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Price Pressure at Russell Index Reconstitution

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ABSTRACT

The transparent rules of the Russell Index methodology allow index changes at reconstitution to be anticipated long in advance. Investors in index funds may be concerned about possible losses due to speculative trading around reconstitution. These effects are particularly pronounced in the case of the small cap Russell 2000 Index, due to its popularity and due to the impact of changes at the top end of the index. We measured the temporary price–pressure effect of reconstitution by computing returns to adds and deletes following the event. Because the reconstitution process implements changes at a single point in time, common factors other than the reconstitution itself may influence the returns observed around the event. To control for common factors, abnormal returns were measured against control portfolios, consisting of stocks that did not change in the indexes, with characteristics that match those of the affected stocks. Without controlling for the common factors, the impact on the Russell 2000 Index return averaged –0.64% for the period 2000–2006 while, after controlling for cap size, sector, and momentum, the impact was only –0.08%. There is also evidence that the reconstitution effect is diminishing over time, possibly due to the decreased number of index changes in the recent low–volatility years, the changes in index methodology introduced by Russell, and the increase in short positions and active strategies in recent years.

INTRODUCTION

The Russell Indexes are purposely constructed in a transparent and objective manner. Having the rules for construction publicly available allows the indexes to be readily tracked and replicated, making them useful tools for both active and passive investors.[1]

[1] The Russell Index methodology is available from http://www.Russell.com/Indexes.

The indexes are reconstituted annually near the end of June. With knowledge of the rules, it is possible to predict with good accuracy the changes in the index constituents long in advance of the annual reconstitution. Information about the expected changes enables portfolio managers to adjust their portfolios accordingly. The growth in popularity of the indexes has led to a substantial volume of trading around the time of the reconstitution. In addition to index fund managers, active fund managers and other participants may choose to trade in anticipation of or in response to the event.

Given the increasing dollar value of passive assets tracking the indexes, there is concern that trading activity may be creating an implicit transaction cost for index funds. It is common practice for index funds to trade at or near the reconstitution in order to minimize tracking error. Anticipating these trades, an active manager might buy the stocks to be added to an index in advance of reconstitution, for example, expecting to sell them at higher prices to index funds at reconstitution. The volume of orders for stocks added to (deleted from) an index may temporarily drive the prices of those stocks above (below) their equilibrium levels. If the prices return to equilibrium levels subsequent to reconstitution, then arguably indexers who trade at reconstitution are paying a premium to those who are supplying liquidity at the event. It is possible, however, for prices to adjust to a new equilibrium level without a temporary overshoot. In this case, there is no implicit additional cost to indexers for liquidity.

The implicit cost borne by index funds is reflected in the index return because the index rebalances at closing prices on the day of reconstitution. In this paper, we measure the amount of loss (or gain) experienced by the index, or an index fund to the extent it executes its trades at the same time as the index, due to temporary price pressure.

We study both the Russell 1000 and Russell 2000 because there are significant passive assets benchmarked against both indexes—as of 31 December 2006, $254.6 billion were indexed to the Russell 1000 and $62.0 billion were indexed to the Russell 2000 (both amounts include the basic index and the respective growth and value style indexes).

We focus on the Russell 2000 Index because, with stocks ordered by cap size, a small cap index has constituents entering and exiting both from the top and from the bottom of the list. In contrast, stocks enter or leave the

large cap Russell 1000 Index from the bottom. Therefore, for a small cap index, the reconstitution is a more significant event as a larger fraction of the index is turned over and the event is likely to have a more significant impact on the index returns.

The study enables us to also examine the effect of certain changes in the index methodology that Russell implemented to help reduce the burden of the annual reconstitution on indexers. Starting in the fourth quarter of 2004, IPOs have been added to the Russell Indexes on a quarterly basis, spreading out those additions throughout the year instead of waiting for reconstitution. Further, the NASDAQ Closing Cross prices have been used at reconstitution for NASDAQ–listed stocks since 2004. Also since 2004, provisional indexes have been published that enable portfolio managers to track indexes that rebalance on different dates than the official reconstitution date. This change helps spread the demand from indexers to different dates surrounding reconstitution.

BACKGROUND

Previous studies of price movements surrounding index changes have documented abnormal returns to the affected stocks. Figure 1 depicts the stylized price movement of a stock added to an index that has generally been observed.

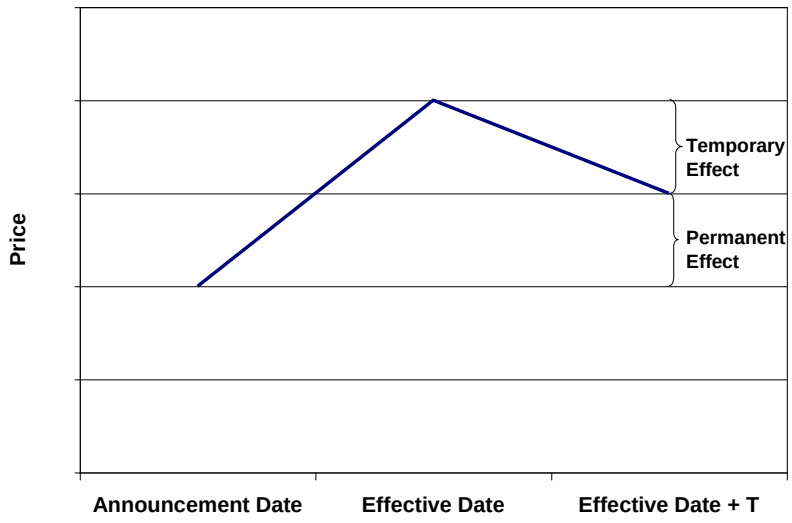

Figure 1
Typical price movement of a stock added to an index. For stocks deleted from an index, the pattern is inverted.

