December 2018

A Golden Goose Goes Missing

The curious disappearance of the index effect

This paper examines the Index Effect and reports that it has weakened significantly since 2013. The Index Effect is the phenomenon where stocks added to an index experience positive excess returns in the days immediately before they are officially added to the index, while stocks that are removed from the index experience negative excess returns in the days immediately before they are officially removed.

The weakening of the Index Effect has been particularly pronounced for indices composed of large- and mid-cap stocks. The Index Effect can still be observed in many (but not all) indices with small-cap stocks. The paper also examines the importance of several other aspects related to the Index Effect including whether or not illiquid names added or dropped have larger excess returns than more liquid names and whether or not the Index Effect has weakened for unscheduled rebalances.

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The weakening of the Index Effect has occurred concurrently with a substantial increase in passive investing. One potential explanation for the weakening is that the ETF market makers trade on price disparities as soon as they occur, eliminating any sustained positive or negative price movements. If true, this would be evidence that ETF trading adds liquidity to the market.

1. Introduction

This paper examines the Index Effect and reports that it has weakened significantly since 2013. The Index Effect is the phenomenon where stocks added to (deleted from) an index experience positive (negative) excess returns in the days immediately before they are officially added to (removed from) the index.

From the perspective of 2018 — meaning a time when passive investing is a sizeable market segment — an explanation of the Index Effect seems obvious. Managers of equity index products (e.g., SPY) are required to track the official index closely and have little leeway to take advantage of announced index changes in advance[1] (Arnott et al., 2018). Other traders know that there will be demand to buy (sell) the additions (deletions) on the official rebalance date, so they buy (sell) the additions (deletions) beforehand with the intention of profiting when the passive indexers are forced to update their holdings.

Nevertheless, no matter how obvious or true the passive investing explanation may be, the Index Effect existed since S&P first started announcing index changes in advance in October 1989. While passive investing existed in 1989 [2], it was not as large a market segment as it is now. Indeed, academics viewed this phenomenon as an attractive test case for the core assumptions of classical finance theory. In theory, the price impact from an index rebalance should be small, since the index change does not contain any non-public information. A number of competing explanations have been proposed:

- Addition (deletion) of a stock to an index increases (decreases) demand for the stock, driving up (down) the price. The demand may or may not be transitory in nature. See for example, Shleifer (1986), Harris and Gurel (1986), Beneish and Whaley (1996), Lynch and Mendenhall (1997), Wurgler and Zhuravskaya (2002), Blume and Edelen (2004), Biktimirov (2004), and Biktimirov et al. (2004).
- Some investors may only “know” of a subset of stocks such as the constituents of widely followed benchmarks. Index addition raises awareness of or is perceived as good news for certain stocks, increasing their demand. Jain (1987), Chen et al. (2002, 2004), Denis et al. (2003).
- Since stocks in major benchmark indices receive greater attention and are traded more actively, addition to an index increases trading volume which results in lower transaction costs. Investors require compensation for trading costs, so reduced costs mean higher prices. Amihud and Mendelson (1986), Beneish and Whaley (1996), Lynch and Medenhall (1997), Beneish and Gardner (1995).

[1] Most indexes announce forthcoming changes one or two weeks in advance.
[2] SPY, the SPDR S&P 500 trust ETF, was launched in 1993, preceded by the short-lived Index Participation Shares that launched in 1989.

- In the methodology for constructing market-capitalization weighted indices, stocks are added to (deleted from) an index if they reach sufficiently high (low) market capitalization. Additions and deletions are therefore biased towards firms exhibiting strong (weak) price momentum. Elayan et al. (2000), and Bechmann (2004).

What is perhaps most interesting about this older research, is that none suggests low tracking error constraints imposed by passive products as the explanation of the Index Effect. Times certainly have changed!

However, even though the above explanations of the Index Effect, both before and after the rise of passive investing, are reasonable, the data suggests that the rise of passive investing has coincided with a substantial weakening of the Index Effect.

Figure 1 illustrates the extent of this weakening for the S&P 500 Index. There are two graphs in the Figure: the top graph shows results for aggregated data prior to 2013 while the bottom graph shows results for aggregated data since 2013.

In each graph, the blue curves show results for index additions while the red curves show results for index deletions. The number of cases for each is shown to the right of the graph: pre-2013, there were 575 additions and 575 deletions; since 2013, there were 152 additions and 147 deletions.[3]

The horizontal axis shows the trading days after rebalance which ranges in values from -10 days (e.g., two weeks before the formal index change) to +10 (two weeks after). Zero trading days after rebalance is, of course, the day on which the index officially changes constituents. Many but not all indices announce the forthcoming changes two weeks before they before official, which corresponds to -10 trading days before rebalance.

The vertical axis shows the average, daily specific return, along with error bars indicating the standard error (at the 5% significance level). We use the specific returns from Axioma's Fundamental Factor, Medium-Horizon, Equity Risk Model (AXUS4-MH) as a measure of excess return. Risk model specific returns are the residual return after performing a cross-sectional regression of asset returns across style, industry, and country (if any) factor exposures. Since this risk model specific return is adjusted for industry and style biases, it is a reliable measure of excess return[4]. It is a more reliable estimate of excess returns than running a time-series regression of stock returns against a model with one to four factors, as has often been done in the literature (Siu, 2015).

