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An Anatomy of the "S&P Game": The Effects of Changing the Rules

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ABSTRACT

This study analyzes the effects of changes in S&P 500 index composition from January 1986 through June 1994, a period during which Standard and Poor's began its practice of preannouncing changes five days beforehand. The new announcement practice has given rise to the "S&P game" and has altered the way stock prices react. We find that prices increase abnormally from the close on the announcement day to the close on the effective day. The overall increase is greater than under the old announcement policy although part of the increase reverses after the stock is included in the index.

THE "S&P GAME" IS BASED upon the perceived price reaction of a stock to news that it will be added to the S&P 500. The game involves buying the shares of the stock ahead of S&P 500 funds and then selling after index fund demand is satisfied.

The opportunity to play the S&P game arose in October 1989 when Standard and Poor (S&P) began its practice of preannouncing changes to the S&P 500. Before that time, S&P announced the change in composition after the close of trading, with the change becoming effective by the following morning's open. With no lead time, index funds bought the shares of the newly included stock on the day following the announcement. The buying pressure caused prices to rise. For additions during the period 1976 through 1983, for example, Shleifer (1986) found an abnormal price increase of 2.79 percent on the day following the announcement. Using roughly the same sample period, Harris and Gurel (1986) reported a 3.13 percent average increase.

To ease order imbalances on the day following the announcement, S&P began, in October 1989, to preannounce changes in index composition. Under the new policy, the announcement takes place after the market close; however, the change does not become effective until five days later. Since many index funds wait until the effective day to rebalance, "risk arbitrageurs" can step in

ahead of the index funds—buying on the day following the announcement and selling, presumably at a higher price, a few days later.[1]

The purpose of this study is to analyze the effects of S&P's change in announcement policy. Using a sample of S&P 500 additions during the period January 1986 to June 1994, we investigate several interrelated issues. The subperiod January 1986 through September 1989 documents market behavior under the old announcement policy. This is important for two reasons. First, we can gauge the effects of the index fund growth without considering the effects of S&P's change in announcement policy. The Shleifer and Harris/Gurel samples end in 1983, and, since that time, the money invested in S&P 500 funds has grown enormously. Second, we can help to distinguish between competing hypotheses regarding the nature of the price increase. Shleifer and Harris/Gurel, despite their common finding that prices increase, reach different conclusions regarding whether the increase is permanent or temporary. We find that the price increase is larger than those reported in past work and that it is permanent. The subperiod October 1989 through June 1993 focuses on the effects of the rule change. Under the new announcement policy, we find that the average price increase is even larger than under the old announcement policy. Part of the effect appears transitory, however. We ascribe the transitory component to the trading of risk arbitrageurs.

The outline of the article is as follows. In Section I, we describe the origin and current level of fund indexing. Section II describes how S&P determines changes in the S&P 500, and why and how they changed their announcement policy. Section III describes our sample of S&P 500 additions, the sources of the data used in our analysis, and our abnormal return measurement methodology. Section IV examines trading volume, trade size, and bid/ask price quote behavior of stocks in the days surrounding their inclusion in the index, and Section V examines abnormal returns. Section VI examines directly the effects of the change in announcement policy. The article concludes in Section VII with a brief summary of the major results and our conclusions.

I. Fund Indexing

The origin of fund indexing rests in the Sharpe (1964)/Lintner (1965) capital asset pricing model (CAPM). The CAPM says that investors should hold portfolios that consist of all risky securities in the marketplace, with the proportion of wealth invested in each security equal to that security's market value relative to the total market value of all risky securities. Active portfolio management is unnecessary.[2] Cash dividends are simply reinvested in the

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[1] Technically speaking, arbitrage involves the simultaneous purchase and sale of perfect substitutes. The "risk arbitrage" in this case refers to speculation that prices will increase as a result of the impending purchases by index funds (a form of front-running).

[2] Actively managed funds are those that attempt to earn superior returns through stock selection and market timing. Active trading involves costs, however, and typical annual expenses for such funds are 1.35 percent (see Clements (1995, p. C1). Passively-managed index funds, on the
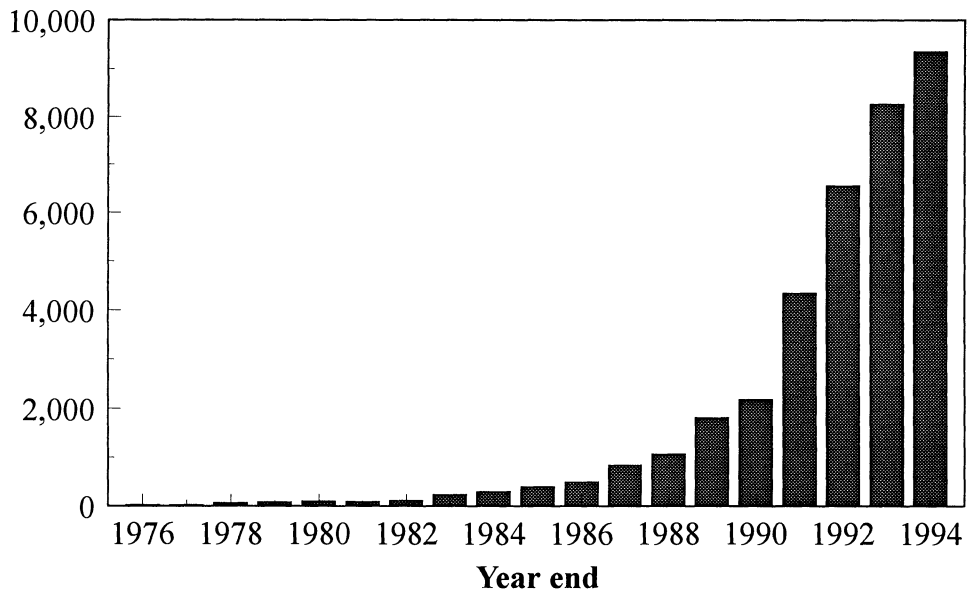
Net assets ($ millions)

Figure 1. Asset value in millions of dollars of the Vanguard Index Trust-500 Portfolio at the end of December of each year from 1976 through 1994.

proportions dictated by the current index market value weights. Other than that, investors "buy-and-hold."