In general, it has been found that stocks added to an index have positive abnormal returns over a period of time leading up to the effective date and tend to experience a reversal over a period of time afterward. For stocks deleted from an index, the picture is inverted.

These phenomena were first documented in the case of changes to the S&P 500 Index and a variety of hypotheses have been advanced to explain these general patterns. For our purposes, the various explanations divide into two categories:

- *Index membership effect*. The permanent change in value due to factors such as increased demand (Schleifer 1986), lower costs (Amihud and Mendelson 1986, Goetzmann and Garry 1986), increased liquidity (Beneish and Whaley 1996), information signals (Jain 1987), etc., associated with membership in the index.
- *Price pressure effect*. The temporary effect of a mismatch in buy and sell orders around the effective date (Harris and Gurel 1986).

Although the interpretation of these effects may be important, we particularly note the distinction between the temporary and permanent effects. Assuming that an index fund trades at or near the effective date, the temporary effect depicted in Figure 1 represents an immediate loss to the index fund investor. The permanent effect, in contrast, reflects an adjustment to a new equilibrium and does not indicate a loss to an index fund investor.

Russell research by Weigel and Weigel (1992) uncovered price pressure in the early Russell 2000 reconstitutions. Both permanent and temporary effects have been documented in the case of the Russell Indexes in Madhavan (2003), Biktimirov, Cowan, and Jordan (2004), Chen (2006), and Chen, Noronha, and Singal (2006).

The previous studies used data from Russell reconstitutions from 2002 and earlier. In this paper, we advance this line of research in two ways.

First, we use data through 2006, which enable comparisons before and after certain events. Market volatility since the start of 2003 has been significantly lower than before, possibly resulting in fewer index changes. Starting with the 2004 reconstitution, provisional indexes have been posted and the NASDAQ Closing Cross prices have been used. The quarterly addition of IPOs to the indexes first affected the 2005 reconstitution. Finally, with attention drawn to reconstitution effects by the earlier studies and with the recent growth in hedge fund and portable alpha strategies, it is possible that return patterns that existed earlier might be dissipating. Given all of these factors, we are interested in comparing results before and after these changes.

Second, we take a more careful approach toward measuring abnormal returns than in the previous studies. A key feature of the Russell Index reconstitution is that the index changes happen all at once. This fact is

significant because it is possible for factors other than the reconstitution itself to be affecting returns.

To explain this point, some background on event studies is in order. Typically, in studying price movements around an event, the analysis consists of averaging over many stocks. The events (mergers and acquisitions, for example), typically occur at different times for the different stocks. Consequently, other factors that potentially cause prices to move are likely to cancel each other out over the sample.

In the case of the Russell Indexes, the addition and deletion of stocks happen all at the same time, at reconstitution. Consequently, by averaging returns over all affected stocks at the same time, the effect of exposures of the stocks to certain factors could be magnified instead of canceling out. Averaging across time may help but, given that the event is annual, there may not be enough years of data to control for other factors potentially driving returns.

In the case of the Russell 2000, there are some such factors that immediately come to mind. In a small cap index, stocks can enter or leave the index from the top or the bottom. (In a large cap index, stocks are not removed if they get too large, only if they get too small.) Those that enter or leave from the top will naturally have the greatest impact as they have the largest weights in the adds or deletes portfolios. Stocks entering from the top are small cap declining stocks while those being deleted from the top are midcap/largecap advancing stocks. As a result, the Russell 2000 adds–minus–deletes portfolio will likely have a negative exposure to size and momentum factors. In addition, the adds–minus–deletes portfolio could also have sector bets as the small cap declining stocks could be from different sectors than the midcap/largecap advancing stocks. The payoffs to each of these factors around reconstitution will influence the returns to the adds–deletes portfolios and need to be controlled for in order to measure the reconstitution–related price–pressure effects.

The goal of this paper is to measure the temporary price–pressure effect on the Russell Indexes while controlling for other factors that happen to be affecting returns at the time of reconstitution.

SAMPLE

Our sample covers seven annual Russell reconstitution events over the period 2000 to 2006. We use the daily index holdings data on the day of reconstitution and one day prior to reconstitution to identify additions and deletions to the Russell 1000 and Russell 2000 Indexes. Also, we use daily returns to move the weights of the pre–reconstitution index constituents forward from one day prior to reconstitution to the reconstitution date in

order to measure the proportion/weight of the index being added or deleted at reconstitution.

The numbers and weights of the additions/deletions from the Russell Indexes by year are given in Table 1.