In the top graph, which gives results prior to 2013, the additions experience positive excess returns up until the day of rebalance while the deletions exhibit negative excess returns. This is the classic Index Effect phenomenon. After rebalance, there is mean reversion, so the additions experience a smaller negative excess return while the deletions exhibit a smaller positive return, which lasts for a few days. The error bars indicate that the excess returns before rebalance are statistically significant.

[3] There are more pre-2013 events because that time window covers 24 years, while post-2013 covers only 5 years.
[4] It is worth noting that if excess returns are measured as simple active asset returns, the results are not notably different. Specific returns are certainly a better measure of excess returns, but the differences appear to be second order.

In the bottom graph, which gives results aggregated since 2013, we see that the Index Effect phenomenon has disappeared. None of the excess returns is statistically different from zero.

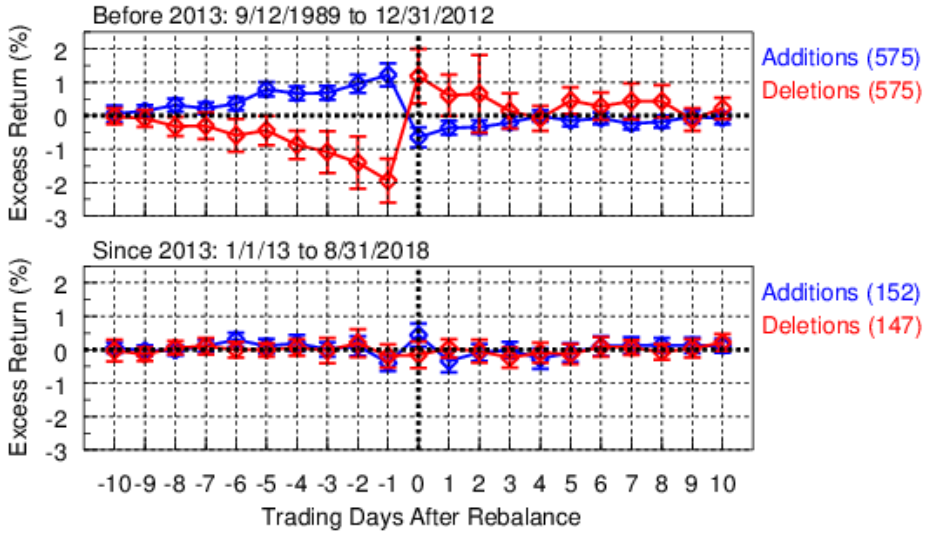

Figure 1. Average, daily specific return for the S&P 500 Index additions (blue) and deletions (red) as a function of the days after the official index rebalance (negative numbers indicate days before rebalance; rebalance occurs on day zero). Top: before 2013; bottom: since 2013. Error bars indicate standard error at 5% significance. The numbers in parentheses at right indicate the number of data points. Index changes are often announced 2 weeks prior to becoming official, which corresponds to -10 trading days after rebalance.

In the following sections, we document the evolution of the Index Effect for a number of different indices. The results indicate that the weakening of the Index Effect has been particularly pronounced for indices composed of large- and mid-cap stocks. The Index Effect can still be observed in many (but not all) indices with small-cap stocks.

This paper also examines the importance of several other aspects related to the Index Effect including whether or not illiquid names added or dropped have larger excess returns than more liquid names and whether or not the Index Effect has weakened for unscheduled rebalances. Finally, we consider whether recent changes to Global Industry Classification Standard (GICS) have produced an effect similar to the Index Effect.

2. The Index Effect for a Cross Section of Indices

Figure 1 illustrates the weakening of the Index Effect in the S&P 500 Index since 2013. For the S&P 500, the Index Effect has not just weakened, it has, in fact, disappeared. In this section, we examine the Index Effect for a cross section of different indices with the aim of determining whether the Index Effect still exists and in which kinds of indices.

One of the disadvantages of the manner in which the data is presented in Figure 1 is that it does not show the Index Effect evolving over time in a continuous way. In this section, we present results in a different format so that the evolution over time is evident.

We consider a "buy-and-hold" strategy for potentially exploiting the index effect. We buy all the additions or deletions either ten, five or one day(s) prior to the official change and then sell them at the close of the day before the official rebalance. If the prices exhibit the classic Index Effect phenomenon, then this buy-and-hold strategy should give large positive excess returns for the additions and large excess negative returns for the deletions. As before, we measure excess returns as cumulative specific returns as reported by Axioma's fundamental factor risk models.

In order to ensure that there are enough events (e.g., additions and deletions) in each sample to give a statistically meaningful return, we compute the cumulative specific return for the buy-and-hold strategies over rolling, three-year time windows.

Figure 2 shows the cumulative specific returns for the S&P 500 index over time for 10 (blue), 5 (red), and 1 (green) day buy-and-hold strategies. There are several key take-aways from this Figure:

- In general, the returns are positive for the additions and negative for the deletions, as one would expect from the classic Index Effect.
- The return for the 10 day buy-and-hold is larger than the five day buy-and-hold, which, in turn, is larger than the one day buy-and-hold. This, too, is consistent with the classic Index Effect.
- Historically, many of the returns have been surprisingly large: -17.0% for deletions in 1989-1992; +9.3% for additions in 1998-2000.
- However, since the 2009-2011 time window, the excess returns for both additions and deletions has steadily decreased in magnitude and is now best measured in basis points rather than percent. For the last three-year time window, the 10-day returns are +15 bps for additions and -23 bps for deletions, both of which are smaller than their standard errors.

