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RESEARCH AND PRODUCT DEVELOPMENT

# Hedging the Russell 1000 Index

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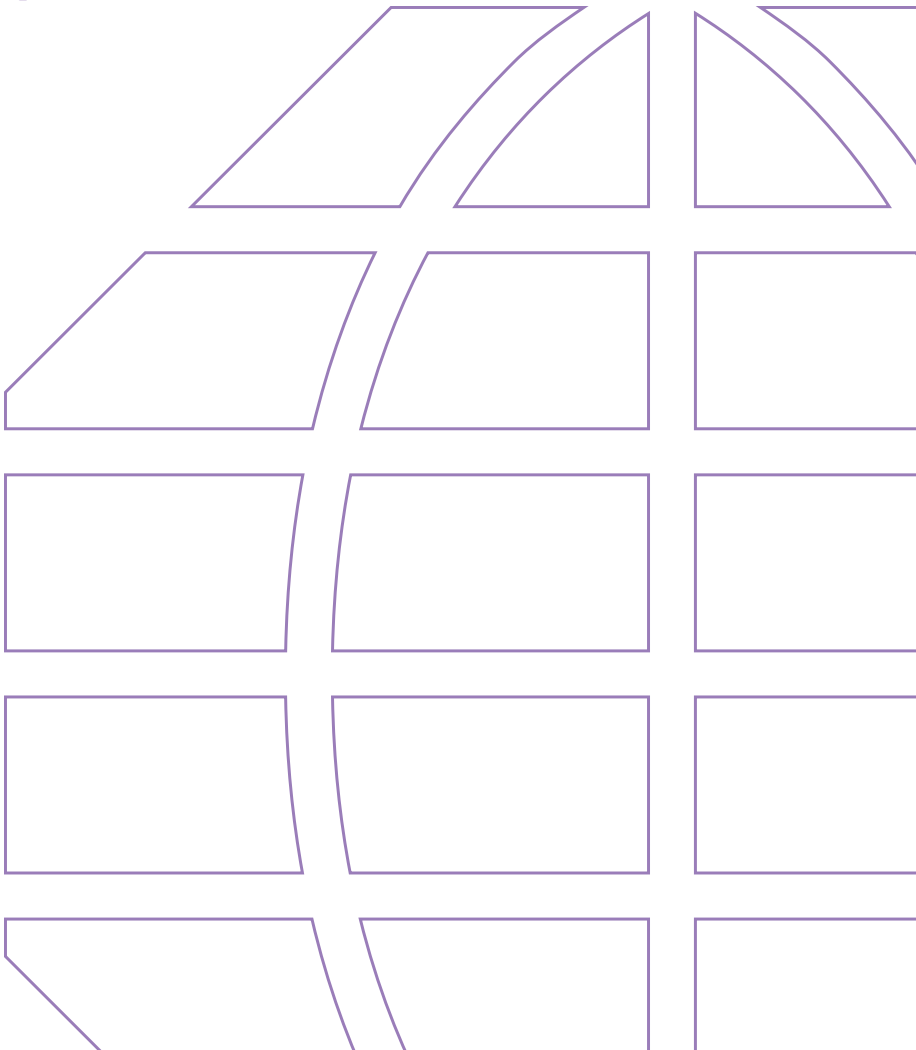


This article discusses ways to effectively hedge the Russell 1000 Index in the absence of a liquid derivatives contract on the index.

Synthetic replication of benchmark indexes has never been easier. But with respect to indexes that are served by less liquid derivative markets, synthetic replication may boil down to two less-than-satisfactory choices. Market participants may attempt to utilize an illiquid derivative based directly upon the index of interest or they may attempt to replicate the index by using (more liquid) futures on a different index and accepting the inevitable tracking error. There is no "right" solution to this dilemma. But our analysis demonstrates that the latter solution may be quite serviceable in the context of the Russell 1000 index.

We chose to highlight the Russell 1000 index in this analysis insofar as substantial monies are benchmarked or indexed to the Russell 1000. Furthermore, it is evident that liquidity in Russell 1000 futures contracts is rather thin. Fortunately, market participants may rely upon the superior liquidity in S&P 500 and S&P MidCap 400 ("MidCap") index futures to replicate the performance of the Russell 1000 index.

## Index Overlap

There is significant overlap between the index constituents. As of this writing, some 498 of the S&P 500 constituents were also included in the Russell 1000 index, totaling approximately 87.5 percent of the Russell 1000 index by weight. Some 273 of the S&P MidCap 400 index constituents are included in the Russell 1000 index, accounting for 6.4 percent of the Russell 1000 index by weight. Thus, only 6.1 percent of the Russell 1000 index by weight was not represented in the two S&P indexes. This incomplete coverage, however, does not suggest that the combination of S&P indexes does not track the Russell 1000. Indeed, correlations between daily price returns of the three indexes are high as Exhibit 1 shows.

**EXHIBIT 1:**
Index Correlations

| | Russell 1000 | S&P 500 | S&P MidCap 400 |
|---|---|---|---|
| Russell 1000 | 1.0000 | 0.9988 | 0.9376 |
| S&P 500 | | 1.0000 | 0.9229 |
| S&P MidCap 400 | | | 1.0000 |

The 0.9988 correlation between the Russell and the S&P 500 indexes might have been anticipated, noting the 87.5 percent overlap. Correlation between the Russell and S&P MidCap 400 indexes is lower at 0.9376. The S&P MidCap 400 index can still play a vital role, however, in the replication of the Russell 1000 index.

