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# Stock prices, stock indexes and index funds

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*In recent years, many UK investors have given up the quest for superior performance and have instead simply sought to match the returns on some broad market index. This has led to the suggestion that the growth in index funds has depressed the stock prices of those companies that are not represented in the index and has thereby increased their cost of capital. This effect may have been accentuated by the actions of fund managers, whose performance is compared with that of a market index and so who also have an incentive to avoid those stocks that are not included in the index. This paper argues that, in practice, these price effects are likely to be very small. In support of this view, the paper examines the price adjustments that occur when a stock is added to, or removed from, a stock market index.*

## Introduction

The well-documented difficulty of choosing an active fund manager who will provide superior performance has led to a rapid growth in index funds in the United Kingdom. These index (or ‘tracker’) funds do not seek to provide superior investment performance, but instead are designed to match the returns on a broad stock market index.

The distinction between index funds and funds that closely resemble some benchmark portfolio is somewhat artificial, but in 1999 explicitly indexed funds were estimated to hold about £134 billion of equities (see Table A).<sup>(2)</sup>

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**Table A**  
**Index funds—holdings of equities; 1999**

	£ billions
Pension funds	98.1
Insurance	11.9
Retail	2.0
Overseas	22.0
<b>Total</b>	<b>134.0</b>

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Although about 22% of pension equity holdings are indexed, the proportion is much smaller for other categories of investor, so that the total estimated investment in indexed funds amounts to 8.6% of the capitalisation of UK-traded equities.

One commonly expressed concern is that the growth of investment in these funds has pushed up the price and lowered the required return of index stocks. Correspondingly, (it is argued), index funds do not

hold the stocks of smaller companies that are not included in the market index and this has increased the cost of capital for these companies.<sup>(3)</sup>

Though index funds have an obvious reason to avoid stocks that are not included in the market index, many other funds may also be reluctant to buy such stocks. This reluctance arises from the common practice of measuring a fund’s performance against that of a market index. In this case, an investment in the index is effectively risk-free in the eyes of the manager, while investments in excluded stocks are risky and will therefore be held by a risk-averse manager only if they offer a correspondingly higher return. So index funds and performance benchmarking are likely to have similar effects on required returns.

These concerns about the effects of index funds and index benchmarking seem to have been heightened by the relatively poor performance of small-firm stocks in recent years, when indexation has boomed. For example, while the Hoare-Govett Smaller Companies (HGSC) index outperformed the FTSE All-Share index by an average of 6.1% a year during the period 1955–86, the average annual return on the HGSC index was 6.4% below that on the All-Share index during the years 1989–98. As will be evident from the discussion below, it is implausible that index funds can account for these sharp differences in stock returns. Nor are alternative explanations lacking, for the underperformance of small-firm stocks during these years has been largely a consequence of their industry composition and has been matched by a lower growth in dividends (see Dimson and Marsh (1999)). Moreover, the indexation argument does not sit easily with the more recent

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(1) I am grateful to colleagues at the Bank of England and to Elroy Dimson of the London Business School for providing comments on this paper. The paper has benefited from considerable assistance from Louise Boustani and Stephen Senior.

(2) I am grateful to Lindsay Tomlinson of Barclays Global Investors for providing these estimates.

(3) For example, a CISCO survey of analysts that specialise in small companies found that more than 90% believed that the growth of index funds is damaging the market for smaller quoted companies. See Thunhurst (1999).

performance of small-cap stocks; in 1999 the HGSC index provided a return of 54.2%, 30% above that of the All-Share index.

The rest of this article is organised as follows. The next section uses a simple mean-variance portfolio model to examine the effect of the portfolio adjustments forced on other investors by index funds. The discussion suggests that it is improbable that the growth of index funds in the United Kingdom has had any economically significant effect on the cost of equity capital. The following section widens the discussion to look at the possible effect on stock prices of using the market index as a benchmark to assess the performance of active as well as passive managers. Since we cannot, *a priori*, specify managers' reluctance to take on the risk of investing outside their benchmark, we can be less dogmatic about the magnitude of the effect. The fourth section looks at the empirical evidence of the effect of index composition on equity prices. Although this evidence is not unanimous, we place most weight on the modest price effects of adding a stock to the market index or removing it. These effects suggest that adding a stock to a market index is likely to change required returns by only a few basis points. A puzzling finding is that the effect of index changes is not confined to the FTSE All-Share index, despite the fact that this is the benchmark for most index funds and for measuring the performance of active portfolios. This suggests that changes in index composition may have some labelling or information effect. The final section provides a summary and conclusion.

