Gambling on the S&P 500’s Gold Seal:
New Evidence on the Index Effect

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Abstract

This study examines the abnormal returns, trading activity and long term performance of stocks that were added to the S&P 500 Index during the period 1990 to 2002. By using a three-factor pricing model that allows for firm size and value characteristics as well as market risk, we are able to shed new light on the widely observed ‘index effect’. We argue that for the years 1990-1997 in particular, firm size mattered in the long-run and firm size effects cannot be captured by a single factor model for abnormal returns. We also find a transitory increase in trading volume between the announcement and a few days after the effective date. The “seal” of S&P 500 Index membership has very long term effects and inclusion is not an information-free event.

**JEL Classification Numbers:** G10, G14

**Keywords:** Index effect, S&P 500, market efficiency, price pressure, three-factor model

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I. Introduction
One of the strongest implications that followed from the development of the Capital Asset Pricing Model was the efficiency of the market portfolio. Although it took some time for the message to be assimilated, by the mid-1970s there had been several index funds established in the US market\(^1\). Indexing is an investment approach that seeks to track the performance of a particular benchmark. There is no attempt to “beat the market” or to use active management strategies to make bets on individual stocks. In order for the tracking error (defined as the difference between the performance of the index and the performance of the index fund after management costs) to be minimised, index funds should hold all of the securities in the index being tracked. In cases where the index fund holds only a representative sample of securities to reduce transaction costs, the tracking error could be significant. Thus, most index funds try to buy and hold all of the stocks that comprise their benchmark and rebalance their holdings immediately when a change in index composition is made. The growth in the number and size of index funds leads to trades that necessarily result from any change in the composition of the index being tracked.

The “index effect” refers to the price pressure that is observed when a stock is added to or deleted from an index. The proportion of funds under management in the US that are indexed has been growing through time and this growth would be expected to ensure a positive demand for the added stocks and a negative demand for the deleted stocks. One of the main reasons why the Standard and Poor’s Index Committee changed their policy concerning additions to and deletions from the S&P 500 in 1989 was the increase in abnormal returns of the stocks after those announcements. Under the new announcement policy, changes are pre-announced an average of five days before they become effective in order to alleviate price pressures during the event. Other indices that might appear to be equally important benchmarks in the US market do not face such a problem because there is less indexed money tracking them. For example, in the case of the Dow Jones Industrial Average (DJIA), the prices and trading volumes of added stocks are largely unaffected, consistent with the fact that index tracking is limited for that index (Beneish and Gardner, 1995). However, firms that were removed from the index experienced significant stock price declines.

\(^1\) The largest index fund in the US market is the Vanguard 500 Index Fund that was created in 1976.
In addition to those observed in the US market, price pressures from index changes were also found in the German market for the DAX blue-chip and the DAX mid-cap (Deininger, Kaserer and Roos, 2000), as well as in the New Zealand market (Elayan, Li and Pinfold, 2000). The latter study is of particular interest since the abnormal returns could not be attributed to index fund trading due to the relatively small capitalization of passive funds in New Zealand (0.5% of market capitalization). There were also significant price reactions from changes in the in MSCI country indices (Chakrabarti et al., 2002).

Our study focuses on the index effect of S&P 500 additions and builds upon existing studies from four important viewpoints. First, the Fama-French three factor model (Fama and French, 1995) is employed to calculate abnormal returns during an event window around the inclusion, rather than the single-factor models employed exclusively in the current literature. This allows us to determine whether the index effects observed in extant papers can be explained by the use of a broader risk-adjustment model incorporating additional factors that have been widely cited as driving the variation in stock returns. Second, we make use of a longer run of data on index additions than was possible for previous research in this area. Third, we separately examine the impact of firm size on the strength of the index effect. Finally, we disaggregate the index effect by sector, and investigate how it has changed through time.

To anticipate our main findings, we observe a significant price increase of 4.54% on the first day after an announcement of impending S&P 500 inclusion, as well as a cumulative price increase of 2.38% for the average 4-day period from the first day after announcement until the day of the event. The “price pop” is partially reversed on the first three days after the event but the positive effects of inclusion seem to be permanent. Abnormal trading patterns are also observed during the event window. We also find a negative and significant relationship between abnormal return on the first day after the event and the firm’s market capitalization as well as between the cumulative return realized from the announcement until the event and the number of days comprising that interval. In addition, the size of the firm might be a useful indicator of the length of the interval between announcement and event. Based on the change in importance of the Fama-French size factor through time, we argue that the Capital Asset Pricing Model (CAPM) is unable to explain abnormal returns after addition in the S&P 500 for the years 1990-1997. The CAPM overstates the performance of larger firms and understates the
performance of smaller firms for the nine-month period after the event of inclusion. Firm size seems to matter in the long-run and therefore it should be taken into account when appraising the performance of inclusions.

The remainder of this study is organized as follows. The second section describes the selection process and criteria for S&P 500 Index changes. The third section presents a summary of the relevant literature and the fourth section provides details about the data and methodology used in this paper. The fifth section analyses the results and the sixth section presents a comparison between the Fama-French three-factor model, and the Capital Asset Pricing Model. The seventh section analyses the prevailing hypotheses behind the index effect and Section 8 concludes.

II. The Selection Criteria and Announcement Policy of the Standard and Poor’s Index Committee

The S&P 500 Selection Process

The S&P 500 is a market value-weighted index, the level of which reflects the total market value of all 500 component US stocks relative to a particular base period. Stocks are selected to be representative of their sector. The selection and management of the index is determined by the Standard and Poor’s Index Committee, which tries to ensure that the S&P 500 satisfies the goals and objectives set by the Standard and Poor’s Corporation. The Committee faces a number of crucial management and policy decisions regarding the Index, the outcomes of which can affect enormous dollar amounts of investment that are tied directly or indirectly to the S&P 500.

An important concern of the Committee is the management of stock replacements, due to the positive price effect that has been observed when a new stock is added to the index and the negative price effect when a stock is deleted from the index. Therefore, the Committee seeks to maintain “independence and objectivity” by not allowing companies to apply for S&P 500 membership, and there is no contact between the management of the companies and the Committee. Only publicly available data are used for the selection process. The changes in index composition are mainly caused by companies which effectively cease to exist in their current form through mergers, takeovers or bankruptcies as well as by the restructuring of member companies. The changes in index composition through time are

therefore mainly driven by the requirement that a firm has to be deleted from the S&P 500 and the replacement process is a complicated issue. Candidate firms are monitored carefully and the criteria for inclusion are highly stringent. After screening of candidate companies, an S&P 500 Replacement Pool is created that contains at least 10 companies. The prevailing company from the Replacement Pool is chosen whenever a new entry to the Index is required following to the deletion of another company. The companies that are removed are not always known in advance and a number of removals can happen at the same time, leaving the Committee with a set of possible replacement scenarios.

The Selection Criteria
The selection process for S&P 500 membership does not simply refer to a typical quantitative ranking system. Therefore, it is difficult for institutional investors and fund managers to anticipate the changes. This is in contrast with the procedures that operate for most other major indices. In the case of the FTSE 100 for example, where the main criterion is the company’s capitalization, the anticipation of the event is a simpler issue. In this case, by the time the capitalization of a company falls below those of the largest excluded firms, the change takes place immediately on the next quarterly composition change date and the excluded stock with the highest capitalization is added to the index. The “index effect” is not so intense in this case due to significant anticipation of the event. Goodacre and Lawrence (1994) found a positive and permanent stock price increase of 2.5% with an anticipation that appeared eight days prior to the announcement. There was also no index effect for the Danish Blue Chip Index (Bechmann, 2002) at the time of the announcement, since the selection criteria were publicly known and stocks experienced a 5% price increase in the last month before the announcement.

