

The Hidden Costs of Index Rebalancing: A Case Study of the S&P 500 Composition Changes of July 19, 2002

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Periodic index rebalancing is associated with substantial price movements for the stocks added to and deleted from the index. These price changes represent significant hidden costs to portfolio managers who track the index. This article examines this issue, focusing on the dramatic return movements associated with the change of the S&P 500 index composition on July 19, 2002 when seven non-US companies were replaced by seven US companies. We examine the liquidity and return patterns in these 14 stocks following the announcement date on July 9, 2002. We show that by adopting a trading strategy that spreads out trades in the period before the reconstitution date, trading costs can be dramatically reduced without bearing significant tracking error risk. These differences can significantly improve the net performance of investment funds. More generally, these results indicate that trading strategies that provide guaranteed market-on-close prices have hidden costs to investment managers.

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The rebalancing of equity indexes is typically associated with large price movements for the stocks added to and deleted from the index. These price changes can represent significant hidden costs to portfolio managers who track the index and rebalance on the reconstitution date itself. This article examines this issue, focusing on a specific case: the change of the S&P 500 index composition on July 19, 2002. Specifically, at the market close on July 19, 2002, the seven companies in the S&P 500 index domiciled outside the US were removed and replaced by seven US companies. This shift in index composition is in many ways an ideal subject for a case study because it represents a major change in the composition of a widely followed index. Indeed, some non-US companies had been in the index for decades, while five of the seven newly added US companies are new to the S&P index family. Given the enormous size of the assets benchmarked against the S&P 500, conservatively estimated at over \$830 billion, the action was expected to induce billions of dollars of net inflows and outflows.

The change in index composition was associated with substantial excess return movements in the 14 affected stocks. In particular, following the announcement after the market close on July 9 to the reconstitution date itself, the stocks added to the index had excess returns over the index of 13.9%, on average, while deletions experienced excess returns of -5.7% . Trading volumes and money flows were also extremely large. These effects are similar to those documented in other analyses of index rebalancing such as Madhavan's (2002) analysis of the Russell Reconstitutions in the period 1996-2002.

We argue that investment managers could have dramatically reduced the costs of rebalancing by trading prior to the rebalancing date. In particular, the pre-trade cost estimates, even for relatively large trades in the 14 affected stocks were relatively modest compared to the returns associated with index addition and deletion, especially if trades were broken up over time. Early trading is often shunned by index managers concerned about tracking error risk. However, such a strategy need not have resulted in significant tracking error risk, as we show using a risk decomposition of the S&P 500 before and after the action. More generally, these results indicate that trading strategies that provide guaranteed market-on-close prices contain large "hidden" transaction costs for investment managers who rebalance their portfolios on reconstitution date to match index revisions.

Background

The stated purpose for the changes of July 19 were to make the S&P 500 more closely reflect the domestic large cap equities market.¹ Most of the seven foreign names to be deleted were originally added to the S&P 500 before S&P had global indexes.

Characteristics of Stocks Added and Deleted from SPX

ADDS				DELETES			
Symbol	Market Cap*	GICS Sector**	Source	Symbol	Market Cap*	GICS Sector**	Country
UPS United Parcel Service	68 bn	Industrials	New	RD Royal Dutch Petroleum	119 bn	Energy	Netherlands
GS Goldman Sachs	35 bn	Financials	New	UN Unilever	37 bn	Consumer Staples	Netherlands
PRU Prudential	18 bn	Financials	New	NT Nortel	6 bn	Info Tech	Canada
EBAY eBay	16 bn	Consumer Discr.	New	AL Alcan	12 bn	Materials	Canada
PFG Principal Financial Group	10 bn	Financials	New	ABX Barrick Gold Corp	11 bn	Materials	Canada
ERTS Electronic Arts	9 bn	Info Tech	S&P400	PDG Placer Dome	3.8 bn	Materials	Canada
SDS SunGard Data Systems	6 bn	Info Tech	S&P400	N Inco Ltd	4.1 bn	Materials	Canada

* As of Market Close July 9, 2002 (the announcement day).

