Russell Reconstitution Effect Revisited

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ABSTRACT

We argue that the recent changes in reconstitution procedures introduced by the Frank Russell Company to ease the migration of affected constituents into and out of index-tracking portfolios, as well as continued growth in the size of speculative capital devoted to the event merit another study of the Russell reconstitution effects. We build upon Madhavan (2003) and conduct a more direct test of the role of order flow imbalances and liquidity changes on returns of Russell 3000 additions and deletions. Our results support both price pressure and index membership hypotheses. While index deletions are heavily sold far ahead of, during, and long after the event, the trading of additions is focused close to the event date. We find that the Russell reconstitution effect weakens during the more recent years. Price pressure-induced reversal effects are found to be much smaller to nonexistent in the recent years.

I. Introduction

Every year at the end of June, the Frank Russell Company reconstitutes all of its indices. Due to the size of passive assets tracking these benchmarks ($558 billion as of March 27, 2006)[1], this event leads to significant flows by indexers, active managers, and speculative hedge funds. Unlike S&P 500 or Dow Jones indices, Russell membership is entirely rule-based and, hence, event-day changes are by and large predictable. Index composition is determined as a function of market capitalization of the eligible universe as of May 31 and although ambiguities in the calculation of inputs such as float and dual-class share adjustments do create errors, brokers circulating preliminary lists of additions and deletions usually have accuracy rates in excess of 90%.[2]

Not unexpectedly, anecdotal evidence suggests that Russell reconstitution has attracted significant speculative interest and caused concerns that this preemptive trading leads to increased transaction costs and economic losses for index funds (in their attempts to minimize tracking error, the latter are compelled to trade on or close to the day of reconstitution). In an effort to mitigate arbitrage activities, the Frank Russell Company has made several recent changes to the reconstitution process. IPOs are included into Russell indices on a quarterly basis since September 2004, reducing the size of the predictable universe reshuffling in June. Furthermore, beginning in 2004, provisional indices were introduced, allowing indexers a venue to rebalance their portfolios to the new membership gradually starting a month before the effective date. This transitional time was extended to a month after the event in 2005.

Although considerable academic attention has been devoted to changes in S&P 500 and Dow Jones indices, Russell index rebalancing events have received surprisingly little coverage.

[1] "Russell Reconstitution Analysis", Merrill Lynch, Equity Derivatives; May 02, 2006.
[2] For a detailed description of the rebalancing procedures, see http://www.russell.com/indexes/PDF/Methodology.pdf

Notable exceptions are Madhavan (2003) and Chen, Noronha and Singal (2006). These studies document economically and statistically significant abnormal returns and wealth transfers associated with the annual reconstitution from 1995 to 2002. Increases in the amount of speculative capital in recent years (evidenced by soaring hedge fund industry assets) coupled with the procedural changes described above, are likely to have drastically reduced the level of available speculative gains rendering the existing research findings potentially inapplicable.

In this paper, we revisit the subject of Russell reconstitution utilizing a sample period which spans the years before and after the above-mentioned procedural changes were instituted, enabling us to examine their effects. Furthermore, we improve upon the methodology of earlier studies by including direct measures of liquidity and order flow as the hypothesized driving forces behind the cross-section of event-related returns. While the findings of this study are based on Russell 3000, the conclusions are relevant to other indices with objective and transparent reconstitution guidelines (e.g. MSCI).

We find that the Russell reconstitution effect weakens during the more recent 2002-2005 window versus the 2000-2002 period. Consistent with Madhavan (2003), we show support for both, price pressure and index membership hypotheses. The effect is economically stronger for additions. We find that unlike deletions, which are heavily sold far ahead of, during, and long after the event, the trading of additions is focused close to the event date. In summary, we argue that the overall weakening of the reconstitution effect is caused by a combination of factors, including increased attention to the event from market participants and changes in the methodology introduced by the Frank Russell Company in recent years.

The rest of the paper is organized as follows. Section II provides a brief review of the related literature as well as its limitations and summarizes the main testable hypotheses. Section

III describes our data sources, variable construction and sample selection. Section IV presents the empirical results. Section V concludes.

II. Background and Hypotheses

Extant literature on index membership effects centers almost entirely on the S&P 500 index and investigates two primary hypotheses. According to the ***Price Pressure Hypothesis***, temporary imbalances in order flow for index additions and deletions lead to transitory positive and negative event-related returns, respectively. The ***Index Membership Hypothesis***, on the other hand, suggests that index entry and exit events are related to permanent changes in asset valuations, due to changes liquidity and/or information environment. The former hypothesis stems from the early market-maker inventory control models starting with Garman (1976), wherein differences between the actual and target levels of dealer inventory lead to temporary price concessions and subsequent reversals.[3] The latter is based on arguments that index membership elicits permanent improvements in liquidity as well as reductions in information asymmetries (see, e.g. Amihud and Mendelson (1986)) and hence higher asset values. An alternative theoretical foundation for the permanent index-induced valuation effects can be found within the investor recognition hypothesis, first introduced by Merton (1987). The author argues that incomplete information dissemination affects investor behavior and security values. If market participants are not aware of some securities and do not own them in their portfolios, they will be insufficiently diversified and will demand a premium for taking on idiosyncratic risk. As a result, a firm's required rate of return will be a function of its ownership structure. Consequently, improved visibility and a greater

[3] For models and empirical evidence of price pressure effects, see Lakonishok and Smidt (1984), Shleifer (1986), Harris and Gurel (1986), Ritter (1988), Grossman and Miller (1988), Blume et al. (1989), Stoll and Whaley (1990), Jegadeesh and Titman (1995), Lynch and Mendenhall (1997).

investor base (e.g. due to index inclusion) is conjectured to lead to a reduced cost of capital and a higher market value.[4]

The existing empirical evidence is largely mixed. Consistent with the price pressure hypothesis, Lamourex and Wansley (1987) and Lynch and Mendenhall (1997) show that the price increases for additions to S&P 500 are temporary. Lending support to the index membership hypothesis, Shleifer (1986), Goetzmann and Garry (1986), Jain (1987), Beneish and Whaley (1996), and Hedge and McDermott (2003) document permanent changes in prices and liquidity for S&P 500 events.

