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Index effects: Evidence from Australia

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Abstract

This paper presents the findings of the first study of the index effects from changes in the composition of Australia's tradeable benchmark index: the S&P/ASX 200. Prior to the introduction of the S&P/ASX200 changes to the composition of the market's (then) benchmark index (the All Ordinaries Index) became evident before the formal announcement dates and the changes were made the following trading day. These announcement arrangements enabled profitable front-running trading. Along with the introduction of the new indices (including the S&P/ASX200) the arrangements for announcing changes to the composition of the index were changed to remove the opportunity for profitable frontrunning trading. While this objective was largely met for additions to the index the study found statistically significant evidence of price pressure between the announcement and implementation dates which were partially offset over

the subsequent 20-day period. In relation to deletions the study found negative abnormal returns prior to announcement dates as well as between the announcement and implementation dates that were partially reversed over the subsequent 20-day period. The overall conclusion is that the event of changes in the composition of the S&P/ASX200 is on average associated with positive abnormal returns for additions and negative abnormal returns for deletions.

Keywords: **S&P/ASX 200; S&P 500; Price-pressure hypothesis; Investor awareness hypothesis**

INTRODUCTION

There is a very substantial literature on the S&P 500's index effects (abnormal return and trading volume effects for additions and deletions to the index). There have also been studies of the index effects of other major indices such as the Nikkei 225, FTSE 100, S&P/TSX 60 the DAX 30. But there has not been a published study of the index effects for changes to the composition of the S&P/ASX 200; Australia's tradeable benchmark index that serves as the principal benchmark index for institutional investors. The purpose of this paper is to fill this gap in the literature on index effects by reporting the findings of a study covering the period since the S&P/ASX 200 was introduced in April 2000 up to June 2009.

There are several reasons for examining the index effects of the S&P/ASX 200. Australia has a large managed funds industry with approximately 40% of the funds being benchmarked to the S&P/ASX 200 [1]. This industry developed mainly as a result of compulsory (defined contribution) superannuation. In June 2000 the managed funds industry had $A191 billion invested in the 'equities and unit trust' asset class and the amount increased to $A450 billion by June 2009 (which represented 41% of the market's total market capitalisation). Consequently portfolio re-balancing trades by fund managers (especially index funds) following the announcement of the changes, especially on days prior to implementation dates could be expected to have observable index effects.

The S&P/ASX 200 is comprised of firms with very unequal market capitalisations. The largest 20 firms represented around two-thirds of the index's total market capitalisation over the period of the study with the largest having index weights of 5-7% whereas the smallest firms in the index have weights of around 0.1% or less. In fact the smallest 100 firms in the S&P/ASX 200 form part of the small-cap index. Moreover the vast majority of the changes in the composition of the index involved small-cap firms. Their influence on the size of average index effects could be small, should these shares not be widely held by index funds (because of their small size) or large, should they are held by index funds and so re-balancing trades would have a large impact on the market for the

shares [2].

Finally, the arrangements for managing the composition of the index (by the Index Committee) are intended to help ensure the index serves to measure market values rather than influence them. The index is reviewed quarterly with regard to each stock's index market capitalisation and to the integrity of its constituent sector indices (12 Global Industry Classification Standard sectors). Consequently the selected changes to the index's composition have a low predictability and so should not provide front-running trading opportunities prior to announcement dates. The changes though are announced 10 business days before being implemented [1] and thus index effects should be expected during this period depending on when the funds that benchmark against the index conduct their portfolio re-balancing trades.

The rest of this paper is structured as follows. Section 2 briefly reviews the literature relating to the index effect. Section 3 presents the data and the research method. Section 4 provides empirical findings and Section 5 concludes.

LITERATURE REVIEW

The extensive literature on the S&P 500's index effects presents evidence of index effects since the mid-1970s as well as explanations for the effects; some key studies include Harris et al. [3], Shleifer [4], Jain [5], Beneish [6], Chen et al. [7], and Soe et al. [8]. The reported average abnormal returns (AARs) on announcement dates for additions ranged around 3% for the period September 1976 to September 1989. In October 1989 Standard and Poor began to pre-announce changes to the composition of the S&P500, which gave rise to the 'S&P 500 game [6] buying on the announcement and selling on implementation dates. Chen et al. [7] found AARs on announcement dates of 5.4% that increased on a cumulative basis to 8.9% by implementation dates for additions over the period October 1989 to December 2000.

