**Market Reaction to Inclusions and Exclusions
in the Toronto Stock Exchange 300 Index**

BY

Tsuyoshi Okumura, B. A. (Honours) (1996)

A thesis submitted to
The Faculty of Graduate Studies and Research
in partial fulfilment of the requirements for the degree of
Master of Business Administration

Eric Sprott School of Business
Carleton University
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Thesis Supervisor

Director, Eric Sprott School of Business

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Abstract

This thesis empirically examines implications of index revision in the Toronto Stock Exchange 300 Composite Index (TSE 300) during the period 1991-2000 on the short-term and long-term return as well as trading volume of revised stocks.

The short-term results indicate that index rebalancing activities predominantly take place around the actual revision date. In addition, a permanent change in the prices of both included and excluded stocks is observed.

The long-term results show a significant upward (downward) price movement of included (excluded) stocks that starts around twelve months before the revision date. Moreover, the price levels of both types of revised stocks stabilise after the actual revision. The stabilisation of price levels is consistent with that of the downward sloping demand curve after the actual revision.

The results are robust for the choice of benchmarks and are consistent with the predictions of the imperfect substitutes hypothesis.

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Thesis

Market Reaction to Inclusions and Exclusions in Toronto Stock Exchange 300 Index

CHAPTER I. Introduction

In this thesis, we empirically investigate implications of inclusion and exclusion from the Toronto Stock Exchange 300 Composite Index (TSE 300) during the period 1991-2000 on the short-term and long-term return as well as trading volume of affected stocks. The TSE 300 was developed in 1977 and has been used as a barometer of the Canadian market since then¹. In contrast to the inclusion and exclusion criteria followed by the U.S. stock exchanges, inclusions in and exclusions from the TSE 300 have been primarily based on the size of market capitalization of securities (see Chapter III for details). That is, index revisions of the TSE 300 are assumed to bring no managerial information to the market around the time of the revision. Thus, investigating these revisions would be appropriate to examine the hypotheses that relate to the shape of the demand curve and liquidity factors as noted below.

Most of the previous empirical research in this area (see Chapter II and Appendix A for more details) has been mostly conducted in the U.S. market, which has mostly focussed on the inclusion in and exclusion from the S&P 500 index. This research has typically shown anomalous movements of stock prices around and after the time of

¹ <http://www.spglobal.com/releases/tsefaq.pdf>

exclusions and inclusions. The two Canadian studies in this area, which have had a very limited focus and very short time period, support two diametrically opposite conclusions.

In this thesis, in addition to testing for both the short-term and the long-term implications on prices and trading volumes over a much longer time period, we also test for the robustness of our results by utilising multiple benchmarks and improved methodology. Thus, we believe that this thesis provides comprehensive and potentially more conclusive evidence on the various hypotheses and conjectures in this area.

The theoretical research in this area has put forward five hypotheses related to either the inclusions or exclusions in the index or with the cross listing of stocks across the U.S. exchanges (NASDAQ, the New York Stock Exchange (NYSE), and the American Stock Exchange (AMEX)). The research has relied primarily on these hypotheses to explain the reasons for abnormal changes in prices and trading volumes of these stocks.

The first hypothesis, termed as the perfectly elastic demand curve hypothesis, claims that the demand curve for individual securities is perfectly elastic because securities are perfect substitutes for each other. Therefore, the inclusion or exclusion of stocks from an index or cross listing across exchanges would have no impact on the price of these stocks.

The second hypothesis, termed as the imperfect substitute hypothesis (ISH) (Shleifer (1986)), assumes that securities are not perfect substitutes for each other, and thus, the demand curve of a security is downward sloping. Therefore, when demand for an included (excluded) stock is increased (decreased), the downward sloping demand curve shifts to the right (left), permanently impacting on the stock price as long as there are no additional events that could shift the curve.

The third hypothesis, termed as the price pressure hypothesis (PPH) (Harris and Gurel (1986)), assumes that the demand curve is only temporarily inelastic. Thus, if trading volume suddenly changes by index rebalancing activity, the short-run demand curve shifts to the right, creating a temporary discrepancy between the actual price and the expected price, but the discrepancy disappears in the short run as the demand curve resumes its elasticity.

The main difference between ISH and PPH is whether or not the price level demonstrates reversal in the short run. It should also be noted that both PPH and ISH assume that index inclusion and exclusion or exchange cross listings are informationless and depend strictly on the imbalance of supply and demand for the included or excluded stocks but do not focus on the supply side.

The fourth hypothesis, termed as the liquidity hypothesis (e.g. Sanger and Peterson (1986)), assumes that security prices are affected by the level of the liquidity indicated by trading volume and/or bid-ask spread. That is to say, if a specific event

increases (decreases) the liquidity of a specific type of stocks, the price level would be increased (decreased). From an empirical perspective, the implications for the price of the securities are the same as under ISH.

The fifth hypothesis, termed as the valuable membership hypothesis, has been proposed by Morck and Yang (2002). This hypothesis treats the inclusion or exclusion itself as a valuable event, implying that this event affects the underlying value (price) of an included or excluded stock. This hypothesis assumes that the value effect is permanent as long as a stock is included in or excluded from an index. Here again from the perspective of prices, the implications are the same as ISH.

It should also be noted that an underlying assumption in these hypotheses is that the trading activity surrounding the index revisions is caused by those investors who are interested in ensuring that the stocks that get included (excluded) are bought (sold) to ensure that their portfolios mimic the underlying index. Thus, prior to any news about index revisions or even after the revisions are announced, these investors are not market participants in the “to be revised” stocks. Their interest in these stocks mainly arises very close to the actual revision of the index.

The results, when focusing on the short-run perspective, indicate that the index rebalancing activities predominantly take place around the actual revision date (implementation date) and not around the announcement date. These index rebalancing activities also cause the buying (selling) pressure before the actual inclusion (exclusion)

and correspondingly the price level is increased (decreased) and the volume levels of both types of stocks are increased. The evidence that, in the exclusion sample, the price level decreases as the volume level increases, indicates that the demand curve for these stocks is downward sloping. We also see a permanent change in the prices of both included and excluded stocks supporting ISH.

The results on the long-run return performance show that there is a significant upward (downward) price movement of the included (excluded) stocks that starts around 12 months prior to the revision. This is not surprising since this is consistent with the methodology followed for the inclusion and exclusion of the stocks in the TSE 300. We observe that the price levels of both types of revised stocks remain almost constant after the actual revision. Thus, it implies that the demand curve stabilises after the actual revision.

In both cases (short-term and long-term), the results are robust for the choice of the benchmarks and are consistent with the predictions of ISH. We find that the demand curve for securities is downward sloping even in the long run. In addition, on average, the index rebalancing activities were found to be concentrated around the implementation date and not around the announcement date. These results also support the conjecture that there is an increased interest by index portfolio investors in the revised stocks around the implementation date and not around the announcement date.

The remainder of the thesis is organised as follows. In the next chapter, the existing literature that is almost exclusively dominated by the U.S. papers is reviewed to provide further context for this thesis. Chapter III introduces the TSE 300 and the procedure for the annual index revision; the research questions are described in Chapter IV and the research methodology is explained in Chapter V. Chapter VI and VII describe the empirical results and discussion, and conclusion on the results, respectively. Finally, the benefits of this thesis, the limitations, and suggestions for further research are described in Chapter VIII.

CHAPTER II. Literature Review

Related literature in this area can be roughly classified into two groups. The first group deals with the impact on prices and trading volumes of stocks that were cross-listed across exchanges. The second group focuses on the membership of stocks in and out of popular indices.

As noted first by Merjos (1962,1963, 1967), newly cross-listed stocks on either NYSE or AMEX perform better prior to their cross-listing; the majority of newly listed stocks experienced price increases during a two or three month period prior to the listing date, but around 30 days after the actual listing their price levels declined to the original levels.

Since the above research focused on the price performance around the actual listing date and without comparing the performance of the benchmark stocks, Van Horne (1970) examined the price performance around the listing announcement and discovered positive abnormal returns against the industrial average returns at and around the announcement dates. However, Furst (1970) found that after accounting for the differences in dividend and corporate size, the listing anomaly was not observed. On the contrary, Ying, Lewellen, Schlarbaum, and Lease (1977) examined monthly abnormal returns using the market model and found that stocks experience significant abnormal returns at the actual listing month and one month before the listing month. Thus, they concluded that it is reasonable to regard the listing as a value relevant event.

The above findings led to further research on how and why the abnormal returns occur. The hypothesis that the price increase is attributed to the liquidity increase has been supported by the empirical studies such as Sanger and McConnell (1986) and Sanger and Peterson (1990). The Sanger and McConnell study examined the listings in NYSE from the over-the-counter (OTC) market from 1966 to 1977, using the market model. They observed significant abnormal returns in the pre-NASDAQ period in the OTC market (before 1970); while after the introduction of the NASDAQ communication system, the abnormality was found to be insignificant. Since the NASDAQ communication system affected the degree of the liquidity provided, their results implied that the liquidity effect is responsible for the listing anomaly.

On the other hand, Sanger and Peterson focused on delisting from NYSE or AMEX from 1962 to 1985. They observed that the weekly volume was significantly reduced after the delisting and that the announcement-day abnormal return was significantly explained by negative changes in the weekly trading volume and in the bid-ask spread divided by the stock price. Thus, they concluded that the liquidity effect could also explain the delisting anomaly.

In the early 1980s, the research shifted to the investigation of inclusion and exclusion from major stock market indices beginning with the S&P 500 index. Shleifer (1986) examined price impacts related to changes in the S&P 500 index list from 1966 to 1983, using the market model. He showed that the price level did not reverse to the pre-

announcement level; that is, cumulative abnormal returns persisted. Therefore, he concluded that securities are not perfect substitutes for each other, and thus, the demand curve is inelastic even in the long run (ISH).

Harris and Gurel (1986) also examined changes in the composition of the S&P 500 index from 1973 to 1983. They attributed the evidence of abnormal returns to the increased demand resulting from the portfolio rebalancing activity by index fund managers. However, most of the change in the price level reversed to the pre-announcement level in a relatively short time period, which implies that other stocks were deemed to be substitutes for the revised stocks. Thus, they concluded that the demand curve is only temporarily inelastic, but in the long run it is perfectly elastic (PPH).

The difference in the results between the above two studies is thought to result from the large increase of index funds after 1978. Harris and Gurel observed that the trading volume of an included security around the announcement date was larger in the latter period in their sample relative to that before 1978. Thus, they attributed the observed increase in the trading volume to portfolio rebalancing activities of index fund managers. Moreover, it is also possible that investors could find substitutes more easily for the revised stock after 1978 than before 1978.

To further (and more directly) investigate the importance of institutions, Pruitt and Wei (1989) examined the correlation between changes in institutional security holdings and abnormal returns. They found that the correlation was significantly

positive, which supports the suggestion that buying and selling pressures by index fund managers are responsible for the abnormal returns around the list change. However, their results were brought into question by Jain (1987) who also examined index inclusions in the S&P 500 index during 1973 through 1983 but used a control group of stocks included in the supplementary indices published by S&P, which are not traded by index fund managers. He showed that these stocks also experienced abnormal returns.

The next study by Dhillon and Johnson (1991) examined the price level on pre- and post-announcement date along with the S&P 500 list revisions from 1978 through 1988. Their evidence indicated that the price level did not reverse to the pre-announcement level when examining the included stocks in the S&P 500 list from 1984 to 1988, an observation that is consistent with ISH and inconsistent with PPH. In addition, they examined call option prices and showed that the option price increased significantly by 26% at the announcement date of index inclusions. Since there is no reason to believe that the price movement viewed temporally by the market influences the volatility of the stock, they concluded that the price movement is not temporal and index inclusions would convey valuable information to the market.

The above studies about the S&P 500 index examined the period during which the announcement of the inclusion or exclusion in the S&P 500 index was simultaneous with the actual inclusion or exclusion. However, this policy changed in October 1989, and the index revision has been announced prior to the implementation date.

Subsequently, Lynch and Mendenhall (1997) examined the stock price reaction in the post-1989 period around these two separate events: the announcement date, which typically occurred one week prior to implementation of the index inclusion and exclusion, and the implementation date. Their evidence showed that there were significantly positive (negative) price reactions for the index inclusion (exclusion) and from the announcement date to the implementation date the trading volume was excessively high on average. They also found that the price reversal occurred on the implementation date. These results are consistent with PPH.

To focus on the information content of the inclusion or exclusion event, Beneish and Gardner (1995) examined the stock market effect of changes in the composition of the Dow Jones Industrial Average (DJIA). They regressed the prediction errors of the market model on days -1 to +1 with proxies for information signalling (future growth using the market value as a proxy), imperfect substitutes (abnormal trading volume on days -1 to +1), liquidity (bid-ask spreads), and information availability whose proxy was the difference in the number of published performance in year +1 versus year -1 relative to the year of the change in the DJIA composition. Their results indicated that trading costs and information availability could explain the prediction errors. Therefore, they concluded that investors demand a premium for higher trading costs and for holding securities that have relatively less available information. That is, the evidence did not support information signalling hypothesis, liquidity hypothesis, ISH, or PPH.

They claimed that their results also imply that investors behave rationally in the stock market and the frequency of available information plays an important role in deciding a security price. Therefore, they concluded that the index inclusion of prominent and active firms in DJIA does not affect their security prices, while excluded firms became relatively thinly traded and experienced negative stock performance mainly because of small information availability and high trading costs.

Elliot and Warr (2001) studied index inclusions in the S&P 500 index related to stocks that were traded on NASDAQ versus NYSE, focusing on the different dealer systems between NASDAQ and NYSE. The evidence showed that stocks listed on NASDAQ experienced significantly higher price reaction than that from NYSE. Therefore, they concluded that the NYSE specialist system could absorb the demand shocks following the index inclusion and exclusion better than the NASDAQ dealer system.

In contrast to these studies relating to the short- or immediate-term impact on returns and volumes around the inclusion dates, Edmister, Graham and Pirie (1996) examined the long-term stock price for the S&P 500 index replacements occurred from 1983 to 1989. Their interest was to investigate the possible selection bias in the S&P selection criteria for the index replacement. They focused on the following selection criteria of S&P (also focused on in Beneish and Whaley (1996)): 1) industry classification- the firm selected from an important or emerging US industry segment; 2) market value- the firm that generally has the highest market value within its industry; 3)

market capitalization - the shares are widely held; 4) fundamental analysis- the firm that has financial and operating conditions strong enough to be able to be in the index longer; and 5) trading activity- the firm that has trading volume such that its movement can be reflected timely in the market.

They examined cumulative abnormal returns calculated by the error terms of the market model from the 2nd day to the 100th day after the replacement announcement. When using the post-announcement estimation period to estimate the market parameters, the cumulative abnormal return in the investigation window was positive. On the contrary, when the pre-announcement estimation period was used, it was negative. Thus, they indicated that the past results of the price reversal might be biased by the S&P selection criteria.

To avoid the effects of the selection criteria, Chung and Kryzanowski (1998) examined changes in the composition of the TSE 300 over the period from 1990 to 1994.

² They used both single and multi-factor models and included variables such as liquidity changes and Jensen's performance measure in order to eliminate the effects related to the selection criteria shown in the case of the S&P 500 revision. Since the selection bias adjusted abnormal returns occurred in the announcement window (0 date through +1 date relative to the announcement date) vanished in the post-announcement window, they supported PPH.

² As far as we can tell, this is one of the two Canadian studies that deals with the index inclusion and exclusion and is conducted over a very short time period with a limited research focus.

In a related study, Kaul, Mehrotra and Morck (2000) focused on the event of an index weight adjustment in the TSE 300, which became effective November 15, 1996 and was assumed to convey no information and have no effect on shareholders in a legal manner. Their evidence showed that the stocks that increased their weights experienced significant abnormal returns during the event week but there was no evidence of price reversal. Thus, they concluded that securities have the downward sloping demand curve even in the long run, which is consistent with ISH.

Another related and interesting study in this area is by Morck and Yang (2002) who tested the hypothesis about a permanent effect associated with index inclusion by comparing Tobin's q ratios of S&P 500 companies with those of similar companies. Since Tobin's q ratios of S&P 500 companies were larger than those of similar companies, they regressed average Tobin's q ratio from S&P 500 membership (represented by dummy variables), controlling for three-digit industry fixed effects, R&D spending, advertising spending, leverage, and firm size. Their results showed that the membership dummy was significantly different from zero. Therefore, these results imply that membership in the S&P 500 results in excess value simply due to the membership in an index (the valuable membership hypothesis).

CHAPTER III. The annual revision in the TSE 300

In this thesis, we test both the short-term and long-term return and trading volume implications of the membership in the TSE 300, which is considered the barometer of Canadian stock market. The index consists of 300 stocks that are categorised into 14 industry groups and is computed by dividing the sum of the quoted market value of the 300 issues by the trade-weighted average quoted market value for all original index stocks for the year 1975 (Toronto Stock Exchange Monthly Review and see Appendix B for more details.).

Abstracting from the changes to the listing requirements for the new S&P/TSX Composite Index (changes to have taken effect beginning May 1st, 2002), index inclusion and exclusion in the TSE 300 have been based on several requirements that have been employed by the TSE Index Review Board³. As seen from the requirements, the stocks with higher market value with higher trading volume would be included in the index. These requirements, in summary, are:

1. A stock has been listed for at least 6 months in Toronto Stock Exchange.
2. A stock has been ranked between one and 150 in terms of the quoted market value (see Appendix B).
3. A stock should have been issued by the company incorporated in Canada or owned by Canadian in substance.
4. A stock, in the past 12-month period, has \$100 million of the quoted market value.

5. A stock must have traded 100,000 shares; \$1,000,000 in value; 100 transactions in the previous 12 months.

When a firm meets the requirements, the stock would be considered for inclusion in the TSE 300 and a stock with the lowest market capitalization would be removed from the index. That is, the security that experiences consecutive price upward (downward) would be included (excluded) from the index.

³ <http://www.spglobal.com/releases/tserulechg.pdf>

CHAPTER IV. Research Questions

This thesis focused on the following research questions:

- 1) What are the short-term return and volume implications of annual revisions of the TSE 300 list, for both inclusions and exclusions?
- 2) What are the long-term return and volume implications of annual revisions of the TSE 300 list, for both inclusions and exclusions?
- 3) Which of the competing hypotheses is supported by the empirical evidence?
- 4) How robust are these results to the choice of the benchmark?

CHAPTER V. The research methodology

V-1. Hypotheses

Referring to the past research, the following hypotheses are primarily evaluated against the revision in the TSE 300. We also test indirectly for the liquidity hypothesis but not for the valuable membership hypothesis.

1) *Perfectly elastic demand curve hypothesis*⁴

The demand curve for any good is horizontal if it has perfect substitutes with unlimited supply. That is to say, since the stock price is always constant with the expected price, there is no opportunity to exploit the index revision for profits. This hypothesis assumes that the demand curve for an individual stock is perfectly elastic because securities are perfect substitutes for each other. Therefore, there should be no abnormal returns as a result of index revisions.

2) *Imperfect substitutes hypothesis (ISH)*

In this hypothesis, securities are assumed to be imperfect substitutes, which means that the demand curve is not elastic even in the long run, implying that once the demand curve shifts, the difference between the newly observed equilibrium price and the equilibrium price expected under the condition that the

⁴ This hypothesis is referred as the substitution hypothesis in Scholes (1972) where it is mentioned that the market will evaluate assets like that the expected rates of return on assets, which have similar risk, are equal. Thus, if the abnormal returns exist, investors would arbitrage the opportunity away. As the result, the price effects derived from new issues and investors purchase or sales must be quite small.

demand curve is flat does not disappear. This hypothesis can also lead to the observation that there would be an abnormal change in the trading volume due to the portfolio rebalancing activity along with inclusions and exclusions. The index rebalancing activity can also be the factor that makes the supply curve shift through changing the tradable amount of revised stocks in the market.

3) *Price-pressure hypothesis (PPH)*

In this hypothesis, since the demand curve is temporarily inelastic, a discrepancy between the actual equilibrium price and the expected equilibrium price temporarily occurs. However, the discrepancy gradually diminishes as the demand curve resumes its elasticity, and then the price level returns to the expected equilibrium price. As stated in ISH, also in this hypothesis, the abnormal trading volume can be observed following the exclusion or inclusion, which can make the demand curve shift as well as the supply curve.

V-2. Sample

All annual revisions in the TSE 300 list for the period 1991 through 2000 were obtained for both included and excluded stocks (see Appendix C for more details of the revised stocks.). The data, daily and monthly returns and volumes, were obtained from Canadian Financial Markets Research Centre (CFMRC) database. When a security did not have the return and volume data at a specific date (mainly due to non-trading), the return and volume were treated as zero at the date in order to avoid the survivorship bias

(Antunovich and Laster (1998)). If a security was excluded due to mergers, bankruptcy, and so on, the return and volume were treated as zero from there on for the same reason. Finally, a security whose data is not available in CFMRC database was excluded from the sample.

From the above procedure, our sample consists of 152 included stocks and 144 excluded stocks out of the total of 187 included or excluded stocks in the period from 1991 through 2000 (see Table I). As per the revision criteria, the weights of the included stocks in the TSE 300 are generally larger than those of the excluded stocks (see Appendix C for more details.).

Table I

Sample construction

The data were obtained from Canadian Financial Markets Research Centre (CFMRC) database. A security whose data was not available in CFMRC database was excluded from the sample.

	Revised Stocks		Our sample	
	Inclusions	Exclusions	Inclusions	Exclusions
1991	18	18	13	14
1992	19	19	14	12
1993	19	19	13	13
1994	23	23	21	18
1995	23	23	18	19
1996	18	18	18	14
1997	31	31	27	25
1998	8	8	7	6
1999	16	16	12	13
2000	12	12	9	10
Total	187	187	152	144

Note: The above number indicates the daily base sample. In the monthly base sample are included 147 included stocks and 143 excluded stocks.

Further analysis reveals that most of the included stocks come from the Oil and Gas sector (45 stocks), the Industrial Products sector (40 stocks), and the Consumer

Products sector (19 stocks), whereas the Industrial Products sector (34 stocks), the Gold and Precious Minerals sector (26 stocks), and the Financial Service sector (21 stocks) mostly dominate the excluded stocks (see Appendix D for more details).

Moreover, the following Table II reveals that the excluded stocks experienced many no trading dates relative to the included stocks. Also non-trading days are relatively higher during the 1991 to 1993 period than during the latter years.