But in the case of the S&P 500, predicting the stocks that will be included is more difficult because criteria other than market capitalization are also important for the selection decision. In general, S&P member companies have the largest market value in their industry, but this is not always the case. Companies are selected to represent their industry in the US market. The selection process also entails an examination of the firm’s trading activity, such as public floats and liquidity/turnover ratios, to ensure high liquidity and to reduce the probability of deviations from the fair stock price. Ownership of the company is also monitored to detect “closely held” companies. These companies are likely to have low public floats and to experience less trading activity. A final but important criterion is
fundamental analysis in order to ensure the future financial stability of the candidate firms. Although the selection criteria are the same for all the S&P indices, the Committee has particularly high standards concerning liquidity and closely held ownership for the S&P 500 due to the large and continuously growing proportion of funds that track this index. The companies that meet the above criteria are then included in the Replacement Pool, but company analysis continues even after a firm has entered the Pool, and the firm can be removed if any of the criteria are no longer met.

As stated above, a change takes place most often due to the removal of a firm from the index, which is mainly caused by a merger or an acquisition. Deletion of a company can also take place if the company no longer represents its industry group. If, for some reason, a particular industry is no longer economically important, a firm can also be deleted even if it is a leading firm. Bankruptcy of a member firm can cause immediate removal and its place taken by a company from the Replacement Pool. Restructuring is also considered to be an important criterion for deletion and intensive scrutiny on the part of the Committee would take place under such circumstances.

The above criteria seem to give important weight to the member companies and there is a considerable debate concerning whether S&P 500 Index composition changes are information-free events. However, the Committee strongly argues that the changes do not reveal any new information about the investment appeal of the company or about its expected future stock price. On the other hand, “…inclusion may not convey new information about the investment merits but it does contain the assumption that the company is going to remain in business”\(^3\). It is therefore reasonable to expect that companies seek to enter the S&P 500 list and to obtain its “seal” of recognition and of future financial stability.

*Announcement Policies*

The announcement policy concerning S&P 500 Index changes has been modified twice. The first key date was September 1976. Prior to that date, there was leakage of information about future Index changes to the public before the announcement. Fund managers were contacting Standard and Poor’s Corporation and asking for information about future changes. The changes were reported to “S&P Outlook”, but only on an

\(^3\) [www.standard&poors.com](http://www.standard&poors.com)
occasional basis. After September 1976, Standard and Poor’s started an overnight notification Service. Subscribers to this service were informed of index member changes the evening of the trading day that the change was decided, with the change taking place immediately the day after. Since the market could not anticipate the change, there was strong price pressure on the day after the announcement due to the immediate increase in demand for the included stock.

In October 1989, Standard and Poor’s changed its announcement policy again in order to alleviate this price pressure on the announcement date. Changes were pre-announced an average of five days before the event. The period from the announcement date to the effective date could give enough time for institutional investors and index fund managers to adjust their holdings if they so wished. The announcement date reveals the name of the firm that will be added and the date that the change will become effective (the change becomes effective after the market close). However, in some cases the exact date of the future event might not be known. More details for the length of the interval between announcement and event are provided in the fourth section of this paper.

III. Previous Literature and Candidate Hypotheses that can explain the Index Effect

According to the statements of the S&P 500 Index Committee, changes in the S&P 500 composition are supposed to be information-free events - in other words, they do not convey any new information about the future prospects of the underlying stocks. However, observed stock behaviour during the event period is not consistent with this perception and high abnormal returns often occur on the day after the announcement. Even if Standard and Poor’s changed its announcement policy to smooth these abnormalities, arbitrage trading could still be very profitable. Beneish and Whaley (1996 and 1997) were the first researchers to examine the effects of the new Standard and Poor’s announcement policy implemented in October 1989. They found that the price increase after inclusion was permanent (nearly 4%) and that under the new policy, the average price increase was greater. The opportunity for the so-called “S&P game” rose, with arbitrageurs buying the stock on the announcement date and selling the stock on the effective date at a premium when index funds and other institutional investors were rebalancing their portfolios. Index funds do not necessarily rebalance on the announcement date due to the tracking error that

4 We would like to thank Milvia Luckenbach from Standard and Poor’s Corporation for providing information about the new announcement policy.
might be realized before the actual inclusion takes place. The importance of the increased demand caused by index funds and other institutional buyers after index changes was tested in 1989 by Pruitt and Wei (1989), who found a positive relation between the abnormal return on the first day after addition and the net change in institutional ownership. Graham and Pirie (1994) examined the index fund rebalancing that was required when RJR/Nabisco was removed from the S&P 500 Index, in February 1989. This was an event that caused a decrease of 0.9% in the aggregate value of the portfolio represented by the S&P 500. A buying pressure 11.4 times larger than the rebalancing required for the mean replacement stock for all the other 499 stocks was created, since index funds ended up with a considerable cash surplus.

The period during which a change in index composition occurs also constitutes a useful laboratory for testing the Efficient Market Hypothesis (EMH). Fama (1970) has defined an efficient market as a market in which security prices reflect all available information. The semi-strong form of the Efficient Market Hypothesis states that all publicly available information is reflected in security prices. Under this theory, the market’s historical knowledge of abnormal returns for index additions (deletions) would drive the security’s price up (down) to its expected addition (deletion)-day value on the day after the announcement. The profits from buying the stock on the day after the announcement and selling it on the effective date should be fully eliminated and the increase in the security’s price should happen overnight. Cusick (2001) found evidence of an increase in market efficiency through time, and a decrease in the trading profit available to arbitrageurs who were buying additions and selling deletions.

The index effect has been shown in numerous other studies to result in stock price behaviour during the event period that cannot be consistent with EMH. Consequently, a number of other hypotheses have been considered to justify this performance. The hypotheses that have been proposed in the previous literature are the Price Pressure Hypothesis, the Imperfect Substitutes/Downward-Sloping Demand Curve for Stocks Hypothesis, the Liquidity Cost Hypothesis, the Information Content/Index Member Certification Hypothesis, and the Market Segmentation/Investor Recognition Hypothesis. Their main differences concern whether the stock price or volume change is temporary or permanent after the event, what kind of information is revealed with an addition or deletion, and what are the main issues for stock and investor behaviour.
The Price Pressure Hypothesis (PPH)

The main concept underlying this hypothesis is that investors who provide liquidity to the market without having any motivation to trade, should be compensated by a premium that reflects their extra costs and the risks of these trades. This may cause a temporary less than perfectly elastic demand curve for the underlying stock. After the event period, any abnormal return is expected to reverse fully and to reflect the long-term equilibrium price. The effect on trading volumes should closely resemble the price effect. Harris and Gurel’s (1986) results were in favour of the Price Pressure Hypothesis since they found a significant stock price increase of 3.13% after inclusion, which was fully reversed after two weeks. Even though they found that the increase in average trading volume was permanent, the existence of index funds could justify this increase and did not affect their conclusions about the Price Pressure Hypothesis. Woolridge and Ghosh (1986) found that trading volumes also increased temporarily for the period around the event. Arnott and Vincent (1986) found price increases for additions and price decreases for deletions and both were significant and persistent for a period of four weeks after the event, but they could not tell with certainty if the Price Pressure Hypothesis held. Lamoureux and Wansley (1987) showed that the prices of additions reversed twenty days after the event. Their volume results also supported the Price Pressure Hypothesis since volumes declined to the same levels as in the pre-event period and there was no evidence of increased trading with the exception of the date of the S&P 500 change. Lynch and Mendenhall (1997) considered index funds to be the driving force behind the temporary price pressure and they argued that price pressure would end once trading volume returned to its normal level. Malkiel and Radisich (2001) also found significant “price pops” after inclusion, but no longer-term effects on prices.

