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The effect of changes in equity index composition on stock price

The case of the S&P/ASX 20, 50, and MidCap 50

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Abstract

This paper is aimed at evaluating the index effect for the Australian blue-chip and midcap indices using changes in index composition from the S&P/ASX 20, 50 and MidCap 50. For the midcap index I find significant CAARs for the period prior to the announcement period which would signify that market participants anticipate the changes to index composition and possibly try to exploit the already established in literature phenomenon that is the index effect. For exclusions from the S&P/ASX MidCap 50, I find significant negative price effect after the effective date which does not revert in the next 20 days. The imperfect substitutes hypothesis is used to explain the finding.

Keywords:

Index effect, S&P/ASX 20, S&P/ASX 50, S&P/ASX MidCap 50, Event study

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Table of Contents

1. Introduction

The change in the price of a stock related to its inclusion or exclusion from a stock index, commonly known as the index effect, is a topic which has long been of interest to researchers. A number of academic papers have been published on the subject. However, as of the writing of this paper, the Australian stock market has been examined to a limited extent. The market is very interesting from a research perspective as passive investment is very popular in the country, Australia has a market-based economy, and the examined equity indices are comparable to past research on the US equity market. This paper examines the index effect for the large-cap Australian stock market indices S&P/ASX 50 and S&P/ASX 20, and also the mid-cap index S&P/ASX Midcap 50. All three of the indices use a similar methodology for changes in index constituents which is based on public information.

The research topic has both practical and theoretical relevance as the index inclusion/exclusion effect can be seen as a trading strategy and also, potentially, as a contradiction to the Efficient Market Hypothesis (EMH) which states that all information regarding a publicly traded company is reflected in its stock price. As the inclusion and exclusion of a stock from an equity index does not reveal new information regarding the company, there should not be any effect on a newly included or excluded stock's price. However, some theories propose that the changes in index composition convey information to the market that could be priced which would not be in contradiction with the EMH.

This paper draws motivation from the surge in popularity of passive investing in the form of exchange-traded funds (ETF) and index funds. The idea of matching the market returns by investing in a portfolio that replicates an index. An index fund essentially is a mutual fund that replicates a stock index by creating a portfolio which matches the weights of companies that are included in the index, thus replicating the performance of the index.

The S&P/ASX 20, 50 and MidCap 50 are equity indices for the Australian market developed and maintained by Standard and Poor's. All three of the indices are part of the S&P/ASX family of equity indices designed to represent the Australian stock market. The ASX 20 represents around 47% of Australia's stock market capitalization (as of March 2017) and the S&P/ASX 50 is valued at around 62% of the Australian market capitalization. All three indices contain highly liquid institutionally investible stocks listed on the Australian Securities Exchange and are replicated by ETFs. The ASX MidCap 50 is seen as the benchmark performance of the mid-cap sector for stocks listed on the Australian Securities Exchange.

The research objective of this paper is to show that a stock index inclusion/exclusion causes an anomaly in the price of a public company's stock and to examine the underlying reasons. The prevailing literature uses four main theoretical hypotheses to explain the previous findings for the index effect. Namely, these are the imperfect substitute hypothesis, the price pressure hypothesis, the information signaling hypothesis, and information cost/liquidity hypothesis which will be examined on a later note.

The rest of this paper is structured in the following way. Section 2 contains literature from past studies on the index effect. Section 3 examines the most prevalent theoretical explanations for the researched topic. Section 4 describes the use of an event study to measure the abnormal performance of the examined stocks. Section 5 describes the data used in this paper. Section 6 presents the results from the event study for the different indices. Section 7 presents the conclusion drawn from the event study based on theory and findings.

2. Previous literature

The index effect has been a popular topic with researchers and it has been examined for most major equity markets in the world. Past literature for these various indices has documented that companies subject to changes in index composition experience abnormal returns which can be temporary or long-term. Additionally, there has been some research that shows that the index effect is diminishing (Kappou, 2017) which would be reasonable to assume since its popularity has grown over the years.

One of the first to examine the index effect, Shleifer (1986) showed significant abnormal returns associated with the S&P 500 on the announcement day which last for at least 10 days after the effective date. His paper provides support to the hypothesis that demand for stocks has a downward sloping curve. Additionally, the author finds no correlation between bond ratings for the companies and stock index participation, and therefore, argues against the hypothesis that an index inclusion is a sign of good stock quality.

In their paper, Harris and Gurel (1986) provide evidence for the price pressure hypothesis which is examined in Section 3.1analyzing the S&P 500 over the period of 1973-1983. Their findings are that there is a 3% increase in the stock price of the stocks included in the index on the announcement date. However, the effect is not permanent and is reversed within 3 weeks. This supports the notion of a downward sloping curve for stocks i.e. that stock price is dependent on the quantity of stock demanded.

Using data from April 2000 to June 2009, Zhao R, et al. (2016) analyzed the index effect for the S&P/ASX 200 which is regarded as Australia's benchmark equity index. They find significant average abnormal returns on announcement date for both inclusions and exclusions. Their findings show that exclusions experience -3.11% average abnormal returns around the announcement date and negative CAARs between the announcement and effective dates which are reversed after the implementation date. Additionally, abnormal trading volumes are discovered around the effective dates which coupled with their other findings provides partial support for the price pressure hypothesis (which will be examined in chapter 3.1).

Kappou (2017) argues that due to the popularity of the index effect its potency has diminished through time. Using a post-2008 financial crisis sample, the author analyzes the S&P 500 index and shows that there are no abnormal returns between announcement and effective dates. Furthermore, all abnormal returns on the effective date are insignificant and all price changes are fully reversed in the long-term. The author provides evidence against the prevailing hypotheses that aim to explain the index effect, arguing that the S&P composition changes hold no tradeable information.

Tsenev (2015) performed a study on the index effect which aimed to determine if the effect was permanent using the Euro STOXX 50 stock index. The author's findings were that stocks which are included or excluded from a stock index show a significant short-term effect, but do not show any long-term abnormal returns which provides support for the price pressure hypothesis. Additionally, the author provided a study on changes in operational performance of included and excluded stocks to try and match the results of an earlier study carried out by Denis et al. (2003) for the S&P 500 index, who found a positive association of index inclusion and operational performance. However, the study on the Euro STOXX index did not match the earlier results.