Soe et al. [8] present findings that indicate that index effects were becoming smaller during the 2000s decade. This study reported CAARs of only 1.75% for additions (between the first day of trading following the announcements and implementation dates) for the period September 2003 and August 2008. This finding is confirmed by other studies [9].

Explanations of index effects depend on the evidence. The pricepressure hypothesis (PPH) is advanced to explain temporary index effects; positive AARs for additions that are subsequently reversed [3]. The imperfect-substitutes hypothesis [4] and the informationcontent hypothesis [5] are advanced to explain a permanent increase in prices for additions (i.e., the new price level being sustained over the remaining window of each study). Some studies find the price effects were sustained whereas some found they were reversed and others found the abnormal returns were partially reversed [7].

Chen et al. [7] report much larger cumulative abnormal return effects for deletions (-

8.5% on announcement dates and -14.4% by implementation dates) over the period October 1989 to December 2000 that were largely reversed over the 20-day period after implementation dates and were fully reversed over the 60-day period following implementation dates. They offer the investor-awareness hypothesis (IAH) to explain this reversal of the abnormal negative returns following implementation dates. The basic reason for index effects is the practice of index funds trading on implementation dates to minimise their tracking error. However the recent diminution in index effects (for the S&P 500 and for certain other national benchmark indices) has been explained by strategic trading by index and other funds that benchmark against the index prior to implementation dates [8,9]. Evidence of such trading in Australia was found by Aitken et al. [10] and by Frino et al. [11]. The latter study of a representative sample of large and enhanced-index funds found their trading in the added and deleted shares commenced 5-12 days prior to implementation dates and were largely completed by implementation dates.

There have been only two published studies of index effects in Australia. Chan et al. [2] examine the period January 1995 to July 1998 when the All Ordinaries Index (AOI) was the institutional benchmark index. This study found AARs of 2.6% for the additions to the AOI on day -1 prior to implementation dates. The study found negative abnormal return effects for deletions of -3.3% on day -1 and +2.6% on day 0. The level of these effects are lower than those for the S&P 500, which is likely to reflect the difference in the size structure of the two indices; the AOI comprised even more small firms than the S&P/ ASX 200. Also the announcement arrangements for the AOI enabled investors to anticipate additions and deletions well before they were formally announced.

Pinfold et al. [12] investigate the index effects from changes in the composition of the S&P/ASX 100 and S&P/ASX 300 indices over the period from the second quarter of 2000 to the end of 2003. The study reports AARs on implementation dates for additions to the S&P/ASX 100 and S&P/ASX 300 of -0.84% and 1.06%, respectively and for deletions on implementation dates of -0.25% and -2.78%, respectively. However these findings are not statistically significant. As regards deletions (from both indices) the study found CAARs fell prior to announcement dates and subsequently increased following implementation dates.

DATA AND METHODOLOGY

Data

We examine the price and trading volume effects before and after announcement and implementation dates for changes in the composition of the S&P/ASX 200 since its introduction in April 2000 up to June 2009, excluding changes that resulted from corporate events, such as mergers, takeovers and liquidations.

A data set was developed of the firms added to, and deleted from, both indexes over the study period from the Standard and Poor's website including the date each change was implemented. The announcement dates were obtained from S&P Press Releases.

