Wolf in sheep's clothing: the active investment strategies behind index performance

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Abstract

This paper argues that the commonly used market indices imply forms of active investment management in disguise. The selection and rebalancing rules make these indices highly exclusive and dynamic regarding their underlying components and significantly bias their performance. Any passive investment tracking these indices turns into an active strategy characterised by market timing and state-dependent performance. Evidence is provided that exclusive indices outperform (underperform) more inclusive peer indices over upward (downward) markets. The constitution and maintenance rules of exclusive indices correspond to a set of active trading and investment rules similar to momentum and stop-loss strategies.

Keywords: index performance, active / passive investment management, momentum strategies, index constituents; selection and rebalancing rules; performance measurement; "buy-and-hold" strategy.

JEL codes: G11

It is a widely held assumption that stock indices represent markets. An index is supposed to be a representative performance indicator of a given market as a whole. The widespread use of indices in the public, by investors and within the financial industry related to this perception of an index is in one way or another. The practice of benchmarking against indices as well as index replicating 'passive' investment management does indeed confirm this perception. This paper argues that – rather then offering a passive market performance – the vast majority of all indices and the so-called passive investment management based on them, , simply offer a different form of active investment management in disguise, albeit at times a quite successful one. Indeed, the most widely used indices tend to be highly exclusive (i.e. selective) and dynamic with regard to their underlying assets. The difference in performance between an exclusive index and its more inclusive peer is explained by the selection and exclusion rules underlying their constitution. These rules do in fact correspond to a set of active trading and active investment approach.

The theses of this paper are as follows: first, true market indices are *all-inclusive* indices for the relevant political, geographical or currency area they are supposed to represent. With all-inclusive indices, the question of inclusion or exclusion does not arise by definition, and the related effects of under or overperformance of index constituents after their inclusion or exclusion do not exist.

Second, passive investment management is *passive*. A passive investment approach implies that the reference index, i.e. the stocks underlying an index, are bought and held. There should be no change regarding the underlying assets of an index except for technical reasons, such as initial public offerings (IPOs), mergers, capital increases, changes in the free float, etc. All-inclusive indices are passive by their very nature. In contrast, index tracking is generally based on *exclusive, i.e. selective* types of indices and, in reality, represents a form of active investment management. In fact, exclusive indices embody a set of *active* investment and trading rules. These active rules bias the index performance. As a corollary to the difference between all-inclusive and exclusive index constructions, any benchmarking based on exclusive indices compares one form of active investment management with another.

Third, the set of rules determining the index construction in selective types of indices are conformable to momentum strategies. The timing and methods implied by the selection and rebalancing rules of the most widely used selective equity indices are consistent short-run momentum strategies which consider the continuation effect of recent winners and losers or dynamic trading with respect to reference levels, such as stop-loss strategies.

Market indices have mostly been studied in two ways: first, considering a market index as a proxy of the market portfolio; second, looking at effects of index inclusion or exclusion on index components. The relevance of defining a market portfolio as a reliable indicator for the market as a whole is a largely debated issue. Roll (1977) argues that the CAPM may appear to be rejected in tests not because it is wrong, but because the proxies for the market return are not close enough to the true market portfolio available to investors. In this line of reasoning, Lehmann and Modest (1987), among others, find that the measurement of mutual fund performance is sensitive to the benchmark chosen. Our study differs from this research area. We are interested in how and to what extent index rules characterise index behaviours. We look into the "microstructure" of market indices and examine if specific index rules characterise their performance.

The second research area studies the effect of inclusion of individual shares in indices and/or their exclusion. Most studies in this field show that the inclusion or exclusion of shares has significant price and volume effects on those shares[1] and result in a variety of hypotheses

[1] E.g. Beneish and Gardner, 1995; Beneish and Whaley, 1996; Dhillon and Johnson, 1991; Harris and Gurel, 1986; Lynch and Mendenhall, 1997; Pruitt and Wei, 1989; Shleifer, 1986

to explain these performance effects[2]. While these studies concentrate on index constituents, we are interested in the indices themselves. We investigate how the inclusion or exclusion of individual stocks in an index affects the index performance on an *aggregated* basis.[3] It is indeed surprising that most of the literature in this field focuses on individual rather than aggregated effects. After all, if there is evidence that stocks included in an index outperform (underperform) the index after its inclusion (exclusion), shouldn't the index itself also outperform its reference market?