Table 1
Russell Index Additions and Deletions at Reconstitution

			Control Portfolios Matched on		
Recon Date	Weight in Index at Recon	Number of Stocks	CapSize (% of Portfolio)	CapSize & Sector (% of Portfolio)	CapSize & Sector & Momentum (% of Portfolio)
		R1000 Adds Portfolio			
2000–06–30	3.91%	192	100.0%	100.0%	80.6%
2001–06–29	2.33%	177	100.0%	100.0%	87.4%
2002–06–28	2.59%	159	100.0%	100.0%	89.0%
2003–06–30	1.29%	101	100.0%	100.0%	91.2%
2004–06–25	1.25%	83	100.0%	100.0%	89.9%
2005–06–24	1.81%	95	100.0%	100.0%	92.8%
2006–06–30	1.85%	98	100.0%	100.0%	68.3%
		R1000 Deletes Portfolio			
2000–06–30	0.95%	139	100.0%	100.0%	99.0%
2001–06–29	0.60%	113	100.0%	100.0%	99.4%
2002–06–28	0.61%	107	100.0%	100.0%	98.0%
2003–06–30	0.74%	83	100.0%	100.0%	97.9%
2004–06–25	0.74%	68	100.0%	100.0%	98.6%
2005–06–24	0.82%	80	100.0%	100.0%	100.0%
2006–06–30	0.61%	59	100.0%	100.0%	100.0%
		R2000 Adds Portfolio			
2000–06–30	32.58%	684	100.0%	100.0%	96.1%
2001–06–29	20.61%	609	100.0%	99.8%	98.6%
2002–06–28	16.77%	486	100.0%	100.0%	95.8%
2003–06–30	16.03%	365	100.0%	99.8%	99.2%
2004–06–25	15.00%	377	100.0%	99.6%	95.4%
2005–06–24	12.94%	286	100.0%	100.0%	98.3%
2006–06–30	11.23%	287	100.0%	100.0%	95.9%
		R2000 Deletes Portfolio			
2000–06–30	32.01%	436	100.0%	100.0%	81.2%
2001–06–29	25.81%	417	100.0%	100.0%	88.8%
2002–06–28	24.17%	360	100.0%	100.0%	89.8%
2003–06–30	16.77%	275	100.0%	100.0%	91.1%
2004–06–25	13.71%	272	100.0%	100.0%	94.8%
2005–06–24	16.03%	299	100.0%	100.0%	92.0%
2006–06–30	16.76%	267	100.0%	100.0%	76.8%

The number of index changes at reconstitution has declined substantially over the sample period. The decline in numbers since 2003 reflects the general decline in market volatility since that time. In addition, the effect of quarterly IPO additions is reflected in the 2005 and later reconstitutions.

As expected, the weights of changes to the Russell 2000 Index are much greater than the weights of the changes to the Russell 1000, because changes to the Russell 2000 may take place at the large end of the index.

In all of the work below, we formed float–adjusted cap–weighted portfolios of the adds and of the deletes.

MEASURING TEMPORARY EFFECTS

As a first cut at measuring the temporary price pressure, we calculate the return of the adds and deletes portfolios in excess of the index over various periods: from May–end to reconstitution (recon), and from recon to various dates thereafter. Table 2 shows the results for both the Russell 1000 and the Russell 2000, by year, for the 2000–2002 and 2003–2006 subperiods, and over the entire period.

Table 2
Returns in Excess of the Index

Recon Date	May–end to Recon	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end	May–end to Recon	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end
	R1000 Adds Portfolio					R2000 Adds Portfolio				
2000–06–30	24.93%	–1.98%	4.10%	–7.45%	3.38%	12.01%	0.78%	1.27%	–3.13%	–2.93%
2001–06–29	–0.27%	1.19%	1.35%	0.70%	1.72%	–0.56%	–2.13%	–1.77%	–2.81%	–7.04%
2002–06–28	0.53%	–1.81%	–0.07%	1.81%	3.24%	0.38%	–2.06%	–2.20%	–4.10%	–4.96%
2003–06–30	–1.99%	3.43%	4.77%	6.18%	9.08%	2.98%	–0.95%	0.35%	0.76%	0.73%
2004–06–25	1.42%	1.04%	–0.60%	–2.69%	–5.05%	–0.95%	–1.03%	–1.11%	–2.17%	–0.96%
2005–06–24	2.08%	0.50%	0.97%	1.12%	1.68%	1.16%	–1.02%	–1.40%	–1.51%	–1.18%
2006–06–30	3.90%	–2.33%	–4.33%	–7.95%	–9.89%	–4.80%	0.64%	0.52%	0.29%	0.73%
Avg 2000–2002	8.40%	–0.87%	1.80%	–1.64%	2.78%	3.94%	–1.14%	–0.90%	–3.35%	–4.98%
Avg 2003–2006	1.35%	0.66%	0.20%	–0.83%	–1.05%	–0.40%	–0.59%	–0.41%	–0.66%	–0.17%
Avg 2000–2006	4.37%	0.00%	0.89%	–1.18%	0.59%	1.46%	–0.83%	–0.62%	–1.81%	–2.23%
	R1000 Deletes Portfolio					R2000 Deletes Portfolio				
2000–06–30	–4.24%	4.79%	4.30%	7.21%	5.20%	5.77%	–1.38%	0.40%	–6.26%	3.30%
2001–06–29	3.56%	–6.78%	–7.06%	–9.89%	–13.34%	–6.47%	5.32%	5.88%	7.13%	6.72%
2002–06–28	–4.69%	–7.45%	–8.53%	–16.24%	–18.14%	–4.15%	3.64%	3.79%	9.26%	12.67%
2003–06–30	3.96%	–0.85%	1.96%	3.23%	6.60%	–2.57%	3.25%	2.02%	2.16%	3.01%
2004–06–25	0.51%	–0.41%	–1.51%	–2.25%	–0.58%	–2.14%	1.04%	1.56%	0.29%	–1.06%
2005–06–24	1.92%	0.30%	1.28%	2.20%	1.59%	–0.92%	0.38%	0.02%	0.40%	2.35%
2006–06–30	–4.59%	0.22%	0.05%	–0.78%	1.23%	2.55%	–0.63%	–0.91%	–4.32%	–6.72%
Avg 2000–2002	–1.79%	–3.15%	–3.76%	–6.31%	–8.76%	–1.62%	2.52%	3.36%	3.38%	7.56%
Avg 2003–2006	0.45%	–0.19%	0.45%	0.60%	2.21%	–0.77%	1.01%	0.67%	–0.37%	–0.60%
Avg 2000–2006	–0.51%	–1.46%	–1.36%	–2.36%	–2.49%	–1.13%	1.66%	1.82%	1.24%	2.90%

