The S&P 500 inclusion and exclusion effect

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1. Introduction

As an investor who wants to invest his or her money in the stock market, the easiest way to do this is buying a stock index tracker. A stock index tracker is a fund that basically replicates a specific index. This means that the fund where you put your money in, will for you buy all the stocks that are part of the index. And therefore you only have to make one transaction to have invested your money in possibly hundreds of stocks. This makes it very attractive for investors to invest in an index fund, because it gives the advantage of not having to buy hundreds of stocks yourself. This practice would be for most small investors way too time consuming, not even taking into account the transaction costs that this will generate by doing hundreds of transactions.

This has led to a wide offer of indexes around the globe, and an amount invested via indexes instead of specific stock picking that is increasing over years. Moody's has published a report in 2017 that says that index funds will be more than 50% of all the assets invested in the investment management business between 2021 and 2024 (www.reuters.com). This makes that the money that is flowing into stocks via indexes is from somewhere between 2021 and 2024 more than the money that is invested directly into stocks.

For a specific stock this means that there is more demand in the stock if it is listed in one or more indexes. Since a stock that is not listed will not have the demand from the index provider that buys the stock to have the index covered. And therefore there could be an effect on the price of a stock if it will be taken into an index or as well if it will be excluded from an index.

If the fact that a stock is part of an index does really have any effect on the price of the stock. It means that the price of stocks responds to something that has in general nothing to do with the value of the company itself. Hence, there will be no changes in the value of a company pure by taking a company up in an index, or deleting a stock from an index. Since the company itself does not change, it is only taken into a list of stocks published by an index provider.

If this price change does really exist, it means that the price of the stock changes based on something that has nothing to do with the value of the company itself. Something that should not be possible following the Efficient Market Hypothesis of Fama (1970). Since this hypothesis

states that a stock's price always fully reflects all available information on a company. And the inclusion of a stock in an index should not give any new information on a stock's value.

As will be extensively discussed in the literature review of this thesis, there is already been done a lot of research on this so called inclusion or exclusion effect. Most of this research is been done on the inclusion or exclusion effects of the S&P 500. For example, Shleifer (1986) found that between 1976 and 1983, stocks gained on average 2.8% on the day that the inclusion was announced, and this effect did not disappear in the 10 days following the announcement. Some years later Beneisch and Whaley (1996) did a similar study, they found that in the period from October 1989 through June 1994 stocks gained a 3.1% increase at the market opening price the day after the announcement of inclusion in the S&P 500. And till the end of the day that the stock was getting really included in the S&P 500, the stock's price was already increased by 7.2%.

This 7.2% increase in price does show that the fact that a stock is getting included in the S&P 500 generates a positive price effect. And assuming that this inclusion does not have any effect on the value of the stock this would argue that the Efficient Market Hypothesis does not hold.

However one could argue as well that the inclusion in an index does have an increase in the value of a firm. And hereby this increase in price is caused by the inclusion in the S&P 500. Reasons for this could be for example the positive news that an index is included in the S&P 500. As it can be seen as a prestigious thing that a company is part of the biggest 500 companies in the US. However that this statement is not very likely to be the only reason that the price of a stock will rise after the announcement of the inclusion. It must be kept in mind that this could be a counter argument on the statement that the Efficient Market Hypothesis does not hold.

In this thesis there will be checked if the price effects that are being found in earlier studies can also be found in more recent years. And as well if this price effect did change over time. Therefore there will be done a research on the inclusion and exclusion effects from 1995 till 2018. Since possibly effects that were found some decades ago could have been changed over years. As already mentioned, the amount of money that is invested in the stock market via

index funds is still growing. This could be the reasoning for an increase in the index effect. On the other side markets have become more efficient over the years. This is the effect of the developing of the internet, and the way and speed that stocks are traded have become way more efficient. This has led to an increase in trading volume and liquidity (Chordia, Roll & Subrahmanyam, 2011). This increase in market efficiency could lead to a decrease in the index effect, since markets have become better in giving the stock already it correct price. The results over the years could show which of the 2 trends did have the upper hand in the developing of the index effect.

2. Literature

2.1 The index effect

As stated in the introduction of this thesis, there is been done a lot of research on the so called inclusion or exclusion effect. Most of this research is been done on the inclusion or exclusion effects of the S&P 500. For example, Beneisch and Whaley (1996) found that in the period from October 1989 through June 1994 stocks gained a 3.1% increase at the market opening price the day after the announcement of inclusion in the S&P 500. And till the end of the day that the stock was getting really included in the S&P 500, the stock's price was already increased by 7.2%.

Petajisto (2010) did a similar event study on the effect of inclusions in the S&P 500 and the Russell 2000. He found that the effect from the announcement date till the effective date of a stock inclusion in the S&P 500 resulted in an average 8.8% increase in price. And the inclusion in the Russell 2000 resulted in a 4.7% price increase. Next to this inclusion effect, the research of Petajisto shows as well the effect of an exclusion out of the S&P 500. He found that the effect of exclusion from the S&P 500 resulted in a decrease of 15.1%. For the Russell 2000 the price of a stock dropped 4.6% around the exclusion.

To check if the same effects were also found in other regions then the US, Brealey (2000) did a comparable event study on the London Stock Exchange. He was not able to find a significant effect of stocks that were getting included in the FTSE 100 or the FTSE All-share. On the other side he did found a significant effect on the Exclusions from this both indexes. Since the stocks that were getting excluded from the FTSE 100 did drop 4.5% in the 11 days after the exclusion. And in the same period stocks that were getting excluded from the FTSE All-share did drop 2.0%.

2.2 Hypothesis

Because of the significant findings in price moments around index inclusions and exclusions, different theories are developed over time to explain why this price effect exists. Since the efficient market hypothesis of Fama (1970) states that the price of a stock always reflects all

available information in the market, there are only 2 possible explanations. The first option is that inclusion and exclusion in an index gives new information to the market, and therefore it is following the efficient market hypothesis possible that the price of the stock will change. The second option is that the fact that a stock being included or excluded from an index does not give any new information about the company. If that is the case, the price effect that is been found around index changes means that efficient market hypothesis does not hold.

2.3 Price pressure hypothesis

Most literature that is written to try to explain why the index effects does exist, argues that the Market Hypothesis does not hold. Kraus and stoll (1972) came up with two hypothesis that were of this kind of hypothesis. The first one they proposed is the price pressure hypothesis, that explains that price effect are the result of a large change in demand for stocks. They confirm that small buy or sell offers of stocks does not influence the market. But as the price pressure hypothesis states: 'a large interest in a specific stock can change the price.' Therefore the index funds, which have to acquire stocks that are included in the market, can be the reason for the change in price. This hypothesis can only hold if the price effect can be obtained as being temporary. Since the large demand on the stock will be of a temporary basis, and therefore will be eliminated over time. Harris and Gurel (1986) tested if this price effect on index inclusions was temporary and found evidence that the increase in a stock price around an inclusion was canceled out by a later on negative return. This confirms the statement of the price pressure hypothesis that a price effect as a result of index inclusion is only temporary. Following the price pressure hypothesis the effect of an index exclusion should work exactly in the opposite way. Hence that the stock that is excluded from the index will have a high supply on the day of the exclusion. And therefore the price will fall. However this effect will also be temporary since the supply in the stock will decrease again to the normal state.

2.4 Imperfect substitute's hypothesis.

The other hypothesis of Kraus and Stoll (1972) is the Imperfect substitutes hypothesis. This hypothesis states that there are no perfect substitutes for every stock, and therefore the demand curve for a stock is not perfectly elastic. This means that a stock will find a new

equilibrium after the price shock that not has to be the old price. Kaul, Mehrotra & Morck (2000) found evidence for this hypothesis by looking to the Toronto Stock Exchange 300 index. And found that after a 2.3 percent excess return in the week that the exchange increased their weights in specific stocks, the price did not reversed to the old equilibrium, but created a new higher equilibrium. Following the imperfect substitutes hypothesis the exclusion of a stock out of an index would have a reversed effect on the price of a stock. Since the high supply of the stock that is created by index trackers that rebalance their portfolio.