Comparing the index effect for the OMXS 30 and the EURO STOXX 50 indices Blomstrand et al. (2010) found evidence to support the Price pressure hypothesis. The results of the paper showed that for both the OMXS 30 and the EURO STOXX 50, inclusions had an upward effect on prices and increase in volumes traded in the short term while exclusions provided evidence for a downward effect on prices and an increase in volumes traded around the effective date. Furthermore, the authors also found a more pronounced long-term effect for OMXS 30 than the EURO STOXX 50 which they attribute to the smaller market of Swedish companies in comparison to the European blue-chip index. The authors argue that this finding provides support for the imperfect substitute hypothesis (examined in chapter 3.2) which would mean that the Swedish market offers fewer substitutes than its counterpart.

3. Theoretical background

According to the Efficient Market Hypothesis (EMH), a company's stock price fully reflects all available information regarding the company. A shift in stock price after the inclusion or exclusion of a stock from an equity index would signify a contradiction of the EMH. A public company that issues the shares does not experience any change in performance and no new information about the company is revealed due to the inclusion/exclusion of its stock from an equity index.

The methodology for index composition used by the equity index of interest for this paper is transparent and changes are publicly announced before the actual event. Additionally, the company information needed for the ranking of potential changes in index composition is readily available on most financial data sources. Therefore, changes in the index composition can be predicted by investors. In other words, by using the market capitalizations and trading volumes of the largest companies in the Australian stock market, an investor can predict all changes to the composition of the equity index which are related to the quarterly index review. In essence, the changes made to the index composition are public information and, therefore, according to the EMH, should not be a predictor of future price performance.

To try and explain the empirical findings of past research that have captured the index effect, researchers have proposed several theoretical hypotheses. The most prevalent explanations for the abnormal returns associated with the index effect are the price pressure hypothesis (PPH), the information cost/liquidity hypothesis (ICH), the imperfect substitute hypothesis (ISH), and the information signaling hypothesis (InSH).

3.1 The price pressure hypothesis

This hypothesis first introduced by Scholes (1972), contradicts the EMH and proposes that investors must be compensated for trades that they would otherwise not have made. In essence, the transaction costs and portfolio risks that the sellers/buyers are required to incur are compensated with a premium designed to cover their costs for supplying the required liquidity by the market. Therefore, a short-term fall/rise in stock price would be observed when an event causes the unwilling sale/buy transaction of the affected stock, Thereafter, the price would revert as soon as the demand is balanced.

In the case of the index effect, this hypothesis would signify that a price of a stock can experience a short-term increase/decrease due to an increase/decrease in demand spurred by the investment funds which replicate the stock index. The index funds which replicate the index would need to immediately buy the newly included stock and sell the newly excluded stock. This sudden increase in demand for the newly included stock would need to be met by selling parties who need to be rewarded for supplying the sudden demand for liquidity in the market. In turn, the newly sold stock would need to be sold at a lower price than the current market price. Therefore, a short-term spike in price and increase in trading volumes should be observed when a stock is introduced to an index and a short-term fall in price and increase in traded volumes should be observed when a stock is excluded from an index.

3.2 The imperfect substitutes hypothesis

Proposed by Scholes (1972), Kraus & Stoll (1972), Hess & Frost (1982) the imperfect substitutes hypothesis contradicts the assumption made by the EMH that stocks are near perfect substitutes of each other. The specific argument which is contradicted is that due to the near perfect elastic demand of stocks, shocks on the demand or supply that hold no new information about the stocks should not affect the stock price. The theory argues that stocks are not close substitutes to other stocks and demand for equities is not near perfectly elastic in the long-term. Therefore, the equilibrium prices would change when excess demand causes a shift in the demand curve and prices would not go back to their initial level.

Due to the need to rebalance investors' portfolios after the changes in index composition, this theory proposes a long-term permanent effect of the index effect which would mean that following an inclusion/exclusion of a stock from an equity index a long-term price rise/fall would be observed for the affected stock. The effect on trading volumes stemming from this theory is not clear but if investors use buy and hold strategies the volume effects should be the same as in the price pressure hypothesis.

3.3 The Information cost/liquidity hypothesis

The paper by Barry and Brown (1985) suggests that as more information regarding a security is supplied to the market, the less risk there will be regarding the security as expectations of stakeholders converge. Beneish and Gardner (1995) build on the previous notion by analyzing the index effect on the US equity index Dow Jones Industrial Average (DJIA) and propose the information cost/liquidity hypothesis. Contrary to other scientific papers for other American indices, they do not find any effect on stock price and trading volumes for newly included stocks in the DJIA. However, the authors find a negative effect on stock prices of excluded stocks from the equity index. They argue that the DJIA for their sample space does not have index funds who replicate the index and attribute the negative effect on the price of excluded stocks to the information cost/liquidity hypothesis which states that investors would require a premium for higher trading costs and holding stocks who have relatively less information about them. The expected effect of this theory is permanent and positive for inclusions and negative and permanent for exclusions. For volumes the hypothesis is not clear if there would be any significant effect.

3.4 The Information signaling hypothesis

Jain (1987) in her paper on the index effect for the S&P 500 discusses the information signaling hypothesis. The premise is that inclusion/exclusion of a stock in an equity index can be seen as good/bad news about the company as there are requirements for the inclusion of a company in a stock index which might indicate that a company deserves to be priced higher/lower. The hypothesis goes further by proposing that the permanent price increase is attributed to the additional media coverage resulting in the company receiving additional media attention when included into a stock index. This hypothesis proposes a long-term price increase/decrease of a stock inclusion/exclusion from an equity index. For the trading volume, it is not exactly clear what the effect would be but a long-term increase in trading volumes is suggested for inclusions and long-term decrease in trading volumes for exclusions. Because equity index participation is widely covered by the media, it can be argued that being included in an index is widely recognized and would bring about the attention of additional research on the index participants.

4. Methodology

In order to quantify the index effect, I employ a standard event study as specified by MacKinlay (1997). As financial theories advocate that a firm's stock price contains all available information regarding the firm, the use of an event study shows whether there is any quantifiable effect from an event. In the case of this paper, the event is defined as a stock inclusion or exclusion from a stock index. A standard event study description follows below. I start by defining the characteristics of the events study which are the length of the examined period, the length of the period used for estimation of the expected return models, effective date (actual event date), and announcement period (the indices have a fixed period before the effective date where they supply the information to the market).