Out of what seemed an esoteric theory in the early 1960s grew the practice of fund indexing. Early on, the most widely known, market value-weighted stock index in the United States was the S&P 500. Consequently, index funds began pegging their holdings to the S&P 500 portfolio, and the practice was born. The growth in S&P 500 funds has been incredible. Perhaps the most well known S&P 500 fund is the *Vanguard Index Trust-500 Portfolio*. As Figure 1 shows, the asset value of the *500 Portfolio* was $14 million in 1976 and $9,356 million in 1994 — an increase of nearly 67,000 percent!

The $9.36 billion in the *500 Portfolio* only begins to describe the full amount of money invested in S&P 500 funds. After all, this is just *one* S&P 500 fund of *one* investment company. Vanguard also has an *Institutional Index Fund* pegged to the S&P 500, and its value was $3.27 billion at the end of 1994. At the same time, Wells Fargo Nikko Investment Advisors had $64.61 billion in their S&P Funds. Together these funds account for $77.24 billion; however, together they represent only *a portion of the publicly traded* S&P 500 funds.[3]

other hand, simply buy and hold an index portfolio of stocks. Annual expenses for index funds are as little as 0.07 percent (see Vanguard Institutional Index Fund Annual Report 1994).

[3] Besides index funds, investment in the S&P 500 portfolio is available through Standard & Poor's Depository Receipts or SPDRs traded on the American Stock Exchange. These receipts represent an interest in the portfolio of securities held by a unit investment trust but trade like

Moreover, conversations with fund advisors indicate that *privately held* funds pegged to the S&P 500 have even greater value than public funds. One investment advisor estimates that the value of all of the S&P 500 funds (both public and private) is about ten percent of the index portfolio value. At the end of 1994, the S&P 500 portfolio had a market value of $3.35 trillion, so his estimate of S&P 500 fund investment is $335 billion.[4]

Even if only half this amount is pegged to the S&P 500, however, the index fund trading activity induced by a change in the S&P 500 is enormous. Consider, for example, the Microsoft addition to the S&P 500 in June 1994. At the time, Microsoft's shares had a market value of about one percent of the S&P 500 portfolio. This means that, for every $100 billion of S&P 500 fund wealth, *$1 billion* in Microsoft shares were purchased.

II. Changes in S&P 500 Composition

The S&P 500 Composite Stock Price Index (or simply "the S&P 500") is a market value-weighted index composed of 500 stocks from the New York Stock Exchange, the American Stock Exchange, and the Nasdaq National Market System. This section focuses on the construction of the S&P 500, how and why changes in the index occur, and S&P's change in announcement policy in October 1989.

A. Additions and Deletions

Additions to the S&P 500 are made *only* when stocks must be removed.[5] The most common reason for a stock's removal is that it merges with or is acquired by another firm. In these cases, the stock is removed as close as possible to the tender offer expiration date or to the shareholder vote date. Corporate restructuring can also cause a stock's removal. Whether the firm or any of its spin-offs

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shares of common stock, with a share price approximately equal to one-tenth the index level. Currently, the market value of outstanding SPDRs is about $500 million.

[4] Pruitt and Wei (1989) examine the changes in the institutional holdings of S&P 500 stocks in the days surrounding change in index membership.

[5] To identify a replacement for a removed firm, S&P turns to its candidate replacement pool. The pool contains a set of firms that have been pre-approved by the S&P Index Committee to be included in the S&P 500. Naturally, the identity of the firms in the pool is kept secret. The primary objective of the S&P 500 is to be the performance benchmark for U.S. equity markets. The selection criteria for the replacement pool therefore include: a) industry representation—the firm must be from an important (or emerging) U.S. industry segment; b) firm size—the firm generally has the highest market value within its industry; c) number of shareholders—the firm's shares must be widely-held to avoid adverse effects of market illiquidity; d) trading volume—the greater is the trading activity of the firm's shares, the more efficient is their pricing and the more timely is the movement in the index; and e) financial soundness—the firm's financial and operating conditions are rigorously analyzed to ensure that added firms will have longevity. Based on these criteria, firms are identified and discussed at periodic S&P Index Committee meetings. A firm is included in the candidate replacement pool if unanimously approved by the committee. Since there is no way of knowing exactly when a candidate in the pool might be included in the index, the committee also monitors the pool to ensure that all candidates continue to meet suitability requirements.

stays in the index after the restructuring is decided on a case-by-case basis. Bankruptcy is another potential cause. Removal occurs if a shareholder-approved recapitalization dramatically changes the firm's debt ratio, or when Chapter 11 is filed. Finally, a firm can be removed when it no longer meets the criteria for inclusion in the index.

B. Announcement Practices

Up until October 1989, S&P followed the practice of changing index composition overnight. After the close, S&P announced the names of the stocks added/deleted from the S&P 500. By the following morning, the change was complete. Under the "old announcement policy," the first opportunity to buy the newly added stock was at the open on the day following the announcement.

Beginning October 1989, S&P began the practice of preannouncing the change in composition of the S&P 500 "... to ease order imbalances that typically happen to stocks just added to the "500" ..." (see *S&P 500 Index 1992 Directory* (p. 6)). Under the "new announcement policy," S&P announces after the close not only the identity of the added and deleted firms, but also the date on which the change will become effective. As a matter of policy, S&P announces the change five business days beforehand.[6] On occasion, S&P *must* use a shorter interval due to a bankruptcy filing or uncertainty about the timing of regulatory approval of a merger or acquisition. The Prime Motors Inns replacement in 1990, for example, had only one day separating the announcement day and the effective day. Prime Motors announced its Chapter 11 filing on September 18, 1990. Just after the close on that day, S&P announced that Prime Motors would be dropped and JWP Inc. added to the index as of the close on September 19. S&P may *choose* to use an announcement interval longer than five days. This occurs rarely. One instance was Microsoft's addition in June 1994. Given Microsoft's high market capitalization, S&P chose to use a sixteen trading day interval.

III. Sample, Data, and Abnormal Return Measurement

This section describes the sample of S&P 500 additions, the sources of market data, and the abnormal return measurement methodology.

