SOLACTIVE
German Index Engineering

MONEY LEFT ON THE TABLE – WHY YOU SHOULD THINK ABOUT THE TIMING OF THE RECONSTITUTION

White Paper

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EXECUTIVE SUMMARY

In this white paper, we examined the effectiveness of the timing of the reconstitution of indices. Within each size segment, we observed statistically insignificant differences in historical return, random pattern of ranking by the impact of reconstitution, and similarity of turnover amongst indices reconstituted in different months of a year. Hence, spreading reconstitution over several periods may be one of the ways to mitigate the effects of the unmanageable timing factor.

HIGHLIGHTS OF THE PAPER

In our historical analysis of the annually reconstituted indices in different months of a year, over the period from December 27, 2002, to December 27, 2019, we observed:

- out of a total of 66 combinations within each size segment, there were only 3, 9, and 18 index pairs with a statistically significant difference in return for large-, mid- and small-cap segments respectively
- within the respective size segments, the pattern of rank by the impact of reconstitution was random, and the turnover of the indices was very similar
- spreading reconstitutions over all 12 months of a year achieved average performance with large-, mid-, and small-cap segments delivering a total return of 10.26%, 12.51%, and 12.48% respectively

A SHORT RECAP ON RECONSTITUTION TIMING

The majority of the rules-based benchmark indices reconstitute periodically on a fixed schedule to reflect changes in the market. When the timing of reconstitution is not a decision at will, it can lead to remarkable dispersion in the long-run performance out of "timing luck" [Reference 1].

As we discussed in our earlier paper [Reference 2] that index trackers incurred considerable hidden impact from advance index arbitrage behaviours at the time of reconstitution of the indices, an intuitive question is whether there can be an optimal timing for reconstitution or there is randomness which will render futile the efforts to time it.

In this white paper, we address whether passive market participants should pin down their reconstitution at a certain month or spread it over different periods to hedge against the reconstitution luck. We investigate the historical return, the impact of reconstitution, and turnover of the indices reconstituted in different months of a year and for various size segments.

OUR APPROACH TO THE PROBLEM

We used the simulated indices from our earlier research paper on 'Money Left on the Table - Passive Investing and the Effects of Reconstitution' [Reference 2] to evaluate the differences between indices reconstituted in different months of a year within the respective size segment.

As in our earlier paper, we again acknowledge that for a more robust study, various permutations and combinations of cumulative weight cutoff limits for the initial universe, size segments, buffers, as well as the dates of reconstitution and selection could be evaluated.

HISTORICAL OBSERVATIONS

In this section we present the difference in return, impact of reconstitution rank and turnover of the indices reconstituted annually for each month of a year and every size segment.

WE SAW INSIGNIFICANT DIFFERENCE IN RETURNS

In Exhibit 1, both the row and the column headers represent the annually reconstituted large-cap indices in different months of a year by the first letter of the month's name in chronological order. The data in the table displays the return difference

between a pair of indices, calculated as the column index return minus the row index return. For example, the large-cap index reconstituted annually in October lagged the large-cap index reconstituted annually in November by 12 basis points over the period from December 27, 2002, to December 27, 2019. Exhibits 2 and 3 could be read similarly.

We observed historically that the return difference between various indices rebalancing annually in different months of a year belonging to a respective size segment was not statistically significant for the majority of the cases (see Exhibits 1, 2, and 3).

Out of a total of $C_2^{12} = \frac{12!}{2! \times 10!} = 66$ combinations within each size segment, the large-cap segment had only three pairs of annually reconstituted indexes with a statistically significant difference in return at various significance levels. While the mid- and small-cap segments had nine and eighteen pairs, respectively.

Exhibit 1: Annualized Total Return Difference in Basis Points Between the Large-Cap Indices Reconstituted Annually in Different Months of a Year

	J	F	M	A	M	J	J	A	S	O	N	D
J												
F	-10											
M	-14	-4										
A	-6	4	8									
M	-21	-11	-7	-15								
J	-7	2	6	-2	13							
J	0	10	14	6	21	8						
A	-25	-16	-12	-20	-5	-18	-26					
S	-18	-8	-4	-12	3	-10	-18	8				
O	-8	2	6	-2	13	-1	-9	17	9			
N	-20	-10	-6	-14	1	-13	-21	5	-3	-12		
D	-9	1	5	-3	12	-1	-9	17	9	-1	11	

Statistically significant (p-value < 1%)
Statistically significant (p-value < 5%)
Statistically significant (p-value < 10%)

The months of a year are represented in chronological order by their first letter.