The empirical analysis supporting our hypotheses is organised as follows. We search for peer indices based on the same construction and rebalancing rules but consisting of a different range of components. We compare the performance of the most exclusive and inclusive of these index twins. We then provide compelling evidence that the performance reported by exclusive indices is biased. Exclusive indices tend to outperform (underperform) more inclusive indices over bull (bear) periods. This comparative analysis is performed on international, national, sector indices and across diverse sample periods.

To better understand whether this bias is attributable to construction and rebalancing index rules, we attempt to build a truly passive index. The comparison between an exclusive index and a pure passive benchmark should shed some light on the extra performance due to the active component. Using the MSCI index components for several countries, we construct a passive portfolio in which the underlying assets tend to remain unchanged over time. We thereby compare the performance of the MSCI indices with the related static and passive 'buy and hold' portfolios. The empirical findings show that the implicit active investment strategy of MSCI indices strongly characterises their performance. Evidence is provided that dynamic indices outperform passive indices over equity markets with a positive trend.

The paper proceeds as follows. We briefly survey the factors determining the demand and supply for indices. Second, we compare the performance of inclusive and exclusive types of indices. Third, we construct a passive index and we measure its performance with the respective dynamic index. Fourth, we analyse the reasons explaining the different behaviour of passive and active indices. We then discuss the main implications for asset managers. Some conclusive remarks follow thereafter.

1. The market for market indices

In general, a market index is supposed to represent *prima facie* a stock market as a whole. The way to achieve this would be to include all traded shares of a given market in the index. Ignoring the various technicalities linked to the way indices are calculated, such an all-inclusive index would represent the publicly traded and investible market as a whole. If this is true, one might wonder why the vast majority of equity market indices are highly exclusive.

The explanation is essentially rooted in practical reasons. In defining a benchmark, an asset manager essentially faces the trade-off between wider diversification and market liquidity. All-inclusive indices are more representative of the whole market and allow a higher degree of diversification. On the other hand, all-inclusive indices are composed of a large number of constituents, and a considerable number of them are illiquid assets. This undoubtedly increases transaction costs. In summary, exclusive indices are more attractive

[2] Eg Bechmann, 2002; Jessop, 2002.

[3] The research of Hill et al. (2001) is one of the few studies in this context which is not focused on index constituents. It shows that the outperformance of the DJIA in comparison to the S&P 500 or NASDAQ during 2000/ 2001 was not due to the selection of index constituents but its price-weighted nature. Treynor (2003) compare the index performance on the basis of different construction rules.

because they imply lower transaction costs, higher liquidity. Moreover, information is more readily available (e.g. analyst coverage). Hence, there could be objective disadvantages for investors willing to replicate market index performance.

Further advantages in favour of exclusive indices are the availability of derivative instruments, typically options and futures contacts. In fact, index derivatives are largely available for exclusive types of indices[4] only. This availability permits hedging and arbitrage strategies that make exclusive indices more attractive than all-inclusive ones. A more widespread use of index derivatives, for example, relies on arbitrage between the index derivative and the stocks underlying the index, enabling the derivative market to function properly. In case the index encompasses thousands of different shares, the arbitrage between the index derivative and the underlying stocks becomes expensive and leads to price deviations from the underlying values, making the index derivatives unattractive to a large segment of investors.