Table II

Percentage of days with no trading

“AD” and “ID” stand for the announcement date and the implementation date, respectively. The no trading date is defined as the date that has no trading volume. As for the three years, 1991 to 1993, there were no trading days between the 10th date after the announcement date and the 10th date prior to the implementation date. Therefore, for these three years this period is noted as “not applicable”.

	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	All
Panel A. Inclusion											
(AD-120, AD-11)	5.8%	5.2%	14.0%	1.1%	1.0%	5.8%	6.8%	18.3%	11.7%	11.9%	7.6%
(AD-10, AD+10)	3.2%	6.5%	15.0%	0.5%	1.6%	2.6%	6.3%	17.7%	7.1%	14.3%	6.5%
Interval	1.2%	4.2%	6.3%	0.0%	0.0%	1.4%	2.5%	n.a.	n.a.	n.a.	1.9%
(ID-10, ID+10)	0.5%	1.2%	8.8%	0.0%	0.0%	4.2%	3.7%	11.3%	2.9%	6.3%	3.9%
(ID+11, ID+120)	0.8%	12.3%	22.2%	10.7%	0.2%	7.2%	7.6%	13.7%	6.1%	5.7%	6.8%
Panel B. Exclusion											
(AD-120, AD-11)	0.7%	3.6%	15.0%	6.4%	17.3%	7.1%	9.1%	41.7%	33.6%	29.8%	16.7%
(AD-10, AD+10)	0.0%	3.7%	22.2%	2.6%	17.9%	4.8%	6.2%	22.6%	27.4%	31.2%	15.3%
Interval	0.0%	4.9%	20.4%	1.3%	12.5%	5.6%	3.3%	n.a.	n.a.	n.a.	7.4%
(ID-10, ID+10)	0.0%	3.7%	16.7%	1.3%	14.3%	1.6%	6.2%	22.0%	23.2%	25.9%	11.7%
(ID+11, ID+120)	0.6%	8.0%	25.8%	3.3%	16.4%	5.1%	14.6%	30.7%	30.3%	30.6%	17.0%

V-3. Event day(s)

The Toronto Stock Exchange Monthly Review identifies the date on which the stock is last traded or first traded as a stock in the TSE 300 list. However, since TSE 300 annual revisions have been announced prior to the actual revision (Table III), two types of event date can be set: one is the announcement date, and another is the actual inclusion or exclusion date (the implementation date). In setting the announcement date, we relied on the announcements in the major newspapers in Canada. In the analysis relating to the long-term monthly performance, we set the month of the actual revision as the event month.

Table III

The announcement dates and the implementation dates

The announcement date was the first date when either *The Globe and Mail* or *The Financial Post* described the index revision. The implementation date is based on the *Toronto Stock Exchange Monthly Review*.

	Announcement date	Implementation date
1991	January 5, 1991	February 1, 1991
1992	January 7, 1992	February 3, 1992
1993	January 9, 1993	February 1, 1993
1994	January 7, 1994	February 18, 1994
1995	January 7, 1995	February 17, 1995
1996	January 6, 1996	February 16, 1996
1997	January 14, 1997	February 21, 1997
1998	January 13, 1998	February 20, 1998
1999	January 6, 1999	February 19, 1999
2000	January 7, 2000	February 18, 2000

V-4. Empirical analysis

The empirical analysis was conducted on short-term and long-term returns and volumes using three benchmark indices: the TSE 300, TSE Group Index (Sector Index), and a combination of two weight matching stocks, matched based on the industry and

market capitalization as explained below. Also the short-term and long-term empirical research focuses on the direct comparison in the different performance between the included stocks and the excluded stocks.

V-4-i. Abnormal daily return measures

The abnormal return (AR) of a security at time t is defined as:

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

where $R_{i,t}$ is the return of the revised stock under consideration at day t ; $E(R_{i,t})$ is the expected return of the revised stock i at day t .

As the proxy of the expected return, we adopted the following benchmark portfolios.⁵

Three benchmark portfolios were used to ensure robustness of the results.

- 1) *Returns on the TSE 300 composite index (market adjusted AR).*
- 2) *Returns on Sector Index that the stock belongs to (sector adjusted AR).*
- 3) *Returns on two matching stocks closest by weight in the sector of the tested stock (matching stock AR).*

To examine whether the tested stocks experienced different performance from the benchmark portfolio, the average abnormal return was calculated as follows.

$$AR_t = \frac{1}{N} \sum_{i=1}^N AR_{i,t}$$

In addition, cumulative abnormal returns were used to investigate the relative price levels against the benchmark.

$$CAR_t = \frac{1}{N} \sum_{i=1}^N CAR_{i,t}$$

$$CAR_{i,t} = \sum_{t=d_0}^{dt} AR_{i,t}$$

The above abnormal return measures were calculated in the following three investigation windows: (1) announcement window, (2) implementation window, and (3) overall window. As for the third window, we examined only the cumulative abnormal return to see the relative price performance to the benchmark portfolio.

The (first) investigation window focuses on the 10th date preceding the announcement date (AD) to the 10th date after AD. The (second) investigation window consists of the 10th date preceding the implementation date (ID) through the 10th date after ID. Finally, the third investigation window is made from the 10th date preceding AD to the 60th date after ID.

It should be noted that the number of trading days in the interval term between the date of AD+10 and that of ID-10 is different for each year because each announcement

⁵ Given that we are concerned with daily returns and given that it has been shown in many papers that the market adjusted model (the one being used here) and the market model provide similar results, we have

date does not have the same number of trading days from the implementation date (see Table III in the previous section). Also since we treated the interval term as one day, the cumulative average abnormal return in the overall window had to be adjusted when calculating it after the interval.

That is to say, the cumulative abnormal return for the interval was calculated as follows.

$$CAR_{t \text{ (interval)}} = \frac{1}{N} \sum_{i=1}^N \left(\sum_{t=AD-10}^{AD+10} AR_{i,t} + CAR_{i, \text{interval}} \right)$$

$$CAR_{i, \text{interval}} = \sum_{t=AD+11}^{ID-11} AR_{i,t}$$

After ID-10, the cumulative abnormal return measure is as follows.

$$CAR_t = \frac{1}{N} \sum_{i=1}^N CAR_{i,t}$$

where the measure of the cumulative abnormal return for each tested stock after the interval is:

$$CAR_{i,t} = \sum_{t=AD-10}^{AD+10} AR_{i,t} + CAR_{i, \text{interval}} + \sum_{t=ID-10}^{dt} AR_{i,t} \quad ^6$$

Significance tests for the abnormal return measures

decided to use the former in this study.

⁶ The years from 1991 to 1993 do not have the interval, and thus, the stocks revised in these years are removed from the calculation for the cumulative abnormal returns in the interval. Moreover, since the two event windows for these years are overlapping for a few days, the cumulative abnormal returns in the overlapping period were adjusted to avoid double counting.

The following statistics (Linn and McConnell (1983)) were used to examine whether or not the abnormal return and the cumulative abnormal return at time t are significantly different from zero (the null hypothesis: $AR_t = 0$).

$$Z_t = \overline{AR}_t / S(\overline{AR})$$

$$\text{where } S(\overline{AR}) = \left(\frac{T-2}{N(T-4)} \right)^{1/2}, \quad \overline{AR}_t = \frac{1}{N} \sum_{i=1}^N \overline{AR}_{i,t}, \quad \text{and } \overline{AR} = AR_{i,t} / \hat{S}(AR_i)$$

The standard deviation for each stock was calculated in the estimation window (AD-70, AD-11)⁷. To account for the possible auto-correlation in daily returns, the standard deviation of each stock was adjusted for the first-order auto-correlation using the following method introduced by Heinkel and Kraus (1988)⁸.

$$\hat{S}(AR_i) = \left(\text{Var}(AR_i) + 2 \text{Cov}(AR_{i,t}, AR_{i,t+1}) \right)^{1/2}$$

The standard deviation, $S(\overline{AR})$, is based on that the $\overline{AR}_{i,t}$'s have a t-distribution with $T-2$ degree of freedom, and when N is large, the distribution of the Z statistics is approximately unit normal.

⁷ The variance for each stock in the estimation window is: $\text{Var}(AR_i) = \left(\sum_{t=AD-70}^{AD-11} (AR_{i,t} - \overline{AR}_i)^2 / (T-1) \right)$,

where $\overline{AR}_i = \frac{1}{T} \sum_{t=AD-70}^{AD-11} AR_{i,t}$ and $T=60$ ($=AD-11-(AD-70)+1$).

⁸ While in their study the adjusted variance is introduced as $\text{Var}(AR_i) + 2 \sum_{n=1}^{\infty} \text{Cov}(AR_{i,t}, AR_{i,t+n})$, we focused on the adjustment of the first order auto-correlation.

As for the cumulative abnormal return, the following statistic was used to examine the null hypothesis: $CAR_t = 0$.

$$Z_t = \overline{CAR}_t / S(\overline{AR})$$

$$\overline{CAR}_t = \frac{1}{N} \sum_{i=1}^N \overline{CAR}_{i,t}$$

$$\overline{CAR}_{i,t} = \left(\sum_{t=K}^L \overline{AR}_{i,t} \right) / (q)^{1/2}$$

where K and L denote the beginning and the end of the investigation windows, or the announcement window and the implementation window, and q is the number of trading days between K and L ($q = L - K + 1$).

However, as mentioned above, since each year has different number of trading days in the interval term, to examine whether or not the cumulative abnormal return in the overall window is significantly different from zero, the following statistic was used.

$$Z_t = \overline{STCAR}_t / S(\overline{AR})$$

$$\overline{STCAR}_t = \frac{1}{N} \sum_{i=1}^N \overline{CAR}_{i,t}$$

$$\overline{CAR}_{i,t} = \left(\sum_{t=b_i}^{c_i} \overline{AR}_{i,t} \right) / (q_i)^{1/2}$$

where b_i and c_i are the beginning date and the ending date of the overall window for a stock i , and q_i is the number of trading days between b_i and c_i .

V-4-ii. Abnormal daily trading volume measures

To detect changes in the trading volume around the event dates, the difference in volume ratio (volume of a tested stock divided by that of benchmark portfolio) between the investigation windows (the announcement window, the implementation window, and the overall window) and the estimation window (AD-70, AD-11), termed as “abnormal” volume, was calculated as follows.

Since cross-sectional $V_{i,t} / V_{p,t}$ has non-normal distributions, these values are log-transformed and the difference from the average in the estimation window was measured as follows.

$$AV_{Ti} = V_{Ti} - V$$

$$V_{Ti} = \frac{1}{N} \sum_{i=1}^N V_{i,Ti}$$

$$V_{i,Ti} = \frac{1}{Tt} \sum_{t=d_0}^{dt} \ln\left(\frac{V_{i,t}}{V_{p,t}}\right)$$

$$V = \frac{1}{N} \sum_{i=1}^N V_i$$

$$V_i = \frac{1}{Te} \sum_{t=AD-70}^{AD-11} \ln\left(\frac{V_{i,t}}{V_{p,t}}\right)$$

where $V_{i,t}$ is the trading volume at time t for a stock i , $V_{p,t}$ is the average volume in the benchmark portfolio at time t , Tt is the number of trading days in the tested window

calculated from the beginning of the tested window ($Tt = dt - d_0 + 1$), and Te is the number of trading days in the estimation window (60 days)⁹.

Since volume data for sector index is not available in CFMRC data set, $V_{p,t}$ is correspondent to the volume of the TSE 300 and the average of the two weight-matching stocks¹⁰.

Significance test for abnormal volume

To examine whether the abnormal volume ratio is significantly different from zero, the following t-statistic was adopted (the null hypothesis: $AV_{Tt} = 0$).

$$t = \frac{VTt - V}{\sqrt{\frac{Var(VTt)}{n_1} + \frac{Var(V)}{n_2}}} \quad (11)$$

where n_1 is the number of stocks at time t , and n_2 is the number of stocks in the estimated window¹².

⁹ As the result of the log-transformation and removal of outliers (discussed later), the Kolmogorov-Smirnov test shows that the distribution of V_i is normal and there is almost no non-normality for $V_{i,Tt}$.

¹⁰ The source of the volume data of the TSE 300 is the Market Data Service at the Toronto Stock Exchange.

¹¹ $Var(VTt) = \sum_{i=1}^N (V_{i,Tt} - VTt)^2 / (N - 1)$ and $Var(V) = \sum_{i=1}^N (V_i - V)^2 / (N - 1)$

¹² The degree of freedom is calculated as: $df = \left(\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2} \right)^2 / \left(\frac{(S_1^2/n_1)^2}{n_1} + \frac{(S_2^2/n_2)^2}{n_2} \right)$, where S_1^2 is the variance of V_{Tt} ($Var(V_{Tt})$) and S_2^2 is the variance of V ($Var(V)$).

V-4-iii. Long-run performance measures

To examine how the stocks performed before and after their revision in the long run basis, the following monthly abnormal returns and long-run price movements were examined at the term from 2-year before through 2-year after the revision month.

The monthly abnormal returns (MAR) are defined as follows.

$$MAR_t = \frac{1}{N} \sum_{i=1}^N MAR_{i,t}$$

$$MAR_{i,t} = MR_{i,t} - MR_{p,t}$$

where $MR_{p,t}$ is the monthly return on the benchmark at time t .

When a particular stock was delisted due to bankruptcy or mergers, the monthly returns of that security from the delisting date was treated as zero to avoid the survivorship bias (Antunovich and Laster (1998)).

Significance test for monthly abnormal returns

To examine whether or not the monthly abnormal returns are different from zero (the null hypothesis: $MAR_t = 0$), the following statistic was adopted. Since skewness has a greater effect on the t-statistics than kurtosis in this case, the following skewness

adjusted t-statistic was used (Lyon, Barber, and Tsai (1999) originated by Johnson (1978)¹³).

$$t_t = \sqrt{N} \left(S_t + \frac{ut}{3} S_t^2 + \frac{ut}{6N} \right)$$

$$S_t = \frac{MAR_t}{S(MAR_t)}^{14}$$

$$ut = \frac{1}{N} \sum_{i=1}^N (MAR_{i,t} - MAR_t)^3 / S(MAR_t)^3$$

where N is the sample size and ut is the statistics for skewness.

Abnormal long-run price performance

Since we are interested in the long-run price performance, the following performance measure was used in this thesis.¹⁵

$$ALP_t = \frac{1}{N} \sum_{i=1}^N ALP_{i,t}$$

$$ALP_{i,t} = LP_{i,t} - LP_{p,t}$$

$$LP_{i,t} = (1 + MR_{i,1}) * (1 + MR_{i,2}) * \dots * (1 + MR_{i,t})$$

¹³ Lyon, Barber, and Tsai (1999) drew 1,000 bootstrapped re-samples from the original sample of size $N/4$ and then they examined the buy-and-hold abnormal returns seeing the distribution of the t-statistics from the 1,000 re-samples. They also showed that the results of the metrics we adopted also significantly reduced the misspecification.

¹⁴ $S(MAR_t) = \left(\sum_{i=1}^N (MAR_{i,t} - MAR_t)^2 / (N - 1) \right)^{1/2}$

¹⁵ Barber and Lyon (1997) examined the relation between buy-and-hold abnormal returns and cumulative abnormal returns and found out that as the buy-and-hold abnormal returns become large, the cumulative abnormal returns become dramatically smaller than the buy-and-hold abnormal returns.

where $MR_{i,t}$ is monthly return for a stock i at time t . $LP_{p,t}$, which is the long-run price performance of the benchmark, was calculated in the same manner as the tested stocks.

This measure assumes equal initial investments in each revised stock and benchmark in the 25th month prior to the revision.

By examining the above compound measure, we could see the abnormal price movements through 4 years surrounding the event.

Significance test for the long-run performance

Since the cross-sectional long-run performance measures were also proved to have significant skewness, the same significance test as that of monthly abnormal returns was used to examine whether the long-run abnormal performance is significantly different from zero or not (the null hypothesis: $ALP_t = 0$).

Abnormal long-run volume performance

The following relative volume metric was used to investigate the relation between price and volume performance. Since in the long run the shares outstanding would have changed and since the change may influence the trading volume different from the examination against the daily trading volume, each volume was adjusted by the shares outstanding and then was log-transformed to avoid extreme values. Moreover, same as the long-run return measure, when a security was delisted from the Toronto

Stock Exchange, the increasing rate of the trading volume was treated as zero to avoid the survivorship bias.

That is, the abnormal volume performance (*AVP*) at time t is:

$$AVP_t = \frac{1}{N} \sum_{i=1}^N AVP_{i,t}$$

$$AVP_{i,t} = LMVP_{i,t} - LMVP_{p,t}$$

$$LMVP_{i,t} = (1 + LMVR_{i,1}) * (1 + LMVR_{i,2}) * \dots * (1 + LMVR_{i,t})$$

$$LMVR_{i,t+1} = (LMV_{i,t+1} - LMV_{i,t}) / LMV_{i,t}$$

where $LMV_{i,t}$ is log-transformed monthly volume divided by log-transformed shares outstanding of security i at time t . $LMVP_{p,t}$ is log-transformed volume of the benchmark, and when 2 weight matching stocks are used as benchmark portfolio, the average of the log-transformed and shares outstanding adjusted volume was calculated as $LMVP_{p,t}$. When the raw volume at time t and/or $t+1$ is zero, $LMVR_{i,t+1}$ was treated as zero. By using the above metric, we could track the relative volume movements to that of benchmark portfolio through 4 years surrounding the event.

Significance test for the long-run volume performance

Same as the significance test at the monthly abnormal returns, since $AVP_{i,t}$ has non-normal distribution even after the log-transformation, the skewness adjusted t-statistics (see the section for the significance test for monthly abnormal returns) were

adopted to examine whether AVP_t is significantly different from zero or not (the null hypothesis: $AVP_t = 0$).

V-4-iv. The difference between the included stocks and the excluded stocks

To directly compare the different performance between the included stocks and the excluded stocks, the following performance measures were adopted.

Price performance

Since the daily cumulative return (CR) can be an approximate proxy for the daily price performance for the revised stocks, the following measure was calculated for both the included stocks and the excluded stocks, respectively.

$$CR_t = \frac{1}{N} \sum_{i=1}^N CR_{i,t}$$

$$CR_{i,t} = \sum_{t=d_0}^{dt} R_{i,t}$$

where $R_{i,t}$ is the daily return of a stock i at time t .

On the other hand, as discussed earlier, since the monthly cumulative returns are not appropriate to examine the long-run price performance, the following buy-and-hold metrics were used.

$$LPP_t = \frac{1}{N} \sum_{i=1}^N LPP_{i,t}$$

$$LPP_{i,t} = (1+MR_{i,1}) * (1+MR_{i,2}) * \dots * (1+MR_{i,t})$$

where $MR_{i,t}$ is the monthly return of a stock i at time t .

Volume performance

To track the daily volume performance (VP), we treated the volume level at the beginning of the tested window as one, and conducted the following procedure.

$$VP_t = \frac{1}{N} \sum_{i=1}^N VP_{i,t}$$

$$VP_{i,t} = (1+LDVR_{i,1}) * (1+LDVR_{i,2}) * \dots * (1+LDVR_{i,t})$$

$$LDVR_{i,t+1} = (LDV_{i,t+1} - LDV_{i,t}) / LDV_{i,t}$$

where $LDV_{i,t}$ is the log-transformed daily volume of a stock i at time t .

When the raw volume at time t and/or $t+1$ is zero, the volume-increasing rate ($LDVR_{i,t+1}$) was treated as zero. The same procedure as the above was applied for the monthly volume to examine the long-run volume performance for each of the two types of revised stocks except that the long-run volume performance was examined through log-transformed monthly volume divided by log-transformed shares outstanding.

Significance test

The following t-statistic was adopted to examine whether or not there is a significant difference in the price and volume performance between the included stocks and the excluded stocks are different.

$$t = \frac{D_t}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

where D_t stands for the difference between the performance metrics of the included stocks less the excluded stocks, n_1 and n_2 are the numbers of the included stocks and the excluded stocks, respectively.

V-4-v. Outliers

Two percent of the sample that had the highest absolute values in either the cross section for abnormal daily return or the abnormal daily volume ratio (stock volume divided by benchmark volume), or abnormal long-run price and volume was regarded as outliers and these values were eliminated from the sample.

CHAPTER VI. Empirical results and discussion

In this chapter, we describe the results for short-term and long-term price (return) and volume implications of revisions to the TSE 300. We first describe the short-term results for inclusions and then exclusions. These are followed by our long-term results and the direct comparison between the two types of revised stocks.

VI-1. Short term results – Around the event dates

In this section, we report the short-term results of the price and volume performance in the announcement window, the implementation window, and the overall window. We first describe the issues surrounding inclusions to the index. As noted earlier, when the demand curve is downward sloping, any changes in interest in the sample stocks due to index revision would shift the demand curve. For example, if this interest was predominantly from index portfolio investors, we would expect that the buying activity to add the included stocks to the portfolio would shift the demand curve to the right, increasing both price and volume levels. But once they finish rebalancing their index portfolio, the demand curve would shift back to the original place along with a decrease in price and volume to the original levels, because they are no longer interested in these stocks. In addition, if their holding of the included stocks is significant, it may reduce the available tradable amount, and the supply curve may even shift to the left. In this scenario, we would expect that both the price level and the volume level would increase on the day of index rebalancing. In addition, after the index rebalancing, if there

were no other factors that could shift the demand and the supply curves, then the price level would be maintained at a level higher than the original level. On the contrary, the volume level would decrease compared to the pre-index rebalancing level.

On the other hand, in the case of exclusion, the supply curve for the excluded stocks would shift to the right because index managers would sell the excluded stocks in order to rebalance their index portfolio. However, since their selling pressure would disappear once they finish their rebalancing activity, the supply curve would shift back to the original level. Therefore, when the demand curve is downward sloping, the price level would be significantly lower due to the shift of the supply curve at the date of the index rebalancing activity, but after the activity it would revert to the pre-index rebalancing level.

In the section below, we first focus on the results related to the included stocks followed by the results of the excluded stocks. These results are reported for each of the benchmarks used and for both around the announcement dates and actual inclusion dates in tabular and graphical forms.

Table IV

Short-run performance in the announcement window (Inclusion)

The sample size is 149 included stocks. "AD" indicates the announcement date. The abnormal return (AR) is the average difference in the return performance between the included stock and the benchmark, and the cumulative abnormal return (CAR) is the average of the summation of the abnormal returns for each stock. The statistical significance of the two abnormal return measures was examined by Z statistics introduced by Linn and McConnell (1983). The abnormal volume (AV) is the difference in volume ratio (a volume of tested stock divided by that of benchmark) between the tested time and the estimation window (AD-70, AD-11). The significance level of AV was measured by the student t- statistics. The proportion positive indicates how many stocks experienced the positive abnormal returns and the binominal Z test was adopted. The graphs are available in Appendix E.