The Imperfect Substitutes and the Downward-Sloping Demand Curve for Stocks Hypothesis (DSH)

Scholes (1972) argued that stocks are not “unique works of art” and their demand curves are kept flat by arbitrage between perfect substitutes. However, this hypothesis states that stocks belonging to the S&P 500 Index do not have perfect substitutes and have downward-sloping demand curves. Therefore, their exact characteristics cannot be described by a combination of other securities, and replicating strategies are less than perfect. According to that hypothesis, prices will change to eliminate any excess demand.
in the market and no reversal is expected in the long-term. In addition, abnormal trading activity should be temporary until the new level of price equilibrium is reached. Shleifer (1986) examined whether the DSH holds in a situation where information effects probably play no role. He found that the share price increase at the announcement date of an index addition was positively related to the shift of the demand curve for stocks. Wurgler and Zhuravskaya (2002) argued that in reality, stock markets do not work as effectively as theory suggests because individual stocks do not have perfect substitutes and when arbitrageurs hedge with opposite positions in imperfect substitutes, they bear the risk. In other words, they are likely to trade less aggressively due to this arbitrage risk. The DSH could also explain the results of Morck and Yang (2002), who found that S&P 500 membership was associated with significantly higher valuations of member firms and that index stocks did not have perfect substitutes. Denis, McConnell and Ovtchinnikov (2002) on the other hand, found that newly included companies experienced significant increases in earnings per share forecasts and significant improvements in realized earnings. This result demonstrated that inclusion in the S&P 500 might not be an information-free event and therefore that it could undermine previous tests of the Downward Sloping Demand Curve Hypothesis. However, they could not determine whether index inclusion causes improved firm performance or whether good performance leads to inclusion.

The Liquidity Cost Hypothesis (LCH)
Since the S&P 500 is tracked by the majority of leading index funds, inclusion should enhance the liquidity of the underlying stock. Liquidity ensures the ability to sell a stock immediately and at an appropriate price. Mikkelson and Partch (1985) found that an increase in the stock’s liquidity could result in an increase in its price due to lower transaction costs, a finding echoed by Amihud and Mendelson (1986). Since transaction costs play an important role in the determination of bid-ask spreads, it is reasonable to expect that high liquidity stocks will have lower spreads. According to the LCH, inclusion in the S&P 500 Index is an event that promises a permanent increase in the stock’s liquidity and therefore prices and trading volumes should both increase permanently to reflect this new advantage of the included stock. Edmister, Graham and Pirie (1996) found permanent price effects attributed to permanently increased liquidity after inclusion and a permanent decrease in trading costs, rejecting the Price Pressure Hypothesis, as well as the Downward Sloping Demand Curve Hypothesis.
The results of Erwin and Miller (1998) were also in favour of the Liquidity Cost Hypothesis, since they observed a significant decrease in both the relative and absolute bid-ask spread when a stock was added to the S&P 500 (1984-1988), while controlling for changes in all the other variables. Their main innovation was to discriminate between stocks with traded options and those without. They argued that the effect of inclusion was less robust for the optioned stocks since there were two markets (derivative and stock market) that shared the arbitrage profits.

The Information Content Hypothesis and the Certification of an Index Member (ICH)

According to this hypothesis, an important piece of information is revealed when a stock is included in the index that should be permanently reflected in prices. Although the Standard and Poor’s Index Committee states the contrary, investors seem to prefer index member stocks. The price change if this hypothesis holds will be permanent but the volume changes will be temporary. The S&P 500 certification effect can increase the firm’s expected future cash flows. Inclusion can also help companies to attract new capital more easily since financial institutions may be more willing to lend to firms that are index members. Jacques (1988) found approximately 4% extra return per year (1983-1988) for S&P stocks. This outperformance was reinforced by the growth of indexing as active equity fund managers lost market share to index funds, and non-S&P stocks were sold to make room for S&P purchases.

Goetzmann and Garry (1986) examined seven deletions from the S&P 500 which occurred simultaneously on November 30, 1983. They found a long-term drop (of nearly 2%) in the prices of the deleted stocks, consistent with the negative price impact on deletions. They suggested that delisting might convey some special information and that analysts focused less on those companies in the future. Although the loss in value was expected to follow from a lack of information for fundamental analysis for these companies, they observed a price fall in advance of the announcement.

The Information Content Hypothesis was supported by the findings of Dhillon and Johnson (1991), who observed changes in stock prices, bond prices and option prices and found permanent effects. The prices of call options rose by an average of 26% on the first day after the event, a level that was unlikely to be caused by price pressure only, and bond prices also rose significantly on the announcement date. Jain (1987), also argued that
inclusion does convey new information concerning the investment appeal of a company and he rejected the null hypothesis of a temporary price increase after inclusion in the index.

*The Market-Segmentation and Investor Recognition Hypothesis (IRH)*

According to Merton’s (1987) Investor Recognition Hypothesis, investors know of only a subset of all stocks (in this case, only S&P 500 member stocks), hold only the stocks that they are aware of, and demand a premium (shadow cost) for the non-systematic risk that they bear. Chen, Noronha and Singal (2002, 2003) argued that a stock’s inclusion in the S&P 500 Index alerts investors to its existence, and since this stock becomes part of their portfolios, the required rate of return should fall due to a reduction in non-systematic risk. Since investors cannot be unaware of a deleted stock, the increase in the shadow cost of a deleted stock should be lower than the decrease in the shadow cost for an included stock. According to their observations of cumulative abnormal returns, there was a permanent effect on the stock price after the index change, and the behavior of additions and deletions was not symmetrical, consistent with the Market Segmentation Hypothesis.

The above hypotheses seem to be quite controversial, but all found some support in previous studies for explaining abnormal returns during the event. Differences in findings across studies can be attributed to differing sample periods or to differing definitions of what constitutes the short or long run. Different approaches for calculating returns were also employed and therefore it is difficult to discriminate between the various hypotheses. Based on the findings of Dhillon and Johnson (1991) and Denis, McConnell and Ovtchinnikov (2002), we would expect to find that inclusion is not an information-free event and that the certification of becoming an S&P 500 index member should matter in the long run.

