Market Reactions to Changes in the S&P 500 Index: An Industry Analysis

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Introduction

The primary objective of the Standard & Poor's 500 index is to be the performance benchmark for U.S. equity markets (Sui, 2003). Investors and index funds routinely buy stock in the member companies of the S&P 500. Sometimes, the S&P 500 deletes a stock from its index and adds another stock in its place. Stocks added to the index must have a large trading volume and must be from financially sound companies (Sui, 2003). Added stocks must also represent the industry that the company is a part of, and have a strong market value within its industry. In a way, the stock is a representative of its industry. If the stock is performing well, investors should be optimistic about the industry it is a part of. If investors knew how the stock prices of additions and deletions were going to move in each industry, they could make profits by investing in those industries with the largest price movements.

In October of 1989, Standard and Poor started announcing future deletions and additions about 5 days before the actual change. When a change is announced, investors typically purchase shares in the soon to be added company before the S&P adds the company to its index. Beneish and Whaley (1996) refer to this as the "S&P Game." Speculators purchase the addition and sell the deletion because they trust that the S&P did extensive research on the future performance of the stocks' earnings. The research done by the S&P basically provides free information or advice for investors and index funds.

Additions to the S&P historically show large increases in return around the days of the announcement. Deletions show even larger negative returns around the announcement day (Cusick, 2001). These changes in return can be explained by four hypotheses. The abnormal returns surrounding an announcement can allow any investor to profit if they purchase the added stock or short sell the deleted stock. I predict that certain industries provide larger returns than others. This is important information for many investors and is the topic of this paper. The paper observes the abnormal returns relative to the market's returns for additions to and deletions from the S&P 500 index from 2000-2003. More importantly, I categorize additions and deletions by industries in order to see if any particular industry in the index has greater returns than others around change dates. The knowledge of how stocks in a particular industry react after an announcement may lead investors to favor some industries more than others when investing around a date of change to the S&P 500 index.

Theory and Review of Literature

An important point made by Philip A. Cusick (2001) was that abnormal returns, surrounding the announcement and change dates of additions and deletions, violate the assumptions of market efficiency. The semi-strong form of the efficient market hypothesis states that all publicly available information is reflected in securities' prices. However, under this theory, the market's historical knowledge of high abnormal positive returns for index additions and large abnormal negative returns for deletions would drive a

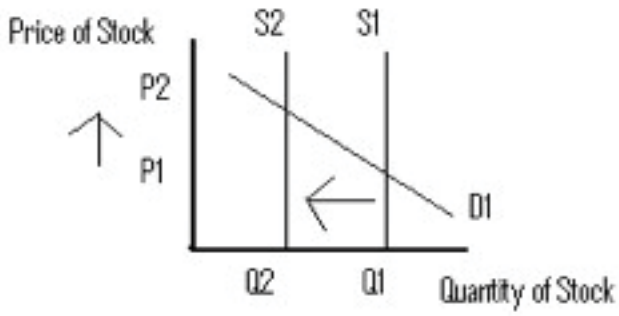
stock's price up to its expected change day value on the day after the announcement, but this does not happen (Cusick, 2001). Over the years, the abnormal returns have been slowly decreasing, but the abnormal returns are still existent and still violate the stated hypothesis. Even though additions and deletions are not known prior to the announcement, the returns are still considered abnormal once the new information is revealed because the returns are abnormal in relation to the overall market's return.

What causes these abnormal returns? Well there are four generally excepted hypotheses to explain this market inefficiency with the increases (decreases) in stock price surrounding additions (deletions). They are the price-pressure, downward sloping demand curve, information, and liquidity hypotheses.

Libo Sui (2003) studied price effects of additions and deletions and found results similar to those of previous studies. However, he like all the other past studies, measured price effects of all additions and deletions with out separating them into industry like this study does. Sui found a mean abnormal return from announcement day to change day of 8.44% for additions and –11.10% for deletions. Even 20 days after the change, Sui found an abnormal return of 6.19% for additions and –6.20% for deletions. The hypothesis generated by Sui to explain these abnormal returns was the price-pressure hypothesis. The price-pressure hypothesis says that the price movements around the time of the index change are caused by heavy trading by index funds, which temporarily move stock prices away from equilibrium.