2.5 Information signaling hypothesis

In contrast with the price pressure hypothesis and the imperfect substitute's hypothesis there are also hypothesis that do not violate the efficient market hypothesis. These hypothesis all try to find changes in the value of the company by the fact that a stock gets included in an index. One of these hypothesis is the Information signaling hypothesis (Jain 1987). This hypotheses states that the announcement of an inclusion may contain information that investors perceive as important. He explains that the risk that investors perceive may drop because of an inclusion. And since the drop of risk in a stock leads to a higher price, this could explain the positive inclusion effect. This is following the information signaling hypothesis the explanation that the index effect does exist. Following the information signaling hypotheses the price of a stock after an exclusion should decrease because of the perceived risk that this stock has after being excluded from an index is higher.

2.6 Liquidity hypothesis

Another hypothesis that is built on the idea that an inclusion or exclusion generates new information is the liquidity hypothesis from Amihun and Mendelson (1986). They assigns the reason of the price increase due the fact that a stock in an index has on average lower trading costs, since the bid and ask price will be closer to each other. As described by Beneish & Gardner (1995) is this the result of the higher trading volume that stocks in large followed indexes have. Another factor is the information availability for stocks in indexes. Stocks in indexes are more discusses and valuated by analytics, this makes the information that is available about the stock broader. This two changes of a stock in an index are advantages for

investors in the stock, and therefore the positive price effect after an inclusion could be explained. The liquidity hypotheses therefore would expect that the exclusion of a stock out of an index would have a reversed effect. Since the stock will get higher trading costs after its exclusion. And analytics will have less attention for the stock in the future. The reasoning behind the liquidity hypothesis results in the expectation that the index effect will not be only temporary. Since the information availability and decrease in trading cost will be effective for the full time that the stock is included in the index.

2.7 Attention hypothesis

Another hypothesis that focuses on the change in value of a stock is the attention hypothesis. Polonchek & Krehbiel (1994) discussed that the fact that a stock gets included in an index generates a lot of media attention. A stock being called in different news articles about the inclusion can lead to more awareness of the stock by investors. This could lead to a permanent price increase for new added stocks. However on a short term there should be no negative effect for excluded firms. This because the deletion of a stock out of an index will not lead directly to less awareness of the stock under investors. This is because investors will not directly forget about the stock after that it is being excluded from an index.

2.8 Russel indexes

To check what kind of hypothesis are more likely to be true, it is interesting to give a closer look to the Russel indexes. The Russel has two different indexes that are widely followed. Namely the Russel 1000 and the Russel 2000. The Russel 1000 are the biggest 1000 companies based on market valuation. While the Russel 2000 are the following 2000 companies in this rank. Since the fact that both of those indexes are market capitalization weighted, it makes that there is more money from index trackers following the big stocks in the Russel 2000 then the small stocks in the Russel 1000. This is because only a small portion that is invested in the Russell 1000 will track the stocks between place 901 and 1000. But on the other side the stocks that are just outside the Russell 1000, are the big weights in the Russell 2000. This makes that stocks placed 1001 till 1100 will attract almost 10 times as much money by index funds as the stocks between place 901 and 1000. Yen-Cheng Chang, Harrison Hong and Inessa Liskovich (2015)

found that stocks that were excluded from the Russell 1000 and were added in the Russell 2000 gained a positive return. And on the other side when a stock was getting included in the Russell 1000, it resulted in a negative price effect. This would have been the other way around if you argue that the price demand change should not matter and only the new information about the company would have been the explanation. This gives evidence in favor of the price pressure hypothesis and the imperfect substitute's hypothesis, since both hypothesis explain the inclusion effect because of the pure demand or supply of the stock. On the other side this gives evidence against the information signaling hypothesis, liquidity hypothesis and the attention hypothesis. Al of these hypothesis explain the inclusion effect based on changes in the value of the company. Following these theories a change from the Russel 2000 to the Russel 1000 would have resulted in an increase in price instead of the decrease that was found.

3. Data

3.1 S&P 500

The composition of the S&P 500 is decided by the index committee of Standard & Poor. Their aim is to select the 500 biggest companies based on market capitalization. However they have as well some criteria that stocks have to meet to be able to be selected for their index. These criteria are based on liquidity, share ownership, profitability and sector representation. However Standard & Poor does use a lot of criteria to make their index, and it is hard to predict their behavior in inclusions and exclusions, they state in their index methodology (2019) that: 'Inclusion of a security within an index is not a recommendation by S&P Dow Jones Indices to buy, sell, or hold such security, nor is it considered to be investment advice.'

Up until October 1989, Standard & Poor did not pre-announce changes in the index. And therefore changes did get included in the index overnight. This meant that there was no change for investors to trade between the announcement date and the actual date that the stock was getting included or excluded. After 1989 till today Standard & Poor is pre-announcing changes in the S&P 500 index, as well as the date that the change will take place. This makes it possible for investors to trade before the actual inclusion in the index. Their policy is to announce the inclusion or exclusion five business days beforehand. However there are some cases where the index committee did choose for another interval. This was mostly because of firms going bankrupt or other rare situations (Beneish & Whaley, 1996).

3.2 Data selection

The data of stocks that were included or excluded from the S&P 500 index is been downloaded from the Wharton Research Data Services website (www.wharton.upenn.edu). There is made use of the Compustat- Captail IQ category of index Constituents. Via this database all the S&P 500 constituents from the beginning of the database in March 1964 till September 2019 are downloaded together with the date of inclusion and the date of exclusion (If a company is being part of the S&P 500 index for different time periods with a gap in between, there are 2 separate lines for the same company).

This resulted in a database of 1785 lines of timeframes were a company was included in the S&P 500. This data is divided into one file with information about the inclusions, and one with the information of all the exclusions. This resulted in a list of 1785 inclusions and 1280 exclusions. The difference in the number of inclusions and exclusions can be explained by the stocks that are at the moment in the S&P 500 index. This makes sense since the number of shares in the S&P index at September 2019 is 505 (ww.us.spindices.com)

Since this study will have its focus on the effects from 1995 till 2018, the inclusions and exclusions files will separately be cleaned up of any inclusion or exclusion that has been done before 1995. This means that if a stock is included in the S&P 500 before 1995 and after some years the stock is excluded, this inclusion will not fall in the scope of this research, but the exclusion will. This resulted in a list of 677 inclusions after 1994 and 672 exclusions after 1994. To be able to analyze the results of the stocks in the period after the inclusion or exclusion. All changes after June 2018 are also kept out of the database. This resulted in an extra deletion of 30 inclusions and 30 exclusions that took place from July 2018 till September 2019.

When observing the database their were found 21 companies that entered the S&P 500 database on the same day as that they were excluded again. Since there is no logical explanation for stocks being one day in the S&P 500 index, I took a closer look to those variables. As for example BIOVERATIV INC (BIVV) was included on the 2th of February 2017, but was excluded on the same day as well. After investing some of these examples it resulted that this was the effect of a spin-off. Since for example BIOVERATIV INC was a spin-off from S&P 500 constituent BIOGEN INC (BIIb), and started trading in February 2017 (www.forbes.com). The WRDS Database traded this as being an S&P 500 company on the day of the Spin-off. And an exclusion on the same day. Since this inclusion and exclusion in the database has nothing to do with a real act of inclusion or exclusion, those 21 lines of data are deleted as well. Resulting in a list of 626 inclusions and 621 exclusions.

3.3 Merges and acquisitions

As the reason why a stocks is excluded from the S&P 500 is commonly because it is taken over by another firm, the databased of exclusions have to be cleaned out by companies that were

taken over by other firm. This because there is nothing to say about the results of a stock after the exclusion data as the stock is getting bought by another company. As well as companies that are getting included in the S&P 500 because they merge with another company. If the company is part of a merge, the fact that the company is merged would have a significant impact on the returns of the stocks. And therefor is not interesting to measure the pure effects of being included in an index. To check if companies are not excluded from the S&P 500 index because they are bought by another company I checked if the company was getting part of the bigger S&P 1500 index after the exclusion. This should be the case for all stocks that left the S&P500 because they were getting to small for the S&P 500 index. The case where a company is getting that much smaller that it is at one moment in time part of the biggest 500 companies in the US. And after a new calculation is not even part of the biggest 1500 company's by market capitalization is so unlikely that it can be assumed as being nil. Therefor the only reason of a company being excluded from the S&P 500 index and not being part of the S&P 1500 index afterwards is because it is bought by another company. The same holds for companies that are included in the S&P 500. Every company that is getting included in the S&P 500 is likely to be part of the S&P 1500 index for at least a year before. If a company was not in the biggest 1500 companies in the US, but in the year afterwards was part of the S&P 500, there can be assumed that the company is a new company that is the result of a merge. After all the mergers and acquisitions are moved out the database, the database consisted out of 378 inclusions and 153 exclusions.

