

## Index Rebalancing and the Technology Bubble

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**Abstract:** To maintain coverage of their target universe, stock market indices must periodically be rebalanced. This can give rise to turnover that is large, even by the standards of actively managed portfolios. High turnover is not only costly; it can also have a marked impact on reported returns. We demonstrate the problems posed by index rebalancing through a case study of how the year-2000 technology bubble interacted with index rebalancing rules to enhance the performance of a popular index. We draw on this case to discuss the design of performance benchmarks.

**Keywords:** *index funds; benchmark; passive management; rebalancing; performance measurement; smaller companies*

### Introduction

Stock market indices are essentially passive portfolios. A passive portfolio comprises a broad basket of securities – for example all domestic equities, or the 100 largest stocks. To be regarded as passive, the portfolio must also be subject to the minimum of turnover. However, unless indices are rebalanced from time to time, they will eventually deviate from their target coverage of the investment universe. Rebalancing is required to take account of new listings and delistings, changes in the relative sizes of index constituents, and entry or exit from the target segment of the market.

Rebalancing amounts to trading in the constituents of an index. There is therefore a conflict between the need for passivity in coverage (ensuring the index does not deviate from, say, the 100 largest companies) and passivity in turnover (ensuring the index does not undertake avoidable transactions). When rebalancing activity reaches a significant threshold, the index is impaired. For example, it may experience turnover at levels that

are unacceptable to investment professionals who, unlike index compilers, incur transaction costs when securities enter and leave a portfolio. With excessive rebalancing, an index can cease to be suitable as a passively managed benchmark.

An 'all share' type of equity index needs a relatively modest amount of rebalancing activity: initial public offerings (IPOs) have to be brought into the index portfolio, and constituents have to be re-weighted when listed companies issue shares. Size-based indices, however, are rather more troublesome. This is because more substantial rebalancing is required in order to ensure that an index continues to cover companies of the requisite market capitalisation. In particular, mean-reverting or mean-averting stock price behaviour can have a marked impact on performance.

Historically, contrarian investment strategies had been thought to be profitable. DeBondt and Thaler (1985) find that stocks that have outperformed over several years tend subsequently to underperform, and vice versa. Jegadeesh (1990) and Lehman (1990) find that stocks that have outperformed over the previous week or month tend also to underperform, and vice versa. Since they are transaction intensive, such short-term price patterns are, inevitably, difficult to exploit in practice, but indices can still appear to benefit from such anomalies. Campbell, Lo and MacKinlay (1997) provide a detailed survey of the literature on mean-reversion in stock prices. The jury is out as to whether mean-reversion or mean-aversion is on average to be expected, or whether these patterns are perceived as a result of data-mining past series. Transient periods of reversal or momentum are, however, frequently observed.

Exposure to mean-reverting or mean-averting stock price behaviour is fundamental to size-based indices. Low-capitalisation indices include firms that have had smallness thrust on to them, and these once-larger companies sometimes continue to decline, but also quite often recover. In the UK, mean-reversion may have enhanced the long-term performance of low-cap investment strategies over a number of periods (see Dimson and Marsh, 1999). Large companies include firms whose growing market capitalisation accelerates them into the realms of the market leaders, and these once-smaller firms sometimes continue to grow, but also quite often revert back to their earlier status. This may have contributed to the fact that, before the 100-share index went live, the return on the FTSE 100 index was below the return of the market as a whole (see Dimson and Marsh, 1984). The impact of mean-reversion can vary over time. Stock market reversals benefited value and low-cap investors during the 1980s. During the 1990s momentum strategies, which exploit trend persistence rather than mean reversion, proved more successful.

The literature on portfolio rebalancing clarifies the potential profitability of reversal-based investment strategies, and compares this with the profitability of trend-following strategies. Even though much of this analysis is in the context of selecting a portfolio from a very limited range of assets (such as equities and bonds) the insights are broader than this. Arnott and Lovell (1993), together with Goodsall and Plaxco (1994,1996), popularised the concept of disciplined rebalancing at the asset class level, and present evidence on the impact of differing rebalancing frequencies. Perold and Sharpe (1988, 1995) stress that the profitability of rebalancing a portfolio will be low if appreciating (depreciating) assets continue to rise (fall) in value, and will be high if appreciating (depreciating) assets go on to fall (rise) in value.