Date	AR	CAR	AV	Proportion positive
Panel A. Benchmark: TSE 300				
AD-10	0.0002	0.00022	0.42610**	47.97
-9	0.0015	0.00171	0.28802	47.30
-8	0.0017	0.00343	0.41662**	57.43**
-7	-0.0006	0.00280	0.09820	40.54**
-6	0.0008	0.00360	0.43282**	45.95
-5	0.0007	0.00425	0.30333	33.78***
-4	0.0045***	0.00874*	0.36930*	53.38
-3	0.0015	0.01022*	0.19516	55.03
-2	0.0002	0.01043*	0.18481	44.97
-1	0.0014*	0.01183**	0.31698	51.01
AD	0.0045***	0.01638***	0.78838***	61.74***
1	0.0005	0.01688***	0.73430***	48.32
2	0.0022*	0.01911***	0.44545**	56.38*
3	0.0025**	0.02159***	0.62979***	50.34
4	0.0036***	0.02520***	0.67057***	52.35
5	-0.0002	0.02502***	0.27663	53.02
6	0.0011	0.02616***	0.39765**	51.68
7	-0.0034**	0.02279***	0.23942	38.26***
8	-0.0018	0.02098***	0.37489*	46.98
9	-0.0005	0.02044***	0.58282***	49.66
AD+10	0.0064***	0.02680***	0.27218	57.05**

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table IV (Cont.)

Short-run performance in the announcement window (Inclusion)				
Event	AR	CAR	AV	Proportion positive
Panel B. Benchmark: Sector Index				
AD-10	0.00133	0.00133	n.a.	55.41*
-9	0.00068	0.00201	n.a.	46.62
-8	0.00200	0.00401	n.a.	53.38
-7	0.00029	0.00430	n.a.	48.65
-6	0.00027	0.00457	n.a.	47.30
-5	0.00034	0.00491	n.a.	43.92*
-4	0.00519***	0.01011**	n.a.	56.08*
-3	0.00008	0.01012*	n.a.	47.65
-2	-0.00117	0.00894	n.a.	44.30*
-1	0.00144*	0.01038*	n.a.	44.30*
AD	0.00705***	0.01743***	n.a.	61.74***
1	0.00272**	0.02015***	n.a.	57.72**
2	0.00249*	0.02264***	n.a.	55.03
3	0.00259**	0.02523***	n.a.	53.02
4	0.00467***	0.02991***	n.a.	55.70*
5	-0.00021	0.02970***	n.a.	53.02
6	0.00023	0.02993***	n.a.	52.35
7	-0.00305**	0.02688***	n.a.	48.32
8	-0.00260	0.02428***	n.a.	44.30*
9	-0.00257	0.02171***	n.a.	49.66
AD+10	0.00605***	0.02775***	n.a.	57.05**
Panel C. Benchmark: 2 weight matching stocks				
AD-10	0.00265***	0.00265***	0.20546	52.70
-9	-0.00173	0.00091	-0.15891	46.62
-8	0.00078	0.00169*	0.07016	47.30
-7	0.00352	0.00521	0.27316	47.30
-6	-0.00095	0.00425	0.32098	39.86***
-5	0.00294	0.00719	-0.05770	45.95
-4	-0.00089	0.00630	0.05788	46.62
-3	-0.00429***	0.00197	0.16267	38.93***
-2	-0.00464***	-0.00267	0.18351	40.27***
-1	0.00085	-0.00181	0.19971	43.62*
AD	0.00615**	0.00434	0.61113***	53.69
1	0.00230**	0.00664	0.59057***	49.66
2	0.00503***	0.01167*	0.37183	59.73***
3	0.00099	0.01266*	0.40729*	49.66
4	0.00638***	0.01904**	0.62934***	50.34
5	0.00097	0.02000**	0.20529	50.34
6	-0.00285	0.01715**	0.56272***	40.27***
7	0.00156	0.01871**	0.29939	51.68
8	-0.00089	0.01782**	0.53358***	45.64
9	0.00268**	0.02050**	0.43722*	56.38*
AD+10	0.00655***	0.02719***	0.40248*	54.05

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Focussing on Table IV (see also Appendix E), in the announcement window, the included stocks experience significant positive abnormal return (0.45% ($Z=2.84$) with 61.74% positive abnormal return against the TSE 300, 0.71% ($Z=3.86$) with 61.74% positive abnormal return against Sector Index, and 0.62% ($Z=2.16$) with 53.69% positive abnormal return against 2 weight matching stocks). Their abnormal price level also goes up after the announcement date, since the CARs continue to be statistically significant. As for the volume level, the abnormal volume measure indicates a significant increase after the announcement date relative to the level in the (AD-70, AD-11) window.

These results showing that both the abnormal return and the abnormal volume increase indicate that the included stocks are not substitutes for other stocks. Thus, after the announcement date, it can be suggested that the downward sloping demand curve shifts to the right increasing both the price and volume levels. Moreover, since the price reversal is not observed in the announcement window, it implies that most of the trading is conducted by a speculative investment activity and there is no significant activity of index portfolio investors to include the “to be added” stocks in their portfolio.

Table V

Short-run performance in the implementation window (Inclusion)

The sample size is 149 included stocks. "ID" indicates the implementation date respectively. The abnormal return (AR) is the average difference in the return performance between the included stock and the benchmark, and the cumulative abnormal return (CAR) is the average of the summation of the abnormal returns for each stock. The statistical significance of the two abnormal return measures was examined by Z statistics introduced by Linn and McConnell (1983). The abnormal volume (AV) is the difference in volume ratio (a volume of tested stock divided by that of benchmark) between the tested time and the estimation window (AD-70, AD-11). The significance level of AV was measured by the student t-statistics. The proportion positive indicates how many stocks experienced the positive abnormal returns and the binominal Z test was adopted. The graphs are available in Appendix E.

Event	AR	CAR	AV	Proportion positive
Panel A. Benchmark: TSE 300				
ID-10	-0.00209	-0.00209	0.46536	45.64
-9	-0.00071	-0.0028	0.33948*	51.01
-8	0.00029	-0.00252	0.38462**	44.97
-7	0.00274*	0.00022	0.36619*	57.72**
-6	-0.00145	-0.00123	0.52109***	35.57***
-5	0.00289**	0.00166	0.61953***	60.40***
-4	0.00194*	0.00361*	0.80345***	56.38*
-3	0.00153*	0.00514*	0.94163***	50.34
-2	0.00513***	0.01027**	0.85714***	51.01
-1	0.02428***	0.03456***	1.49220***	79.19***
ID	-0.00816***	0.02639***	0.83136***	27.52***
1	-0.00247*	0.02392***	0.72910***	34.23***
2	-0.00315	0.02077***	0.60918***	40.27***
3	-0.00429**	0.01648***	0.44729***	43.62*
4	-0.00018	0.01630***	0.21795	43.62*
5	0.00298***	0.01928***	0.27155*	48.99
6	-0.00169	0.01766***	0.47627***	43.62*
7	-0.00196*	0.01564**	0.57121***	50.34
8	-0.00215*	0.01349**	0.42326**	42.28**
9	0.00162	0.01511**	0.50481***	55.03
ID+10	-0.00427***	0.01084**	0.33007*	38.93***

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table V (Cont.)

Short-run performance in the implementation window (Inclusion)				
Event	AR	CAR	AV	Proportion positive
Panel B. Benchmark: Sector Index				
ID-10	-0.00164	-0.00164	n.a.	44.30*
-9	-0.00208	-0.00372	n.a.	48.99
-8	0.00161*	-0.00211	n.a.	50.34
-7	0.00343**	0.00132	n.a.	53.02
-6	-0.00250	-0.00117	n.a.	36.91***
-5	0.00197**	0.00079	n.a.	51.68
-4	0.00104	0.00184	n.a.	52.35
-3	0.00238*	0.00421*	n.a.	48.32
-2	0.00655***	0.01076***	n.a.	53.69
-1	0.02341***	0.03417***	n.a.	70.47***
ID	-0.00795***	0.02621***	n.a.	32.89***
1	-0.00333**	0.02288***	n.a.	36.24***
2	-0.00429**	0.01859***	n.a.	38.93***
3	-0.00366***	0.01493***	n.a.	40.27***
4	-0.00242	0.01251**	n.a.	38.26***
5	0.00307**	0.01559***	n.a.	45.64
6	-0.00080	0.01478***	n.a.	48.32
7	-0.00265**	0.01214**	n.a.	46.31
8	-0.00030	0.01184**	n.a.	46.31
9	0.00200	0.01384**	n.a.	55.03
ID+10	-0.00393***	0.00991*	n.a.	39.60***
Panel C. Benchmark: 2 weight matching stocks				
ID-10	0.00169**	0.00169**	0.52557***	55.03
-9	0.00073	0.00241**	0.35817*	46.31
-8	0.00475**	0.00716***	0.24135	48.99
-7	0.00584***	0.01300***	0.35252	56.38*
-6	0.00357***	0.01657***	0.20255	47.65
-5	0.00043	0.01700***	0.62785***	51.68
-4	0.00220*	0.01920***	0.86834***	54.36
-3	0.00715***	0.02635***	0.95954***	51.01
-2	0.00652***	0.03287***	0.91183***	53.69
-1	0.01780***	0.05067***	1.49367***	65.10***
ID	-0.00711***	0.04356***	0.77319***	34.90***
1	-0.00343*	0.04013***	0.85122***	40.94**
2	-0.00207*	0.03806***	0.53996***	40.27***
3	-0.00209*	0.03596***	0.30991	45.64
4	-0.00095	0.03502***	0.00461	45.64
5	-0.00311**	0.03191***	0.15580	46.98
6	-0.00383**	0.02808***	0.49537***	46.31
7	-0.00664***	0.02144**	0.53171***	35.57***
8	-0.00366**	0.01778**	0.35981	40.27***
9	0.00380***	0.02158***	0.45405**	53.02
ID+10	-0.00521***	0.01638*	0.30603	36.24***

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

On the other hand, one day before the actual implementation date (Table V and Appendix E), the included stocks experience significant positive abnormal return (2.43% ($Z=14.58$) with 79.19% positive abnormal return against the TSE 300, 2.34% ($Z=13.73$) with 70.47% positive abnormal return against Sector Index, and 1.78% ($Z=8.08$) with 65.1% positive abnormal return against 2 weight matching stocks). This is followed by a slight reversal at the actual inclusion date, day 0. The CARs in the window (ID-10, ID +10) indicate that the price level reverses to around 1% level after it reaches to the highest level. Since the CARs around the end of the implementation window (ID+10) are statistically significant, this evidence indicates that the demand curve is not perfectly elastic.

Moreover, the abnormal volume changes also indicate that the index rebalancing activity can be explained through the changes to the supply and demand curves. The transition of the abnormal volume around the implementation window supports the suggestion that the volumes move in concert with the price levels.

The above evidence also supports the conjecture that the downward sloping demand curve shifts to the right one day prior to the actual inclusion, increasing both price and volume temporarily. In addition, after the actual inclusion, since the abnormal volume is reduced to the lower level than its pre-implementation level, it implies that the supply curve shifts to the left because of the decrease in the tradable number of shares. This evidence may also be the reason why the price level remains high after the actual inclusion.

Although the actual numbers are different, Panel B and C in Table V and graphs (Appendix E) using the two other benchmark indices indicate that the results based on the TSE 300 benchmark are similar to those found using the other two benchmarks.

Focussing now on the exclusion set, we report results for this set in similar manner as that for the inclusion set above.

Table VI

Short-run performance in the announcement window (Exclusion)

The sample size is 141 excluded stocks. “AD” and “ID” indicate the announcement date and the implementation date, respectively. The abnormal return (AR) is the average difference in the return performance between the included stock and the benchmark, and the cumulative abnormal return (CAR) is the average of the summation of the abnormal returns for each stock. The statistical significance of the two abnormal return measures was examined by Z statistics introduced by Linn and McConnell (1983). The abnormal volume (AV) is the difference in volume ratio (a volume of tested stock divided by that of benchmark) between the tested time and the estimation window (AD-70, AD-11). The significance level of AV was measured by the student t-statistics. The proportion positive indicates how many stocks experienced the positive abnormal returns and the binominal Z test was adopted. The graphs are available in Appendix F.

Date	AR	CAR	AV	Proportion positive
Panel A. Benchmark: TSE 300				
AD-10	-0.00120	-0.00120	0.26126	40.43**
-9	0.00180	0.00060	0.26385	45.39
-8	-0.00008	0.00052	0.48745**	52.48
-7	-0.00122	-0.00070	0.17691	36.88***
-6	-0.00347**	-0.00417	0.54664***	31.91***
-5	-0.00476***	-0.00893**	0.47428***	24.82***
-4	-0.00018	-0.00911**	-0.01213	43.26*
-3	0.00232	-0.00679*	0.04553	61.70***
-2	0.00161	-0.00518*	0.03503	42.55**
-1	0.00290	-0.00228	-0.13800	47.52
AD	-0.01228***	-0.01456***	0.55497***	41.84**
1	-0.00249***	-0.01705***	0.47092***	39.72***
2	-0.00328	-0.02034***	0.40878**	53.19
3	0.00296*	-0.01737***	0.40840**	50.35
4	-0.00259	-0.01996***	0.21329	54.61
5	0.00027	-0.01969***	0.45557***	43.97*
6	-0.00343	-0.02312***	0.55048***	53.19
7	0.00138	-0.02174***	0.25763	37.59***
8	-0.00842***	-0.03016***	0.24542	46.10
9	-0.00380	-0.03396***	0.30540**	43.97*
AD+10	-0.00043*	-0.03440***	0.24072	55.32

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table VI (Cont.)

Short-run performance in the announcement window (Exclusion)				
Event	AR	CAR	AV	Proportion positive
Panel B. Benchmark: Sector Index				
AD-10	-0.00124	-0.00124	n.a.	46.10
-9	0.00111	-0.00014	n.a.	46.81
-8	0.00086	0.00073	n.a.	51.06
-7	-0.00066	0.00007	n.a.	46.10
-6	-0.00486**	-0.00479*	n.a.	36.88***
-5	-0.00352**	-0.00832**	n.a.	36.88***
-4	-0.00046	-0.00878**	n.a.	46.10
-3	0.00200*	-0.00678*	n.a.	53.90
-2	0.00012	-0.00666*	n.a.	51.06
-1	0.00331	-0.00336	n.a.	38.30***
AD	-0.01066***	-0.01402***	n.a.	40.43***
1	-0.00242***	-0.01644***	n.a.	46.10
2	-0.00347	-0.01991***	n.a.	49.65
3	0.00415**	-0.01576***	n.a.	55.32
4	-0.00241	-0.01817***	n.a.	50.35
5	0.00151	-0.01666***	n.a.	45.39
6	-0.00324	-0.01991**	n.a.	55.32
7	0.00159**	-0.01831*	n.a.	51.77
8	-0.00673***	-0.02504**	n.a.	43.26*
9	-0.00547*	-0.03051***	n.a.	50.35
AD+10	0.00077	-0.02974**	n.a.	53.19
Panel C. Benchmark: 2 weight matching stocks				
AD-10	0.00206*	0.00206*	-0.49435**	53.19
-9	-0.00053	0.00153	-0.10771	43.97*
-8	-0.00570**	-0.00417*	0.15081	33.33***
-7	0.00235	-0.00182	0.36913	52.48
-6	-0.00331**	-0.00513	0.17316	41.13**
-5	-0.00747***	-0.01260***	0.07440	36.88***
-4	-0.00311**	-0.01571***	-0.30212	35.46***
-3	-0.00427	-0.01998***	-0.08359	40.43**
-2	0.00091	-0.01908***	-0.15296	53.90
-1	0.00098	-0.01809***	-0.23380	43.97*
AD	-0.00056	-0.01865***	0.63232***	42.55**
1	-0.00388***	-0.02253***	0.18897	44.68
2	-0.00105	-0.0236***	0.25251	41.84**
3	0.00477***	-0.01881***	-0.24059	51.77
4	0.00220***	-0.01661**	0.32053	52.48
5	0.00931***	-0.00730	0.29773	50.35
6	-0.00532	-0.01262	0.64691**	43.97*
7	0.00713***	-0.00549	0.24171	53.90
8	-0.00403	-0.00952	0.20818	44.68
9	0.00010	-0.00942	-0.30562	51.06
AD+10	-0.00013*	-0.00955	-0.27035	47.52

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

As can be seen in Table VI (and also seen in Appendix F), in the announcement window, the excluded stocks experienced a significant price decline compared to the TSE 300 and Sector Index (-1.23% ($Z=-6.12$) with 41.84% positive abnormal return against TSE 300, -1.07% ($Z=-5.52$) with 40.43% positive abnormal return against Sector Index, and -0.06% ($Z=-1.10$) with 42.55% positive abnormal return against 2 weight matching stocks). Although the abnormal return against 2 weight matching stocks is not statistically significant, the evidence implies that investors respond to the deletion announcement negatively.

When focusing on the volume movements, the abnormal volume level also becomes high after the announcement date relative to the pre-announcement level, implying that the selling pressure from the stockholders increased noticeably after the announcement. However, since the abnormal volume level remains significantly high even after the announcement date, it can be concluded that the selling pressure continues to exist. This is the reverse of what would be expected if there were a significant index rebalancing activity. Since the price and volume levels do not experience resumption to the pre-announcement levels, the trading activity in the announcement window could be mostly attributed to the interest from non-index portfolio investors.

Table VII

Short-run performance in the implementation window (Exclusion)

The sample size is 141 excluded stocks. "AD" and "ID" indicate the announcement date and the implementation date, respectively. The abnormal return (AR) is the average difference in the return performance between the included stock and the benchmark, and the cumulative abnormal return (CAR) is the average of the summation of the abnormal returns for each stock. The statistical significance of the two abnormal return measures was examined by Z statistics introduced by Linn and McConnell (1983). The abnormal volume (AV) is the difference in volume ratio (a volume of tested stock divided by that of benchmark) between the tested time and the estimation window (AD-70, AD-11). The significance level of AV was measured by the student t- statistics. The proportion positive indicates how many stocks experienced the positive abnormal returns and the binominal Z test was adopted. The graphs are available in Appendix F.

Date	AR	CAR	AV	Proportion positive
Panel A. Benchmark: TSE 300				
ID-10	-0.00430	-0.00430	0.38082**	43.97*
-9	-0.00691***	-0.01120***	0.27578	47.52
-8	-0.00152	-0.01272***	0.29103*	45.39
-7	0.00485	-0.00787**	0.17265	52.48
-6	-0.01196***	-0.01983***	0.41552**	26.95***
-5	0.00425**	-0.01558***	0.33015**	64.54***
-4	-0.00328	-0.01887***	0.37945**	49.65
-3	0.00137	-0.01750***	0.32956*	54.61
-2	-0.00228	-0.01977***	0.40402**	34.04***
-1	-0.01617***	-0.03595***	1.23202***	33.33***
ID	0.01001***	-0.02594***	0.87885***	57.45**
1	0.00304**	-0.02290**	0.61148***	49.65
2	0.00325	-0.01965**	0.36339**	48.23
3	0.00697***	-0.01268	0.13245	54.61
4	-0.00329**	-0.01597	0.16043	41.84**
5	0.00686***	-0.00911	-0.02474	52.48
6	0.00350***	-0.00561	0.04991	59.57**
7	0.00257	-0.00304	0.03488	49.65
8	0.00086	-0.00218	0.38504**	50.35
9	0.00075	-0.00143	0.23407	53.90
ID+10	-0.00071	-0.00214	0.16494	43.97*

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table VII (Cont.)

Short-run performance in the implementation window (Exclusion)				
Event	AR	CAR	AV	Proportion positive
Panel B. Benchmark: Sector Index				
ID-10	-0.00475	-0.00475	n.a.	43.26*
-9	-0.00816***	-0.01291***	n.a.	41.13**
-8	0.00018	-0.01273***	n.a.	48.94
-7	0.00504	-0.0077**	n.a.	48.94
-6	-0.01222***	-0.01992***	n.a.	33.33***
-5	0.00435**	-0.01556***	n.a.	56.74*
-4	-0.00310*	-0.01866***	n.a.	43.97*
-3	0.00360	-0.01506***	n.a.	51.06
-2	-0.00152	-0.01659***	n.a.	41.84**
-1	-0.01520***	-0.03179***	n.a.	36.88***
ID	0.01008***	-0.02171***	n.a.	56.74*
1	0.00410**	-0.0176***	n.a.	46.81
2	0.00212	-0.01548***	n.a.	41.13**
3	0.00686***	-0.00862	n.a.	56.03*
4	-0.00215*	-0.01077*	n.a.	49.65
5	0.00678***	-0.00398	n.a.	51.06
6	0.00335***	-0.00064	n.a.	54.61
7	0.00259	0.001951	n.a.	52.48
8	-0.00165	0.000301	n.a.	44.68
9	0.00153	0.001831	n.a.	58.87**
ID+10	0.00035	0.002185	n.a.	46.10
Panel C. Benchmark: 2 weight matching stocks				
ID-10	-0.00324	-0.00324	0.07571	44.68
-9	-0.00568***	-0.00892***	0.23834	42.55**
-8	0.00608***	-0.00284	-0.17605	53.90
-7	0.00943**	0.006586	-0.06769	50.35
-6	-0.01143***	-0.00484*	0.10361	35.46***
-5	-0.00297	-0.00781*	0.11078	46.10
-4	-0.00015	-0.00796	-0.30430	45.39
-3	0.00405	-0.00391	-0.34887	56.03*
-2	-0.00020	-0.00411	-0.16474	43.97*
-1	-0.01893***	-0.02304***	0.83809***	27.66***
ID	0.01035***	-0.01269**	0.45608**	61.70***
1	0.00594***	-0.00675*	0.23709	55.32
2	-0.00344*	-0.01018**	0.18222	39.01***
3	0.00745***	-0.00273	-0.28722	51.06
4	-0.00281	-0.00554	0.00426	41.84**
5	0.00479***	-0.00075	-0.32547	46.81
6	0.00176	0.00101	-0.28949	43.26*
7	-0.00111	-0.00010	-0.43056	46.10
8	0.00243	0.00234	0.26961	50.35
9	0.00821**	0.01054	0.07256	51.06
ID+10	0.00364***	0.01418	-0.03489	52.48

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

On the other hand, in the implementation window (Table VII and Appendix F), the excluded stocks experience further significant negative abnormal return on the one-day before the implementation date (-1.62% ($Z=-6.19$) with only one-third of the stocks showing positive abnormal return against the TSE 300, -1.52% ($Z=-7.05$) with 36.88% positive abnormal return against Sector Index, and -1.89% ($Z=-7.21$) with 27.66% positive abnormal return against 2 weight matching stocks) while they have significant positive abnormal return on the next day, or the implementation date (1.00% ($Z=4.84$) with 57.45% positive abnormal return against the TSE 300, 1.01% ($Z=5.27$) with 56.74% positive abnormal return against Sector Index, and 1.04% ($Z=3.55$) with 61.70% positive abnormal return against 2 weight matching stocks).