Anthony W. Lynch and Richard R. Mendenhall (2001) also studied the reaction to stocks added, but not deleted. They found an abnormal return of 3.807% from announcement day to change day. One hypothesis used to explain this price increase was the downward sloping demand curve hypothesis, which is closely related to the price-pressure hypothesis. Lynch and Mendenhall explain the downward sloping demand curve by saying that as firms are added to the S&P 500, index funds buy the stock and remove a substantial fraction of the firm's shares from circulation. This demand by index funds reduces the stock's availability or supply in the market, causing the market-clearing price to increase (Lynch and Mendenhall, 2001). This hypothesis is shown in Figure 1.

Figure 1: Stock Demand



Lynch and Mendenhall also explain the information and liquidity hypotheses. The information hypothesis says that price movements of changed stocks are due to S&P's knowledge of non-public information. The non-public information that S&P receives must be reflected in the increase and decrease of stock price for additions and deletions. For example, if the S&P discover that Dell was to come out with the best and cheapest computers on the market, they would know before the public that Dell's stock price will likely increase, so S&P would announce an addition of the stock before the price increases.

The last hypothesis, the liquidity hypothesis, says that an added or deleted stock's trading volume, or liquidity, increases around the change date (Chen, Noronha, Singal, 2004). An increased liquidity increases the attention given to the stock, which leads to further investment in the company by people watching the stock.

It is probable that for each change to the S&P 500 there is an over dominating hypothesis. Sui (2003) explains that if there is a price reversal after the change, that this is evidence of the price pressure hypothesis. The price reversal shows that the heavy trading by index funds prior to the change actually slows down after the change and prices reverse closer to their previous levels. Sui (2003)

also explains that if there is no price reversal, but rather a permanent price change, that it is evidence of the downward sloping demand curve. Index funds remove much of the shares from circulation for additions and sell shares for deletions, making the supply decrease for additions and increase for deletions. The decreased (increased) supply causes the market clearing price to increase (decrease).

For the purposes of this study, I only look for the effects of the price pressure and the downward sloping demand curve hypotheses in the results. Due to time and data constraints, I am unable to generate all of the information needed to determine if the information and liquidity hypotheses help explain the abnormal returns. Therefore, the price pressure and the downward sloping demand curve hypotheses are examined in explaining why abnormal returns vary across industry.

Using stock returns of additions and deletions from 2000-2003, I predict that there are abnormal positive returns for additions and abnormal negative returns for deletions. My study will add to the research done in this area by looking at the abnormal returns of these additions and deletions when separated into 8 different industries. I predict that abnormal returns greatly differ across these industries. Previous studies I researched have not analyzed abnormal returns of specific industries around a change to the S&P 500; thus my findings add to the subject. The 8 industries I test are basic materials, consumer goods, financials, healthcare, industrial goods, services, technology, and utilities.

Once abnormal returns are calculated for each industry, we should be able to determine whether the price pressure or the downward sloping demand curve hypotheses dominate the explanation for the abnormal returns. If the price pressure theory dominates we will see the price of an addition (deletion) increase (decrease) before the change, then decrease (increase) after the change. If the downward sloping demand curve theory dominates we will see no price reversal, but rather, continued increases (decreases) in stock price for additions (deletions) after the change.

Data

To test my model, I use data from Standard and Poor's website. It has every addition and deletion in the index's history. I will only be looking at additions and deletions from 2000-2003. I collected daily stock prices of each company from 30 days before the change to 30 days after the change. These daily stock prices come from finance.yahoo.com.

Since I also run a regression of abnormal returns by industry, I categorized each company into 1 of 8 different industries. These categorizations are derived from finance.yahoo.com as well. Finance.yahoo.com assigns an industry to each company in the stock market. All together, I test 105 additions and 96 deletions. There are more additions tested than deletions because sometimes a company is deleted because they cease to exist. Therefore, there are no data for these companies after the change to the index. When broken down into industries; basic materials has 6 additions and 14 deletions, consumer goods has 6 additions and 14 deletions, financials has 21 additions and 9 deletions, healthcare has 13 additions and 7 deletions, industrial goods has 2 additions and 10 deletions, services has 14 additions and 20 deletions, technology has 36 additions and 15 deletions, and utilities has 7 additions and 7 deletions.