There were 237 additions to, and 239 deletions from the S&P/ASX 200 over the period of the study. Firms were deleted from the study's data set if they had listed on the ASX within six months prior to the event date, had been added to the indices due to consolidation or firm spin offs or had been removed from the indices for reasons other than breach of the size or liquidity conditions (such as corporate events). In addition, firms which had delisted within the event period, subsequent to removal from either index were not included even though this introduces a potential survivorship bias. As a result, the study's sample comprises 126 additions to, and 109 deletions from the S&P/ASX 200. Nearly half (51) of the additions in our sample were in the energy and materials sectors with the rest being widely distributed across the other GICS sectors. This pattern is similar to the composition of the index, except for the financial (excluding property trusts) sector which is dominated by a small number of large banks. The deletions were more evenly distributed across all sectors, except for the financial (excluding property trusts) sector where only one insurance company was added and deleted. Price histories, trading volumes and the number of each company's shares were obtained from Bloomberg and DataStream. Specifically, the daily adjusted closing prices were utilised, which accounts for all corporate actions such as stock splits, dividends/ distributions and rights offerings. This is appropriate when analysing historical stock returns as it provides an accurate representation of the firm's share value beyond the simple market price. In addition, the daily AOI accumulation level was collected from Bloomberg. These data were utilised to calculate continuously compounded daily abnormal returns. The study used an event window of 61 days evenly distributed around the event date i.e., from day -30 to +30 relative to the announcement dates.

Measuring stock price effects

We use a control firm (CF) approach to measure the impact of the index events on the returns of the added and deleted firms. The methodology measures abnormal returns as the movement in a firm's share price relative to a CF's share price. The CF is selected from the firms in the same industry that are of a comparable size (i.e., market capitalisation). The abnormal returns are calculated as follows:

$$AR_{i,t} = R_{i,t} - R_{ic,t} \quad (1)$$

Where
$R_{i,t}$ = the rate of return on the stock of sample firm i on day t,
$R_{ic,t}$ = the rate of return on the stock of the control firm for firm i on day t

Where possible the control firms were in the same industry within the Global Industry Classification System (GICS) code. The GICS codes comprise four levels; Sector, Industry Group, Industry and Sub-Industry, each level is denoted by two digits. The firms were not matched based on their sub-industry as this identification system is extremely narrow.

The average market capitalisation was determined for each sample firm under examination, based on its historical market capitalisation over the six months prior to the event period (which we define as -30 to +30 days either side of the index event day). An appropriate match was determined using the Barber et al. [13] upper and lower bounds of 70% and 130% of the sample firm's market capitalisation. Approximately 75% of the control firms were selected on this basis. If a firm within this range did not exist then the industry basis was broadened to a list of all firms within the same Industry Group (the four digit GICS codes). The remaining CFs (approximately 20%) were those with the closest market capitalisation value to the sample firm; provided the CFs had not been added to, or deleted from the index in the eight months prior to, or after the event period (to ensure the abnormal return calculations were not biased by their upward or downward price movement that influenced their addition or deletion from the index). Moreover, the CFs for both additions and deletions had very similar mean market capitalisations to those for the firms in the study.

AAR and CAAR were computed for the S&P/ASX 200 additions and deletions separately. The AAR for day t is computed as follows:

$$AAR_t = \sum_{i=1}^{n} AR_{i,t} \quad (2)$$

where:
n = The number of firms in the sample

The individual period AAR may then be accumulated over a number of periods to produce a CAAR, this is computed as follows:

$$CAAR_{\theta} = \sum_{t=t1}^{t2} AAR_t \quad (3)$$

where
CAARθ = cumulative average abnormal return for firms for a period of length θ
t_1 = The first day of the accumulation period
t_2 = The last day of the accumulation period

The periods over which the accumulated abnormal returns were calculated are intended to show when abnormal returns begin a nonrandom pattern, and when they end such a pattern [14].

Measuring trade volume effects

Abnormal volume was computed using the market model approach, which is similar to that employed by Biktimirov et al. [15] and Shankar et al. [16] which was initially proposed by Campbell et al. [17]. The expected trading volume is estimated over the same period as for the abnormal return analysis, i.e., it comprises 210 days extending from day -31 to day -240. Furthermore, the AOI is employed as a proxy for the market portfolio.

$$E(V_{i,t}) = \alpha_i + \beta_i(V_{m,t}) \quad (4)$$

Where

$$V_{m,t} = \frac{1}{N}\sum_{i=1}^{N} V_{i,t} \quad (5)$$

N= the number of firms comprising the market index (AOI)
Therefore, abnormal volume is computed as follows:

$$AV_{i,t} = V_{i,t} - E(V_{i,t}) \quad (6)$$

Where

$$V_{i,t} = \ln\left(\frac{100n_{i,t}}{S_{i,t}} + 0.00025\right) \quad (7)$$

$n_{i,t}$ = The number of shares traded for firm i on day t
$S_{i,t}$ = The number of shares outstanding for firm i on day t
α_i and β_i = the OLS parameter estimates for firm i

In order to account for days on which a firm's stock was not traded 0.00025 is added to the ratio of shares traded over shares outstanding. The log transformation is used to approximate a normal distribution [18,19].