### The effect on stock returns of changing portfolio weights

As index funds are passive investors, their transactions do not provide information to other investors, and these funds take considerable care when trading to demonstrate that their transactions are not information-motivated. So the purchase of stocks by index funds is unlikely to have a significant direct effect on the price of index stocks.

However, the activities of index funds may change the market proportions of large and small-company stocks that are available to non-indexed (or 'active') investors. These investors are therefore obliged to hold a higher proportion of small-company stocks than they formerly held. Since no single active investor is constrained to hold particular proportions of large or small-firm stocks, the stock prices of small firms would need to decline to induce the active investors to increase their holdings. The extent of this

decline depends on the magnitude of the changes that the active investors are required to make and the effect of these changes on portfolio risk. For example, if small-firm stocks are close substitutes for large-firm stocks, these investors will require a smaller inducement to make the portfolio shift.

We can put some approximate numbers on the price adjustments needed to bring about the necessary shifts in portfolio holdings. UK index funds hold an estimated 8.6% of the total market, and all but about 5% of these funds are indexed to the FTSE All-Share index. For simplicity, therefore, we assume initially that they invest only in the All-Share index, which accounts for 93.9% of total UK market capitalisation. We use the HGSC index as a proxy for returns on non-index stocks.<sup>(1)</sup> Using index data from January 1990 to April 1999, we estimate the monthly standard deviation of the All-Share index as 4.3% and that of the HGSC index as 4.6%. The correlation between the monthly returns on the two indexes during this period was 0.82.

In the absence of index funds, the representative investor would hold 93.9% of his portfolio in index stocks. If index funds account for 8.6% of the market, then the representative active investor is obliged to reduce his holdings in index stocks to 93.3% of his portfolio<sup>(2)</sup> and to increase correspondingly his holding of non-index stocks. This portfolio shift causes a very small decline in the risk of the active investor's portfolio as it becomes better diversified. The 'beta'<sup>(3)</sup> of the index stocks relative to the portfolio of the active investor increases by a negligible 0.02%, while the comparable beta of the non-index stocks rises by a slightly greater 0.28%.<sup>(4)</sup> Since the required risk premium should be proportional to an investment's beta relative to the mean-variance efficient portfolio,<sup>(5)</sup> the direct effect of an increase in the beta is to increase the required risk premium. If active investors continue to require the same return on their portfolio, the required returns on small-firm stocks would need to rise to compensate for the relative increase in their betas. However, even if the market risk premium were as high as 10%, the increase in the cost of equity for small firms would be less than 3 basis points.

This may not be quite the end of the story, since the risk premium is unlikely to be constant. For example, if investors have constant relative risk-aversion, the portfolio risk premium that they require should change proportionately with the portfolio variance. In our example, the active manager's portfolio becomes more diversified as a

(1) Since the HGSC index contains the smallest 10% of stocks by market capitalisation, our use of this index is likely to have somewhat underestimated the standard deviation and overestimated the correlation between index and non-index stocks. The direction of the effect on our results is indeterminate.

(2) Calculated as  $(0.939 - 0.086)/(1 - 0.086) = 0.933$ .

(3) The 'beta' measures the contribution of an investment to the risk of a portfolio. It is equal to the sensitivity of the investment's return to changes in the value of the portfolio. If a portfolio is efficient, the expected reward from each holding is proportional to its beta.

(4) The beta of the index stocks relative to the active investor's portfolio increases from 1.00378 to 1.00398 and that of the non-index stocks increases from 0.94205 to 0.94467. Since the weighting of non-index stocks in the portfolio is increased, the weighted average of the betas remains at 1.0.