For calculating abnormal returns, not only are daily stock prices of each addition and deletion required, but daily market figures are required as well. The return of the market is collected from the universe of publicly traded companies from the Center for Research in Security Prices. I will look at several different time spans, or windows, around each change date. Windows around the change dates will be (-5,+5), (-5,+1), (-1,+1), (0,0), (-2,+2), (+1,+5), (-30,+1), (-1,+30). For clarification, (-5,+5) is a window starting 5 days before the change and ending 5 days after the change, and (0,0) is simply the change date. Having different windows will allow for a more

detailed analysis of the results. For example, the different windows will allow us to see if the abnormal returns are greater before the change or after the change.

Empirical Model

The model to be tested is that there is a mean cumulative abnormal positive return for additions and a mean cumulative abnormal negative return for deletions. The mean cumulative abnormal return (MCAR) is found for each industry for additions, and each industry for deletions. MCAR allows us to see the return of a group of stocks, for example all additions and deletions, as a percent above the market. This allows us to see whether some industries have higher abnormal returns than others. To find mean cumulative abnormal return I first find the abnormal return for each stock on each day of the window surrounding a change to the index. Abnormal return for a specific day is simply the return of a stock minus the return of the market on that day.

$$AR_{+1} = SR_{+1} - MR_{+1}$$

In this example, SR_{+1} is the stock's return 1 day after its change, and MR_{+1} is the market's return one day after that stock's change.

Once each stock's abnormal return is calculated for every day, the cumulative abnormal return (CAR) is calculated. This is done by taking the difference of a stock's total return and the market's total return for an entire window. In other words, CAR is found by combining the abnormal returns of all the days of a window for a stock, and finding its difference from the combined abnormal return for the market in the same window. In the formula below, $SR_{(-30,+30)}$ is the stock's total return from 30 days before the change to 30 days after; and $MR_{(-30,+30)}$ is the market's total return during this same window.

$$CAR_{(-30,+30)} = SR_{(-30,+30)} - MR_{(-30,+30)}$$

Finally, the mean cumulative abnormal return is found by taking the average of each stock's CAR in the window. In the example below the CAR of all additions is averaged during the window from 30 days before to 30 days after the changes.

$$MCAR_{(-30,+30)} = (\sum CAR_{additions(-30,+30)})/n$$

$\sum CAR_{additions(-30,+30)}$ is the sum of all the CAR's for additions and n is the total number of additions. The window to be used in my model is (-30, +30) and once this MCAR is calculated, we can then look at smaller windows to analyze the effects of an announcement of an addition or deletion on stocks' prices in the 8 industries. MCAR should be positive for additions and negative for deletions. Each of the 8 industries will be tested for MCAR to see which industries show the largest and smallest abnormal returns, if any. A standard Z-test will be used to compare the mean abnormal returns of the added and deleted stocks to the mean abnormal returns of the entire stock market. In tables 1 and 2, a $ represents a statistical significance level of 10%. A * represents a level of 5%, ** 1%, and *** 0.1%. The same explanation can be found at the bottom of tables 1 and 2. Furthermore, the sign of the z-statistic indicates whether abnormal returns were positive or negative.

Results

After reviewing the results in tables 1 and 2, it is clear that there are positive abnormal returns for additions and negative abnormal returns for deletions in the time around the change. These results are consistent with those of all the past literature on the topic including Lynch (1997), Cusick (2001), Beneish (2002), Sui (2003), and Chen (2004),. Each window's mean cumulative abnormal returns are significant for All Additions and All Deletions categories at the 5% level or better when compared to the mean return of the market. When looking at all additions and all deletions, we see that every window for deletions has a larger absolute abnormal return than additions, which is consistent with past studies. This fact may be due to investor awareness (Honghui, Noronha and Singal, 2004).

It appears that investors are more aware of deletions to the S&P 500 than they are of additions. Therefore, investors are more concerned with losing money than making money. In other

words, investors are extremely risk averse, as they should be because, as stated earlier, the market is inefficient and investors can not fully know when stock prices may go down. Investors can never fully anticipate what is going to happen to a stock's price. The fact that the additions and deletions of this study have abnormal returns gives evidence of market inefficiency, as supported by the findings of Cusick (2001). If the market were efficient the stock prices of those added and deleted stocks would already be up or down before the change to the index.