More recently and focusing on Russell indices, Madhavan (2003) finds economically and statistically significant abnormal returns associated with the reconstitution events from 1996 to 2002. Similarly, Chen, Noronha and Singal (2006) document substantial wealth transfers around Russell 2000 and S&P 500 additions and deletions over the 1990-2002 period. Madhavan (2003) links event-month returns to forecasts of liquidity changes as well as a proxy for order flow imbalances (index addition and deletion dummies) and finds evidence supporting both, price pressure and index membership hypotheses. The forecast of liquidity change is modeled a function of lagged changes in liquidity, capitalization, returns, and volatility. The study uses average daily volume as a proxy for liquidity. However, in the presence of short-sale constraints, one would expect volume to be related to returns regardless of the liquidity implications of the former (see, e.g. Miller (1977)). Thus, to the extent that a stock leaving or entering the index may have a liquidity effect not captured by these explanatory variables (e.g. due to changes in analyst coverage and the asymmetric information component of the spread), and insofar as volume is a poor measure of liquidity, one is biased against the index membership hypothesis. Furthermore,

[4] E.g. Bacmann et al. (2002) link the size of a firm's investor base to its stock price reaction during an exchange listing transfer.

while event dummies are indeed likely to identify stocks with significant order flow imbalances, different levels of strategic arbitrage activity and transitional trading by passive funds will yield cross-sectional variation not captured in this set-up, resulting in a potential bias against the price pressure hypothesis. Lastly, if increased arbitrage activities and improvements in the rebalancing rules had an effect on reconstitution-related returns, the results of the previous studies may no longer be pertinent.

We improve upon the recent studies by jointly testing the effects of ex-post measures of liquidity as well as directly capturing order flow imbalances associated with the events over a sample period spanning several years before and after the changes instituted by the Frank Russell Company.

III. Data

We obtain Russell 3000 membership records during the 2000-2005 window from the Frank Russell Company. Daily stock returns and volumes are extracted from IDC via FactSet Research Systems while accounting data are from Compustat. Intraday data, including trades, quotes, and trade and quote sizes are extracted from the New York Stock Exchange Trades and Quotes (TAQ) database for a 127-trading day window centered on the event day.

We subdivide our sample in three groups: additions, deletions, and non-event stocks. Additions are stocks that are added to Russell 3000 on the reconstitution day and deletions are stocks that are deleted from the index. Non-event stocks are the remaining Russell 3000 securities, excluding migrations from Russell 2000 (Russell 1000) to Russell 1000 (Russell 2000). We exclude migrations due to their economically significant rebalancing flows.[5] This differentiates our research design from Madhavan (2003), who treated migrations as part of the control group.

[5] Although the total level of assets managed against Russell 2000 is lower than that tied to Russell 1000, the increases in weights for stocks migrating into Russell 2000 from Russell 1000 typically more than offset this differences, resulting in a net positive reconstitution-related flows.

Returns and accounting data are obtained for the May-July window around each reconstitution event.[6]

We compute three measures of liquidity:

1. *ILLIQ* is the average ratio of absolute value of daily return to volume as suggested in Amihud (2002).

$$ILLIQ_i = \sum_{j=1}^{D} \frac{|\, r_{i,j} \,|}{volume_{i,j}}$$

Where $r_{i,j}$ is the return for security i on day j and D is the number of days in the analyzed month.

2. *Quoted Spread* – is the average ratio of the quoted bid-ask spread to the midquote point. We take the posted quotes preceding each trade and compute the average percentage spread for a given day. As suggested by Lee and Ready (1991), we define the applicable quote to be the most recent quote that is at least 5 seconds old. We than average these daily measures across all days in a month.[7,8]

$$QuotedSpread_i = \frac{\sum_{j=1}^{D}\left[\sum_{k=1}^{K} \frac{Ask_{i,j,k} - Bid_{i,j,k}}{midquote_{i,j,k}}\right]}{D}$$

Where K is the total number of trades on day j and $Ask_{i,j,k}$ and $Bid_{i,j,k}$ are the posted quotes preceding transaction k on day j for stock i. As before, D is the number of days in the analyzed month.

[6] Because reconstitution takes place on the last Friday of June since 2003, we define the corresponding reconstitution month returns as cumulative returns from May 31 until the last Friday of June.

[7] We require intraday trades to have TAQ correction codes of 1 or 0, condition of 'Regular Way' (Blank or *), and size and price above zero. Similarly, the quotes are required to have mode of 12, Ask>Bid>0 and positive depths. Furthermore, because non-primary exchange quotes are not NBBO-eligible (see, e.g. Chordia, Roll, and Subrahmanyam (2001, 2002)), we limit all the quotes to only primary exchange designation.

[8] We choose to weight each day equally to be consistent with the ILLIQ measure.

3. *Effective Half-Spread* is the average realized half-spread, measured as the absolute value of the difference between the transaction price and the applicable midquote point, divided by the midquote point.

Similar to Quoted Spread, a daily averaged is computed and a monthly measure is then an average of the former.

$$EffectiveHalfSpread_i = \frac{\sum_{j=1}^{D}\left[\sum_{k=1}^{K}\frac{price_{i,j,k} - midquote_{i,j,k}}{midquote_{i,j,k}}\right]}{D}$$

To measure event-related order flow imbalances, we classify the trades as buyer-initiated or seller-initiated using the position of the transaction price relative to the midquote price where the latter is the most recent quote posted at least five seconds prior to the trade (Lee and Ready (1991)). Trades at the midquote price are dropped. Order flow imbalance is then calculated as the ratio of the difference between the dollar volume of buys and the dollar volume of sells, to the total dollar volume over the corresponding time window.

$$OrderFlowImbalance_i = \frac{Buys_i - Sells_i}{Buys_i + Sells_i}$$

Table 1 provides sample statistics. Chen et al. (2006) argue that the recent procedural changes should have no impact on index arbitrage because they do not affect incentives of fund managers, whose objective is to minimize tracking error. Note, however, that while the incentives may remain unchanged, the scale of the reconstitutions is likely to diminish. Indeed, the number of stocks affected by the event declines considerably in and after 2002. Not surprisingly, additions are affected the most – to the extent that quarterly IPO inclusion replenishes the index, the number of required additions in June declines considerably. Table 1 also reports mean and median of 5-year beta relative to S&P500 (*Beta*), market capitalization (*MC*), and market-to-book ratio (*MB*). As expected, additions average more than three times greater market capitalization than deletions.

