

**Price Effects of Changes to Size Sub-indexes on the Australian Stock
Exchange: An Event Study**

(FIRST DRAFT)

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Abstract

The purpose of this paper is to examine whether the general effect of index inclusion is present in relation to inclusion in the size sub-indexes on the Australian Stock Exchange. The three size sub-indexes that are considered are the ASX 20 leaders, ASX 50 leaders, and the ASX 100. A market model is used to calculate abnormal returns for both additions and deletions to these sub-indexes between January 1994 to December 1999. Results appear to show that positive abnormal returns can be made for additions in the 30 days prior to the announcement date, however cumulative abnormal returns for the next 90 days are negative. Results of deletions are not so clear however it is apparent that over the 120 day event window deletions show a positive CAR. In relation to the overall AOI, it appears that the index effect is stronger for the AOI as reported by Howard and Chan (1999), than it is for the sub-indexes examined here. This may be due to index fund managers being more concerned with reducing tracking error, and buying/selling stocks as they enter or leave the broad market index, instead of trying to reduce transaction costs. Attempting to reduce transaction costs could see managers holding one of the sub-indexes as a proxy for the AOI, and as such buying/selling stocks as changes to these indexes occur.

Keywords: Index Effect, Sub-Index, Abnormal Return

1. Introduction

Share market indexes are designed to give a quantitative measure of the performance of the market against which investment performance can be judged. In this context they typically provide a benchmark in the calculation of the risk/return trade-off. Market indexes such as the Australian All Ordinaries index (AOI), the United States' Standard and Poors 500 (S&P 500) and Britain's Financial Times Stock Exchange 100 (FTSE 100) give a broad measure of share price movements. In addition to these market indexes, there are also 'sub-indexes'. Sub-indexes are used to assess the performance of stocks with similar characteristics. The more common sub-indexes are style indexes, industry indexes, and size indexes, the last of which is investigated in this study.

Considerable evidence has found that companies added (removed) to a broad market index, experience a positive (negative) price effect around the time of inclusion (exclusion). Harris and Gurel (1986), Shleifer (1986), Arnott and Vincent (1986), Dhillon and Johnson (1991), Edmister, Graham and Pirie (1994), Beneish and Whaley (1996), and Lynch and Mendenhall (1997) are some of the researchers who find evidence of the 'index effect' for the S&P 500¹. Chung and Kryzanowski (1998), and Chan and Howard (1999) also confirm this effect for the Canadian and Australian markets respectively.

This paper looks at whether the index effect described above is present when changes to sub-indexes are considered. Thus, the aim of this paper is to examine whether stocks included or excluded from sub-indexes on the Australian Stock Exchange

¹ The S&P 500 is a market value-weighted index made up of 500 stocks from the New York Stock Exchange, the American Stock Exchange, and the Nasdaq National Market System.

(ASX) experience the same abnormal returns found for composition changes in broad market indexes. The ‘sub-index effect’ is studied because it is thought that perhaps sub-indexes such as the ASX 20 Leaders, the ASX 50 leaders, or the ASX 100 are more ‘investable’ than the broad market indexes and therefore used by fund managers as replicas for the market index. In addition to this, the comparatively small size of the Australian market means that stocks included or excluded from the AOI are relatively small. Thus it may be impractical for fund managers tracking this index to invest in these ‘border-line stocks’ and consequently the entire list of AOI stocks.

If the above reasoning were valid then fund managers would track these sub-indexes then we would expect the index effect to hold for sub-indexes as well as the broad market index. Studying the index effect is of interest, as there appears to be an opportunity to earn abnormal returns. This opportunity arises primarily because of the behaviour of index fund managers who have to track the market index. Fund managers have two considerations, namely, to minimise tracking error², and/or minimise transaction costs.

To minimise transaction costs a manager has two options. Firstly, they could buy portions of stock in the days/months leading up to effective day (ED), attempting to reduce costs that result from a stock being included in an index. Secondly, they could hold a sample of the market index such as a sub-index like those studied in this paper. In order to minimise tracking error, a fund manager would buy stocks in the

² Tracking error is the difference between the return on a fund replicating a market index and the return of the market index. In order to minimise tracking error, fund managers would buy on the effective day of the index change.

appropriate weights reflecting the market index, and buy them very close to the time when they are actually added to the index.³

The plan for the remainder of this paper is as follows. Section two details the size sub-indexes on the ASX, in particular the ASX 20 leaders, ASX 50 leaders, and the ASX 100. Section three outlines the previous literature regarding index inclusion/exclusion and the subsequent index effect. Section four considers the nature of the data and the methodology used in this study. Section five presents the empirical results. Finally section six contains concluding remarks.

2. Size Indexes on the Australian Stock Exchange

The ASX publishes approximately 50 indexes, with price and accumulation versions being available on most of these. The core market index used in Australia is the ASX All Ordinaries Index (AOI), which prior to 3 April 2000 was an open-ended index comprising approximately 330 stocks⁴. Entry into the AOI index was based on satisfying both a market capitalisation criterion and a liquidity criterion. Within the market index are sub-indexes, these can be classified into three distinct groupings⁵:

- 1) Size sub-indexes- including ASX 100, ASX 50 leaders, ASX 20 leaders, and the Small Ordinaries.

³ Edmister et. al. (1994) observes that index fund managers have a greater incentive to reduce tracking error than to reduce transaction costs.

⁴ This study looks at price effects on size sub-indexes prior to 3 April 2000. After this date the AOI changed to a closed-end index comprising of 500 stocks, and style indexes are no longer present.