As global markets switched from the trend-following internet and technology euphoria of 1999 to the bursting bubble of 2000, there was a profound change in the rewards to different investment strategies. While the logic that underpins a fund manager's trading may not be observable, indices follow strictly mechanical rules for portfolio management. By examining a detailed case study, which deals with size-based indices, we can learn about the impact of differing investment strategies, the importance of rebalancing frequencies, and the susceptibility of benchmarks to unexpected distortions. This is the focus of our article.

In this article we look at a case study, based on the smaller companies sector of the UK equity market. We illustrate the problems inherent in portfolio rebalancing by examining the large gap that opened up during the year 2000 between the performance of two low-cap equity indices. These indices were originally designed to measure the same segment of the market, and were previously thought by many to be close substitutes. However, their respective performance figures diverged by a large margin over the course of 2000, not primarily because of the market segment they represent, but because of their differing approaches to index rebalancing.

The indices we examine are the Financial Times-Stock Exchange (FTSE) SmallCap and the Hoare Govett Smaller Companies (HGSC) indices. The FTSE SmallCap is defined as all FTSE All-Share constituents that fall outside the FTSE 350, an index that targets the largest 350 UK stocks. The SmallCap is rebalanced in complex way (described below) based on quarterly reviews, but there are also numerous intra-quarter constituent changes. The HGSC is rebalanced only once per year, so as to ensure that it covers all equities that fall within the bottom 10 percent of the UK market by value. This currently results in a rather larger size threshold for what constitutes a smaller company than the SmallCap. However, the focus of our case study is not on size differences, but on the impact of the different intra-year rebalancing rules. Focusing just on the FTSE SmallCap constituents at the start of 2000, we show that the two different index rebalancing rules led to a return difference during 2000 of some 7 ½ percentage points.

By understanding the reasons for the discrepancy between these two indices, we cast light on how to design, manage and interpret stock market indices. We start by presenting our case study – an analysis of the year's performance by small capitalisation stocks. In the section on 'rebalancing and index turnover' we examine the alternative index rebalancing rules, and their impact on index turnover. We will then turn in the section on 'the technology bubble' to look in detail at the first quarter of 2000, when new economy stocks were promoted out of the FTSE SmallCap into the FTSE 350 index. We quantify the impact of the technology bubble on index performance. Our concluding section includes a discussion of the dangers of making an inappropriate choice of investment benchmark.

## **Case study**

We begin with the recent performance of the HGSC and FTSE SmallCap indices. The HGSC is Britain's longest established small-company index, compiled on a consistent basis from 1955 to date. It is described in Dimson and Marsh (2000) and is the basis for

classifying UK smaller-company unit trusts (AUTIF, 2000). Perhaps because of its long history, it is used widely as a benchmark for evaluating performance of UK equity portfolios (e.g., Quigley and Sinquefeld, 2000). Launched in 1993, the FTSE SmallCap is described in FTSE (2000). The SmallCap is part of the FTSE-Actuaries UK share index series disseminated by FTSE International.

Both the HGSC and FTSE SmallCap are arithmetic indices, with each constituent's performance being weighted in proportion to its market capitalisation. There can occasionally be minor deviations in relative weightings, for example, because the two index providers compute market capitalisations in slightly different ways, but these are immaterial. In practice, performance deviations between the two indices are almost entirely attributable to just two factors: start-year differences in index composition, and/or subsequent index rebalancing.

By definition, the HGSC starts each year with comprehensive coverage of the bottom tenth by market capitalisation of the main UK equity market. Over time, this has given rise to a maximum market capitalisation for index constituents that has kept pace with what most investors view as a smaller company. In contrast, the FTSE SmallCap is defined as a residue. It comprises those FTSE All-Share constituents that are left over, after determining the composition of the FTSE 100 and 250.

The HGSC went live at the beginning of 1987. When the FTSE SmallCap was introduced in 1993, it had a similar cut-off to the HGSC. Since then, several years of relative outperformance by larger companies has caused the FTSE SmallCap index to shrink in coverage, so that by the start of 2001 it represented just four percent of the market. The FTSE Fledgling index, which comprises companies too small to be included in the FTSE All-Share, represented a further one percent. But even taken together (as the FTSE All-Small), these two indices account for only around half the value of the HGSC's small-cap universe. In order to achieve its coverage of the bottom tenth by value of the market, the HGSC now includes over half the stocks in the lower reaches of the FTSE 250.