The mean betas of additions and deletions are twice as large as those of the control group. This, however, appears driven by outliers as the median beta for additions is comparable to non-even stocks while that of deletions is still higher. On average, deletions have the highest *MB* and non-event stocks have the lowest *MB*. However, the high average for deletions is largely attributable to 2004 when mean market-to-book reached 64, while median *MB* was only 1.62. Comparison of median *MB*'s suggests that additions tend to be growth stocks while deletions are more value stocks.

IV. Results

A. Portfolio Analysis

As described above, our analysis focuses on returns, liquidity, and order flow dynamics associated with Russell 3000 reconstitution. We begin by studying portfolio returns. Table 2 shows mean cumulative returns around the event day for portfolios of additions, deletions, as well a spread portfolio long the former and short the latter by year. From 2000-2005, a spread portfolio held for the entire duration of the reconstitution month and liquidated one day before the reconstitution would realize positive return of 6.77%. For the holding period of five days prior to the event, average spread is 2.09%, while the event day average spread is 0.55%. All are statistically significant at conventional levels. Results by year are mixed and suggest that such a naïve strategy would expose one to a considerable level of risk, consistent with the suggestions in Madhavan (2003). For example, in 2003 such a portfolio would have suffered a loss of 6.5%.

Supporting the price pressure hypothesis, additions decline and deletions rise during the post-reconstitution month. The spread return for the month of July is negative 3.39%. Examination of the recent years indicates that the effects weaken. Although the spread remains positive and statistically and economically significant in the month of reconstitution for 2004 and 2005, event day returns diminish and lose significance in 2005. Similarly, the July reversal

robustly present in years 2000 through 2004 is insignificant in 2005. These findings are generally suggestive of a decline in the price pressure in recent years.

While the portfolio results document reversals, they mask the rich cross-sectional dependencies within each portfolio. As a further test of the price pressure effects, we examine the autocorrelations of returns around reconstitution days. Table 3 reports spearman correlations of the event day return with past and future returns. Consistent with the price pressure hypothesis, rank correlations between event-day and post-event returns are strongly negative for the whole sample averaging in excess of 22%. However, this effect is attributable to only the first three years and abruptly disappears thereafter.

Table 4 and Figure 1 summarize the dynamics of the average order flow imbalances around reconstitution events. Lending further credence to the price pressure hypothesis, Russell 3000 additions (deletions) exhibit positive (negative) and statistically significant event-day order flow imbalances of 14.55% (16.63%). While deletions are exposed to selling pressure before, on, and after the event, buying pressure experienced by additions appears to be concentrated on and immediately after the event day.[9]

In Figures 2, 3, 4 plot daily dynamics of the three liquidity measures over 6 months centered on the event. Similarly, Table 5 presents Amihud (2002) *ILLIQ* metric, quoted spreads, realized half-spreads, as well as number of trades. We report the change in each measure from April through June and August, as well as the difference of differences – to capture the temporary and the permanent changes in liquidity.

Illiquidity declines (liquidity improves) for both additions and deletions during the reconstitution month, sharply dropping further on the event day. After the reconstitution *ILLIQ* of

[9] Consistent with prior literature finding that, ceteris paribus, order flow tends to be positive, Figure 1 shows the imbalances for non-event stocks tend to be stable at approximately 5%.

the deletions reverts to its pre-event level and subsequently increases to a new level, exceeding its historical level for the past three months. Similarly, next day after reconstitution *ILLIQ* of the additions spikes reaching its pre-event level. Unlike the case of deletions, additions' liquidity does not seem to change much after the event. *ILLIQ* of non-event stocks does not experience any sudden liquidity shocks around the event, suggesting that the liquidity effect is only driven by additions and deletions. These results suggest that liquidity permanently changes only in case of deletions.

As can be seen in Figures 3 and 4, effective half-spreads and quoted spreads for both additions and deletions gradually decline until the day of the event and rebound thereafter. Consistent with Amihud (2002) proxy, liquidity of deletions appears to decline after the reconstitution event, which is evidenced by higher spreads one month after the event. Encouragingly, all three measures of liquidity yield qualitatively similar results.

B. Regression Analysis

Madhavan (2003) shows that the change in price related to index reconstitution can be represented as a linear function of the expected change in long-term liquidity and order flow imbalance, namely:

$$\Delta Price = \gamma \Delta Liquidity + \lambda Imbalance$$

While the expected change in liquidity captures a permanent effect associated with index reconstitution, order flow imbalance (*OFI*) captures temporary price pressure effects. Madhavan (2003) develops a forecast of long-term change in liquidity (measured as average daily volume), and uses this forecast along with event dummies to estimate the model above.

We build upon this design by using ex-post measures of liquidity change and order flow during the reconstitution month - Amihud (2002) *ILLIQ* and *OFI*, respectively - to model the cross-sectional variation in reconstitution month returns. To control for other factors known to

affect cross-section of returns, we include risk, size, and growth factors. Estimates for six different specifications are presented in Table 6. The independent variable in all models is the reconstitution month return computed as a 1-month return ending on day of the reconstitution.[10] The independent variables included in all specifications are a 5-year beta relative to S&P500 (*Beta*), log of market capitalization (*Size*), market-to-book ratio (*MB*), and two dummy variables, *Add_RUA* and *Del_RUA*. *Add_RUA* takes a value of 1 if an issue is a Russell 3000 addition and 0 otherwise. Similarly, *Del_RUA* takes a value of 1 if a security is deleted from Russell 3000 and 0 otherwise. In Model 2, we add an additional variable *OFI*, aggregate June order flow imbalance. Model 3 examines the interaction of *OFI* with dummy variables to differentiate the impact of transient order flow shocks on returns of additions, deletions and migrations. In Model 4, we modify Model 2 by adding a change in liquidity, $\Delta ILLIQ$, *ILLIQ* of the month of reconstitution divided by *ILLIQ* of the previous month. While in Model 5 we interact $\Delta ILLIQ$ with dummy variables, in Model 6 these interactions are included for both $\Delta ILLIQ$ and *OFI*.

Panel A of Table 6 presents estimation results for the period from 2000 to 2002. Across all specifications, coefficients of *Size* and *MB* are positive and statistically significant, suggesting that larger 'growth' firms performed better during this period. Consistent with Madhavan (2003), the loading on *Add_RUA* (*Del_RUA*) is positive (negative) and statistically significant, indicating that additions experience positive (negative) returns in the reconstitution month. However, the magnitude of the coefficients differs from Madhavan's results. While the effect for additions is comparable, the coefficient for deletions is much smaller. This could be a result of increased trading activity in deletions in months other than June during these years (as discussed earlier).