Focusing on the movement in trading volumes, it can be seen that the abnormal volume goes up significantly one day before the actual exclusion date (to 1.23 (ID-1) from 0.40 (ID-2) against the TSE 300 and to 0.83 (ID-1) from -0.16 (ID-2) against 2 weight matching stocks). However, after the implementation date the abnormal volume level decreases and becomes finally statistically insignificant by the end of the implementation window. Moreover, reviewing the CARs, the abnormal price level significantly decreased one day before the implementation date. However, since the CARs after the implementation date are indifferent from zero, it can be said that the prices revert to their original level.

Thus, the evidence above implies that the supply curve shifts to the right resulting in an increase in trading volume and the corresponding decrease in prices one

day before the actual exclusion date. Also the price and volume reversal to the pre-event level after the actual exclusion supports the hypothesis that, once the index portfolio investors finish their rebalancing activity, the supply curve reverts back to the previous level as the selling pressure disappears. The evidence in the implementation window supports the suggestion that index portfolio investors are thought to have engaged in their index rebalancing activity just before the implementation date.

Table VIII

Performance in the overall window

The sample size is 149 (110 for the interval) included stocks and 141 (105 for the interval) excluded stocks. “AD” and “ID” indicate the announcement date and the implementation date, respectively. The cumulative abnormal return (CAR) is the average of the summation of the abnormal returns for each stock. The statistical significance for CAR was examined by Z statistics introduced by Linn and McConnell (1983). The abnormal volume (AV) is the difference in volume ratio (a volume of tested stock divided by that of benchmark) between the tested time and the estimation window (AD-70, AD-11). As for the “ID+30” and “ID+60”, the abnormal volume is the difference between the average volume in each of the (ID+11, ID+30) and (ID+31, ID+60) windows and the above estimation window. The significance level of AV was measured by the student t- statistics. The graphs for CARs are available in Appendix G.

From AD-10 to:	Inclusion		Exclusion	
	CAR	AV	CAR	AV
Panel A. Benchmark: TSE 300				
Interval	0.0376***	0.1665	-0.0623***	0.3261*
ID-1	0.0623***	1.4922***	-0.0814***	1.2320***
ID	0.0542***	0.8314***	-0.0714***	0.8788***
ID+1	0.0517***	0.7291***	-0.0683***	0.6115***
ID+10	0.0386***	0.3301**	-0.0476**	0.3879**
ID+30	0.0287***	0.1672	-0.0569*	0.0434
ID+60	0.0253***	0.0726	-0.0572	-0.0643
Panel B. Benchmark: Sector Index				
Interval	0.0477***	n.a.	-0.0530***	n.a.
ID-1	0.0678***	n.a.	-0.0702***	n.a.
ID	0.0598***	n.a.	-0.0601***	n.a.
ID+1	0.0565***	n.a.	-0.0571***	n.a.
ID+10	0.0435***	n.a.	-0.0362**	n.a.
ID+30	0.0353***	n.a.	-0.0478*	n.a.
ID+60	0.0242**	n.a.	-0.0499	n.a.
Panel C. Benchmark: 2 weight matching stocks				
Interval	0.0456***	0.1857	-0.0029	-0.2981*
ID-1	0.0803***	1.4937***	-0.0255	0.8381***
ID	0.0732***	0.7732***	-0.0152	0.4561**
ID+1	0.0697***	0.8512***	-0.0258	0.2371
ID+10	0.0460***	0.5306***	0.0117*	-0.1551
ID+30	0.0482***	0.2646	-0.0088	-0.7943*
ID+60	0.0556***	0.2451	-0.0180	-0.8617**

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table VIII describes the abnormal return/price and volume performances in the overall window. In the case of the inclusion sample, the abnormal price level for the included stocks remains high, while the abnormal volume level decreases to the average level in the (AD-70, AD-11) window. Since the abnormal price level remains significantly high and the volume level experiences resumption, this evidence implies

that after the demand curve shifts to the right and reverts back to the original position, the supply curve shifts to the left and remains in that position for a while. The reason why the volume level does not decrease to the level in the pre-overall window, it could be hypothesised that there is a new level of demand for the included stocks.

As for the exclusion sample, the level of CARs does not change within the entire window except for the case of the 2 weight matching stocks used as the benchmark. Although as the time passes from the actual revision the statistical significance decreases, the price level of the excluded stocks remains quite low as compared to the benchmarks. On the other hand, the abnormal volume level gradually diminishes after the actual exclusion. This combination of the abnormal price and volume movements implies that the demand to the excluded stocks becomes continuously weaker relative to benchmark stocks. Based on this evidence, it can be said that the excluded stocks and the benchmark stocks are also not substitutes for each other.

VI-2. Long run performance

In this section, we describe the results of the long-term performance of the sample stocks (both inclusions and exclusions) in comparison to each of the three benchmarks examining both return/price and volume performance.

Table IX

Monthly abnormal returns

The sample size is 144 for the included stocks and 140 for the excluded stocks. The month 0 indicates the month when the annual index revision was conducted. The abnormal return (AR) is the average difference in the return performance between the included stock and the benchmark. The statistical significance for AR was examined by skewness-adjusted t-test introduced by Johnson (1978). Each column represents the abnormal returns against each TSE 300, Sector Index, and 2 weight matching stocks (2MS).

Month	Inclusion			Exclusion		
	TSE300	Sector Index	2MS	TSE300	Sector Index	2 MS
-24	-0.0004	-0.00432	-0.02168**	0.0006	0.0004	-0.0234**
-23	0.0304***	0.01914*	0.00115	-0.0034	-0.0016	-0.0192**
-22	0.0075	0.00471	0.00693	-0.0224***	-0.0190**	-0.0352***
-21	0.0066	-0.00002	0.01451	-0.0327***	-0.0263***	-0.0282**
-20	0.0163**	0.01520**	0.00330	-0.0200***	-0.0094	-0.0212**
-19	0.0009	0.00548	0.01218	-0.0167*	-0.0237**	-0.0114
-18	0.0165**	0.01422*	0.01558*	-0.0093	-0.0086	-0.0037
-17	0.0305***	0.02624***	0.01374	-0.0113	-0.0077	-0.0205*
-16	0.0131*	0.01514*	0.01011	-0.0385***	-0.0251***	-0.0223*
-15	0.0230***	0.02528***	0.01880**	-0.0332***	-0.0223***	-0.0155
-14	0.0027	-0.00047	-0.00685	-0.0087	-0.0128*	-0.0250*
-13	0.0509***	0.04664***	0.03051**	-0.0280***	-0.0280***	-0.0221*
-12	0.0588***	0.05174***	0.04236***	-0.0298***	-0.0227***	-0.0381***
-11	0.0383***	0.03390***	0.03129**	-0.0301***	-0.0295***	-0.0185*
-10	0.0231***	0.02456***	0.01763*	-0.0184*	-0.0182**	-0.0123
-9	0.0131	0.01029	0.01358	-0.0641***	-0.0542***	-0.0483***
-8	0.0310***	0.02539***	0.02564**	-0.0194***	-0.0172**	-0.0014
-7	0.0077	0.00983	0.02733***	-0.0264***	-0.0212**	0.0027
-6	0.0251***	0.01425*	0.03267***	-0.0171*	-0.0146*	0.0180
-5	0.0205**	0.01176	0.01933**	-0.0101	-0.0234**	-0.0027
-4	-0.0213**	-0.01231	0.00856	-0.0634***	-0.0571***	-0.0183*
-3	-0.0022	0.00581	0.00750	-0.0285**	-0.0177	0.0126
-2	0.0114	0.01313**	0.03289***	-0.0187**	-0.0195**	-0.0070
-1	0.0327***	0.03878***	0.04860***	-0.0438***	-0.0415***	0.0124
0	0.0184**	0.01467*	0.01122	0.0217*	0.0269**	0.0211

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table IX (Cont.)

Monthly abnormal returns						
Month	Inclusion			Exclusion		
	TSE300	Sector Index	2MS	TSE300	Sector Index	2 MS
1	-0.0080	-0.00593	-0.00088	0.0092	0.0107	-0.0084
2	0.0021	-0.00627	0.00023	-0.0002	-0.0134	0.0027
3	0.0112	0.01551**	0.02864***	-0.0190*	-0.0129	-0.0100
4	-0.0061	-0.00202	-0.00978	-0.0128	-0.0221**	-0.0089
5	-0.0160**	-0.00967	0.00270	-0.0092	-0.0053	0.0088
6	-0.0012	0.00001	0.00550	0.0130	0.0170*	0.0206*
7	-0.0058	-0.01264	-0.01603	0.0150	0.0027	-0.0074
8	-0.0254***	-0.02217***	-0.00045	-0.0291***	-0.0273***	-0.0122
9	-0.0232**	-0.00737	-0.01826	-0.0107	-0.0006	0.0034
10	-0.0194**	-0.00521	-0.00412	-0.0231***	-0.0109	0.0244**
11	-0.0223**	-0.01688*	-0.00373	0.0005	0.0116	0.0213
12	-0.0132	0.00105	-0.02229**	0.0201**	0.0233**	0.0109
13	-0.0006	-0.00041	-0.00427	-0.0100	-0.0045	-0.0165
14	0.0124	0.00157	0.00383	-0.0119	-0.0247***	-0.0035
15	-0.0144*	-0.00473	-0.00734	-0.0140*	-0.0146*	-0.0293*
16	-0.0033	0.00587	0.01310	-0.0049	-0.0044	0.0066
17	-0.0288***	-0.02486***	-0.02773***	-0.0141	-0.0139	-0.0234**
18	0.0061	0.00521	-0.01555	0.0053	0.0043	0.0027
19	0.0180*	0.00994	0.01369	-0.0158*	-0.0227**	-0.0163
20	-0.0266***	-0.00991	0.00972	-0.0143	-0.0120	0.0144
21	-0.0118	-0.01067	-0.00050	-0.0221**	-0.0226**	-0.0276**
22	0.0036	0.00976	0.02171**	-0.0008	-0.0040	0.0071
23	-0.0176*	-0.01168	-0.00135	-0.0216**	-0.0094	-0.0095
24	0.0038	-0.00605	-0.01974*	0.0054	0.0005	-0.0137

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table IX shows the monthly abnormal returns in the (-24, +24) window compared to each of three benchmark portfolios. The prominent movements on the included stocks can be seen in the (-13, -12) and (-2, 0) window. Since the 13th month prior to the revision month is January and the included stocks have small market capitalization relative to other TSE 300 stocks, the abnormal return at the month may be explained by the so-called January effect. However, compared with the 2 weight matching stocks, the included stocks experienced significant abnormal return in the window, which means that the abnormal returns are not attributed to the small market

capitalization. Thus, it can be assumed that the movement in the (-13, -12) window reflects the expectation of investors for the possibility on the future index inclusion, because the revision criteria were well known and left little to speculation.

In addition, the included stocks experience significant abnormal return in the (-2, 0) window. Again, since the revision criteria are clear, investors can purchase the expected stocks to be included in the TSE 300 by considering the inclusion to be a positive event for the stocks.

On the other hand, the excluded stocks continue to experience significantly negative abnormal returns until the month of the actual exclusion from around the 22th month before the actual exclusion. But not differently from the inclusion case, around the 13th month before the actual revision month the market seemed to notice the possibility for the excluded stocks to be actually excluded. Therefore, the revision event can be said to start at least one year prior to the actual revision.

Table X

Buy-and-hold abnormal returns

The sample size is 144 for the included stocks and 140 for the excluded stocks. The month 0 indicates the month when the annual index revision was conducted. From the 23rd month after the actual revision month, the sample size is 135 for the included stocks and 130 for the excluded stocks due to lack of data from 23 month after the revision (January 2002). The buy-and-hold abnormal returns (BHAR) assume equal initial investments in each revised stock in the 25th month prior to the actual revision month. The statistical significance for BHAR was examined by skewness-adjusted t-test introduced by Johnson (1978). Each column represents BHAR against each TSE 300, Sector Index, and 2 weight matching stocks (2MS).

Window	Inclusion			Exclusion		
	TSE300	Sector Index	2MS	TSE300	Sector Index	2 MS
(-24,-13)	0.3518***	0.3187***	0.1681***	-0.2135***	-0.1717***	-0.2414***
(-12,-1)	0.4475***	0.4308***	0.4766***	-0.3040***	-0.2743***	-0.0964***
(-1,0)	0.0688***	0.0714**	0.0725***	-0.0257	-0.0190	0.0285
(+1,+12)	-0.1252***	-0.0265	-0.0414	0.0136	0.0145	0.0519
(+13,+24)	-0.1370**	-0.0003	-0.0600	-0.0956*	-0.0308	0.0153
(-24,+24)	0.9230***	0.9775***	0.8085***	-0.5210***	-0.4148***	-0.2662***

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

From Table X, it can be seen that a large fraction of the major price movements for both included and excluded stocks is more or less completed before the actual revision and that there is no longer any room for investors to exploit these revised stocks after the actual revision. The details of the stabilisation of prices past the actual date can be seen graphically below.

Figure I

Long-run performance (Benchmark: TSE 300)

The left and right vertical axes indicate the levels of the buy-and-hold abnormal returns (BHAR) and abnormal volume, respectively. The abnormal volume is calculated as the difference in trading volume between the revised stocks and the benchmark, which assume each of their log-transformed and shares outstanding-adjusted volume as one at the 25th month prior to the actual revision month. The notations, ADD(R), ADD(V), DEL(R), and DEL(V), stand for BHAR, the abnormal return for the included stocks, BHAR for the excluded stocks, and the abnormal volume for the excluded stocks, respectively. The numbers and the significance level are available in Appendix H.

As noted earlier, if the demand curve for a security is perfectly elastic, the buy-and-hold abnormal return, which also indicates the abnormal price movement, would be zero and the price level would be neutral to the volume fluctuation.

As can be seen in Figure I, the abnormal buy-and-hold return continues to increase until the time of the actual inclusion. On the contrary, after the actual inclusion, the abnormal buy-and-hold return stays almost constant.

Besides the abnormal price movement, focusing on the abnormal volume movement for the included stocks, as the abnormal price level goes up, the abnormal

volume level also grows except for the (-10, -2) window where the abnormal volume level is almost constant. This may have been caused because investors demand the “to be included” stocks and then wait for the best opportunity to sell them. That is, it is suggested that the demand curve shifts to the right while the supply curve shifts to the left reducing the tradable amount, both of which boost the price level upward but maintain the volume level constant.

Thus, the sharp increase of the abnormal trading volume from the first month prior to the revision month to the actual inclusion can be explained by the demand increase and also probably by the supply increase by the above stock holders who wait for the price increase.

After the actual inclusion, the price level looks settled. Since the revision event starts at least one year prior to the actual revision and as long as the abnormal price level does not diminish, the downward sloping demand curve cannot be said to resume its elasticity even after the actual revision month. This implies that since the volume movement is not neutral to the price, the demand curve remains downward sloping even in the long run.

As for the exclusion case, the abnormal price level continues to decline until the actual exclusion but after the event month it stays at almost the same level. Looking at the abnormal volume movement, we can see that it decreases until the 5th month before the actual exclusion. However, as reaching the actual revision, the abnormal volume

increases while the abnormal price level declines. This may indicate that the selling pressure on the excluded stocks plays a significant role in this window, indicating that the supply curve may have shifted to the right. Given that the demand curve is perfectly elastic, although this trading activity of investors can shift the supply curve to the right, the price level does not seem to be affected.

After the actual exclusion, the abnormal price level increases until the first month after the actual revision month, lifting the abnormal volume level, which would imply that the supply curve shifts to the pre-revision spot as the selling pressure disappears. From then, the abnormal volume is seen to decline but the abnormal price level remains constant from the actual deletion date. Indeed, the neutral movements between the abnormal price and volume levels imply that the demand curve resumes its elasticity after the actual exclusion. However, since the abnormal price level does not resume to the level that the market starts to be careful about the revision event, the excluded stocks and the benchmark stocks cannot be said to be substitutes for each other, indicating that the demand curve is not perfectly elastic.

The next figure shows the result in the case of taking Sector Index as the benchmark portfolio.

Figure II

Long-run performance (Benchmark: Sector Index)

The left and right vertical axes indicate the levels of the buy-and-hold abnormal returns (BHAR). The notations, ADD(R) and DEL(R) stand for BHARs for the included stocks and for the excluded stocks, respectively. The numbers and the significance level are available in Appendix H.

Figure II shows that the abnormal price for the included stocks experienced continuous increase until the actual inclusion, but after that, the abnormal price became almost constant. Similarly, the excluded stocks show the constant reduction on the abnormal price level, but after the actual exclusion, it remains constant. Although the relation between the demand curve and the supply curve is not clear due to the lack of the volume data of each sector index, we can see that at least the abnormal price movement is almost same as the result shown in Figure I. Therefore, as long as the abnormal price exists, the relation between the sector index and the revised stocks cannot be expressed as the substitute relationship.

Figure III shows the result when the 2 weight matching stocks in the sector that a tested stock belongs to were adopted as the benchmark.

Figure III

Long-run performance (Benchmark: 2 weight matching stocks)

The left and right vertical axes indicate the levels of the buy-and-hold abnormal returns (BHAR) and abnormal volume, respectively. The abnormal volume is calculated as the difference in trading volume between the revised stocks and the benchmark, which assume each of their log-transformed and shares-outstanding adjusted volume as one at the 25th month prior to the actual revision month. The notations, ADD(R), ADD(V), DEL(R), and DEL(V), stand for BHAR, the abnormal return for the included stocks, BHAR for the excluded stocks, and the abnormal volume for the excluded stocks, respectively. The numbers and the significance level are available in Appendix H.

As can be seen from the above figure, the results using the alternate benchmark are quite similar to the results using the TSE 300 as a benchmark. A notable observation in the exclusion case is shown in the (-13, -10) window, in which as the abnormal price level declines the abnormal volume level increases. This upward volume trend in conjunction with the decline in the abnormal price level can be attributed to the possibility that the excluded stocks were sold more than the 2 weight matching stocks. Until the 5th month prior to the revision month the price and volume movements are also

opposite, so that we can hypothesise that the relative selling pressure for the excluded stocks gradually disappears. These results also indicate that the excluded stocks are not substitutes for the 2 weight matching stocks.

Focusing on the term after the 5th month prior to the actual revision month, the price level is constant while the volume level is increased. Indeed, the neutral relation between the abnormal price and volume levels implies that the demand curve is perfectly elastic. However, in the long run, the abnormal price level does not diminish and remains at the lower level than the level experienced around the 13th month before the actual revision when the market is assumed to notice the index revision. Thus, it is thought to be premature to say that the excluded stocks and the benchmark stocks become substitutes for each other.

VI-3. The comparison between the included stocks and the excluded stocks

So far, we observed that securities are not perfect substitutes for each other, implying that the demand curve is downward sloping. In this section we focus on the direct comparison between the included stocks and the excluded stocks, by focussing on the actual price and volume levels.

The following examination in the announcement window shows us how the revision announcement affects the actual price and volume movements of the two types of revised stocks.

Table XI

**The comparison between the included stocks and the excluded stocks
in the announcement window**

The return (R) is the average return of the revised stocks and the cumulative return (CR) is the average of the aggregated return of each revised stock. The difference between the two types of the revised stocks is examined by the standard t-test. The log-transformed volume (V) for each stock is assumed one at the 10th day before the announcement. "AD" notates the date of the announcement of the revision. The graphs are available in Appendix I.

Panel A. Return performance						
Event	Inclusion (N=149)		Exclusion (N=141)		t-value	
	R	CR	R	CR	R	CR
AD-10	0.0039	0.0039	0.0034	0.0034	0.152	0.161
-9	0.0016	0.0056	0.0016	0.0050	0.005	0.107
-8	0.0032	0.0088	0.0014	0.0065	0.571	0.389
-7	0.0037	0.0125	0.0036	0.0100	0.014	0.343
-6	0.0047	0.0171	-0.0004	0.0098	1.483	0.949
-5	0.0053	0.0225	0.0004	0.0102	1.594	1.515
-4	0.0047	0.0271	-0.0003	0.0098	1.466	1.985**
-3	0.0004	0.0276	0.0008	0.0107	-0.118	1.832*
-2	0.0016	0.0292	0.0030	0.0135	-0.397	1.505
-1	0.0032	0.0324	0.0047	0.0184	-0.370	1.262
AD	0.0070	0.0394	-0.0091	0.0097	4.068***	2.505**
1	0.0017	0.0410	-0.0009	0.0085	0.624	2.554**
2	0.0035	0.0444	-0.0011	0.0075	1.047	2.774***
3	0.0027	0.0470	0.0032	0.0108	-0.150	2.695***
4	0.0011	0.0481	-0.0045	0.0061	1.469	3.012***
5	0.0006	0.0487	0.0003	0.0065	0.096	2.963***
6	0.0025	0.0512	-0.0029	0.0035	1.377	3.260***
7	0.0013	0.0524	0.0064	0.0099	-1.088	2.867***
8	-0.0011	0.0513	-0.0074	0.0026	1.530	3.287***
9	-0.0031	0.0482	-0.0060	-0.0034	0.890	3.424***
AD+10	0.0033	0.0516	-0.0037	-0.0070	1.862	3.774***

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table XI (Cont.)