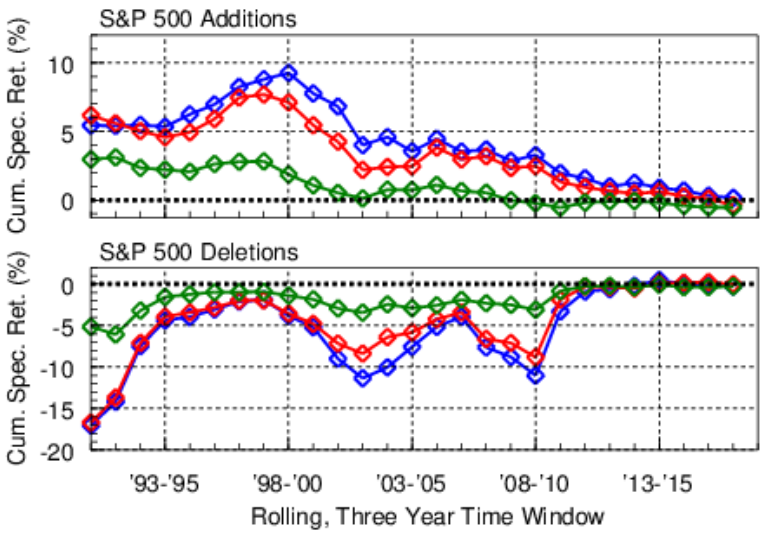

Figure 2. Average, cumulative specific returns for the S&P 500 over rolling three-year time windows for three different buy-and-hold strategies. Top: Additions; bottom: deletions. Names are bought and held 10 (blue), 5 (red), or 1 (green) day(s) prior to official index rebalance. All names are sold on the close the day before the official rebalance.

Figure 3 shows the cumulative specific returns for the S&P 1500 index over time for the three different buy-and-hold strategies. As with the S&P 500 results, these results are consistent with the classic Index Effect: positive returns for the additions and negative returns for the deletions. However, unlike the S&P 500, the Index Effect is still effective even over the most recent three-year time window. For the 10-day buy-and-hold over the 2016-2018 time window, the returns are 4.94% for additions and -4.65% for deletions. The one-day buy-and-hold is less effective for deletions and not effective for additions.

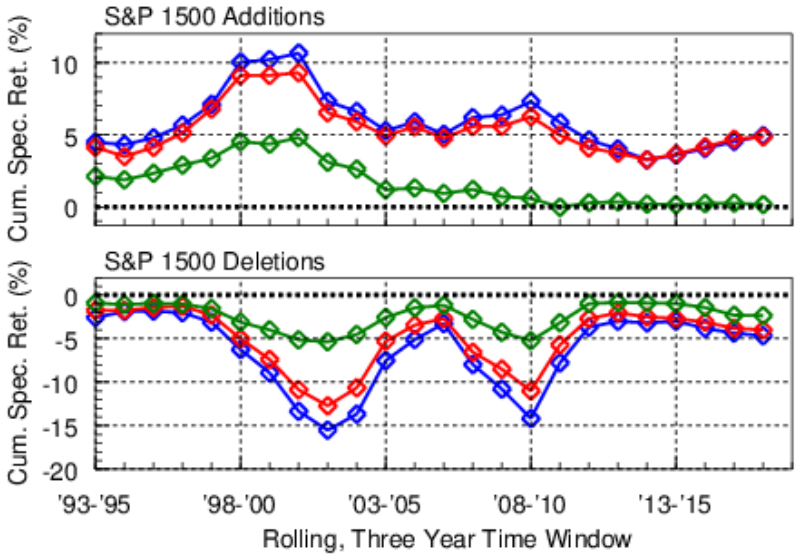

Figure 3. Average, cumulative specific returns for the S&P 1500 over rolling three-year time windows for three different buy-and-hold strategies.

Figures 4 and 5 show the cumulative specific returns for the FTSE Developed Index and the FTSE Developed All Cap Index, respectively[5].

The results for the FTSE Developed Index are similar to those of the S&P 500 in that the magnitude of the Index Effect has weakened in recent years. The Index Effect is no longer present for additions, and, while still present for deletions, has been close to zero as recently as 2014-2016.

[5] For the FTSE-Russel indices, we only include index additions and deletions that occur on a scheduled rebalance date. See Section 4.

