SENIOR PROJECT – APPROVAL

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College: Business Department: Finance

PROJECT TITLE: An Empirical Investigation of Abnormal Returns Associated With Firms Added to or Deleted from the S&P 500 Stock Index

I have reviewed this completed senior honors thesis with the student and certified that it is a project commensurate with honors level undergraduate research in this field.

Signed: Deborah L. Murphy, Faculty Mentor

Date: May 7, 2003

Comments (Optional):

I have truly enjoyed interacting with Eric over the last year. He is a very talented individual with an exceptional work ethic and clearly capable of graduate level work. The results of his paper are not only interesting, but also worth further investigation. Indeed, Eric and I have discussed and agreed to continue to work together on this topic in hopes that it will result in a manuscript suitable for publication in an academic journal in the field of finance. With this goal in mind, we will be pursuing the following extensions: (1) conducting the event study using market model parameter estimates calculated with post-event returns (the paper currently uses pre-event return data); (2) testing for beta (systematic risk) shifts surrounding the announcements; (3) analyzing changes in firm specific risk and volume of trading as a result of a firm being added to or deleted from the S&P 500 index; (5) validating the results of this study by replicating the results of previous studies; and (6) analyzing changes in forecasts of earnings and the dispersion of forecasts by analysts. I look forward to working with Eric over the next year.

An Empirical Investigation of Abnormal Returns Associated with Firms Added to or Deleted from the S&P 500 Stock Index

Eric Watts

Faculty Mentor – Dr. Deborah Murphy

May 6, 2003

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Thank You

Dr. Deborah Murphy,

I would like to thank Dr. Murphy for her guidance and support over the past few years. I truly appreciate the time you have put in to mentoring me and guiding me through this research process. It often seemed that I would find a new problem every week, but you were always there to offer the proper advice. You are a fantastic teacher and the best mentor that I could have possibly chosen. Thank you again for all of your time.

Rongrong Zhang,

I would like to thank Rongrong for performing the abnormal return calculations on such short notice. Without your help I would have never finished this report. Thank you again for taking the time out of your busy schedule to help with my research.

Introduction

Prior to October of 1989, it was the policy of Standard & Poor's to announce and implement additions and deletions to the S&P 500 on the same day. Quantitative analysis by Arnott and Vincent has shown that additions (deletions) to the S&P 500 index prior to October of 1989 were accompanied by a rise (decline) in the affected company's stock price on the date of the addition (deletion) that was sustained over an extended period of time[1]. Beginning in October of 1989, it has been the policy of Standard & Poor's to, whenever possible, announce the impending index change one week prior to implementation. Research by Lynch and Mendenhall has shown that addition (deletion) announcements are accompanied by a positive (negative) announcement day abnormal return and a positive (negative) cumulative abnormal return over the period from announcement to implementation[2].

Both the Arnott and Vincent study and Lynch and Mendenhall study point to market anomalies that contradict semi-strong market efficiency theory. According to semi-strong market efficiency, stock prices should accurately reflect all publicly available information, including past stock prices and volumes and announcements made by Standard & Poor's. But according to research, investors could create a set of investment rules using only publicly available information that would allow them to profit. According to Arnott and Vincent, the profit opportunities would be modest, but Lynch and Mendenhall suggest that post October 1989 data shows significant abnormal returns in excess of that found prior to the 1989 policy change. This study will examine the abnormal returns on stock of firms that have been added to or deleted from the S&P 500 Index over the time period of January 1, 1997, to December 31, 2001.

Further, according to Beneish and Whaley, the Standard and Poor's have become more aggressive in recent years in voluntarily removing companies from the index, where in the past it was generally done only in the case of merger or acquisition, corporate restructuring, or bankruptcy filing[3]. The S&P now deletes companies for such reasons as low market capitalization, low share price, falling market share, or in order to make room for an up and coming stock that needs to be added to the index. Voluntary deletions from the index were more

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[1] Robert D. Arnott and Stephen J. Vincent, "S&P additions and deletions: A market anomaly." *Journal of Portfolio Management*, Fall 1986, pp. 19-23.
[2] Anthony W. Lynch and Richard R. Mendenhall, "New Evidence on Stock Price Effects Associated with Changes in the S&P 500 Index." Journal of Business. 1997, Volume 70, number 3, pp. 351-383.
[3] Messod D. Beneish and Robert E. Whaley, "S&P 500 Index Replacements." *Journal of Portfolio Management*, Fall 2002, pp. 51-60.

prevalent in the late 1990s than at any prior time since the S&P 500's creation. This study will examine any differences in the abnormal returns of firms that have been deleted from the S&P 500 Index for either discretionary reasons or because of mergers and acquisitions. Previous research by Sawyer and Shrieves into abnormal returns of merging companies examines abnormal returns for companies that merge together within a homogeneous industry, but also notes that abnormal returns in general vary for the bidding company around the announcement date and are positive for the target company over the same time period[4#].