A. Sample

The first step in the sample selection process is to identify all changes to the S&P 500 in the period January 1986 through June 1994. To do so, we rely on various issues of Standard and Poor's *S&P 500 Information Bulletin.* Of 177 additions in the period, we eliminate 45 pre-1993 Nasdaq stock additions for which intraday trade and quote data are not available on the Institute for the Study of Securities Markets (ISSM) tapes, and 29 firms for which the an-

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[6] We are grateful to Elliott Shurgin of Standard and Poor for describing in detail the new announcement procedure.
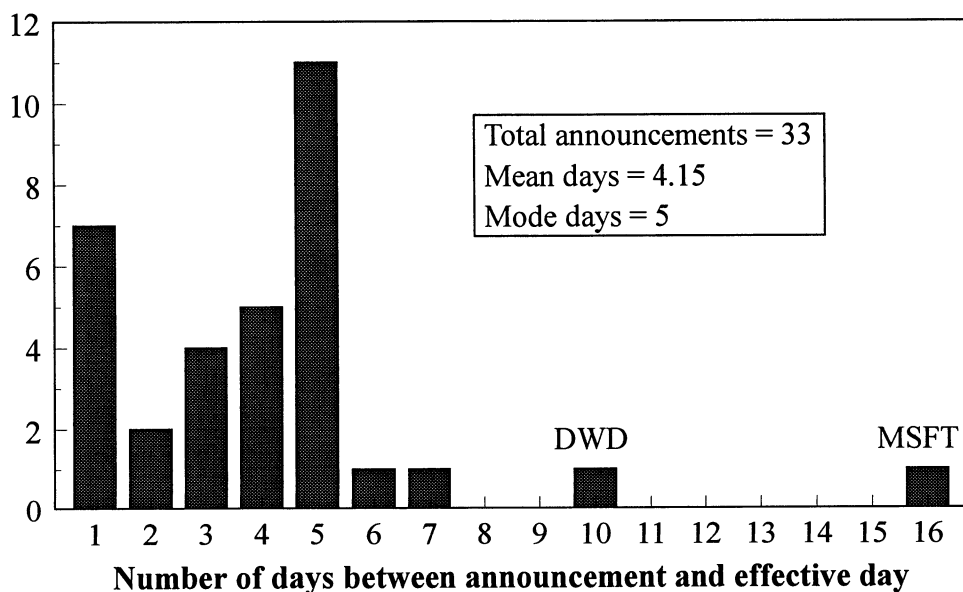
Number of announcements

Figure 2. Frequency distribution of the number of trading days between the announcement day and the effective day for the sample of 33 S&P 500 additions during the period October 1989 through June 1994.

nouncements of listing changes are contaminated by firm specific releases.[7] As in past studies, we do not examine the price and volume behavior of stocks *removed* from the S&P 500 because the removed stocks either do not trade after the change in the index is made, or the announcement of the removal is confounded by firm-specific information. The final sample consists of 103 additions.

Of the 103 additions, 33 occur under the new announcement policy (i.e., October 1989 through June 1994). Figure 2 shows a frequency distribution of the number of trading days between the announcement day and the effective day. The range is from one to sixteen trading days, and the mode is five. The outliers at ten and sixteen trading days are the Dean Witter Discover addition in 1993 and the Microsoft addition in 1994.

B. Stock Market Data

The stock market data used in this study come from three sources. Transaction price and volume data, as well as bid/ask quotes for the years 1986

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[7] The contaminated listings are identified as those with one of the following types of announcements in the period two days before and two days after the listing change announcement: earnings or earnings forecasts (12 times), initial or increased dividends (5), acquisition or reorganization (2), spin-offs (2), multiple announcements (2), and one each of bond redemption, rights plan adoption, oil find, share repurchase, potential malpractice liability and S&P rating change.

through, 1992, are taken from ISSM. Since this file contains only New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks, our sample contains only NYSE and AMEX additions prior to 1993. Transaction price and volume data as well as bid/ask quotes for the period January 1993 through September 1994 are taken from the NYSE's Trade and Quote (TAQ) data base. TAQ includes NYSE, AMEX, and Nasdaq firms. Cash dividend and stock split/dividend information on the ISSM and TAQ files are verified against the Center for Research in Securities Prices (CRSP) Daily Master file. Where discrepancies are detected, the CRSP information is used.

In the analysis that follows, we focus on trading volume, trade size, and market bid/ask quotes as measures of trading activity. We use only trades and quotes from the stock's primary exchange to avoid the possibility that announcement day trading activity can be driven by the announcement itself.[8] All S&P announcements come after the markets close for the NYSE, AMEX, and Nasdaq stocks. Consequently, any abnormal trading on the announcement day must be attributable to either information leakage or speculation regarding the change in S&P 500 composition.

C. Market Return Proxy and Abnormal Return Definition

Past studies of the price effects of S&P 500 additions use daily data and thus are unable to distinguish whether the abnormal return on the day following the announcement is attributable to overnight price movement or price movement during the following day. To separate the two components, we use intraday data.

Using intraday data poses a problem in measuring abnormal return. Normally market return is proxied for using the reported return of a cash index like the S&P 500. While measuring daily returns based on a cash index may be reasonable, measuring overnight returns is not. The problem arises from the fact that the reported S&P 500 cash index level is based on last trade prices. When the cash index is computed and reported for the first time at the beginning of the day (9:30 AM EST), its level is based almost entirely on the prices of the stocks at the previous day's close. To circumvent this problem, we use returns of the nearby (with at least one week to expiration) S&P 500 futures contract. Unlike the reported S&P 500 cash index level, the opening price of the S&P 500 futures is the price of a *single* security at the time of the opening trade of the day. This generally occurs only seconds after 9:30 A.M. EST. Time and sales data for the futures are provided by the CME for the period 1986 through 1993 and by Tick Data, Inc. for January 1994 through September 1994.

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[8] Trading on the announcement day may be possible on other exchanges in the U.S. The post-October 1989 changes in the S&P 500 are generally announced about an hour after the market close. For the announcements in our second subperiod, for example, the median time between the close on the NYSE (4:00 PM EST) and the announcement on the Dow Jones Broad Tape is 70 minutes and all announcements were made before 6:30 PM. This leaves open the possibility of announcement-day trading in the United States on a) the Pacific Stock Exchange (closes 4:50 PM) and the Arizona Stock Exchange (closes 5:00 PM) for some of the stocks in the sample, and b) Instinet's Crossing Network (closes 6:30 PM) for all stocks.

The abnormal return computed using our futures-based approach[9] has a second important feature—it measures the return on a *viable* trading strategy. The strategy is to buy the newly included stock and to sell an appropriate number of S&P 500 futures. When the trading interval ends, the positions are closed. The holding period return of this strategy is

$$\text{Abnormal return}_i = \left(\prod_{t_i=1}^{T} (1 + \text{R}_{i,t_i}) - 1 \right) - \left(\prod_{t_i=1}^{T} (1 + \text{R}_{m,t_i}) - 1 \right),$$

where $\text{R}_{i,t}$ and $\text{R}_{m,t}$ are returns of the stock i and the S&P 500 futures, respectively, and T is the length of the trading interval.