Consistent with the evidence from previous studies, the excess returns for the adds have been positive on average in the period leading up to the event, while the deletions averaged negative excess returns. For the Russell 2000, the excess returns are quite variable, however. For the adds portfolio, the excess return in the month prior to recon ranged from a high of 12.01% in 2000, to a low of –4.80% in 2006. Looking at subperiods, the averages over the subperiod 2000–2002 are consistent with the evidence reported in previous studies. However, the subsequent years 2003–2006 display a much less–pronounced effect, with the adds portfolio actually averaging negative 0.40% excess return. For the deletes portfolio, the absolute magnitude of the excess return prior to recon is reduced from –1.62% in the first subperiod to –0.77% in the 2003–2006 subperiod. These results suggest that the reconstitution effect may be diminishing over time. Similar results are observed when we look at the excess returns in the two subperiods for Russell 1000 additions and deletions. The pre–reconstitution excess returns from the 2000–2002 period to the 2003–2006 period fall from 8.40% to 1.35% for Russell 1000 adds while they increase from –1.79% to 0.45% for Russell 1000 deletes.

As Figure 1 shows, temporary price pressure effects must be measured using post–reconstitution returns. To measure the temporary price pressure, a specific time window must be specified. What is an appropriate length of the window over which to measure these effects? Past studies have used varying window lengths ranging from two weeks (Lynch and Mendenhall 1997) to up to two months (Chen, Noronha, and Singal 2006). If the window is too short, then we might not capture the entire temporary price pressure effect. However, if the window is too long, other effects could start to be captured and dominate the post–event abnormal returns.

In Table 2 we report the cumulative excess returns for periods up to 5 trading days, to 10 trading days, to the end of July, and to the end of August. Looking at the periods after recon in Table 2, the excess returns of the Russell 2000 adds are negative on average and those of the Russell 2000 deletes are positive on average. This return reversal is, again, consistent with findings in earlier studies of the existence of temporary effects. On average, a substantial amount of the effect occurs in the first 5 days after recon. For the Russell 2000 deletes portfolio, the average excess return is 1.66% after the first 5 days, 1.82% after the first 10 days, and is only 1.24% by the end of July. Although the excess returns continue to extend into August, the pattern in the first 5 to 10 days suggests that other factors may be coming into play that many weeks after recon. For example, firms start making earnings announcements a few weeks after quarter–ends. Consequently, we believe post–recon returns over a one to two week period (5 to 10 trading days) are likely to capture most of the effects. At most, the period from recon to the end of July should be adequate for measuring the temporary price–pressure effect.

Just as with the pre–reconstitution period, the subperiod averages show that the temporary price–pressure effects on Russell 2000 adds and deletes were smaller in the 2003–2006 period than in the 2000–2002 period. Based on excess returns till July–end, we see that the Russell 2000 adds experienced a reversal of 3.35% in the first subperiod compared to 0.66% in the second, while the Russell 2000 deletes experienced a reversal of 3.38% in the first subperiod compared to a price continuation of 0.37% in the second subperiod.

The typical temporary price–pressure effects associated with index additions and deletions don't appear to be present for the Russell 1000 adds and deletes. Instead of price reversals, we see evidence of price continuations for Russell 1000 additions and deletions. The reason behind this is that a large proportion of Russell 1000 adds and deletes represent stocks migrating from or to the Russell 2000. These stocks are more likely to reflect price patterns associated with their entering or leaving the Russell 2000 Index as opposed to the Russell 1000 Index given the dollars indexed to these indexes.[2] For instance, a stock migrating from Russell 1000 to Russell 2000 is a Russell 1000 delete as well as a Russell 2000 add. The stock is more likely to experience a drop in price subsequent to reconstitution as the fact that it is a Russell 2000 add dominates the fact that it is a Russell 1000 delete. This could drive Russell 1000 deletes to experience price continuations. The same reasoning would apply for price continuations for Russell 1000 adds.

[2] The market cap of the Russell 1000 Index is approximately nine times that of the Russell 2000 Index, but it has only about four times as much money indexed to it relative to the Russell 2000. Therefore, the net demand by index funds for stocks moving between the Russell 1000 and Russell 2000 Indexes will primarily reflect the demand of Russell 2000 index funds.

CONTROLLING FOR PORTFOLIO BIASES

Although the results in Table 2 indicate the existence of temporary price pressure, we take a further step to accurately estimate the magnitude of the effect. As mentioned above, the adds and deletes portfolios are likely to have exposures to common factors unrelated to reconstitution that could influence returns.

To control for common factors, we use a characteristic–based control–portfolio approach (see Daniel, Grinblatt, Titman, and Wermers 1997). We calculate abnormal returns relative to the returns to control portfolios with similar characteristics as the sample firms. The control portfolios are formed by matching on three sets of characteristics: (1) market cap, (2) cap and sector, and (3) cap, sector, and momentum.

To construct control portfolios, we start for a given reconstitution with the stock universe defined as the union of pre–recon and post–recon Russell 3000 members. The universe stocks are independently classified along each characteristic as follows:

- *Cap*. The stocks are grouped into three buckets based on their cap ranking in the post–recon index (i.e. based on May–end cap values). The three buckets are rank 1 to 500, rank 501 to 1000, and rank 1001 onwards.
- *Sector*. The stocks are grouped into 12 sectors based Russell's Economic Sector Classification.
- *Momentum*. Stocks are assigned to momentum deciles based on their trailing 12–month return ending in May. If data is unavailable, then it is based on their trailing 9–month, 6–month, or 3–month return depending on data availability.

Within each grouping, the control portfolio return is calculated as the float–adjusted cap–weighted return of those stocks assigned to that group, but excluding Russell 1000 and Russell 2000 Index adds and deletes. In this way, the sample firms (index adds and deletes) don't influence the control portfolio returns. Also, a minimum of three stocks are required to calculate the control portfolio returns.