Further, this study will seek to determine if the exchange effect has any bearing on abnormal returns resulting from additions and deletions to the S&P 500. Research by Cheon, Christensen, and Bamber into the exchange effect finds that abnormal returns associated with NADAQ firms are significantly higher than that of NYSE firms following earnings announcements[5]. This study will determine if similar variations may be noted in abnormal returns from firms that are added to or deleted from the S&P 500 index.

Research indicates that additions and deletions to the S&P 500 are accompanied by significant abnormal returns, and that these additions and deletions have become more frequent in recent years. The purpose of this study is to quantitatively analyze the abnormal returns of stocks that have been added to or deleted from the S&P 500 and determine if the abnormal returns are significant, if those returns vary significantly with reasoning behind the index change (be it discretionary or due to a merger or acquisition), and if those returns vary significantly for stocks traded on the NASDAQ versus those traded on the NYSE and AMEX.

Methodology

Event study methodology will be used to determine the stock price reaction to the announcement of addition or deletion from the S&P 500. Event study analysis allows the

[4] Granville M. Sawyer Jr. and Ronald E. Shrieves, "Stockholder Returns Among Homogeneous Groups of Mergers." *The Journal of Financial Research*. Spring 1994, Volume 17, number 1, pp. 45-63.
[5] Youngsoon Susan Cheon, Theodore E. Christensen, and Linda Smith Bamber, "Factors Associated with Differences in the Magnitude of Abnormal Returns Around NYSE Versus NADAQ Firms' Earnings Announcements." *Journal of Business Finance and Accounting*, Nov./Dec. 2001, Volume 28, numbers 9 and 10, pp. 1073-1108.

behavior of stock prices to be analyzed around a particular critical event, in this case the announcement made by Standard & Poor's regarding impending index changes.

Day zero ($t = 0$) is defined as the date of the announcement as found in either the *Wall Street Journal* or in releases by *PR Newswire* and *Business Newswire*. Day $t = 0$ will not be the same chronological date for every company included in the study. Daily abnormal returns for each stock are calculated over the interval $-10 < t < +10$, or ten days prior to the announcement and the ten following days afterwards. Daily risk-adjusted abnormal returns for each company j on day t, denoted E_{jt}, are defined as:

$$E_{jt} = R_{jt} - \alpha_j - \beta_j R_{mt} \qquad (1)$$

Where R_{jt} is the actual return on the stock of company j on day t, α_j is the intercept, β_j is the systematic risk of stock j which is determined in an estimation period consisting of a minimum of 150 and a maximum of 250 trading days prior to the event period, and R_{mt} is the return on the market portfolio on day t, which is defined as the return on equally weighted portfolio of all stocks trading on the NYSE and AMEX on day t. The average daily risk adjusted abnormal return on day t, denoted A_{rt}, is defined as:

$$A_{rt} = \left[\sum_{J=1}^{Nt} E_{jt} \right] / N_t \qquad (2)$$

Where N_t is the number of firms in the sample on day t and E_{jt} is defined in equation (1). Test of statistical significance are based on the Z statistic, which is defined as:

$$Z_t = \sqrt{N_t} \left[AR_t / \sigma_t \right] \qquad (3)$$

where σ_t is the standard deviation of abnormal returns on day t and N_t and AR_t are defined in equation (2).

Because identifying the first announcement of an event is difficult, the cumulative abnormal returns, or CAR_t, will be examined. CAR_t will be defined as:

$$CAR_t = \sum_{t=1}^{T} AR_t \qquad (4)$$

and are determined for the interval $-10 < t < +10$, or $T = 1$ to 21.

Data

The sample of additions and deletions is assembled by a search of two sources. The first source of announcement dates is the *Wall Street Journal Index* for the dates January 1, 1997, to December 31, 2001. The headings used in the Index were "Standard & Poor's Corp" and "Stock Indexing." In addition, a search of the *Lexis Nexis* database was used to complete the sample. Both *PR Newswire* and *Business Newswire* provided announcement dates after two searches using the keywords "S&P, announces, change" and "S&P 500, index, change."