Consistent with the price pressure hypothesis, the coefficient of *OFI* in Model 2 is positive and statistically significant. Model 3 estimation shows that the link between order flow and

[10] In 2005 the return is computed from May 25 to June 24, the Russell reconstitution date.

returns is stronger for additions, consistent with these stocks experiencing greater price pressure during June. This further corroborates the earlier finding that deletions are sold consistently before and after reconstitution, effectively smoothing out the transition whereas the order flow for additions is more concentrated around the event. One possible explanation for this asymmetry is that it is potentially easier to identify a subset of stocks in the index likely to be dropped than it is to determine those outside they will be replaced with due to considerably different scopes of the associated search problem. Returns for deletion are also strongly positively related to order flow. Not surprisingly, adding *OFI* increases adjusted R-squared of the regression from 9.78% to 11.04%, implying that it is an important determinant of cross-sectional patterns in returns during the reconstitution month.

In Model 4, we add Δ*ILLIQ* and find it to also explain the cross-section of June returns. The coefficient is negative (-3.5) and statistically significant, implying improvements in liquidity lead to higher concurrent returns, consistent with Amihud and Mendelson (1986). Interacting Δ*ILLIQ* with dummy variables (see Model 5), we find that the liquidity effect is more pronounced for additions (-9.35 versus -3.78), suggesting that liquidity-induced return is smaller for deletions. To the extent that deletions may have been identified before June, the liquidity effect is likely to have at least partially materialized outside of our examination window. Inclusion of both *OFI* and Δ*ILLIQ* interactions (Model 6) yields results comparable to those in models 3 and 5.

In Panel B, we repeat the analysis for a more recent period, spanning years 2003 through 2005. In this period, *Beta* is not significant, consistent with previous studies. The coefficient of *Add_RUA* is positive and statistically significant only for Model 1, while the coefficient associated with *Del_RUA* is negative and statistically significant in 5 out of 6 specifications. This suggests that adding *OFI* and Δ*ILLIQ* explains the outperformance of additions, but does not fully explain underperformance experienced by deletions.

OFI is positive and highly significant economically and statistically. Consistent with the results in Panel A, additions exhibit a stronger *OFI* effect. Adding *OFI* to Model 1 significantly increases adjusted R-square of the model (from 0.75% to 5.88%). Thus, price pressure appears to be the most significant determinant of cross-sectional return variation in the reconstitution month in recent years. We explain this finding by an increased trading activity by hedge funds and other institutional investors in the reconstitution month. Based on Model 3, Model 5, and Model 6 results, order flow and liquidity effects are still strongest for additions. In summary, we find that both order flow and liquidity still exert pressure on prices of additions and deletions in recent years.

Examining marginal improvements in adjusted R-squares, we can conclude that returns during the reconstitution months can be explained by both *OFI*, a measure of temporary price pressure, and $\Delta ILLIQ$, a measure of the liquidity effect. *OFI* appears to have a greater effect on the cross-section of returns, however, in recent years both effects weakened. The finding that order flow imbalance is the strongest determinant of cross-sectional returns suggests that price pressure is quite large during reconstitution months.

Our findings suggest that in recent years order flow imbalance explains most of the cross-sectional variation in returns during the month of the reconstitution. Because for many large investors trading ahead of the reconstitution is not feasible, we expect that order flow and liquidity patterns will be more pronounced on the day of the event.

V. Conclusion

Recent changes in the Russell 3000 reconstitution procedures were designed to alleviate the transition process for passive and index-plus investors tracking this index. We extend the literature by examining the effects these changes had on the returns of affected constituents as well as the determinants of their cross-sectional variation. Using direct measures of order flow and ex-post

liquidity dynamics, we find that for the whole sample spanning years before and after the changes the results are consistent with Madhavan (2003). We show support for both, price pressure and index membership hypotheses. Both order flow and liquidity are strongly related to event month returns. The effect is economically stronger for additions. We find that unlike deletions, which are heavily sold far ahead of, during, and long after the event, the trading of additions is focused close to the event date. This is likely due to the fact that their identification represents a more challenging search problem. Price pressure induced reversal effects are found to be much weaker to nonexistent in the recent years, showing that the changes instituted by the Frank Russell Company as well as a greater level of speculative interest following these events had an effect on the arbitrage returns that may have been available in the past.

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Table 1. Sample Statistics

Event Type	Year	Obs.	Mean			Median		
			Beta	MC, $ mill.	MB	Beta	MC, $ mill.	MB
Non-event	2000	2206	0.92	8,097	5.08	0.86	1,039	2.30
	2001	2248	1.03	6,202	4.29	0.77	992	2.41
	2002	2384	0.98	4,851	3.17	0.76	761	2.11
	2003	2544	0.95	4,466	3.27	0.77	698	1.99
	2004	2560	0.64	5,095	5.04	0.72	914	2.33
	2005	2630	0.92	5,286	3.76	0.86	964	2.34
	Total	**14,572**	**0.90**	**5,503**	**4.05**	**0.79**	**877**	**2.23**
Additions	2000	547	1.83	675	8.94	0.89	498	5.58
	2001	500	1.78	312	16.90	0.62	249	2.45
	2002	382	0.38	270	3.59	0.42	194	2.11
	2003	283	1.34	226	4.15	0.62	162	2.25
	2004	310	4.14	340	7.16	1.33	265	3.14
	2005	206	6.35	305	7.89	0.96	238	3.14
	Total	**2,228**	**2.22**	**387**	**8.90**	**0.75**	**259**	**3.03**
Deletions	2000	319	0.91	119	1.77	0.93	120	0.98
	2001	263	1.27	71	1.70	2.04	67	0.89
	2002	222	2.54	64	2.43	1.82	61	1.01
	2003	181	1.51	90	1.95	1.36	87	1.07
	2004	205	0.96	131	64.08	0.50	133	1.62
	2005	210	5.07	131	7.51	1.73	139	1.56
	Total	**1,400**	**1.94**	**101**	**12.46**	**1.37**	**100**	**1.17**

Note: The sample is all stock holdings of the Russell 3000 indexes from 2000 until 2005 from the Frank Russell Company. Additions are stocks that are added to Russell index on the reconstitution day and deletions are stocks that are deleted from the index following the reconstitution. Non-event stocks are the remaining stocks in Russell 3000, excluding migrations from Russell 2000 (Russell 1000) to Russell 1000 (Russell 2000). Beta is 5-year beta relative to S&P500. MC is a market capitalization and MB is market-to-book ratio.