Because the event study tool that is been offered by WRDS did not give any reliable solution on how to do an event study with the data that was downloaded, I transformed the company information (TICKER code and company name) into the connecting ISIN codes. Those ISIN codes can be used to do an event study in DataStream. Because these ISIN codes are not easily matched with TICKER symbols, I downloaded the complete S&P 500 constituent's lists from DataStream for January every year from 1995 till 2019. In those 24 lists I checked what the changes were from year to year. For example the differences in the database of January 1995 till January 1996 must have been changes in the year 1995. This changes where matched with the inclusions and exclusions in the existing database. And following this practice the ISIN codes

where added to the database. For 8 of the inclusions and 6 of the exclusions there was no possible match to make following this practice and therefore these companies where deleted out of the database. Therefore the final observations that are used in this research are 370 inclusions and 147 exclusions.

3.4 Time periods

Since the database consists of observations from 1995 till 2008. And there could be a change of the effects over time, the database will be split into different time periods. These time periods will be from 1995 till 1999, from 2000 till 2004, from 2005 till 2009, from 2010 till 2014 and from 2015 till 2018. These 5 time periods will be used to see the difference over time in the inclusions as well as in the exclusions. This split up generated sub sets from 18 numbers of observations in the smallest sub sample (exclusions, 2005-2009) till 93 observations in the largest sub sample (inclusions, 1995-1999)

3.5 Methodology

The event study of the total of 517 events is been performed with use of the DataStream event study tool. This tool makes it possible to perform large event studies with the matching event dates. The event study tool uses the DataStream database to download stock prices on hysterical dates that are needed to perform the event study as well as the S&P 500 index to set the market return.

There is used a standard event study methodology to perform this research. As described by MacKinlay (1997), an event study measures the impact of a specific event on a stock's return using historical return data. This means in this case that the event study will measure the impact of the inclusion or exclusion of a stock in an index. This will be done by calculating the abnormal return of the stocks in the period around the inclusion or exclusion.

The abnormal return is the return that is left after subtracting the normal return that can be expected in the event period, from the return that is measured in the event period. This means that there is for every stock on every day a prediction on what should happen if the event did not take place. And if this prediction deviates from the actual return that is measured, this

unpredicted part of the measured return is left over as abnormal return. Therefore abnormal returns (AR) are calculated by subtracting the normal return (NR) from the measured return (R), of any share (i) in time (t):

$$AR_{i,t} = R_{i,t} - NR_{i,t}$$

The normal return of a stock can be measured on different ways. In this event study the Market Model is been used to calculate the normal return. As described by Brown and Warner (1985), the Market Model can be seen as the best way of predicting normal returns if there is event clustering in the observations. Event clustering takes place if more events take place around the same date. And since the S&P 500 does often make more than one change in the same day, this methodology is followed. The Market Model as described by Mackinlay (1997), uses a linear function between the market return and the return of the specific stock. For the market return I used the S&P 500 index because it can give a good representation of what the stock would do if it did not had an inclusion or exclusion. This because the S&P 500 index will be the most comparable with the stocks that will be included or excluded into the same S&P 500. The normal return is calculated based on the following linear regression. Where the normal return (NR) will be calculated based on the sum of the estimation of the stocks Alpha (α) in the estimation period, and the estimation of the stocks Beta (β) in the estimation period, times the return of the market on that day.

$$AR_{i,t} = \hat{\alpha}_i + \hat{\beta}_i R_{mt}$$

With the abnormal return calculated per stock as described above, there can be calculated for every day in the event period the average abnormal return (AAR). This is just the average of all the abnormal returns observed on that estimation date. Hence that this date will be the date relatively to the event. And therefore will be another date for every event, except for inclusions or exclusions occurring on the same date. The formula is calculated as follows:

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

Next to the average abnormal returns per day that are calculated. The sum of the average abnormal returns will also be used to see what happens over time. These average returns over time are called the cumulative average abnormal returns (CAAR). These cumulative average abnormal returns will be calculated over the period prior to the inclusion or exclusion (day -10 till day 0) to see what the result was before the change itself. And the cumulative average abnormal return will be separately calculated over the period after the inclusion or exclusion (day 0 till day 9). To see if the total event period has any abnormal returns the cumulative average abnormal return will also be calculated over the total period (day -10 till day 9). The formula that will be used to calculate the cumulative average abnormal returns is the following:

$$CAAR = \sum_{t=1}^{t} AAR_t$$

3.6 Significance

To test wherever or not the abnormal returns that are measured around the event give any significant results, we will test both the AAR and the CAAR for significance. The AAR per day will be used to see on what days, in perspective to the event, there are abnormal returns measured that are significantly different from zero. This is done by dividing the AAR of that day by the standard deviation (S) of that day. This number times the square of the number of observations (N) gives the t-statistic (TS) that is used to check for significance. The formula is as stated below:

$$TS = \sqrt{N}\ \frac{AAR_t}{S_t}$$

For the CAAR the formula uses the standard deviation of the cumulative abnormal returns (CAR). This is the standard deviation that is calculated by first calculating the return over the time period per stock, and from that cumulative returns is calculated the standard deviation. Hence this is a different standard deviation for the 3 different time period. And with this standard deviation the TS is calculated via the same way as this is done for the AAR:

$$TS = \sqrt{N}\ \frac{CAAR}{s}$$

3.7 Standardization

Since for the AAR and the CAAR, there have to be assumed that the variance of abnormal returns is equal for all series, there will be presented average standardized abnormal returns (ASAR) and cumulative average abnormal returns (CASAR.) The advantage of those two standardized significance tests is that they do not have negative effects from some volatile stocks in the sample that cause large variation in the AAR. Therefore the test has higher power (Patell 1976).

Standardized abnormal returns (SAR) are calculated by dividing the AR with their associated standard deviation:

$$SAR_{it}\ =\ \frac{AR_{it}}{S_i}$$

With the SAR the average standardized abnormal returns (ASAR) are calculated as follows:

$$ASAR_t\ = \frac{1}{N}\sum_{i=1}^{N} SAR_{it}$$

And as well the sum of the average standardized abnormal returns (CASAR) to calculate the significance level over the period before and after the inclusion or exclusion, and for the total period. The Casar is calculated as follows:

$$CASAR = \sum_{t=1}^{t} ASAR_t$$

To test what the significance level is after the standardization of the abnormal returns there will be used the following tests for significance:

$$TS = \sqrt{N}\, ASAR_t$$

And for the CASAR there will be used a similar kind of test:

$$TS = \sqrt{\frac{N}{T}}\, CASAR$$

3.8 Estimation window

To calculate the normal return of the stocks, the estimation period from 250 days prior the event till 50 days prior to the event is used. This period of 200 trading days will be sufficient to make a good approximation of a stocks normal return. The gap of 50 days before the event will be kept to make sure that the event itself does fall outside the estimation period. This to make sure that the estimation window estimates the normal return without any influence of the event.

3.9 Event window

The event window that is used to check what the abnormal returns around the events are is 10 days before the event till 10 days after the event. This period is used to capture at least the 5 business days before the event so the announcement and inclusion are both covered. Next to this, the 10 days after the change are measured to see if the inclusion or exclusion is permanent, or if stocks recovered back to the old price for what it was traded before the beginning of the event period.

3.10 One Sample T-test

To test whether or not the abnormal returns significantly different from zero, we use a one Sample T-Test. This test estimates if the return that is calculated is significantly different from zero. The critical values that are used in this thesis are the critical values for the 1%, 5% and 10% level of significance. These levels have respectively critical values of 1.64, 1.96 and 2.58. Those are the critical values of a two tailed t-test.

4. Inclusion Results

4.1 Average abnormal returns

The average abnormal returns that are collected per day in the event period can be found in figure 1. The AAR's of the 370 observations are shown with their associated Standard deviation (SD) and significance levels (SIG). As shown 9 of the 10 days before the inclusion show a positive AAR. And after the inclusion all 10 days show a negative AAR. For 13 days the returns are significant for at least the 10% significant level. On the stronger significant level of 5% there are still 4 days before the event (-6, -4, -3, -2), and 3 days after the event (1, 3, 10) significant. Both 3 days before the event and 2 days before the event are even significant for the 1% significant level**.**

4.2 Standardized

When observing the average standardized abnormal returns, the significant levels are close to the not standardized ones. However there are 2 days less where a significant level of at least 10% could be observed (day -5 and 8 lost their significance), there became more days where the significance level of 5% could be observed (10 days instead of 7 with the non-standardized returns). The 1% significance level did also occurred one time more since day -2 till day -4 became all significant at the 1% significant level.