4.1 Event Periods

This paper defines Event Day (ED) as the day on which changes in index composition are made effective. The length of the examined period further defined as the Event window is set to 30 days before and 20 days after the Event date inclusive.

The period used to estimate the expected return models, defined as the Estimation window, is set to 100 days which in event time is represented by the period of ED -131 to ED – 31. To avoid the event returns having an influence on the estimated returns, the Event window and Estimation window do not overlap each other.

As information about the index composition changes is conveyed to the market one week, or around five trading days, prior to the effective date, the day of announcement is included in the event window. For the periodic index composition review changes in March, June, and

December the effective dates are announced two weeks prior and for the reviews, in September the effective dates are announced one week prior. The announcement period is therefore set in event time as ED-10 to ED-5 as the data is in trading days. The Event study periods are illustrated in *Figure 1*.

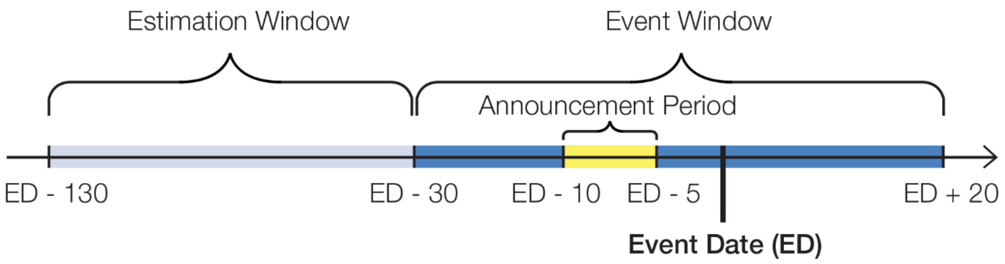

Figure 1. Event study periods

4.2 Abnormal returns

To show if there is any effect of the event on the stock prices of the companies, I calculate the abnormal returns who represent the difference between the actual returns and the estimated expected normal returns which would have happened if no event had occurred. The calculation is specified in equation 1.

$$AR_{i,t} = R_{it} - E(R_{i,t}|X_t) \qquad (1)$$

Where $AR_{i,t}$ is the abnormal return, R_{it} is the actual return, X_t is the examined event, and $E(R_{i,t} | X_t)$ are the expected returns conditional on event X_t not occurring.

The abnormal returns show how the stock price deviates from its expected values which would have happened without the effect of the event for single days and single stocks. Abnormal returns vary across the time-series and the cross-section. The average abnormal returns are calculated in order to aggregate the abnormal returns along the cross-section.

$$AAR = \frac{1}{N}\sum_{i=1}^{N} AR_{i,t} \qquad (2)$$

Where AAR is Average abnormal returns and $AR_{i,t}$ is previously defined.

I use the cumulative abnormal returns to calculate the variation of the stocks across the time dimension.

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{i,t} \qquad (3)$$

Where CAR is the cumulative abnormal return for the period of ED-30 < $t_1 \leq t_2 \leq$ ED+20 and AR is previously defined.

In order to identify a pattern in the whole data set for the changes in index composition, the Cumulative Average Abnormal Returns are calculated to aggregate along both the securities and through time. An assumption is made that there is no correlation between the abnormal returns for the sample of securities as the events do not overlap one another.

$$CAAR = \frac{1}{N} \sum_{i=1}^{N} CAR_{t_1,t_2} \qquad (4)$$

Where

CAAR is the Cumulative average abnormal returns in the event window ED-30 $\leq t_1 \leq t_2 \leq$ ED+20,

CAR is the Cumulative average return

N is the number of days in the event window

4.3 Constant mean return model

In order to estimate the Expected returns, this paper employs two return models – the constant mean return model and the market return model. This is consistent with past literature on other indices that research the index effect and will be used for comparison purposes.

The model posits that a security's mean return is constant over time. Although very restrictive in nature, Brown and Warner (1980, 1985) show that the model generates very close results to those of other more sophisticated models. In this paper, the constant mean model is estimated as the average return of 100 trading days over of the period of 131 days before the event date to -31 days before the event date.

4.4 Market model

The assumption of the market model is that a stable linear relationship exists between the market return and the individual stock return. By controlling for the variance in the returns of the market, the model decreases the variance in the abnormal returns. The model is specified as follows.

$$AR_{i,t} = R_{it} - \left(\alpha_i - \beta_i * R_{m,t}\right) \qquad (5)$$

Where

α_i and β_i are the intercept and slope estimated by an OLS regression of the company returns on the S&P/ASX 200 market returns.

$R_{i,t}$ is the return for the individual company which is subject to change in index composition

$R_{m,t}$ is the return for the market index, ASX 200 which contains the 200 largest companies by float-adjusted market capitalization in Australia and is perceived to be a good representation of the market return.

A possible bias of using the market model is reported by Edmister et al. (1994), who argues that there is a possibility of biased coefficient estimates due to a selection criteria effect. The argument is that a stock with a significant price increase or decrease in comparison to the market during the pre-event period is more likely to be included or excluded from an index. For this reason, I present both models in the results section.

4.5 Abnormal volumes

The abnormal trading volumes are calculated in a similar manner as the abnormal returns. However, there is a need to transform the volume variables before doing the calculations. All calculations are done in accordance with Campbell and Wasley (1996). Additionally, a log-transformed variable is used as suggested by Ajinkya and lain (1989), and Cready and Ramanan (1991).

$$V_{i,t} = \log\left(\frac{n_{i,t} + 0.000255}{S_{i,t}} * 100\right) \qquad (6)$$

Where

$V_{i,t}$ is the abnormal volume transformed variable

$n_{i,t}$ is the trading volume for company i on day t

$S_{i.t}$ is the number of shares outstanding for firm i on day t

0.000255 is a constant which has the purpose of preventing log-transformation on negative values

4.6 Significance testing

I use a cross-sectional student's t-test to check for statistical significance in the cumulative abnormal returns and the average abnormal returns. Testing if the average abnormal returns are zero, I specify H_0: AAR = 0 and H_1: AAR ≠ 0.