Table 2. Daily Total Returns Around Russell Index Reconstitution

Event Type	Year	Obs.	Total Return, % (-21,Event-1)		(-5,Event-1)		(-2,Event-1)		Event		(Event,+1)		(Event,+5)		(Event,+21)	
Additions	2000	547	31.37	***	9.95	***	2.39	***	0.21		1.35	***	3.71	***	2.35	***
	2001	500	3.50	***	3.08	***	-0.12		7.33	***	-1.62	***	-1.23	***	2.52	***
	2002	382	4.62	***	3.39	***	2.31	***	1.23	***	-1.07	***	-1.18	***	-1.27	***
	2003	283	6.00	***	-0.29		-0.99	***	-0.22		-0.38	*	3.79	***	10.49	***
	2004	310	5.69	***	1.95	***	-0.48	***	-0.08		-1.12	***	-0.75	**	-1.61	***
	2005	206	9.90	***	-0.80	***	-0.68	***	0.26		-0.17		1.62	***	6.63	***
	Total	**2,228**	**11.64**	***	**3.87**	***	**0.69**	***	**1.90**	***	**-0.44**	***	**0.96**	***	**2.66**	***
Deletions	2000	319	3.61	***	-0.11		-0.76	***	5.11	***	3.51	***	3.71	***	6.86	***
	2001	263	6.91	***	5.68	***	1.84	***	-0.16		3.12	***	2.24	***	2.64	***
	2002	222	1.27	*	1.69	***	0.62		1.04	*	0.60		1.55	*	1.81	**
	2003	181	12.49	***	3.79	***	2.11	***	0.71	*	2.51	***	5.98	***	12.86	***
	2004	205	1.68	**	0.20		0.70	***	-0.71	***	0.96	***	1.76	***	0.67	*
	2005	210	4.50	***	-0.37		-1.21	***	0.36		0.26		2.42	***	12.95	***
	Total	**1,400**	**4.86**	***	**1.78**	***	**0.47**	***	**1.35**	***	**1.99**	***	**2.91**	***	**6.05**	***
Spread	2000	228	27.77	***	10.05	***	3.15	***	-4.90	***	-2.16	***	0.01		-4.51	***
	2001	237	-3.41	***	-2.60	***	-1.96	***	7.49	***	-4.74	***	-3.47	***	-0.12	***
	2002	160	3.35	***	1.70	***	1.69	***	0.19		-1.67	***	-2.73	***	-3.07	***
	2003	102	-6.49	***	-4.09	***	-3.10	***	-0.93	**	-2.90	***	-2.18	***	-2.38	***
	2004	105	4.01	***	1.75	***	-1.18	***	0.62	*	-2.08	***	-2.50	***	-2.28	***
	2005	-4	5.40	***	-0.43		0.53	**	-0.10		-0.42		-0.79		-6.32	
	Total	**828**	**6.77**	***	**2.09**	***	**0.23**		**0.55**	**	**-2.43**	***	**-1.94**	***	**-3.39**	***

Note: The sample is all stock holdings of the Russell 3000 indexes from 2000 until 2005 from the Frank Russell Company. Additions are stocks that are added to Russell index on the reconstitution day and deletions are stocks that are deleted from the index following the reconstitution. Spread is the difference between number of observations and mean returns of additions and deletions. Event denotes day of the reconstitution. Total return for a given window is a compounded return from daily total returns. * indicates a t-test is significant at 10% level; ** indicates a t-test is significant at 5% level; *** indicates a t-test is significant at 1% level. For Spread T-test for equality of means between two populations with unequal variances is performed.

Table 3. Spearman Correlations between Event Day Return and Past/ Future Returns

			Spearman Correlations, %											
Event Type	**Year**	**Obs.**	**(-21,Event-1)**		**(-5,Event-1)**		**(-2,Event-1)**		**(Event,+1)**		**(Event,+5)**		**(Event,+21)**	
Additions	2000	547	8.90	**	-6.11		4.77		-21.28	***	-8.80	**	-16.73	***
	2001	500	3.05		-0.03		-8.90	*	-34.68	***	-22.30	***	-28.11	***
	2002	382	6.37		5.53		9.51	*	-9.90	*	-4.15		-7.46	
	2003	283	5.26		10.68	*	2.18		1.09		-3.42		2.41	
	2004	310	4.45		4.98		1.64		6.18		-1.72		-11.38	**
	2005	206	-3.94		-13.27	*	-7.46		2.04		2.51		1.54	
	Total	**2,228**	**-8.68**	***	**-2.29**		**-0.08**		**-22.29**	***	**-19.15**	***	**-13.79**	***
Deletions	2000	319	-14.97	**	-5.12		5.15		-54.72	***	-37.56	***	-19.05	***
	2001	263	7.03		4.81		13.29	**	-34.81	***	-25.46	***	-12.82	**
	2002	222	-3.86		5.78		11.11		-26.61	***	-15.56	**	-17.47	**
	2003	181	-7.88		13.89	*	11.23		0.79		-0.80		-7.89	
	2004	205	4.66		5.45		2.18		-7.05		-6.55		-10.36	
	2005	210	-9.29		-5.26		16.94	**	14.90	**	4.24		-4.66	
	Total	**1,400**	**-2.33**		**-0.16**		**6.03**	**	**-22.69**	***	**-17.21**	***	**-8.77**	***

Note: The sample is all stock holdings of the Russell 3000 indexes from 2000 until 2005 from the Frank Russell Company. Additions are stocks that are added to Russell index on the reconstitution day and deletions are stocks that are deleted from the index following the reconstitution. Event denotes actual day of the reconstitution. Total return for a given window is a compounded return from daily total returns. * indicates a t-test is significant at 10% level; ** indicates a t-test is significant at 5% level; *** indicates a t-test is significant at 1% level.