(5) A mean-variance efficient portfolio offers the highest expected return for a given level of portfolio risk (or variance).

result of the increased holdings of small-firm stocks and its risk therefore declines slightly. The net effect is that the required return on small-firm stocks would also decline slightly.

There are several reasons why the estimated effect of indexing on required returns is so low. The first is simply that, while there has been rapid growth in the proportion of pension portfolios that are indexed, the proportion of total market capitalisation that is indexed remains relatively modest, at 8.6%. Second, as most index funds track the All-Share index, which accounts for a very high proportion of market capitalisation, active investors are obliged to make only small portfolio shifts as a result of the activities of index funds. Third, as small-company stocks are relatively good substitutes for large-company stocks, active investors do not require much inducement to make these shifts.

It is useful to check how sensitive these findings are to the choice of parameters. We therefore repeated the exercise assuming separately that index funds account for 20% of market capitalisation, that the index accounts for 70% of the market (roughly the equivalent of the FTSE 100 index), and that the correlation between index and non-index stocks is 0.4. In no case does the beta of the active investor's portfolio increase by more than 0.01.

The changes in the required returns for non-index stocks stem from our assumption that investors who switch to index funds increase their weighting in index stocks from market proportions to 100%. This is not always the case. Some funds use index portfolios simply as a way to manage their existing holdings in large-capitalisation stocks and they continue to maintain their weighting in smaller-company stocks. In addition, some institutional investors also invest their small-firm holdings in funds that seek to track small-firm indexes. If the shift to index funds merely changes the way that investors manage their existing holdings in index stocks, then active investors would not need to make any portfolio adjustments and the growth of index funds would be unlikely to have any impact on prices of small-firm stocks.

It is also important to note that our analysis is partial insofar as it focuses only on the costs of indexation. These costs arise because a portfolio that is invested in an index fund which tracks only a sub-section of the market is mean-variance inefficient. Such funds oblige the representative non-indexed investor also to hold a mean-variance inefficient portfolio and this investor has to be 'bribed' to do so. But the costs to an index fund of omitting some stocks from the portfolio and bribing the active investor to buy them are likely to be far outweighed by the savings in management costs and transaction fees.

These cost savings should be reflected in a decline in the cost of equity for larger firms.<sup>(1)</sup>

Finally, we should note that membership of an index is partly within the control of the firms themselves. For example, if index membership conveyed substantial advantages, then firms whose stocks are included in the index would have an incentive to acquire their less fortunate brethren. While this would eliminate any index effect on returns, the process could involve significant deadweight costs.

## The effect of performance benchmarks

We have argued that the impact of index funds on the cost of capital for smaller firms is likely to be negligible. However, index fund managers are not the only portfolio managers whose portfolio decisions are affected by the composition of stock market indexes. In this section we broaden the discussion of market indexes to consider the wider issue of the effect of performance benchmarks on the cost of equity.

Approximately 80% of equity funds in the United Kingdom are managed on an agency basis by professional fund managers. The performance of these managers may affect directly the fees that they receive, or it may do so indirectly if it influences the amount of funds under management. Sometimes the performance of a portfolio is measured against that of a peer group; in other cases it is measured against a passive benchmark portfolio, which in the case of UK equity managers is typically the FTSE All-Share index.<sup>(2)</sup> It seems highly likely that a manager's portfolio decisions will be affected by the way that performance is measured.

The implications of a passive benchmark for prices have been analysed in Brennan (1993), who showed that in such a setting expected returns would vary linearly with the expected returns on both the market portfolio and the benchmark portfolio. Other things being equal, stocks that are highly correlated with the benchmark would exhibit lower expected returns. Thus Brennan's analysis of benchmarking implies that the use of market indexes to measure the performance of professional managers is likely to lower the required return on shares that are represented in the index, relative to those of non-index firms.

Investment in the benchmark index is riskless for a manager who is compared against that benchmark; the only risk that matters for him is the covariance between stock returns and the portfolio of non-index stocks. How much of this risk a manager is prepared to assume depends on his risk-aversion. Thus an index fund can be viewed as an extreme case of a

(1) Some impression of the potential impact of these cost savings can be gained from Cuoco and Kaniel (1999), who consider the case of proportional management fees on required returns. They conclude that with proportional fees over five years equal to 12% of the terminal value of the portfolio, the equilibrium ratio of reward to risk (the Sharpe ratio) would be between 40% and 60% higher than it would be in an economy in which all investors managed their portfolios directly and costlessly.