$$t_{AAR_t} = \sqrt{N}\frac{AAR_t}{S_{AAR_t}} \qquad (7)$$

Where

AAR_t is the average abnormal return at time t

t_{AARt} is the test statistic

N is the sample size

S_{AARt} is the standard deviation across firms at time t, its calculation is specified in equation (8)

$$S^2_{AAR_t} = \frac{1}{N-1}\sum_{t=1}^{N}(AR_{i,t} - AAR_t)^{\,2} \qquad (8)$$

For the average cumulative abnormal returns, I use the same test as for AARs but respecify it to test if the cumulative average abnormal returns are zero, I specify H_0: CAAR = 0 and H_1: CAAR ≠ 0.

$$t_{CAAR} = \sqrt{N}\frac{CAAR}{S_{CAAR}} \qquad (9)$$

Where

CAAR is the Cumulative average abnormal return

t_{CAAR} is the t statistic for the CAARs

N is the number of firms

S_{CAAR} is the standard deviation of the cumulative abnormal returns in the sample and is calculated as specified in equation (10)

$$S_{CAAR}^2 = \frac{1}{N-1}\sum_{i=1}^{N}(CAR_i - CAAR)^2 \qquad (10)$$

5. Data

The S&P/ASX 20, S&P/ASX 50, and S&P/ASX MidCap 50 are equity indices developed and maintained by Standard and Poor's for stocks listed on the Australian Securities Exchange. All three of the indices are part of the S&P/ASX family of equity indices designed to represent the Australian stock market across different company sizes and industries. The S&P/ASX 20, S&P/ASX 50, and S&P/ASX MidCap 50 are calculated using a methodology which is the same as that of all other equity indices from S&P Dow Jones Indices. Tickers for all three indices for most major databases can be observed in Table 1.

The S&P/ASX 20 is designed to represent the segment of the largest equities in the Australian market. The companies that are represented by the equity index are the 20 most actively-traded and most liquid stocks in the Australian Market ranked by float-adjusted market capitalization. The S&P/ASX 50 is an expanded version of the ASX 20 and is meant to represent the top 50 largest and most liquid stocks by float-adjusted market capitalization in the Australian market. Finally, the S&P/ASX MidCap 50 represents the 50 mid-cap stocks in the larger S&P/ASX 100 index.

The members of the indices are reviewed and adjusted quarterly according to members' market capitalization and liquidity for six months of historical data. All changes from the periodic review are made effective after market close on the third Friday of March, June, September, and December. The announcements about changes in the constituents are made one week before the effective dates, on the second Friday of March, June, and December for the respective reviews and for the September review the announcement is made two weeks prior. Under certain circumstances (e.g. a delisted company) there may be a need to make an extraordinary change in the list of constituents for the index. Whenever a stock is excluded into the equity index, a new stock that meets the criteria for inclusion is immediately included to replace it. Under these circumstances, the announcement for the change is made 2 to 5 days before the event. In the dataset for this thesis, adjustments have been made to reflect such events in cases where they do not yield information for the examined index effect.

Stock Exchanges who develop and maintain equity indices publicly announce changes to the indices' composition on their official websites which is then spread through all business media as it is considered a significant event. For the purposes of this paper, a collection of the constituent change effective dates for the Australian Securities Exchange is sourced from the Thomson Reuters Eikon database. Additionally, for the estimation of the market model, historical quotes data for the period of 02.01.2000 to 01.5.2019 for the S&P/ASX 200 equity index is obtained from the same source. The individual stock prices and market index are then transformed into logarithmic returns. Trading volumes and the number of shares outstanding is obtained from the Datastream database.

The total set of all inclusions in the S&P/ASX 50 index are 94 for the period of 03.03.1994 to 21.11.2018. Due to the nature of changes in index composition, the dataset needs to be adjusted in order to remove events that might have an artificial reason for being included or excluded (e.g. spin-offs, mergers and other). After adjustments, the dataset for the inclusions in the S&P/ASX 50 is reduced to 43 events. The sample for exclusions for the same index initially contains 210 events which after adjustments has been reduced to 27 events. The S&P/ASX MidCap 50 initially has a dataset consisting of 826 total events split into 422 joiners and 404 leavers. After making necessary adjustments 117 inclusions and 64 exclusions are left. The data for the S&P/ASX 20 starts with 61 inclusions and 74 exclusions. After reviewing the dataset 22 inclusions and 20 exclusions remain. As the sample for this index is relatively small, results in the following section should only be illustrative.

6. Empirical Results

6.1 S&P/ASX MidCap 50

As discussed earlier, changes in constituents for the S&P ASX family of indices can easily be predicted using readily available information. Taking advantage of this fact arbitrageurs can speculate to buy or sell the potential stocks that are predicted to be subject to change in the ranks of the constituents. *Figure 2 and 3* show the cumulative average abnormal returns for the ASX 50 estimated using the market model and constant mean model, respectively. For the S&P/ASX MidCap 50 I find significant positive average cumulative abnormal returns for inclusions for all periods from ED-30:ED-27 to ED-30:ED-9 which might indicate investors anticipating the change in index composition. These results are summarized in *Table 2*. The cumulative abnormal returns for the inclusions in the ASX MidCap 50 index provide evidence for this possibility. Statistically significant values for the cumulative abnormal returns can be observed for all periods leading up to the announcement period which is held 5 to 10 days prior to the effective date. For the market returns model the CAAR range from 1% to 2% with the period of ED-30:ED-13 showing a CAAR of 1.97%, statistically significant at the 1% level. The constant mean model confirms the results from the market model but shows significant results for fewer periods, namely, ED-30:ED-13 which gives a 1.71% CAAR, significant at the 5% level. After the inclusion date, the effect is quickly reversed and there is no long-term effect of the event.