Table 1: Mean Cumulative Abnormal Returns for Additions

Windows	All Add	BM	CG	FIN	HEALTH	IG	SERV	TECH	UTIL
(-5,+5)	2.80%	0.11%	3.07%	1.17%	8.03%	4.13%	1.64%	3.46%	-1.01%
	(2.074*)	-0.076	-1.097	-0.919	(2.187*)	-0.44	-0.463	-0.932	-0.629
(-5,+1)	4.21%	2.62%	4.60%	2.14%	4.72%	5.88%	3.55%	5.46%	4.98%
	(5.862***)	-0.995	(2.724***)	(2.416**)	(1.868*)	-1.016	(2.202*)	(3.158***)	(1.712*)
(-1,+1)	1.48%	-0.19%	-0.12%	0.77%	4.25%	4.95%	0.92%	2.35%	-3.11%
	(2.551**)	-0.082	-0.061	(1.779*)	(2.146*)	(1.291$)	(1.555$)	(1.382$)	(2.281*)
(0,0)	1.03%	-0.08%	0.51%	1.34%	3.13%	1.88%	-0.62%	1.70%	-2.69%
	(3.278***)	-0.444	-0.369	(3.947***)	(1.901*)	-1.128	(1.456$)	(1.616$)	(2.986**)
(-2,+2)	1.75%	-1.03%	0.25%	0.94%	6.57%	4.45%	-0.09%	2.71%	-3.16%
	(2.262*)	-0.572	-0.376	(1.437$)	(2.850**)	-0.557	-0.068	(1.686*)	(1.646*)
(+1,+5)	-2.42%	-2.43%	-1.04%	-2.31%	0.18%	-3.64%	-1.28%	-3.70%	-3.29%
	(-4.252***)	-0.684	(-1.263)	(2.818**)	-0.526	(-.868)	(-2.166*)	(-2.498**)	(1.309$)
(-30,+1)	6.39%	5.13%	12.85%	4.12%	15.66%	1.25%	9.64%	3.44%	1.60%
	(3.707***)	-0.771	(2.821**)	(1.863*)	(1.813*)	-0.487	(1.958*)	-0.979	-0.084
(-1,+30)	-4.30%	-3.04%	-5.97%	-2.74%	-1.18%	8.44%	2.39%	-10.65%	1.28%
	(-2.692**)	-0.339	(-1.561$)	-1.095	(-.831)	-0.827	(-.443)	(-2.559**)	-0.404

The symbols $,*,**,and*** represent statistical significance at the 10%, 5%, 1%, and 0.1% levels.

There have not been past studies on the abnormal returns of individual industries around a change to the S&P 500, but the results in Tables 1 and 2 do support my prediction that abnormal returns should vary across industries. The basic materials and the consumer goods industries showed abnormal returns similar to those of the overall abnormal returns for both additions and deletions. It appears that the movements of these industries' prices with an announcement react much in the same way as the entire group of additions and deletions. Both the basic materials and the consumer goods industries' stock prices move back down after the change for additions, and move back up after the change for deletions. This trend supports the price pressure hypothesis as discussed in past literature (Sui, 2003). The price reversal shows that the heavy trading by index funds prior to the change, actually slows down after the change and prices reverse closer to their previous level. In the basic materials industry for deletions, prices actually reversed so much that they returned to higher prices than before the change to the index. The decrease in prices before the change was definitely caused by the price pressure that index funds created.

The financial industry also showed the predicted positive abnormal returns for additions and negative abnormal returns for deletions. This industry, like basic materials and consumer goods, also showed a price reversal, but only for companies added to the index, not deleted. Financial deletions continued decreasing in stock price 30 days after the change. This may be due to continuously low interest rates during the periods of the deletions. If rates were not expected to increase, the future outlook for these financial companies would not look too bright and the stock prices would continue to fall. Therefore, the continued decrease in stock price for financial deletions is probably due to an economic condition, like low interest rates. Perhaps these deleted companies were not adjusting to the economic conditions as well as the other financial companies. The continued negative abnormal returns after the change for deletions show that these movements are permanent (Sui, 2003). A permanent change is evidence of the downward

sloping demand curve hypothesis. Index funds removed much of the shares from circulation for the deleted companies, making the supply increase for these companies. The increased supply caused the market clearing price to decrease.