⁵ After 3 April 2000 the style indexes were no longer published by the ASX/ S&P index service.

- 2) ASX/Russell Style indexes- Including ASX/Russell All Value, ASX/Russell All Growth, ASX/Russell Value 100, and ASX/Russell Growth 100.
- 3) Sector indexes- including All Industrials, All Resources, and various industry indexes.

This study examines three size indexes, the ASX 20 leaders, ASX 50 leaders, or the ASX 100, all of which are subsets of the ASX AOI. For a company to be eligible for inclusion in any of these indexes it must satisfy the market capitalisation and liquidity requirements of the AOI. This means that if a large company is excluded from the AOI for liquidity reasons then it will be ineligible for inclusion in the size indexes.

The composition of the size indexes is determined by each company's full market capitalisation, despite the fact that a company's down-weighted 'index market capitalisation' will be used for calculation of these indexes⁶.

The ASX 100 contains the 100 stocks in the AOI with the largest aggregate market capitalisation and is generally regarded as the boundary between large and small companies. It covers approximately 90 percent of the domestic market capitalisation and has good coverage of most sectors of the market. The ASX 100 contains both industrials and resource stocks and is comprised of two subsets, the ASX 50 leaders and the ASX mid-cap 50.

As mentioned above the ASX 50 leaders is a subset of the ASX 100. It covers around 75 percent of domestic market capitalisation whilst containing only 8 percent of listed companies. This index is widely recognised as the cut-off between large cap and mid-

⁶ A company's full market capitalisation refers to its market price per share multiplied by the number of shares on issue. A company's down-weighted market capitalisation refers to its full market capitalisation down-weighted due to failure to meet the AOI liquidity requirements and/or double-counting (DC) due to cross holdings.

cap companies. The ASX 50 leaders has increased in coverage during the 1980's and 1990's due to both the transfer of capitalisation from resources to industrials, and the increasing number of large initial public offerings (IPO's) in recent years.

The ASX 20 leaders index is a subset of the ASX 50 leaders and represents approximately 55 percent of the domestic market based on capitalisation. Membership to this sub-index is reserved for the largest and most active stocks in the market. There is very little turnover in this index with changes primarily due to new listings or take-overs.

Changes to these three sub-indexes are announced via the "Monthly Index Analysis" published by the ASX. Changes are announced six weeks in advance of the effective date where possible. As these indexes have an exact quantity of member stocks, when one company is added, one must be removed. This implies for example that the number of additions to the ASX 20 leaders must equal the number of deletions for the ASX 20 leaders.

3. Index Changes Literature

The index effect is the anomaly relating to the reaction in stock prices on being added to or deleted from a market index. Excess positive price movements are common with stocks that are included in an index. Conversely negative price reactions have been associated with stocks which are removed from an index. Academic literature regarding the index effect has predominantly focused on changes to market indexes, not sub-indexes.

US studies examining this anomaly include Harris and Gurel (1986), Shleifer (1986), Arnott and Vincent (1986), Dhillon and Johnson (1991), Edmister, Graham and Pirie (1994), Beneish and Whaley (1996), and Lynch and Mendenhall (1997). These studies found inclusions (deletions) have an abnormal return of around 3.0 percent (-1.5 percent) when changes in the index compositions are announced.

Two further studies conducted by Chung and Kryzanowski (1998), and Chan and Howard (1999) for the Canadian and Australian markets respectively find similar results. Specifically, Chung and Kryzanowski (1998) find the mean cumulative abnormal returns (CAR) of approximately 2 percent when index inclusions are announced. Chan and Howard (1999) find that the four months prior to inclusion shares have significant positive returns. The day (week) before actual inclusion also has a significant positive return of 3.1 percent (3.0 percent). For deletions they find abnormal returns during the day (week) before actual deletion to be around -3 percent (-10 percent).

Harris and Gurel (1986) show that for the period 1978 to 1983, 84 additions to the S&P 500 recorded a mean abnormal return of 3.13 percent on the day the change was announced (AD). However the abnormal return attributed to additions was almost entirely reversed over the next twenty days. There were also 13 deletions during this time period, the analysis showed an abnormal return of -1.4 percent on day (ED +1), with no immediate price reversal after the effective date.

Shleifer (1986) also using S&P 500 additions data found that price increases associated with index inclusion has increased over time, suggesting a strong influence of the growth in index funds. Sheifer found no significant AD effect prior to 1976,

however for the periods 1976-80 and 1981-83, mean abnormal returns of 2.27 percent and 3.19 percent respectively were found.

Jain (1987) found the mean abnormal return for the S&P 500 on the AD to be 3.07 percent between the years 1977 and 1983, and the mean abnormal return for deletions on AD to be -1.16 percent. In addition to the S&P 500 Jain (1987) also examined additions to 'supplementary indexes' and found that stocks added to these indexes experienced an abnormal return of 2.93 percent on the actual addition day⁷. No significant returns were found for deletions to these supplementary indexes.

Beneish and Whaley (1996) investigate additions to the S&P 500 over the period January 1986 through to June 1994. Abnormal returns of 4.39 percent from AD to close ED were found. When a complete sample was split into sub-periods, they find the abnormal returns increased from 3.67 percent during the period January 1986 to September 1989 to 5.9 percent for the period October 1989 to June 1994. They also find a dramatic increase in volume after the announcement day.