Stock exclusions, on the other hand, exhibit significant results starting from the announcement date period. Both market returns model and constant mean returns model show significant results for a negative price effect starting from -1.44% for ED-30:ED-9 and peaking at the day prior to the event -30:-1, with a negative average cumulative abnormal return of -3.42%. While this is similar to the results for the inclusions, here the price drop is not reversed immediately following the effective date and a long-term effect can be observed. CAARs for all periods starting from ED-30 can be observed in *Table 3*. This result provides evidence for the imperfect substitutes hypothesis as the permanent price change indicates that excluded stocks find a new price equilibrium after the event. Australia's stock market is not considered a large market and is similarly capitalized as the Swedish stock market. Therefore, a parallel could be made with the Blomstrand et al. (2010) paper by making the argument that due to it smaller comparable size the smaller, less renowned companies on the Australian market are not perfect substitutes of each other. Additionally, the fall in price for exclusions could be explained by the information cost/liquidity hypothesis which also predicts a permanent effect on the stock price

Average abnormal returns which aggregate the event effect over the cross-section show significant negative abnormal returns of -1.3% on the day prior to exclusion and a positive 0.55% AAR on the effective exclusion date. These results are displayed in *Table 4.* For inclusions, there are no significant results for average abnormal returns around the effective date. Providing further proof that the index effect's strength has diminished.

The analysis on abnormal trading volumes (see *Figure 8*) shows a significant spike in trading volumes on the effective date for both inclusions and exclusions. This finding is overwhelmingly attributed by previous literature to the fact that index funds that replicate an equity index need to rebalance their portfolios on changes.

6.2 S&P/ASX 50

Inclusions in this index showed significant results for the CAARs starting from ED-30:ED-13 up to ED-30:ED-8 (see table 5). The results describe an upward pressure on the price starting prior to the announcement period which again shows support for the notion that the index effect has become popular and arbitrageur are speculating with the goal to take advantage of the phenomenon. A visual representation of the CAARs for both the inclusions and exclusions is shown in *Figure 4 and 5.* This notion is further supported by the lack of significant AAR around the effective date (see *Table 6*). Which would suggest that all trading on the index changes in composition are done before the actual event date. Calculating CAARs with the market model for exclusions in the S&P/ASX 50 index yielded only one statistically significant return with a value of -2.19% for the period of ED-30:ED-4. In contrast with the S&P/ASX MidCap 50, this index illustrates a reversion of the price effect in the days following the actual event. If this finding were significant it would have provided evidence for the price pressure hypothesis. Average abnormal volumes were not calculated for this index as the daily shares outstanding data on Datastream was not available for a period further back than 2006. This severely restricted the sample and made calculations not relevant. Other data sources to the knowledge of the author did not offer the requested data for the Australian stocks researched in this paper.

6.2 S&P/ASX 20

The research on the S&P/ASX 20 showed no significant results which might be attributed to the necessity to make adjustments to the dataset in order to remove misleading events that do not yield information regarding the examined index effect. Due to the remaining few observations, results for this index can only be illustrative. A plot of the cumulative average abnormal returns for inclusions and exclusions can be seen in *Figure 6 and 7*. The results for inclusions do not match those of the other two examined indices and represent a temporary price increase which if were significant would have provided evidence for the price pressure hypothesis. Additionally, it would have meant that the index effect is still a valid trading strategy. For future references this index could be examined again with a larger dataset to see if it would yield significant results. Exclusions for this index show the same pattern as the mid-cap index showing a negative price effect starting around the announcement period. Although only illustrative for this index this finding has already been discussed. Average abnormal trading volumes are not calculated for this index as well. The restricted availability of data reduced the already small sample and made calculations not relevant.

7. Conclusion

The index effect has long been of interest to arbitrageurs as it gives the opportunity for speculating on changes in equity index composition. This paper has aimed at evaluating the index effect for the Australian equity market using the S&P/ASX 20, 50 and MidCap 50 equity indices which represent blue-chip and mid-cap companies. The S&P/ASX 20 and the S&P/ASX 50 represent the 20 and 50 largest companies in the Australian market by float-adjusted market capitalization, respectively, while the S&P/ASX MidCap 50 represents the 50 mid-cap companies in the S&P/ASX 100 equity index. The findings of this paper differ from prior research by Zhao R, et al. (2016) for the period of 2000 to 2009 on the benchmark index S&P/ASX 200 that represents the Australian stock market. As opposed to the research on the S&P/ASX 200 equity index, I do not find any significant cumulative abnormal returns for the S&P/ASX MidCap 50 inclusions around the announcement period and the effective date. However, I find significant CAARs for the period prior to the announcement period which would signify that market participants anticipate the changes to index composition and possibly try to exploit the already established in literature phenomenon that is the index effect. This finding is in line with the Kappou (2017) paper on the diminishing strength of the index effect. However, for exclusions in the S&P/ASX MidCap 50, I find significant negative CAARs over the announcement period for all days up to the effective date, which is not reversed in the following 20 days. This finding provides support for the imperfect substitutes hypothesis which suggests that following the exclusion the demand curve for the excluded stock shifts causing a new price equilibrium which is permanent.

Analysis on the blue-chip part of the market for the S&P/ASX 50 yielded similar results for both stock inclusions and exclusions providing evidence for upward price pressure for inclusions and downward price pressure for exclusions prior to the announcement period. However, only the inclusions showed statistically significant results for CAARs in the pre-announcement period and all CAARs were fully reversed following the effective date. These findings provide inconclusive evidence for the price pressure hypothesis although with the growing popularity of the index effect, market arbitrageurs take advantage of the predictability of the market spur demand for the affected stock, which would revert as soon as the demand is balanced. The S&P/ASX 20 provided similar results as its larger counterpart but due to small sample size, the results are only illustrative.

In conclusion, this paper uses a long-term event study to present evidence that the index effect has become too popular and an ineffective trading strategy as stocks which are seen in the market as potential changes in index constituents experience price pressure prior to the announcement period. Furthermore, the changes in index constituents are based on public information and as of the time of writing are not connected in any way with company performance. However, equity index participation can have other benefits to companies such as improved liquidity and informational coverage of stocks. Therefore, I do not find conclusive evidence that the EMH is violated by the index effect for my dataset. For future research, I suggest to evaluate the index effect with a behavioral-finance approach and after events have accumulated over time to reevaluate the S&P/ASX 20 equity index with a larger sample.

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9. Appendices

Index	Bloomberg	Reuters	IRESS
S&P/ASX 200	AS51	.AXJO	XJO
S&P/ASX 50	AS31	.AFLI	XFL
S&P/ASX MidCap 50	AS34	.AXMD	XMD
S&P/ASX 20	AS26	.ATLI	XTL

Table 1. Tickers for the researched stock indices.