**The comparison between the included stocks and the excluded stocks
in the announcement window**

Panel B. Volume performance			
Event	Inclusion (N=149)	Exclusion (N=141)	t-value
	V	V	
AD-10	1	1	
-9	0.9782	0.9907	-0.716
-8	0.9485	0.9723	-1.056
-7	0.9519	0.9456	0.267
-6	0.9633	0.9772	-0.500
-5	0.9677	0.9815	-0.446
-4	0.9575	0.9305	0.949
-3	0.9841	0.9523	0.976
-2	0.9824	0.9537	0.913
-1	1.0238	0.9554	1.941*
AD	1.0468	0.9841	1.648
1	1.0397	0.9778	1.615
2	1.0415	0.9831	1.421
3	1.0226	0.9443	1.998**
4	1.0112	0.9450	1.522
5	0.9736	0.9479	0.657
6	0.9738	0.9422	0.774
7	0.9699	0.9273	1.047
8	0.9679	0.9293	0.891
9	0.9537	0.9161	0.921
AD+10	0.9582	0.9275	0.699

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

As can be seen in Table XI (see also Appendix I), in the announcement window, the price movements indicated by the cumulative returns (CRs) have the opposite direction at the announcement date, where the price level of the included stocks goes upward and that of the excluded stocks goes downward. Since the returns are significantly different between the two types of revised stocks at the announcement date, it implies that the market responds positively to the index inclusion but negatively to the exclusion. After the announcement date, the performance gap based on the CRs continues to get larger. The interesting evidence is that the announcement has a

significant impact on these stocks because until the announcement these stocks have the almost same return performance.

On the other hand, the volume performance is quite similar for each type of revised stocks, in which the actual volume levels are large around the announcement date relative to other dates. The evidence implies that both the buying and selling pressures are responsible for the included-stock performance and the excluded-stock performance, respectively.

After the announcement date, since the volume level for the included stocks goes down while the price level goes up, it can be conjectured that investors continuously buy stocks and hold them, thereby decreasing the tradable amount. This results in the demand curve gradually shifting to the right while the supply curve shifting to the left simultaneously, lifting the price level but leaving the volume level constant.

On the contrary, both the price and volume levels continuously decline for the excluded stocks, which implies that investors consecutively sell stocks and then lose interest in them. This attitude leads to the implication that the supply curve shifts to the right due to the consecutive existence of the selling pressure and the demand curve consecutively shifts to the left, thereby decreasing both the price and volume levels after the announcement.

The following Table XII (see also Appendix J) provides how index rebalancing activities influence the price and volume performance of the two types of revised stocks.

Table XII

**The comparison between the included stocks and the excluded stocks
in the implementation window**

The return (R) is the average return of the revised stocks and the cumulative return (CR) is the average of the aggregated return of each revised stock. The difference between the two types of the revised stocks is examined by the standard t-test. The log-transformed volume (V) is assumed to be one at the 10th day before the announcement. "ID" is the date of the implementation of the revision. The graphs are available in Appendix J.

Panel A. Return performance						
Event	Inclusion (N=149)		Exclusion (N=141)		t-value	
	R	CR	R	CR	R	CR
ID-10	-0.0013	-0.0013	-0.0030	-0.0030	0.481	0.486
-9	-0.0028	-0.0041	-0.0091	-0.0121	1.697*	1.602
-8	0.0014	-0.0027	-0.0008	-0.0129	0.463	1.697*
-7	0.0022	-0.0004	0.0045	-0.0084	-0.585	1.216
-6	0.0030	0.0025	-0.0075	-0.0159	2.681***	2.416**
-5	-0.0003	0.0022	0.0017	-0.0142	-0.581	2.004
-4	0.0030	0.0052	-0.0020	-0.0162	1.678*	2.524**
-3	0.0014	0.0066	0.0013	-0.0149	0.025	2.322**
-2	0.0068	0.0134	-0.0005	-0.0154	1.858*	2.830**
-1	0.0218	0.0352	-0.0185	-0.0339	8.240***	6.103***
ID	-0.0076	0.0277	0.0106	-0.0233	-4.715***	4.446***
1	-0.0008	0.0269	0.0053	-0.0180	-1.873*	3.911***
2	-0.0037	0.0232	0.0032	-0.0148	-1.709*	3.105***
3	-0.0046	0.0186	0.0059	-0.0089	-2.886***	2.125**
4	-0.0009	0.0177	-0.0041	-0.0130	1.007	2.367**
5	0.0027	0.0204	0.0066	-0.0064	-0.975	2.007**
6	0.0010	0.0214	0.0062	-0.0002	-1.349	1.572
7	-0.0025	0.0190	0.0020	0.0017	-1.426	1.226
8	-0.0018	0.0172	0.0014	0.0032	-0.826	0.935
9	0.0022	0.0193	0.0021	0.0053	0.020	0.943
ID+10	0.0003	0.0197	0.0048	0.0101	-1.527	0.653

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table XII (Cont.)

**The comparison between the included stocks and the excluded stocks
in the implementation window**

Event	Panel B. Volume performance		t-value
	Inclusion (N=149)	Exclusion (N=141)	
	V	V	
ID-10	1	1	
-9	0.9816	0.9918	-0.522
-8	0.9825	0.9815	0.046
-7	0.9846	0.9698	0.605
-6	1.0058	1.0035	0.081
-5	0.9816	0.9713	0.388
-4	0.9828	0.9462	1.322
-3	1.0347	0.9813	1.594
-2	1.0178	0.9831	1.070
-1	1.0986	1.0691	0.823
ID	1.0075	1.0042	0.092
1	0.9696	0.9396	0.831
2	1.0101	0.9475	1.682*
3	0.9894	0.9376	1.381
4	0.9539	0.9202	0.936
5	0.9507	0.8973	1.356
6	0.9646	0.9030	1.424
7	0.9905	0.9068	2.009**
8	0.9757	0.9195	1.372
9	0.9615	0.8975	1.602
ID+10	0.9414	0.8794	1.478

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

The price performance reveals that revised stocks have an opposite performance especially one day before the actual implementation date where the price levels go clearly in the opposite directions. As for the volume performance, however, there is almost no difference in movement between the two types of revised stocks in the implementation window. On the other hand, since the volume levels of each type of revised stocks remarkably increase one day before the implementation date, the buying pressure for the included stocks and the selling pressure for the excluded stocks occur at the same time.

When focusing on the included stocks, after the actual implementation date, the price level declines but still remains high relative to the pre-inclusion level while the volume level becomes lower compared to that in the pre-inclusion level. In addition, the excluded stocks experience the price reversal. The evidence supports the suggestion discussed in the previous section that the index rebalancing activity is conducted in the implementation window.

Moreover, it is interesting to note that the degree of price improvement of the included stocks and that of the price decline of the excluded stocks are almost the same. Also there is almost no different movement for the volume levels of both types of revised stocks. That is, the impact from each of the selling pressure and the buying pressure is quite similar though the price movements are in the opposite directions, which would confirm that the index rebalancing activity occurs one day before the implementation date.

When assessing the power of each of the selling pressure and the buying pressure as the volume elasticity of price¹⁶ focusing on the term from the second day before the actual revision to the first day before the actual revision, the values are 1.413% for the buying pressure and -1.042% for the selling pressure.

¹⁶ The calculation formula is as follows: $((P_{-1} - P_{-2}) / P_{-2}) / ((V_{-1} - V_{-2}) / V_{-2})$. We used the proxy of the price level as the average cumulative returns. As for the volume changing rate, we first took the average of the log-transformed volume to reduce the difference between the median and average values, and secondly we released the logarithm and calculated the changing rate. Since when calculating the selling pressure we assumed that the demand curve is static, if there are any factors to shift the demand curve, the elasticity is not accurate. The same thing can be said to the elasticity calculation on the buying

Therefore, since the volume elasticity for the selling pressure is negative and is different from zero, the demand curve for the excluded stocks can be viewed downward sloping. Moreover, the supply curve for the included stocks is upward sloping, since the volume elasticity is non-zero and has a positive value.

The following examination in the overall window allows us to see the entire period including the both event windows and the performance after the events, and to provide information as to the extent of changes in the price and volume levels after the events.

Table XIII

**The comparison between the included stocks and the excluded stocks
in the overall window**

The return (R) is the average return of the revised stocks and the cumulative return (CR) is the average of the aggregated return of each revised stock. The difference between the two types of revised stocks is examined by the standard t-test. The volume (V) for each stock is assumed one at the 10th day before the announcement. “AD” and “ID” indicate the announcement date and the implementation date of the revision, respectively. The graphs are available in Appendix K.

Panel A. Return performance			
Event	Inclusion (N=149)	Exclusion (N=141)	t-value
	CR	CR	CR
AD-10	0.0039	0.0034	0.1611
AD-1	0.0324	0.0184	1.2624
AD	0.0394	0.0095	2.5051**
AD+1	0.0410	0.0085	2.5536**
AD+10	0.0516	-0.0071	3.7738***
Interval	0.0648	0.0111	2.6046***
ID-10	0.0610	-0.0117	4.1699***
ID-1	0.0975	-0.0426	6.7045***
ID	0.0900	-0.0319	5.8668***
ID+1	0.0892	-0.0267	5.6237***
ID+10	0.0820	0.0014	3.4671***
ID+30	0.0697	-0.0068	2.7683***
ID+60	0.0864	0.0072	2.3588**

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

pressure. If the volume elasticity is zero, which also means that the price elasticity is infinite, then the demand curve is flat.

Table XIII (Cont.)

**The comparison between the included stocks and the excluded stocks
in the overall window**

Panel B. Volume performance			
Event	Inclusion (N=149)	Exclusion (N=141)	t-value
	V	V	
AD-10	1	1	
AD-1	1.0238	0.9554	1.941*
AD	1.0468	0.9841	1.648
AD+1	1.0397	0.9778	1.615
AD+10	0.9582	0.9275	0.699
Interval	0.9586	0.9257	0.758
ID-10	0.9667	0.9385	0.627
ID-1	1.0299	0.9888	0.766
ID	0.9505	0.9249	0.496
ID+1	0.9153	0.8784	0.692
ID+10	0.8750	0.8270	0.926
ID+30	0.8239	0.7357	1.512
ID+60	0.7434	0.6535	1.454

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

The interesting evidence on Table XIII (see also Appendix K) is that until the 10th date after the implementation date from the announcement date the price movements for both types of revised stocks have opposite directions. In addition, after the announcement date, the difference between the two types of stocks increases until the implementation date.

After the actual revision, there is a consecutive decline of the volume levels for both types of the stocks, which implies that the trading activities settle after the revision. Although the above volume movement does not consider any possible changes in number of outstanding shares, it supports the suggestion, as discussed earlier, that since the investors lose interest after the revision, both the supply and demand curves shift to the left, decreasing the volume but keeping the price level constant. Moreover, the excluded stocks recover the price level around the 10th day after the actual exclusion. But as seen

in the previous sections, this evidence does not imply that the demand curve resumes its elasticity, because their performance is still different from those of the benchmark stocks. Thus, since the evidence supports that the excluded stocks and the benchmark stocks are not substitutes for each other, the demand curve still remains downward sloping.

One of the implications of this evidence is that if investors bought the included stocks at the announcement date and sold them at the actual inclusion date, they would have been able to gain an average of around 7% return from the trading, although not considering trading costs.

The following examination further reveals the difference between the two types of the revised stocks from the long-run perspective to provide implications about the long-run demand and supply curve movements and the trading strategy.

Figure IV

**The direct relation between the price and volume performances
for the included stocks**

The sample size is 143 included stocks, though from the 23rd month after the revision month it is 134 due to the lack of data from January 2002. Both the price and volume levels are assumed to be one at the 25th month before the revision month. The left and right vertical axes are the price level and the volume level, respectively. The horizontal axis notates the event month, where zero is the revision month. ADD(R) and ADD(V) are the buy-and-hold return measure (price) and the volume measure for the included stocks, respectively. The actual numbers are available in Appendix L.

Focusing on the volume movement for the included stocks in Figure IV, as the price level goes up, the volume level also grows except for the (-10, -6) window where the volume level is decreasing a little. As discussed earlier, the evidence supports the suggestion that the demand curve shifts to the right while the supply curve shifts to the left, because the tradable amount decreases. Moreover, since the price and volume levels are boosted in the (-2, -1) window, it can be said that the buying pressure dominates the trading of the included stocks.

Moreover, although after the actual inclusion the price and volume movements seemed to settle, the movements can be said to occur along with each other. It implies that the demand curve is not flat.

Figure V

**The direct relation between the price and volume performances
for the excluded stocks**

The sample size is 139 excluded stocks, though from the 23rd month after the revision month it is 129 due to the lack of data from January 2002. Both the price and volume are assumed to be one at the 25th month before the revision month. The left and right vertical axes are the price level and the volume level, respectively. The horizontal axis notates the event month, where zero is the revision month. DEL(R) and DEL(V) are the buy-and-hold return measure (price) and the volume measure for the excluded stocks, respectively. The actual numbers are available in Appendix L.

As can be seen in Figure V, since both the price and volume levels are declining, until the 5th month before the exclusion the demand curve seems to be continuously shifting to the left. But the opposite movements of the price and volume movements in the (-5, -1) window indicate that the selling pressure dominates especially in the (-2, -1) window and shifts the supply curve to the right along with the downward sloping demand curve¹⁷.

¹⁷ The power of each of the buying pressure and the selling pressure can be calculated in the same manner as done in the previous part. When calculating the buying (selling) pressure the supply (demand) curve is assumed to be static. Although it is difficult to say one of the curves is static in the long run basis, the values would be 0.147% (the price elasticity of excess demand is 6.803 (0.147^{-1})) for the buying pressure and -0.038% (the price elasticity of supply is 26.316 (0.038^{-1})) for the selling pressure when focusing on the (-2, -1) window, which is assumed to be dominated by the selling and buying pressures. Since the price

After the actual revision, as the selling pressure disappears the price level is increased, which implies that the supply curve, which has shifted to the right because of the selling pressure, goes back to the pre-revision spot after 2 months. After the effect of the selling pressure disappears, the movements of both the price and volume seem to be in concert with each other, which implies that the demand curve is not flat even in the long run.

Figure VI

The difference in price performance between the two types of revised stocks

The sample size is 144 included stocks and 140 excluded stocks, though from the 23rd month after the revision month it is 135 and 130 respectively due to the lack of data from January 2002. The price is measured as the buy-and-hold return for each two type of the revised stocks. The difference between the performances of the different types of the revised stocks is calculated by the buy-and-hold return for the included stocks less that for the excluded stocks.

As can be seen on Figure VI, one year before the actual revision through the actual revision, the price level for the included stocks almost doubles. As for the comparison between the included stocks and the excluded stocks, the dispatch between

elasticity of each of supply and demand is not infinite, it can be said that the supply curve and the demand

them stays constant after the revision, which implies that there is no significant room to exploit the index revision after the actual implementation.

curve are upward sloping and downward sloping, respectively, even in the long run.

CHAPTER VII. Summary and conclusion

The main intent of this thesis was to investigate the short-term and long-term price and volume consequences of index inclusion and exclusion in the TSE 300. The results indicate that, in the short run, the index rebalancing activity occurs in the implementation window while the speculative investment dominates in the announcement window, in which the market has reacted positively to the inclusion but negatively to the exclusion.

In the implementation window, the evidence for the included stocks indicates that, one day prior to the actual inclusion date, both the price and volume levels are increased, implying that the demand curve shifts to the right due to the significant buying pressure. After the actual inclusion date the price level decreases but remains at a higher level than the pre-implementation level, indicating that the downward sloping demand curve reverts to the original level as the buying pressure disappears, and that the upward sloping supply curve shifts to the left because available tradable amounts are reduced by index portfolio investors who hold the stocks in their portfolios. On the other hand, the excluded stocks experience the significant price decrease and volume increase one day before the actual exclusion, but after the actual exclusion the price and volume levels revert to the pre-exclusion level. It indicates that the supply curve shifts to the right due to the significant selling pressure and reverts to the pre-exclusion spot as the selling pressure disappears. These price and volume movements are consistent with what the index rebalancing activity would expect.

This conclusion is also supported by the evidence that, one day prior to the implementation date, the extents of the selling and buying pressures are quite consistent; the volume movements are almost identical and the price movements of both types of stocks are symmetrically opposite.

Therefore, from the perspective of the short-run performance, the demand curve for the stocks is downward sloping, which is consistent with ISH. In addition, the results are robust with respect to the choice of benchmarks.

From the long-run perspective, the evidence also supports the suggestion that the long-run demand curve is downward sloping. More specifically, since in the exclusion case the price level decreases while the volume level increases before the actual exclusion, the long-run demand curve can be said to be downward sloping. Also the price movement of the included stocks is in concert with the volume movements, which supports the conclusion that the downward sloping demand curve shifts along with the upward sloping supply curve.

Another interesting observation is that since the price movements end by the time of the actual revision, there is no opportunity to exploit the revision through investment in the revised stocks after the actual revision.

In conclusion, this research suggests that the demand curve is downward sloping even in the long run, and the evidence is robust with respect to the choice of benchmarks. The evidence also shows that there is no opportunity to exploit the index revision after the actual revision.

CHAPTER VIII. Benefits, Limitations, and suggestions for further research

VIII-1. Benefits

This thesis has implications for both the researchers and market participants.

For researchers, this study helps in understanding the stock performance from both the short-term and long-term perspectives. By focusing on the movements of the supply curve as well as the demand curve from the short-run perspective, this thesis reveals that the price reversal depends on the consecutive movements of the demand curve and the supply curve. More specifically, the results show that, in the case of the index rebalancing activity for the included stocks, the downward sloping demand curve shifts to the right by the buying pressure but the curve shifts back to the original spot as the buying pressure disappears. Moreover, the supply curve shifts to the left because of a decrease in the tradable shares.

On the other hand, as for the index rebalancing activity for the excluded stocks, the supply curve due to the selling pressure shifts to the right and this movement is responsible for the price and volume performances of the excluded stocks. But as the selling pressure disappears, the supply curve shifts back to the original spot.

The examination from the long-run perspective shows that the demand curve is downward sloping even in the long run. This evidence supports the notion that the price

reversal observed in the examination from the short-run perspective does not depend on the elasticity resumption of the short-run demand curve. Moreover, these results are supported by the price elasticity analysis to understand the shape of the demand and supply curves for the revised stocks.

Finally, this study has some unique features in the research methodology. First of all, the weight matching stocks in the same industry as the tested stocks were considered the benchmark, because the substitute relation among stocks is one of the critical discussions in this area; this benchmark has not been examined in past research. Secondly, since the auto-correlated movements of the daily stock returns could critically affect the reliability of the statistical significance test, this thesis adjusted the first-order auto-correlation by using the method introduced by Heinkel and Kraus (1988). Finally, the adjustment of the non-normality of the return and volume measures, especially skewness, ensured the statistical reliability of the significance level in this thesis.

This thesis also provides some implications to market participants. Based on the examination from the short-run perspective, this study reveals that the index rebalancing activity has been conducted mostly one day before the actual revision date while around the announcement date the speculative investment has dominated. Since the price level for the included (excluded) stocks at the announcement is on average lower (higher) than that at the implementation date, the announcement would have been critical information for future stock performance.

The most interesting implication from the long-run perspective is that the price adjustment for the revision event started around one year before the actual revision and finished by the revision month, and after the event the stock performance has been stabilized. This result would significantly contribute to portfolio management strategy.

VIII-2. Limitations

There are some limitations in this research. First of all, no examination was conducted against the direct evidence on the trading activity of the index portfolio investors. Thus, the conclusion of this thesis can be considered indirect at best.

Secondly, the announcement date was based on the press release in the major newspapers. Thus, if the publicity of the revision information occurred before the press release, the results in the announcement window would be insignificant.

Thirdly, since the actual supply and demand curves are not (cannot be) directly observed, the conclusions in this research was based on the implications that relied on the price and volume performance and estimation of price elasticity, but not through the direct observation of the supply and demand curves.

Finally, this study does not consider the transaction costs in the empirical analysis. Some past studies such as Edmister, Graham, and Pirie (1996) incorporate the costs into their analyses and most of them do not observe the abnormal returns. Therefore, it would

be possible that the transaction costs play a significant role in this research.

VIII-3. Suggestions for future research

The limitations discussed in the previous section would lead to future research. First of all, given that the trading activity of the portfolio managers, although Pruitt and Wei (1989) conducted, it would provide more reliability with the interpretation of the empirical analysis.

Secondly, since this research does not intend to directly reveal the shape of the actual supply and demand curves, it relies on the implications obtained from the empirical observations. Thus, it would be interesting to examine the cost function and the utility function in order to directly observe the supply and demand curves.

Finally, as discussed in the previous section, the trading costs need to be taken into consideration in order to obtain the more practical implications to the market participants.

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Appendix A: Review of the past literature

Author (s)	Index, period, etc	Methodologies	Key results
Van Horne (1970)	NYSE & AMEX 1960-1967 80 listings for NYSE 60 listings for AMEX	The author examined the changes in price of both the listed stocks and the industry average that a listed stock belongs to. The change rates were calculated among four and two months prior to listing registration, the registration date, the listing date, and two and four months after the listing. The announcement occurred in the term between the two month prior to the registration and the registration date. He examined the abnormal changes using the standard t-test. To take transaction costs into consideration, he used the ask price as the stock price, and when investors were considered to be engaged in selling he used the bid price as the stock price.	When considering the transaction costs, the price difference between the listed stocks and industry averages is not significantly different. Thus, the author concluded that a listing is not valuable event and there is no significant opportunity to exploit the event.
Furst (1970)	NYSE 1960-1965 198 listings	The author used the market model where the price is a function of the income stream (dividend and its growth rate), the earnings stability index (the variance of the difference between the actual and the expected earnings per share calculated by the present earnings per share multiplied by the growth rate), the leverage (a ratio considered the long-term debt, preferred stocks, and corporate bond rate), and the corporate size (total assets minus current liabilities). To examine the listing effect, a dummy variable (after the listing one assigned) was added to the model and also the model was applied to the sample divided into each industry. In addition, the pre and post listing samples were examined by using the model.	The listing dummy variable was not significant while the income stream and the corporate size were significant. The same results were emerged in the examination about the pre and post listing sample. When using industry samples, the listing variable is not significant for seven out of the eight industry sample. Therefore, the author concluded that listing does not significantly affect the market prices of common stocks.

Appendix A (Cont.)

Author (s)	Index, period, etc	Methodologies	Key results
Ying, Lewellen, Schlarbaum, & Lease (1977)	NYSE or AMEX 1966-1968 248 listings	The market model adjusted by the Fama-MacBeth method was used to calculate the abnormal (monthly) returns. Their investigation window consisted of 24 months prior to the actual listing through the 24 months after the actual listing.	Since the one month before the actual listing and the actual listing month experienced significant positive abnormal returns, the authors concluded that it is not unreasonable to consider the listing as the valuable event. Also their evidence indicated the existence of the information response time lag, which is inconsistent with the market efficiency.
Sanger & McConne II (1986)	NYSE 1966-1977 319 listings	The market model was adopted to calculate the abnormal returns and the cumulative abnormal returns. To see the difference between the pre and post introduction of the NASDAQ communication system, the cumulative abnormal returns in the two periods was compared, and the market model was adjusted by using dummy variables to examine the coefficient change between the pre and post NASDAQ.	In the pre NASDAQ period the positive reaction was observed to the listing announcement, while the insignificant reaction existed after the NASDAQ introduction. Also the adjusted market model revealed that the market response to the listing announcement significantly different between the pre and post NASDAQ periods. Therefore, they concluded that the introduction of the NASDAQ communication system reduced the liquidity effects shown in the pre NASDAQ period.
Sanger & Peterson (1990)	NYSE or AMEX 1963-1985 520 delistings	The market model was used to calculate the abnormal returns by comparing the market adjusted returns. To examine the liquidity hypothesis, they regressed the announcement day-abnormal return on the liquidity variables such as changes in the bid-ask spread and the trading volume.	Since the negative abnormal return at the announcement date can be explained by the changes in liquidity, where the greater reduction of liquidity the larger decline of the value, the authors supported the liquidity hypothesis.