In a more recent study, Lynch and Mendenhall (1997) used additions and deletions from the S&P 500 for the period March 1990 to April 1995. They found that additions from the clean sample earned a significant AD abnormal return of 3.8 percent.⁸ They find that a partial reversal occurs after the effective day (ED) which supports the notion that the temporary price effect is a result of index fund trading. Stocks deleted for the clean set were found to experience a significant abnormal return on AD of the magnitude of -6.3 percent. Between the announcement day, and the effective day

⁷ These supplementary indexes cover around 40 stocks that are not included in the S & P 500. Thus inclusion into such an index should not imply increased demand from index managers. Indexes not included in the S&P 500 in 1983 were gaming, Canadian oil and gas exploration, investment companies, real estate investment companies, and low-priced common stocks (Jain (1987)).

⁸ The clean set excludes firms effected by merger of spin-off activity around the time of index change.

cumulative abnormal return (CAR) for the clean additions (deletions) group was 3.8 percent (-14.1 percent). Partial reversals of these abnormal returns were found after the effective day.

Chung and Kryzanowski (1998) examined data for the Toronto Stock Exchange 300 (TSE 300) on the Canadian Stock Exchange for the period 1990 to 1994. They find the mean cumulative abnormal return (CAR) to be 1.7 percent for annual additions and 2.5 percent for non-annual additions respectively. An important point related to the current study is that additions (deletions) are drawn from stocks that have performed abnormally well (badly) relative to the market for an extended period prior to then announcement date as well as the immediate period before the actual inclusion date.⁹

Chan and Howard (1999) use data on Australian companies added to the All Ordinaries Index (AOI) from January 1992 to July 1998. As with the TSE 300, AOI inclusion has a long event window, with notification of index changes usually occurring six weeks prior to the effective date. Significant returns were found for the four months preceding the ED, and significant at the 1 percent level on ED-1. Chan and Howard (1999) find the effect of index funds buying to be 3.1 percent (3 percent) in the day (week) before the ED. The analysis shows that companies outperform (underperform) in the lead-up to being included (excluded) from an index, and then show random abnormal returns after the inclusion or deletion occurs.

⁹ A number of studies have shown that stocks included in an index outperform in the lead up to actual inclusion, see for example Edmister et. al. (1994) and Chung and Kryzanowski (1998). This suggests that a study of index inclusion may have some relation to the price momentum literature – studies related to the price momentum and winner-loser anomalies include De Bont and Thaler (1995,1997), Chan, Jegadeesh, and Lakonishok (1996), and Hong (1999). For the Australian market see Brailsford (1992), Allen and Prince (1995) and Gaunt (2000).

4. Data and Methodology

This study uses an initial sample comprising all changes to the ASX 20 leaders, ASX 50 leaders and ASX 100 between January 1994 and December 1999. The final sample of index changes however, is smaller, particularly for additions. This is due to limited historical data on large IPO's, such as Telstra, AMP, and C&W Optus, which are practically included straight into these-sub indexes.

Changes to the above sub-indexes were collected from the ASX publication "Monthly Index Analysis". This publication gives the first public notification of forthcoming changes to ASX indexes. When possible changes to the indexes are announced six weeks in advance of upcoming changes.

A uniqueness of the Australian market compared to other developed stock markets is that the exact announcement date of index changes is not known. This is because the time between when the "Monthly Index Analysis" is published and the time when market participants receive it is usually up to a week, or even longer. For this reason we should see more of an announcement window, rather than an announcement date approximately six weeks before the effective addition/deletion date (ED).

This study uses daily price data for all companies added to or deleted from the ASX sub-indexes and the AOI. Returns for 150 days prior to the effective date and 60 days post the effective date are used. All data was taken from the IRESS database¹⁰. The initial sample for the ASX 100 contained 62 additions and deletions, 25 additions and deletions for the ASX 50 leaders, and 10 changes were recorded for the ASX 20 leaders. The final samples consisted of 34 additions and 50 deletions for the ASX 100,

¹⁰ IRESS is a real-time provider of financial data owned by Bridge News.

17 additions and 21 deletions for the ASX 50 leaders, and 6 additions and 8 deletions to the ASX 20 leaders.

[INSERT TABLE 1 ABOUT HERE]

The reason for the reductions in sample size for additions is primarily due to the number of large IPO's lacking the necessary 150-day price history prior to being included in an index. The primary reason for the smaller sample regarding deletions is due to companies being taken over and thus subsequently being removed from the IRESS database.

Daily returns are calculated on a continuously compounded basis:

$$R_{i,t} = LN\left(\frac{P_{i,t}}{P_{i,t-1}}\right) \quad (1)$$

where $R_{i,t}$ is the continuously compounded return for stock i on day t , LN is the natural logarithm, $P_{i,t}$ is the price of stock i at time t , and $P_{i,t-1}$ is the price of stock i the previous trading day.

Daily average abnormal returns are calculated for each stock added to or deleted from the ASX sub-indexes using a market model (Brown and Warner (1985)). The abnormal return for stock i on day t is estimated by:

$$AR_{i,t} = R_{i,t} - (\mathbf{a}_i + \mathbf{b}_i R_{m,t}) \quad (2)$$

A 90-day estimation period is used to estimate α_i , and β_i . This historical period consists of pre-event trading days (ED-150 to ED-61). The daily abnormal return is estimated for 60 days prior to the effective change date and 60 days post the effective

date. The average abnormal return is then found for each of these 120 days. The average abnormal return is calculated as follows:

$$AAR_t = \frac{1}{N} \sum_{i=1}^N AR_{i,t} \quad (3)$$

A long event window is used to capture both the occurrences around both the effective date and the announcement date. As the announcement date is not a precise date, we should expect an announcement window to occur around day (ED -30), or approximately six weeks before the effective date.