To compare the HGSC with the FTSE SmallCap, we divide the HGSC into four components. The first two comprise the FTSE SmallCap and the FTSE Fledgling constituents. All of these companies are also constituents of the HGSC. The overlap of the HGSC with the FTSE 250 index comprises our third HGSC component. The fourth component consists of all the remaining HGSC constituents, namely those small stocks which the FTSE indices exclude because of liquidity, free-float, or other constraints, or because they are split trusts, etc. We then assess the contribution of each of these components to the HGSC's return over the course of 2000.

Table 1 shows the buy-and-hold return for each group of stocks, assuming there was no subsequent intra-year index rebalancing. This is the approach used for the HGSC index, which is rebalanced just once a year. For the FTSE SmallCap, the buy-and-hold return column in the table thus shows the performance of the companies that were constituents of that index at the end of 1999, ignoring any subsequent changes in index membership.

**Table 1: Performance of HGSC Index Subcomponents Over 2000**

Subcomponent of HGSC Index	Start-2000 weight in HGSC (%)	Return on buy-and-hold basis (%)	Published index return (%)
FTSE 250 stocks within HGSC	35.4	1.5	n.a.
FTSE SmallCap stocks	46.4	-1.9	5.5
FTSE Fledgling stocks	10.5	6.1	8.0
Non-FTSE stocks within HGSC	7.8	6.7	n.a.
Total HGSC Index	100.0	0.8	0.8

Over the course of the year, the HGSC's 0.8 percent return was simply the weighted average return on its four subcomponents. Over this period, the HGSC outperformed the FTSE All-Share. As is frequently the case when smaller companies outperform the market as a whole, the smallest companies *within* the HGSC perform best of all. The table shows that this was indeed the case during 2000, with the smaller FTSE Fledgling constituents performing the best, with a return of 6.1 percent, compared with a return of -1.9 percent for the FTSE SmallCap constituents. Over this period, the HGSC's FTSE SmallCap constituents therefore dragged down its performance.

The most striking difference revealed in Table 1, however, is between the FTSE SmallCap buy-and-hold return of -1.9 percent and its published return of 5.5 percent, shown in the final column of the table. Since the -1.9 percent is the return from the original start-year constituents, it follows that the large difference of 7.4 percent between these two numbers must be attributable to FTSE SmallCap constituent changes made over the course of the year.

Normally, we would expect the differences arising from intra-year constituent changes and rebalancing to be small. Averaged over a number of years, we would expect the effects to be roughly neutral (although over the last decade, they may even have been slightly negative). To understand how such a large difference could have arisen over the course of 2000, the next section reviews the FTSE constituent change rules, and documents how these gave rise to high levels of turnover. Later, we show how these high turnover levels coincided with unusual stock market conditions, and how this distorted index performance.

### **Rebalancing and index turnover**

There are a number of differences between the rebalancing procedures used for the FTSE and HGSC indices. The HGSC is designed to follow a policy that could be replicated by a fund manager seeking to track index performance without excessive turnover. Clearly, any small-company index needs to be rebalanced periodically;

otherwise it ceases to do its job. But rebalancing an index too often leads to too many stocks bouncing in and out of the index. The result is high monitoring costs and needless turnover, which is costly for investors.

Prior to launch of the HGSC in 1987, research suggested that over the period 1955-86, annual rebalancing provided the best trade-off for a small-cap index. This also coincided most closely with the way in which active investors managed and reviewed their portfolios. Mostly, they let their successes run for a while instead of selling stocks as soon as they move beyond a technical boundary. The HGSC definition leads to an annual exercise that divides the stock market into high-cap equities (the top 90 percent of the market) and smaller companies (the bottom 10 percent). The high-cap equity index, together with subdivisions of the smaller companies index, are analysed in Dimson and Marsh (2001).

When FTSE International introduced its own SmallCap index in 1993, followed by the Fledgling in 1995, it chose mostly to follow the HGSC rebalancing philosophy with respect to smaller companies. The FTSE SmallCap and FTSE Fledgling are rebalanced just once a year in December, and it is only at this point that rebalancing takes place between the SmallCap and Fledgling, and that all IPOs are allowed to enter (only larger IPOs are allowed to enter at the quarterly rebalancing dates).