**IV. Data and Methodology**

a. *The Sample*

Standard & Poor’s Corporation provided us with the names, announcement dates and effective dates of all the stocks that were added to the S&P 500 Index for the years 1990-2002. Our initial sample consisted of 353 additions. Stock closing prices adjusted for dividends, market values and trading volumes were obtained from Thomson Datastream. Our final sample contained 272 stocks due to the elimination of some additions for the
following reasons: 24 stocks were excluded because there was insufficient historical price information, 6 stocks were removed due to a lack of data during the event (new firms), 31 stocks were also excluded because the addition was caused either by a merger or by an acquisition, or by a rename/reconstruction of the firm. If those firms had been included, the results would have been biased for two reasons. The first reason concerns the cases where the event of addition happened at the same time as other firm-specific events and therefore investors might buy the stock for reasons other than index membership. The second reason concerns cases where additions did not require a change in index fund holdings. Finally, since our final estimates of the relevant pricing models were based on information from the period after inclusion (see below), data for some of the most recent additions did not exist at the time that the research was conducted, and we therefore had to remove those firms from the sample.

b. The Event Window and Model Chosen for the Abnormal Return Calculation
Our initial event window started seventy trading days before the announcement date (AD-70) but since we observed no anticipation of the event (as previous studies had also confirmed, e.g., Jain, 1987), and there were no significant abnormal returns during that period, the results presented below examine the firm’s performance from five trading days before the announcement date (AD-5). Our short-run event window is defined to end fifteen trading days after the effective date (ED+15), and the long-run event window is defined to end one hundred and eighty trading days after the effective date (ED+180). The average length of the interval between the announcement and effective date is 5 days – this will be explained in detail below.

Previous studies have used a variety of different methods for calculating abnormal returns during the event window. One early method was simply to subtract the return of the benchmark from the return of the stock, effectively assuming that both the benchmark and the stock had the same beta. However, the most common method that past studies have used is the single-factor model, incorporating market risk. Estimates of the alpha and beta coefficients would then be obtained using a historic estimation period. However, Jain (1987) and Edmister, Graham and Pirie (1994 and 1996) argued that the parameter estimates derived from the period before the event would be biased since the firms were likely to have performed well before their inclusion in the index. In other words, they
might well have been included in the index precisely because of their relatively good past performance.

Instead of the Capital Asset Pricing Model or a single factor model, we employ the Fama-French 3-factor model (Fama and French, 1995) to control for size and value effects. The Fama-French factors are constructed using the 6 value-weight portfolios formed on size and book-to-market, obtained from French’s website. In the regression analysis below, the variables are defined as follows. SMB (Small Minus Big) is the average return on the three small firm portfolios minus the average return on the three large firm portfolios, HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios, $R_m - R_f$ is the excess return on the market index, which is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from the Centre for Research in Security Prices, CRSP) minus the one-month Treasury Bill rate (from Ibbotson Associates). We estimate two sets of Fama-French coefficients and calculate abnormal returns using both sets: using 250 trading days before the event window; using 250 trading days after the event window. The Fama-French model (FF) is specified as follows for each firm $i$ at time $t$:

$$R_{it} - R_{ft} = a + b_m( R_{mt} - R_{ft} ) + b_sSMB_t + b_vHML_t + u_t$$ (1)

where variable definitions are as above, $a$ is the return when the factor portfolio returns are zero, the $b$’s are sensitivities to each source of risk, and $u_t$ is a disturbance term.

The abnormal return for each stock will thus be given by:

$$AR_{it} = R_{it} - R_{ft} - [\hat{a} + \hat{b}_m( R_{mt} - R_{ft} ) + \hat{b}_sSMB_t + \hat{b}_vHML_t ]$$ (2)

c. The calculation of Abnormal Returns from AD to ED

The Standard and Poor’s Index Committee announces the name of the included stock, but the event date is not known at the time of the announcement. On average, the firm is added to the Index after five days, but this could vary from one day to seventy-one days (the latter occurs in only one extreme case). Figure 1 shows the number of days between announcement and event date and the frequencies of each case. Most intervals are around four and five days; it would be difficult to derive strong conclusions about the price

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performance after AD+7 since the number of observations is very small\(^6\). Therefore, our statistical tests will concentrate only on the price behavior in the first seven days after the announcement date.

d. The Calculation of Abnormal Volumes

We examine volume patterns before, during and after the addition event. Since we observed no anticipation of the event, we did not expect to find significantly increased trading before the addition of the stock to the index. Volume data could give information about the timing of purchases caused by index funds and other institutional investors, as well as about demand that might have been caused by arbitrageurs. The latter might have entered the market after the announcement date but before the effective date to capture any potential profits that arise from price pressure during the event period. Index funds, on the other hand, might chose to wait for the event date in order to minimize their tracking errors. Volume patterns could reveal the dominant date of index fund purchases since that date is expected to experience the highest level of trading in the event period and would be expected to signal sales by arbitrageurs.

In order to calculate the level of abnormal volume, we compute a volume ratio, which is the method employed by Harris and Gurel (1986) and by Beneish and Whaley (1996). We estimate a level of volume considered as the base volume for each added stock as well as for the S&P 500 Index by taking average volume over the last 12 weeks (60 trading days) before the event window for each stock and for the S&P 500. We then compare this average stock-to-index ratio with the daily stock-to-index-ratios observed during and after the event. The null hypothesis is that the mean volume ratio should equal one. If the null is not rejected, then there is no significant abnormal volume during the event. The volume ratios are given by:

\[
VR_{it} = \frac{V_{it}}{V_{mt}} \cdot \frac{V_{m}}{V_{i}}
\]

and

\(^6\) There is one extreme case with 51 days between announcement and event and another case with 70 days between announcement and event. Therefore from AD+23 until AD+51, the performance of the average firm is described by only two firms and from AD+51 until AD+70 the performance is described by only one firm.
\[ MVR_{it} = \frac{1}{N} \sum_{i} VR_{it} \]  

(4)

where \( MVR_{it} \) is the mean volume ratio of the stock relative to the S&P 500, \( V_{it} \) is the trading volume for each stock during and after the event period, \( V_{mt} \) is the trading volume of the S&P 500 during and after the corresponding periods, \( V_i \) and \( V_m \) are the average trading volumes of each stock and of the S&P 500 in the 12 weeks preceding the event window, and \( N \) is the number of firms in the sample.

V. Results

\( a. \) Event Window – Short-Term Price Performance

We examine firm performance during the short-term event window by calculating abnormal returns in three different ways. First, we use 250 trading days before the event to obtain a first set of the Fama-French model coefficients and then we use the 250 trading days after the event window to obtain a second set of coefficients. Those estimates are used to calculate abnormal returns from AD-5 to ED+15. For comparison, we also use a third method, which involves subtracting the daily return of the market portfolio from the daily return of the stock. Table 1 shows the estimates of the two sets of Fama-French model coefficients with their corresponding \( t \)-statistics. The last row refers to the \( t \)-statistics when testing the change in the values of the estimators between the pre-event and the post-event period. The coefficients are all significant apart from that for the book to market factor \( (b_v) \) using the pre-event period. We also test for whether the average coefficients in the pre-event period are significantly different from those in the post-event period. A relatively high alpha using the pre-event period gives relatively high expected returns and low realized abnormal returns. In other words, pre-period alphas will misleadingly show that after inclusion, the performance of the firm became weak. Therefore, previous studies that used a pre-event period for estimating abnormal returns might have found price reversals purely due to the coefficient bias. Apart from the change in the sign of the alphas, we also find a significant change in the size factor parameter, \( b_s \).