After completing a sample of additions and deletions for the given time period, the sample is stratified into several other categories. Calculations to determine the abnormal returns and cumulative abnormal returns over the event period are preformed on the entire sample and each separate stratified category. The firms in the sample are stratified in the following manner:

(1) Additions to the S&P 500
    (a) Additions of firms trading on the NASDAQ exchange
    (b) Additions of firms trading on the New York Stock Exchange or the American Stock Exchange
(2) Deletions from the S&P 500
    (ai) Deletions of firms trading on the NASDAQ exchange
    (aii) Deletions of firms trading on the New York Stock Exchange or the American Stock Exchange
    (bi) Deletions resulting from a merger or acquisition of the listed firm by another separate firm
    (bii) Deletions resulting from lack of representation, or similar discretionary reason

Information regarding the reason for adding or deleting specific firms is found within the same articles and the same sources from which the announcement dates are taken. Information regarding the exchange on which each firm was trading for the event period is taken through a search of the CRSP database. The daily stock returns and returns on the market were also taken from the CRSP database.

Firms were eliminated from the sample if returns for the firm were not available for a minimum of 150 days prior to the event period and the first 11 days of the 21-day event period itself (a minimum total of 161 days).

The final sample consists of 300 total additions and deletions to the S&P 500 index. There are 147 additions, of which 93 trade on the NYSE or AMEX, and 54 trade on the NASDAQ exchange. There are 153 total deletions, of which 141 trade on the NYSE or AMEX, and 12 trade on the NASDAQ exchange. In addition, 106 of the deletions were due to involvement in a merger or acquisition, and 47 were a result of discretionary action taken by the Standard & Poor's Corporation.

Results

Table I displays the cumulative abnormal returns for additions and deletions and the subsequently stratified segments of the original sample.

Model	CAR(-1,0)		CAR(-1,+1)		CAR(-3,+3)		CAR(-10,+10)	
Variable	CAR and Z- Stat		CAR and Z- Stat		CAR and Z- Stat		CAR and Z- Stat	
Additions	2.778%	7.543*	6.144%	15.144*	6.489%	18.419*	4.744%	14.885*
Additions – OTC	2.565%	3.613*	6.500%	7.864*	7.564%	10.420*	3.760%	5.522*
Additions – Auction	2.902%	7.034*	5.938%	13.922*	5.865%	16.106*	5.316%	17.015*
Deletions	-2.307%	-3.874*	-3.759%	-6.621*	-4.200%	-8.694*	-1.506%	-3.361*
Deletions – OTC	-3.612%	-3.299*	-4.672%	-3.340*	-5.682%	-4.635*	-0.465%	-0.347*
Deletions – Auction	-2.196%	-3.481*	-3.682%	-6.173*	-4.076%	-8.040*	-1.803%	-3.863*
Deletions – Merger	0.244%	0.974	0.181%	0.681	0.002%	0.010	-2.065%	-9.759*
Deletions - Other	-8.060%	-4.501*	-12.562%	-7.527*	-13.514%	-9.404*	-7.121%	-5.585*

*Significant at .01 level (two tailed test)

Conclusion

Additions show highly significant abnormal returns throughout the 21 day event period. The abnormal returns are not, however, concentrated in the -1,0 time period as one would expect. The largest abnormal returns are actually found in the -3,+3 time period. There are several possible reasons that could explain this apparent violation of efficient market theory. Information leakages prior to the event date as defined in this study could explain excess returns prior to the event date. Announcements of changes in the S&P are made in several financial publications, as evidenced by the number of sources used to determine announcement dates for this study. After being added to the S&P 500, firms can expect a wave of positive publicity and buying pressure that could continue to push stock prices up over an extended period of time (beyond the event date). First, investors (both institutional and individual) who maintain portfolios that attempt to mimic the S&P 500 will buy the stock of an added firm, pressing the stock price higher. Particularly for institutional investors, this reaction would likely be very quick. But news coverage of the addition, including newspaper articles, press releases, television news reports, and others, would potentially prolong public exposure of the change. Because being added to the S&P 500 index is generally viewed as a positive sign that a firm is performing well, prolonged exposure of the change could be a significant cause for the increased abnormal returns over extended periods that we see in this study.

Similarly, deletions exhibit abnormal returns over a period of time -3,+3 that is much larger than that of -1,0. The same general reasons that additions exhibit positive abnormal returns can explain the negative abnormal returns for deletions. Firms that are deleted from the S&P 500 are exposed to negative buying pressure from individuals and institutions that seek to mimic the index. Investors are also likely to view the deletion as a negative indicator of the future performance of the firm. Prolonged coverage of the event is likely to exaggerate the effect further. In the case of both additions and deletions, the time period -10,+10 exhibits lower cumulative abnormal returns, indicating that the market begins to reverse the trends observed in time periods -1,+1 and -3,+3. As the time period is extended, it also becomes more likely that various other pieces of information regarding individual firms are obtained by the market and are subsequently priced into the firm's stock. These could include various events ranging from earnings reports to editorial articles in newspapers to appearances by the firm's CEO on television programs.