IV. Trading Activity

Analyzing the trading activity of S&P 500 additions is important. If S&P 500 funds minimize tracking error, they will buy the shares of the newly added stock on the day the change becomes effective. This means that trading volume and trade size should be highest on the effective day, and bid/ask spreads should be lowest.

A. Trading Volume

To isolate abnormal trading volume in the days after the announcement of a change in the S&P 500, we compute the ratio of daily trading volume to average daily trading volume over the 60 trading days prior to the announcement day.[10] If the daily trading volume on or after the announcement day is not different from normal, the abnormal trading volume ratio is not different from one. If the daily trading volume is greater, the ratio exceeds one.

Abnormal trading volume in the days immediately following the announcement is unmistakable.[11] As reported in Panel A of Table I, trading volume on

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[9] Defining abnormal return as the stock return less the S&P 500 futures return has two weaknesses. First, the futures basis is ignored. The S&P 500 futures return differs from the cash index return by the short-term interest rate. For the short measurement intervals used in this study, however, the difference is inconsequential. During the period January 1986 through June 1994, for example, the average 30-day T-bill rate was 5.28 percent annually, which implies a daily holding period return of 0.0145 percent. The maximum rate during the period was 9.43 percent annually, for a daily holding period return of 0.0258 percent. Second, we do not attempt to estimate systematic risk and risk-adjust the abnormal returns. While theoretically it may be more correct to do so, Brown and Warner (1985) show that explicit risk-adjustment is unnecessary using event study methodologies on daily return data.

[10] All daily trading volume figures are adjusted for stock splits and/or stock dividends.

[11] While not germane to our analysis, the abnormal trading volume results on the announcement day are interesting. In the first subperiod, trading volume does not appear abnormal. The average abnormal trading volume ratio on the announcement day is 0.990 with a t-ratio of -0.11. In the second subperiod, however, the abnormal trading volume ratio is 1.399 with a t-ratio of 2.12. Under the new announcement policy, trading volume on the announcement day is nearly 40 percent greater than normal. Since the announcement occurs after the close, this abnormal volume indicates that news of the identity and timing of the change has "leaked out" prior to the formal

the day after the announcement is 7.311 times normal (with a *t*-ratio of 9.52) in the first subperiod. Since changes to the S&P 500 during the January 1986 through September 1989 period were made under the old announcement policy, the figure is directly comparable to the 1.89 times normal figure reported by Harris and Gurel (1986, p. 819) for the 1973–83 period. This nearly four-fold increase in abnormal trading volume corresponds to a period of dramatic index fund growth. Vanguard's *500 Portfolio,* for example, increased in asset value by a factor of 7.7 from 1983 to 1989 (See Fig. 1).

In the second subperiod, the abnormal trading volume ratios on the day following the announcement are 10.788 (with a *t*-ratio of 2.95) and 3.484 (with a *t*-ratio of 5.24) for the samples, with one day and more than one day between the announcement and effective days, respectively. Weighting these estimates by the number of observations, we find that the average abnormal volume on the day following the announcement is 5.033, down from 7.311 in the first subperiod, despite the fact that index fund wealth also grew dramatically over our two subperiods (e.g., Fig. 1 shows that Vanguard's *500 Portfolio* asset value increased by more than 400 percent from 1989 to 1994). S&P's change in announcement policy apparently reduced abnormal trading volume on the day following the announcement, presumably reflecting S&P's desired easing of order imbalance.

The overall abnormal trading volume from the day after the announcement through the effective day has increased dramatically, however. In the subsample with more than one day between the announcement day and the effective days, trading volume is about 3.484 times normal on the day following the announcement, 7.212 times normal across all days between the announcement day and the effective day, and 10.565 times normal on the effective day.[12] Summing these figures, we find that the total trading from the day following the announcement through the effective day is 21.261 times normal. Combining this estimate with the 10.788 for the subsample with only one day between the announcement and effective days, we find an overall average abnormal trading volume of 10.040, compared with 7.311 times normal in the first subperiod.

Contrasting the results of the two subsamples in the second subperiod is also instructive. Where trading volume is 10.788 times normal for the subsample with only one day between the announcement day and the effective day, it is 21.267 times normal for the subsample of additions with more than one day. This difference cannot be attributed to growth in index fund investment since the additions occur during the same period. Neither can the difference be explained by the possibility that longer-interval stocks tend to be more highly capitalized stocks. We measure *abnormal* trading volume, so this explanation

announcement or that traders know that a change in the S&P 500 composition is imminent (e.g., a firm currently in the index has filed for bankruptcy or received regulatory approval to merge) and are actively speculating on the identity of the stock that will be added.

[12] This evidence suggests that many index funds wait until the effective day to rebalance their portfolios. As much abnormal trading volume takes place on the effective day, 10.565, as on the other days after the announcement combined, 3.484 + 7.212.

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Table I

Abnormal Trading Volume, Abnormal Trade Size, and Abnormal Quoted Bid/Ask Spread of Stocks Added to the S&P 500 Index in the Days Surrounding the Announcement and Effective Days

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Abnormal trading volume is defined as the stock's daily trading volume divided by the average trading volume of the stock during the 60 trading days immediately preceding the announcement. Abnormal trade size is defined as the ratio of the stock's average daily trade size (i.e., daily trading volume divided by number of trades) to the mean of the average daily trade size over the 60 trading days preceding the announcement. Abnormal quoted bid/ask spread is defined as the stock's average daily bid/ask quote divided by the mean of the average daily bid/ask quotes of the stock during the 60 trading days preceding the announcement. In the first subperiod, the announcement day and the effective day are the same. In the second subperiod, the announcement day precedes the effective day by at least one trading day. The second subperiod's postannouncement/effective day interval results are partitioned by whether one day or more separate the announcement and effective days in order to distinguish between the day following the announcement day and the effective day.