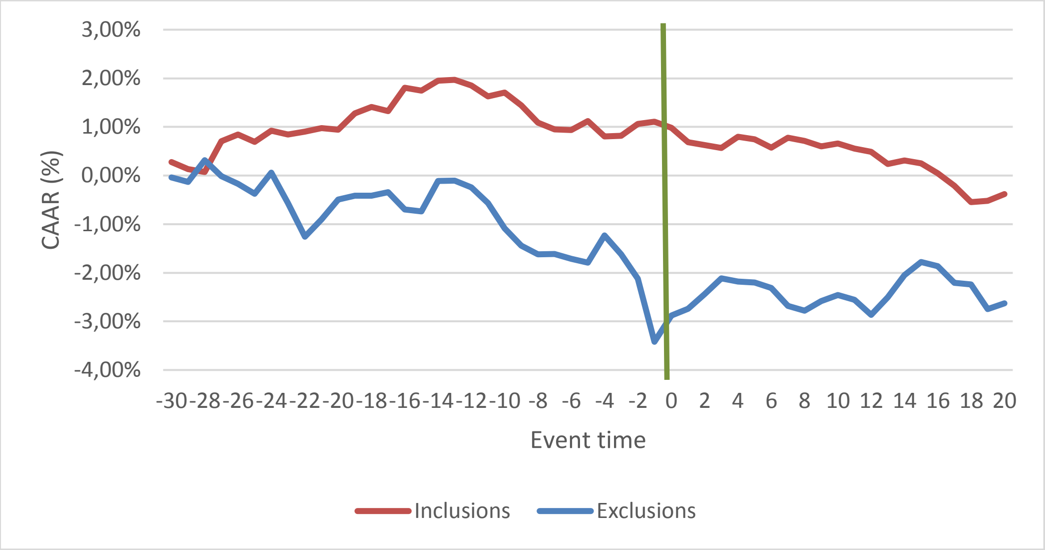

Figure 2: ASX 50 Midcap – CAAR - Market model

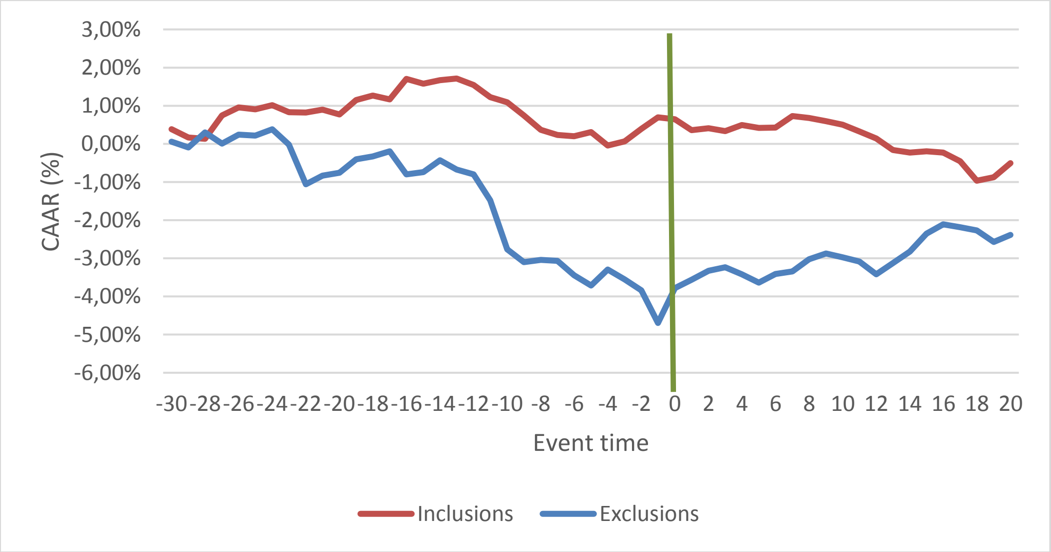

Figure 3. ASX 50 Midcap - CAAR - Constant mean model

CAAR ASX MidCap 50 Inclusions

Market model			Constant mean model		
t_1:t_2	CAAR	t-value	t_1:t_2	CAAR	t-value
-30:-27	0.71%	2.25**			
-30:-26	0.84%	2.65***			
-30:-25	0.69%	1.9*			
-30:-24	0.93%	2.39**			
-30:-23	0.84%	2.3**			
-30:-22	0.91%	2.37**			
-30:-21	0.98%	2.51**			
-30:-20	0.94%	2.3**			
-30:-19	1.28%	2.66***			
-30:-18	1.41%	2.9***			
-30:-17	1.33%	2.69***			
-30:-16	1.80%	3.32***			
-30:-15	1.74%	3.08***			
-30:-14	1.95%	2.98***	-30:-14	1.67%	2.18**
-30:-13	1.97%	2.93***	-30:-13	1.71%	2.24**
-30:-12	1.85%	2.71***	-30:-12	1.54%	2**
-30:-11	1.63%	2.41**			
-30:-10	1.70%	2.42**			
-30:-9	1.45%	1.99**			

Table 2. Cumulative average abnormal returns for the S&P/ASX 50 inclusions of a company in an equity index using the constant mean and market return models. Where a standard t-test is used for which "*", "**", and "***" mean significance at the 10%, 5%, and 1% level, respectively.

ASX 50 MidCap Exclusions

Market model			Constant mean model		
t_1:t_2	CAAR	t-value	t_1:t_2	CAAR	t-value
-30:-9	-1.44%	-1.73*	-30:-9	-3.10%	-2.78***
-30:-8	-1.62%	-1.99*	-30:-8	-3.04%	-3.01***
-30:-7	-1.61%	-1.85*	-30:-7	-3.07%	-2.75***
-30:-6	-1.71%	-2.11**	-30:-6	-3.45%	-3.23***
-30:-5	-1.79%	-2.09**	-30:-5	-3.71%	-3.52***
-30:-4	-1.23%		-30:-4	-3.29%	-3.07***
-30:-3	-1.62%		-30:-3	-3.55%	-3.06***
-30:-2	-2.12%		-30:-2	-3.84%	-3.11***
-30:-1	-3.42%	-2.56**	-30:-1	-4.69%	-3.32***
-30:0	-2.88%	-2.16**	-30:0	-3.78%	-2.69***

-30:1	-2.74%	-1.95*	-30:1	-3.56%	-2.38**
-30:2	-2.44%	-1.7*	-30:2	-3.32%	-2.22**
			-30:3	-3.24%	-2.03**
			-30:4	-3.42%	-2.08**
			-30:5	-3.64%	-2.16**
			-30:6	-3.41%	-2.07**

Table 3. Cumulative average abnormal returns for the S&P/ASX 50 exclusion of a company from an equity index using the market return model. Where a standard t-test is used for which "*", "**", and "***" mean significance at the 10%, 5%, and 1% level, respectively.