Appendix A (Cont.)

Author (s)	Index, period, etc	Methodologies	Key results
Shleifer (1986)	S&P500 1966-1983 246 additions	Average cumulative abnormal return based on prediction error of the market model were examined around the announcement day, which is the publishing day of monthly Cumulative Index to Standard and Poor's Outlook before 1976 and after 1977 the effective day of the actual inclusion. Moreover, abnormal volume, announcement date volume, and usual volume (1) were calculated and regressed on abnormal returns of the announcement day in order to examine the shape of the demand curve.	The evidence showed that cumulative abnormal return persisted for at least 10 to 20 trading days after the announcement day. The abnormal return could be significantly explained by the abnormal volume and the announcement volume positively but by the usual volume negatively. Therefore, he concluded that the demand curve is downward sloping.
Harris & Gurel (1986)	S&P500 1973-1983 228 additions and deletions	Market model adjusted abnormal return and market adjusted volume (2) were calculated and examined around the effective day, which is the day after the announcement of changes. Computing mean cumulative excess returns and market adjusted volume around the effective day, whether price reversal existed were examined.	The evidence showed that there was a large increase in volume and increase in price at the effective day, which suggested a shift of demand curve. Since the price and volume effects were small in the 1973-1978 period, in which index funds were small, these effects in 1979-1983 period were said to be brought by the increased institutional influence.
Pruitt & Wei (1989)	S&P500 1973-1986 250 additions	They calculated the change of institutional holdings by subtracting a percentage of institutional share holdings before addition from a percentage after addition, and examined the difference between the change and that of control portfolio, which consisted of randomly selected 5 firms from Dow Jones 30 firms. The difference also was regressed into abnormal return.	The difference of institutional holdings between the added stocks and control portfolio was significant. They found a significantly positive relation between the difference and abnormal return. Thus, they concluded that institutional holdings are responsible for abnormal return.

Appendix A (Cont.)

Author (s)	Index, period, etc	Methodologies	Key results
Jain (1987)	S&P500 1977-1983 87 additions 22 deletions	The abnormal returns based on the market model prediction errors were calculated on added stocks both in S&P500 index and those in supplementary indexes (control group) that are not traded by index fund managers.	Since abnormal returns were observed on added stock in S&P500 index and also on those in control group, he concluded that the price pressure, in which index fund managers are assumed to shift the demand curve, is not supported. That is, index inclusion in S&P500 is valuable information in the market.
Dhillon & Johnson (1991)	S&P500 1978-1988 187 additions	Splitting sample into 1978-1983 period and 1984-1988 period, market model adjusted abnormal returns were calculated and examined around the announcement day. To examine price reversal, the posterior odds ratios (3) were used. In addition, mean returns of options were calculated around S&P500 inclusions.	In the 1984-1988 period, cumulative abnormal returns for added stocks did not return to their pre-announcement level, in contrast to the 1978-1983 period. Moreover, since call prices increase and put prices declined, the evidence supports the information hypothesis, not the price pressure hypothesis.
Lynch & Mendenhall (1997)	S&P500 1990-1995 71 additions 71 deletions	Setting two event dates: the announcement day and implementations day, market adjusted abnormal returns and market adjusted abnormal volume (4) were calculated and examined.	The evidence showed significantly positive (negative) post announcement abnormal returns that were only partially reversed to the pre-announcement level. These results support the price pressure hypothesis.

Appendix A (Cont.)

Author (s)	Index, period, etc	Methodologies	Key results
Beneish & Gardner (1995)	Dow Jones Industrial Average (DJIA) 1929-1988 37 additions 31 deletions	Market adjusted abnormal return and market adjusted volume (4) were examined around the day when the change was reported in the Wall Street Journal. To examine competing hypotheses, a cross-sectional model was established such that the abnormal returns on days -1 to +1 were regressed from proxies for information signalling (future growth of market value), imperfect substitute (trading volume on days -1 to +1), and liquidity (bid-ask spread) and information availability whose proxy was the difference in the number of performance announced in year +1 versus year -1 relative to the year of DJIA change.	The evidence showed a significant wealth loss to shareholders of deleted firms and the return performance of added firms was not affected by index portfolio re-balancing. In addition, the results of the cross-sectional regression showed that trading costs and information availability could explain the abnormal return. Therefore, the price pressure and imperfect substitute's hypotheses are not supported.
Elliott & Warr (2001)	S&P500 1983-2000 490 additions	The market model adjusted abnormal returns were calculated about stocks included in the S&P500 index from NASDAQ and NYSE respectively. The abnormal returns were regressed from abnormal volume (2), listing exchange dummy variable (when an added stock was listed in NYSE before inclusion, it takes 1, otherwise 0.), time dummy variable (when additions occurred after September 1989, in which S&P started pre-announcing additions, it takes 1, otherwise 0.), and some firm specific variables.	The evidence showed positive abnormal returns that were bigger for NASDAQ stocks than for NYSE stocks. From the regression, since the listing exchange dummy was significant while other variables including abnormal volume were not significant, the exchange is a significant determinant of the abnormal returns. From the above, NYSE tends to more absorb demand shock caused by index inclusion than NASDAQ.

Appendix A (Cont.)

Author (s)	Index, period, etc	Methodologies	Key results
Edmister, Graham & Pirie (1996)	S&P500 1983-1989 168 additions and deletions	Since there might be a selection bias in the S&P selection criteria, they examined cumulative abnormal returns (calculated by adding market model error terms) using two types of market model parameters obtained from post-announcement and pre-announcement estimation periods. To examine their hypothesis that the expected trading cost has a major role to the abnormal return, the abnormal returns were regressed from variables such as bid-ask spread, trading volume, and open interest in the index futures contracts.	Results did not support price reversal story but indicated that a selection bias caused serious effect to examination of the price pressure hypothesis. In addition, since the three parameters of variables were significantly positive, they concluded that an expected reduction of future transaction cost provides a reasonable explanation about abnormal returns of replaced stocks.
Chung & Kryzanowski (1998)	TSE 300 112 additions (82 annual revisions) 72 deletions (49 annual revisions) 1990-1994	The authors set the investigation window as (AD, AD+1), (AD+2, ED-1), (ED, ED+1), and (ED+2, ED+60), where AD is the announcement date and ED is the effective date. The single and multi-factor models, which included variables such as liquidity change and Jensen performance measure to erase the effects of the revision criteria shown in the case of S&P500 index revision, were used to calculate the abnormal returns.	Since the abnormal returns for inclusions (deletions) at the announcement date were significantly positive (negative) but later reversed to the post announcement levels, they concluded that their evidence supported the price pressure hypothesis. Also they indicated that index fund investors generally revised index portfolio on the date other than the effective date.

Appendix A (Cont.)

Author (s)	Index, period, etc	Methodologies	Key results
Kaul, Mehrotra & Morck (2000)	TSE 300 31 weight changed stocks on November 1996	The difference in weekly returns between the weight affected stocks (the tested group) and the unaffected stocks (the comparison group) that were in TSE 300 was calculated as the excess returns. To detect the index rebalancing activity, they used the ratio of weekly trading volume to the number of shares outstanding (turnover), and the difference between the tested group and the comparison group was examined. Also they conducted the cross-sectional regression to examine the price reversal seeing whether the abnormal returns explain the cumulative abnormal returns.	The authors first examined the announcement date of the weight change but there was no significant abnormal return or volume, which indicated that the information hypothesis was rejected. Since the turnover is significantly different between the two groups in week -1 through week +1 (week 0 is the week of weight change), they indicated that fund managers adjusted their index portfolios through those three weeks. Also the regression between the CARs and ARs conducted in the (+1, +15) window supports the partial reversal, so that they concluded that the demand curve is downward sloping.
Morck & Yang (2002)	S&P500 1978-1997	They examined Tobin's q ratios between index listed companies and similar ones. They regressed the actual returns of each stock on the replacement cost of its tangible assets, research and development spending, advertising spending, and value of leverage. Since the authors thought the residuals can be a value explained by membership, they set dummy variables counted by 1 when a stock is in index, otherwise 0. Moreover, a weight variable, which measures the weight of a stock in index, was included in the regression equation. Before running the regression, they constructed three types of sample, which consists of index firms and similar non index included firms selected by size and/or industry.	Their evidence showed that the average q ratios of S&P500 companies were larger than those of other similar companies, and thus, they concluded that the membership in the index itself is valuable in the stock market. The results also showed that the coefficients of the index dummy and weight were significantly different from zero. Thus, the results were interpreted that there is an additional shareholder value associated with index membership and weight. Moreover, the results implied that the demand curve is downward sloping in the long run.

Appendix A (Cont.)

Note:

(1) Announcement volume: trading volume at the announcement day divided by the number of shares outstanding.

Usual volume: the average daily volume in the previous six months divided by the number of shares outstanding.

Abnormal volume: calculated by the announcement date volume minus usual volume

(2) Market adjusted volume (ratio) is calculated as follows (Harris and Gurel (1986)).

$$MVR_t = \frac{1}{N} \sum_{i=1}^N VR_{it}$$

$$\text{where } VR_{it} = \frac{V_{it}}{V_{mt}} * \frac{V_m}{V_i},$$

where V_{it} is defined as the trading volume of security i at time t , and V_{mt} is denoted by trading volume of the total NYSE at time t . Also V_i and V_m are defined as the trading volumes respectively of the security and of the total NYSE in the 8 weeks prior to the announcement week.

(3) The posterior odds ratio is the ratio of the sample likelihood of the data under the “no reversal” hypothesis to that under the “full reversal” hypothesis.

(4) The measure of the volume: $vi(t) = \ln(1 + Vi(t)) / \ln(1 + Ei(t))$ (Lynch and Mendenhall (1997))

where $Vi(t)$ is dollar volume of stock i at day t , and $Ei(t)$ is dollar value of outstanding share of stock i at day t .

Since $vi(t)$ can be regressed as;

$$vi(t) = ai + bi vm(t) + ei(t), \text{ where } vm(t) = \ln(1 + Vm(t)) / \ln(1 + Em(t))$$

then the abnormal volume can be expressed by the error term as follows:

$$AVi(t) = vi(t) - (ai + bi vm(t))$$

Appendix B: The calculation of the TSE 300

(Quoted from Toronto Stock Exchange Monthly Review, January 1999)

The index is calculated as follows.

$$\frac{\text{Aggregate Float QMV}}{\text{Divisor}} \times 1,000 = \text{TSE 300 Index}$$

Definition:

“Aggregate Float QMV” = The sum of the float quoted market value of the 300 issues which comprise the index. The float QMV is calculated as follows.

$$(\text{Outstanding Shares} - \text{Control Block}) \times \text{Price}$$

“Outstanding Shares” = Number of shares each company has issued and outstanding. This information is obtained from the TSE’s Listing Department and the individual companies.

“Control Block” = Any individual or group of related individuals who control 20 % of more of the outstanding shares. This information is obtained from each company’s information circular, contact with the company, or from insider reports from the Ontario Securities Commission.

“Price” = The last trade price for a board lot of shares. This information is obtained directly from the on-line trading system.

“Divisor” = The trade-weighted average quoted market value for all original Index stocks for the year 1975. Whenever a change to the Index occurs (i.e., additions, deletions, changes in share capital), the divisor is adjusted in order to ensure that the Index level remains unaltered following the changes.

“1000” = This multiplier is always 1000. It was put in place so the start-up of the Index level would be approximately 1000 in 1975.

Appendix C: TSE 300 Annual Revisions

TSE 300 Annual Revisions (Inclusions)

1991

Tick	Name	Index code	Index name	Weight
BGO	Bema Gold	2.1	Gold & Silver Mines	0.04
CHV	Chauvco Resources	3.2	Oil & Gas Producers	0.06
CIR	Cimarron Petroleum	3.2	Oil & Gas Producers	0.06
CBE	Cabre Exploration	3.2	Oil & Gas Producers	0.06
RRL	Ranchmen's Resources	3.2	Oil & Gas Producers	0.03
PNN	Pinnacle Resources	3.2	Oil & Gas Producers	0.02
CRW	Cinram Ltd.	5.5	Household Goods	0.03
AAZ	Archer Communications	6.5	Electrical/Electronic	0.05
IIT.A	Intera Information	6.9	Business Services	0.04
COR	Corel Systems	6.9	Business Services	0.07
CSN	Cognos Inc.	6.9	Business Services	0.06
ITW	IntraWest Development	7.1	Developments & Contractors	0.08
RPC	Revenue Properties	7.2	Property Managers	0.03
MPI	Markborough Properties	7.2	Property Managers	0.05
TMP	Transmountain Pipelines	9.1	Oil Pipelines	0.02
RCL.A	Rogers Communication CL.A	11.2	Cable & Entertainment	0.03
BCH	IAF Biochem	12.6	Lodging, Food & Health	0.07
CNN.UN	Canada Trust Inc. Inv.	13.3	Investment Co's & Funds	0.02

1992

Tick	Name	Index code	Index name	Weight
CCO	Cameco Corp.	1.4	Non-Base Metal Mining	0.13
GLG	Glamis Gold Ltd.	2.1	Gold & Silver Mines	0.04
PCA	Petro-Canada	3.1	Integrated Oils	0.23
HOC	Home Oil Company Ltd.	3.2	Oil & Gas Producers	0.12
IRP	International Petroleum Corp.	3.2	Oil & Gas Producers	0.08
POU	Paramount Resources Ltd.	3.2	Oil & Gas Producers	0.02
SFF	Slocan Forest Products Ltd.	4.1	Paper & Forest Producers	0.05
IPR	Inter-City Products Corp.	5.5	Household Goods	0.05
PDI	Premdor Inc.	5.5	Household Goods	0.05
LNR	Linamar Machine Ltd.	5.6	Autos & Parts	0.04
BRA	Biomira Inc.	5.8	Biotechnology & Pharmaceuticals	0.11
MXX	International Murex Technologies Corp.	5.8	Biotechnology & Pharmaceuticals	0.07
BRK	Bracknell Corporation	6.2	Fabricating and Engineering	0.04
DR.A	DMR Group Inc. CL.A	6.5	Technology	0.03
GAC	Geac Computer Corp. Ltd.	6.5	Technology	0.03
SSK	Softkey Software Products Inc.	6.5	Technology	0.05

Appendix C (Cont.)

NWC	North West Company Inc.	12.5	Specialty Stores	0.06
FHV.A	Fahnestock Viner Holdings Inc.	13.3	Investment Co's & Funds	0.05
MWI	Midland Walwyn Inc.	13.3	Investment Co's & Funds	0.08

1993

Tick	Name	Index code	Index name	Weight
ARX	Arimetco International Inc.	1.2	Metal Mines	0.03
ACM.A	Astral Communications Inc. C.I.A	11.2	Cable & Entertainment	0.06
CGS.S	Canwest Global Communications Corp.	11.1	Broadcasting	0.04
CC	Chai-Na-Ta Ginseng Products Ltd.	5.1	Food Processing	0.05
COE	Co-Enerco Resources Ltd.	3.2	Oil & Gas Producers	0.1
DSW	Discovery West Corp.	3.2	Oil & Gas Producers	0.05
GRT.B	G.T.C. Transcontinental Group Ltd. C.I.B	11.3	Publishing & Printing	0.03
GSC	Golden Star Resources Ltd.	2.1	Gold & Silver Mines	0.08
HRT	Hillcrest Resources Ltd.	3.2	Oil & Gas Producers	0.05
ISO	I.S.G. Technologies Inc.	6.5	Technology	0.12
ISM	ISM Information Systems Management Corp. C.I.A	6.9	Business Services	0.05
KCN	International Colin Energy Corp.	3.2	Oil & Gas Producers	0.09
ISE.B	International Semi-Tech Microelectronics Inc. C.I.B	12.5	Specialty Stores	0.06
IVI	International Varifact Inc.	6.5	Technology	0.04
IES	Inverness Petroleum Ltd.	3.2	Oil & Gas Producers	0.11
OCE.B	Ocelot Energy Inc. C.I.B	3.2	Oil & Gas Producers	0.07
SCD.A	Schneider Corporation C.I.A	5.1	Food Processing	0.03
TLR.A	Tri Link Resources Ltd. C.I.A	3.2	Oil & Gas Producers	0.09
TN	Tarragon Oil and Gas Ltd.	3.2	Oil & Gas Producers	0.08

1994

Tick	Name	Index code	Index name	Weight
BPL	Barrington Petroleum Ltd.	3.2	Oil & Gas Producers	0.05
BCD	Bramalea Ltd.	7.3	Real Estate	0.12
CMS	C-MAC Industries	6.5	Technology	0.05
CRZ	CS Resources Ltd.	3.2	Oil & Gas Producers	0.04
CCH	Campbell Resources Inc.	2.3	Gold & Silver	0.03
CGO	Cogeco Inc.	11.1	Broadcasting	0.07
CYN	Consolidated Ramrod Gold Corp.	2.3	Gold & Silver	0.06
CGT	Consumers' Gas Company (The)	10.4	Gas/Electrical Utilities	0.07
CZR	Czar Resources Ltd.	3.2	Oil & Gas Producers	0.04
ESV	Ensenv Corp.	6.2	Fabricating & Engineering	0.05
EEI	Excel Energy Inc.	3.2	Oil & Gas Producers	0.05

Appendix C (Cont.)

ITY	Intensity Resources Ltd. C.I.A	3.2	Oil & Gas Producers	0.04
JDN.A	Jordan Petroleum Ltd. C.I.A	3.2	Oil & Gas Producers	0.06
K	Kinross Gold Corp.	2.3	Gold & Silver	0.11
MOG	Mannville Oil & Gas Ltd.	3.2	Oil & Gas Producers	0.06
MNI	Meridian Technologies Inc.	6.2	Fabricating & Engineering	0.06
PD.A	Precision Drilling Corp. C.I.A	6.2	Fabricating & Engineering	0.04
RAX	Rio Alto Exploration Ltd.	3.2	Oil & Gas Producers	0.1
RFP	Riverside Forest Products	4.1	Paper & Forest Products	0.05
SRX	SR Telecom Inc.	6.5	Technology	0.08
SUI	Summit Resources Ltd.	3.2	Oil & Gas Producers	0.05
TWE	Transwest Energy Inc.	3.2	Oil & Gas Producers	0.04
TMF	Trimark Financial Corp.	13.3	Investment Co's & Funds	0.07

1995

Tick	Name	Index code	Index name	Weight
ALP	Alliance Forest Products Inc.	4.1	Paper & Forest Products	0.15
ARC	Archer Resources Ltd.	3.2	Oil & Gas Products	0.07
BAU	Beau Canada Exploration Ltd.	3.2	Oil & Gas Products	0.05
CFC	Canadian Fracmaster Ltd.	3.3	Oil & Gas Products	0.04
CFI	Crestbrook Forest Industries Ltd.	4.1	Paper & Forest Products	0.07
DYF	DY4 Systems Inc.	6.5	Technology-Hardware	0.05
ENL	Encal Energy Ltd.	3.2	Oil & Gas Products	0.09
FL	Falconbridge Limited	1.1	Integrated Mines	0.38
G.A	Goldcorp Inc. C.I.A SV	2.3	Gold & Precious Minerals	0.07
GRT.A	G.T.C. Transcontinental Group Ltd. C.I.A	11.3	Publishing & Printing	0.05
GZM.UN	Gaz Metropolitain & Co. Limited Partnership Units	10.4	Gas/Electrical Utilities	0.09
IMZ	International Musto Exploration Ltd.	1.2	Mining	0.07
MAE	Miramar Mining Corp.	2.3	Gold & Precious Minerals	0.10
MTI	Malette Inc. SV	4.1	Paper & Forest Products	0.07
NRK	Northrock Resources Ltd.	3.2	Oil & Gas Products	0.05
PFF	Pacific Forest Products Ltd.	4.1	Paper & Forest Products	0.05
PLD	Petersburg Long Distance Inc.	10.3	Telephone Utilities	0.08
PNT	Petromet Resources Ltd.	3.2	Oil & Gas Products	0.05
PWA	PWA Corporation	8.1	Transport & Environment Services	0.07
PWT	Penn West Petroleum Ltd.	3.2	Oil & Gas Products	0.05
SO	Stone-Consolidated Corp.	4.1	Paper & Forest Products	0.11
TFL	Timberwest Forest Ltd.	4.1	Paper & Forest Products	0.08
UWB	United Westbume Inc.	12.1	Wholesale Distributors	0.09

Appendix C (Cont.)

1996

Tick	Name	Index code	Index name	Weight
ATP	AT Plastics Inc.	6.7	Chemicals & Fertilizers	0.05
ATY	ATI Technologies Incorporated	6.5	Technology - Hardware	0.05
BLD	Ballard Power Systems Inc.	6.11	Autos & Parts	0.09
BRA	Biomira Inc.	5.8	Biotechnology/Pharmaceuticals	0.08
CCH	Campbell Resources Inc.	2.3	Gold & Precious Minerals	0.06
CN	Call-Net Enterprises Inc.	10.3	Telephone Utilities	0.07
EIC	Eicon Technology Corporation	6.5	Technology - Hardware	0.04
GBM	Gibraltar Mines Limited	1.2	Mining	0.05
HPC	Hyal Pharmaceutical Corporation	5.8	Biotechnology/Pharmaceuticals	0.07
HRC	Hamac Pacific Inc.	4.1	Paper & Forest Products	0.05
MIP	Merfin Hygienic Products Ltd.	5.5	Household Goods	0.05
MLS	Milltronics Limited	6.2	Fabricating & Engineering	0.07
NET.A	Cleartnet Communications Inc. Cl. A NV	10.3	Telephone Utilities	0.05
PHX	Phoenix International Life Insurance Inc.	5.8	Biotechnology/Pharmaceuticals	0.07
SPL	Scott Paper Ltd.	5.5	Household Goods	0.06
SSI	Slater Industries Inc.	6.1	Steel	0.05
WMI	Westmin Resources Ltd.	1.2	Mining	0.15
WS	Western Star Truck Holdings Ltd.	6.4	Transportation Equipment	0.06

1997

Tick	Name	Index code	Index name	Weight
AGF.B	AGF Management Ltd. Cl. B NV	13.3	Investment Companies & Funds	0.11
AGR	Agra Industries Ltd.	6.2	Fabricating & Engineering	0.07
AC.A	Air Canada Cl. A NV	8.1	Transport & Environment Services	0.05
ALG	Algoma Steel Inc.	6.1	Steel	0.06
AXB	Allelix Biopharmaceuticals Inc.	5.8	Biotechnology/Pharmaceuticals	0.04
CIR	Cimarron Petroleum Ltd.	3.2	Oil & Gas Services	0.05
CXS	Counsel Corporation	12.6	Hospitality	0.08
DRE.A	Dreco Energy Services Ltd. Cl. A	3.3	Oil & Gas Services	0.08
ELD	Eldorado Gold Corporation J	2.3	Gold & Precious Minerals	0.07
ESI	Ensign Resource Service Group Inc.	3.3	Oil & Gas Services	0.09

Appendix C (Cont.)