Interval		First Subperiod Jan/86–Sep/89			Second Subperiod Oct/89–Jun/94		
From	Until	n	Mean	t-ratio	n	Mean	t-ratio
Panel A: Abnormal Trading Volume							
ann. day		65	0.990	−0.11	33	1.399	2.12
Ann.day and eff. day are same. ann. day +1/eff. day +1		70	7.311	9.52			
One day between ann. and eff. days ann. day +1/eff. day					7	10.788	2.95
More than one day between ann. and eff. days ann. day +1					26	3.484	5.24
between ann. day +1 and eff. day					24	7.212	5.12
eff. day					26	10.565	5.71
eff. day +1					33	3.460	6.11
eff. day + 2	eff. day + 10	70	1.688	6.50	33	1.968	3.85
eff. day + 10	eff. day + 20	70	1.632	3.74	33	1.616	3.55
eff. day + 20	eff. day + 40	69	1.301	3.62	33	1.734	2.75
eff. day + 40	eff. day + 60	68	1.324	2.76	33	1.553	3.44
Panel B: Abnormal Trade Size							
ann. day		65	0.937	−0.92	33	1.235	1.85
Ann. day and eff. day are same. ann. day +1/eff. day + 1		70	3.157	10.56			
One day between ann. and eff. days ann. day +1/eff. day					7	2.440	3.60

Table I—*Continued*

Interval		First Subperiod Jan/86–Sep/89			Second Subperiod Oct/89–Jun/94		
From	Until	n	Mean	t-ratio	n	Mean	t-ratio
Panel B: *Continued*							
More than one day between ann. and eff. days							
ann. day +1					26	1.614	4.13
between ann. day +1 and eff. day					24	1.715	2.15
eff. day					26	4.146	7.15
eff. day +1					33	1.571	4.60
eff. day + 2	eff. day + 10	70	1.269	5.03	33	1.140	2.00
eff. day + 10	eff. day + 20	70	1.092	2.06	33	1.035	0.60
eff. day + 20	eff. day + 40	69	0.943	−1.42	33	1.009	0.14
eff. day + 40	eff. day + 60	68	0.947	−1.12	33	0.909	−1.70
Panel C: Abnormal Bid/Ask Spread							
ann. day		65	0.966	−1.55	30	1.021	1.29
Ann. day and eff. day are same.							
ann. day +1/eff. day +1		70	0.871	−8.65			
One day between ann. and eff. days							
ann. day +1/eff. day					7	0.916	−1.81
More than one day ann. and eff. days							
ann. day +1					23	0.978	−0.96
between ann. day +1 and eff. day					21	1.005	0.12
eff. day					22	0.950	−1.17
eff. day +1					30	0.893	−3.29
eff. day + 2	eff. day + 10	70	0.907	−7.20	30	0.951	−1.63
eff. day + 10	eff. day + 20	70	0.980	−1.33	30	0.973	−1.06
eff. day + 20	eff. day + 40	69	1.008	0.43	30	0.978	−0.79
eff. day + 40	eff. day + 60	68	1.018	1.01	30	1.036	0.91

makes sense *only* if some index funds peg to the larger stocks in the S&P 500. The most likely explanation is that the longer the time interval between the announcement and effective days, the greater the demand by risk arbitrageurs.

Finally, although trading volume declines dramatically after the stock is added to the index, it does not appear to revert to preannouncement levels. In the first subperiod, the abnormal trading volume ratio is about 69 percent higher than normal in the first ten days after the addition and is about 63 percent higher than normal in days 11 through 20. While trading volume

declines further from these levels as time passes, it remains more than 30 percent above normal as far as 60 days after the announcement. The results are similar for the second subperiod. Trading volume never falls below 55 percent of preannouncement levels, even as far as 60 days after the addition. Apparently the stock's trading volume is affected permanently by its addition to the S&P 500. Again, growth in index fund investment can be ruled out as a potential explanation for this behavior. Indeed, since index funds buy and hold, average trading volume should be lower after the stock's addition to the index than it was before. An explanation that is consistent with the results is that the stock is now part of the S&P 500 basket used in the arbitrage with S&P 500 futures and options.[13] While index arbitrage may increase trading volume, it should not increase average trade size, since arbitrage-induced trades of the individual stocks in the S&P 500 cash portfolio are generally quite small.[14]

B. Trade Size

Average trade size is also an important metric in identifying when index funds rebalance. Given the sheer size of index fund wealth, index fund rebalancing trades are certain to be larger than normal. To measure abnormal trade size, we compute the ratio of the average trade size on or after the announcement to the average of the average daily trade size over the 60 trading days preceding the announcement. Panel B of Table I contains the results.

In the days following the announcement, the trade size results support the notion that index fund rebalancing is taking place. In the first subperiod, the average trade size is 3.157 times normal on the day following the announcement and 1.269 times normal during the ten days following the announcement. Trade size then reverts to normal levels.

The results are qualitatively similar for the second subperiod. Larger than average trades appear from the announcement day through ten days after the effective day. Interestingly, for subsample of firms with more than one day between the announcement day and the effective day, the average trade size figure, 4.146, is highest on the effective day. Clearly, many index funds are

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[13] Another possible explanation is that that the stock, once it is added to the S&P 500, becomes more liquid as a result of a change in the information environment. Beneish and Gardner (1995), for example, argue that, newly added stocks may be scrutinized more fully by analysts, investors, and institutions, hence the firm's information environment becomes richer and its stock trades more actively.

[14] The average trade size of the stocks used in S&P 500 index arbitrage is considerably less than the average trade size of the stocks in our sample before they were added to the S&P 500. Using a sample of index arbitrage trades between January 15, 1990 and July 13, 1990, Sofianros (1993, p. 11) reports that the average cash value of the stocks traded is $7 million and that about 280 of the S&P 500 stocks are used. Assuming an average share price of $50, this means that the number of shares purchased or sold in an index arbitrage trade is about $7,000,000/[(280 stocks)($50 per share)] = 500 shares. The typical pre-addition trade size for the stocks in our sample, however, is 2,515.

waiting until the effective day to buy the shares of the newly added index stock.

C. Quoted Bid/Ask Spreads

The permanent upward shift in trading volume suggests increased liquidity and would be consistent with decreased spreads. The temporary shift in average trade size, however, indicates that any decrease in spread may be only temporary, particularly if index funds tend to use limit orders when they go about acquiring the shares of the newly added stock. Consequently, we examine changes in the quoted bid/ask spread by computing the ratio of the average bid/ask spread across all quotes on a particular day to the average of the average daily bid/ask spreads during each of the 60 trading days preceding the announcement. The results are contained in Panel C of Table I.