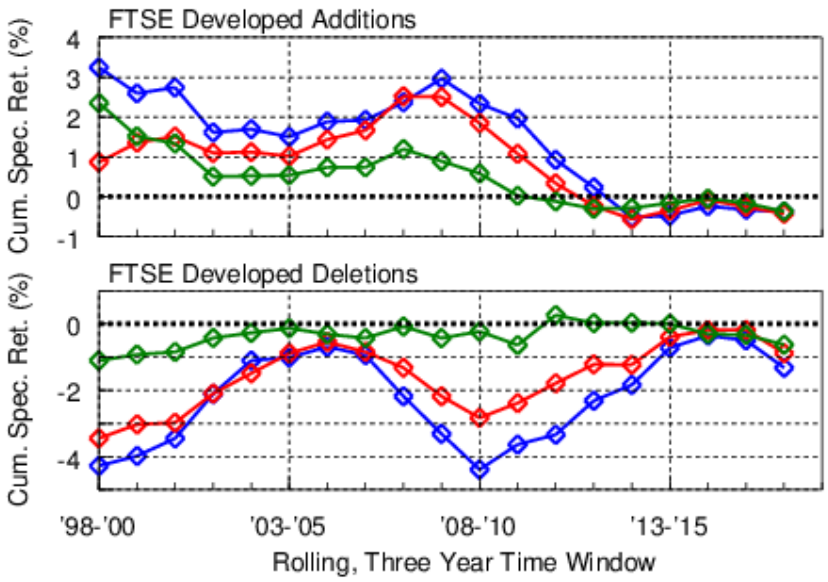

Figure 4. Average, cumulative specific returns for the FTSE Developed over rolling three-year time windows for three different buy-and-hold strategies.

The results for the FTSE Developed All Cap Index are similar to those of the S&P 1500 results in that the Index Effect, while smaller than in the past, is still present, except perhaps for the one-day buy-and-hold strategies.

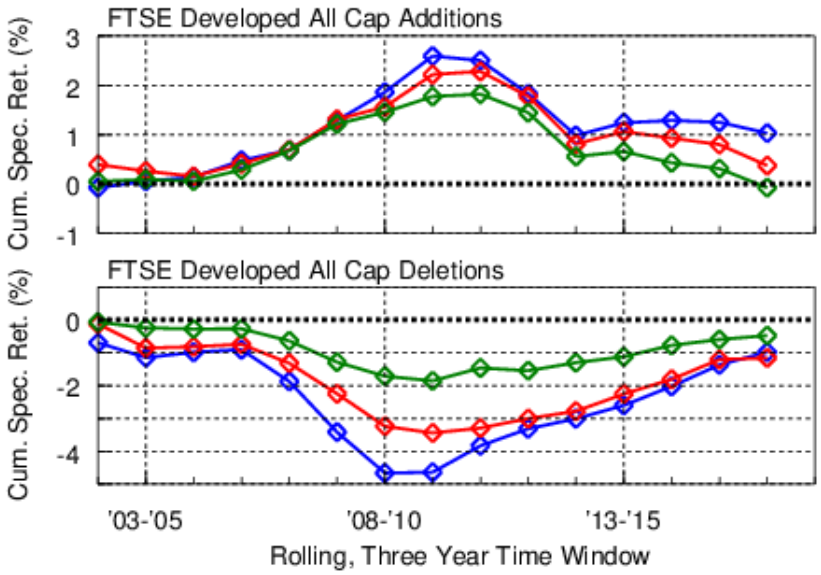

Figure 5. Average, cumulative specific returns for the FTSE Developed All Cap over rolling three-year time windows for three different buy-and-hold strategies.

Table 1 shows a summary of whether or not the Index Effect is present in the recent rebalances of nine core (large- and mid-cap) indices and nine all-cap indices. The designation "Maybe" indicates that only one of the 10, 5, or 1 day buy-and-hold strategies is working (statistically different than zero) while the other two have not.

Core Indices (Large, Large-Midcap)		
	Additions	Deletions
S&P 500	No	No
Russell 1000	No	No
FTSE 350	No	No
FTSE Developed	No	Maybe
FTSE Emerging	No	Maybe
FTSE All World	No	Maybe
FTSE Europe	No	No
FTSE Asia Pacific	No	Yes

All Cap Indices		
	Additions	Deletions
S&P 1500	Yes	Yes
Russell 3000	No	Yes
FTSE All Share	Yes	Yes
FTSE Developed All Cap	Yes	Yes
FTSE Emerging All Cap	No	Maybe
FTSE Global All Cap	Yes	Yes
FTSE Europe All Cap	Yes	Yes
FTSE Asia Pacific All Cap	Yes	Yes

Table 1. Whether or not the Index Effect is present in the recent rebalances of 18 indices.

By breaking the table into Core and All Cap indices, it is apparent that, in general, the Index Effect is no longer present for the Core indices but is present for the All Cap indices. Also, the Index Effect is more likely to be present for deletions than for additions. Since the additions and deletions for the All Cap Indices are primarily small cap stocks[6], Table 1 tells us that the Index Effect is most likely to be found for small cap names entering and exiting an All Cap index.

3. Do Illiquid Names Exhibit a Stronger Index Effect?

It is often suggested that illiquid names are the best candidates for the Index Effect because difficulty trading these names is likely to increase the magnitude of the excess returns. Here we test that hypothesis using two different measures of liquidity:

- The Twenty Day Average Daily Volume (herein denoted "ADV").
- Axioma's risk model liquidity factor (denoted "LIQ")[7].

We report both ADV and LIQ as the percentile scores of the names in the underlying index: 0% indicates that the name is less liquid than any name in the underlying index, and 100% indicates that the name is more liquid than any name in the underlying index.

Figure 6 shows the performance of the 10-day buy-and-hold strategy for the FTSE Developed All Cap Index as a function of ADV. Three curves are shown: all data (green); only names with ADV less than the 35th percentile (blue); and only names with ADV less than the 15th percentile (brown).