Stocks listed on the NYSE or AMEX (auction market) exhibit slightly smaller abnormal returns over the time periods -1,+1 and -3,+3 when compared to companies listed on the NASDAQ (OTC). This is consistent with previous research that has indicated NASDAQ firms exhibit abnormal returns of a greater magnitude when compared to those of NYSE firms when observing a time period surrounding the earnings announcements of individual firms. This could be a result of a greater amount of information regarding NYSE firms when compared to those on the over the counter market. The NYSE and AMEX have a larger number of large firms which attract more institutional coverage and media attention. This could be an anomaly along the lines of the size effect. If less information about firms on NASDAQ is available to the market, it is likely that new information would be absorbed with greater volatility. In addition, firms on the NASDAQ could be viewed by investors as offering greater growth opportunities than the larger more established firms of the NYSE and AMEX. In this case, an addition to the S&P 500 could be viewed as a significant sign of positive future performance for the smaller NASDAQ firms, creating greater buying pressure and increasing abnormal returns. It is possible that investors view positive news about NASDAQ firms with greater enthusiasm than positive news about NYSE and AMEX firms.

The structure of the auction markets versus the over the counter market could further explain the larger magnitude of abnormal returns exhibited by NASDAQ firms in this study. In the auction market, buyers and sellers determine prices through a bidding process in a specific physical location. In the OTC market, security dealers act as intermediaries and make the market in each security. These dealers have a vested interest in each transaction, introducing an aspect of trading that does not exist in the auction markets. The NASDAQ's electronic trading system makes transactions instantaneous. Both the increased coverage of NYSE firms and the instantaneous transactions on the NASDAQ system could potentially be seen as arguments for greater efficiency. But evidence suggests that the reaction to new information is not always rational. Abnormal returns exist prior to and beyond the critical event. It seems that reaction to new information is more volatile over the time periods -1,+1 and -3,+3 for NASDAQ firms, perhaps because institutional investors (professionals) are a greater driving force on the NYSE than on the NASDAQ. Trading hours and media and analyst coverage could also potentially explain the differences between the results of the two samples.

Deletions of firms that were involved in mergers or acquisitions showed no significant abnormal returns over the periods -1,0 -1,+1 or -3,+3, while deletions of firms that were removed for discretionary reasons were accompanied by significant abnormal returns of a large magnitude during every time period. There are several reasons that could explain this difference. Firms that are involved in merger or acquisition negotiations are likely to be subject to a greater amount of coverage by the news media and investors, specifically institutional investors. A deletion from the S&P 500 is likely to be expected in these cases and the event could be priced into the stock prior to the actual event. In addition, the merger or acquisition itself could be viewed by the market as a positive sign for future earnings potential rather than a negative sign, so upward buying pressure could counteract at least a portion of the loss caused by the deletion. If the merger is viewed as a significant positive event for the firm, it is possible that the effect of the deletion from the S&P 500 would be completely absorbed by the positive news and the resulting market reaction. Firms that are deleted because of a lack of representation, on the other hand, are likely to be subject to less coverage by analysts and journalists. The deletion announcement would be a greater shock to the market, and perhaps more importantly, would be viewed as a significant negative sign for the future performance of the firm. There is no new "positive" information regarding these firms that could potentially offset the market reaction to the deletion, and as a result the firm feels the full impact of the announcement. This penalty is often extreme; -13.514% over a -3,+3 time period. This is by far a more severe reaction than that faced by firms that are deleted as a result of mergers or acquisitions. It is interesting to note that, although prior research indicates that the Standard and Poor's Corporation has increased the number of discretionary deletions in recent years, there are still far fewer discretionary deletions than deletions as a result of pending merger or acquisition.

This study has shown that there are significant penalties paid by companies that are deleted from the S&P 500, and that firms added to the S&P 500 are rewarded by the market. Firms listed on the NASDAQ system exhibit cumulative abnormal returns of slightly greater magnitude than those listed on the NYSE and AMEX. And finally companies that are deleted from the index at the discretion of the Standard and Poor's Corporation suffer far greater penalties than firms that are deleted as a result of merger or acquisition. This suggests that there are significant anomalies associated with announcements of changes in the S&P 500 Index and that investors could potentially profit by developing a set of investment rules that exploit them.

Over the full 21 day event period, cumulative abnormal returns tend to be smaller than those found in 3 and 7 day periods surrounding the announcement of the change. Information leakages, failure to recognize the original announcement, inefficient distribution of available information, and irrational investment decisions could all potentially explain these differences. The results of this study indicate that further research into abnormal returns following announcements of changes in the S&P 500 Index would be beneficial in further understanding efficient market theory and the anomalies that conflict with it.

Notes

[#] For the purposes of this study, only the fact that a company is being removed from the S&P 500 due to a merger or acquisition will be considered. No attempt has been made to classify merging companies into homogeneous and heterogeneous groups, or group them in any other way based upon individual firm characteristics.