	AAR	SD AR	SIG	ASAR	SIG
day -10	-0.12%	2.33%	-0.99	-0.049	-0.94
day -9	0.06%	2.77%	0.39	0.023	0.45
day -8	0.14%	2.51%	1.06	0.052	1.00
day -7	0.24%	2.45%	1.85*	0.103	1.98**
day -6	0.29%	2.42%	2.32**	0.130	2.51**
day -5	0.26%	2.59%	1.91*	0.076	1.46
day -4	0.33%	2.68%	2.37**	0.146	2.80***
day -3	0.34%	2.52%	2.62***	0.154	2.96***
day -2	0.54%	2.86%	3.64***	0.261	5.02***
day -1	0.09%	3.56%	0.50	0.016	0.31
day 1	-0.33%	2.82%	-2.22**	-0.110	-2.11**
day 2	-0.18%	2.28%	-1.52	-0.074	-1.43
day 3	-0.32%	2.49%	-2.49**	-0.130	-2.50**
day 4	-0.20%	2.11%	-1.82*	-0.123	-2.36**
day 5	-0.13%	2.32%	-1.05	-0.059	-1.14
day 6	-0.23%	2.30%	-1.94*	-0.106	-2.04**
day 7	-0.20%	2.23%	-1.69*	-0.110	-2.11**
day 8	-0.20%	2.24%	-1.71*	-0.045	-0.87
day 9	-0.15%	2.46%	-1.16	-0.052	-1.00
day 10	-0.29%	2.38%	-2.32**	-0.088	-1.69*

Figure 1

4.3 Cumulated results

The cumulative abnormal returns (CAR) are split up in the period before the inclusion and the period after the inclusion. The period before the inclusion generates over 10 days a cumulated average abnormal return (CAAR) of 2.17 percent (Figure 2). The CAAR for the period after the inclusion showed a negative CAAR of -2.22 percent (figure 3). This together with the returns in the period before the inclusion resulted in a CAAR of the total period of -0.05 percent. This means that in the 10 days after the inclusion the positive effect from before the inclusion disappeared.

before		
	AAR	CAAR
day -10	-0.12%	-0.12%
day -9	0.06%	-0.06%
day -8	0.14%	0.07%
day -7	0.24%	0.31%
day -6	0.29%	0.60%
day -5	0.26%	0.86%
day -4	0.33%	1.19%
day -3	0.34%	1.53%
day -2	0.54%	2.07%
day -1	0.09%	2.17%

Figure 2

after			
	AAR	CAAR	CAAR (start -10)
day 1	-0.33%	-0.33%	1.84%
day 2	-0.18%	-0.51%	1.66%
day 3	-0.32%	-0.83%	1.34%
day 4	-0.20%	-1.03%	1.14%
day 5	-0.13%	-1.16%	1.01%
day 6	-0.23%	-1.39%	0.78%
day 7	-0.20%	-1.58%	0.58%
day 8	-0.20%	-1.78%	0.38%
day 9	-0.15%	-1.93%	0.24%
day 10	-0.29%	-2.22%	-0.05%

figure 3

With the CAAR of the period before the event, after the event and the one of the total time there are calculated significant levels of the CAAR's. This shows that the CAAR before the event is highly significant on the positive side (1% level). While the period after the event is highly significant on the negative side (1% level). The total period does not give any significance. The same results can be observed when measuring the cumulative average standardized abnormal returns (CASAR). For the CASAR's it shows as well that both the period before the event and after the event are significant at the 1% significant level, and that the total period does not show any significance.

	CAAR	SD CAR	SIG	CASAR	SIG
before	2.17%	9.28%	4.49***	0.911	5.54***
after	-2.22%	6.71%	-6.36***	-0.897	-5.46***
total period	-0.05%	13.92%	-0.07	0.014	0.06

Figure 4

4.4 Time periods

When dividing the period from 1995 till 2018 over shorter time periods there is found that the inclusion effect did change drastically over time. Figure 5 gives a graphical representation on how the inclusion effect did change over time. The AAR's per day split up in the time period can be found in the appendix.

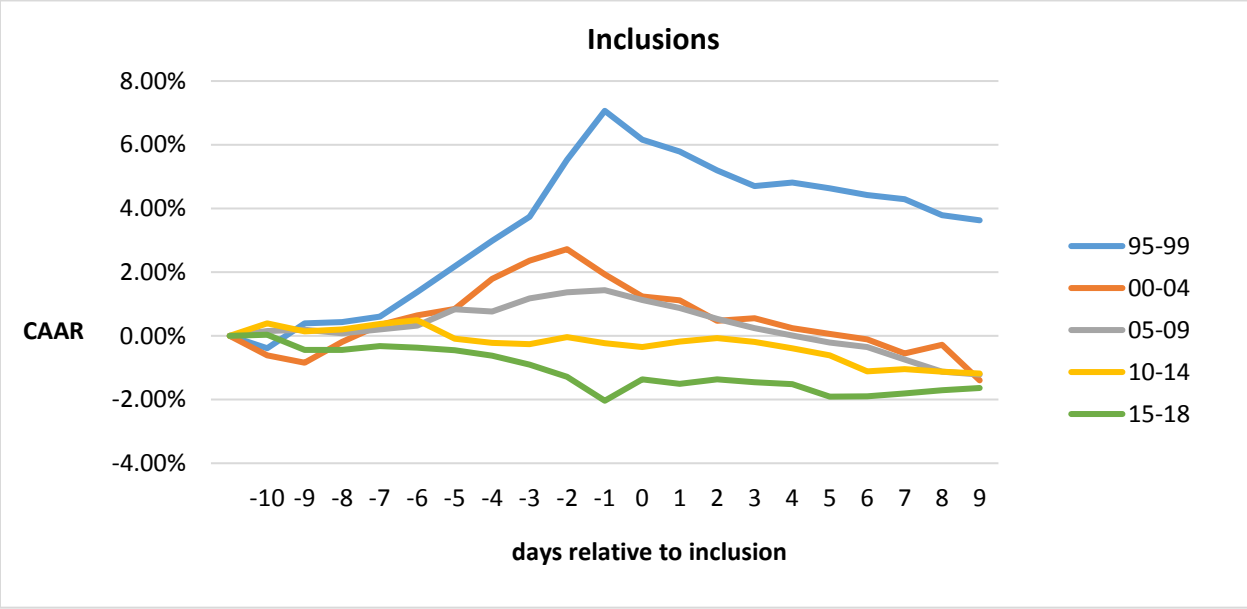

Figure 5

When measuring the significance levels for every time period separately, it shows that before the event the CAAR is only significant (positively) for the period from 1995 till 1999 (1% significant level). And in the period from 2012 till 2018 the effect before the event is even found significantly negative at the 1% level. However when looking to CASAR's the periods from 2000 till 2004 and from 2005 till 2009 are also significant at respectively 1% and 5% significance levels.

For the period after the event the CAAR's and the CASAR's are significant at the 1% level for the first 3 time periods that represent the period from 1995 till 2009. After that the effect of the CAAR's and the CASAR's going down the days after the exclusion is not significant anymore.