In the post event period, the parameter on the size factor decreased significantly and this had a positive effect on the level of realized abnormal returns after inclusion.

Figure 2 compares the average cumulative return during the short-term event-window under the pre- and post-event period estimation approaches. For comparison, Figure 2 also shows the abnormal return derived from subtracting the return of the market portfolio
from the stock return (dashed line). This method of abnormal return calculation was used in previous studies and although it is free of coefficient bias, it cannot reflect systematic risk or size effects. It can be seen that under the pre-event period calculation method, the performance of the average firm appears poor after addition and the price reversal continues even after the event window, whereas using the post-event calculation method, the price reversal is considerably smaller. The method of subtracting the return of the benchmark from the return of the stock yields post-event performance that lies between the two methods. These results, together with those of Table 1, are indicative of the existence of membership bias (Jain, 1987 and Edmister et al., 1994), i.e. that models estimated using pre-event prices provide a poor basis for estimating abnormal returns after the event. Consequently, our analysis below will be based only on the results obtained from factor models estimated using the post-event period.

According to the average firm performance indicated in Figure 2, there was no anticipation of the event since there were no significant abnormal returns before the announcement of inclusion. Since the announcement of the change occurs in the evening, the abnormal returns are observed one day after the announcement date, on AD+1.

Table 2 presents the abnormal returns from the announcement date through to fifteen days beyond the effective date. Average abnormal returns are given from both the Fama-French and the CAPM (single-factor model) approaches, together with $t$-ratios to test the null hypothesis that the true abnormal return (averaged across all included firms) on that day is zero. The average abnormal return on AD+1, the first post-announcement opportunity for investors to purchase the stock, is 4.54% with a $t$-statistic of 17.02. 90% of the firms in the sample realized a positive return on that date. The average 4-day interval period that follows after AD+1 also shows significant abnormal returns on each day. We calculate that on average, during the interval between announcement and event, the stock earns an additional return of 2.38%. Since the length of that period varies among firms, and since the number of firms with an interval of more than seven days is very low, the results are

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7 There are several methods that could be used to calculate this abnormal return. In order to allow for differences in the number of days between announcement and event for each firm, we calculate the cumulative abnormal return between AD+1 and ED and divide it by the corresponding number of days between AD+1 and ED for each firm. We then multiply it by the average interval period (four days). We divide the sum of all these returns by the number of firms to find an average abnormal return of 2.38%. An alternative approach, which gives very similar results, is to sum the abnormal returns observed from AD+1 until AD+5 (in Table 2), but this method omits from the sample any firms with an interval longer than 5 days.
presented only until seven days after the announcement. We test the statistical significance of returns only until AD+7 and find that returns on AD+3, AD+5, AD+6 and AD+7 are also positive and significant. It is also of interest to note that, averaging across all firms, there is no negative return on any day between AD and AD+8, showing that there is persistent buying pressure that does not reverse, and so in theory, profitable trading could take place on those days. After the event date, there are three consecutive significant price reversals. The total price reversal realized over the first three days after the event is 1.78%, but this figure is considerably less than the positive cumulative return typically achieved between the announcement and effective dates. Such a partial price reversal is consistent with the results of Beneish and Whaley (1996).

b. Event Window – Long-Term Price Performance
In order to examine the long-run return performance of the firm, we allow for a longer event window that starts five days before the announcement date, and ends one hundred and eighty trading days after the event date. We use 250 trading days from ED+120 until ED+370 to estimate the Fama-French coefficients. The coefficients that we obtain from that 250-day period are similar to the ones employed above and derived from the period ED+15 to ED+265. The long-run performance of the firm, shown in Figure 3, reveals a partial reversal in the average firm’s stock price. Therefore, we argue that a permanent stock price effect holds at least nine months after the event and this could confirm the importance of the S&P 500’s “gold seal” in the long-run and would be consistent with the result reported by Denis, McConnell and Ovtchinnikov (2002) that inclusion of a firm within the S&P index leads to an improvement in the firm’s performance.

c. The impact of the length of the interval from announcement to event
We also expected the number of days between announcement and event to play a role in the cumulative performance of the firm during that interval. A large number of days between announcement and event could reduce the positive effect of an addition. The length of this period cannot be anticipated and is dependent on the S&P 500 Committee’s policy. We find a negative relationship between the number of days from announcement to event and the cumulative abnormal return in that interval, showing that the demand for the included stock is exhausted five days after the announcement date. This reduces the potential positive momentum of abnormal returns after the event. Our results are
summarized as follows (with $t$-ratios in parentheses and three asterisks denoting significance at the 1% level):

$$\hat{CR}_i = 0.077 - 0.0017 \text{ DAYS}_i$$

(5)

(11.1***) (-1.97**)

where, $\hat{CR}_i$ is the cumulative abnormal performance of the average firm, and $\text{DAYS}_i$ the number of days, between AD and ED. Thus, every additional day that S&P delays actual inclusion after the announcement reduces average cumulative performance by 0.17%. In order to investigate whether there is a non-linear relationship between the number of days in the event window and the realized cumulative abnormal return over that period, we add a quadratic term to equation (5), and the results are as follows:

$$\hat{CR}_i = 0.061148 + 0.002444 \text{ DAYS}_i - 0.000084 \text{ DAYS}_i^2$$

(6)

(6.57***)(1.29)(-2.47***)

The results indicate that allowing for simple non-linearities in this way yields a more complex pattern, where an increase in the number of days between announcement and actual inclusion leads to virtually no change in average cumulative abnormal returns up to around 15 days, but beyond this interval, cumulative returns diminish rapidly. According to the results in equation (6), an interval length of greater than 45 days leads to negative cumulative abnormal returns over the interval.

d. The effects on trading activity

Again, the volume ratios reported in Figure 4 suggest that there was no anticipation of the event. On the day of the announcement, we observe the first significant abnormal volume. It is worth noting that, although there is a very slight increase in the trading volume on that date, there were no abnormal returns since the announcement is revealed to investors in the evening, when the market closes. The last two columns of Table 2 also present the volume ratios and the $t$-statistic for testing a null hypothesis that the true value of this ratio is unity. On AD+1 and ED+1, the $t$-statistics for the volume ratios are highly significant, resulting from the demand pressure on that date. The trading volume on the first day after announcement and on the first day after event is 7.12 and 16.03 times larger than normal with a $t$-statistic of 8.13 and 16.32 respectively. The trading volumes of included stocks take more than three weeks to fall close to their historical pre-announcement values.
In order to focus on the trading activity around the time of the event, we replot the volume ratios in Figure 5, but we now also present abnormal cumulative returns on the same graph. Since the number of firms with an interval of more that 7 days between announcement and event becomes very small, we plot the event window from AD-5 to AD+7 and from ED+1 to ED+15. Abnormal trading volume is also observed between announcement and event, but the highest trading activity by far takes place on the day after the event, suggesting that most of the institutional investors tracking the index are entering the market at that time. On the first date after announcement, the increased trading volume is accompanied by positive abnormal returns and this continues over the 7 day-interval between announcement and event. However, on the first date after the event, a significant price reversal occurs together with the highest abnormal volume of the event period. In particular, on ED+1, the highest trading activity is accompanied by the largest price reversal.