However, at the top end of the SmallCap index, throughout the year there is a steady interchange of constituents with the FTSE 250. The traffic is heaviest at the four quarterly rebalancing dates. The process is driven, however, by large-cap not small-cap considerations. It is a direct by-product of the way FTSE International defines and maintains its larger-capitalisation indices.

The FTSE 100 and FTSE 250 are managed so as to ensure they always contain exactly a hundred and 250 constituents. Together, these stocks comprise the FTSE 350 index. As noted above, small-caps are simply the residue of All-Share constituents that fall outside the 350. This means that whenever a FTSE 100 stock is acquired, or an IPO enters the FTSE 100 directly, this reverberates down the line, and requires a promotion from (or demotion into) the FTSE 250, which in turn requires a promotion from (or demotion into) the SmallCap. Similarly, the acquisition of a FTSE 250 stock triggers a promotion from the SmallCap. These adjustments are made as needed throughout the year. In addition, each quarter, stocks are reassigned to ensure that the FTSE 100 contains the hundred largest stocks (subject to certain buffer limits) and the FTSE 250 contains the next largest 250 stocks. This generates significant turnover as FTSE 250 stocks are relegated to the SmallCap and SmallCap stocks are promoted to the FTSE 250.

The FTSE SmallCap is therefore a potentially high turnover index. At the start of 2000, the SmallCap had 457 constituents. During the course of the year, but excluding the major end-year December 2000 rebalancing exercise, there were 82 promotions to, and 76 relegations from, the FTSE 250. In addition, 36 other securities were acquired or left the index for other reasons, while 15 constituents, mostly larger IPOs, were added (again, this excludes the major annual rebalancing exercise in December 2000). To mirror these changes, a SmallCap tracker fund would need to have incurred turnover. Measured as purchases plus sales, expressed as a percentage of start-quarter fund value,

quarter-by-quarter turnover in the index during 2000 was 49, 30, 36 and 13 percent respectively, where the figure for the final quarter excludes the turnover incurred in the major end-year rebalancing. Further details on turnover within the FTSE index series are provided by Brumwell (2000).

Summing these quarterly figures gives a total turnover for the year of 128 percent. Of this, 17 percent was unavoidable, since it involved reinvestment of the proceeds from acquisitions, etc.. The balance of 111 percent relates to avoidable, intra-year turnover incurred as a result of the FTSE index management rules. This is a very high level of turnover for a passive fund, particularly since it excludes end-year turnover associated with the major annual rebalancing exercise. It implies a total annual turnover that far exceeds the volume of transactions for most actively managed small-cap funds. In addition, this high level of turnover is not an observation made with hindsight, after the bubble had burst. Indeed, in January 2000 it was already clear that *'trading costs and rebalancing expenses are now much larger for portfolios that track the FTSE All-Small than for HGSC trackers'* (Dimson and Marsh, 2000, page 43).

Despite the fact that the FTSE 250 uses buffer zones to dampen down index turnover, many promotions and demotions are rapidly reversed. In the second quarter review during June 2000, fourteen of the promotions made earlier in the year were reversed, and likewise twelve of the demotions. An extreme example of avoidable turnover arising from these rules was the promotion of Vocalis to the FTSE 250 on June 5<sup>th</sup> 2000, when it had a market capitalisation of just £88 million and was ranked 700<sup>th</sup> in the market. This promotion was reversed just ten trading days later as a result of the quarterly review.

Small-cap indices have a lower overall market capitalisation than mid-cap indices such as the FTSE 250. It follows that a misclassified security has a bigger distortionary impact on small-cap than on mid-cap indices. Rebalancing has to be considered particularly carefully for low-capitalisation index series.

### **The Technology Bubble**

New economy and technology stocks performed strongly during the early part of 2000, while old economy stocks mostly underperformed. New economy stocks reached their peak on March 10<sup>th</sup> 2000. From then on they fell sharply, while old economy stocks staged a comeback.

The March 10<sup>th</sup> peak coincided almost exactly with the FTSE quarterly review, which was completed on March 8<sup>th</sup> and came into effect at the close of business on March 17<sup>th</sup>. A high proportion of the stocks that were promoted out of the FTSE SmallCap at this time were thus new economy stocks, drawn from the best performing sectors at that time. The stocks that were demoted from the FTSE 250 into the SmallCap to replace them tended to be old economy stocks, drawn from the worst performing sectors.