For the full period from 10 days before the event till 9 days after the event only the period from 1995 till 1999 shows that the positive effect from before the event did not totally disappeared after the event. This was found at the 1% significant level. The most recent period from 2015 till 2019 even shows a negative effect at the 5% significant level for the full period from 10 days before the event till 9 days after the event.

before				
	CAAR	**SIG**	**CASAR**	**SIG**
95-99	7,06%	6.69***	2,86%	8.72***
00-04	1,93%	1,30	0,94%	2.61***
05-09	1,43%	1,60	0,80%	2.28**
10-14	-0,23%	-0,20	0,19%	0,44
15-18	-2,04%	-2.80***	-1,41%	-3.59***
after				
	CAAR	**SIG**	**CASAR**	**SIG**
95-99	-3,44%	-5.19***	-1,27%	-3.87***
00-04	-3,32%	-3.36***	-1,04%	-2.88***
05-09	-2,65%	-3.50***	-1,12%	-3.17***
10-14	-0,95%	-1.24	-0,50%	-1.16
15-18	0,40%	0.84	0,13%	0.32
total				
	CAAR	**SIG**	**CASAR**	**SIG**
95-99	3,63%	2.39**	1,59%	3.43***
00-04	-1,40%	-0.61	-0,09%	-0.19
05-09	-1,21%	-0.82	-0,31%	-0.63
10-14	-1,18%	-0.67	-0,31%	-0.51
15-18	-1,64%	-1.45	-1,28%	-2.31**

Figure 6

5. Exclusion results

5.1 Average abnormal returns

The AAR's and ASAR's, together with their significant levels over the exclusion period of 147 observations are presented below (figure 7). The results show that before the event the AR is negative for day -9 till day -1, and after the event the AR is positive for 8 out of 10 days. However the exclusion effect is on less days significant then the inclusion effect. With normal AAR's only being significant at the 5% level on day -6. And only day -7 and 2 are still significant at the 10% level. When taking the ASAR's we can conclude that these add significance at day 1 and day 2 till a 1% significance level. And that they make day -4 and day 8 significant at the 10% significance level.

	AAR	SD AR	SIG	ASAR	SIG
day -10	0,19%	2,52%	0,93	0,069	0,84
day -9	-0,26%	2,85%	-1,09	-0,044	-0,54
day -8	-0,36%	3,14%	-1,38	-0,104	-1,27
day -7	-0,40%	2,69%	-1.82*	-0,159	-1.92*
day -6	-0,36%	2,14%	-2.01**	-0,103	-1,24
day -5	-0,29%	3,06%	-1,16	-0,117	-1,42
day -4	-0,15%	3,20%	-0,57	-0,136	-1.65*
day -3	-0,20%	3,68%	-0,66	-0,081	-0,99
day -2	-0,12%	2,61%	-0,55	0,000	0,00
day -1	-0,11%	2,72%	-0,49	-0,085	-1,03
day 0	0,02%	4,07%	0,05	-0,029	-0,35
day 1	0,55%	5,73%	1,17	0,232	2.81***
day 2	0,51%	3,68%	1.69*	0,251	3.04***
day 3	0,26%	2,87%	1,12	0,095	1,15
day 4	-0,20%	2,37%	-1,03	-0,020	-0,25
day 5	0,04%	2,63%	0,20	0,015	0,19
day 6	0,11%	2,46%	0,54	0,042	0,51
day 7	0,04%	2,68%	0,19	-0,021	-0,25
day 8	0,79%	6,06%	1,59	0,137	1.66*
day 9	-0,26%	2,11%	-1,52	-0,116	-1,40

Figure 7

5.2 Cumulated results

On the same way as the cumulated results are shown for the inclusion in figure 2, the cumulated results for the exclusion are presented below in figure 8 and figure 9. The CAAR for the period before the exclusion is 2.05 percent. While the period after the exclusion had a positive CAAR of 1.87 percent. This lets the negative effect from before the exclusion almost disappear till an overall effect of -0.19 percent.

before		
DAY	AAR	CAAR
day -10	0,19%	0,19%
day -9	-0,26%	-0,06%
day -8	-0,36%	-0,42%
day -7	-0,40%	-0,83%
day -6	-0,36%	-1,18%
day -5	-0,29%	-1,47%
day -4	-0,15%	-1,63%
day -3	-0,20%	-1,83%
day -2	-0,12%	-1,94%
day -1	-0,11%	-2,05%

Figure 8

after			
DAY	AAR	CAAR	CAAR (start -10)
day 0	0,02%	0,02%	-2,04%
day 1	0,55%	0,57%	-1,48%
day 2	0,51%	1,08%	-0,97%
day 3	0,26%	1,35%	-0,71%
day 4	-0,20%	1,15%	-0,91%
day 5	0,04%	1,19%	-0,86%
day 6	0,11%	1,30%	-0,75%
day 7	0,04%	1,34%	-0,71%
day 8	0,79%	2,13%	0,08%
day 9	-0,26%	1,87%	-0,19%

figure 9

The CAAR's before the exclusion as well as the CAAR's after the exclusion are both significant at the 5% level. While the results while measuring standardized significant levels are even more significant for before the event (1% significant level). After the exclusion the CAAR and the CASAR measure the same confidence (5% level).

	CAAR	SD CAR	SIG	CASAR	SIG
before	-2,05%	12,44%	-2,00**	-0,759	-2,91***
after	1,87%	10,88%	2,08**	0,586	2,25**
total period	-0,19%	21,94%	-0,10	-0,173	-0,47

Figure 10

The result of the exclusion is comparable to the result of the inclusion. Where the inclusion shows a positive effect before the inclusion of 2.17 percent, does the exclusion result in a negative effect of 1.87 percent. Both inclusion and exclusion show that the effect almost totally disappears. Figure 11 shows as well that inclusion and exclusion are almost perfectly inverted.

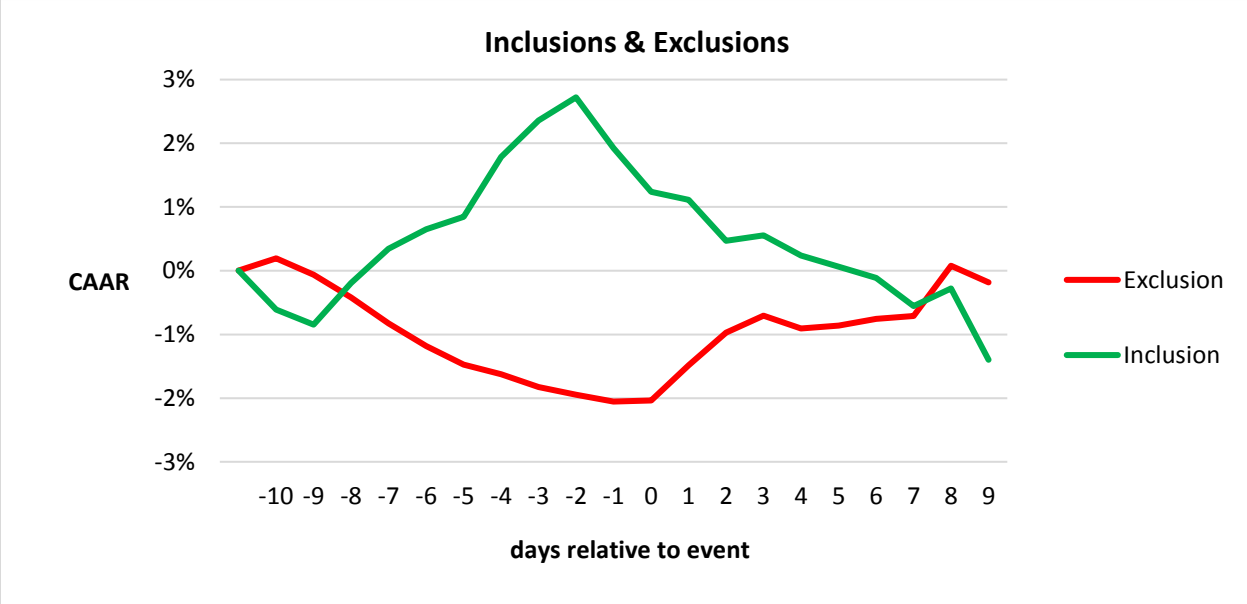

Figure 11

5.3 Time periods

When dividing the exclusion dates over the same periods as the inclusions, the results are more divergent from the results of the total period. The results per time period are shown graphically in figure 12. The more detailed numbers per day with their individual significance levels are added to the appendix.