In addition to this, the cumulative average abnormal return (CAAR) is also estimated for the periods: days (ED-61) to (ED-31), approximately pre-AD, and days (ED-29) to (ED-1) approximately post announcement but pre ED. After the ED the CAAR was also estimated for days (ED+1) to (ED+30) immediately post ED, and days (ED+1) to (ED+60) a longer period post AD. The CAAR was also calculated over the entire event window, days (ED-60) to (ED+60). The cumulative abnormal return is calculated as follows:

$$CAAR_t = \sum_{i=1}^N AAR_i \quad (4)$$

Calculating the CAAR allows analysis of time periods surrounding the announcement and effective change dates. This may allow some conclusions to be drawn concerning the behaviour of market participants, particularly regarding anticipating the announcement of index changes or to identify if there is any evidence of mean reversion present.

5. Results

The samples of additions and deletions from the three sub-indexes produce quite mixed results. As predicted, most of the price activity generally appears to occur around the time of announcement rather than when the actual changes occur. Also, as expected there is no one specific announcement date that is significant. The announcement window appears to be around (ED-34) to (ED-28), and there appears to be some evidence that the market anticipates the announcement of index changes.

The daily average abnormal returns for the six companies added to the ASX 20 leaders are shown in Table 2. The results show that there is consistently positive AAR up until day (ED-32). This is perhaps the day the market is publicly notified of upcoming index changes. This seems to imply that market participants anticipate the announcement of the index changes. This is a reasonable conclusion to draw considering the selection criteria, ie. Aggregate market capitalisation is a readily accessible measure. Market participants appear to buy stocks before the announcement is made and then sell after the news becomes public hoping that the release of information to the public will push up the price allowing them to sell at a profit. There is also a similar, although weaker pattern before the effective change date. Abnormal returns are positive in the days leading up to the change, with the AAR on (ED-2) is 1.3 % and significant at the 10 % level, and then become negative after the stock has been included in the sub-index.

[INSERT TABLE 2 ABOUT HERE]

A similar argument holds for deletions to the ASX 20 leaders seen in Table 3. There appears to consistently positive abnormal returns prior to the announcement date, with (ED-34) having an AAR of 1.54 % and being significant at the 10 % level The

announcement date appears to be around (ED-30), negative returns are present in the days immediately following. There also appears to be negative price pressure leading up to the time of actual change with AAR being -1% on (ED-1). The effective change date however, is followed by positive returns on day (ED+2) to (ED+5), with these four days have a CAR of around 3% .

[INSERT TABLE 3 ABOUT HERE]

The lack of significant AAR's in both the additions and deletions sets may be attributable to the small sample sizes, however it may also indicate that the ASX 20 leaders index is not widely tracked by fund managers. This may not be a great surprise as the ASX 20 leaders only covers approximately 55 percent of the AOI. In any case the results for this index differ from those Howard and Chan (1999) found for the AOI, where significant negative returns were found on (ED -2),(ED -1), and ED for deletions, and (ED -1), and ED for additions.

Additions to the ASX 50 leaders, in Table 2 present a similar story to the ASX 20 additions, however the results are more convincing. Up until (ED-29), the AAR's are consistently positive with the AAR on this date being 1.08% and significant at the 10% level. After this date however returns are almost completely negative with a much higher incidence of significant returns, the CAR for the five days leading up to the effective date is -2.7% . There does appear to be a partial reversal after the effective date however. Returns are negative up to this time and then appear randomly distributed afterwards. This randomness of returns after index inclusion is consistent with the findings of Howard and Chan (1999) for the AOI.

Deletions from the ASX 50 leaders index in Table 3, does not offer a clear picture of what is happening. There does appear to be some negative abnormal returns prior to

(ED-32), after which returns are generally positive until (ED-4). There is negative price pressure in the days leading up to the effective change date with the return on (ED-1) being -0.67% and significant at the 10 percent level. After the effective date, returns again appear to be randomly distributed.

The sample containing additions to the ASX 100 index shown in Table 2 shows that around the announcement date, which is estimated to be (ED-28), predominantly positive returns are evident. Again the common pattern for the addition samples emerges. Positive returns prior to the announcement are replaced by negative returns in the period immediately following. Days (ED-27), and (ED-26) are both negative and significant at the 10%, and 5% level respectively. The period leading up to the announcement is again negative with the abnormal return on day (ED-1) being -1.05% and significant at the 1% level, and the abnormal return on (ED-1) is -1.07% and significant at the 5% level.

For the sample of deletions to the ASX 100 in Table 3, all of the price pressure appears to be occurring during the announcement window. The announcement date would appear to be (ED-28). Prior to this date returns were consistently negative and they are consistently positive following this date, with (ED-28) having an AAR of 1.09%, which is significant at the 1% level. Returns are positive but insignificant in the time both prior to, and post the effective date.

The results for the six samples show a definite pattern present around the time of the announcement and the effective date. The additions provide a clearer indication of what is happening relative to the deletion samples. It appears that investors anticipate the announcement of index changes and buy stocks that are going to be added to indexes prior to the announcement and then sell them once the announcement is made

publicly. The opposite appears to happen with deletions, with investors selling them prior to the announcement date and buying them after the announcement.