** Standard and Poor's GICS sector classifications used.

¹ July 9, 2002 Press Release: "Standard & Poor's Announces Changes to the S&P Indices," Standard and Poor's 2002, available at www.standardandpoors.com

As noted above, however, given the size of the assets indexed to the S&P 500 (approximately \$830 billion) the announcement of the change on July 9, 2002 generated considerable concern. These are relatively large index constituents, as shown in the following, which also provides some characteristics of the 14 affected stocks. One expects that the changes of July 19 might be quite dramatic given the size of the stocks being added and dropped from the index. The following table provides some statistics on trading volumes and projected money flows.

Liquidity Characteristics of Adds and Deletes

Ticker	Market Cap (7-9)	ADV	7-9 Price	Projected Money Flow (\$ millions)	Projected Shares	No. of Days
Adds						
PFG	9,682	1,699,782	27.00	885	31,596,910	18.59
GS	35,292	3,108,473	70.91	3,225	44,794,624	14.41
EBAY	15,985	7,158,718	57.05	1,461	26,446,107	3.69
ERTS	8,821	3,224,650	60.78	806	13,702,978	4.25
PRU	17,778	3,341,809	30.31	1,624	49,373,482	14.77
SDS	6,248	1,433,068	22.15	571	26,247,333	18.32
UPS	67,848	1,841,968	60.74	6,199	96,685,218	52.49
Deletes						
RD	118,858	3,042,055	55.89	10,591	250,907,368	82.48
NT	5,949	20,533,464	1.55	498	508,163,265	24.75
AL	11,547	990,577	35.96	1,079	39,136,743	39.51
UN	37,221	905,509	65.12	3,420	60,901,158	67.26
N	4,091	742,236	22.45	365	21,933,934	29.55
ABX	10,527	3,178,568	19.54	1,021	65,864,516	20.72
PDG	3,777	2,000,641	11.45	365	42,613,769	21.30

With an estimated \$830 billion indexed to the S&P 500, these index changes could result in large money flows, which translate into large volume pressure between announcement and a few days after the effective date. Indexers may choose to trade the rebalance before or after the effective day, while arbitrageurs/speculators may accumulate positions ahead of the rebalance expecting the liquidity pressure from indexers.

Changes of this magnitude could potentially roil the markets. Indeed, several empirical studies of index revisions (Beneish and Whaley, 1996) document significant return effects associ-

ated with changes in the S&P 500 index. According to a recent S&P research paper, relative to a broad market index, symbols added to the S&P 500 tend to gain 8.5% between the announcement and the rebalancing date, while names deleted from the S&P 500 index tend to decline by 11.7%.² Most of these price changes tend to reverse over the next year following the rebalancing. In the case of the deletes, the rebound is much more rapid, occurring within 1-2 weeks of the rebalancing. Other than July 19, 2002 the other major simultaneous change in S&P 500 index composition occurred when seven companies were replaced by the “Baby Bells” created by the breakup of AT&T in 1983. (Companies are typically added singly.) Goetzmann and Garry (1986) study the effect of delisting from the S&P 500 index of seven stocks on November 30, 1983 and find significant, long-term price declines for the delisted stocks.