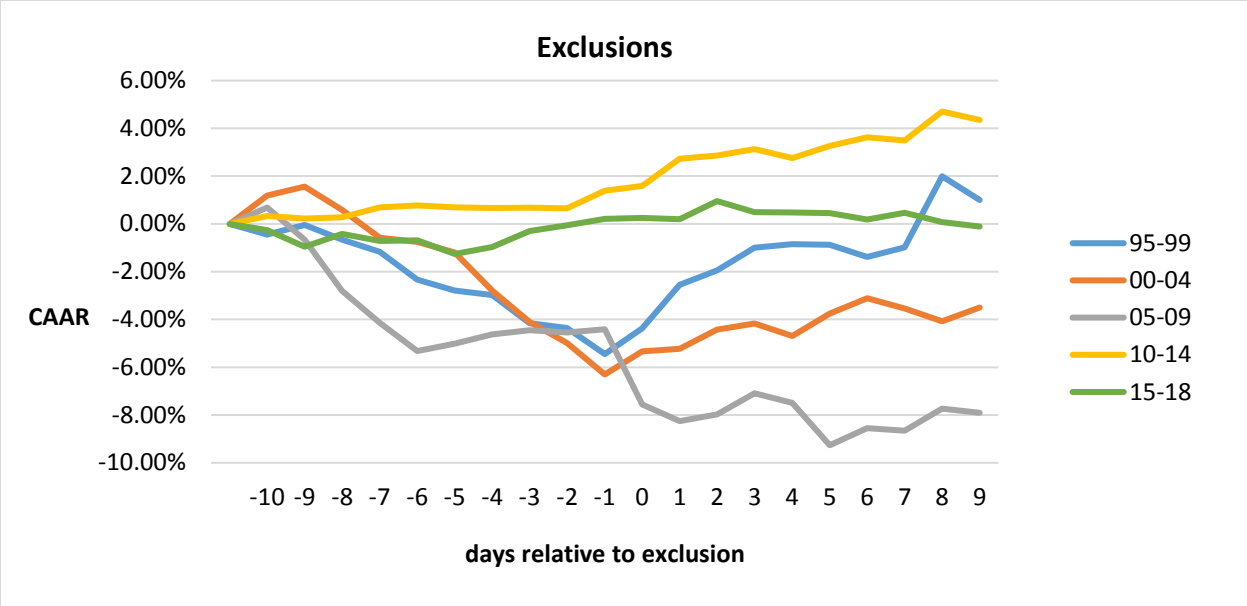

Figure 12

Before the CAAR's and CASAR's will be discussed over the exclusion period it is important to note that the exclusion sub samples are smaller than the samples for the inclusions. Where the inclusions smallest sub sample still had 54 observations does the exclusion observations vary from 18 till 41. This makes the averages less reliable to make conclusions on the results. Therefore the significance levels have to be observed with extra attention. As can be observed in figure 10 the period before the event gives from 1995 till 2004 a negative CAAR and CASAR for at least the 5% confidence level. The period from 2005 till 2009 still gives a negative CASAR for the 10% level. After the exclusion only the period from 1995 till 1999 and the period from 2010 till 2014 give significantly positive measures. Significant levels for CAAR and CASAR are the same at the 5% level on the two periods mentioned. The total period does not give any significant results at all when looking to the CAAR levels. Only when taking the standardized significant levels the periods from 2000 till 2004 and from 2010 till 2014 give from 10 days before the exclusion till 9 days after the exclusion negative CASAR's (5% significance level)

before				
	CAAR	**SIG**	**CASAR**	**SIG**
95-99	7,06%	6.69***	2,86%	8.72***
00-04	1,93%	1,30	0,94%	2.61***
05-09	1,43%	1,60	0,80%	2.28**
10-14	-0,23%	-0,20	0,19%	0,44
15-18	-2,04%	-2.80***	-1,41%	-3.59***
after				
	CAAR	**SIG**	**CASAR**	**SIG**
95-99	6,45%	2,57**	1,75%	2,87***
00-04	2,81%	1,47	0,72%	1,07
05-09	-3,50%	-1,04	-0,10%	-0,14
10-14	2,95%	2,05**	1,26%	2,49**
15-18	-0,33%	-0,23	-0,60%	-1,22
total				
	CAAR	**SIG**	**CASAR**	**SIG**
95-99	1,00%	0,21	-0,39%	-0,46
00-04	-3,49%	-0,82	-2,24%	-2,35**
05-09	-7,91%	-1,16	-1,38%	-1,31
10-14	4,35%	1,58	1,81%	2,52**
15-18	-0,11%	-0,04	-0,25%	-0,35

Figure 13

6. Conclusion

6.1 Inclusion

Results over the event period show that the inclusion or exclusion from the S&P 500 results in significantly abnormal returns around this event. In the period from 1995 till June 2018, stocks that were getting included had an average abnormal return of 2.17 percent before the inclusion. These results were significant at a 1% confidence level, measured via abnormal returns and standardized abnormal returns. This gives evidence for the existence of the index effect that is getting explained by all hypothesis described in the literature review.

6.2 exclusion

Stocks that were getting excluded resulted in a negative abnormal return of 2.05 percent. This suggests that exclusions have a negative effect on the price of the stock and therefore the index effect is not only applicable to index inclusions, but also for index exclusions. This supports the price pressure hypothesis, information signaling hypothesis and the liquidity hypothesis, since those hypothesis explain the index effect as something that works on two sides. The same effect that is explained for inclusion, but reversed, can be used to explain why an exclusion would generate a negative return. On the other side gives this evidence against the imperfect substitute's hypothesis and the attention hypothesis, since they argue that the index effect should not exists for exclusions.

6.3 Permanent or temporary

In the 10 days after the inclusion in the S&P 500, the abnormal returns in the period from 1995 till July 2018 decreased with on average -2.22 percent. And the period after an exclusion results on average in a 1.87 percent increase. These results show that in the 10 days after the event, the abnormal return that was generated totally disappears. After an inclusion the abnormal return even drops below zero (-0.05 percent). This gives evidence for the price pressure hypotheses. Since this hypotheses predicts that the effect of the inclusion and exclusion is only temporary. All other hypothesis that are discussed assume that the price effect is permanent,

and therefore this results give evidence against all other hypothesis then the price pressure hypothesis.

6.4 Changes over time

However these results suggest that there is clear evidence for the price pressure hypothesis over the period of 24 years, different time periods show various results. So therefore there should be considered that the effect could be changed over time, and therefore as well the hypothesis that explains the results as best could be different per time period. As can be seen in the results, from 1995 till 1999 the inclusion effect did showed an effect that kept standing the 10 days after the inclusion of 3.63 percent. However almost half of the 7.06 percent disappeared, there is still a significant positive abnormal return over the total period. This would suggest that over the total period from 1995 till 1999 the information signaling and liquidity hypothesis would be the best fitting with the data.

The two 5 years periods that shows together the results from 2000 till 2009 show similar results with each other. In this period the results are the most comparable with the results of the full time period. The results show significant increases before the inclusion, and after the inclusion the effect totally disappears. Therefore the price pressure hypothesis, which was already discussed for having the best fit with the full dataset, can be seen as the best explaining hypothesis for the period from 2000 till 2009.

For the period from 2010 till 2018 the index inclusion effect seems to be not existent anymore. While the period from 2010 till 2014 does not show any positive significant results, the period from 2015 till 2018 does even show significant negative results in the 10 day period before the event. There is no hypothesis that would explain why this negative results could be obtained.

When observing the results of the exclusion effect over time there seems to be a comparable trend over time as discussed for the inclusions. While the 3 periods that covered together the period from 1995 till 2009 did still showed negative abnormal returns before the exclusion. The period from 2010 till 2018 did not show this negative abnormal returns anymore. While the period from 2005 till 2009 did generate a negative return of 4.41 percent. There have to be mentioned that this result was almost not significant (only at the 10% level of standardized

returns). The lower significance levels are the result of the low number of observations that every sub sample has over the exclusion effect. Because of the data that is used for the exclusion effects have a lower number of observations, it is more likely that the expected value of the abnormal returns are more effected by random price movements. This is most likely the reason that the results of the exclusion effect per time period tend to look more randomly then the results of the inclusion effect. And therefore as well are harder to match with any theoretical hypothesis that are existing on index effects.