Table 4. Order Flow Imbalance Around Reconstitution Date

Event Type	Year	Obs.	Order Flow Imbalance, % (-21,Event-1)		(-5,Event-1)		(-2,Event-1)		Event		(Event,+1)		(Event,+5)		(Event,+21)	
Additions	2000	547	0.22		2.98	***	9.30	***	14.09	***	7.52	***	-0.96		-4.98	***
	2001	500	-3.18	***	-0.61		-4.64	***	20.16	***	11.36	***	5.81	***	1.17	*
	2002	382	0.66		6.01	***	9.70	***	14.27	***	7.58	***	3.06	***	-1.39	*
	2003	283	1.76	**	0.22		-12.46	***	-1.93		-4.06	**	9.38	***	7.28	***
	2004	310	3.55	***	6.97	***	6.45	***	14.86	***	2.56	*	4.81	***	-1.58	**
	2005	206	5.44	***	1.81		-5.52	**	25.01	***	2.23		7.68	***	5.52	***
	Total	**2,228**	**0.70**	****	**2.81**	****	**1.66**	****	**14.55**	****	**5.69**	****	**4.22**	****	**0.07**	
Deletions	2000	319	-3.14	***	-7.72	***	-11.02	***	-20.02	***	5.85	**	-7.13	***	-8.99	***
	2001	263	-6.76	***	-5.10	***	-6.99	***	-17.33	***	-6.19	***	-9.12	***	-9.67	***
	2002	222	-7.36	***	-4.82	***	0.90		-5.80	***	-15.14	***	-13.67	***	-12.37	***
	2003	181	-0.37		-0.81		14.14	***	2.41		6.33	**	1.30		-3.00	**
	2004	205	-5.66	***	-6.29	***	-0.03		-28.77	***	-7.27	***	-5.21	***	-7.34	***
	2005	210	-4.22	***	-4.94	***	-13.72	***	-26.24	***	-10.04	***	-9.42	***	-2.88	***
	Total	**1,400**	**-4.67**	****	**-5.22**	****	**-3.80**	****	**-16.63**	****	**-4.10**	****	**-7.48**	****	**-7.64**	****
Spread	2000	228	3.37	***	10.70	***	20.32	***	34.12	***	1.67		6.17	***	4.00	***
	2001	237	3.58	***	4.49	**	2.35		37.49	***	17.55	***	14.94	***	10.83	***
	2002	160	8.02	***	10.83	***	8.80	***	20.07	***	22.72	***	16.73	***	10.97	***
	2003	102	2.14		1.04		-26.60	***	-4.34	*	-10.39	***	8.08	***	10.28	***
	2004	105	9.21	***	13.26	***	6.48	**	43.63	***	9.83	***	10.02	***	5.76	***
	2005	-4	9.66	***	6.75	***	8.21	***	51.26	***	12.26	***	17.11	***	8.40	***
	Total	**828**	**5.36**	****	**8.02**	****	**5.46**		**31.18**	**	**9.79**	****	**11.70**	****	**7.71**	****

Note: The sample is all stock holdings of the Russell 3000 indexes from 2000 until 2005 from the Frank Russell Company. Additions are stocks that are added to Russell index on the reconstitution day and deletions are stocks that are deleted from the index following the reconstitution. Spread is the difference between number of observations and mean order flow imbalances of additions and deletions. Event denotes day of the reconstitution. Order flow imbalance is computed as number of buyer-initiated trades minus number of seller-initiated trades divided by total volume. The initiator of the trade is determined by Lee-Ready algorithm. * indicates a t-test is significant at 10% level; ** indicates a t-test is significant at 5% level; *** indicates a t-test is significant at 1% level. For Spread T-test for equality of means between two populations with unequal variances is performed.

Table 5. Liquidity Effects around Russell Reconstitution

		ΔAmihud (2002) ILLIQ, %			ΔEffective Half-Spread,%			ΔQuoted spread,%			ΔNumber of Trades,%		
Event Type	period	June	August	Diff	June	August	Diff	June	August	Diff	June	August	Diff
Non-event	2000-2002	1.52	31.28	-29.77	-0.63	15.32	-15.95	-4.70	10.11	-14.80	15.66	5.66	10.00
		[1.96]	[20.76]	[-23.18]	[-0.71]	[9.61]	[-13.98]	[-11.76]	[13.69]	[-27.66]	[19.42]	[7.03]	[13.08]
	2003-2005	-5.55	8.41	-13.96	-5.81	-2.40	-3.40	-6.27	-3.68	-2.59	16.58	19.20	-2.61
		[-9.61]	[10.75]	[-21.95]	[-19.86]	[-3.48]	[-4.91]	[-24.93]	[-10.84]	[-9.74]	[13.57]	[14.33]	[-3.07]
Additions	2000-2002	-17.16	29.76	-46.91	-26.45	-8.87	-17.58	-27.51	-9.50	-18.01	109.45	42.28	67.16
		[-7.62]	[6.74]	[-13.94]	[-35.43]	[-6.62]	[-17.21]	[-37.17]	[-7.1]	[-17.64]	[19.58]	[9.2]	[13.52]
	2003-2005	-18.91	24.76	-43.67	-11.29	0.26	-11.55	-11.81	1.95	-13.76	120.71	90.44	30.27
		[-8.63]	[6.22]	[-14.62]	[-8.46]	[0.15]	[-8.13]	[-9.8]	[1.14]	[-11.41]	[15.99]	[6.01]	[2.13]
Deletions	2000-2002	5.20	96.45	-91.25	4.74	38.22	-33.48	4.17	39.22	-35.05	27.11	-26.26	53.37
		[1.72]	[11.57]	[-11.95]	[2.66]	[12.87]	[-18.02]	[2.22]	[11.77]	[-16.85]	[9.61]	[-7.04]	[7.97]
	2003-2005	-22.62	43.71	-66.34	-1.01	9.55	-10.56	-4.03	9.94	-13.98	76.89	3.58	73.32
		[-10.70]	[3.68]	[-5.74]	[-0.33]	[4.57]	[-8.65]	[-3.37]	[4.72]	[-8.70]	[13.72]	[0.96]	[3.46]

Note: The sample is all stock holdings of the Russell 3000 indexes from 2000 until 2005 from the Frank Russell Company. Additions are stocks that are added to Russell index on the reconstitution day and deletions are stocks that are deleted from the index following the reconstitution. Non-event stocks are the remaining stocks in Russell 3000, excluding migrations from Russell 2000 (Russell 1000) to Russell 1000 (Russell 2000). T-statistics are reported in brackets.