(2) Foreign investors in UK shares are more likely to be measured against an index of large-cap stocks such as the MSCI index.

benchmarked portfolio, where the manager has infinite risk-aversion and so totally avoids non-index stocks.

Since we do not know the degree of risk-aversion of active fund managers, we cannot predict the magnitude of the effect on prices of the use of indexes to benchmark their performance. Brennan undertook an empirical test of his model using US data. However, such tests of asset-pricing models are notoriously subject to noise and, perhaps not surprisingly, Brennan's results were indeterminate. For the entire 1931–91 period, the estimated expected return declined significantly as a stock's sensitivity to the index increased, but in recent years this effect largely disappeared or was even reversed. When Brennan controlled for a variety of factors, the more recent data were consistent with the hypothesis that a high correlation with a market index reduced expected returns.

More recently, Cuoco and Kaniel (1999) have employed a general equilibrium model to examine the effect of alternative compensation schemes for portfolio managers. They show that with symmetric performance fees, managers will have an incentive to overweight the benchmark portfolio, and this increases the required return on non-benchmark stocks. They estimate that with very high levels of performance fees, the price differential between benchmark and non-benchmark stocks is around 4% if the returns on the two portfolios are uncorrelated, and less than 1% if the correlation is 0.9. As we shall see, these effects are similar in magnitude to the price changes that are observed at the time of changes to index composition.

### Empirical evidence on the effect of membership of stock market indexes

We now consider the empirical evidence on the effect of index membership on required returns. Such effects may be due to the role of index funds, to the use of indexes as performance benchmarks, or, more speculatively, to some form of information effect.

Most studies of the effect of membership of a market index have focused on abnormal returns at the time of changes to index composition. Before reviewing these studies, we discuss briefly two other relevant papers: Chan and Lakonishok (1993) and Goetzmann and Massa (1999). Chan and Lakonishok's analysis was based on a sample of returns on all NYSE, AMEX, and Nasdaq stocks with a market capitalisation in excess of \$50 million during the period 1977–91. For each year the authors estimated a cross-sectional regression of return on beta, market capitalisation, the book-to-market ratio, an industry dummy, and a dummy for membership of the Standard and Poor (S&P) Composite.

The regression coefficients for the S&P dummy are reported in Table B and show the excess realised return to membership of the index. The mean excess return is 2.2% per annum and the excess compound return over the

**Table B**  
Estimated excess return to membership of the S&P Composite index

Per cent			
Year	Excess return	Year	Excess return
1977	-3.99	1985	-0.08
1978	-4.85	1986	2.21
1979	5.33	1987	5.92
1980	2.39	1988	3.45
1981	3.17	1989	4.87
1982	6.94	1990	-2.94
1983	1.58	1991	4.15
1984	4.69		
<b>Mean</b>	<b>2.19 (t = 2.33)</b>		

Source: Chan and Lakonishok (1993).

15 years is 36.0%. It is difficult to know how to interpret these findings. It is possible that the estimated returns to index membership are spurious and that the index dummy is simply proxying for errors in (say) the size variable. If, however, the index composition is the true reason for the excess returns, then one interpretation is that the coefficient on the index dummy is measuring the effect on the equilibrium expected returns. In this case, required returns are substantially higher for index stocks. Alternatively, the succession of positive returns on index stocks may reflect successive unanticipated changes in required returns, perhaps as a result of the growth of index funds. However, it is difficult to reconcile such a large and prolonged excess return with the far smaller price movements that occur when individual stocks are included for the first time in the index.

The view that the growth of index funds has had a major effect on market prices is supported by Goetzmann and Massa (1999), who find a strong contemporaneous correlation since 1993 between daily inflows into three Fidelity indexed mutual funds and changes in the S&P index. The authors argue that the market is reacting to daily demand and that the effects on price are permanent. They estimate the index level, net of any flows effect, and conclude that 'the important role played by the index funds is shown not only by the huge difference (-36%) between the two indexes that can be explained in terms of funds' flows'. Unfortunately for our purposes, the Goetzmann and Massa paper does not examine whether flows into the indexed mutual funds are correlated with similar flows into actively managed funds or whether the price movements are limited to the S&P index. So it is possible that they are simply picking up an example of the impact of mutual fund flows on overall market levels.