6.5 Final conclusion

Therefore the conclusion about what hypothesis are the ones that explain the results that are found the bests will mostly be based on the results from the inclusion. Because of the significant positive returns before the inclusion from 1995 till 2009, this thesis gives evidence for the existing of the index effect till the year 2009. However the hypothesis that fits the best changed in this period. Because till 1999 the return came out to be permanent. But after 1999 the abnormal return always return back in the days after the inclusion. Therefore there will be in this timeframe 2 different kind of hypothesis explaining the results. The hypothesis that are found to be most convenient are found in figure 14:

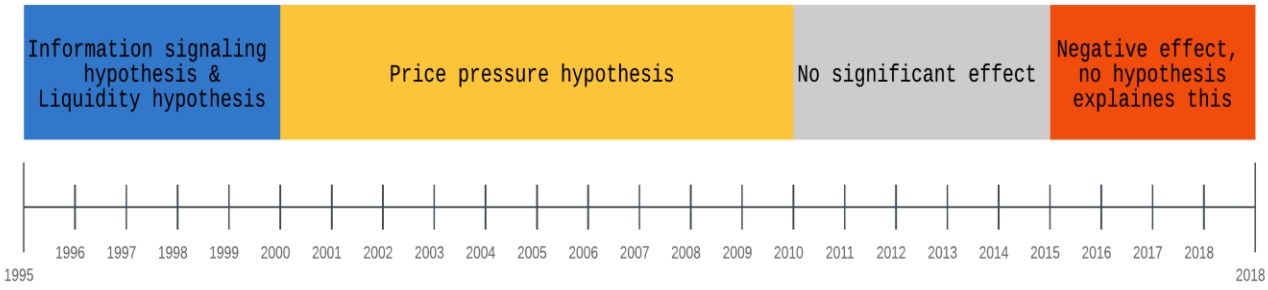

Figure 14

7. Limitations and future research

There have to be mentioned that the conclusion of this thesis is mostly based on results of inclusions, and due to the small number of exclusions these results were less useful for the conclusions. Therefore it could be interesting to do a broader research on exclusion effects on more indexes than just the S&P 500.

As the general conclusion that is generated from this thesis results in different hypothesis explaining the index effects, and it is not very likely that economic fundamentals did change so rapidly in this time period, it could be interesting to research how it could happen that index effects did change this way. There could be other factors next to the pure economic fundamentals that have led to this change. For example technical factors as changes in the way that stocks are traded that have influenced the index effects. As well as papers that were published on index effects that could have triggered investors to try to benefit of the expected effects of the index effect. Therefore it could be interesting to do future research on the pattern of stocks around index inclusions and exclusions as well as the strategies that companies of index funds trackers used over time to follow the index.

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Appendix 1

Inclusions 1995-1999					
	AAR	SD AR	SIG	ASAR	SIG
day -10	-0,39%	2,24%	-1,68*	-0,225	-2,17**
day -9	0,78%	3,46%	2,18**	0,451	4,35***
day -8	0,04%	2,69%	0,14	0,018	0,17
day -7	0,17%	2,90%	0,56	0,032	0,31
day -6	0,77%	3,28%	2,27**	0,726	7,00***
day -5	0,81%	3,16%	2,45**	0,135	1,31
day -4	0,81%	2,86%	2,72***	0,497	4,80***
day -3	0,75%	3,00%	2,40**	0,087	0,84
day -2	1,80%	3,83%	4,53***	0,396	3,82***
day -1	1,53%	4,49%	3,29***	0,741	7,14***
day 0	-0,90%	2,60%	-3,34***	-0,248	-2,39**
day 1	-0,38%	2,50%	-1,45	-0,024	-0,23
day 2	-0,59%	2,96%	-1,92*	-0,185	-1,78*
day 3	-0,49%	2,45%	-1,93*	-0,096	-0,92
day 4	0,11%	3,05%	0,34	0,061	0,59
day 5	-0,18%	2,92%	-0,60	-0,462	-4,45***
day 6	-0,21%	2,24%	-0,90	-0,146	-1,41
day 7	-0,13%	2,14%	-0,57	-0,150	-1,44
day 8	-0,51%	2,63%	-1,85*	0,033	0,32
day 9	-0,16%	2,46%	-0,63	-0,054	-0,52

Inclusions 2000-2004					
	AAR	SD AR	SIG	ASAR	SIG
day -10	-0,61%	3,08%	-1,73*	-0,152	-1,33
day -9	-0,24%	3,39%	-0,62	0,011	0,10
day -8	0,65%	3,63%	1,58	0,233	2,05**
day -7	0,54%	3,13%	1,52	0,194	1,70*
day -6	0,30%	2,82%	0,94	0,147	1,29
day -5	0,20%	3,18%	0,54	0,020	0,17
day -4	0,94%	3,62%	2,28**	0,262	2,30**
day -3	0,57%	3,05%	1,65*	0,248	2,18**
day -2	0,36%	3,01%	1,05	0,116	1,02
day -1	-0,80%	4,82%	-1,45	-0,135	-1,19
day 0	-0,69%	3,93%	-1,53	-0,251	-2,20**
day 1	-0,13%	2,78%	-0,40	-0,023	-0,20
day 2	-0,65%	2,69%	-2,11**	-0,220	-1,93*
day 3	0,09%	2,66%	0,28	-0,044	-0,39
day 4	-0,31%	2,56%	-1,08	-0,028	-0,25
day 5	-0,18%	2,62%	-0,59	-0,047	-0,41
day 6	-0,17%	3,06%	-0,50	-0,058	-0,51
day 7	-0,44%	2,88%	-1,35	-0,102	-0,89
day 8	0,28%	3,76%	0,64	0,073	0,64
day 9	-1,12%	3,56%	-2,76***	-0,339	-2,98***

Inclusions 2005-2009					
	AAR	SD AR	SIG	ASAR	SIG
day -10	0,15%	2,71%	0,49	0,033	0,30
day -9	0,05%	2,32%	0,18	0,084	0,75
day -8	-0,11%	2,19%	-0,44	-0,054	-0,49
day -7	0,12%	2,51%	0,41	0,099	0,9
day -6	0,12%	1,96%	0,56	0,086	0,78
day -5	0,52%	2,02%	2,30**	0,188	1,69*
day -4	-0,08%	2,57%	-0,28	-0,005	-0,05
day -3	0,42%	2,11%	1,77*	0,224	2,02**
day -2	0,19%	2,24%	0,78	0,073	0,66
day -1	0,06%	2,25%	0,25	0,073	0,66
day 0	-0,31%	2,82%	-0,98	-0,125	-1,12
day 1	-0,25%	2,38%	-0,94	-0,053	-0,48
day 2	-0,35%	2,95%	-1,06	-0,159	-1,43
day 3	-0,29%	2,09%	-1,26	-0,110	-0,99
day 4	-0,23%	2,43%	-0,85	-0,162	-1,46
day 5	-0,23%	2,31%	-0,88	-0,058	-0,52
day 6	-0,13%	2,29%	-0,51	-0,142	-1,28
day 7	-0,40%	2,57%	-1,39	-0,150	-1,35
day 8	-0,38%	1,75%	-1,94*	-0,182	-1,64*
day 9	-0,09%	1,95%	-0,43	0,026	0,23

Inclusions 2010-2014					
	AAR	SD AR	SIG	ASAR	SIG
day -10	0,40%	1,31%	2,23**	0,172	1,27
day -9	-0,25%	1,34%	-1,40	-0,092	-0,68
day -8	0,05%	1,46%	0,28	0,068	0,50
day -7	0,18%	1,29%	1,03	0,113	0,83
day -6	0,12%	1,56%	0,55	0,080	0,59
day -5	-0,58%	2,14%	2,00**	-0,189	-1,39
day -4	-0,14%	1,78%	-0,56	-0,057	-0,42
day -3	-0,03%	2,25%	-0,11	0,066	0,49
day -2	0,22%	1,91%	0,85	0,127	0,93
day -1	-0,19%	1,67%	-0,84	-0,098	-0,72
day 0	-0,12%	2,26%	-0,39	-0,115	-0,84
day 1	0,17%	1,65%	0,75	0,010	0,07
day 2	0,11%	1,64%	0,49	0,105	0,77
day 3	-0,12%	1,27%	-0,71	-0,068	-0,50
day 4	-0,20%	1,25%	-1,20	-0,084	-0,62
day 5	-0,22%	1,18%	-1,38	-0,069	-0,51
day 6	-0,50%	1,73%	-2,12**	-0,301	-2,21**
day 7	0,07%	1,75%	0,28	0,059	0,43
day 8	-0,08%	1,53%	-0,37	-0,015	-0,11
day 9	-0,06%	1,24%	-0,35	-0,021	-0,16