This consistency pattern is also evident when the cumulative abnormal returns (CAR) are analysed. For additions to the three sub-indexes, the CAR's seen in Table 4, show that prior to the announcement date all three samples have positive abnormal returns ranging from 1.1% for the ASX 20 leaders, to 2.01% for the ASX 50 leaders. After the announcement date however, all the samples show a negative abnormal return, by the magnitude of over 11 % for the ASX 50 leaders. Over the whole 120-day period all three additions samples have a negative CAR, with the smallest being 6.44 % for the ASX 20 leaders.

[INSERT TABLE 4 ABOUT HERE]

The CAR results for the deletion samples however are mixed and no clear pattern is identifiable, this can be seen in Table 5. It does appear however that after the announcement date all three deletion samples earn substantial positive abnormal returns. The sample containing deletions from ASX 50 leaders index experienced the smallest CAR of 9.6 %, while deletions from the ASX 20 leaders earned a CAR of 13.7 % after the announcement date.

[INSERT TABLE 5 ABOUT HERE]

The above results are also represented in Figures 1-6. These figure show that for samples both entering and exiting a sub-index, a trend in the CAR's appears to be established around the time of announcement. In each of the samples this trend continues for at least 60 days after the effective date. This is contrary to what was expected. After the effective date abnormal returns should be close to or equal to zero,

thus establishing a flat trend in the CAR figures. This does not however appear to be the case. None of the graphs, except perhaps additions to the ASX 50 leaders appear to show a flattening of the CAR trend.

Additions appear to consistently underperform after it is announced that they will be included in a sub-index, and deletions seem to outperform after it is announced that they will be excluded. This trend is particularly noticeable for the samples with the most data, the ASX 100 additions and deletions.

[INSERT FIGURES 1-6 ABOUT HERE]

These figures also illustrate that although there appears to be some price action around the effective date, there is a much stronger occurrence around the announcement date. As expected, this reinforces the findings outline above that the market reacts predominantly to the announcement of the change rather than the actual change.

Comparing these results to the results that Howard and Chan (1999) found for the AOI, it appears that if the index effect witnessed is due to index fund managers, then those who track the Australian market are more likely to invest in the AOI, rather than use a proxy such as the ASX20 leaders, ASX 50 leaders, or the ASX 100.

If the above argument holds true then it would seem that index fund managers are more concerned with reducing the tracking error than reducing transaction costs. This can be seen through the much stronger index effect for the AOI deletions and additions in comparison to the sub-index effect. If index fund managers do track the AOI then they would already hold stocks added/deleted from the sub-index and thus

would not be forced to buy upon announcement or the effective date of change. This would have the effect of reducing the sub-index effect.

6. Conclusion

This paper examines the price effect on stocks being added to or deleted from size sub-indexes on the Australian Stock Exchange. The analysis shows that there is a definite, albeit weak price effect around the time of both the announcement and the effective change. Additions to these indexes earn a positive CAR in the thirty days before the announcement date, but this is reversed in the following 90 days, which produce a negative CAR. Deletions do not offer such a clear picture, this is consistent with the findings of Jain (1987), who found mixed results for deletions to supplementary indexes in the US. It is clear however, that deletions earn a positive CAR over the whole 120-day time period.

From the results presented here and those of Howard and Chan (1999), it would appear that the index effect in Australia is much more prominent for the AOI compared to the size-sub-indexes. From this we might draw the conclusion that index managers tracking the market are more inclined to hold the entire AOI as their market portfolio rather than to hold a sub-index as a proxy for the AOI. This develops the belief that index fund managers in Australia are more concerned with reducing tracking error than reducing transaction costs.

Table 1: Additions and deletions to ASX size sub-indexes

	ASX 20 leaders		ASX 50 leaders		ASX 100	
	<i>Additions</i>	<i>Deletions</i>	<i>Additions</i>	<i>Deletions</i>	<i>Additions</i>	<i>Deletions</i>
Initial Sample	10	10	25	25	62	62
Final Sample	6	8	17	21	34	50

