during the event-period. The dashed line represents the small-scale deleted stocks and the solid line depicts the large-scale deleted stocks.

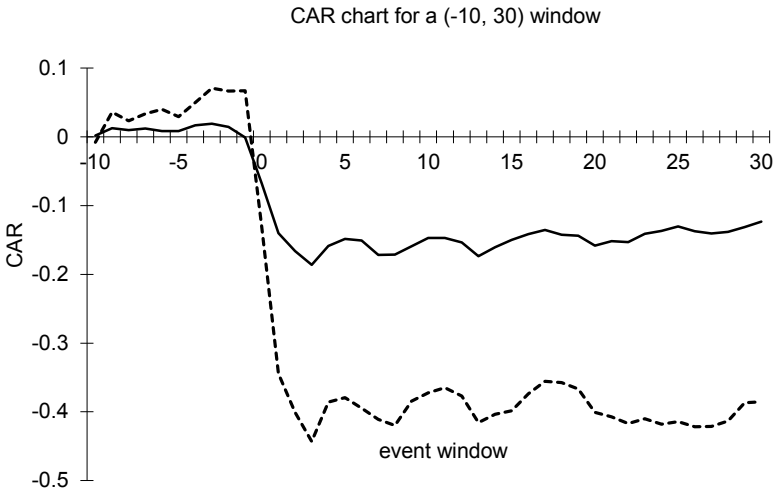
Figure 4： Mean Cumulative Abnormal Returns for Stocks Deleted from the Nikkei 225 Index, 1991-2008.



This figure shows the trend of the mean cumulative abnormal returns for 51 deleted stocks during the event-period from 1991 to 2008.

Large-scale and small-scale deleted stocks respectively experience significant negative CARs in the six event periods. The t-statistics indicate the difference in CARs between large-scale and small-scale deleted stocks. The CARs differ markedly among the four event periods (days -10 to -1, day 0, days -10 to 15, days -10 to 30). The results reveal that small-scale deleted stocks have larger price responses.

Figure 5：Mean Cumulative Abnormal Returns for Large-Scale and Small-Scale Stocks Deleted from the Nikkei 225 Index, 1991- 2008.



This figure shows the trend of mean cumulative abnormal returns for 26 large-scale deleted stocks and 25 small-scale deleted stocks during the event-period from 1991 to 2008. The dashed line represents the small-scale deleted stocks and the solid line depicts the large-scale deleted stocks.

Table 6： Analysis of CARs of Category 1: Large-Scale and Small-Scale Stocks Deleted from the Nikkei 225 Index, 1991- 2008.

Event Period									
		1	2	3	4	5	6	7	8
Subsample	N	-10 to -1	0	1 to 5	1 to 10	1 to 15	1 to 30	-10 to 15	-10 to 30
Large-scale	26	-0.10%	-6.70%***	-8.10%***	-8.00%***	-8.20%***	-5.60%	-15.0%***	-12.4%***
		(-0.05)	(-3.06)	(-4.19)	(-3.13)	(-2.57)	(-1.63)	(-5.00)	(-4.13)
Small-scale	25	6.70%***	-19.90%***	-24.8%*	-24.10%	-26.70%*	-25.40%*	-39.9%***	-38.5%***
		(2.62)	(-8.33)	(-1.70)	(-1.67)	(-1.88)	(-1.81)	(-3.34)	(-3.26)
Pairwise t-test									
Difference		-6.80%**	13.20%***	16.70%	16.10%	18.50%	19.80%	24.90%*	26.10%**
p-value		0.046	0.000	0.267	0.280	0.215	0.183	0.053	0.041

*This table reports market-adjusted mean cumulative abnormal returns (CARs). The CARs are calculated in various event periods for "Large-scale" and "Small-scale" deleted stocks from 1991 to 2008. Each cell reports the average CAR for the respective event periods. Day 0 denotes the announcement day. T statistics are reported in parentheses. ***, **, and* indicate significant at 1, 5 and 10 percent levels respectively.*

CONCLUSIONS

This study uses an event study methodology to examine the price changes of stocks either added to or removed from the Nikkei 225 Index during the periods from September 1991 to March 2008. This study demonstrates that prices of stocks added to and deleted from the Nikkei 225 Index respectively fluctuate accordingly on the announcement days. These price trends then reverse during the post-announcement period. These results are consistent with the price pressure hypothesis.

This study also categorizes the composite stocks depending on the market value and upwards and downwards analyst earnings forecast revisions to explore the price reactions of different types of composite stocks. By classifying the composite stocks into two categories, this study finds that small-scale stocks exhibit larger price responses than large-scale stocks. In addition, the results show that newly added stocks with upward revised earnings forecasts earn higher abnormal returns than those with downward revised earnings forecasts during the post-announcement period. These results imply that investors can take advantage of these empirical results by purchasing stocks with upward earnings forecast revisions which are newly added to the Nikkei 225 Index. In this paper, I only consider price response to associated changes in the Nikkei 225 composition. A remaining question is if analysts that more accurately forecast earnings have a different influence on the market. This question will be addressed in future research

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