AAR - ASX MidCap 50

Inclusions			Exclusions		
Event time	**AAR**	**t-statistic**	**Event time**	**AAR**	**t-statistic**
-1	0.05%	0.23	-1	-1.30%	-4.37***
0	-0.13%	-0.76	0	0.55%	2.88***
1	-0.29%	-1.60	1	0.14%	0.49

Table 4. Average abnormal returns for the S&P/ASX MidCap 50 exclusions of a company from an equity index using the market model and the constant mean return model. Where a standard t-test is used for which "*", "**", and "***" mean significance at the 10%, 5%, and 1% level, respectively.

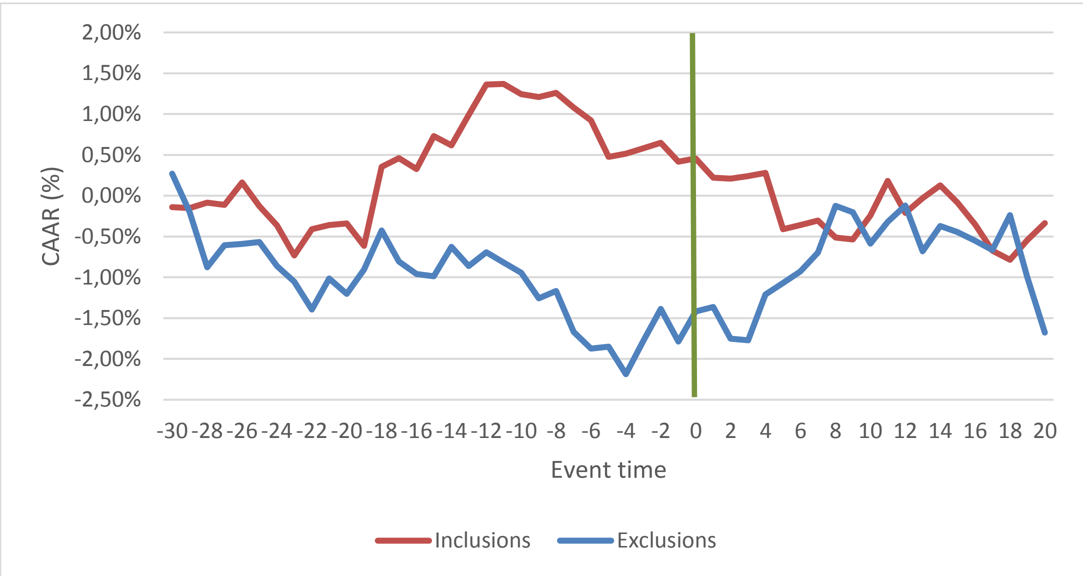

Figure 4. ASX 50 – CAAR - Market model

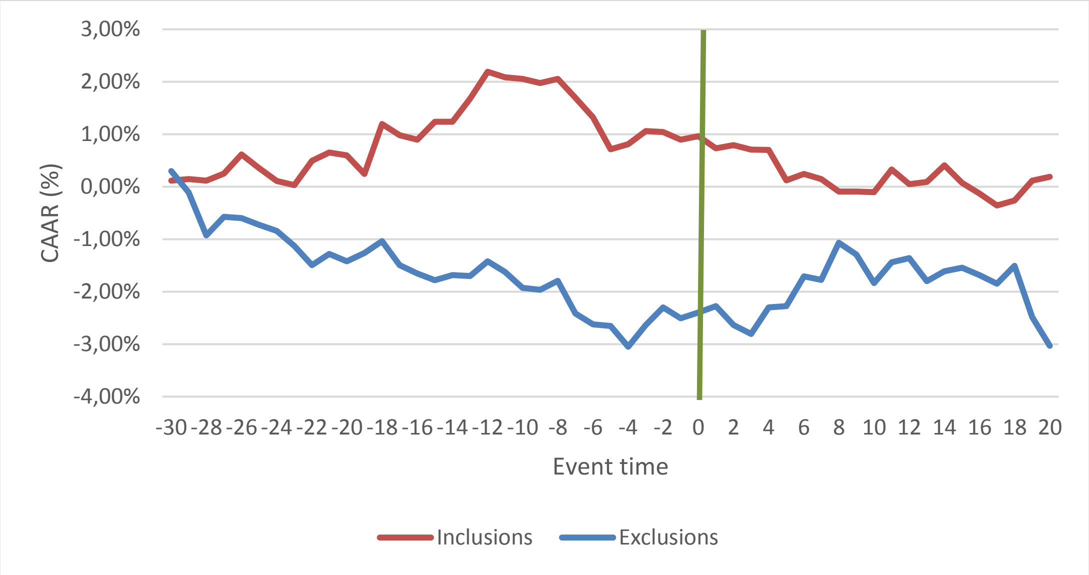

Figure 5. ASX 50 – CAAR - Constant mean model

ASX 50 Inclusions

Inclusions		
t_1:t_2	**CAAR**	**t-value**
-30:-13	0.01677	1.71*
-30:-12	0.021914	2.04**
-30:-11	0.020864	1.89*
-30:-10	0.02058	1.98*
-30:-9	0.019784	1.84*
-30:-8	0.020546	1.95*

Table 5. Cumulative average abnormal returns for the S&P/ASX 50 inclusions using the constant mean return model. Where a standard t-test is used for which "*", "**", and "***" mean significance at the 10%, 5%, and 1% level, respectively.

AAR ASX 50

Inclusions			**Exclusions**		
Event time	**AAR**	**t-value**	**Event time**	**AAR**	**t-value**
-1	-0.23%	-0.89	-1	-0.40%	-0.92
0	0.04%	0.22	0	0.37%	1.32
1	-0.24%	-0.98	1	0.05%	0.16

Table 6. Average abnormal returns for the S&P/ASX 50 the constant mean return model. Where a standard t-test is used for which "*", "**", and "***" mean significance at the 10%, 5%, and 1% level, respectively.