[6] Large- and mid-cap stocks can enter or exist the All Cap indices due to corporate actions, such as spin offs, mergers, etc., but most of the changes occur in the small-cap spectrum.
[7] Axioma's risk model liquidity factor is an equally weighted average of: (1), ADV/Market Capitalization; (2), the inverse of the Amihud illiquidity ratio; and (3), the percent of returns traded. The three descriptors are standardized prior to averaging.

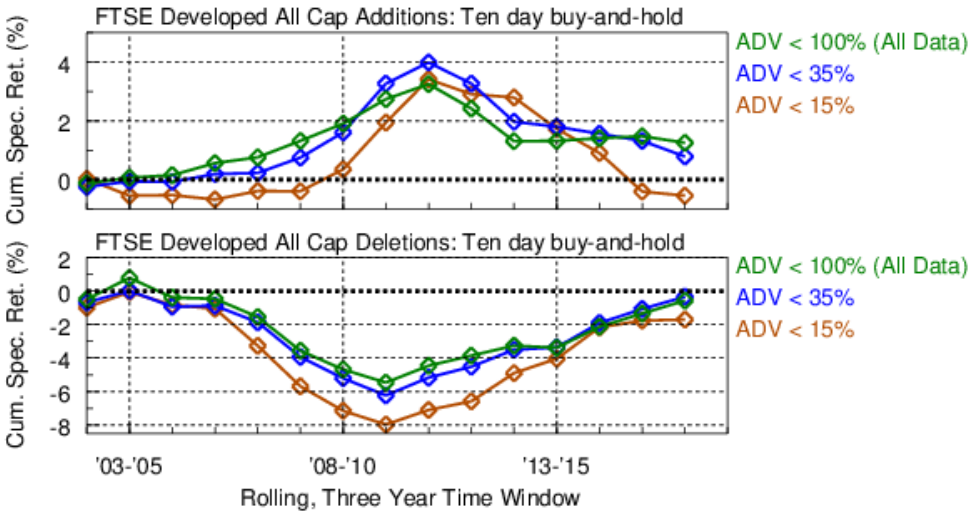

Figure 6. Excess returns for the FTSE Developed All Cap Index for the 10-day buy-and-hold strategy as a function of ADV. Green = all cases; blue = ADV < 35th percentile; brown = ADV < 15th percentile.

If the illiquidity thesis is valid, then the performance of the brown, 15th percentile curves should be better than the blue 35th percentile curve, which should be better than the green all-cases curve. This is true for deletions, but not for additions.

Figure 7 shows the performance of the 10-day buy-and-hold strategy for the FTSE Developed All Cap Index as a function of LIQ, with the same three cases shown (all data, 35th percentile, and 15th percentile).

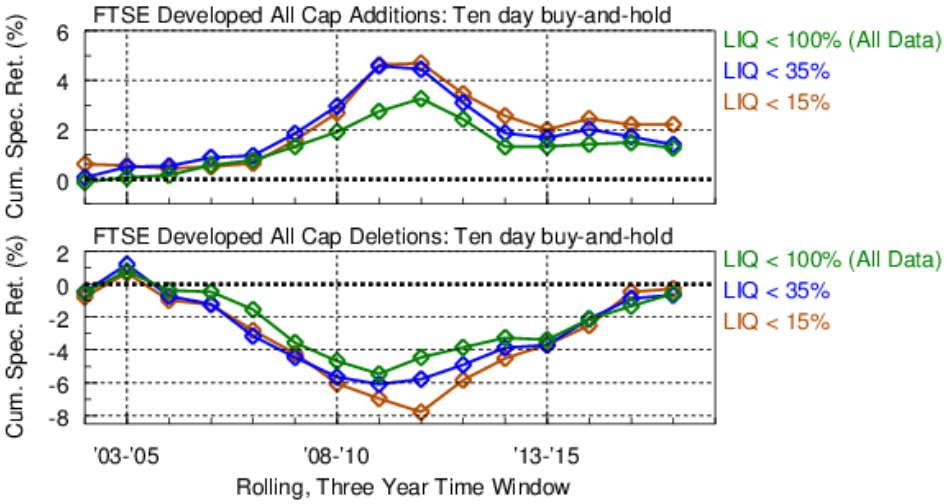

Figure 7. Excess returns for the FTSE Developed All Cap Index for the 10-day buy-and-hold strategy as a function of LIQ. Green = all cases; blue = LIQ < 35th percentile; brown = LIQ < 15th percentile.

Unlike the ADV results shown in Fig. 6, names with lower LIQ scores consistently out-perform those with higher LIQ scores, both for additions and deletions, with the exception of recent deletions, for which there is no real trend as a function of LIQ.

The data in **Fig. 7** (and to a lesser extent Fig. 6) is broadly supportive of the thesis that illiquid names exhibit stronger Index Effects than liquid names.

4. Scheduled vs. Unscheduled Rebalances

For most of its history, the S&P indices did not rebalance on a set schedule. However, most other index providers have a periodic rebalance calendar. For example, the FTSE indices rebalance quarterly in March/June/September/December. The Russell indices rebalance once a year in June.

However, names can enter or leave an index on dates other than the scheduled rebalance dates due to corporate actions (spin offs, delistings, and, depending on the index, IPOs) and due to names no longer qualifying for the index under the methodology guidelines. Unscheduled additions and deletions to an index are announced in advance, just like the scheduled changes, they simply do not fall on a scheduled rebalance date.