Table 1 shows the percentage of the sample portfolio that has a matched control portfolio return under these three sets of characteristics. When calculating abnormal returns, if a sample stock does not have a control portfolio return under a particular level of grouping then we revert to the grouping one–level up to assign a control portfolio return—i.e., if a stock does not have a control portfolio return based on cap/sector/momentum, then we use the control portfolio return based on cap/sector; if that too is not available, then we do it based on cap alone. In this manner, all sample

firms are assigned a control portfolio return under each of the three sets of control characteristics.

With the control portfolios constructed as above, we compute the abnormal return for a sample stock as the difference between the stock's return and its respective control portfolio return. We then compute the float–adjusted cap–weighted average of these abnormal returns to arrive at the abnormal returns of the adds or deletes portfolio. The results are shown in Table 3 for the Russell 1000 and Table 4 for the Russell 2000. Each table is grouped into four sections, corresponding to the control portfolio used for calculating the abnormal returns (we include the index as a control portfolio for comparison). The left–hand columns report the abnormal returns of a spread portfolio, which is simply the adds portfolio minus the deletes portfolio. The post–reconstitution abnormal returns should now provide a better estimate of the temporary price–pressure effects especially when we control for cap, sector, and momentum at the same time. The impact of these temporary price–pressure effects on returns to the index is reported in the right–hand columns and is calculated as follows:

Impact on index return =

(Weight of adds in post–recon index ×
Post–recon abnormal return of the adds portfolio)

– (Weight of deletes in pre–recon index ×
Post–recon abnormal return of the deletes portfolio).

In the formula above, the post–recon abnormal return measures the magnitude by which the closing price at reconstitution differs from the price on subsequent dates after controlling for common factors, while the weight of the adds (deletes) measures the proportion of the index that is bought (sold) at the closing price at reconstitution. Therefore, the larger the temporary price pressure is at reconstitution, as reflected in more negative (positive) post–event abnormal returns for adds (deletes), the more adverse the impact would be on the index return. Also, the larger the weight is of the adds or deletes portfolio, the more significant the impact would be, because a larger fraction of the index would have changed at reconstitution at prices that include temporary price pressure.

The weights of the adds and deletes portfolios in the post–reconstitution and pre–reconstitution indexes are in Table 1. For example, for the Russell 1000 at the year 2000 reconstitution, using the weights from Table 1 together with excess returns over the index from Recon to Day 5 from Table 2, gives:

$$(0.0391 \times -1.98\%) - (0.0095 \times 4.79\%) = -0.12\%,$$

which is the result shown in Table 3. The impact on the index is –12 bps as the index bought stocks worth 3.91% of the index at a price that was 1.98% higher than the equilibrium price and sold 0.95% of the index at a price that was 4.79% lower than the equilibrium price due to temporary price pressure.

Table 3
Abnormal returns of Russell 1000 adds minus deletes portfolio.

Recon Date	Abnormal Returns of Adds Minus Deletes					Impact on Index Returns			
	May–end to Recon	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end
Benchmark : R1000 Index									
2000–06–30	29.17%	–6.77%	–0.19%	–14.65%	–1.82%	–0.12%	0.12%	–0.36%	0.08%
2001–06–29	–3.83%	7.97%	8.41%	10.59%	15.06%	0.07%	0.07%	0.08%	0.12%
2002–06–28	5.22%	5.64%	8.47%	18.05%	21.39%	0.00%	0.05%	0.15%	0.19%
2003–06–30	–5.95%	4.28%	2.81%	2.96%	2.47%	0.05%	0.05%	0.06%	0.07%
2004–06–25	0.91%	1.46%	0.91%	–0.43%	–4.47%	0.02%	0.00%	–0.02%	–0.06%
2005–06–24	0.15%	0.20%	–0.30%	–1.07%	0.09%	0.01%	0.01%	0.00%	0.02%
2006–06–30	8.48%	–2.55%	–4.39%	–7.17%	–11.11%	–0.04%	–0.08%	–0.14%	–0.19%
Avg 2000–2002	10.18%	2.28%	5.56%	4.66%	11.54%	–0.02%	0.08%	–0.05%	0.13%
Avg 2003–2006	0.90%	0.85%	–0.24%	–1.43%	–3.26%	0.01%	–0.01%	–0.03%	–0.04%
Avg 2000–2006	4.88%	1.46%	2.24%	1.18%	3.09%	0.00%	0.03%	–0.03%	0.03%
Benchmark: Control Portfolio matched on Cap Size									
2000–06–30	35.80%	–7.28%	–1.03%	–16.88%	–3.19%	–0.14%	0.09%	–0.45%	0.03%
2001–06–29	1.83%	6.04%	6.76%	8.33%	14.46%	0.07%	0.09%	0.08%	0.10%
2002–06–28	10.04%	3.45%	6.71%	13.25%	16.46%	0.02%	0.07%	0.16%	0.21%
2003–06–30	–5.68%	5.12%	4.83%	5.19%	4.82%	0.06%	0.05%	0.06%	0.06%
2004–06–25	2.25%	1.97%	0.09%	–1.87%	–6.80%	0.02%	0.00%	–0.02%	–0.07%
2005–06–24	1.90%	0.98%	1.79%	1.17%	1.60%	0.00%	0.01%	0.00%	0.02%
2006–06–30	8.93%	–3.70%	–6.47%	–8.65%	–12.17%	–0.04%	–0.08%	–0.13%	–0.17%
Avg 2000–2002	15.89%	0.74%	4.15%	1.56%	9.24%	–0.02%	0.08%	–0.07%	0.11%
Avg 2003–2006	1.85%	1.09%	0.06%	–1.04%	–3.14%	0.01%	0.00%	–0.02%	–0.04%
Avg 2000–2006	7.87%	0.94%	1.81%	0.08%	2.17%	0.00%	0.03%	–0.04%	0.03%