The average abnormal volume for day t is computed as follows:

$$AAV_t = \frac{\sum_{i=1}^{n} AV_{i,t}}{n} \quad (8)$$

n = The number of firms in the sample

The individual period AAV may then be accumulated over a number of periods to produce a CAAV, this is computed as follows:
Where

$$CAAV_\theta = \sum_{t=t1}^{t2} AAV_t \quad (9)$$

CAAVθ = Cumulative average abnormal volume for n stocks for a period of length θ
t_1 = The first day of the accumulation period
t_2 = The last day of the accumulation period

EMPIRICAL RESULTS

Table 1: S&P/ASX 200 additions announcement date stock price effects (-10, 10)

Day	AAR (%)	t-statistics	Rank Test
-10	0.69	1.62	5.05***
-9	-0.45	-1.14	-1.43
-8	-0.34	-0.87	-1.06
-7	-0.25	-0.75	0.23
-6	0.26	0.59	-0.04
-5	-0.42	-1	-3.02***
-4	0.47	1.08	2.93***
-3	0.13	0.31	0.85
-2	-0.96	-1.68*	-5.30***
-1	-0.34	-0.9	-1.56
0	1.66	1.99**	10.86***
1	1.66	4.28***	9.85***
2	-0.22	-0.47	-1.11
3	0.06	0.14	0.65
4	0.02	0.05	0.91
5	0.06	0.12	0.3
6	0.3	0.93	2.97***
7	0.28	0.82	2.64***
8	1.13	3.27***	7.79***
9	0.66	1.71*	2.85***
10	0.3	0.02	-0.91

This table reports the average abnormal returns (AAR) for the period Day -10 to +10 relative to the announcement date of additions to the S&P/ASX 200 index during 2000-2009. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively, for

two-tailed tests using either the Student's t-test or the non-parametric Wilcoxon-Signed Rank Test.

We start with the abnormal returns for additions and observe that in Table 1 AARs were positive on announcement dates and the following day. The announcement date effect (1.66%) is statistically significant at the 5% level utilising a t-test and at the 1% level according to the Rank Test and the positive AAR (also 1.66%) on day 1 is significant at the 1% level using either statistical test. Since trading by index funds has been found to occur over the five days up to implementation dates this finding is most likely the result of front running by risk-arbitrageurs in anticipation of price pressure from index funds buying closer to implementation dates. Over the 10-day period after announcement dates the CAAR shown in Table 2 (day +1 to Day +10) were 4.25%, statistically significant at the 1% level. The abnormal returns found immediately prior to, and after the implementation dates are presented in Table 3. Observe AARs of 2.15%, significant at the 1% level, were found on the day prior to the implementation date. Interestingly, there is a partial reversal of returns with an abnormal return of -0.76%, significant at the 10% level, on the implementation date. This is consistent with selling pressure from front running traders closing out their positions offsetting buying by index funds on implementation dates.

Table 2: S&P/ASX 200 additions announcement date stock price effects (-30, 30)

Window	**CAAR (%)**	**t-statistics**
(-20, -1)	0.85	0.48
(-10, -1)	-1.21	-0.94
(-1, +1)	2.98***	3.22
Announcement Day	1.66**	1.99
(+1, +10)	4.25***	3.31
(+1, +20)	2.15	1.39
(-30, +30)	3.27	1.1

This table reports the cumulative average abnormal returns (CAAR) for the period Day -30 to +30 relative to the announcement date of additions to the S&P/ASX 200 index during 2000-2009. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively, for two-tailed Student's t-test.