Source: Solactive and FactSet. Data from December 27, 2002 to December 27, 2019 in USD. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 2: Annualized Total Return Difference in Basis Points Between the Mid-Cap Indices Reconstituted Annually in Different Months of a Year

	J	F	M	A	M	J	J	A	S	O	N	D
J												
F	-11											
M	37	48										
A	33	43	-4									
M	3	14	-33	-29								
J	-8	2	-45	-41	-12							
J	17	28	-20	-16	14	25						
A	26	37	-11	-6	23	35	9					
S	-16	-5	-53	-49	-20	-8	-33	-42				
O	0	11	-37	-32	-3	9	-17	-26	17			
N	-31	-20	-68	-63	-34	-22	-48	-57	-15	-31		
D	-32	-21	-69	-65	-36	-24	-49	-58	-16	-33	-1	

Statistically significant (p-value < 1%)
Statistically significant (p-value < 5%)
Statistically significant (p-value < 10%)

The months of a year are represented in chronological order by their first letter.

Source: Solactive and FactSet. Data from December 27, 2002 to December 27, 2019 in USD. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 3: Annualized Total Return Difference in Basis Points Between the Small-Cap Indices Reconstituted Annually in Different Months of a Year

	J	F	M	A	M	J	J	A	S	O	N	D
J												
F	-40											
M	-33	7										
A	-6	34	27									
M	-34	6	-1	-28								
J	-38	2	-4	-31	-4							
J	-16	24	17	-10	18	22						
A	-51	-11	-18	-45	-17	-13	-35					
S	-18	22	15	-12	16	20	-2	33				
O	12	52	45	18	46	50	28	63	30			
N	-11	29	23	-4	24	27	5	40	7	-23		
D	-14	26	19	-8	20	24	2	37	4	-26	-3	

Statistically significant (p-value < 1%)
Statistically significant (p-value < 5%)
Statistically significant (p-value < 10%)

The months of a year are represented in chronological order by their first letter.

Source: Solactive and FactSet. Data from December 27, 2002 to December 27, 2019 in USD. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

THE IMPACT OF RECONSTITUTION IS RANDOM

In Exhibit 4, the row header represents the annually reconstituted large-cap indices in different months of a year by the first letter of the month's name in chronological order. The column header represents the impact of reconstitution rank. Indices with lower impact ranked better than others. The rank is bounded between 1 and 12 (both inclusive) since there are 12 months in a year.

The data in the table displays the number of times a rank was achieved by an index. It was calculated in two steps. First, the indices were ranked by the impact of reconstitution in each year over the period under observation. Then the number of times each rank achieved was counted. Therefore, the total of each row is 17 since our historical simulations spanned over 17 years. For example, a large cap index reconstituted annually in June achieved a rank of 8 by the impact of reconstitution four times over the period from December 27, 2002, to December 27, 2019. Exhibits 5 and 6 could be read similarly.

Historically we discovered that within the respective size segments, the pattern of impact of reconstitution rank of indices rebalancing annually in different months of a year was random (see Exhibits 4, 5, and 6). None of the indices consistently ranked higher in our historical analysis, indicating that timing the reconstitution may not lead to a lower impact in the long run for rules-based passive indices.

In our earlier paper on 'Money Left on the Table - Passive Investing and the Effects of Reconstitution' [Reference 2], we mentioned that the impact of reconstitution became statistically significant in the majority of months for all the size segments when the hypothetical portfolios reconstituted four weeks before the actual reconstitution of the underlying indices. Therefore, we used the impact of reconstitution calculated over a four-week advance reconstitution period for our analysis in this paper.