Table 3 (continued)

Recon Date	Abnormal Returns of Adds Minus Deletes					Impact on Index Returns			
	May–end to Recon	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end
Benchmark: Control Portfolio matched on Cap Size & Sector									
2000–06–30	30.22%	–5.66%	–2.02%	–12.82%	–3.41%	–0.10%	0.04%	–0.34%	0.02%
2001–06–29	2.78%	2.34%	4.53%	4.58%	7.52%	0.04%	0.08%	0.06%	0.04%
2002–06–28	4.67%	2.35%	5.08%	10.69%	13.80%	0.01%	0.05%	0.12%	0.17%
2003–06–30	–5.34%	4.64%	4.13%	4.77%	4.24%	0.05%	0.04%	0.06%	0.05%
2004–06–25	2.20%	2.28%	0.98%	–0.43%	–4.30%	0.02%	0.01%	–0.01%	–0.05%
2005–06–24	1.15%	0.63%	1.28%	–0.20%	0.06%	0.00%	0.01%	–0.02%	0.00%
2006–06–30	9.14%	–3.41%	–6.04%	–8.74%	–11.80%	–0.04%	–0.07%	–0.12%	–0.16%
Avg 2000–2002	12.56%	–0.32%	2.53%	0.82%	5.97%	–0.02%	0.06%	–0.05%	0.08%
Avg 2003–2006	1.79%	1.03%	0.09%	–1.15%	–2.95%	0.01%	0.00%	–0.02%	–0.04%
Avg 2000–2006	6.40%	0.45%	1.14%	–0.31%	0.87%	0.00%	0.02%	–0.04%	0.01%
Benchmark: Control Portfolio matched on Cap Size & Sector & Momentum									
2000–06–30	27.04%	–5.54%	–2.49%	–10.60%	–6.68%	–0.09%	0.02%	–0.28%	–0.05%
2001–06–29	2.12%	–0.24%	1.50%	0.80%	–0.38%	0.01%	0.04%	0.01%	–0.04%
2002–06–28	–3.03%	0.31%	2.93%	4.35%	4.20%	0.00%	0.03%	0.07%	0.08%
2003–06–30	–4.77%	4.49%	4.81%	6.16%	7.77%	0.05%	0.05%	0.07%	0.09%
2004–06–25	1.11%	3.00%	2.11%	1.27%	–1.49%	0.03%	0.02%	0.01%	–0.02%
2005–06–24	1.13%	0.16%	1.47%	–0.28%	0.46%	–0.01%	0.01%	–0.01%	0.00%
2006–06–30	7.57%	–2.79%	–4.84%	–8.34%	–9.55%	–0.03%	–0.05%	–0.12%	–0.12%
Avg 2000–2002	8.71%	–1.82%	0.65%	–1.82%	–0.95%	–0.03%	0.03%	–0.07%	0.00%
Avg 2003–2006	1.26%	1.21%	0.89%	–0.30%	–0.70%	0.01%	0.01%	–0.01%	–0.01%
Avg 2000–2006	4.45%	–0.09%	0.78%	–0.95%	–0.81%	–0.01%	0.02%	–0.04%	–0.01%

Table 3 shows that, for the Russell 1000 Index, the temporary price–pressure effect based on post–recon abnormal returns till July–end was positive at 1.18% when the Russell 1000 Index is used as the benchmark. The impact on the index return though was negative at –3bps. This is because the temporary price–pressure effect reported for the adds minus deletes portfolio gives equal weight to the adds and deletes portfolios, while the impact on index returns gives a larger weight to the adds portfolio, as it has a larger weight in the index (see Table 1). When we control for common factors, the temporary price pressure effects fall and become –0.95% when we control for cap, sector, and momentum. The impact on the index return does not change much and moves from –3 bps to –4 bps. This is because the adds and deletes to the Russell 1000 happen only from below and so are a very small proportion of the index, which result in price–pressure effects not impacting the index returns by much.

Table 4
Abnormal returns of Russell 2000 adds minus deletes portfolio.