**Table 2: Sector Reversals During 2000**

Performance	Sector	Return from end-1999 to March 17 <sup>th</sup> 2000	Return from March 17 <sup>th</sup> 2000 to end-2000
Ten best sectors up to March 17 <sup>th</sup>	Electricity	81.8	-100.0
	Pharmaceuticals	68.8	-16.1
	Telecommunication services	61.5	-84.6
	Software and computer services	36.1	-57.8
	Electronic and electrical equipment	31.1	-4.7
	Media and photography	20.7	-15.8
	Distributors	19.0	-16.3
	Leisure, entertainment and hotels	15.4	-29.8
	Information technology hardware	11.4	-40.3
	Health	10.3	-4.8
Ten worst sectors up to March 17 <sup>th</sup>	Forestry and paper	-26.5	19.4
	Oil and gas	-22.3	21.9
	Water	-20.9	61.4
	Insurance	-19.8	66.1
	Restaurants, pubs and breweries	-16.0	5.3
	Aerospace and defence	-13.9	20.5
	Engineering and machinery	-13.2	5.4
	Beverages	-12.1	18.3
	Construction and building materials	-11.8	31.0
	Personal care and household products	-10.0	2.1

Table 2 shows how dramatically the market's performance changed prior to and after the FTSE rebalancing date of March 17<sup>th</sup> 2000. The top panel of the table shows the ten best performing HGSC sectors up to March 17<sup>th</sup>, while the bottom panel shows the ten worst performing sectors. The table shows the return for each of these twenty sectors over the period prior to March 17<sup>th</sup> (penultimate column) and then from March 17<sup>th</sup> to the end of the year (final column). The figures speak for themselves. The reversal effect was large and pervasive. Without exception, the best performing sectors prior to March 17<sup>th</sup> all subsequently experienced negative returns (often large), while the worst performing sectors from the earlier part of the year all enjoyed positive, and often large, returns from that point on.

Given the performance reversal documented in Table 2, it is hardly surprising that the FTSE SmallCap benefited enormously from the first-quarter component changes and rebalancing. Table 3 shows the performance of the FTSE SmallCap promotions, demotions and continuing constituents from March 17<sup>th</sup> 2000 onward. The stocks that were promoted out of the FTSE SmallCap into the FTSE 250 during the first quarter performed extremely poorly subsequently, with a weighted average return of -39.9 percent (March 17<sup>th</sup> quarterly review changes) and -29.8 percent (other first-quarter promotions). While these promotions were only 33 in number, they represented 23 percent of the FTSE SmallCap by value. In contrast, the stocks demoted into the SmallCap, representing 12 percent of its rebalanced value, performed very well, with a

weighted average return of 41.4 percent. This contrasts with the stocks that continued in the index. Those securities that had been a constituent since the start of the year, and which remained index members after the quarterly review, gave a return of -3.8 percent.

**Table 3: Performance of FTSE SmallCap Promotions and Demotions Over 2000**

FTSE SmallCap Constituent Changes	Number of stocks	March 17 <sup>th</sup> value as % of rebalanced SmallCap	Return after March 17 <sup>th</sup> review (%)
Promotions to FTSE 250 (in March 17 <sup>th</sup> review)	24	17.2	-39.9
Promotions to FTSE 250 (before March 17 <sup>th</sup> )	9	5.9	-29.8
Demotions from FTSE 250 (in March 17 <sup>th</sup> review)	32	12.0	+41.4
Stocks continuing in SmallCap (after March 17 <sup>th</sup> )	420	87.0	-3.8
Overall performance of the FTSE SmallCap			-4.4

From the end of 1999 to March 17<sup>th</sup> 2000, the FTSE SmallCap enjoyed a return of 10.4 percent. After March 17<sup>th</sup>, the return over the remainder of the year was -4.4 percent. Based on the figures in the above table, we estimate that had the index not been rebalanced, the return from March 17<sup>th</sup> until the end of 2000 would have -10.9 percent. Without the first-quarter constituent changes, the FTSE SmallCap would thus have returned -1.7 percent for the year. This is very close to the buy-and-hold return of -1.9 percent reported for the FTSE SmallCap constituents in Table 1 above. Virtually the entire performance difference between the buy-and-hold return for the FTSE SmallCap and the published index return was therefore attributable to first-quarter index constituent changes.