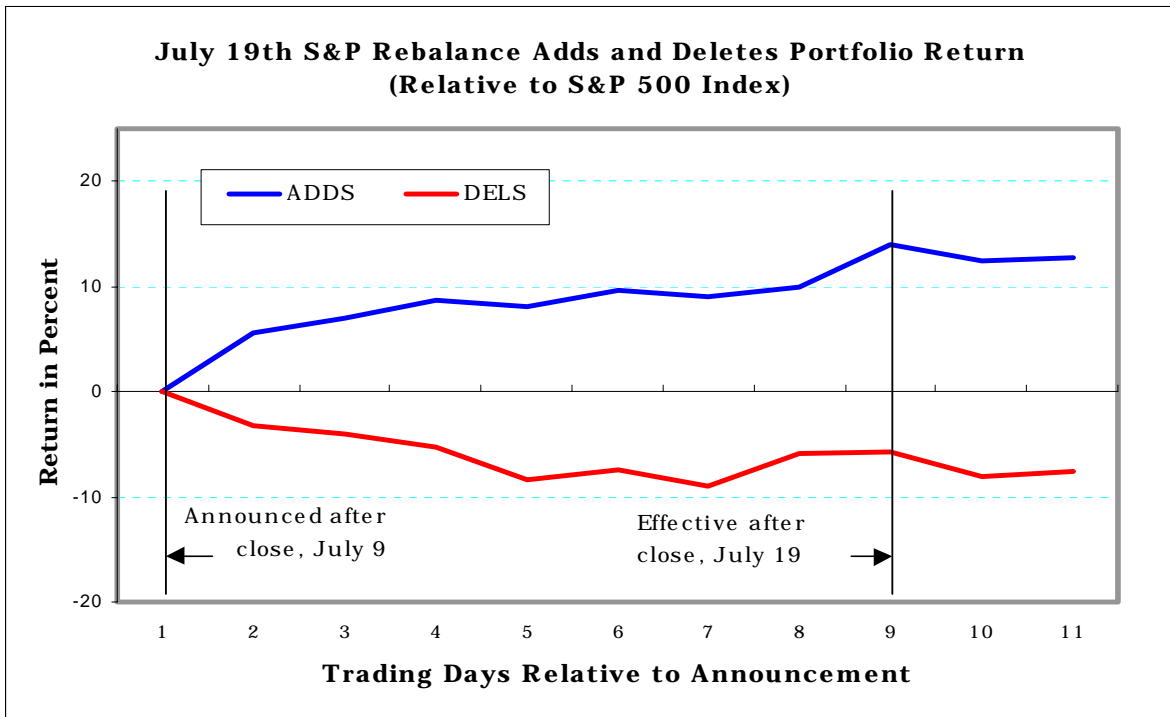
Similar findings apply to other index revisions. Madhavan (2002) examines equity returns associated with the annual reconstitution of the Frank Russell indexes from 1996-2002 and observes much larger return anomalies. Madhavan (2002) advances the hypothesis that returns around index revisions are explained by *both* permanent changes in liquidity associated with changes in index membership and price pressure effects induced by fund flows. These findings are confirmed by a decomposition of returns around the reconstitution. Interestingly, the temporary return effects for stocks being added to an index are larger in magnitude than the corresponding effects for deletions. One explanation is that investment managers do not hold very low capitalization stocks because of illiquidity concerns, so that price pressure upon deletion from an index is weak. In this particular case, given the size of the stocks being added or deleted, most effects are likely to represent temporary price pressure.

The S&P 500 Index Changes of July 19, 2002

The rebalance on July 19 was associated with returns on adds and deletes similar to those observed in the past. If anything, the actual return effects were more dramatic than expected, even after adjusting for movements in the market as a whole. Measured from July 9 close price (Announcement Date) to July 19 close price (Effective Date), the seven added names have an av-

² Blitzer, David M., “Focusing the S&P500 on U.S. Large Cap Stocks and the Removal of Non-U.S. Companies in the S&P500.” Standard and Poor’s 2002, available at www.spglobal.com

verage return of +13.94% while the deleted names have an average return of -5.65%, relative to S&P 500 index returns over the same period. The following chart illustrates the rebalance effect.