FHV.A	Fahnestock Viner Holdings Inc. CI. A NV	13.3	Investment Companies & Funds	0.06
GND	Gennum Corporation	6.5	Technology/Hardware	0.05
GTA	Gentra Incorporated	7.3	Real Estate	0.07
GWE	Grad&Walker Energy Corporation	3.2	Oil & Gas Services	0.04
IMX	Imax Corporation	11.2	Cable & Entertainment	0.07
LTV	Leitch Technology Corporation	6.5	Technology/Hardware	0.09
MFI	Maple Leaf Foods Inc.	5.1	Food Processing	0.06
NPP	Newport Petroleum Corporation	3.2	Oil & Gas Services	0.07
ORV	Orvana Minerals Corporation J	2.3	Gold & Precious Minerals	0.07
OXG	Oxford Properties	7.3	Real Estate	0.08
PAZ	Pacalta Resources Ltd.	3.2	Oil & Gas Services	0.08
PAA	Pan American Silver Corporation J	2.3	Gold & Precious Minerals	0.05
PEC	Pan East Petroleum Corporation	3.2	Oil & Gas Services	0.05
PND	Rand A Technology Corporation	6.5	Technology/Hardware	0.05
RNG	Rio Narcea Gold Mines	2.3	Gold & Precious Minerals	0.05
SWP.B	Saskatchewan Wheat Pool CI. B NV	5.1	Food Processing	0.12
SZ.A	Sceptre Investment Counsel Ltd. CI A NV	13.3	Investment Companies & Funds	0.06
SWG	Southwestern Gold Corporation J	2.3	Gold & Precious Minerals	0.04
TRZ	Tranzat A.T. Inc.	8.1	Transportation & Environment Services	0.07
UCS.B	Unican Security Systems Ltd. CI. B SV	6.2	Fabricating & Engineering	0.09
WIM	William Resources Inc. J.	2.3	Gold & Precious Minerals	0.04

1998

Tick	Name	Index code	Index name	Weight
BWR	Breakwater Resources	1.2	Mining Ltd.	0.03
BEI	Boardwalk Equities Inc.	7.3	Real Estate	0.11
CGH	Computalog Ltd.	3.3	Oil & Gas Services	0.04
LUM	Lumonics Inc.	6.2	Fabricating & Engineering	0.05
MXA	Maax Inc.	6.6	Building Materials	0.05
PEM	Pembridge Inc.	13.5	Insurance	0.07
QFH	Queensway Financial Holdings Ltd.	13.5	Insurance	0.06
VH	Van Houtte A.L. Ltee.SV	5.1	Food Processing	0.09

Appendix C (Cont.)

1999

Tick	Name	Index code	Index name	Weight
ACM.A	Astral Communications Inc. C.I.A NV	11.1	Broadcasting	0.06
ASY	Architel Systems Corp.	6.10	Technology - Software	0.06
BTC	Bentall Corporation	7.3	Real Estate	0.05
CAO.A	Cara Operations C.I.A NV	12.6	Hospitality	0.03
CCA	Cogeco Cable Inc. SV	11.2	Cable & Entertainment	0.06
CFE	Centrefund Realty Corporation	7.3	Real Estate	0.04
CIC	Certicom Corporation	6.5	Technology - Software	0.03
D	Dundee Realty Corporation	7.3	Real Estate	0.04
GEX	Genesis Exploration Inc.	3.2	Oil & Gas Producers	0.03
MHG.A	MDS Inc. C.I.A	5.8	Biotechnology/Pharmaceuticals	0.05
PRX	Probe Exploration Inc.	3.2	Oil & Gas Producers	0.01
STT	Sutton Resources Ltd.	2.3	Gold & Precious Minerals	0.08
TUV	Trojan Technologies Inc.	8.1	Transportation/Environment	0.06
UNH	Unihost Corporation	12.6	Hospitality	0.03
UNS	Uni-Select Inc.	12.1	Wholesale Distributors	0.05
WCS.A	Wescast Industries Inc. NV	6.11	Autos & Parts	0.05

2000

Tick	Name	Index code	Index name	Weight
BRK	Bracknell Corporation	6.2	Fabricating & Engineering	0.03
SAT	Canadian Satellite Comm. Inc.	11.2	Cable & Entertainment	0.06
CWB	Canadian Western Bank	13.1	Banks and Trusts	0.03
CDL.A	Corby Distilleries Ltd. C.I.A	5.4	Breweries & Beverage	0.03
GLE	Global Thermoelectric Inc.	6.2	Fabricating & Engineering	0.11
HKY	Husky Injection Molding Systems Ltd.	6.2	Fabricating & Engineering	0.03
MMD	MDSI Mobile Data Solutions Inc.	6.10	Technology - Software	0.07
NMR	Namibian Minerals Corporation	2.3	Gold & Precious Minerals	0.04
REG	Regional Cablesystems Inc.	11.2	Cable & Entertainment	0.04
SBY	Sobeys Inc.	12.2	Food Stores	0.05
SEH	Startech Energy Inc.	3.2	Oil & Gas Producers	0.03
TKX	Teklogix International Inc.	6.5	Technology - Hardware	0.03

Note: Weight: one month after the actual inclusion in TSE 300

Appendix C (Cont.)

TSE 300 Annual Revisions (Exclusions)

1991

Tick	Name	Index code	Index name	Weight
BND	Brenda Mines	1.2	Metal Mines	0.01
DEN	Denison Mines CL.A	1.4	Uranium & Coal	0.01
CMX	Caramax Resources	2.1	Gold & Silver Mines	0.00
MUS	Muscocho Explorations	2.1	Gold & Silver Mines	0.00
BME	Belmoral Mines	2.1	Gold & Silver Mines	0.00
EST.A	Equity Silver Mines	2.1	Gold & Silver Mines	0.01
GLG	Glamis Gold	2.1	Gold & Silver Mines	0.02
SCD.A	Schneider Corp. CL.A	5.1	Food Processing	0.02
HSG.A	Harris Steel CL.A	6.1	Steel	0.02
SIC	Sico Corp.	6.7	Chemicals	0.02
BD.A	BCE Development	7.1	Developers & Contractors	0.00
IPR	Inter-City Products	10.1	Gas Utilities	0.01
CMP	Campeau Corp.	12.3	Department Stores	0.00
STD	Standard Trustco	13.2	Trust, Saving & Loan	0.00
RSS.S	Reed Stenhouse Special	13.5	Insurance	0.03
RMN	Roman Corp.	14.1	Management Companies	0.00
UNLA	Unicorp CL.A	14.1	Management Companies	0.01
CEZ	Consolidated Enfield	14.1	Management Companies	0.01

1992

Tick	Name	Index code	Index name	Weight
HBM.S	Hudson's Bay Mining & Smelting Ltd.	1.1	Integrated Mines	0.02
CCH	Cambell Resources Inc.	1.2	Metal Mines	0.01
DML.A	Dickenson Mines Ltd. CL.A	2.1	Gold & Silver Mines	0.01
BWR	Breakwater Resources Ltd.	2.1	Gold & Silver Mines	0.01
GLC	Galatic Resources Ltd.	2.1	Gold & Silver Mines	0.01
MVG	MinVen Gold Corporation	2.1	Gold & Silver Mines	0.01
CGH	Computalog Ltd.	3.2	Oil & Gas Producers	0.01
COH	Coho Resources Ltd.	3.2	Oil & Gas Producers	0.01
INO	International Innopac Inc.	5.7	Packaging Products	0.01
CXA.A	Consolidated HCI Holdings Corp. CL.A	7.3	Real Estate & Construction	0.01
ALC	Algoma Central Corp.	8.1	Trans. / Enviro. Services	0.01
WJX	Wajax Limited CL.A	12.1	Wholesale Distributors	0.02
GFG.A	Grafton Group Limited CL.A	12.4	Clothing Stores	0.00
CEH	Central Capital Corp.	13.2	Trust, Savings & Loan	0.00
CEH.A	Central Capital Corp. CL.A	13.2	Trust, Savings & Loan	0.00
CGA	Central Guaranty Trusco Ltd.	13.2	Trust, Savings & Loan	0.01
CRX	Crownx Inc.	13.5	Insurance	0.00

Appendix C (Cont.)

CXE	Consolidated Canadian Express Ltd.	13.6	Financial Management Co's	0.01
CAM.A	Canam Manac Group Inc. C.I.A	14.1	Conglomerates	0.01

1993

Tick	Name	Index code	Index name	Weight
BPT.A	BGR Precious Metals Inc. C.I.A	2.2	Precious Metal Funds	0.02
CNN.UN	Canada Trust Income Investment Trust Units	13.3	Investment Co's & funds	0.02
SAT	Canadian Satellite Communications Inc.	11.2	Cable & Entertainment	0.02
CSW	Canada Southern Petroleum Ltd.	3.2	Oil & Gas Producers	0.03
FC	FCA International Ltd.	13.6	Financial Management	0.01
FMC	Ford Motor Co. of Canada Ltd.	5.6	Autos & Parts	0.03
TTG	General Trustco of Canada Inc.	13.2	Trust, Savings & Loan	0.00
G	Goldcorp Inc. C.I.A	2.2	Precious Metal Funds	0.02
GXL	Granges Inc.	2.1	Gold & Silver Mines	0.02
GLZ	Great Lakes Power Inc.	13.6	Financial Management	0.02
HLV	Haley Industries Ltd.	6.2	Fabricating & Engineering	0.00
IIT.A	Intera Information Technologies Corp. C.I.A	6.5	Technology	0.02
NGX	Northgate Exploration Ltd.	1.2	Metal Mines	0.01
PMC	Princeton Mining Corp.	1.2	Metal Mines	0.02
TCG.B	TCG International Inc. C.I.B	12.5	Specialty Stores	0.00
TM.B	Tele-Metropole Inc. C.I.B	11.1	Broadcasting	0.03
UGO.B	Unigesco Inc. C.I.B	12.2	Food Stores	0.01
WGL	Westar Group Ltd.	4.1	Paper & Forest Products	0.01
WDS	Woodward's Ltd.	12.3	Department Stores	0.00

1994

Tick	Name	Index code	Index name	Weight
ARX	Arimetco International Inc.	1.2	Metal Mines	0.01
BMS	Brunswick Mining & Smelting Corp. Ltd.	1.1	Integrated Mines	0.02
GYP	CGC Inc.	6.6	Building Materials	0.02
COC	Camco Inc.	5.5	Household Goods	0.02
CDN	Carena Developments Ltd.	7.3	Real Estate	0.01
CIR	Cimarron Petroleum Ltd.	3.2	Oil & Gas Producers	0.02
COR	Cominco Resources International Ltd.	1.2	Metal Mines	0.02
CXS	Counsel Corp.	13.6	Financial Manage. Co's	0.01
CFI	Crestbrook Forest Industries Ltd.	4.1	Paper & Forest Products	0.02
DR.A	DMR Group Inc. C.I.A	6.9	Business Services	0.02
DEP	Deprenyl Research Ltd.	5.8	Biotech./Pharmaceuticals	0.02

Appendix C (Cont.)

FPL	FPI Ltd.	5.1	Food Processing	0.03
GTA	Gentra Inc.	13.2	Trust, Savings & loan	0.02
GHC	Greyhound Lines of Canada	8.1	Transport & Environment Services	0.02
HAY	Hayes-Dana Inc.	5.6	Autos & Parts	0.03
IRP	International Petroleum Corp.	3.2	Oil & Gas Producers	0.02
MDS	MDS Health Group Ltd. Cl.A	5.8	Biotech./Pharmaceuticals	0.02
PWA	PWA Corp.	8.1	Transport & Environment Services	0.02
RLG	Royal LePage Ltd.	7.3	Real Estate	0.01
TMP	Trans Mountain Pipe Line Co. Ltd.	9.3	Pipelines	0.02
TZC.B	Trizec Corp. Ltd. Cl.B, Ordinary	7.3	Real Estate	0.01
UWI	United Westbume Inc.	12.1	Wholesale Distributors	0.04
WMI	Westmin Resources Ltd.	1.2	Metal Mines	0.02

1995

Tick	Name	Index code	Index name	Weight
AGR.B	Agra Industries Ltd. Cl. B NV	6.2	Fabricating & Engineering	0.03
BRA	Biomira Inc.	5.8	Biotechnology/Pharmaceuticals	0.02
BRK	Bracknell Corporation	6.2	Fabricating & Engineering	0.03
CAO	Cara Operations Ltd.	12.6	Hospitality	0.03
CC	Chai-Na-Ta Corporation	5.1	Food Processing	0.02
CCH	Campbell Resources Inc.	2.3	Gold & Precious Minerals	0.04
CGI	Canadian General Investments Ltd.	13.3	Investment Corporations & Funds	0.02
CMS	C-Mac Industries Inc.	6.5	Technology-Hardware	0.02
DLX.A	Dyle Ltd. Cl.A	12.5	Specialty Stores	0.01
DEY	Dreco Energy Services Ltd. Cl.A	3.3	Oil & Gas Products	0.03
DRL	Derlan Industries Ltd.	6.2	Fabricating & Engineering	0.02
DSW	Discovery West Corp.	3.2	Oil & Gas Products	0.03
FHV.A	Fahnestock Viner Holding Inc. Cl.A NV	13.3	Investment Corporations & Funds	0.03
GAN	Gandalf Technologies Inc.	6.5	Technology-Hardware	0.03
GKR	Golden Knight Resources Inc.	2.3	Gold & Precious Minerals	0.02
GRT.B	GTC Transcontinental Group Ltd. Cl.B MV	11.3	Publishing & Printing	0.02
IVI	International Verifact Inc. J	6.5	Technology-Hardware	0.01
KGL.B	Kaufel Group Ltd. Cl.B SV	6.2	Fabricating & Engineering	0.03
MXX	International Murex Techn. Corp. J	5.8	Biotechnology/Pharmaceuticals	0.03
SCD.A	Schneider Corp. Cl.A NV	5.1	Food Processing	0.03
SEM.B	Semi-Tech Corporation Cl.B	12.5	Specialty Stores	0.01
SPL	Scott Paper Ltd.	5.5	Household Goods	0.04
SRC.C	Scott's Hospitality Inc. Cl.C	12.6	Hospitality	0.02

Appendix C (Cont.)

1996

Tick	Name	Index code	Index name	Weight
CFL	Corporate Foods Ltd.	5.1	Food Processing	0.03
CGO	Cogeco Inc. SV	11.1	Broadcasting	0.04
CPX	Cineplex Odeon Corp.	11.2	Cable & Entertainment	0.02
EML	Emco Ltd.	6.6	Building Materials	0.02
GDS	Gendis Inc. CI. A	12.5	Specialty Stores	0.02
HSC	Hawker Siddeley Canada Inc.	6.4	Transportation Equipment	0.03
IPR	Inter-City Products Corporation	5.5	Household Goods	0.01
ISO	I.S.G. Technologies Inc.	6.5	Technology - Hardware	0.03
KCN	International Colin Energy Corp.	3.2	Oil & Gas Products	0.02
MNI	Meridian Technologies Inc.	6.2	Fabricating & Engineering	0.03
POU	Paramount Resources Ltd.	3.2	Oil & Gas Products	0.03
RCL.A	Rogers Communications Inc. CI. A	11.2	Cable & Entertainment	0.03
RET.A	Reitman's Canada Ltd. CI. A	12.5	Specialty Stores	0.03
RFP	Riverside Forest Products Limited	4.1	Paper & Forest Products	0.03
SSK	Softkey Software Products Limited	6.10	Technology - Software	0.01
TWE	Transwest Energy Inc.	3.2	Oil & Gas Products	0.02
WFR	Wharf Resources Ltd.	2.3	Gold & Precious Minerals	0.03
XXC.B	Xerox Canada Inc. CI. B	6.9	Business Services	0.02

1997

Tick	Name	Index code	Index name	Weight
ARC	Archer Resources Ltd.	3.2	Oil & Gas Producers	0.03
ACM.A	Astral Communications Inc. CI. A NV	11.2	Cable & Entertainment	0.04
BNB	Baton Broadcasting Inc.	11.1	Broadcasting	0.02
CA	Canadian Airlines Corporation	8.1	Transportation & Environment Services	0.01
CFC	Canadian Fracmaster Ltd.	3.3	Oil & Gas Producers	0.03
CAO.A	Cara Operations Ltd. CI. A NV	12.6	Hospitality	0.03
CEF.A	Central Fund of Canada Ltd. CI. A NV	13.3	Investment Companies & Funds	0.02
CDL.A	Corby Distilleries Ltd.	5.3	Distilleries	0.03
CFI	Crestbrook Forest Industries Ltd.	4.1	Paper & Forest Products	0.02
DYF	DY4 Systems Inc.	6.5	Technology/Hardware	0.02
EIC	Eicon Technology Corporation	6.5	Technology/Hardware	0.01
ITY	Intensity Resources Limited	3.2	Oil & Gas Producers	0.02
IVA.A	Ivaco Inc. CI. A SV	6.1	Steel	0.02
LB	Laurentian Bank of Canada	13.1	Banks & Trusts	0.03
MPI	Markborough Properties Inc.	7.3	Real Estate	0.01

Appendix C (Cont.)

MIP	Merfin International Inc.	5.5	Household Goods	0.02
MOL.B	Molson Companies Ltd. (The) Cl. B	5.4	Breweries & Beverages	0.04
NMA.A	Noma Industires Ltd. Cl. A NV	5.5	Household Goods	0.02
NWC	North West Company Inc. (The)	12.5	Specialty Stores	0.04
PNT	Petromet Resources Ltd.	3.2	Oil & Gas Producers	0.03
QIX	Quest International Resources Corp.	2.3	Gold & Precious Minerals	0.01
RPC	Revenue Properties Company Ltd.	7.3	Real Estate	0.02
ST.A	St. Lawrence Cement Inc. Cl. A SV	6.6	Building Materials	0.04
SRG	Scott's Restaurants Inc. SV	12.6	Hospitality	0.02
SSI	Slater Steel Inc.	6.1	Steel	0.04
SUI	Summit Resources Ltd.	3.2	Oil & Gas Producers	0.04
UAP.A	UAP Inc. Cl. A RV	6.11	Autos & Parts	0.03
UNC	United Corporations Ltd.	13.3	Investment Companies & Funds	0.03
EIF.UN	Enemark Income Fund Trust Units	13.3	Investment Companies & Funds	0.11
GZM.UN	Gaz Metropolitan & Co. Ltd. Partnership	10.4	Gas/Electrical Utilities	0.08
PGF.UN	Pengrowth Energy Trust Units	13.3	Investment Companies & Funds	0.08

1998

Tick	Name	Index code	Index name	Weight
APQ	Asia Pacific Resources Ltd.	6.7	Chemicals & Fertilizers	0.02
CCH	Campbell Resources Inc.	2.3	Gold & Precious Minerals	0.02
OCE.B	Ocelot Energy Inc. Cl.B	3.2	Oil & Gas Services	0.02
PEC	Pan East Petroleum Corp.	3.2	Oil & Gas Services	0.01
PCX	Pioneer Natural Resources Ltd.	3.2	Oil & Gas Services	0.03
RAY	Rayrock Yellowknife Inc.	2.3	Gold & Precious Minerals	0.02
SWG	Southwestern Gold Corporation	2.3	Gold & Precious Minerals	0.01
PJC.A	Jean Coutu Group Cl.A	12.5	Specialty Stores	0.06

1999

Tick	Name	Index code	Index name	Weight
ABC	Abacan Resources Corporation	3.2	Oil & Gas Producers	0.01
AXB	Allelix Biopharmaceuticals Inc.	5.8	Biotechnology/Pharmaceuticals	0.01
BWR	Breakwater Resources Ltd.	1.2	Mining	0.01
DE	Delrina Corporation Exch.	6.10	Technology - Software	0.01
GSC	Golden Star Resources Ltd.	2.3	Gold & Precious Minerals	0.01
HRC	Harmac Pacific Inc.	4.1	Paper & Forest Products	0.00

Appendix C (Cont.)