Table 2: Additions to the size sub-indexes on the Australian Stock Exchange

Event Day	ASX 20 Leaders Additions			ASX 50 Additions			ASX 100 Additions		
	Number of firms	Daily Average Abnormal Returns (AAR)	t-statistic for AAR	Number of firms	Daily Average Abnormal Returns (AAR)	t-statistic for AAR	Number of firms	Daily Average Abnormal Returns (AAR)	t-statistic for AAR
-60	6	0.0048	0.88	17	0.0053	0.77	34	0.0028	0.73
-50	6	0.0063	0.98	17	-0.0067	-1.63	34	0.0019	0.68
-40	6	0.0004	0.04	17	0.0069	1.54	34	-0.0086	-1.35
-34	6	0.0062	1.27	17	0.0016	0.42	34	0.0036	1.30
-33	6	0.0149	1.88	17	-0.0021	-0.43	34	0.0018	0.52
-32	6	-0.0072	-1.95	17	0.0029	0.57	34	0.0058**	2.72
-31	6	-0.0075	-0.92	17	0.0039	0.85	34	-0.0018	-0.72
-30	6	-0.0003	-0.04	17	0.0057	1.16	34	-0.0021	-0.53
-29	6	-0.0040	-0.42	17	0.0108*	2.07	34	0.0013	0.56
-28	6	0.0026	0.91	17	-0.0006	-0.14	34	0.0019	0.74
-27	6	0.0076	0.77	17	-0.0006	-0.15	34	-0.0047*	-1.75
-26	6	-0.0046	-0.91	17	-0.0015	-0.46	34	-0.0067**	-2.15
-20	6	0.0014	0.51	17	-0.0039	-1.15	34	0.0036	0.94
-10	6	-0.0043	-1.69	17	-0.0070*	-1.82	34	0.0010	0.48
-5	6	0.0046	0.52	17	-0.0025	-0.55	34	-0.0105***	-3.13
-4	6	0.0068	1.12	17	-0.0091**	-2.14	34	0.0002	0.04
-3	6	0.0021	0.61	17	-0.0066*	-2.02	34	-0.0028	-1.04
-2	6	0.0130*	2.46	17	-0.0024	-0.59	34	-0.0004	-0.13
-1	6	-0.0071	-0.95	17	-0.0019	-0.67	34	-0.0107**	-2.64
0	6	-0.0051	-1.21	17	0.0020	0.68	34	0.0060	1.63
1	6	-0.0047	-0.66	17	-0.0033	-1.07	34	0.0058	1.27
2	6	0.0022	0.29	17	0.0021	0.36	34	-0.0024	-1.05
3	6	-0.0075	-1.58	17	-0.0023	-1.33	34	0.0050	1.05
4	6	-0.0010	-0.22	17	0.0004	0.13	34	-0.0009	-0.27
5	6	0.0057	0.66	17	-0.0046	-1.01	34	-0.0054	-1.60
10	6	-0.0076	-1.17	17	-0.0079*	-1.76	34	0.0036	1.01
20	6	0.0059	1.30	17	0.0016	0.19	34	-0.0021	-0.45
30	6	-0.0068	-1.80	17	0.0034	0.72	34	-0.0060*	-1.88
40	6	-0.0074	-1.36	17	0.0015	0.48	34	-0.0039	-1.17
50	6	0.0064	1.24	17	-0.0014	-0.53	34	-0.0054	-1.60
60	6	0.0097*	2.32	17	-0.0006	-0.23	34	-0.0015	-0.59

* Statistically significant at the 10 percent level for a two tailed test.
 ** Statistically significant at the 5 percent level for a two-tailed test.
 *** Statistically significant at the 1 percent level for a two-tailed test

Table 3: Deletions to the size sub-indexes on the Australian Stock Exchange

Event Day	ASX 20 Leaders Deletions			ASX 50 Deletions			ASX 100 Deletions		
	Number of firms	Daily Average Abnormal Returns (AAR)	t-statistic for AAR	No. of firms	Daily Average Abnormal Returns (AAR)	t-statistic for AAR	Number of firms	Daily Average Abnormal Returns (AAR)	t-statistic for AAR
-60	8	0.0157	1.79	21	-0.0064	-1.51	50	-0.0016	-0.43
-50	8	0.0088	1.49	21	0.0071**	2.17	50	0.0020	0.69
-40	8	-0.0014	-0.14	21	-0.0057	-1.49	50	-0.0017	-0.62
-34	8	0.0154*	2.03	21	0.0013	0.25	50	-0.0064**	-2.37
-33	8	0.0042	0.87	21	-0.0176	-1.19	50	-0.0013	-0.43
-32	8	0.0071	1.28	21	-0.0063	-0.93	50	-0.0031	-1.16
-31	8	0.0147	1.81	21	0.0054	1.02	50	-0.0016	-0.29
-30	8	-0.0089	-1.30	21	0.0002	0.03	50	-0.0039	-1.10
-29	8	-0.0031	-0.83	21	0.0002	0.04	50	-0.0041	-1.06
-28	8	-0.0089	-1.10	21	0.0126**	2.43	50	0.0109***	2.73
-27	8	-0.0053	-0.96	21	0.0000	0.01	50	0.0023	0.70
-26	8	-0.0034	-0.56	21	0.0083	1.35	50	0.0018	0.56
-20	8	0.0033	0.53	21	0.0072	0.50	50	-0.0050	-1.50
-10	8	-0.0043	-0.94	21	0.0038	1.17	50	-0.0012	-0.34
-5	8	-0.0001	-0.02	21	0.0070	1.01	50	-0.0008	-0.19
-4	8	-0.0009	-0.24	21	-0.0003	-0.11	50	0.0040	1.09
-3	8	0.0021	0.44	21	0.0033	0.74	50	0.0012	0.32
-2	8	-0.0038	-0.69	21	-0.0025	-0.65	50	0.0019	0.48
-1	8	-0.0101	-1.46	21	-0.0067*	-1.77	50	0.0016	0.50
0	8	-0.0092	-0.58	21	0.0031	0.88	50	0.0031	1.08
1	8	-0.0006	-0.09	21	-0.0039	-1.17	50	0.0016	0.60
2	8	0.0044	0.77	21	0.0051	1.26	50	-0.0029	-1.40
3	8	0.0062	0.85	21	0.0039	1.35	50	0.0012	0.32
4	8	0.0138	1.12	21	-0.0043	-1.31	50	0.0061*	1.96
5	8	0.0055	0.75	21	0.0003	0.07	50	0.0046	1.46
10	8	-0.0056	-1.31	21	-0.0008	-0.25	50	0.0010	0.34
20	8	0.0098	1.81	21	0.0055	1.13	50	0.0052	1.51
30	8	0.0057	0.71	21	0.0094*	1.96	50	-0.0017	-0.66
40	8	-0.0051	-0.91	21	0.0068***	3.17	50	-0.0046	-1.13
50	8	0.0023	0.37	21	-0.0030	-0.76	50	-0.0015	-0.48
60	8	0.0042	0.49	21	0.0011	0.31	50	0.0025	0.59

* Statistically significant at the 10 percent level for a two tailed test.