Exhibit 4: Number of Times Impact of Reconstitution Rank Achieved by Large-Cap Indices Reconstituted Annually in Different Months of a Year

	1	2	3	4	5	6	7	8	9	10	11	12
J	1	3	3	3	2	2	2	1				
F	1				2	1	1	2	4	2	1	3
M	2	2	2	2	1	1		3	1	2	1	
A	3	2	1	2	2	1	1		2	1	1	1
M	2	1	4	1	1	1	2			1	1	3
J	1	1	2		1	1	1	4	3	1	2	
J	1	1	2	2	2	4	1		2	1	1	
A	2		2	1	1	1	1	3		3	3	
S	1	4	1	1	2		1		2	2	2	1
O	1	1		3		2	2		3	1	1	3
N	1	1			2	2	2	2		3	2	2
D	1	1		2	1	1	3	2			2	4

The months of a year are represented in chronological order by their first letter. The impact of reconstitution for ranking was calculated over four-week advance reconstitution period.
Source: Solactive and FactSet. Data from December 27, 2002 to December 27, 2019. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 5: Number of Times Impact of Reconstitution Rank Achieved by Mid-Cap Indices Reconstituted Annually in Different Months of a Year

	1	2	3	4	5	6	7	8	9	10	11	12
J	3		2	4	3	3		1			1	
F			1	1	2	2			2	3	4	2
M		2	1	2			3	1	3	1	2	2
A	3		2	2	1	2		2	1	1	2	1
M		1	3	1	1		1	2	5			3
J	4	1	1	2		1	1		1	4	2	
J	2	1		1	2	3	1	3	1	2		1
A	1		2			2	4	1	2	2		3
S	2	7	1	1		2	2	1		1		
O	1	2	2	2	1	2	3	1			2	1
N		1	2		3		1	3	1	2	3	1
D	1	2		1	4		1	2	1	1	1	3

The months of a year are represented in chronological order by their first letter. The impact of reconstitution for ranking was calculated over four-week advance reconstitution period.
Source: Solactive and FactSet. Data from December 27, 2002 to December 27, 2019. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 6: Number of Times Impact of Reconstitution Rank Achieved by Small-Cap Indices Reconstituted Annually in Different Months of a Year

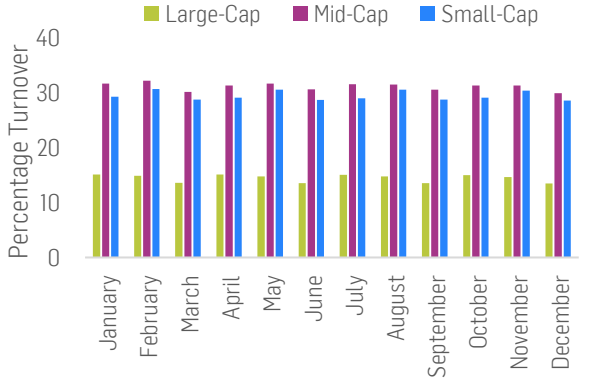
	1	2	3	4	5	6	7	8	9	10	11	12
J	3	1		2	1	1	3	3				3
F	2			1	1	3	2	2	1	2	2	1
M		1	1	1	3	4		1	3		2	1
A	3	3	1		1		1	2	3	2		1
M	3	1	2	1	2	1	1		1		1	4
J		2	2	2	1	1		2	4	1	2	
J	1	4	4	1	3			1	2		1	
A	2		1	2		1	3	2	1	2	1	2
S		1	2		2	4				5	1	2
O	1	3	2	2	2			2		2	3	
N			1	2			7		1		3	3
D	2	1	1	3	1	2		2	1	3	1	

The months of a year are represented in chronological order by their first letter. The impact of reconstitution for ranking was calculated over four-week advance reconstitution period.
Source: Solactive and FactSet. Data from December 27, 2002 to December 27, 2019. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

SIMILARITY OF TURNOVER

The one-way turnover of indices rebalancing annually in different months of a year was very similar within the respective size segments historically (see Exhibits 7). The average turnover of the large-, mid-, and small-cap segments was 14.4%, 31.1%, and 29.4%, respectively.