## Simple Hedge

The appropriate hedge ratio (HR) to replicate the Russell 1000 index using S&P 500 futures was calculated at 0.9927 over the 61 ½ months of our study; i.e., for each dollar of exposure in the Russell 1000 index, one would devote $0.9927 on the S&P 500. This result is attributed to the fact that the S&P 500 index (13.56 percent) is slightly more volatile than the Russell 1000 index (13.48 percent), resulting in a hedge ratio that is less than 1.0. We assume that the residual $0.73 is invested at the Fed Funds rate. Monthly tracking errors associated with this strategy averaged 5 basis points (bps) with a standard deviation of 18 bps, as shown in Exhibit 2. We define tracking error as Russell 1000 performance less performance of the replication strategy. Dividend accruals are accumulated at month's end.

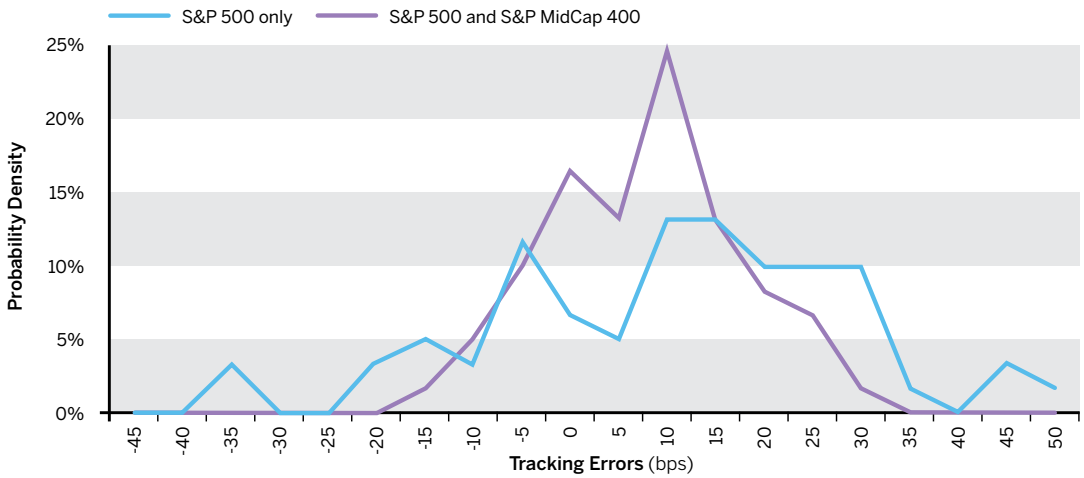
**EXHIBIT 2:**
Monthly Tracking Error (Jan 03 – Jan 08)

| | S&P 500 | S&P 500 + S&P MidCap 400 | Change |
|---|---|---|---|
| Average | 5.18 | 2.73 | -47% |
| Standard Deviation | 18.46 | 10.02 | -46% |

## Combo Hedge

Can practitioners improve upon this simple strategy? Using a combination of the S&P 500 and S&P MidCap 400 indexes reduced the monthly tracking error to 2.73 bps, with a standard deviation of 10.02 bps. This resulted from putting $0.8948 on the S&P 500 and $0.0968 on the S&P MidCap 400 indexes, with the residual $0.0084 invested in money market instruments. These hedge ratios are reminiscent of the constituent weights discussed above.

**EXHIBIT 3:**
Monthly Tracking Errors (Jan 02 – Jan 08)




Thus, inclusion of the S&P MidCap 400 index reduces the tracking error substantially. The graph in Exhibit 3 depicts the distribution of monthly tracking errors. The distribution "tail" for the combo approach is much reduced, suggesting it works better per "distressed" conditions. (Sample kurtosis for the two strategies equals 0.1368 and -0.3799, respectively, with the normal distribution base lined at zero. The width of the middle 95 percent of the distribution shrinks from 73 bps to 37 bps.)

## Conclusions

Our calculations focus on tracking error at the index level only. Absent is consideration of the tracking error of futures against the respective indexes. It is relatively easy to ascertain, however, the efficacy of the actual hedging strategies, which may be represented by the sum total of tracking errors and execution cost.

The two strategies boil down to the following considerations. Using only S&P 500 futures, the strategy may be impacted by a 3 bps per month disadvantage on average. However, S&P 500 futures are extraordinarily liquid. S&P MidCap 400 futures enjoy less liquidity than S&P 500 futures, but that liquidity remains far superior to that in the Russell 1000 futures. Furthermore, tracking errors between the S&P index futures and the underlying indexes are mitigated by CME Group's application of month-end fair value settlement procedures.

Use of Russell 1000 futures directly implies a (theoretical) 3 bps per month advantage. Still, market participants must account for the tracking error of the futures contract, as well as cope with the scant liquidity associated with Russell 1000 futures.

**EXHIBIT 4:**
2007 Average Daily Contract Volumes

| E-mini S&P 500 Futures | CME Group E-mini S&P MidCap 400 Futures | Russell 1000 Futures (All Variations available in 2007) |
|---|---|---|
| 1.65 Million Contracts | 29,000 Contracts | 588 Contracts |



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