As a result of the popularity of passive investment strategies, there has been a strong increase in the demand for such exclusive indices. The widespread use of the so-called passive investment management in the last years is impressive. It ranges over different forms of index replication and has reached around 30% of institutional equity investments under management in the US (Clarkson et al., 2002). The estimates for index investment management in Europe are somewhat lower and vary from 3% (Ireland) to 30% (UK) (Tinker et al., 2002). The remaining proportion that is being actively managed is often benchmarked in relation to the same indices used for passive management. Assuming that deviations from the benchmark are at maximum 20%, this implies that 86% of all institutional equity investments are managed according to indices and, as a consequence, is driven by the composition of these indices. While the figures for privately held equity investments might be somewhat lower, there is a clear general trend towards index-linked investment management and benchmarking.

The supply of "passive" placements is offered through index-based investment vehicles, such as index replicating open-end funds, exchange traded funds, or index performance certificates. It is worth pointing out, however, that these funds are generally issued on selective or exclusive indices that can be replicated with relative ease and at low cost. The constitution of the most widely used indices is, therefore, not guided by the aim to reflect the performance of a given stock market as closely as possible, but rather by the aim to offer "economical indices because they are correctly sized for cost-efficient replication and trading"[5]. Thus, a large variety of exclusive index families have been created in order to meet the demand for so-called 'passive' investment management.

2. Inclusive versus exclusive indices

The first objective of this research is to test whether there is for a systematic difference in the performance of exclusive and inclusive indices. This analysis follows a two-step approach. First, we compare the performance of index twins. To do this, we look into the large supply of equity market indices and we identify those index families that consist of exclusive and more inclusive definitions of the same index. The comparison of these index twins enables us to determine whether there is any systematic difference in the performance of indices based on the same principles but with diverse market coverage. Second, we conduct

[4] Examples for such indices are the DJIA, S&P 100, S&P500, FTSE 100, Nikkei 225, CAC 40, DAX 30, just to mention few.

[5] From Dow Jones STOXX^{SM} indexes, www.stoxx.com/info/development.html (as of 29.8.02)

a regression analysis to find out whether this difference in performance is due to an implicit active strategy of selective indices. More precisely, the regression analysis permits us to determine the existence of market timing driven by constitution and rebalancing rules.

2.1 Performance comparison of exclusive and inclusive indices

Table 1 summarises the main construction principles and maintenance rules of the major stock market indices worldwide. The most frequently used technique is to weight indices on the basis of the market capitalisation with some adjustment for liquidity. The common adjustment is the free-float (the proportion of shares outstanding that are deemed available for trading in the public security market). But many other liquidity proxies are used; see for example the broad set of liquidity indicators used by the Paris Bourse. There is a significant degree of discretion among index providers. In a few cases, the rules governing the index construction are transparent and predefined. In many other circumstances, index committees benefit from wide discretionary scope. Probably the most representative case is represented by the Dow Jones Averages indices, for which the editors of *The Wall Street Journal* select the index components purely on the basis of their good judgement. Discretionary power manifests itself in at least two other aspects of an index life, namely its size and reconstitution timing. Some indices have no fixed number of index components. For instance, the Swiss Market Index is a blue-chip index made up of a maximum of the 30 largest stocks. But its effective number of constituents varies considerably across time. Several index providers have an annual deadline for defining the universe of securities underlying their indices (e.g. MSCI and Russell). However, the effective dates of additions and deletions of the index components are much more frequent and irregular. For example, the S&P US indices change their members when needed. Changes in companies' shares (where 5% or more are outstanding) take place at the effective date. Otherwise, weekly changes apply. In general, changes to the make-up and weighting of the index are made monthly or quarterly (see Table 1).