Table 3 S&P/ASX 200 additions implementation date stock price effects (-1, +1)

Day	AAR (%)	t-statistics	Rank Test
-1	2.15	4.09***	8.93***
0	-0.76	-1.66*	-3.62***
+1	-0.33	-0.85	-1.82*

This table reports the average abnormal returns (AAR) for the period Day -1 to +1 relative to the implementation date of additions to the S&P/ASX 200 index during 2000-2009. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively, for two-tailed tests using either the Student's t-test or the non-parametric Wilcoxon-Signed Rank Test.

The CAARs displayed in Figure 1 for the 30 days before announcement dates show the returns increased to around 3% before falling back to just over 1% on the day before announcement dates, which suggests there was a low level of predictability of the added stocks. This is consistent with the data in Table 2 of no statistically significant positive pre-announcement date CAARs over either the (-20,-1) or (-10,-1) windows. The growth in CAARs between announcement and the implementation dates provides clear evidence of buying pressure both early and late in this period. Observe finally in Figure 1 that the positive CAARs partially fell following implementation dates, which is consistent with the price pressure hypothesis that buying by index funds temporarily pushes up prices for shares that are added to the index. Figure 1 also presents evidence of trading volumes over the period day -30 to day +30 relative to announcement dates. Observe the abnormal average volumes (AAVs) increased around announcement dates and continued to increase up to implementation dates after which they remained elevated for the remainder of the event period. These effects are broadly consistent with the abnormal return effects.

Turning now to deletions the study found larger abnormal return effects than those for additions (in terms of the percent movements). Observe in Table 4 that the AARs on announcement dates were -3.11%,statistically significant at the 1% level. The data in Table 4: S&P/ASX 200 deletions announcement date stock price effects (-10, 10)

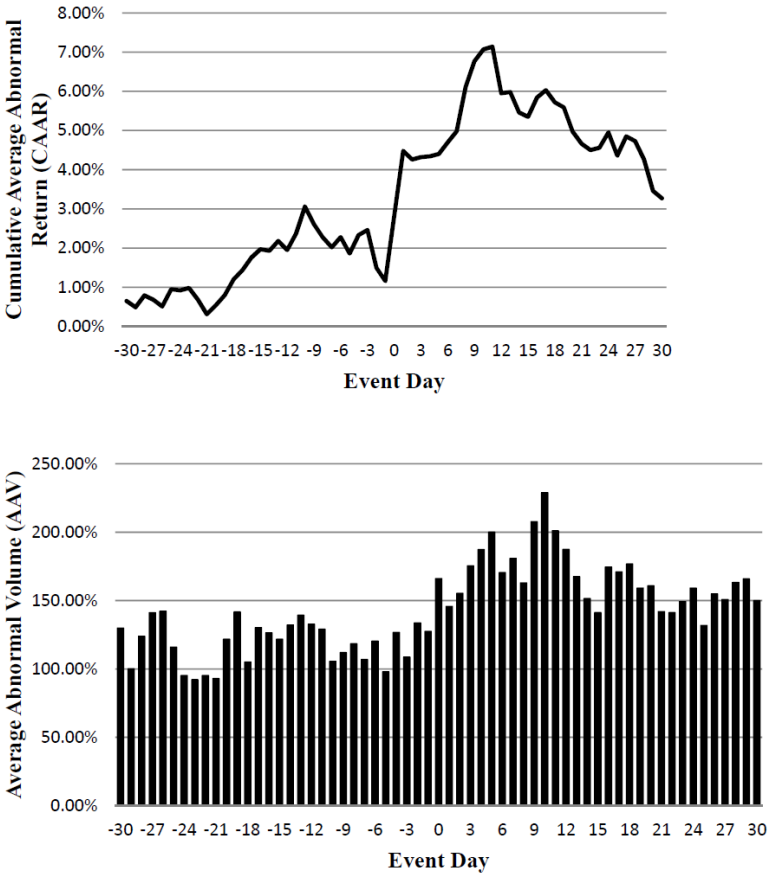

Figure 1: CAAR and Trading volumes for additions to the S&P/ASX 200 for the period of day -30 to 30 relative to the announcement date.