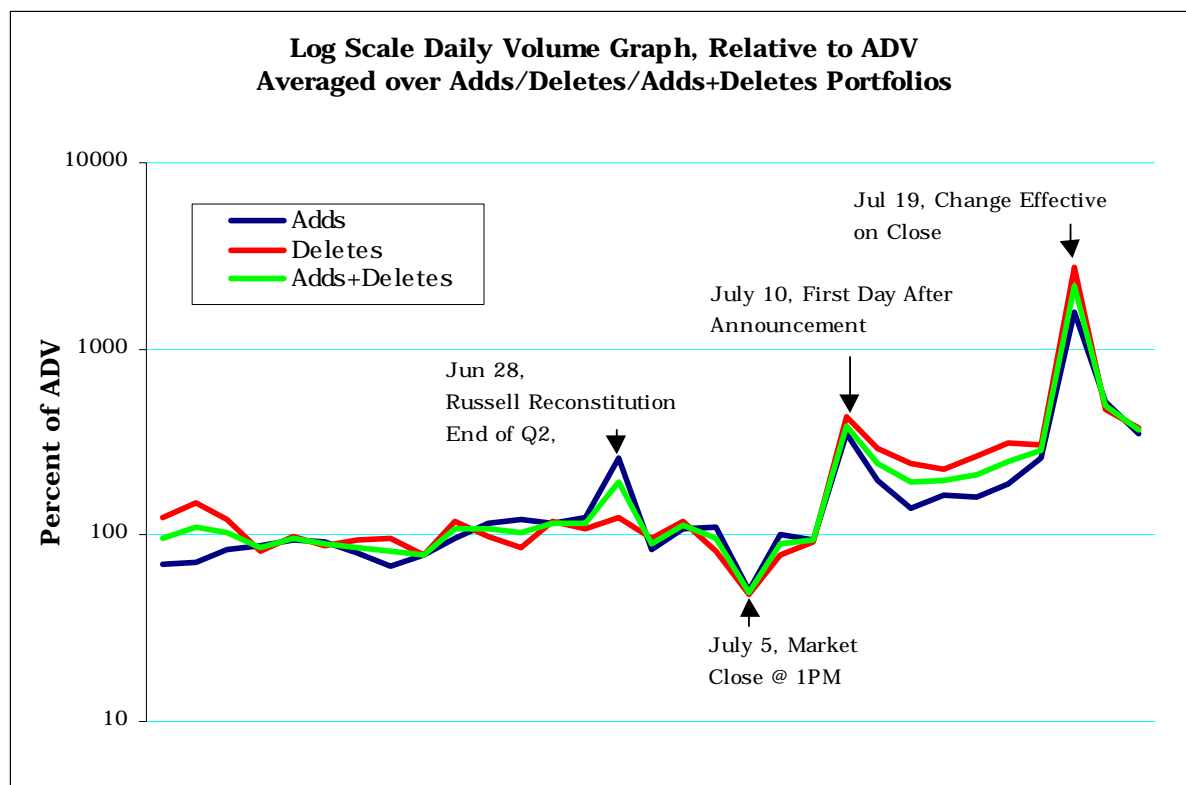


Trading Volumes

As can be seen from the following graph, trading volume on the added/deleted symbols was stable for the month prior to the announcement, with exceptions on Jun 28 and July 5. Following the announcement, there was an immediate run-up of volume. The highest spike occurred on the effective day where average volume for the added/deleted symbols is at 15.8 times ADV and 27.5 times ADV, respectively. Moreover, the entire period after the announcement experienced much higher volume relative to trading prior to the announcement. This indicates that the liquidity pressure has spread into multiple days from the announcement through the rebalance.

In general, when a company in the S&P 500 index is replaced by another company with largely different market cap, indexers will have to adjust positions on all S&P 500 member stocks to achieve the correct S&P 500 weighting. As seen from the table on page 2, for the July 19 rebal-

ance, the aggregated market cap for adds and deletes are roughly in line with each other. This creates a situation where no large moneyflow is expected for other names in the S&P 500 index.



Trading Strategies for Indexers

The return and volume patterns discussed above suggest that indexers may want to trade prior to the rebalance in order to enhance returns and avoid being caught in the middle of the liquidity crunch. Historical event studies documented significant temporary abnormal returns from announcement of index changes to the effective day; and these price changes usually reverse during the year following the rebalance. According to a Standard & Poor’s research paper, deleted symbols usually recoup most of the losses in the first 6 trading days after the rebalance.³

In light of this evidence, it is natural for an indexer to trade added symbols a few days before the effective day. For deleted names, they may either trade shortly after announcement day or wait until a few days after the effective day when most of the loss is recouped. This strategy

³ Srikant Dash, “Price Changes Associated with S&P 500 Deletions: Time Variation and Effect of Size and Share Prices”, Standard & Poor’s , available from <http://www.spglobal.com/research.html>

will enhance the fund’s performance between the announcement and effective day and even after the rebalance if the deleted symbols are to be sold after rebalance.

One way to gauge the effects of early trading is to examine the returns of trading either on the announcement date itself or over the eight trading days before the reconstitution. We computed these returns assuming the traders obtained the volume weighted average price (VWAP) for their corresponding strategy. The gains from early trading are dramatic. It is also clear that there was some slippage, as shown by the return patterns, resulting in lower returns to the multi-day strategy.

Average Gains by Trading Early		
	1 Day VWAP Style	8 Day VWAP Style
Adds	2.79%	3.41%
Deletes	19.18%	10.53%
Total Gain	21.97%	13.94%

Given that the stocks affected had a roughly 2% weight in the index, the gain in basis points due to early trading over a multiday horizon is $13.94\% \times 2\% = 28$ basis points. In fact, a \$10B S&P500 index fund could save about \$28 million by employing an 8-day VWAP-style trading program.