Recon Date	Abnormal Returns of Adds Minus Deletes					Impact on Index Returns			
	May–end to Recon	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end
Benchmark : R2000 Index									
2000–06–30	6.24%	2.16%	0.87%	3.12%	–6.23%	0.70%	0.29%	0.98%	–2.01%
2001–06–29	5.91%	–7.45%	–7.65%	–9.94%	–13.75%	–1.81%	–1.88%	–2.42%	–3.18%
2002–06–28	4.53%	–5.70%	–5.98%	–13.36%	–17.63%	–1.23%	–1.28%	–2.92%	–3.89%
2003–06–30	5.55%	–4.20%	–1.66%	–1.39%	–2.28%	–0.70%	–0.28%	–0.24%	–0.39%
2004–06–25	1.09%	–2.07%	–2.67%	–2.46%	0.10%	–0.30%	–0.38%	–0.37%	0.00%
2005–06–24	2.08%	–1.41%	–1.43%	–1.90%	–3.53%	–0.19%	–0.19%	–0.26%	–0.53%
2006–06–30	–7.34%	1.27%	1.44%	4.60%	7.45%	0.18%	0.21%	0.76%	1.21%
Avg 2000–2002	5.56%	–3.66%	–4.26%	–6.73%	–12.54%	–0.78%	–0.96%	–1.45%	–3.03%
Avg 2003–2006	0.34%	–1.60%	–1.08%	–0.29%	0.44%	–0.25%	–0.16%	–0.03%	0.07%
Avg 2000–2006	2.58%	–2.48%	–2.44%	–3.05%	–5.12%	–0.48%	–0.50%	–0.64%	–1.26%
Benchmark: Control Portfolio matched on Cap Size									
2000–06–30	–0.74%	2.81%	2.02%	5.91%	–4.45%	0.91%	0.66%	1.87%	–1.45%
2001–06–29	0.58%	–5.61%	–6.14%	–7.81%	–13.06%	–1.31%	–1.47%	–1.83%	–2.91%
2002–06–28	–0.37%	–4.15%	–4.76%	–9.40%	–13.67%	–0.82%	–0.95%	–1.91%	–2.86%
2003–06–30	5.33%	–4.97%	–3.46%	–3.36%	–4.24%	–0.82%	–0.58%	–0.57%	–0.72%
2004–06–25	–0.02%	–2.51%	–2.01%	–1.28%	2.04%	–0.36%	–0.29%	–0.21%	0.27%
2005–06–24	0.69%	–1.79%	–2.90%	–3.28%	–4.39%	–0.25%	–0.42%	–0.47%	–0.66%
2006–06–30	–7.79%	2.24%	3.20%	5.71%	8.17%	0.34%	0.50%	0.94%	1.32%
Avg 2000–2002	–0.18%	–2.31%	–2.96%	–3.77%	–10.39%	–0.41%	–0.59%	–0.62%	–2.41%
Avg 2003–2006	–0.45%	–1.76%	–1.29%	–0.55%	0.40%	–0.27%	–0.20%	–0.08%	0.05%
Avg 2000–2006	–0.33%	–2.00%	–2.01%	–1.93%	–4.23%	–0.33%	–0.36%	–0.31%	–1.00%

Table 4 (continued)

Recon Date	Abnormal Returns of Adds Minus Deletes					Impact on Index Returns			
	May–end to Recon	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end	Recon to Day 5	Recon to Day 10	Recon to July–end	Recon to Aug–end
Benchmark: Control Portfolio matched on Cap Size & Sector									
2000–06–30	–0.72%	1.65%	2.29%	5.30%	–4.86%	0.54%	0.74%	1.68%	–1.58%
2001–06–29	–0.05%	–3.10%	–4.59%	–5.22%	–8.11%	–0.76%	–1.16%	–1.30%	–1.83%
2002–06–28	2.99%	–3.25%	–3.68%	–8.19%	–12.53%	–0.66%	–0.76%	–1.63%	–2.61%
2003–06–30	5.18%	–4.61%	–3.05%	–3.18%	–3.48%	–0.76%	–0.51%	–0.54%	–0.59%
2004–06–25	0.12%	–2.65%	–2.36%	–1.96%	0.72%	–0.38%	–0.34%	–0.30%	0.07%
2005–06–24	1.22%	–1.52%	–2.47%	–2.26%	–2.85%	–0.21%	–0.35%	–0.32%	–0.43%
2006–06–30	–8.20%	1.98%	2.66%	5.50%	7.65%	0.29%	0.41%	0.89%	1.22%
Avg 2000–2002	0.74%	–1.57%	–1.99%	–2.70%	–8.50%	–0.30%	–0.39%	–0.42%	–2.01%
Avg 2003–2006	–0.42%	–1.70%	–1.31%	–0.48%	0.51%	–0.27%	–0.20%	–0.07%	0.07%
Avg 2000–2006	0.08%	–1.64%	–1.60%	–1.43%	–3.35%	–0.28%	–0.28%	–0.22%	–0.82%
Benchmark: Control Portfolio matched on Cap Size & Sector & Momentum									
2000–06–30	–3.15%	1.53%	2.61%	5.29%	–1.49%	0.50%	0.84%	1.68%	–0.49%
2001–06–29	0.73%	–1.63%	–3.00%	–3.08%	–3.52%	–0.42%	–0.76%	–0.77%	–0.79%
2002–06–28	7.20%	–2.08%	–2.25%	–4.79%	–7.02%	–0.47%	–0.49%	–1.01%	–1.55%
2003–06–30	4.21%	–4.64%	–3.43%	–3.88%	–6.26%	–0.77%	–0.57%	–0.65%	–1.05%
2004–06–25	1.42%	–2.93%	–3.10%	–3.46%	–0.70%	–0.42%	–0.44%	–0.51%	–0.11%
2005–06–24	1.20%	–1.15%	–2.25%	–1.50%	–3.46%	–0.16%	–0.31%	–0.21%	–0.51%
2006–06–30	–7.10%	1.73%	2.24%	5.58%	6.93%	0.24%	0.32%	0.88%	1.03%
Avg 2000–2002	1.60%	–0.73%	–0.88%	–0.86%	–4.01%	–0.13%	–0.13%	–0.03%	–0.94%
Avg 2003–2006	–0.07%	–1.74%	–1.63%	–0.81%	–0.87%	–0.27%	–0.25%	–0.12%	–0.16%
Avg 2000–2006	0.64%	–1.31%	–1.31%	–0.83%	–2.22%	–0.21%	–0.20%	–0.08%	–0.49%

For the Russell 2000 Index, the effects are more pronounced as shown in Table 4. Based on post–reconstitution returns till July–end, we see that when the Russell 2000 Index is used as the benchmark, the temporary price pressure effects are –3.05% resulting in the index return being lower by 64 bps. However, when we control for common factors, we see that the temporary price–pressure effects reduce substantially. Controlling for cap alone reduces the price–pressure effects by one–third to –1.93% and the impact on index returns is reduced by half to –0.31%. This is significant because the only difference by using cap as opposed to the Russell 2000 as the benchmark is that the deletes from the Russell 2000 from above are now being compared to Rank 1–500 or Rank 501–1000 grouped stocks. When we control for cap and sector, the temporary price–pressure effect falls to –1.43%, and further falls to –0.83% when momentum is also controlled for. The impact on index returns is less significant at –8 bps when all three common factors are controlled for. If a shorter post–reconstitution window of 5 to 10 days were used, the impact on index returns is around –20 bps

which is still much less than the estimate of –50 bps when we don't control for common factors.