It seems that for the healthcare industry, stock prices increase around the change for both additions and deletions. For additions, healthcare had the highest MCAR for the (-30, +1) window of 15.66% and it only dropped 1.18% during the 30 days after the change. This MCAR is extremely large for a time frame of 61 days. Most stocks and indexes never have returns this high, not even on a yearly basis. For healthcare deletions, MCAR for the (-30, +1) window was 11.01% and 0.76% 30 days after the change. This is the opposite of what I hypothesized. I thought that every deletion would have abnormal negative returns, not positive. None of the past literature has calculated abnormal positive returns for deletions; however, no past study has looked at individual industries. Why would the announcements of deletions of healthcare companies lead to an increase in stock prices? An obvious assumption is that the healthcare industry is very strong and competitive. So maybe deletions from the S&P 500 index were of very strong companies, and even stronger companies replaced them.

Additions for the industrial goods and the services industries both had large overall MCAR with the announcements. Both industries also had increased returns after the change date for additions, showing evidence of the downward sloping demand curve cause for increased prices as stated in the theory and literature review section. For deletions, both industries had high negative abnormal returns before the change and large reversals after the change, evidence of price pressure.

For the technology industry, overall abnormal return for the 61 days was negative for additions and positive for deletions. The returns were in the right direction for the (-30, +1) window, but the price reversals in the (-1, +30) window were larger than before the change for both additions and deletions. Therefore, the overall effects of the changes were opposite of what we expected. The large price reversals caused the opposite prediction and are evidence of the price pressure hypothesis.

The utilities industry showed average abnormal returns for additions, but extremely large negative abnormal returns for deletions; it was the largest of all 8 industries. From 30 days before the change to 1 day after, mean cumulative abnormal returns for the utilities industry was -33.91%. Investors are obviously concerned with holding stock in utilities after Standard & Poor announces a deletion of a stock from this industry.

Table 2: Mean Cumulative Abnormal Returns for Deletions

Windows	All Del	BM	CG	FIN	HEALTH	IG	SERV	TECH	UTIL
(-5,+5)	-5.74% (5.663***)	-7.45% (-3.293***)	-4.48% (-2.352**)	1.79% -0.125	-0.97% -0.02	-12.45% (-2.822**)	-4.85% (-2.367**)	-7.36% (1.998*)	-2.90% (-1.265)
(-5,+1)	-7.10% (8.210***)	-7.55% (-3.678***)	-2.33% (-1.318$)	2.10% -0.364	0.11% -0.26	-6.76% (-3.075**)	-10.24% (-4.963***)	-9.48% (2.933**)	-15.61% (-6.617***)
(-1,+1)	-3.30% (6.072***)	1.85% -0.879	-3.90% (-2.791**)	0.54% -0.244	0.25% -0.545	-4.15% (-2.718**)	-1.84% (-1.110)	-2.70% (1.451$)	-21.24% -12.930***
(0,0)	-2.31% (6.840***)	1.60% -0.846	-2.92% (-4.442***)	-0.23% (-.347)	-0.50% -0.36	-2.61% (-3.057**)	-4.29% (-4.663***)	-3.11% (2.637**)	-4.64% (-3.694***)
(-2,+2)	-2.54% (3.025**)	2.11% -0.571	-0.63% -0.049	1.89% -0.782	1.13% -0.975	-3.96% (-1.807*)	-3.29% (-1.309$)	-3.35% (1.465$)	-13.00% (-6.266***)
(+1,+5)	5.77% (7.153***)	-1.75% (1.468$)	1.63% -0.835	-0.19% (-.243)	-2.03% -0.573	-4.41% -1.178	12.25% (5.228***)	8.72% (2.695**)	10.50% 15.823***
(-30,+1)	-12.15% (6.088***)	-12.57% (-2.391**)	-16.34% (-3.746***)	-1.90% -0.003	11.01% -1.233	-17.51% (-3.583***)	-10.70% (-1.484$)	-10.80% (1.351$)	-33.91% (-5.951***)
(-1,+30)	10.32% (7.861***)	14.83% (3.768***)	11.14% (5.354***)	-1.67% (-1.475$)	0.76% -0.62	10.85% (3.518***)	15.24% (2.580**)	11.67% (2.534**)	4.36% (1.564$)

The symbols $, *, **, and *** represent statistical significance at the 10%, 5%, 1%, and 0.1% levels

With depleting resources and rising prices, it is easy to see why investors would sell their utilities stocks with an announcement of a deletion.