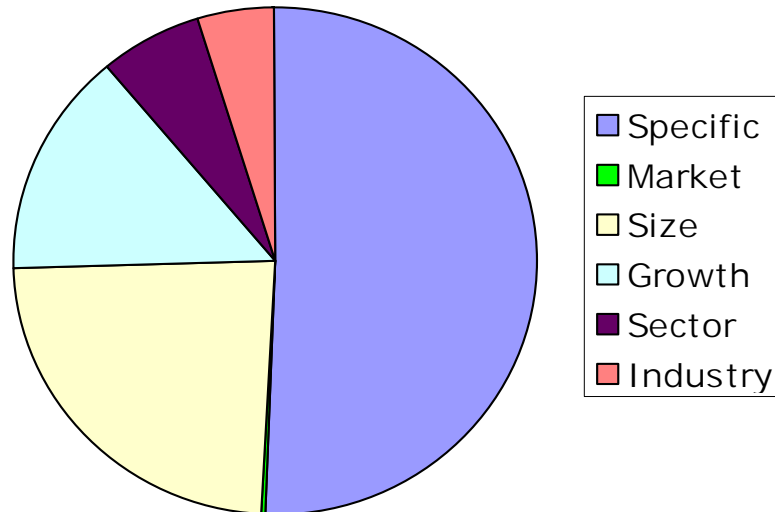
Transaction costs, however, might significantly offset the value to trading quickly. By employing a multi-day trading strategy and avoiding trading on the rebalance day, an index fund could reduce exposure to the liquidity risk in such scenarios. We use ITG Inc.’s pre-trade model (ITG ACETM) to estimate the cost of trading in the period before the rebalancing. ITG ACE is a sophisticated mathematical-econometric model of transaction costs that recognizes that trading style affects costs. More aggressive trading (demanding more liquidity in a given interval of time) will have higher costs than a passive strategy that breaks up an order over several days.

Estimated Transaction Costs		
Fund Size	Single Day Trading	Multi-Day Trading Style
\$1B	\$0.03	\$0.02
	(9 bps)	(7 bps)
\$10B	\$0.15	\$0.09
	(52 bps)	(30 bps)
\$100B	\$1.39	\$0.76
	(482 bps)	(261 bps)

These costs are in line with those reported by Keim and Madhavan (1998). The previous analysis suggests the benefits to trading early. An appreciation of the value of such a strategy can be gained very simply by comparing the expected transaction costs savings from trading in advance of the rebalancing with the tracking error over the period.

But what risks does an index fund take to get these benefits? The figure below shows the percentage of active variance between the S&P 500 index prior to the July 19, 2002 index change and the current post-change index. The total active risk as a result of the change is 0.65%, a relatively small figure. Roughly half the so-called active risk (arising from the index change and other factors) is stock specific risk, as shown below.

Decomposition of Active Risk of S&P 500 Around Shift



Implications

The results have several important implications for practitioners. Investment managers who rebalance their portfolios to match their benchmark indexes on or near the dates of actual index revision pay an extremely steep liquidity premium. This is especially the case for index funds benchmarked against popular indexes where there is a concentration of trading around pre-disclosed index revisions. Such funds, and their investors, would experience higher net returns (albeit with some risk of tracking error) were they to trade ahead of the reconstitution based on predictions of index additions and deletions, or to undertake derivative transactions in the options or futures markets or use equity swaps. Such a strategy is increasingly used by index funds including those benchmarked against the S&P 500 indexes. Alternatively, these findings provide a rationale for the creation of alternative investment vehicles that provide investors with diversification but are designed to incur lower trading costs while tracking a given index.

Alternatively, a passive fund that does not immediately rebalance to match changes in the benchmark can use passive trading strategies to reduce trading costs albeit at the risk of increased tracking error. Such a trading strategy can, as Keim (1999) shows, have a very high Sharpe ratio. These considerations might also drive the creation of new funds benchmarked to non-disclosed indexes (see, e.g., Gastineau, 2002) or alternative methods of index construction or revision. Conversely, the results indicate that a strategy of trading on projected index revisions can be profitable. In conclusion, the results here point to the importance of understanding implicit transaction costs associated with demanding liquidity at specific points in time, and at a broader level, the relationship between liquidity and stock prices.

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