Table 6. Regression Analysis
Panel A. 2000-2002

	1	2	3	4	5	6
Intercept	-15.28	-10.37	-13.39	-5.56	-6.16	-9.35
	[-10.58]	[-7.02]	[-9.28]	[-3.71]	[-4.13]	[-6.43]
Beta	0.11	0.12	0.12	0.09	0.09	0.09
	[2.25]	[2.62]	[2.65]	[1.92]	[2.07]	[1.93]
MB	0.01	0.01	0.01	0.01	0.01	0.01
	[2.14]	[2.01]	[1.94]	[1.82]	[1.98]	[1.92]
Size	2.10	1.30	1.78	0.61	0.67	1.18
	[10.63]	[6.42]	[9.04]	[3.00]	[3.30]	[5.98]
OFI		20.92		22.09	22.12	
		[10.69]		[10.76]	[10.81]	
∆ILLIQ				-3.47		
				[-7.24]		
Add_RUA	19.64	18.69	18.55	16.43	16.73	16.32
	[26.51]	[25.56]	[25.05]	[19.85]	[20.30]	[19.61]
Del_RUA	-1.76	-2.06	-0.60	-4.50	-4.14	-2.26
	[-1.65]	[-1.93]	[-0.54]	[-3.71]	[-3.40]	[-1.79]
Add_RUA*OFI			49.54			52.87
			[10.00]			[8.93]
Del_RUA*OFI			29.51			39.40
			[5.33]			[6.06]
Add_RUA*∆ILLIQ					-9.35	-8.90
					[-9.48]	[-9.00]
Del_RUA*∆ILLIQ					-3.78	-3.60
					[-2.24]	[-2.14]
Adj. R-square:	9.68%	10.91%	11.06%	10.35%	10.93%	10.91%

Panel B. 2003-2005

	1	2	3	4	5	6
Intercept	7.02	8.66	7.08	9.06	9.08	7.57
	[11.08]	[13.91]	[11.30]	[14.22]	[14.26]	[11.79]
Beta	0.00	0.00	0.00	0.00	0.00	0.00
	[-0.06]	[0.26]	[0.20]	[-0.04]	[-0.13]	[-0.26]
MB	0.00	0.00	0.00	0.00	0.00	0.00
	[-0.54]	[-0.34]	[-0.49]	[-0.37]	[-0.30]	[-0.50]
Size	-0.54	-0.88	-0.55	-0.95	-0.95	-0.61
	[-6.18]	[-10.13]	[-6.36]	[-10.70]	[-10.71]	[-7.05]
OFI		20.15		20.33	20.27	
		[21.64]		[20.80]	[20.75]	
ΔILLIQ				-0.89		
				[-3.12]		
Add_RUA	1.29	0.38	-0.44	0.34	-0.04	-0.80
	[2.92]	[0.88]	[-0.96]	[0.76]	[-0.08]	[-1.64]
Del_RUA	-1.89	-1.06	-0.87	-1.47	-1.60	-1.57
	[-3.64]	[-2.09]	[-1.60]	[-2.78]	[-2.95]	[-2.72]
Add_RUA*OFI			34.26			31.84
			[12.39]			[10.89]
Del_RUA*OFI			22.88			21.02
			[7.99]			[6.88]
Add_RUA*ΔILLIQ					-3.31	-2.94
					[-3.70]	[-3.23]
Del_RUA*ΔILLIQ					-1.75	-1.72
					[-1.82]	[-1.77]
Adj. R-squared:	0.71%	5.74%	3.07%	6.28%	6.36%	3.22%

Note: The sample is all stock holdings of the Russell 3000 indexes from 2000 until 2005 from the Frank Russell Company. Additions are stocks that are added to Russell index on the reconstitution day and deletions are stocks that are deleted from the index following the reconstitution. Non-event stocks are the remaining stocks in Russell 3000, excluding migrations from Russell 2000 (Russell 1000) to Russell 1000 (Russell 2000). The dependent variable is contemporaneous return earned for the month of the reconstitution. The month of the reconstitution starts on June 1st and ends on last day of June prior to 2003 and last Friday of the month thereafter. The independent variables include Beta, log of market cap (Size), market-to-book (MB), order flow for the past 21 days (OFI), Amihud (2002) illiquidity measure (ILLIQ), dummy variables that take value of 1 if the event is add (delete) and 0 otherwise, and interaction variables created by interacting dummy variables with OFI and ILLIQ. Beta is 5-year beta relative to S&P500. OFI is computed as number of buyer-initiated trades minus number of seller-initiated trades divided by total volume. The initiator of the trade is determined by the quote test algorithm. T-statistics are reported in brackets.