The bid/ask spread results are less distinct than those reported for trading volume and trade size. Temporary reductions in the bid/ask spread are observed in only some of the days following the announcement. In the first subperiod, the spread is significantly less than normal on the day following the announcement (i.e., the abnormal spread ratio is 0.871 with a t-ratio of -8.65) and in the ten days following (i.e., the abnormal spread ratio is 0.907 with a t-ratio of -7.20). In the second subperiod, the spread is significantly below normal only on the day following the effective day (i.e., the abnormal spread ratio is .893 with a t-ratio of -3.29).

The temporary reduction in bid/ask spread can arise for at least two reasons. First, the specialist may temporarily reduce the size of his spread. With at least a ten-fold increase in trading volume during this period, the specialist can certainly afford to charge a lower spread per share in order to cover his fixed costs of operation. Second, the size of the spread may be reduced as a result of index funds using limit orders to acquire the newly added firm's shares. By placing a limit order to buy the stock at a price higher than the specialist's bid (but lower than the specialist's ask), the index fund, in effect, tightens the spread. Indeed, the fact that the spreads are lowest on the day following the effective day and continue to be low in the subsequent ten-day period may result from limit orders on both sides of the spread—the "best" bid being set by index funds who have yet to complete their rebalancing, and the "best" ask being set by risk arbitrageurs who have not fully unwound their positions. When index fund demand subsides after the effective day, spreads return to normal levels.

V. Abnormal Return Analysis

The abnormal trading activity section documented that trading volume increases permanently as a result of a stock being included in the S&P 500, while average trade size (quoted bid/ask spread) increases (decreases) only temporarily. In this section, we investigate abnormal returns of stocks added to the S&P 500.

Table II
Average Abnormal Returns to Stocks Added to the S&P 500 Index in the Days Surrounding the Announcement and Effective Days

In the first subperiod, the announcement day and the effective day are the same. In the second subperiod, the announcement day precedes the effective day by at least one trading day. The second subperiod postannouncement/preeffective day results are reported separately for the index additions with only one day and with more than one day between the announcement and effective days. Abnormal return is defined as the stock return over the indicated interval less the nearby S&P 500 futures return over the corresponding interval.

Return Measurement Interval		Full Sample Jan/86–June/94				First Subperiod Jan/86–Sep/89				Second Subperiod Oct/89–Jun/94			
From:	Until:	n	Mean	t-ratio	Posterior odds ratio	n	Mean	t-ratio	Posterior odds ratio	n	Mean	t-ratio	Posterior odds ratio
Panel A: Close-To-Close Returns													
ann. −1 close	ann. day close	98	0.096	0.41		65	0.277	0.86		33	−0.263	−0.91	
ann. day close	eff. day close									33	7.211	7.49	
ann. day close	eff. day + 1 close	103	4.388	10.34	1.6×10^{20}	70	3.674	12.16	5.2×10^{45}	33	5.903	5.24	3.1×10^{24}
ann. day close	eff. day + 10 close	103	4.731	7.82	1.6×10^{17}	70	4.638	7.04	2.0×10^{12}	33	4.928	3.83	7.7×10^{4}
ann. day close	eff. day + 20 close	103	4.964	6.56	3.6×10^{8}	70	5.483	5.99	3.7×10^{8}	33	3.862	2.87	0.975
ann. day close	eff. day + 40 close	103	5.208	4.97	1.1×10^{2}	70	6.112	4.87	9.0×10^{3}	33	3.291	1.74	0.012
ann. day close	eff. day + 60 close	103	5.897	3.56	2.0×10^{2}	70	7.400	3.54	2.6×10^{3}	33	2.707	1.03	0.074

Panel B: Returns Between Ann. and Eff. Days

		N		
Ann. day and eff. day are same.				
ann. day close	ann. day + 1 open	70	4.372	11.69
ann. day close	ann. day + 1 open	70	−0.624	−2.35
One day between ann. and eff. days				
ann. day close	ann. day + 1 open	7	5.557	3.72
ann. day + 1 open	ann. day + 1 close	7	1.508	1.09
More than one day between ann. and eff. days				
ann. day close	ann. day + 1 open	26	2.462	5.51
ann. day + 1 open	ann. day + 1 close	26	0.603	1.31
ann. day + 1 close	eff. day close	24	2.520	2.90
eff. day − 1 close	eff. day open	26	0.229	1.42
eff. day open	eff. day close	26	1.445	2.31
eff. day close	eff. day + 1 open	33	−1.050	−2.11
eff. day + 1 open	eff. day + 1 close	33	−0.956	−3.27

Panel C: Open-To-Close Returns

		N			N			N		
ann. day + 1 open	eff. day close	103	0.769	1.30	70	0.285	0.47	33	4.011	4.15
ann. day + 1 open	eff. day + 10 close	103	0.983	1.33	70	1.074	1.25	33	1.796	1.37
ann. day + 1 open	eff. day + 20 close	103	1.136	1.13	70	1.585	1.34	33	0.791	0.55
ann. day + 1 open	eff. day + 40 close	103	1.816	1.13	70	2.830	1.42	33	0.183	0.10
ann. day + 1 open	eff. day + 60 close							33	−0.335	−0.12

A. Daily Returns

At least three hypotheses regarding the abnormal return behavior of newly-listed stocks appear in the literature. Under the *price pressure hypothesis* advanced by Harris and Gurel (1986), the price increase of the newly added stock is temporary. The influx of buy orders by index funds pushes the price above its equilibrium level as passive sellers become willing to step in and provide market liquidity. When prices return to normal over the next few days, the liquidity traders unwind their positions, thereby extracting a fee for their service. Under two other hypotheses, the price increase is permanent. Shleifer (1986) argues that the price increase is driven by the *imperfect substitutes hypothesis,* that is, two identical stocks, one added to the index and one not, are no longer perfect substitutes because of the excess demand placed on the index stock by index funds. A competing explanation for a permanent increase is the *liquidity hypothesis* formalized by Amihud and Mendelson (1986). Under this hypothesis, share price contains the capitalized value of all expected future trading costs. If the bid/ask spread decreases permanently as a result of a stock's addition to the S&P 500, the present value of all expected trading costs for that stock falls and share price rises. The liquidity hypothesis can be ruled out, however, since we already document that the average bid/ask spread decreases only temporarily. To differentiate between the price pressure and imperfect substitutes hypotheses, we compute close-to-close abnormal returns for various holding periods surrounding the announcement.