We now turn to the effect of changes in index composition. If required returns are dependent upon a stock's inclusion in the market index, then any unanticipated additions or deletions of a stock from the market index should be associated with an abnormal change in price, and this should allow a more direct assessment of the effect on required returns of index membership. There have been a number of studies in the United States of the effect of changes in index composition, the results of which are summarised in Table C. Notice that most deletions from the S&P index are

**Table C**  
**Announcement effect of additions to and deletions from the S&P Composite index**

	Years	Abnormal return (per cent)	
		Additions	Deletions
Shleifer (1986)	1966–75	-0.2	n.a.
Shleifer (1986)	1976–83	+2.8	n.a.
Goetzmann and Garry (1986)	1983	n.a.	-2.0
Harris and Gurel (1986)	1973–83	+1.5	-1.4
Woolridge and Ghosh (1986)	1977–83	+2.9	n.a.
Jain (1987)	1977–83	+3.1	n.a.
Lamoureux and Wansley (1987)	1966–75	+0.5	n.a.
Lamoureux and Wansley (1987)	1976–85	+2.3	n.a.
Dhillon and Johnson (1991)	1984–88	+3.3	n.a.
Edmister and Graham (1994)	1983–89	+3.3	n.a.
Beneish and Whaley (1996)	1986–94	+4.4	n.a.
Lynch and Mendenhall (1997)	1990–95	+3.2	-6.3

n.a. = not available.

the result of mergers or bankruptcy and so the number of useful observations for deletions is much smaller than for additions.

Table C indicates that most researchers find a positive return of about 3% when a stock is included in the index and a negative return for deletions. There is less agreement as to whether these abnormal returns reflect temporary price pressure or are consistent with a permanent change in the cost of capital. For example, Harris and Gurel (1986) find that prices tend to revert to their pre-announcement levels after about three weeks. Lynch and Mendenhall (1997) find further positive abnormal returns between the announcement date and the effective date, which is partially reversed after the effective date. Edmister and Graham (1994) observe a permanent shift in price.

A number of commentators attribute the abnormal returns to the influence of index funds, and there is some evidence that a change in index composition does lead to portfolio shifts (though this need not be a result of the activities of index funds). For example, several studies indicate that stocks that are being added to the index experience an abnormal rise in trading volume. Pruitt and Wei (1989) also find that stocks that are added to the S&P index experience an increase in institutional ownership, and that the abnormal return is positively related to this change in institutional ownership.

To see whether changes in index composition have a similar impact on returns in the United Kingdom, we collected data on all additions to and deletions from the FTSE All-Share and FTSE 100 indexes. The FTSE index committee meets each quarter to consider possible additions and deletions. The proposed changes are announced after market close and, on average, become effective six to seven trading days later.<sup>(1)</sup> These changes largely result from earlier new listings or changes in market capitalisation. Between the regular quarterly reviews, changes are made to the index as a result of changes in corporate structure, such as a merger. We focus here only on changes made at the quarterly review, as the stock returns are less likely to be

contaminated by other news. As the principal criterion for inclusion in an index is the stock's market capitalisation, these changes in the index may be partly anticipated and therefore the impact on prices may be underestimated.

Our data samples consist of: (a) all quarterly additions and deletions to the All-Share index between March 1994 and June 1999, and (b) all transfers into or out of the FTSE 100 index from other sections of the All-Share index. So there is no overlap between the two samples. After allowing for missing price data, the sample consisted of 120 additions to and 110 deletions from the All-Share index and 36 additions to and 40 deletions from the FTSE 100 index.