Figure 1. Order Flow around Russell Reconstitution

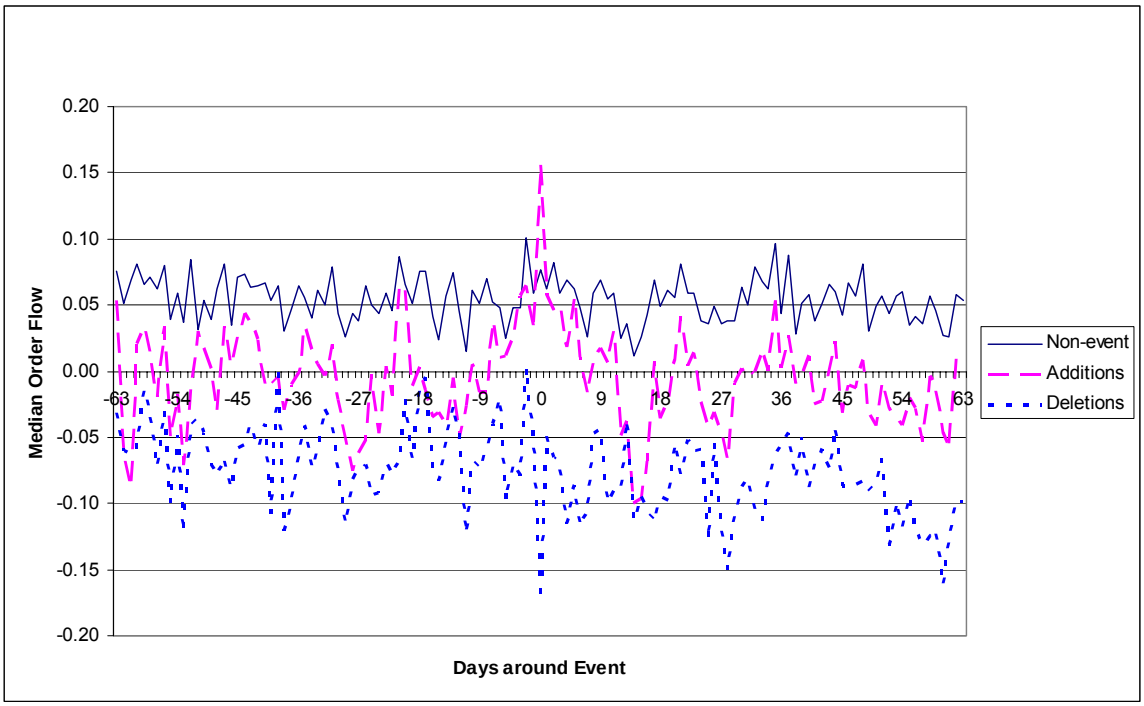

Figure 2. Amihud (2002) Illiquidity around Russell Reconstitution

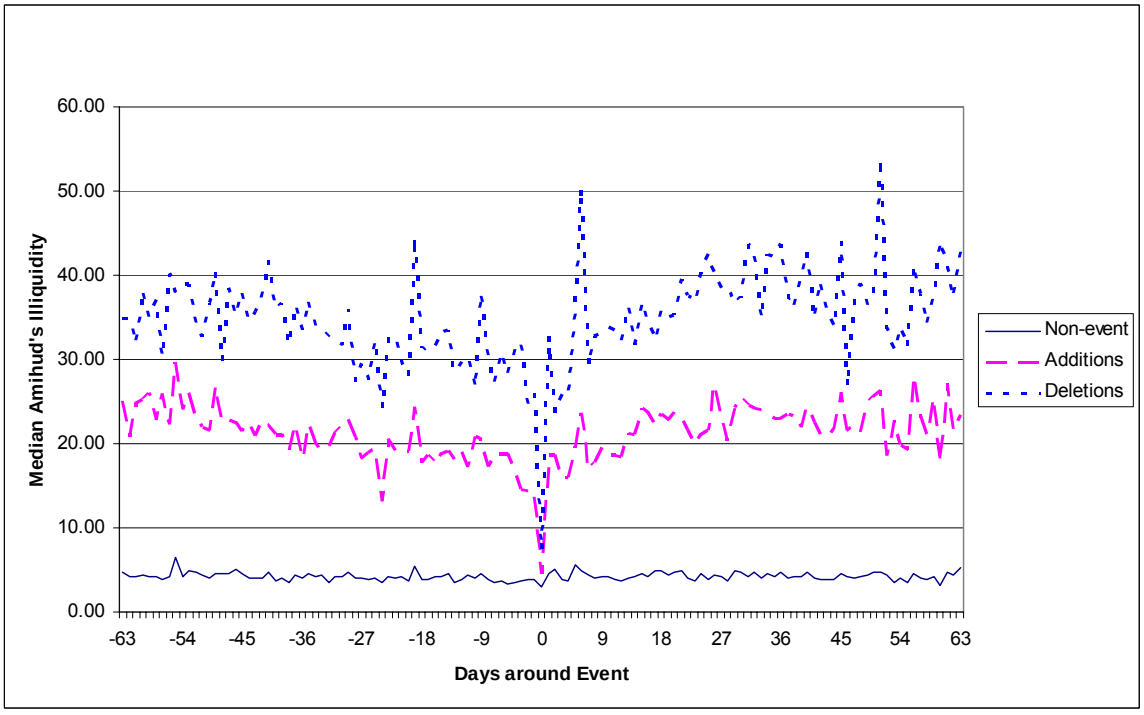

Figure 3. Effective Half-Spread around Russell Reconstitution

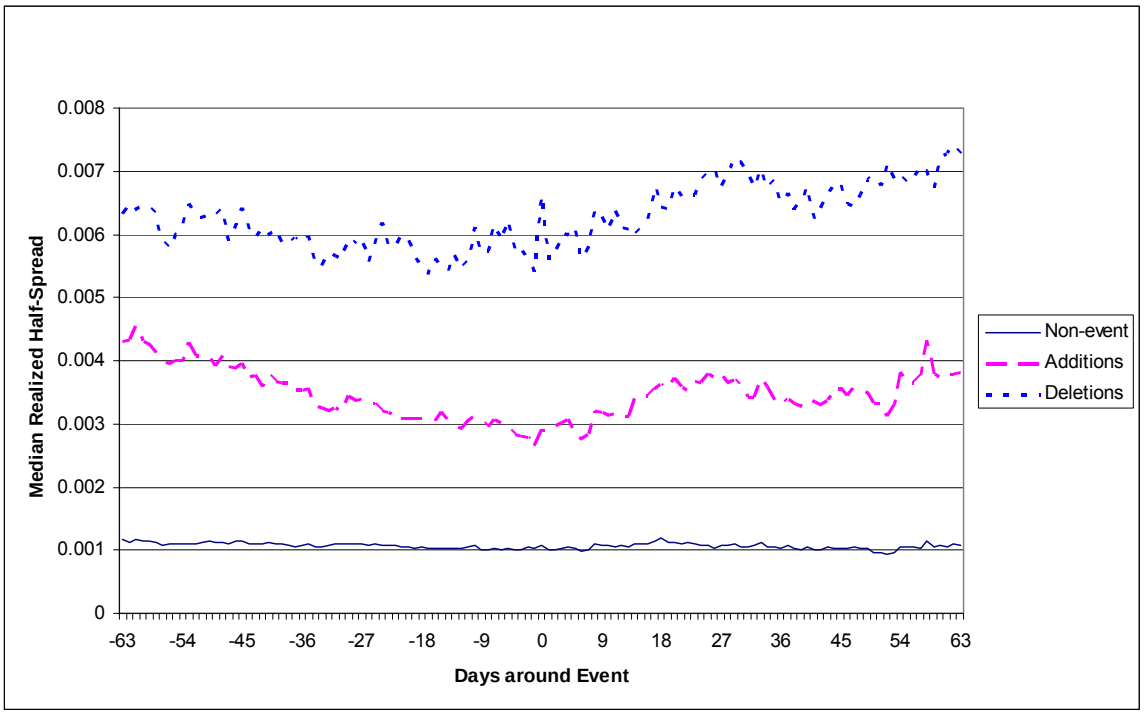

Figure 4. Quoted Spread around Russell Reconstitution