Our focus here has been on the FTSE SmallCap's performance, but the rebalancing had knock-on effects for the FTSE 250, with the poor subsequent performance of the promotions into the FTSE 250 (see Table 3) having a negative impact on index performance. Yet interestingly, the buy-and-hold return on the FTSE 250 was lower than the published index return. This is because the same rebalancing story was being played out between the FTSE 250 and the FTSE 100. The FTSE 250 exported new economy stocks to the FTSE 100, and in return received old economy demotions from the FTSE 100. Because these tended to be the larger stocks, the performance uplift from rebalancing the FTSE 100 outweighed the adverse impact from rebalancing the FTSE SmallCap. In aggregate, the FTSE 250 thus benefited from constituent changes made in the first quarter of 2000, while the loser was the FTSE 100.

## **Performance benchmarking**

If a small-cap index is rebalanced frequently, there is a risk that larger and more volatile constituents may disappear from the index shortly after a stock has been purchased. The manager who has bought such a stock may come under pressure to close out a position that would otherwise be maintained. Trades may therefore be reversed unexpectedly. Unanticipated transactions that do not have a fundamental rationale are likely to be costly, especially when they involve relatively illiquid securities. It is hence inappropriate to use, as a small-cap benchmark, an index that is rebalanced too frequently.

Though they generally monitor their positions on a regular basis, many managers conduct a once-per-year review of investment strategy. The infrequency of such reviews allows holdings that were acquired for the long term to be maintained for a reasonable period. The case for annual index rebalancing therefore has some connection with the practices of investment professionals. Indeed, both Wilshire Associates and Frank Russell International reconstitute their US and non-US size-based indices on a once-per-year cycle, at around the middle of the calendar year.

Thus the British HGSC and the leading foreign indices are rebalanced annually. Moreover, all these index compilers avoided the fateful end-of-first-quarter timing that afflicted rebalancing of the FTSE SmallCap in 2000. This good fortune does not, of course, mean that index rebalancing should be undertaken only on a yearly cycle. Nevertheless, the FTSE SmallCap rebalancing process, which embodies an unusual mix of both quarterly and annual rebalancing, is idiosyncratic. It is linked neither to the needs of fund managers, nor to the requirement to control the level of index turnover.

To the extent that fund managers' behaviour corresponds more closely to the HGSC's investment strategy, rather than the SmallCap's, we would expect UK small-cap fund managers to match the HGSC on average during 2000, and underperform the SmallCap. Data from Micropal of the performance of UK smaller companies unit trusts bears this out. For the 75 UK smaller companies trusts monitored by Micropal, the mean return over the year 2000 was 0.6 percent, while the median return was 0.4 percent. This compares with the HGSC return of 0.8 percent, and the FTSE SmallCap return of 5.5 percent. For the HGSC, 48 percent of funds beat the index, while 52 percent underperformed the HGSC. In contrast, only 25 percent of trusts managed to exceed, or even match, the FTSE SmallCap return.

Even SmallCap trackers will have experienced difficulties, since it would have been almost impossible during 2000 to execute the necessary volume of transactions in a timely way, given the speed and severity of the March 2000 reversal. Indeed, the only small-cap tracker for which NAV data is publicly available, the Themis All-Small Investment Trust, appears to have underperformed its benchmark (FTSE SmallCap plus Fledgling, excluding investment companies) by 4.3 percent during 2000 – a large discrepancy for an index fund.

At the same time, an increasing number of small-cap investors are questioning the use of arbitrary market-capitalisation limits for size-based indices. The current US interpretation of small capitalisation is companies with a value of up to some \$1 ½

billion. It is worth noting that the HGSC market capitalisation limit, as at the end-2000/start-2001 rebalancing date was £793 million or just under \$1.2 billion. This is more than double the upper bound for market capitalisation that is at present implied by the FTSE SmallCap.

In recent months there have been two developments that have spurred investment managers to look more carefully at the benchmarks to which they adhere. One is the increasing interest of clients in paying fees that are linked to performance relative to a benchmark. The other is the threat of litigation for performance that falls dramatically below the benchmark, given the risk level of the fund. It is likely that these developments will increasingly persuade asset managers to scrutinise the index that underpins investment performance measurement. We hope this paper has illuminated some of the issues that demand attention.

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