These patterns cannot allow us to conclude that index funds are buying only on the day of or the day after the effective date as Beneish and Whaley (1996) had suggested. If this were the case, and given the increase of pure indexed assets over the last thirteen years, we would expect to find buying pressure on the day after the event. There are two candidate reasons to justify the volume and price patterns observed during the event window. Firstly, the number of arbitrageurs might have increased since “there are significant profits from playing the S&P Game” (Beneish and Whaley 1996) and traders might monitor the announcements of additions very closely. Secondly, index funds might start buying the added stock before the event and the excess demand for the stock might be exhausted by the day of the event. This would arise if index funds were more concerned with the cost of purchasing the newly included stocks than they were with tracking error. Therefore, arbitrageurs might sell the stock on the day after the event, noise traders might also sell the stock to correct the consecutive buying pressure created from the date of announcement, and both of these could probably offset the pressure caused by some index trackers who were waiting until that date to buy the stock.

**e. The Firm Size Effect**

We examine whether the size of the firm matters after inclusion and our expectations were to find that in the short run, smaller firms should have a more positive return shock than larger firms. Larger firms might already be included in institutional investors’ portfolios...
and any information content of index membership might not play a significant role. Smaller firms, on the other hand, derive more relative advantage when being in the S&P 500 Index, and one would expect those firms to keep most of the positive return realized during the event period. Small firms are also more likely to be affected by the positive liquidity shock of inclusion.

In order to determine the impact on returns of firm size, we regress the abnormal return on the day after the event on the firm’s market value of the same date. In order to construct an appropriate measure of firm size, we divide the market value of each firm one day after the event by the corresponding S&P 500 value on that date. This procedure ensures that the market capitalizations at different points in time through our sample are comparable. There is a significant negative relationship between the market value ratios of the firms and their corresponding abnormal return on the first day after the event. This size effect is negative and significant at the 5% level. Large capitalization stocks tend to lose more on the day after the event. Although that relation is also negative at the AD+1, it only becomes significant on ED+1. The estimated regression line for the first date after the event of addition (ED+1) is:

\[
AR_i^\hat{} = -0.003178 - 4.541062 MV_i
\]

(7)

\(-1.05\) \((-2.28^{**})\)

where \(AR_i^\hat{}\) is the abnormal return and \(MV_i\) the market value ratio of the firm on ED+1\(^8\).

The size of the firm could also be a useful indicator of the length of the event window between announcement and event. We investigated the relationship between the size of the firm and the number of days that it took for the firm to be included in the Index. The estimated regression is the following:

\[
DAYS_i = 3.963723 + 559.2291 MV_i
\]

(8)

\(12.79^{***}\) \((2.94^{***})\)

\(^8\) Citigroup was included in the Index in October 1998, and experienced a positive abnormal return of 2.53% on the day after the event. Its capitalization ratio (0.96% of the total S&P 500’s market value) is considerably higher than that of any other firm at inclusion. Therefore, we consider Citigroup an outlier that is not consistent with the behavior of the average firm, and we remove it from our sample for the regression given in equation (7).

\(^9\) We removed State Street Corp. and Quintiles Transnational from the sample of equation (8) that had the longest and the second longest intervals (51 and 70 days respectively). Those two extreme cases deviate significantly from the average five-day period between announcement and event.
It can be seen that the larger the size of the firm, the longer the time from announcement to inclusion. It may be the case that the Index Committee might deliberately allow for a longer period between announcement and event for the relatively larger firms, since the rebalancing needed for those firms is bigger and institutional investors would need more time to adjust their holdings without driving the price up.

f. Division of the sample into three sub-samples based on firm size

In order to examine firms of different size separately, we divide the observations into three samples based on the market value ratio of the firm. The range of the market value ratios for the added firms over the whole 1990-2002 period varies from 0.01% to 1%. If newly included firms were typical of the existing composition of the index, one would expect that the average included firm should constitute 1/500 (0.2%) of the total S&P 500 market value. However, our sample of additions has an average market value ratio of 0.11%, and only 10% of the firms are above 0.2%. It is also useful to mention that the number of added firms belonging to the smaller size band has increased through time. In particular, over the years 1990-1997, the majority of added firms belonged to the larger band, whereas over the years 1998-2002, the majority belonged to the smaller band. Notwithstanding the argument that the S&P 500 already includes most of the largest firms in the US, this shows that the Standard and Poor’s Index Committee is not biased towards large firms, and that the other inclusion criteria are also important.

To examine the impact of firm size on abnormal returns, we divide the sample according to the distribution of the market value ratios so as to have a sufficient number of firms for each capitalization band. The range of market value ratios for large firms is roughly between 0.1% and 1%, the range for the medium size firms is between 0.06% and 0.09% and the range for the small size firms is between 0.01% and 0.05%. Thus, even firms that we class as of medium size are below the average size of all S&P 500 firms.

Abnormal returns calculated using the Fama-French model take into account size effects and therefore one can draw conclusions about the effect of inclusion in the index for different size bands. If returns were calculated using a single factor model, the results may be misleading since the abnormal returns would not reflect the performance of the corresponding size band. For example, calculating the abnormal return of a small firm by using just the Market Index as a benchmark would not take into account the relative
performance of all small firms and therefore would bias the results. In this case, an arguably more desirable approach would be to use a benchmark for small capitalization stocks. We achieve this by retaining the Market Index as our benchmark, but adding a firm size premium estimated from the relevant Fama-French factor.

To give a more comprehensive picture of the changes in the relative performance of small versus large firms over time, we also split the sample into two sub periods: 1990-1997 and 1998-2002\(^{10}\). The price behavior for the period 1990-1997 is shown in Figure 6. Smaller firms outperform medium sized and large firms by a considerable abnormal return margin until one month after the event. After that date, the cumulative abnormal return of the small firms falls. It is also worth noting the variability in the cumulative abnormal return for the small firm band. The medium sized firms experience negative cumulative returns in the long run and their performances are generally worse than the other two bands. Large firms appear to have the best long-run performance.

In the 1998-2002 period (Figure 7), the short run outperformance of small firms disappears and such firms even experience negative cumulative returns in the long run. On the other hand, the performance of the medium sized firms is improved and their cumulative return does not fall below zero in this period. Finally, large firms seem to have superior risk-adjusted performance and the cumulative return is growing continuously even up to nine months (180 trading days) after the event.

A consideration of the impact of firm size for the whole sample\(^{11}\) would again demonstrate that the larger firms have the best performance in the long run, with the prices of those firms not reversing at all after the event. In other words, once one allows for firm size (and its market-to-book ratio), long-run abnormal performance is positively related to firm size. In other words, the performance of small included firms is insufficient to offset the small firm risk premium. More specifically, larger firms are less sensitive to small-firm and market-to-book risk, and therefore their long-run performances after allowing for these sources of risk are superior.

\(^{10}\) We selected this point at which to split the sample in order to ensure a roughly equal number of firms in each of the two sub-samples. Figures showing performance for the whole sample are not shown due to space constraints, but are available upon request.