We define the abnormal return as the difference between the return on the stock and the return on the All-Share index. We measure the daily abnormal returns on stocks entering or leaving the index during the days surrounding the announcement date. Since the announcement takes place after market close, we define day 0 as the day following the announcement. The effective day is then typically day six or seven. We calculate the mean abnormal return for each day and, to provide a rough measure of significance, we standardise the mean abnormal returns by the standard deviation of the abnormal returns over a period of 76 days surrounding the eleven-day event period (defined below). Given the small price effects that we observe and the considerable noise in the data, we do not attempt to measure whether any abnormal returns are permanent.

Stocks entering or leaving the All-Share index typically have very low market capitalisations. They are therefore thinly traded, and the effect of the announcement may be delayed. Given the fact that the events cluster in time, mismatches between the returns on the stocks and those of the market index may be common across the different stocks, and this is liable to show up in spuriously large absolute abnormal returns. It therefore suggests that our measures of statistical significance, particularly for changes to the All-Share index, should be treated with considerable caution. As a check that our results are not materially affected by such mismatches, we also examine and report raw returns. The choice between abnormal and raw returns does not materially affect the pattern of the results, though for individual days the two measures sometimes differ markedly.

Table D reports the abnormal returns for a period of eleven days surrounding the announcement date. The first column shows that on the day of the announcement of additions to the All-Share index there is a positive, but not significant, abnormal return and this is followed by a significant rise on the following day. Thereafter, the returns are predominantly negative and over the entire eleven-day period additions to the index are associated with a cumulative abnormal return of just 0.3%. In the case of deletions from the All-Share index, returns are fairly consistently and sometimes

(1) The mean number of days from announcement date to effective date varies from 5.5 for FTSE 100 additions to 7.1 for both additions and deletions to the FTSE All-Share.

**Table D**  
**Abnormal returns during the period surrounding the announcement of additions and deletions to the market index, March 1994 to June 1999**

Day relative to announcement	Mean abnormal return ( <i>mean raw return</i> )							
	FTSE All-Share				FTSE 100			
	Additions		Deletions		Additions		Deletions	
-2	+0.2	+0.1	-0.1	-0.1	+1.4 (a)	+1.4 (b)	-0.6	-0.6
-1	+0.1	-0.1	-0.4	-0.7	+1.4 (a)	+1.4 (b)	-0.9	-1.0 (b)
0	+0.5	+0.4	-0.3	-0.7	-0.4	-1.1 (b)	+0.1	-0.7
1	+0.8 (b)	-0.1	-0.4	-1.1 (b)	-0.4	-0.8	+0.6	+0.1
2	+0.2	-0.1	+0.2	+0.3	-0.9 (b)	-0.5	-0.1	+0.3
3	-0.1	+0.1	-1.2 (b)	-0.8	-0.1	+0.2	-0.8	-0.4
4	-0.5	+0.2	-1.2 (b)	-0.6	-0.2	+0.1	+0.0	+0.3
5	-0.2	+0.0	-0.3	-0.1	+1.1 (b)	+0.8	-0.8 (b)	-1.0 (b)
6	-0.2	+0.3	-0.7	-0.8	+1.8 (a)	+1.3 (b)	-1.7 (a)	-2.1 (a)
7	-0.3	+0.2	-0.4	+0.1	-1.1 (b)	-1.2 (b)	+1.4 (a)	+1.3 (b)
8	-0.2	-0.1	+0.2	+0.3	-1.4 (a)	-1.3 (b)	+0.7	+0.7
N	120		110		36		40	

(a) Significant at the 1% level.  
 (b) Significant at the 5% level.

significantly negative for the entire eleven-day period. The cumulative abnormal return over the eleven days is -4.5%.<sup>(1)</sup>

The remaining columns of Table D show the effects of transfer into or out of the FTSE 100 index. The puzzle here is the behaviour of the additions to the index, as the returns are large in absolute terms and appear often to be highly significant. However, there is little consistency in the sign of the returns and the total change over the eleven-day period is an insignificant +1.2%. By contrast, the deletions from the FTSE 100 index are predominantly negative and on three days significantly so. The cumulative abnormal return over the eleven-day period for index deletions is -2.0%.<sup>(2)</sup> Since few funds either track the FTSE 100 or are benchmarked to it, the apparent abnormal returns on changes to the FTSE 100 suggest that the effects of index composition may be more complex than a simple tracking or benchmarking effect.