The close-to-close results are reported in the first panel of Table II. The results show that the postannouncement price increase is large. The average abnormal returns from the announcement day close until the effective day close are significantly positive— 4.388 percent (with a *t*-ratio of 10.34) over the full sample period, 3.674 percent (with a *t*-ratio of 12.16) in the first subperiod, and 5.903 percent (with a *t*-ratio of 5.24) in the second subperiod. These results are noteworthy for two reasons. First, the 3.7 percent return in the first subperiod under the old announcement policy is more than 23 percent higher than the three percent value reported in earlier work. This we attribute to the growth in index fund investment. Second, the abnormal return is 61 percent higher in the second subperiod than in the first. Part of the increase is almost surely attributable to growth in index fund investment; however, part is also likely due to incremental buying pressure from risk arbitrageurs. The second subperiod corresponds to S&P's new announcement policy. If index funds are waiting until the effective day to buy, as is suggested by the trading activity evidence reported in the last section, there is plenty of opportunity to play the S&P game.

The results reported in the first panel of Table II support the proposition that the abnormal price increase following the announcement is permanent (does not reverse). Over the full sample, the average abnormal return from announcement day close until ten days after the change becomes effective remains significantly different from zero (i.e., 4.731 percent with a *t*-ratio of 7.82). Moreover, the results appear roughly consistent across subperiods. In

the first subperiod, the abnormal return is 4.638 percent (with a *t*-ratio of 7.04), and the second subperiod is 4.928 percent (with a *t*-ratio of 3.83). Inclusion in the S&P 500 seems to imply a permanent stock price increase of about five percent.

Curiously, price appears to increase beyond ten days. Sixty days after the effective day the average abnormal return is 5.897 percent. To scrutinize this result further, we test for outliers. In the first subperiod, we note an abnormal price increase about 370 basis points from the effective day until sixty days later and, in the second subperiod, a 320 basis point decline.[15] These values seem large in light of the fact that index fund rebalancing activity should be complete. To test whether outliers have a meaningful impact on the posteffective day results, we eliminate any stock that experienced an absolute return of ten percent or greater in any one day of the posteffective day period.[16] This eliminates 11 additions in the first subperiod and 4 in the second. We then recompute the summary statistics. In the first subperiod, the abnormal return over the 60 trading day period after the effective day was reduced from 7.400 percent to 6.048 percent. In the second subperiod, the abnormal return increased from 2.707 percent to 5.392 percent. Obviously, with small sample size, the effects of extraordinary returns unrelated to inclusion in the index can have a strong impact on averages.

B. Overnight and Intraday Returns

Past studies of S&P 500 additions use daily price data and consequently cannot distinguish between overnight and intraday returns. If the close-to-close return following the announcement is largely driven by the close-to-open price movement, the efficacy of price-setting in the marketplace is supported. If the close-to-close return is largely driven by the price movement from the open to the close on the day following the announcement, a case can be made for market inefficiency.

Average abnormal returns for different overnight and intraday intervals are reported in the second panel of Table II. During the first subperiod, the close-to-close return appears to be driven by the overnight return. The average abnormal return from the close on the announcement day until the open of trading the following morning is 4.372 percent with a *t*-ratio of 11.69, while the mean abnormal return from the open to the close on the day following the announcement is −0.624 percent with a *t*-ratio of −2.35. For this subperiod, no profitable trading opportunities exist. The stock price appears to fully reflect the implications of being added to the index by the following morning's open.

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[15] Dhillon and Johnson (1991) find similar anomolous results. For the period 1978–83, they report a significant abnormal return of 2.38 percent for the day following the announcement, and a significant abnormal return of −6.46 percent for the 60 days following.

[16] In the first subperiod, for example, Thrifty Corp. had a 17.18 percent return 14 days after it was included in the index because of an announcement that it would be acquired by Pacific Lighting. In the second subperiod, Echo Bay Mines had an −11.01 percent return 46 days after it was included as a result of an announcement regarding a soured swap agreement.

If a trader had entered market-on-open orders to buy the stock and sell the futures, his abnormal return over the day following the announcement would have been −0.624 percent on average without considering trading costs. The bottom panel of Table II reports a trader's average abnormal return if he had opened his hedged position on the morning following the announcement and held it until the close 10, 20, 40, and 60 days later. The abnormal returns are all positive but insignificant. In the first subperiod, therefore, the price adjustment on the day following the announcement appears to be permanent.

The second subperiod results are stratified by the number of days between the announcement and effective days. In the seven instances where a single trading day separates the dates, most of the abnormal return associated with the stock addition appears to occur from the close on the announcement day to the open on the following day (5.557 percent). In addition, the stock price continues to rise from the open to the close on the effective day (1.508 percent), although the return is not significant in a statistical sense.

Where more than one day separates the announcement day and the effective day, the average overnight return from the announcement day's close to the following morning's open is statistically significant (2.462 percent with a t-ratio of 5.52), although substantially smaller in magnitude than the 4.372 percent reported for the first subperiod. The intraday return on the day following the announcement is insignificantly positive (.603 percent with a t-ratio of 1.31). From the close on the day following the announcement until the close on the day before the effective day, the abnormal return is 2.326 percent (with a t-ratio of 2.87). Indeed, the abnormal return from the open to the close on the effective day is positive and significant (1.445 percent with a t-ratio of 2.31), presumably reflecting the last day buying pressure of index funds.

The negative abnormal returns after the effective day are consistent with the nature of the S&P game. The demand by risk arbitrageurs beginning at the open on the day after the announcement drives share price upward. Recall that we attribute part of the increase in abnormal trading volume to the actions of risk arbitrageurs. If risk arbitrageurs overestimate index fund demand and are unable to unwind their positions before the close on the effective day, we should observe an immediate stock price drop. Indeed, under the new announcement policy, the price falls by about one percent overnight and another one percent the following day, with both drops being significant statistically. This evidence is consistent with our previous findings that trading volume is higher and bid/ask spreads lower than normal on the day following the effective day.

Finally, we focus on the profitability of risk arbitrage. Buying at the open on the day following the announcement and selling at the close on the effective day is an easily-implemented strategy. Since the trading activity results indicate that buying pressure is exerted over the entire interval from the announcement day through the effective day, it is not surprising to see price continue to drift upward after the open on the day following the announcement. The average abnormal return of the strategy of buying the stock and shorting the S&P 500 futures at the open on the day after the announcement

day and closing the position at the close on the effective day is 4.011 percent (with a t-ratio of 4.15). The average share price of the stocks added to the index during this subperiod was about \$40 per share. The abnormal return, therefore, implies that, if the one-way trading cost in the stock market is less than \$.80 per share, an abnormal trading profit after trading costs can be earned. So, even after accounting for reasonable trading costs, the abnormal return remains positive on average and provides the motivation for the S&P game. The game is not without risk, however. Only 25 of the 33 additions in the second subperiod have positive abnormal rates of return before trading costs; only 22 of 33 using an assumed one-way trading cost of \$.25 per share.