Such unscheduled changed are dominated by deletions rather than additions. The stocks being deleted on unscheduled rebalance dates are often in distress, and these names are followed closely by M&A and distressed-asset traders, so the excess returns of these names close to an unscheduled rebalance date is not entirely the same as for the scheduled rebalance dates in that there are other parties trading these names who are typically not involved on the scheduled rebalance dates. In this study, we include all names that enter and exit the index regardless of the cause.

Figure 8 shows the excess returns for the 10, 5, and 1-day buy-and-hold strategies for the FTSE Developed All Cap Index over time for only unscheduled rebalance additions and deletions. Although there are fewer events for the unscheduled rebalances (147 additions, 466 deletions in the last 3-year time window) than for the scheduled rebalances (819 additions and 874 deletions), there are still enough cases to produce reliable results.

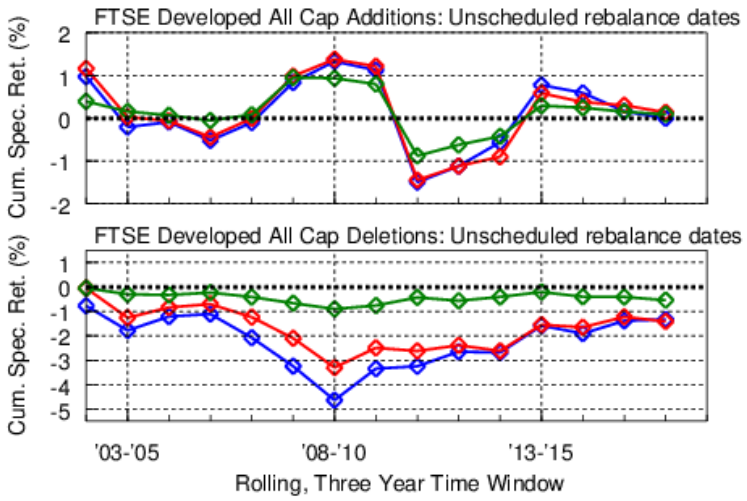

Figure 8. Average, cumulative specific returns for the FTSE Developed All Cap over rolling three-year time windows for three different buy-and-hold strategies on unscheduled rebalance dates. Blue = 10-day buy-and-hold; red = 5-day buy-and-hold; green = 1-day buy-and-hold. The results in Fig. 5 only include events on scheduled rebalance dates.

The results in **Fig. 8** show that the Index Effect continues to be present for unscheduled deletions but not for unscheduled additions.

Table 2 shows a summary of whether or not the Index Effect is present in the recent rebalances of several indices on unscheduled rebalances. Results for scheduled rebalances (and S&P, which has not had a formal schedule) are shown in Table 1. The Index Effect is present in many more cases, particularly deletions, for the unscheduled rebalance than it is for the scheduled rebalance.

Core Indices (Large, Large-Midcap)		
	Additions	Deletions
Russell 1000	No	Maybe
FTSE 350	Yes	No
FTSE Developed	No	Yes
FTSE Emerging	No	Maybe
FTSE All World	No	Yes
FTSE Europe	Yes	Yes
FTSE Asia Pacific	Maybe	Yes

All Cap Indices		
	Additions	Deletions
Russell 3000	Maybe	Yes
FTSE All Share	Yes	No
FTSE Developed All Cap	No	Yes
FTSE Emerging All Cap	No	Maybe
FTSE Global All Cap	No	Yes
FTSE Europe All Cap	Yes	Yes
FTSE Asia Pacific All Cap	No	Yes

Table 2. Whether or not the Index Effect is present in the recent unscheduled rebalances of 16 indices.

As previously mentioned, unscheduled deletions include a large number of stocks in distress, which may be the primary distinguishing feature of these events. That distress carries over to the Style exposures of those names in Axioma's fundamental factor risk models. One would expect these names to have small market capitalization, low momentum, low earnings yield, and high volatility.

The question naturally arises whether or not Style exposures can be used to magnify the Index Effect magnitude for unscheduled deletions. **Figures 9 and 10** illustrate that Style exposures can be used to identify good candidates for the Index Effect.