** Statistically significant at the 5 percent level for a two-tailed test.

*** Statistically significant at the 1 percent level for a two-tailed test

Table 4: Cumulative abnormal returns (CAR) for additions to ASX sub-indexes

	ASX 20 additions	ASX 50 additions	ASX 100 additions
	<i>CAR</i>	<i>CAR</i>	<i>CAR</i>
(ED-60) to (ED -31)	0.0119	0.0201	0.0174
(ED-29) to (ED-1)	-0.0218	-0.0351	-0.0520
(ED+1) to (ED+30)	-0.0148	-0.0552	-0.0338
(ED+1) to (ED +60)	-0.0492	-0.0695	-0.0790
(ED-29) to (ED+60)	-0.0761	-0.1026	-0.1211
(ED-60) to (ED+60)	-0.0644	-0.0769	-0.1058

Table 5: Cumulative abnormal returns (CAR) for deletions from ASX sub-indexes

	ASX 20 deletions	ASX 50 deletions	ASX 100 deletions
	<i>CAR</i>	<i>CAR</i>	<i>CAR</i>
(ED-60) to (ED -31)	0.0727	-0.0412	-0.0493
(ED-29) to (ED-1)	-0.0213	0.0560	0.0465
(ED+1) to (ED+30)	0.0875	-0.0012	0.0582
(ED+1) to (ED +60)	0.1673	0.0370	0.0978
(ED-29) to (ED+60)	0.1370	0.0961	0.1473
(ED-60) to (ED+60)	0.2006	0.0551	0.0941