By taking the major stock markets, Table 2 provides an initial comparison between the most exclusive versus the more inclusive type of index over different sample periods. The beginning of the sample period is determined by the most recent inception of the twin indices. These indices relate to the US as well as for the other major markets[6]. Throughout this paper, the performance is calculated as compounded logarithmic returns. An upward or bull market is when the more-inclusive market index experiences a monthly[7] positive return; vice versa for a downward or bear period. Out of the 14 performance comparisons, there are 12 cases in which the more inclusive type of index outperforms (underperforms) the more exclusive type of index over upward (downward) markets. These results also hold when a risk adjusted measure of performance is used. More precisely, we calculate the Sharpe ratio (SR) as follows:

$$SR_T = \frac{\frac{12}{T}\sum_{t=1}^{T} r_t}{\left(\frac{12}{T-1}\sum_{t=1}^{T}(r_t - E[r_t])^2\right)^{1/2}} \qquad (1)$$

[6] The representative indices for the Canadian stock market in Table 2 are the TSE 35 and 100. However, the S&P/TSE 60 Index has recently replaced these indices.

[7] We also tested the quarterly definition of bear and bull periods. The results remain essentially unchanged.

Where t=1,…T represents the investment horizon on a monthly basis, r_t are continually compounded logarithmic returns; hence, the numerator and denominator are the annualised return and return volatility over the period T, respectively.

Table 3 compares the performance of exclusive and less exclusive indices from different index providers for the US market in the context of a bull and bear market period. We repeated these tests using other definitions of bull and bear markets, in particular the definition of the National Bureau of Economic Research (NBER) for expansion and recession periods. The results remain essentially unchanged. During the bull market period it is always the more exclusive index within the index family that has the higher return (and the higher risk adjusted performance in terms of Sharpe ratio). During the bear market period the more exclusive indices display higher losses then the more inclusive indices.[8] These results suggest that exclusive indices are more exposed to both the upside and downside momentum of the market. Figure 1 provides a clear graphical representation of the main selective US indices outperformance (underperformance) in expansion (recession) periods. Using monthly returns, Table 4 documents the significance levels of the two-tailed *t*-statistics to assess whether there is a significantly difference in performance patterns between pairs of US stock market indices. The non-parametric tests using the Wilcoxson-Mann-Whitney method are perfectly in line with the *t*-statistics[9]. Overall, the results show that returns of the exclusive and inclusive versions of US market indices diverge significantly. The difference seems slightly smaller during bull markets.

The S&P/Citigroup index family represents a straightforward case in which exclusive and inclusive indices can be compared. For a wider set of markets, the S&P/Citigroup[10] provides a couple of indices. The exclusive type of index is called the Primary Market Index (PMI) and the more inclusive one is the Broader Market Index (BMI). A PMI index covers the large capitalisation stock universe (top 80% of available capital of the BMI in each country). The BMI is considered the flagship all-share index.[11] As Table 5 shows, in 30 (26) out of 34 cases, the exclusive type of index outperforms (underperforms) the inclusive one in bull (bear) markets. Comparing the performance on a risk adjusted basis, the PMI still basically outperforms the BMI to the same extent. The risk adjusted performance measure used in this case is the Information Ratio (IR). IR is defined as

$$IR_T = \frac{\frac{12}{T}\sum_{t=1}^{T}\left(r_t^E - r_t^I\right)}{\sqrt{\frac{12}{T-1}\sum_{t=1}^{T}\left(r_t^E - r_t^I\right)^2}} \qquad (2)$$

[8] In Table 3, we compare the Russell 1000 with the Russell 3000. It is worth noting that a more selective index has been recently introduced, namely the Russell Top 50 and 200 Index. The data for this index are available from 1 June 1995 to date. If we compare the Russell 200 and 3000 indices over the bull (June 1995 to February 2000) and bear (March 2000 to March 2003) period, we find that the Russell 200 outperformed the 3000 index by 10% during the bull market and underperformed it by 7% during the bear market. These differences in performance are even stronger if we add dividends to the index values. The same conclusion holds for the Russell Top 50 index.

[9] These additional tests are available upon request.

[10] S&P/Citigroup indices were formerly provided by Salomon Smith Barney under the name Salomon Smith Barney World Equity Indices (SSBWEI). Using SSBWEI and S&P/Citigroup data, the results remain unchanged.

[11] More specifically, all companies in applicable markets are included, provided they have available (float) market capitalisation greater than USD 100 million. Only issues that a non-domiciled investor may purchase are included. Each issue is weighted by the proportion of its available equity capital.