We repeated the exercise with day 0 redefined as the date that the index change became effective. There is no evidence of any effective-day effect for the All-Share index, but there are some quite large changes in the price of stocks entering and leaving the FTSE 100 index. For stocks entering the index there is a mean abnormal return of 2.9% on the preceding day, which is fully reversed on days 0 and +1. For deletions there is an abnormal decline of 2.0% on day -1, which is again reversed on days 0 and +1. This behaviour is suggestive of some anticipatory price pressure.

In summary, stocks that are added to both the FTSE All-Share and the FTSE 100 indexes experience, on average, a positive abnormal return over the eleven-day period immediately preceding and following the announcement. However, this abnormal return is both statistically and economically insignificant. Deletions from the index are

associated with a somewhat larger negative cumulative return.<sup>(3)</sup>

If the price movements stemming from a change in index composition are indeed permanent and unanticipated, then we can estimate roughly the implied change in the cost of capital. The Gordon growth model states that the dividend yield is equal to  $(r - g)$ , where  $r$  is the required return and  $g$  the expected dividend growth rate. It is unlikely that the announcement of a change in index composition affects either the prospective dividend or the expected dividend growth, so the change in the cost of equity is simply equal to the product of the abnormal announcement return and the dividend yield. For example, a permanent 3% rise in price and a 3% dividend yield would imply a 9 basis point decline in the cost of equity. If part or all of the abnormal return is temporary, then the fall in the cost of equity is less than 9 basis points. If the much larger price movements estimated by Chan and Lakonishok and Goetzmann and Massa reflect adjustments to the required returns on index stocks, then the fall in the cost of equity for index stocks is of the order of one percentage point.

## Summary and conclusion

Accumulating evidence that active portfolio managers do not achieve consistently superior performance has led to a rapid growth in index funds with low turnover and reduced management costs. For the most part, these funds track the performance of major market indexes and therefore tend not to be invested in the stocks of very small firms. This growth in index funds has forced active managers to hold a higher proportion of small-firm stocks than they otherwise would and, since they need to be induced to do this voluntarily, the expected return on these stocks must rise. We have argued that the portfolio adjustments forced on active managers are in practice very small and, since small-firm stocks are fairly good substitutes for large-firm stocks, the effect of index funds on required returns is likely to be no more than several basis points.

If market indexes are used as benchmarks for measuring the performance of professional active managers, then index stocks become effectively riskless for these managers and they need to be induced to hold the remaining stocks. Unlike index-fund managers, these active managers are not totally averse to holding non-index stocks, and so the incremental effect on prices of benchmarking is likely to be less than if these funds were formally indexed.

Most empirical studies of the effect on prices of index composition cannot distinguish the effect of index funds from that of benchmarking or possible information effects. Chan and Lakonishok suggest that membership of the S&P index has had a substantial effect on prices in recent years,

(1) For the All-Share index, the cumulative raw returns are +0.9% for index additions and -4.2% for deletions.

(2) For the FTSE 100 index, the cumulative raw returns are +0.4% for index additions and -3.1% for deletions.

(3) One possible explanation is that stocks that are deleted from the index are likely to be smaller than additions. If an index is weighted by market value, then the returns on the index are more heavily influenced by larger companies, so that the abnormal returns on the smaller-cap stocks are likely to be larger in absolute terms than those of the larger-cap stocks. I am grateful to Elroy Dimson for this observation.

while Goetzmann and Massa find that flows into index funds have also had a marked cumulative price effect. However, it is difficult to reconcile these results with studies of the effect of additions or deletions to the index. In the United States these have typically found a price impact of around 3%, which would imply a shift in required returns of a few basis points. Our sample of changes to the FTSE All-Share and FTSE 100 indexes from 1994 to 1999 indicated that in both cases an addition to the index resulted

in a negligible rise in price. Deletions, however, were associated with an eleven-day cumulative abnormal return of -4.5% for All-Share stocks and -2.0% for the FTSE 100 index. If permanent, these returns suggest that index deletions result in a small increase in the required return on equity for the affected firms. However, the fact that abnormal returns are observed for both indexes suggests that the effect is not simply due to the growth of index funds or performance benchmarking.

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