Fig.1: Cumulative Abnormal Returns (CAR) for additions to the ASX 20 leaders

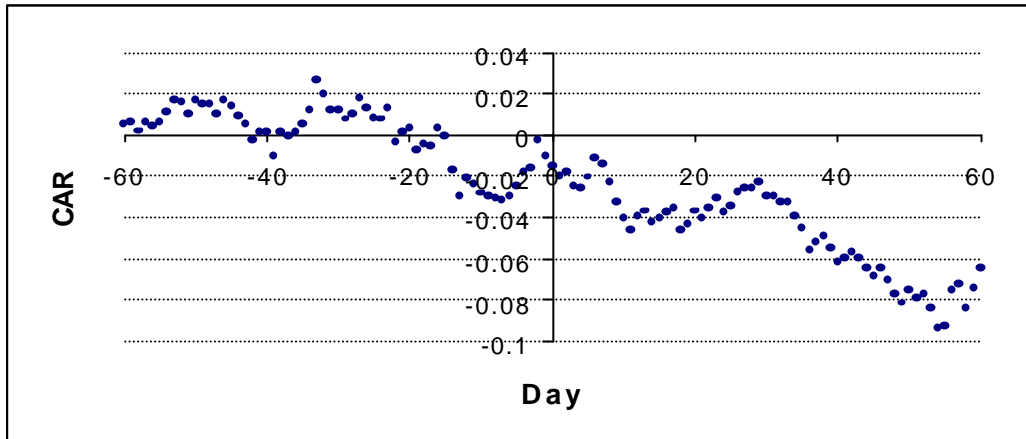


Fig. 2: Cumulative Abnormal Returns (CAR) for deletions to the ASX 20 leaders

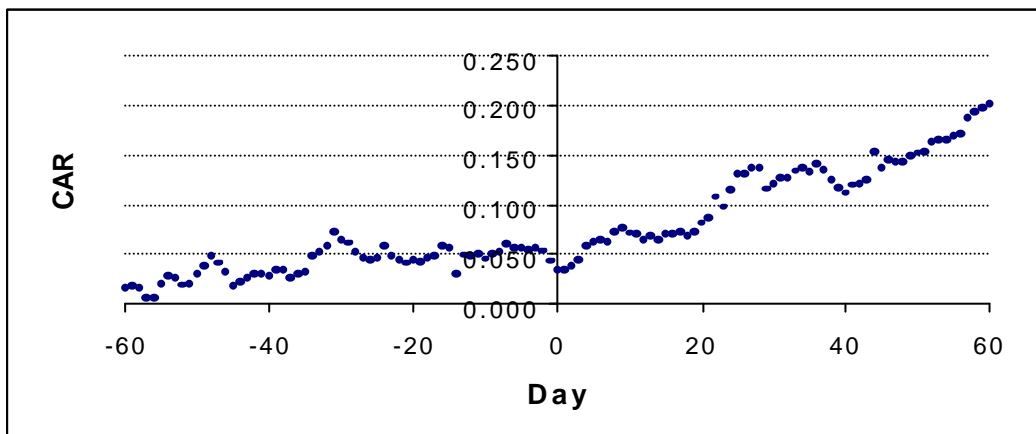


Fig. 3: Cumulative Abnormal Returns (CAR) for additions to the ASX 50 leaders

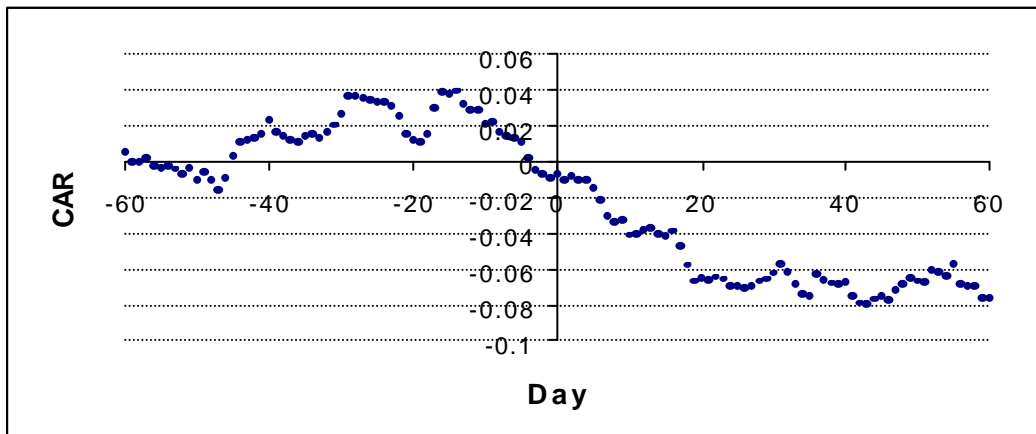


Fig. 4: Cumulative Abnormal Returns (CAR) for deletions to the ASX 50 leaders

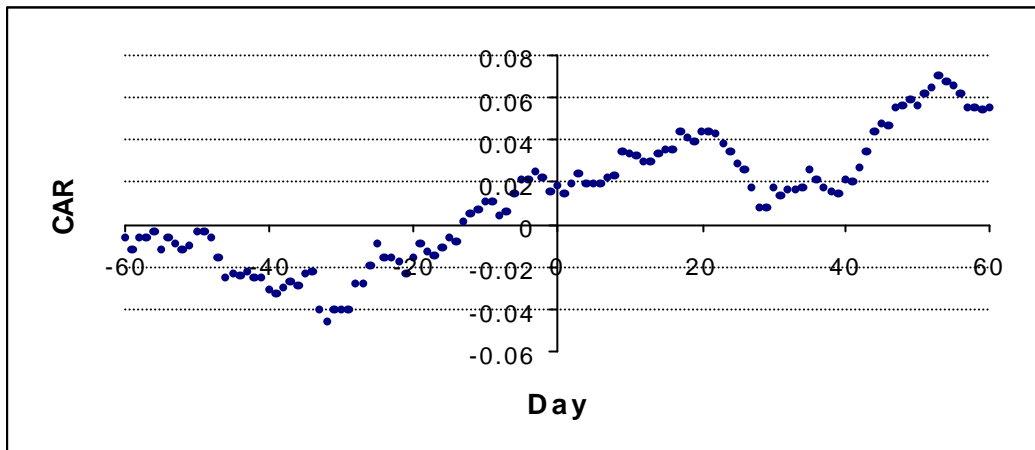


Fig. 5: Cumulative Abnormal Returns (CAR) for additions to the ASX 100

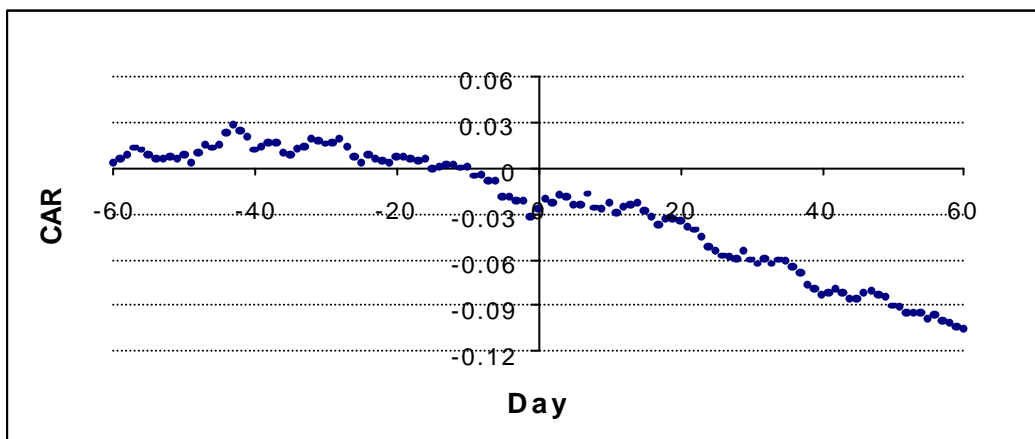
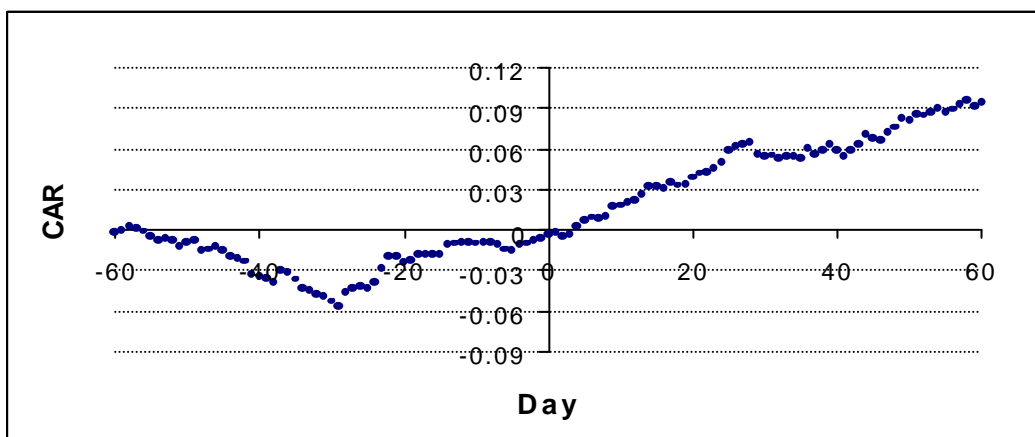


Fig. 6: Cumulative Abnormal Returns (CAR) for deletions to the ASX 100



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