\(^{11}\) Not shown in the interests of brevity but available from the authors on request.
We argue that in the long run, the relatively larger firms might be of greater importance when added in the Index. One reason could be that buying pressure for those firms would arise not only from index funds but also from other institutional investors such as equity mutual funds. In other words, the included large caps might be more attractive to a wider range of mutual funds. On the other hand, firms of medium and small size might be bought predominantly by index funds, which are 100% trackers of the S&P 500 and which buy all the stocks of the index. In addition, small and medium size firms could also be less attractive for non-100% index trackers due to the relatively higher transaction costs. Active managers may shun the smaller firms, leading to reduced buying pressure for those firms. The behavior of the relatively larger firms one day after the event is not consistent with their long-run performance. As stated above, the price reversal on the ED+1 is greater for larger firms, but they appear to do better in the long-run.

The policy of the S&P Index Committee to include relatively large US firms in the S&P 500 suggests that our results are even more striking than they at first appear since the range of market values that we observe is biased towards large firms. The fact that we still find differences among those firms confirms the importance of allowing for firm size when measuring abnormal returns.

Table 3 summarizes the cumulative abnormal returns for the each capitalization band and for each time period separately. Concerning the first day after announcement, we observe that the abnormal return has increased through time for both large and small firms, but has decreased for medium sized firms. On the other hand, the price reversal on the first day after the event increased for both large and small size firms whereas it decreased for the medium sized firms. Examining the level of abnormal return on ED+1, it is clear that small firms experience a smaller price reversal upon inclusion than do medium sized or large firms. This result is consistent with our cross-sectional regression (equation (7), Section V), which showed that size has a negative impact on abnormal returns one day after the event.

Also displayed in Table 3 are the cumulative abnormal returns for longer periods after the event. The importance of considering firms of differing sizes separately is now apparent. The 9-month cumulative average abnormal return of the larger band firms in the more recent period is 21.4%, up from 7.7% in the earlier period, while the small firm abnormal
return average fell from 3.7% to −4.4%. In other words, the performance of the large included firms has improved through time whereas the performance of the small included firms became poor. This effect is washed out when all firms are considered together, and long run cumulative returns averaged 4% and 5.3% in the earlier and latter periods respectively. Thus, only a slight increase in typical cumulative returns is noted for all firms.

g. An Analysis of the performance of included stocks by sector
The 272 available firms that were added to the S&P 500 Index from 1990-2002 come from a variety of sectors. The six most popular sectors in terms of the number of firms added (in declining order of importance) are banks, semiconductors, software, computer hardware, electricity, and telecom equipment. Figure 8 shows the average performance of the four most important sectors after inclusion in the S&P 500, while Figure 9 presents the best and the worst performing sectors. The computer hardware and electricity sectors turn out to be the best, while telecom equipment is the worst. Significant differences between the long-run performances of stocks in these sectors are apparent. The hardware and electricity sectors yield average cumulative abnormal returns that are of the order of 15-20% nine months after inclusion, while investors purchasing newly included telecom equipment stocks would have lost 10% by this time.

It is also worth comparing the best sector performance with that of the average included firm (Figure 10). The performance of newly included firms in the computer hardware or electricity sectors can be as much as 5 times that of the average included firm in the long-run. In the best performing sectors, there appears to be no reversal in the post-announcement price increases until more than four months after the effective date.

VI. A Comparison between the Capital Asset Pricing and Fama-French Models
One innovation in this study relative to its predecessors is the model used in the abnormal return calculation. It is of interest to examine and compare the single factor model (CAPM) with the Fama-French three factor model. The first issue is whether the Fama-French estimates for firm size and book to market value are important determinants of the performance of individual firms. Table 1 shows that in the case where the post-inclusion period is used to determine the Fama-French coefficients, the intercept, the market coefficient and the size coefficient are highly significant (1% level). The book to market
ratio coefficient is significant only at 10% level but all three factors are retained. The second issue is the extent to which the importance of the size factor has varied through time. We compare the models by investigating three sub-samples split by market value separately for each of the periods 1990-1997 and 1998-2002. Figures 11, 12 and 13 present comparisons between the performances of firms under the CAPM and Fama-French risk-adjustment models for small, medium and large firms respectively for the years 1990-1997. When we look at those years - the sample period covered by the majority of existing studies - our models give differing results concerning the level of cumulative abnormal returns, and the differences between them are important in the long-run. In the case of the large and medium size band (Figure 11 and 12), the CAPM tends to overstate the performance of these firms relative to the Fama-French approach. But in the case of the smaller firms (Figure 13), we observe the opposite result that the CAPM understates firm performance, and the difference between the two models increases further after inclusion. Therefore, the single index model for the abnormal return calculation could be considered insufficient over the period 1990-1997 when the size effect played a significant role in the determination of expected returns.

Figures 14 to 16 repeat the analysis of Figures 11 to 13, but using the more recent period (1998-2002). The two models appear to be more consistent in this later period. However, in the case of the larger band, the CAPM seems now to understate their performance (Figure 14). It can be seen that for the largest size band, the models give considerably different conclusions only in the long-run, with such firms yielding higher cumulative returns and a better firm performance after inclusion when risk-adjustment is made using the Fama-French approach. Those differences can be attributed to the fact that the importance of the size premium coefficient changed through time.

VII. The Prevailing Hypotheses
Our price and volume results suggest that addition to the S&P 500 is not an information-free event, and that the “seal” of being an index member matters in the long-run. Although the Standard and Poor’s Index Committee states the contrary, investors seem to prefer index member stocks. We therefore find support for the Information Content Hypothesis, since the stock price increase seems to be only partially reversed and the trading volume changes are temporary. Our findings support those of Dhillon and Johnson (1991). The basic assumption of the Information Content Hypothesis is that the S&P 500 certification
effect might increase the firm’s expected future cash flows and could help the firm to attract new capital more easily since financial institutions might be more willing to lend to firms that are index members. The Information Content Hypothesis is also supported by Woolridge and Ghosh (1986) and Jain (1987). Since the price increase is not temporary, we find no evidence in favor of the Price Pressure Hypothesis of Harris and Gurel (1986). Concerning the volume results, we observe a marginal increase in trading volume in the long-run, consistent with the Liquidity Hypothesis. These results are also consistent with the importance of investor awareness of newly included stocks, as Chen et al. (2003) suggested. Recent evidence (see Barber and Odean, 2002) concerning retail investors shows that they are overwhelmed by the choice of potential asset purchases and therefore they focus only on stocks that catch their attention. However, the volume results are very sensitive to the chosen base volume ratios (average volume over 12 weeks before the event). The volume ratios decrease significantly after the event window and the value of the ratio remains below 1.5 times its historical value in the long-run. Therefore, we could also argue for a temporary increase in volume which is consistent with the Downward Slopping demand curve for index members Hypothesis. However, this hypothesis can only be tested in an information-free environment and since inclusions appear not to be information-free events, it is not possible to draw firm conclusions. Our conclusions concerning the information content of inclusion are also consistent with those of Denis, McConnell and Ovtchinnikov (2002), who show that included companies experience significant increases in earnings per share forecasts and significant improvements in realized earnings.

VIII. Conclusions
This paper has examined the performance of the firms that were included in the S&P 500 Index during the period 1990-2002 using the Fama-French Three Factor Model for the abnormal return calculation. The Fama-French model incorporates additional risk factors, giving a potentially more accurate picture of the long-run performance of firms after inclusion. The size and book-to-market effects were very important in the years 1990-1997, the data period employed in most of the extant literature. During the years 1990-2002, the average included firm had an abnormal return of 4.54% on the first day after the announcement and an additional abnormal return of 2.38% gained over the average 5-day interval period between one day after announcement and event-day. These returns were reversed partially over the three consecutive days after the event. Concerning volume
effects, we found that on AD+1 and ED+1, trading activity was 7 and 16 times its normal level respectively. After the event window, trading activity showed a significant reversal and volume ratios subsequently remained below 1.5.