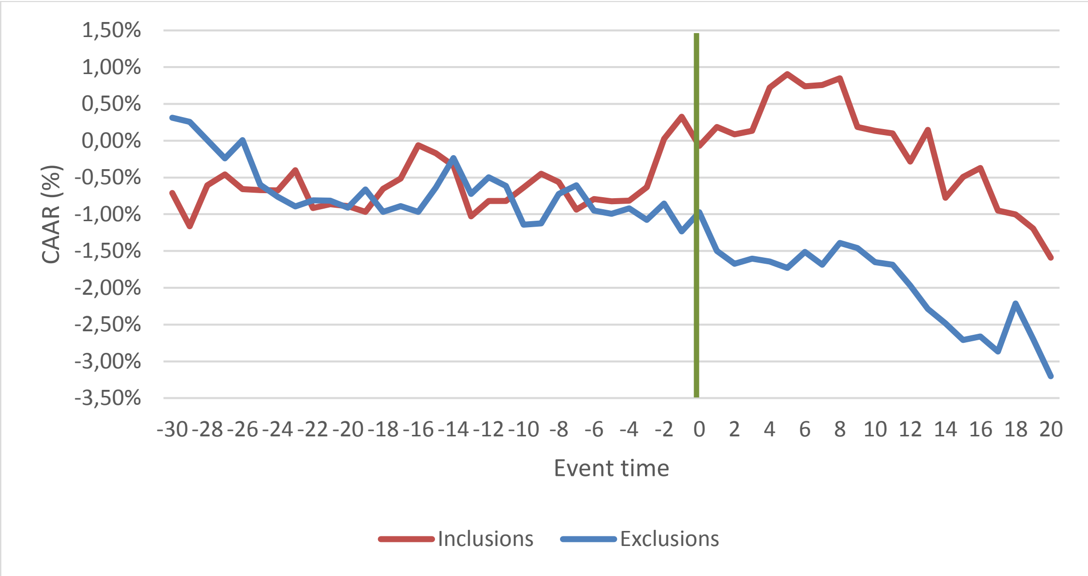

Figure 6. ASX 20 – CAAR - Market model

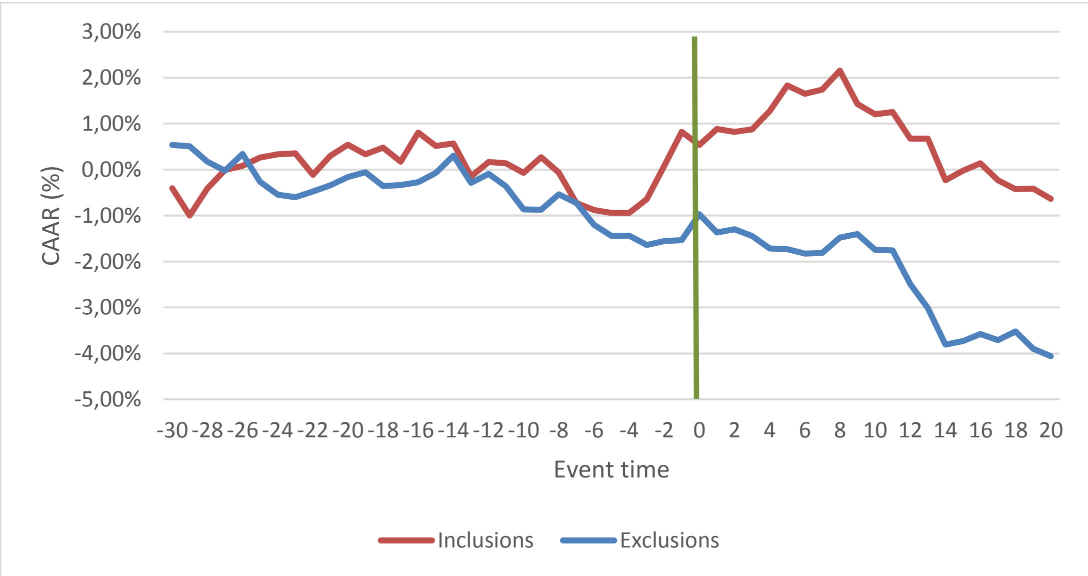

Figure 7. ASX 20 – CAAR - Constant mean model

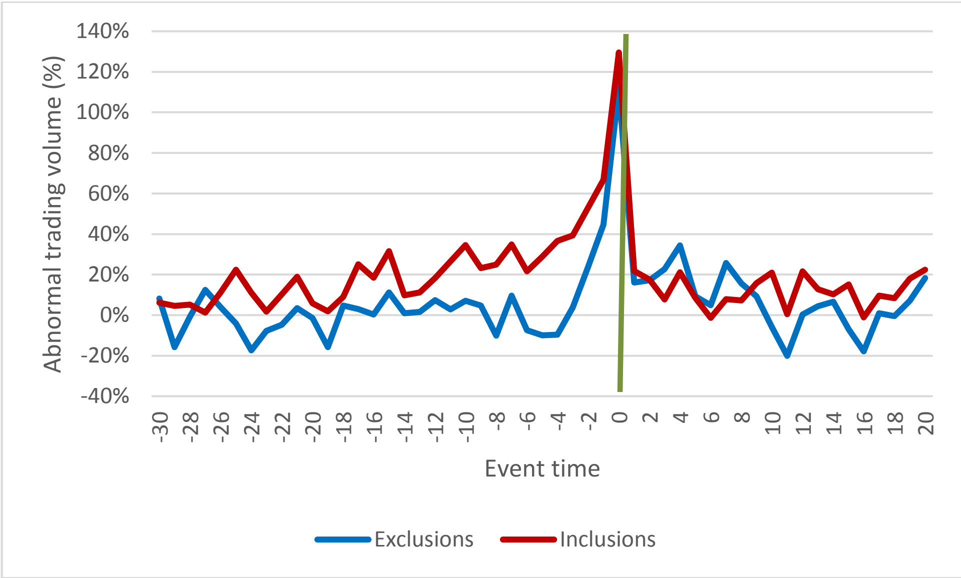

Figure 8. S&P/ASX MidCap 50 – Average abnormal volumes