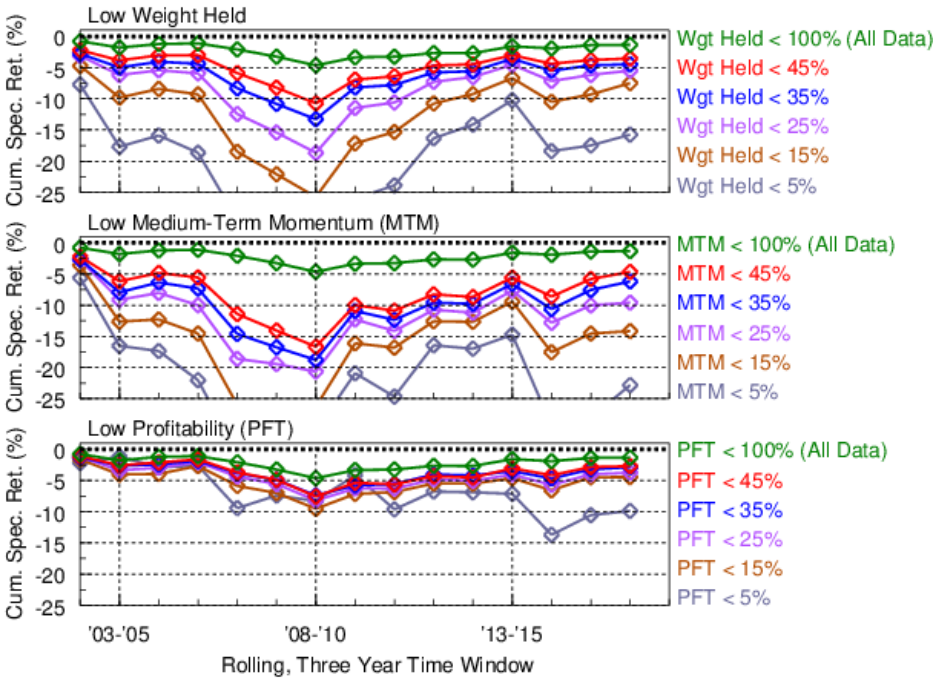

Figure 9. Excess returns for the FTSE Developed All Cap Index for the 10-day buy-and-hold strategy for unscheduled deletions as a function three style factors: Top = weight held (size); middle = medium-term momentum; bottom = profitability. Percentiles corresponding to each colored curve are shown at the right.

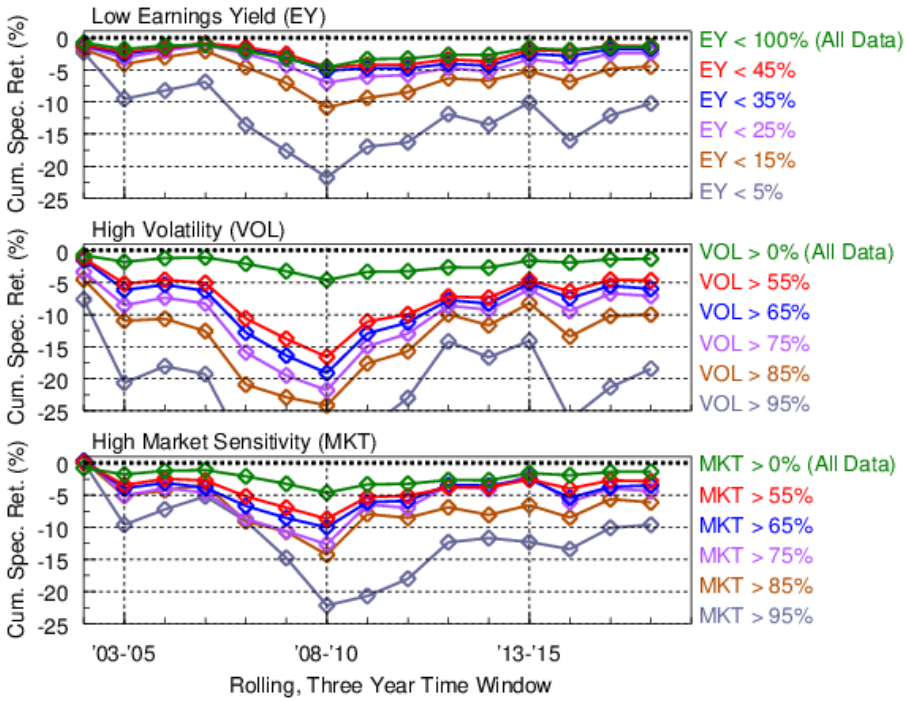

Figure 10. Excess returns for the FTSE Developed All Cap Index for the 10-day buy-and-hold strategy for unscheduled deletions as a function three style factors: Top = earnings yield; middle = volatility; bottom = market sensitivity (beta). Percentiles corresponding to each colored curve are shown at the right.

The data in **Figs. 9 and 10** show that the magnitude of the excess negative return for unscheduled deletions is strongly dependent on style factors, with larger, negative returns being associated with:

- Low weight held (size)
- Low medium-term momentum
- Low profitability
- Low earnings yield
- High volatility
- High market sensitivity (beta)

Although not shown here, the scheduled deletions do not exhibit the strong style-factor dependence that the unscheduled deletions do.

5. A Related Example: GICS Changes

So far, we have sought evidence of the Index Effect in both scheduled and unscheduled index changes and tested whether various stock characteristics can be used to identify assets with stronger Index Effects. In this section we examine a related market change that exhibits a similar kind of effect on asset returns.

The Global Industry Classification Standard (GICS) is an industry taxonomy developed in 1999 by MSCI and Standard & Poor's for the global financial community. A number of sector ETFs derive their constituents directly from GICS, so changes in the GICS classification, which are announced more than a year in advance, are associated with required trading for passive products to reflect the names have been added and deleted from the relevant sector.

This situation is somewhat different from the index changes we have examined so far in that names are shifted from one sector or industry to another, not dropped entirely from a given index. In that sense, this situation is more comparable to names that migrate from, say, a large cap index such as the Russell 1000, to the neighboring small cap index, e.g., the Russell 2000, or vice versa.

Even though the analogy with the Index Effect is imperfect, we examine the excess returns associated with the most recent change to GICS. On October 1, 2018, a new Communications Services sector was added to GICS. Selected stocks that were formerly in the Consumer Discretionary, Telecommunication Services, and Information Technology sectors were reclassified as Communications Services, and the Telecommunication Services sector was discontinued.