We also found evidence of “interval effects”, where a larger interval between announcement and event exhausts the positive shock after addition and reduces the positive price momentum after the event. In addition, the size of the firm might also be a useful indicator of the length of the interval between announcement and event. The larger the size of the firm, the longer the time from announcement to inclusion. There was also evidence of size effects on stock returns only on the first day after the event, with larger firms realizing a greater price reversal than smaller firms. This negative relationship did not hold in the long-run, however, since the larger sized firms outperformed both the medium and the small size bands on a risk-adjusted basis until nine months after the event.

The results were altered when we examined the 1990-1997 and 1998-2002 periods separately. In the 1990-1997 period, small newly included firms outperformed large and medium firms in the short run, but the largest firms did better over the long run period of nine months after the event. In the more recent period (1998-2002), large newly included firms outperformed medium and small firms by a significant abnormal return margin and there was no price reversal for that band in the long run. Overall, the performance of the large included firms has improved through time whereas the performance of the small included firms became poor. These differences cannot be captured by the Capital Asset Pricing Model. For the period 1990-1997, large firm performance is overstated by the CAPM, whereas small firm performance is understated by it relative to an approach that explicitly allows for the impact of firm size on performance. For the period 1998-2002, the two models are more consistent except for the performance of large firms in the long run.

We also found that newly included firms from different sectors could give significantly different levels of abnormal returns, with the performance of the computer hardware and electricity sectors being as much as 5 times that of the average included firm in the long-run. In the best performing sectors, there appears to be no reversal in the post-announcement price increases until more than four months after the effective date. The
sector in which the firm operates appears to be a more important determinant of long-run returns than firm size.

We found no support for the Price Pressure Hypothesis of Harris and Gurel (1986) because the price increases did not fully reverse in the long-run, and the Information Content Hypothesis seemed best able to explain the index effect. We also observed a temporary increase in trading volume. The “seal” of being an index member seems to matter in the long-run and addition to the S&P 500 Index is not an information-free event. Although the Standard and Poor’s Index Committee states the contrary, investors seem to prefer index member stocks.

REFERENCES


Table 1: Fama-French 3-Factor Model

\[ R_{it} - R_{ft} = a + b_m(R_{mt} - R_{ft}) + b_sSMB_t + b_vHML_t + u_t \]

Period used for parameter estimation: 250 trading days before the event window

<table>
<thead>
<tr>
<th>Average coefficient</th>
<th>( a )</th>
<th>( b_m )</th>
<th>( b_s )</th>
<th>( b_v )</th>
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<tbody>
<tr>
<td></td>
<td>0.00079</td>
<td>1.22029</td>
<td>0.41145</td>
<td>-0.05290</td>
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<tr>
<td>t-statistic</td>
<td>8.37***</td>
<td>37.64***</td>
<td>11.62***</td>
<td>-0.69</td>
</tr>
</tbody>
</table>

Period used for parameter estimation: 250 trading days after the event window

<table>
<thead>
<tr>
<th>Average coefficient</th>
<th>( a )</th>
<th>( b_m )</th>
<th>( b_s )</th>
<th>( b_v )</th>
</tr>
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<td>-0.00042</td>
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<tr>
<td>t-statistic</td>
<td>-3.80***</td>
<td>37.70***</td>
<td>4.37***</td>
<td>-1.80*</td>
</tr>
</tbody>
</table>

Test for Equality of Means Across the 2 Estimation Periods

| t-statistic         | 8.33*** | 0.01  | 5.13*** | 0.85 |

***significant at 1% level, **significant at 5% level, *significance at 10% level

Table 2: Abnormal Returns Around the Announcement and Effective Dates, and Volume Ratios

<table>
<thead>
<tr>
<th>Days</th>
<th>Fama-French Three Factor Model</th>
<th>Capital Asset Pricing Model</th>
<th>Volume Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily Abnormal Returns (%)</td>
<td>Daily Abnormal Returns (%)</td>
<td>Daily Volume Ratios</td>
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<td>t-statistics</td>
<td>t-statistics</td>
</tr>
<tr>
<td>AD</td>
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<td>1.49</td>
<td>0.38</td>
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<td>AD+1</td>
<td>4.54</td>
<td>17.02</td>
<td>4.58</td>
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<td>AD+2</td>
<td>0.41</td>
<td>1.96</td>
<td>0.47</td>
</tr>
<tr>
<td>AD+3</td>
<td>0.59</td>
<td>2.62</td>
<td>0.67</td>
</tr>
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<td>AD+4</td>
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<td>1.28</td>
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Notes: AD and ED denote the announcement and effective dates respectively. Figures in bold denote statistics that are significant at the 5% level or better.
Table 3: Cumulative Performance for different time intervals after the event for each size band and for each sub period using a 3-Factor Model

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<th>Firm’s Cumulative Performance from AD+1 until:</th>
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<tr>
<td>Sample</td>
<td>1998-2002</td>
<td>4.76%</td>
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</table>
Figure 1: Number of Days between Announcement and Event

![Figure 1: Number of Days between Announcement and Event](image)

Figure 2: Short-Term Cumulative Performance after Addition under the 3-factor Model using Pre- and Post-Event Windows

![Figure 2: Short-Term Cumulative Performance after Addition under the 3-factor Model using Pre- and Post-Event Windows](image)
Figure 3: Long-term Cumulative Performance after Addition under the 3-Factor Model

![Graph showing long-term cumulative performance after addition under the 3-Factor Model]

Figure 4: Daily Average Volume Ratios

![Graph showing daily average volume ratios]

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Figure 5: Volume Ratios and Cumulative Abnormal Returns in the Event Window

Figure 6: Long Term Cumulative Performance (1990-1997) using a 3-Factor Model
Figure 7: Long Term Cumulative Performance (1998-2002) using a 3-Factor Model

Figure 8: Sector Classification: Performance of the Four Most Important Sectors
Figure 9: Sector Classification: The Best and Worst Cumulative Performance

Figure 10: The Performance of the Best Sectors relative to the Average Added Firm
Figure 11: Cumulative Performance of the Large Added Firms (1990-1997): A Comparison between the CAPM and the 3-Factor Model

![Graph showing cumulative performance of large added firms with event windows and percentage abnormal returns for both CAPM and 3-factor model.]

Figure 12: Cumulative Performance of the Medium Sized Added Firms (1990-1997): A Comparison between the CAPM and the 3-Factor Model

![Graph showing cumulative performance of medium sized added firms with event windows and percentage abnormal returns for both CAPM and 3-factor model.]

Figure 13: Cumulative Performance of the Small Added Firms (1990-1997): A Comparison between the CAPM and the 3-Factor Model

Figure 14: Cumulative Performance of the Large Added Firms (1998-2002): A Comparison between the CAPM and the 3-Factor Model
Figure 15: Cumulative Performance of the Medium Sized Added firms (1998-2002): A Comparison between the CAPM and the 3-Factor Model

Figure 16: Cumulative Performance of the Small Added Firms (1998-2002): A Comparison between the CAPM and the 3-Factor Model