Inclusions 2015-2018					
	AAR	SD AR	SIG	ASAR	SIG
day -10	0,03%	1,25%	0,22	0,030	0,24
day -9	-0,48%	1,33%	-2,91***	-0,240	-1,93*
day -8	0,01%	1,50%	0,04	-0,026	-0,21
day -7	0,12%	1,26%	0,75	0,054	0,44
day -6	-0,06%	1,31%	-0,34	-0,066	-0,53
day -5	-0,07%	1,58%	-0,37	-0,056	-0,45
day -4	-0,18%	1,44%	-0,99	-0,124	-1,00
day -3	-0,28%	1,47%	-1,54	-0,185	-1,49
day -2	-0,38%	1,66%	-1,83*	-0,248	-2,00**
day -1	-0,75%	1,83%	-3,32***	-0,549	-4,42***
day 0	0,67%	1,51%	3,60***	0,385	3,11***
day 1	-0,14%	1,57%	-0,73	-0,127	-1,03
day 2	0,13%	1,05%	1,03	0,050	0,40
day 3	-0,09%	1,28%	-0,57	-0,096	-0,77
day 4	-0,05%	1,16%	-0,36	-0,019	-0,16
day 5	-0,39%	1,55%	-2,04**	-0,234	-1,88*
day 6	0,00%	1,10%	0,04	-0,028	-0,23
day 7	0,09%	1,23%	0,61	0,100	0,81
day 8	0,10%	1,42%	0,59	0,101	0,82
day 9	0,07%	1,50%	0,35	-0,006	-0,05

Exclusions 1995-1999					
	AAR	SD AR	SIG	ASAR	SIG
day -10	-0,44%	1,87%	-1,23	-0,072	-0,37
day -9	0,40%	2,29%	0,92	0,013	0,07
day -8	-0,62%	2,11%	-1,53	-0,214	-1,11
day -7	-0,50%	1,98%	-1,32	-0,204	-1,06
day -6	-1,18%	1,71%	-3,57***	-0,401	-2,09**
day -5	-0,46%	3,87%	-0,61	-0,154	-0,80
day -4	-0,18%	4,74%	-0,19	-0,224	-1,16
day -3	-1,19%	3,02%	-2,05**	-0,323	-1,68*
day -2	-0,19%	3,24%	-0,31	-0,133	-0,69
day -1	-1,09%	3,57%	-1,59	-0,429	-2,23**
day 0	1,08%	5,66%	0,99	0,190	0,99
day 1	1,82%	3,54%	2,67***	0,642	3,33***
day 2	0,61%	6,48%	0,49	0,478	2,48**
day 3	0,95%	3,42%	1,45	0,319	1,66*
day 4	0,14%	2,70%	0,28	0,074	0,38
day 5	-0,02%	2,33%	-0,05	-0,037	-0,19
day 6	-0,51%	3,20%	-0,83	-0,081	-0,42
day 7	0,39%	2,53%	0,81	0,117	0,61
day 8	2,98%	12,81%	1,21	0,400	2,08**
day 9	-0,99%	2,35%	-2,19**	-0,353	-1,83*

Exclusions 2000-2004					
	AAR	SD AR	SIG	ASAR	SIG
day -10	1,18%	2,85%	1,95*	0,313	1,47
day -9	0,38%	3,26%	0,54	0,098	0,46
day -8	-0,97%	3,31%	-1,37	-0,326	-1,53
day -7	-1,18%	2,21%	-2,49**	-0,643	-3,02***
day -6	-0,17%	1,83%	-0,43	-0,061	-0,29
day -5	-0,45%	2,01%	-1,04	-0,287	-1,35
day -4	-1,59%	3,75%	-1,99**	-0,536	-2,52**
day -3	-1,31%	3,27%	-1,88*	-0,545	-2,56**
day -2	-0,89%	4,07%	-1,02	-0,267	-1,25
day -1	-1,31%	3,46%	-1,78*	-0,701	-3,29***
day 0	0,97%	3,75%	1,22	0,264	1,24
day 1	0,10%	3,03%	0,15	0,118	0,55
day 2	0,80%	1,97%	1,91*	0,241	1,13
day 3	0,26%	1,46%	0,83	0,075	0,35
day 4	-0,52%	2,00%	-1,21	-0,164	-0,77
day 5	0,93%	4,04%	1,08	0,164	0,77
day 6	0,64%	2,21%	1,37	0,173	0,81
day 7	-0,43%	2,61%	-0,77	-0,076	-0,36
day 8	-0,53%	2,52%	-0,99	-0,187	-0,88
day 9	0,58%	2,57%	1,05	0,113	0,53

Exclusions 2005-2009					
	AAR	SD AR	SIG	ASAR	SIG
day -10	0,69%	2,07%	1,41	0,173	0,73
day -9	-1,35%	5,14%	-1,11	-0,040	-0,17
day -8	-2,14%	5,89%	-1,54	-0,399	-1,69*
day -7	-1,35%	4,37%	-1,31	-0,255	-1,08
day -6	-1,17%	2,15%	-2,30**	-0,340	-1,44
day -5	0,30%	5,81%	0,22	-0,274	-1,16
day -4	0,39%	4,02%	0,41	-0,281	-1,19
day -3	0,18%	3,98%	0,19	-0,034	-0,15
day -2	-0,09%	2,17%	-0,19	0,103	0,44
day -1	0,14%	2,44%	0,24	-0,010	-0,04
day 0	-3,16%	5,09%	-2,63***	-0,814	-3,45***
day 1	-0,69%	13,19%	-0,22	0,202	0,86
day 2	0,28%	2,59%	0,46	0,253	1,07
day 3	0,88%	3,69%	1,01	0,083	0,35
day 4	-0,41%	1,96%	-0,88	0,012	0,05
day 5	-1,77%	3,73%	-2,01**	-0,278	-1,18
day 6	0,72%	2,43%	1,25	0,235	1,00
day 7	-0,11%	4,58%	-0,10	-0,138	-0,59
day 8	0,92%	2,84%	1,38	0,197	0,84
day 9	-0,18%	1,59%	-0,48	-0,098	-0,42

Exclusions 2010-2014					
	AAR	SD AR	SIG	ASAR	SIG
day -10	0,33%	2,84%	0,72	0,132	0,82
day -9	-0,10%	1,88%	-0,33	-0,011	-0,07
day -8	0,04%	2,02%	0,13	-0,044	-0,27
day -7	0,41%	2,47%	1,05	0,133	0,83
day -6	0,08%	2,55%	0,20	0,033	0,21
day -5	-0,08%	1,95%	-0,24	0,075	0,47
day -4	-0,03%	1,61%	-0,13	-0,025	-0,16
day -3	0,02%	2,81%	0,04	-0,077	-0,48
day -2	-0,02%	1,67%	-0,07	0,047	0,29
day -1	0,74%	1,76%	2,60***	0,335	2,09**
day 0	0,19%	2,17%	0,54	0,091	0,57
day 1	1,14%	4,80%	1,48	0,428	2,67***
day 2	0,13%	2,59%	0,33	0,100	0,63
day 3	0,27%	2,38%	0,72	0,121	0,76
day 4	-0,37%	2,35%	-0,99	-0,054	-0,33
day 5	0,51%	1,66%	1,92*	0,186	1,16
day 6	0,36%	2,58%	0,87	0,106	0,66
day 7	-0,13%	1,59%	-0,51	-0,086	-0,54
day 8	1,21%	3,10%	2,43**	0,456	2,85***
day 9	-0,36%	2,14%	-1,04	-0,063	-0,4

Exclusions 2015-2018					
	AAR	SD AR	SIG	ASAR	SIG
day -10	-0,26%	2,46%	-0,68	-0,074	-0,47
day -9	-0,70%	2,20%	-2,04**	-0,192	-1,23
day -8	0,54%	2,47%	1,41	0,159	1,02
day -7	-0,29%	2,46%	-0,76	-0,104	-0,66
day -6	0,02%	1,96%	0,08	0,047	0,30
day -5	-0,57%	2,03%	-1,80*	-0,115	-0,73
day -4	0,29%	2,16%	0,86	0,096	0,61
day -3	0,67%	4,64%	0,93	0,303	1,94*
day -2	0,24%	2,05%	0,73	0,140	0,90
day -1	0,27%	2,13%	0,82	0,041	0,26
day 0	0,04%	3,29%	0,07	-0,100	-0,64
day 1	-0,05%	2,93%	-0,12	-0,152	-0,97
day 2	0,76%	3,27%	1,49	0,249	1,59
day 3	-0,47%	3,01%	-0,99	-0,061	-0,39
day 4	0,00%	2,55%	-0,01	0,012	0,08
day 5	-0,04%	1,59%	-0,14	-0,063	-0,40
day 6	-0,27%	1,80%	-0,97	-0,092	-0,59
day 7	0,29%	2,64%	0,70	0,032	0,20
day 8	-0,39%	2,35%	-1,06	-0,192	-1,23
day 9	-0,19%	1,74%	-0,69	-0,139	-0,89