Sector ETF and Index providers adjusted their offerings to reflect that change. For example, the Communication Services Select Sector SPDR® Fund (XLC) was established as of 6/18/2018, three and a half months in advance of the GICS change. S&P Dow Jones rebalanced its indices on the close of September 21, to coincide with the quarterly rebalance (one week before). MSCI implemented the change on November 30 as part of its 2018 Semi-Annual Index Review (one month late).

Figure 11 shows the excess return for a strategy that buys the names to be added to the new GICS Communications Services sector up to 20 days prior to the formal introduction of the new sector on 10/1/2018. Three All Cap universes are considered: The S&P 1500, the Russell 3000, and the FTSE Developed All Cap. In all cases, the names to be added exhibited large positive excess returns. In most cases, these excess returns are larger than the standard errors.

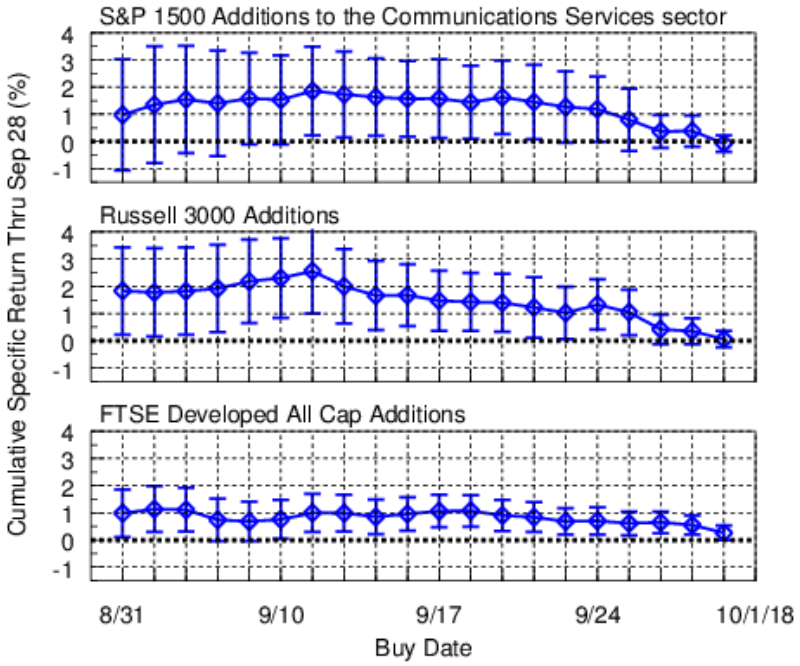

Figure 11. Excess returns for additions to the new GICS Communications Services sector. Top: S&P 1500; middle = Russell 3000; bottom = FTSE Developed All Cap. The strategy buys the names on the date indicated on the horizonal axis and sells the name on the close of 9/28/2018.

6. Discussion and Conclusion

The fact that the Index Effect has been weakening over the last several years may come as a surprise. The rise of passive investing along with the perfectly reasonable intuition that the low tracking error requirements for passive products would force indexers to trade at a loss when an index rebalances suggests that the Index Effect would strengthen, not weaken. Nevertheless, the data conclusively indicates that the Index Effect has weakened considerably for large- and mid-cap indices. However, the Index Effect remains present with many small-cap stocks and indices.

The fact that the Index Effect has weakened at the same time that passive investing has surged in market share suggests (but does not prove, obviously) a connection between these two effects. A plausible hypothesis is that the ETF market makers (e.g., authorized participants) have weakened the Index Effect by trading on price movements before the official rebalance date and before the price movements can become sustained. It is also worth noting that the ETF market is constructed so that authorized participants have three trading days to deliver on promised trades and an additional three-day grace period to deliver after that (Evans, 2018). With such a delivery schedule, the sharpness of the

official index rebalance date becomes a bit fuzzy and the number of potentially lucrative trading strategies around index rebalancing increases.

Historically, unscheduled rebalances have not drawn the same level of attention that scheduled rebalances have. However, it is well-known that trading desks often study an index's methodology in order to anticipate both scheduled and unscheduled events, with the hope of profiting from those events. The data herein shows that unscheduled deletions continue to exhibit the Index Effect for all market cap levels. The question that naturally arises, then, is: if ETF trading has weakened the Index Effect for scheduled rebalances, why has it not weakened the Index Effect for unscheduled rebalances, since the trading incentives for authorized participants are identical in both cases?

It may be that the distress for stocks being deleted on an unscheduled rebalance date engenders a level of illiquidity that even ETF traders cannot overcome. ETF advocates often emphasize that ETF traders add to market liquidity but they cannot generate liquidity when it doesn't exist.

Of course, there are other potential explanations for the weakening of the Index Effect. Since 2013, most markets have experienced low volatility, reduced trading costs, and bullish returns. These conditions may well explain in part why the Index Effect has weakened.

Perhaps the most important take-away from the present research is the recognition that the Index Effect has evolved substantially over the last few years. The excess returns observed one or two decades ago may no longer be achievable, at least for large- and mid-cap stocks. One should be cautious about Index Effect results that report over, say, a 30-year time window. Such an approach will undoubtedly provide the researchers with a high degree of statistical significance for their results, but the benefits they describe may only be available to portfolio managers who can travel back in time.

7. References

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8. Acknowledgements