Looking at the individual years, we note that the control factors had a greater impact in the earlier years than in the latter as the markets were more volatile then. Also, for two of the seven years (years 2000 and 2006), the reconstitution had the opposite effect as it helped instead of hurt the index returns. There are various possible reasons for this. One, liquidity suppliers may have overbought the adds and/or oversold the deletes prior to reconstitution causing them to become liquidity demanders as opposed to liquidity suppliers at reconstitution. Two, as hedge fund strategies and alpha transport become popular and the demand to short the Russell 2000 futures contract increases, dealers and other market participants who hold long positions in Russell 2000 futures hedge their positions by being short in the basket of Russell 2000 stocks. These market participants have the opposite demands to those of traditional indexers at the time of reconstitution as they would have to revise their hedge basket by buying the deletes and shorting the adds. Evidence in Hill (2007) indicates that there is significantly increasing capital in these strategies, which could be partly responsible for the price patterns observed of late.

The subperiod results show that the temporary price–pressure effects are less in the 2003–2006 subperiod than in 2000–2002 even after we control for cap and sector. The only exception to this pattern of diminishing effects over time is seen when we control further for momentum, where we see a modest increase in price–pressure effects when measured over a five to ten day post–event window—the price–pressure effects over a 10–day window are –0.88% in the 2000–2002 subperiod and –1.63% in the 2003–2006 subperiod. However, extending the post–event window to a month, the price–pressure effects at –0.81% are slightly lower in the 2003–2006 subperiod compared to –0.86% in the 2000–2002 subperiod, consistent with diminishing effects over time.

All in all, the evidence shows that common factors can explain a substantial part of the price–patterns observed post–reconstitution. Once these factors are controlled for, the temporary price–pressure effects are less pronounced and the adverse impact on Russell 2000 Index returns is much lower at around –8bps to –20bps. We also observe that the abnormal returns through the end of July are already present by the end of day 5. Again, this fact persuades us that the subsequent abnormal returns in August are caused by events other than the Russell reconstitution.

CONCLUSION

We measured the temporary price pressure effect of reconstitution by computing returns to adds and deletes following the event. Without controlling for common factors unrelated to reconstitution, the impact on the Russell 2000 Index return averaged –0.64% for the period 2000–2006, while after controlling for cap size, sector, and momentum, the impact was only –0.08%. There is also evidence that the reconstitution effect is diminishing over time, possibly due to the decreased number of index changes in the recent low–volatility years, the changes in index methodology introduced by Russell, and the increase in active strategies in recent years.

REFERENCES

Amihud, Y., and H. Mendelson. 1986. "Asset Prices and the Bid–Ask Spread," Journal of Financial Economics Vol. 17, No. 2 (December), pp. 223–249.

Beneish, M. D., and R. E. Whaley. 1996. "An Anatomy of the 'S&P Game': the Effects of Changing the Rules," Journal of Finance Vol. 51, No. 5 (December), pp. 1909–1930.

Biktimirov, Ernest, Arnold Cowan, and Bradford Jordan. 2004. "Do Demand Curves for Small Stocks Slope Down?" Journal of Financial Research Vol. 27, No. 2 (June), pp. 161–178.

Chen, Hsiu–Lang. 2006. "On Russell index reconstitution," Review of Quantitative Finance and Accounting Vol. 26, pp. 409–430.

Chen, Honghui, Gregory Noronha, and Vijay Singal. 2006. "Index Changes and Losses to Index Fund Investors," Financial Analysts Journal Vol. 62, No. 4 (July/August), pp. 31–47.

Daniel, K., M. Grinblatt, S. Titman, and R. Wermers. 1997. "Measuring Mutual Fund Performance with Characteristic–Based Benchmarks," Journal of Finance Vol. 52, No. 3 (July), pp. 1035–1058.

Goetzmann, W., and M. Garry. 1986. "Does Delisting from the S&P 500 Affect Stock Price?" Financial Analysts Journal Vol. 42, No. 2 (March/April), pp. 64–69.

Harris, L., and E. Gurel. 1986. "Price and Volume Effects Associated with Changes in the S&P 500 List: New Evidence for the Existence of Price Pressures," Journal of Finance Vol. 41, No. 4 (September), pp. 815–829.

Hill, Joanne M. 2007. "Equity Trading Capacity Revisited: Growth, Fragmentation and Fluidity." The Journal of Trading (Spring), pp. 1–16.

Jain, P. C. 1987. "The Effect on Stock Price of Inclusion or Exclusion from the S&P 500," Financial Analysts Journal Vol. 43, No. 1 (January/February), pp. 58–65.

Lynch, A., and R. Mendenhall, 1997. "New Evidence on stock price effects associated with changes in the S&P 500 Index," Journal of Business Vol. 70, No. 3 (July), pp. 351–383.

Madhavan, Ananth. 2003. “The Russell Reconstitution Effect.” Financial Analysts Journal Vol. 59 (July/August), pp. 51–64.

Shleifer, A. 1986. “Do Demand Curves for Stocks Slope Down?” Journal of Finance Vol. 41, pp. 579–590.

Weigel, Eric J., and Katie B. Weigel. 1992. “Membership Effects in the Russell 2000 Index.” Russell Research Commentary (October).