Day	AAR (%)	t-statistics	Rank Test
-10	-1.54	-2.93***	-8.79***
-9	-0.87	-1.66*	-3.47***
-8	-0.16	-0.28	-1.85*
-7	-1.19	-2.38**	-5.35***
-6	-0.82	-1.83*	-4.75***
-5	-1.18	-2.33**	-5.31***
-4	-1.27	-1.79*	-4.32***
-3	-1.56	-2.13**	-3.79***

-2	-0.05	-0.09	-1.54
-1	-0.69	-1.23	-2.38**
0	-3.11	-5.72***	-13.43***
1	-1.05	-1.68*	-2.46**
2	-0.15	-0.21	-3.04***
3	-0.58	-0.89	-0.29
4	-0.29	-0.32	-0.17
5	1.22	1.29	-2.36**
6	-0.39	-0.53	-3.28***
7	-0.51	-0.77	-2.95***
8	-0.71	-1.31	-2.32**
9	-1.19	-1.47	-8.79***
10	-2.21	-1.47	-3.47***

This table reports the average abnormal returns (AAR) for the period Day -10 to +10 relative to the announcement date of deletions from the S&P/ASX 200 index during 2000-2009. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively, for two-tailed tests using either the Student's t-test or the non-parametric Wilcoxon-Signed Rank Test.

Table 5 show the CAARs over the -20 to -1 window was -12.43%, significant at the 1% level with the decline being greater over the -10 to -1 window. The data in Table 6 show that there were negative abnormal returns on the day before the implementation date but positive AARs (2.54%) on implementation dates, which marked the beginning of a partial reversal in the returns. This return reversal is displayed by the data in Table 5 for the period +1 to +20 relative to announcement dates and in Figure 2 for the 30-day period after announcement dates. However, despite the partial reversal in returns the deleted stocks' performance was poor overall shown in Table 5 by an event period CAARs of -15.20%, significant at the 1% level. This finding is plausible given that falling market capitalisation principally caused the deletions.

Table 5: S&P/ASX 200 deletions announcement date stock price effects (-30, 30)

Window	CAAR (%)	t-statistics
(-20, -1)	-12.43***	-4.29
(-10, -1)	-9.33**	-4.55
(-1, +1)	-4.85***	-4.56
Announcement Day	-3.11**	-5.72
(+1, +10)	-5.86***	-2.30
(+1, +20)	1.04	0.38
(-30, +30)	-15.20***	-4.01

This table reports the cumulative average abnormal returns (CAAR) for the period Day -30 to +30 relative to the announcement date of deletions from the S&P/ASX 200 index during 2000-2009. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively, for two-tailed Student's t-test.

Table 6 S&P/ASX 200 deletions implementation date stock price effects (-1, +1)

Day	AAR (%)	t-statistics	Rank Test
-1	-3.46	-2.34**	-6.83***
0	2.54	1.97*	3.50***
+1	0.86	1.47	2.70***

This table reports the average abnormal returns (AAR) for the period Day -1 to +1 relative to the implementation date of deletions from the S&P/ASX 200 index during 2000-2009. ***,
** and * denote significance at the 1%, 5% and 10% levels respectively, for two-tailed tests using either the Student's t-test or the non-parametric Wilcoxon-Signed Rank Test.