Conclusions

This paper studies the addition and deletion effects of the Standard & Poor's 500 index on stock prices in different industries. The findings are consistent with the proposed hypotheses and with past literature on the subject. This study found that there are abnormal positive returns for additions to and abnormal negative returns for deletions from the S&P 500 index and that these abnormal returns are evidence of market inefficiency. Deletions have a larger absolute return than additions for every window which is consistent with previous studies. This is representative of investors' risk tolerance. It seems that investors focus more attention on deleted stocks, which leads to higher abnormal returns. Investors focus more on deleted stocks than added stocks because they are more worried about losing money on the deleted stocks than making money on the added one. This shows that most investors are risk averse.

As I predicted, this study finds that certain industries with abnormal returns can be explained by the price pressure hypothesis and some by the downward sloping demand curve hypothesis. For additions, industrial goods, services, and utilities were the only industries with continued, or permanent, abnormal returns after the change date. This is evidence of the downward sloping demand curve hypothesis. All the other industries gave evidence of the price pressure hypothesis for additions. For deletions, financial and healthcare were the only industries with permanent abnormal returns, evidence of the downward sloping demand curve. All other deletions for the remaining industries gave evidence of the price pressure hypothesis with price reversals. Knowing whether abnormal returns are permanent or if the stock price will reverse is important for investors because they need to know when to close their position in the addition or deletion.

For example, when comparing price reversals between deletions and additions, deletions show much larger reversals. This leads me to the conclusion that deletions are more likely caused by the price pressure hypothesis than additions. If my conclusion is correct, then investors would want to be particularly careful about the time frame in which they short sell a deleted stock. If they hold on to the sale for too long, the price reversal may be so large that they loose money or make very little. Ideally, investors would want to close their short sale on the change date of the deletion.

An important finding to note is that for financial deletions, the continued price drop after the change may be due to low interest rates during this time. Many financial companies have lowered revenues in times of low interest rates. If the future economic outlook for financials was poor after the deletions of these companies, investors would probably continue selling the stocks. Therefore, as an investor, one must be particularly careful with financial stocks due to changing economic conditions.

Another important finding to note was the very high positive abnormal returns for the healthcare industry for not only additions, but deletions as well; which supports my hypothesis that abnormal returns should vary across industries. Apparently healthcare is an extremely strong industry during the tested time frame. Deleted companies in healthcare were obviously still very strong and growing, but even stronger companies in healthcare or another industry probably replaced them. It seems that healthcare would be a great investment for any investor.

The technology industry showed huge price reversals after the change date. The reversals were so large that returns were actually below what they were 30 days before the change. The same is true for deletions, but in the opposite direction. This is most likely due to the fact that index funds put much pressure on the stock prices and this pressure quickly dissipated after the change.

One last important finding is that there is an extremely large mean cumulative abnormal

return for utilities deleted from the S&P 500 index. In the window (-30,+1), there is a MCAR of -33.91%. This is an extremely large and abnormal return and may be due to a fear of utilities by investors. With depleting resources, rising costs, and rising prices it is easy to see why investors would want to sell stock in utilities, especially after the S&P 500 deletes a utilities stock from its index. An investor would definitely want to sell short stock of a deleted utilities company to earn large returns.

It is clear that there are abnormal returns for companies added and deleted from the S&P 500, and in the 8 industries tested. Further study in this area may want to test whether the information or liquidity hypothesis add to the cause of abnormal returns. Furthermore, a future study may have the time to find the reasons a stock has been added or deleted by looking for unique characteristics of each company. One could group additions and deletions into companies that have merged or companies that have different growth rates or risk levels. There is much room for future study in the additions and deletions arena.

To expand on this project, it would be even more beneficial to calculate abnormal returns of stocks in relation to their industry's index return instead of the entire market. Seeing an added or deleted stock's return over its industry instead of over the market would allow investors to see whether the abnormal returns are solely for the stock or for the industry as a whole. Then they could invest accordingly.

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