Exhibit 7: Annualized One-Way Turnover of the Indices Reconstituted Annually in Different Months of a Year



Source: Solactive and FactSet. Data from December 27, 2002 to December 27, 2019. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

SPREADING THE RECONSTITUTION

Our observations on return differential being statistically insignificant, the impact of reconstitution rank displaying random pattern and similarity of turnover between indices reconstituted annually in different months of a year within the same size segment lead us to deduce that it's difficult to time the reconstitution of an index for higher performance. Therefore, spreading the reconstitution over different periods may be a substitute to eliminate the timing factor.

There can be many ways to spread the reconstitution. We evaluated one simple case of averaging it over all the twelve months in a year. This approach would mean that the assets under management of the portfolio are divided into 12 equal parts, and each part is tagged to a unique month of a year and reconstituted annually in its tagged month. The benchmark index for this portfolio will be the simple average of all the monthly indices. In our sample, the average indices delivered a total return of 10.26%, 12.51%, and 12.48% respectively in the large-, mid-, and small-cap segments over the period from December 27, 2002, to December 27, 2019 (see Exhibit 8).

CONCLUSION

In this paper, we investigated the historical return, the impact of reconstitution and turnover of the indices reconstituted in different months of a year and for various size segments.

Historically, we observed that the return difference between various indices belonging to same size segment was not statistically significant. We further noted that the pattern of impact of reconstitution rank belonging to the same size segment was random. Lastly, the turnover of the indices belonging to the same size segment was very similar.

Therefore, we concluded that for index trackers, it is difficult to time the reconstitution for higher

gains and spreading it over different periods may be an alternative to remove the timing factor.

REFERENCES

[1] The Luck of the Rebalance Timing

https://blog.thinknewfound.com/2013/08/the-luck-of-the-rebalance-timing/

[2] Money Left on the Table – Passive Investing and the Effects of Reconstitution

https://www.solactive.com/wp-content/uploads/2020/08/Solactive_Money_Left_on_the_Table_Passive_Investing_and_the_Effects_of_Reconstitution.pdf

APPENDIX

The return spread between the indices with maximum and minimum returns was 26, 69, and 63 basis points for large-, mid-, and small-cap indices, respectively (see Exhibit 8).

Exhibit 8: Annualized Total Return (in %) of Indices Reconstituted Annually in Different Months of a Year

Index	Large-Cap	Mid-Cap	Small-Cap
January	10.14	12.52	12.27
February	10.24	12.63	12.67
March	10.28	12.15	12.60
April	10.20	12.19	12.33
May	10.35	12.49	12.61
June	10.22	12.60	12.65
July	10.14	12.35	12.43
August	10.40	12.26	12.78
September	10.32	12.68	12.45
October	10.22	12.52	12.15
November	10.34	12.83	12.38
December	10.23	12.84	12.41
Average	10.26	12.51	12.48
Max	10.40	12.84	12.78
Min	10.14	12.15	12.15
Max - Min	0.26	0.69	0.63

Source: Solactive and FactSet. Data from December 27, 2002 to December 27, 2019 in USD. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

The impact spread between the indices with maximum and minimum impact of reconstitution was 20, 47 and 29 basis points for large-, mid- and small-cap indices, respectively (see Exhibit 9).

Exhibit 9: Annualized Impact of Reconstitution in Basis Points of Indices Reconstituted Annually in Different Months of a Year

Index	Large-Cap	Mid-Cap	Small-Cap
January	3	-2	26
February	23	37	32
March	7	31	30
April	5	5	21
May	8	32	33
June	13	0	24
July	6	15	12
August	11	32	41
September	5	-10	31
October	20	24	32
November	14	20	38
December	18	27	28
Average	11	18	29
Max	23	37	41
Min	3	-10	12
Max - Min	20	47	29

The impact of reconstitution was calculated over four-week advance reconstitution period. The annualized Impact of Reconstitution was calculated by subtracting the annualized total return of the underlying index from the annualized total return of the hypothetical portfolio over the entire back-tested period.

Source: Solactive and FactSet. Data from December 27, 2002 to December 27, 2019 in USD. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

DISCLAIMER

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