ING	Indochina Goldfields Ltd.	2.3	Gold & Precious Minerals	0.01
LIM	LionOre Mining International Ltd.	1.2	Mining	0.01
LUM	Lumonics Inc.	6.2	Fabricating & Engineering	0.01
MAE	Miramar Mining Corporation	2.3	Gold & Precious Minerals	0.01
ORV	Orvana Minerals Corporation	2.3	Gold & Precious Minerals	0.00
RNG	Rio Narcea Gold Mines Ltd.	2.3	Gold & Precious Minerals	0.01
RPP	Repap Enterprises Inc.	4.1	Paper & Forest Products	0.01
SPZ	Spar Aerospace Ltd.	6.5	Technology - Hardware	0.02
SRX	SR Telecom Inc.	6.5	Technology - Hardware	0.01
WIC.B	WIC Western Intl. Comm. Ltd.	11.1	Broadcasting	0.01

2000

Tick	Name	Index code	Index name	Weight
ALG	Algoma Steel Inc.	6.1	Steel	0.01
ATP	AT Plastics Inc.	6.7	Chemicals and Fertilizers	0.01
CGS.A	CanWest Global Comm. Corp. C.I.A	11.1	Broadcasting	0.01
CDV	COM DEV International Ltd.	6.5	Technology - Hardware	0.02
DOM.B	Doman Industries Ltd. C.I.B	4.1	Paper & Forest Products	0.01
IMN	Inmet Mining Corp.	1.2	Mining	0.01
QFH	Queesway Financial Holdings Ltd.	13.5	Insurance	0.01
ROI	Reserve Royalty Corp.	3.2	Oil & Gas Producers	0.01
RUS	Russel Metals Inc.	6.2	Fabricating & Engineering	0.02
SUF	Southern Resources Ltd.	2.3	Gold & Precious Minerals	0.01
VOY	Viceroy Resource Corp.	2.3	Gold & Precious Minerals	0.01
YF.A	Yogen Früz World Wide Inc. C.I.A	12.5	Specialty Stores	0.01

Note: Weight: one month before actual exclusion from the TSE 300

Appendix D: Revisions in each sector

		91	92	93	94	95	96	97	98	99	00	Total
1. Metals & Minerals	Inclusions		1	1		2	2		1			7
	Exclusions	2	2	2	4					2	1	13
2. Gold & Precious Minerals	Inclusions	1	1	1	3	2	1	6		1	1	17
	Exclusions	5	4	3		2	1	1	3	5	2	26
3. Oil & Gas	Inclusions	5	4	8	10	7		7	1	2	1	45
	Exclusions		2	1	2	2	3	5	3	1	1	20
4. Paper & Forest Products	Inclusions		1		1	6	1					9
	Exclusions			1	1		1	1		2	1	7
5. Consumer Products	Inclusions	1	5	2			5	3	1	1	1	19
	Exclusions	1	1	1	5	5	2	4		1		20
6. Industrial Products	Inclusions	4	4	3	5	1	7	6	2	3	5	40
	Exclusions	2		2	2	7	6	6	1	4	4	34
7. Real Estate	Inclusions	3			1			2	1	3		10
	Exclusions	1	1		3			2				7
8. Transportation & Environmental Services	Inclusions					1		2		1		4
	Exclusions		1		2			1				4
9. Pipelines	Inclusions	1										1
	Exclusions				1							1
10. Utilities	Inclusions				1	2	2					5
	Exclusions	1						1				2
11. Communications & Media	Inclusions	1		3	1	1		1		2	2	11
	Exclusions			2		1	3	2		1	1	10
12. Merchandising	Inclusions	1	1	1		1		1		3	1	9
	Exclusions	1	2	3	1	4	2	3	1		1	18
13. Financial Services	Inclusions	1	2		1			3	2		1	10
	Exclusions	2	5	4	2	2		5			1	21
14. Conglomerates	Inclusions											0
	Exclusions	3	1									4
Total		36	38	38	46	46	36	62	16	32	24	374

Appendix E: Short-run performance in the event windows (Inclusion)

The sample size is 149 included stocks. “AD” and “ID” indicate the announcement date and the implementation date, respectively. The cumulative abnormal return (CAR) is the average of the summation of the abnormal returns for each stock. The abnormal volume (AV) is the difference in volume ratio (a volume of tested stock divided by that of benchmark) between the tested time and the estimation window (AD-70, AD-11).

Appendix E (Cont.)

Appendix E (Cont.)

Appendix F: Short-run performance in the event windows (Exclusion)

The sample size is 141 excluded stocks. “AD” and “ID” indicate the announcement date and the implementation date, respectively. The cumulative abnormal return (CAR) is the average of the summation of the abnormal returns for each stock. The abnormal volume (AV) is the difference in volume ratio (a volume of tested stock divided by that of benchmark) between the tested time and the estimation window (AD-70, AD-11).

Appendix F (Cont.)

Appendix F (Cont.)

Appendix G: Performance in the overall window

The sample size is 149 (110 for the interval) included stocks and 141 (105 for the interval) excluded stocks. “AD” and “ID” indicate the announcement date and the implementation date, respectively. The cumulative abnormal return (CAR) is the average of the summation of the abnormal returns for each stock against the benchmarks, TSE 300, Sector Index, and 2 weight matching stocks (2MS).

Appendix H: Long-run performance

The buy-and-hold abnormal returns (BHAR) assume equal initial investments in each revised stock in the 25th month prior to the actual revision month. The abnormal volume is calculated as the difference in trading volume between the revised stocks and the benchmark, which assume each of their log-transformed and shares outstanding-adjusted volume as one at the 25th month prior to the actual revision month. The statistical significance for both BHAR and the abnormal volume was examined by skewness-adjusted t-test introduced by Johnson (1978).

(1) Benchmark: TSE 300

Month	Inclusion					Exclusion				
	N	BHAR	t-Value	AV	t-Value	N	BHAR	t-Value	AV	t-Value
-24	144	0.000	-0.039	0.001	0.069	140	0.001	0.080	0.002	0.098
-23	144	0.039	2.890	0.017	1.742	140	0.001	0.108	0.013	0.675
-22	144	0.053	3.343	-0.009	-0.755	140	-0.028	-1.785	-0.011	-0.478
-21	144	0.063	3.293	0.003	0.276	140	-0.074	-4.516	0.003	0.142
-20	144	0.087	4.041	0.000	-0.031	140	-0.098	-5.176	0.008	0.350
-19	144	0.095	4.113	-0.008	-0.576	140	-0.106	-4.232	-0.015	-0.607
-18	144	0.122	4.846	0.005	0.407	140	-0.108	-4.460	-0.029	-1.246
-17	144	0.169	6.352	0.003	0.272	140	-0.113	-4.786	-0.030	-1.225
-16	144	0.191	6.684	0.007	0.567	140	-0.141	-5.752	-0.017	-0.676
-15	144	0.233	7.334	-0.002	-0.156	140	-0.164	-6.285	-0.027	-1.131
-14	144	0.256	7.446	0.012	0.939	140	-0.178	-7.636	0.002	0.126
-13	144	0.342	8.858	0.032	2.066	140	-0.209	-7.870	-0.031	-1.394
-12	144	0.458	10.297	0.033	2.028	140	-0.239	-8.664	-0.021	-0.898
-11	144	0.525	11.187	0.046	2.928	140	-0.261	-8.808	-0.025	-1.217
-10	144	0.583	11.707	0.058	3.474	140	-0.280	-8.741	-0.027	-1.203
-9	144	0.642	11.659	0.040	2.727	140	-0.328	-10.192	-0.044	-1.719
-8	144	0.736	11.868	0.052	3.214	140	-0.334	-9.552	-0.039	-1.621
-7	144	0.762	12.152	0.043	2.888	140	-0.371	-12.032	-0.053	-2.022
-6	144	0.816	12.444	0.047	2.490	140	-0.374	-11.771	-0.083	-3.345
-5	144	0.857	12.505	0.041	2.423	140	-0.380	-9.810	-0.069	-2.385
-4	144	0.853	12.120	0.045	2.611	140	-0.420	-9.818	-0.033	-0.961
-3	144	0.835	12.308	0.057	3.320	140	-0.442	-10.440	-0.045	-1.614
-2	144	0.874	12.493	0.043	2.703	140	-0.445	-8.926	-0.029	-1.249
-1	144	1.023	12.590	0.093	6.214	140	-0.478	-10.387	0.015	0.550
0	144	1.098	13.219	0.107	6.906	140	-0.450	-8.351	0.027	1.304
1	144	1.081	12.370	0.082	5.003	140	-0.440	-9.192	-0.017	-0.632
2	144	1.090	12.047	0.076	4.453	140	-0.437	-7.984	-0.061	-2.376
3	144	1.138	11.978	0.073	4.209	140	-0.445	-8.214	-0.070	-2.419
4	144	1.106	11.385	0.074	4.363	140	-0.437	-7.707	-0.058	-1.855
5	144	1.091	10.745	0.058	3.354	140	-0.460	-8.122	-0.057	-1.780
6	144	1.052	10.764	0.054	3.231	140	-0.426	-7.405	-0.080	-2.385
7	144	1.035	10.604	0.054	3.068	140	-0.454	-8.472	-0.082	-2.408
8	144	0.995	10.060	0.060	3.707	140	-0.440	-7.077	-0.058	-1.608
9	144	0.941	9.588	0.062	3.693	140	-0.460	-7.227	-0.072	-2.026
10	144	0.959	9.354	0.040	2.269	140	-0.488	-7.725	-0.076	-2.250

Appendix H (Cont.)

11	144	0.889	8.917	0.059	3.415	140	-0.479	-7.452	-0.053	-1.878
12	144	0.912	8.608	0.051	2.736	140	-0.487	-7.460	-0.060	-1.737
13	144	0.950	8.542	0.062	3.431	140	-0.492	-7.649	-0.057	-1.776
14	144	0.963	8.592	0.042	2.509	140	-0.483	-7.661	-0.070	-1.752
15	144	0.947	8.420	0.045	2.534	140	-0.518	-8.495	-0.077	-2.160
16	144	0.940	8.422	0.036	2.092	140	-0.478	-7.723	-0.066	-1.989
17	144	0.871	8.026	0.028	1.631	140	-0.486	-7.626	-0.080	-2.341
18	144	0.840	8.082	0.023	1.280	140	-0.460	-7.135	-0.085	-2.490
19	144	0.877	8.133	0.023	1.253	140	-0.458	-6.851	-0.096	-3.049
20	144	0.857	7.790	0.035	1.738	140	-0.478	-7.077	-0.091	-2.406
21	144	0.850	7.536	0.047	2.566	140	-0.494	-7.246	-0.085	-2.499
22	144	0.910	7.526	0.044	2.368	140	-0.524	-7.524	-0.079	-2.850
23	135	0.905	7.422	0.040	2.207	130	-0.506	-6.421	-0.097	-2.739
24	135	0.897	7.399	0.043	2.496	130	-0.509	-6.552	-0.111	-3.542

(2) Benchmark: Sector Index

Month	Inclusion			Exclusion		
	N	BHAR	t-Value	N	BHAR	t-Value
-24	144	-0.004	-0.494	140	0.000	-0.034
-23	144	0.023	1.977	140	0.002	0.184
-22	144	0.034	0.629	140	-0.015	-1.025
-21	144	0.042	0.005	140	-0.050	-2.962
-20	144	0.065	1.998	140	-0.076	-4.480
-19	144	0.078	0.816	140	-0.099	-5.119
-18	144	0.100	1.899	140	-0.103	-5.128
-17	144	0.140	3.060	140	-0.098	-4.433
-16	144	0.169	1.977	140	-0.128	-6.115
-15	144	0.210	3.155	140	-0.139	-5.869
-14	144	0.229	-0.060	140	-0.138	-5.905
-13	144	0.310	5.097	140	-0.166	-6.562
-12	144	0.419	6.033	140	-0.188	-7.277
-11	144	0.481	3.985	140	-0.207	-7.419
-10	144	0.541	2.968	140	-0.223	-7.564
-9	144	0.593	1.168	140	-0.260	-9.190
-8	144	0.681	3.295	140	-0.264	-8.964
-7	144	0.708	1.361	140	-0.280	-9.628
-6	144	0.748	1.951	140	-0.284	-9.097
-5	144	0.782	1.531	140	-0.301	-8.388
-4	144	0.787	-1.328	140	-0.329	-8.652
-3	144	0.776	0.666	140	-0.346	-8.889
-2	144	0.812	1.999	140	-0.363	-8.956
-1	144	0.966	4.045	140	-0.381	-9.525
0	144	1.031	1.741	140	-0.364	-8.635

Appendix H (Cont.)

1	144	1.020	-0.675	140	-0.355	-8.732
2	144	1.020	-0.764	140	-0.358	-7.480
3	144	1.068	2.047	140	-0.365	-7.922
4	144	1.036	-0.269	140	-0.364	-7.488
5	144	1.024	-1.288	140	-0.364	-6.964
6	144	0.990	0.003	140	-0.356	-7.076
7	144	0.977	-1.678	140	-0.381	-7.716
8	144	0.950	-2.752	140	-0.371	-6.730
9	144	0.922	-0.751	140	-0.364	-6.095
10	144	0.957	-0.542	140	-0.407	-7.365
11	144	0.890	-1.859	140	-0.414	-7.386
12	144	0.928	0.135	140	-0.393	-6.685
13	144	0.967	-0.040	140	-0.388	-6.671
14	144	0.969	0.178	140	-0.407	-7.713
15	144	0.964	-0.608	140	-0.417	-7.719
16	144	0.963	0.794	140	-0.402	-7.672
17	144	0.898	-3.394	140	-0.415	-7.756
18	144	0.869	0.666	140	-0.384	-6.849
19	144	0.901	0.966	140	-0.386	-6.926
20	144	0.890	-1.008	140	-0.399	-7.073
21	144	0.886	-1.219	140	-0.407	-7.201
22	144	0.951	1.246	140	-0.411	-6.914
23	135	0.960	-1.255	130	-0.407	-6.505
24	135	0.949	-0.748	130	-0.407	-6.652

(3) Benchmark: 2 weight matching stocks

Month	Inclusion					Exclusion				
	N	BHAR	t-Value	AV	t-Value	N	BHAR	t-Value	AV	t-Value
-24	144	-0.024	-2.494	0.002	0.123	140	-0.022	-2.206	-0.016	-1.235
-23	144	-0.026	-1.514	-0.003	-0.271	140	-0.043	-3.096	-0.028	-1.940
-22	144	-0.008	-0.364	0.012	0.907	140	-0.084	-4.410	-0.024	-1.641
-21	144	0.009	0.369	0.009	0.608	140	-0.109	-4.202	-0.018	-1.245
-20	144	0.015	0.532	0.011	0.708	140	-0.164	-6.052	0.001	0.083
-19	144	0.054	1.869	0.006	0.415	140	-0.199	-7.499	-0.027	-1.974
-18	144	0.064	2.074	0.029	1.898	140	-0.175	-5.646	-0.023	-1.731
-17	144	0.073	2.051	0.007	0.489	140	-0.210	-6.572	-0.030	-2.195
-16	144	0.090	2.280	0.011	0.701	140	-0.232	-6.964	-0.034	-2.369
-15	144	0.103	2.224	0.012	0.686	140	-0.252	-7.061	-0.036	-2.441
-14	144	0.138	2.799	-0.002	-0.141	140	-0.312	-6.800	-0.017	-1.197
-13	144	0.161	2.982	0.005	0.291	140	-0.339	-7.383	-0.074	-5.208
-12	144	0.237	3.922	0.029	1.659	140	-0.396	-7.252	-0.058	-3.348
-11	144	0.291	4.275	0.048	2.453	140	-0.440	-6.532	-0.053	-3.928
-10	144	0.385	5.686	0.069	4.077	140	-0.502	-5.817	-0.026	-1.715
-9	144	0.388	4.735	0.047	2.724	140	-0.532	-6.479	-0.044	-2.402
-8	144	0.487	5.765	0.045	2.458	140	-0.495	-6.171	-0.044	-2.745
-7	144	0.535	6.268	0.047	2.661	140	-0.479	-5.783	-0.044	-3.069

-6	144	0.611	8.068	0.065	2.946	140	-0.450	-5.293	-0.049	-3.423
-5	144	0.653	8.126	0.038	1.889	140	-0.422	-5.415	-0.070	-4.480
-4	144	0.684	7.729	0.039	2.048	140	-0.427	-5.286	-0.039	-2.276
-3	144	0.667	7.267	0.056	3.025	140	-0.412	-5.132	-0.048	-3.315
-2	144	0.718	7.651	0.045	2.589	140	-0.430	-5.248	-0.045	-2.896
-1	144	0.875	8.918	0.076	4.342	140	-0.425	-5.047	-0.002	-0.134
0	144	0.932	9.160	0.097	5.366	140	-0.425	-4.518	0.000	-0.015
1	144	0.923	8.160	0.063	3.129	140	-0.430	-4.570	-0.036	-2.743
2	144	0.933	8.778	0.065	3.223	140	-0.391	-4.528	-0.054	-3.470
3	144	1.000	9.670	0.086	4.302	140	-0.389	-4.437	-0.060	-3.688
4	144	0.969	9.746	0.048	2.341	140	-0.385	-4.385	-0.077	-4.458
5	144	0.979	9.623	0.059	3.128	140	-0.350	-4.185	-0.069	-3.894
6	144	0.945	9.247	0.070	3.530	140	-0.316	-4.457	-0.036	-2.019
7	144	0.910	8.998	0.054	2.675	140	-0.327	-4.421	-0.059	-3.216
8	144	0.889	8.392	0.058	3.076	140	-0.334	-4.186	-0.058	-2.966
9	144	0.824	7.806	0.067	3.433	140	-0.278	-3.202	-0.055	-2.933
10	144	0.847	7.979	0.039	1.868	140	-0.268	-2.881	-0.082	-4.016
11	144	0.790	7.445	0.052	2.422	140	-0.268	-3.006	-0.044	-2.660
12	144	0.764	6.695	0.052	2.283	140	-0.244	-2.641	-0.070	-3.757
13	144	0.802	6.791	0.065	3.158	140	-0.300	-2.784	-0.069	-3.517
14	144	0.805	6.511	0.058	2.893	140	-0.313	-2.887	-0.076	-3.936
15	144	0.801	6.203	0.054	2.498	140	-0.341	-3.668	-0.055	-2.777
16	144	0.818	6.558	0.039	1.898	140	-0.358	-4.066	-0.063	-3.111
17	144	0.744	6.054	0.037	1.908	140	-0.416	-4.656	-0.096	-4.480
18	144	0.689	5.744	0.026	1.193	140	-0.395	-4.134	-0.055	-2.643
19	144	0.700	5.581	0.037	1.696	140	-0.381	-4.154	-0.065	-3.259
20	144	0.725	5.656	0.039	1.763	140	-0.363	-4.129	-0.048	-2.492
21	144	0.726	5.646	0.053	2.539	140	-0.443	-4.503	-0.071	-3.503
22	144	0.793	5.848	0.045	2.094	140	-0.443	-4.436	-0.064	-3.780
23	135	0.805	5.460	0.029	1.384	130	-0.443	-3.904	-0.076	-3.628
24	135	0.748	4.981	0.027	1.247	130	-0.480	-3.850	-0.097	-4.800

Appendix I: The comparison between the included stocks and the excluded stocks in the announcement window

The return (R) is the average return of the revised stocks and the cumulative return (CR) is the average of the summed return of each revised stock. The difference between the two types of the revised stocks is examined by the standard t-test. The volume (V) is assumed one at the 10th day before the announcement. "AD" and "ID" indicate the announcement date and the implementation date, respectively.

Appendix J: The comparison between the included stocks and the excluded stocks in the implementation window

The return (R) is the average return of the revised stocks and the cumulative return (CR) is the average of the summed return of each revised stock. The difference between the two types of the revised stocks is examined by the standard t-test. The volume (V) is assumed one at the 10th day before the announcement. "ID" is the date of the implementation of the revision.

Appendix K: The comparison between the included stocks and the excluded stocks in the overall window

The return (R) is the average return of the revised stocks and the cumulative return (CR) is the average of the summed return of each revised stock. The difference between the two types of the revised stocks is examined by the standard t-test. The volume (V) is assumed one at the 10th day before the announcement. "AD" and "ID" indicate the announcement date and the implementation date, respectively.

Appendix L: The direct relation between the price and volume performance for the revised stocks

The sample sizes are 143 for the included stocks and 139 for the excluded stocks, though from the 23-month after the revision month they are 134 and 129, respectively, due to the lack of data from January, 2002. Both the price and volume are assumed to be one at the 25th month before the revision month.

Month	Inclusion			Exclusion		
	N	Price	Volume	N	Price	Volume
-25	143	1	1	139	1	1
-24	143	1.0247	1.0022	139	1.0268	1.0055
-23	143	1.0772	1.0256	139	1.0302	1.0153
-22	143	1.0909	0.9954	139	1.0017	0.9898
-21	143	1.1328	1.0154	139	0.9946	1.0034
-20	143	1.1549	1.0127	139	0.9666	1.0105
-19	143	1.1808	0.9895	139	0.9631	0.9769
-18	143	1.1925	1.0041	139	0.9450	0.9633
-17	143	1.2365	1.0030	139	0.9285	0.9708
-16	143	1.2736	1.0175	139	0.9030	0.9781
-15	143	1.3194	1.0176	139	0.8799	0.9788
-14	143	1.3663	1.0135	139	0.8882	1.0069
-13	143	1.4729	1.0619	139	0.8716	0.9848
-12	143	1.6062	1.0644	139	0.8455	0.9976
-11	143	1.6919	1.0792	139	0.8303	0.9931
-10	143	1.7623	1.0881	139	0.8166	0.9803
-9	143	1.8576	1.0678	139	0.7907	0.9713
-8	143	1.9333	1.0819	139	0.7635	0.9605
-7	143	1.9617	1.0611	139	0.7465	0.9370
-6	143	2.0045	1.0630	139	0.7330	0.9259
-5	143	2.0457	1.0757	139	0.7211	0.9406
-4	143	2.0774	1.0797	139	0.7091	0.9762
-3	143	2.0672	1.0965	139	0.6993	0.9826
-2	143	2.1319	1.0769	139	0.7062	0.9869
-1	143	2.3252	1.1395	139	0.6915	1.0374
0	143	2.4069	1.1608	139	0.7174	1.0552
1	143	2.3905	1.1337	139	0.7321	1.0108
2	143	2.4181	1.1222	139	0.7466	0.9612
3	143	2.5131	1.1210	139	0.7683	0.9638
4	143	2.4648	1.1169	139	0.7734	0.9611
5	143	2.4765	1.0979	139	0.7958	0.9669
6	143	2.4413	1.0930	139	0.8022	0.9460
7	143	2.4383	1.1049	139	0.8149	0.9579
8	143	2.4083	1.1109	139	0.8180	0.9674
9	143	2.3223	1.1153	139	0.8265	0.9715

Appendix L (Cont.)

10	143	2.3712	1.0923	139	0.8347	0.9819
11	143	2.3241	1.1197	139	0.8439	0.9825
12	143	2.3641	1.1186	139	0.8740	0.9942
13	143	2.4269	1.1284	139	0.8891	0.9846
14	143	2.4602	1.1034	139	0.8908	0.9705
15	143	2.4628	1.1053	139	0.8998	0.9838
16	143	2.4412	1.0973	139	0.8854	0.9750
17	143	2.3640	1.0776	139	0.8761	0.9509
18	143	2.2795	1.0772	139	0.8542	0.9524
19	143	2.3152	1.0894	139	0.8523	0.9570
20	143	2.3274	1.1002	139	0.8602	0.9801
21	143	2.3284	1.1144	139	0.8534	0.9761
22	143	2.4217	1.1118	139	0.8728	0.9883
23	134	2.4773	1.1170	129	0.9185	0.9874
24	134	2.4541	1.1236	129	0.9234	0.9688