VI. The Effects of Changing the Rules

With the abnormal trading and return activity of the newly added index stocks documented, the analysis now focuses directly on the effects of Standard and Poor's change in announcement policy. Has this new announcement policy been effective? Is the number of days between the announcement day and the effective day related to the magnitude of the price adjustment? What behavior can be expected in the future?

To answer the first question, we regress the abnormal return from the close on the announcement day to the open on the following morning ($ABRET_{cto}$) on a dummy variable (DUMMY) whose value is 0 for the period preceding October 1989 and 1 afterward, using the full sample of 103 additions. If S&P's change in policy had no effect, the slope coefficient will not be different from zero. On the other hand, if the change in policy had the desired effect, the slope coefficient will be negative. The regression results (with t-ratios in parentheses) across the 103 sample additions are:

$$ABRET_{cto,i} = \underset{(11.92)}{4.372} - \underset{(-1.93)}{1.254} \, DUMMY_t$$

The estimated intercept term is the mean close-to-open abnormal return for the first subperiod. The estimated slope coefficient, -1.254 percent, is the change in the abnormal close-to-open return from the first subperiod to the second. The reduction in overnight return is marginally significant in a statistical sense, implying that the change in announcement policy has been effective at reducing the order imbalances at the open.

The second question addresses whether the variation in the number of days between the announcement day and the effective day affects abnormal returns. As is noted in Section II, most of the variation in the number of days is not deliberate. S&P's general policy is to announce the addition five days before it becomes effective. Shorter intervals arise only when stocks must be removed from the index earlier than five days. Only on occasion does S&P deviate from its policy, and that is when the newly added stock has an extremely large market capitalization. This happened in only 4 of our 33 additions. Regardless of the reason for the variation in the number of days (recall Fig. 2), the premise

underlying S&P's policy change is that a longer interval will smooth the transition in price to its post-addition level.

To investigate this issue, we perform two regressions. In the first, we regress the close-to-open abnormal return ($ABRET_{cto}$) on the number of days between the announcement day and the effective day (DAYS) for the 33 additions in the second subperiod. If the length of the announcement interval smoothes the price transition or reduces price pressure at the open on the day following the announcement, the slope coefficient will be negative. In the second, we regress the abnormal return from the open on the day following the announcement until the close on the effective day ($ABRET_{otc}$) on the number of days between the announcement day and the effective day. If index fund rebalancing produces only price pressure effects, the slope coefficient will be negative. On the other hand, if the length of the interval simply provides risk arbitrageurs more time to play the S&P game, the slope coefficient will be positive.

The results of the regression using the close-to-open abnormal returns are

$$ABRET_{cto,i} = \begin{matrix} 4.623 \\ (5.47) \end{matrix} - \begin{matrix} 0.3625 \ DAYS_i, \\ (-2.17) \end{matrix}$$

and indicate that, the longer is the number of days between the announcement day and the effective day, the lower is the overnight abnormal return experienced by the newly added stock. The results of the regression using the subsequent open-to-close abnormal return, on the other hand, are opposite:

$$ABRET_{otc,i} = \begin{matrix} 1.459 \\ (1.90) \end{matrix} + \begin{matrix} 0.6147 \ DAYS_i. \\ (-1.92) \end{matrix}$$

The abnormal return from the open of trading on the day after the announcement until the close on the effective day increases as the length of the announcement interval increases. It appears that buying pressure from risk arbitrageurs causes stock price to increase by more than is warranted from index fund demands alone.

Awareness of S&P game has grown through time, as demonstrated by the number of popular press articles alone. If the game is profitable, it should draw more participants through time and the magnitude of the abnormal return should diminish. Moreover, as index funds become aware of the premium paid as a result of waiting until the close of trading on the effective day (4.011 percent) they, too, should initiate their buying earlier in the announcement interval—in the extreme, with market-on-open orders on the day following the announcement. To test this proposition, we regress the open-to-close abnormal return on the number of days in the announcement interval and a trend variable (TREND). The results are:

$$ABRET_{otc,i} = \begin{matrix} 8.239 \\ (2.12) \end{matrix} + \begin{matrix} 0.8307 \ DAYS_i \\ (2.54) \end{matrix} - \begin{matrix} 0.0032 \ TREND_i, \\ (-0.90) \end{matrix}$$

with an adjusted R-squared of 15 percent. The size of the open-to-close abnormal return appears to be decreasing through time. Presumably this effect will continue until all of the stock's abnormal return associated with being added to the index appears overnight following the announcement.

VII. Summary and Conclusions

This study examines the effects of Standard and Poor's change in announcement policy regarding new listings to the S&P 500. In the period before the change in policy (from January 1986 through September 1989), we find that index funds pay a 3.7 percent premium for the shares of newly added stocks. Since this premium is driven exclusively by the close-to-open return, it does not represent a profitable trading opportunity and attests to the efficacy of price setting in the marketplace. The premium is about 23 percent higher than that reported in past work, reflecting the growth in the amount of money indexed to the S&P 500. In addition, the price increase during this period appears to be permanent.

In an attempt to reduce order imbalances for newly added stocks, S&P began to announce changes to the index about five days beforehand. On one hand, the change in policy can be viewed as effective in the sense that during the period October 1989 through June 1994 the overnight return is only 3.1 percent, about 16 percent lower than under the old policy. On the other hand, based on the trading activity analyses, index funds appear to wait until the effective day to rebalance their portfolios. By the effective day, the stock price has increased by another 4.1 percent, making the total premium paid for acquiring the newly added index stock 7.2 percent. Most of the overall price increase appears to be permanent in the sense that the abnormal return is still nearly five percent two weeks after the effective day. We ascribe the 220 basis point reversal to the price pressure of risk arbitrageurs who buy ahead of index funds in the hope of selling to the index funds on the effective day. If more index funds rebalance earlier in the announcement interval (in the extreme, with market-on-open orders on the morning following the announcement), the abnormal price increase associated with a stock being added to the S&P 500 should again appear overnight following the announcement, with little, if any, subsequent price increase before the effective day close. Consequently, we expect the S&P game (and the adverse effects of S&P's new announcement policy) to disappear.

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