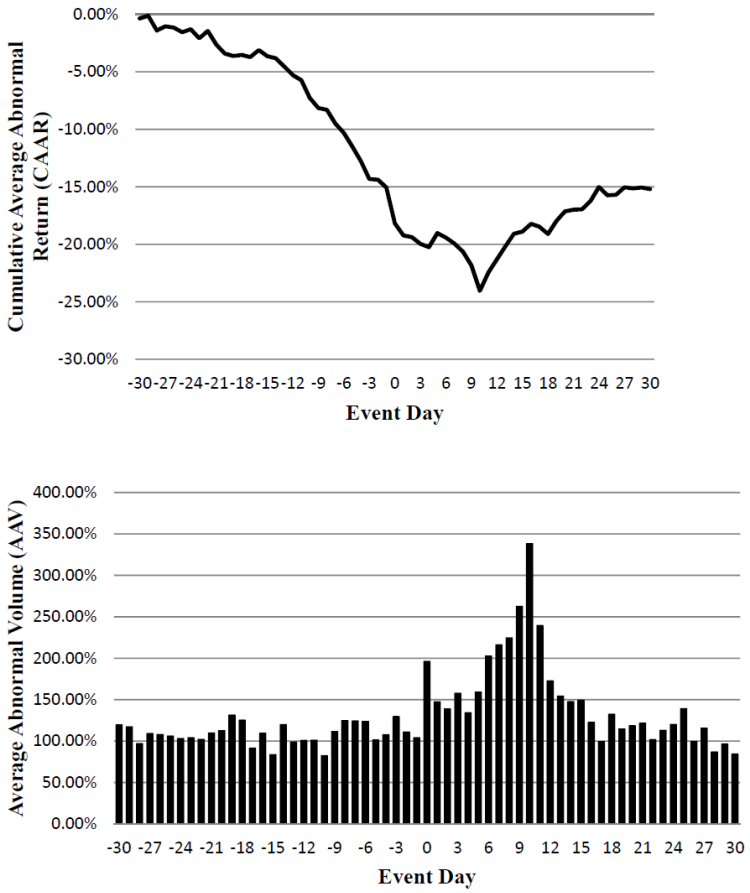

Figure 2: CAAR and Trading volumes for deletions from the S&P/ASX 200 for the period of day -30 to 30 relative to the announcement date.

The CAAR and trading volume data for deletions are presented in Figure 2. Observe the peaks in AAVs around announcement and especially around implementation dates where they were relatively higher than for additions, which is consistent with the abnormal returns data for deletions and additions. These findings are consistent with abnormal return effects.

CONCLUSION

The significant abnormal returns of the stocks that are added to or deleted from the S&P 500 Index have been widely documented after it was first reported by Harris [3] and Sheleifer [4] whereas there have been relatively few studies of index effects associated with changes to the composition of benchmark indices in other countries. This paper presents the findings of the first study of the index effects from changes in the composition of Australia's tradeable benchmark index: the S&P/ASX 200. S&P/ASX 200 serves as the principal benchmark index for institutional investors and is followed by about 40% of the superannuation funds in Australia.

Studying the stocks added to or removed from the S&P/ASX 200 from April 2000 up to June 2009, we find additions to the S&P/ASX 200 have positive AARs on announcement dates of 1.66% that increase on a cumulative basis until implementation dates, after which abnormal returns are partially reversed up to 30 days following announcement dates. Our study also found that trading volume increased substantially on announcement dates and remained abnormally high peaking on implementation dates. These effects appear to provide some evidence of price pressure hypothesis and the pattern is consistent with the results reported by Chen [7] for the S&P 500 for the periods between announcement and implementation dates and post-implementation periods.

Our study did not find clear evidence of consistent price pressure for additions over the 30-day period prior to announcement dates. This suggests investors do not anticipate additions to the S&P/ASX 200 prior to the announcement; however front-running trades could contribute to the abnormal returns on announcement dates given that index funds conduct most of their purchases of the added shares over the five-day period up to implementation dates.

This paper also finds that AARs for deletions on announcement dates were -3.11%. Stocks deleted from the S&P/ASX 200 experience negative CAARs over the 30-day period prior to announcement dates. These negative returns may be explained in part by frontrunning trading prior to announcement dates. The negative CAARs between announcement and the day before implementation dates and the accompanying elevated trading volumes are consistent with index funds selling deleted shares. The negative returns of the deleted firms begin to reverse following implementation dates and so form an asymmetric pattern over the period -30 days through to +30 days around the announcement dates. The reversal in AARs for deletions provide partial evidence supporting the Price Pressure Hypothesis as well as the Investor Awareness Hypothesis (proposed by Chen, Noronha and Singal, 2004 when reporting their S&P 500 findings) that argues investors who remain aware of the deleted shares are attracted by the low prices for them and their purchasing places upward pressure on the prices of these shares.

This paper provides some new insights regarding the impact of the S&P/ASX 200 on the prices and trading volumes of the stocks that are added to or removed from the index. However, theoretical work is still needed to present more solid explanations for the abnormal returns and volume changes following the index composition changes and future research that investigates the parties that are creating the buying/selling pressures between announcement and implementation dates could yield promising results.

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