The terminology used for the IR is consistent with that of the Sharpe ratio. Here, r_t^E and r_t^I mean the return in month t of the exclusive and inclusive index, respectively. Thus, IR represents the annualised outperformance of the exclusive index divided by the annualised tracking error.

The Dow Jones super-sector indices constitute another interesting case. Dow Jones & Company keeps track of the international sectors' behaviours on the basis of two index definitions: the Dow Jones Titans, which are very exclusive indices, and the Dow Jones World Indices, which are their less exclusive cousins.[12] As shown in Table 6, out of the 18 comparisons, there are 13 (11) cases where the more exclusive index outperforms (underperforms) the more inclusive index in upward (downward) markets.

While all these comparisons may not appear exhaustive, a clear picture emerges: exclusive indices perform better during rising markets and tend to perform worse during falling markets. One possible explanation for these results could be the existence of a large cap effect. Indeed, with the increasing international diversification and a general preference for liquid stocks, a case for a large cap effect could be made. But this interpretation would be in contradiction to Banz's (1981) findings of a small cap effect and all subsequent literature on the size effect (e.g. Fama and French (1992)). According to this literature, stocks with low market capitalisation provide higher average returns, and not the opposite. Our interpretation of these results, however, is a different one. We argue instead that the outperformance of exclusive indices – which are admittedly large cap-type indices – is not due to a large cap effect but to the selection and exclusion rules behind the constitution of these indices.

To provide further support for this argument, we perform below a regression analysis to test for a market-timing component characterising the exclusive index performance.

2.2. Market timing of selective indices

The first step is to observe if there is a systematic difference between the exclusive and inclusive index performance across time. To do this, we use the S&P/Citigroup indices since they allow an international and consistent comparison over a significant investment horizon. A simple way to analyse whether the risk-return payoffs of exclusive and inclusive indices are dissimilar across time is to use the market model.

$$\left(r_t^E - r_t^F\right) = a + b\left(r_t^I - r_t^F\right) + e_t \qquad (3)$$

Where r_t^E and r_t^I is the return in t of the exclusive and inclusive index, respectively. r_t^F is the riskless asset return. ε_t is the residual term. α and β are the regression coefficients. The first hypothesis we can test is the following:

Hypothesis 1: if there is a systematic difference in the exclusive and inclusive index performance, then we should observe a beta significantly different from 1 in the Market Model equation.

Table 7 reports the estimated betas for the 34 countries or regions covered by the S&P/Citigroup indices. Estimating the Wald test for the null hypothesis that beta is equal to 1,

[12] Dow Jones & Company supplies four sector decomposition methods of the equity markets, namely industry, supersector, sector, and subsector. The supersector level lends itself to a clear comparison between a selective and more inclusive equity market performance by sectors. Dow Jones Titans supersector indices encompass only the 30 largest companies in the world, which correspond to around 50% of world market value coverage. Dow Jones Supersector Wold indices, however, cover a broader market value that on average is 30-40% larger than the Titans definition.

we can reject in 19 cases at a 5% significance level the hypothesis that exclusive and inclusive portfolios are equivalent.

The simple estimation of the market model does not allow us to detect any selection or timing ability in a managed portfolio. Elton et al. (2003, pp. 640-641) suggest a method for analysing market timing. The intuition behind this method is simply to evaluate the manager performance in two separate domains: the manager's outperformance in upward markets and his underperformance in downward markets. In this line of reasoning, a manger with market timing should have a high up market beta and low down market beta. In our perspective, the exclusive and inclusive indices represent the managed and market portfolio, respectively. In terms of the regression analysis, that is:

$$\left(r_t^E - r_t^F\right) = a + g\left(r_t^I - r_t^F\right) - l\,d_t\left(r_t^I - r_t^F\right) + e_t \qquad (4)$$

The same notation as in the previous equation applies. The new terms here are γ and λ which are regression coefficients and d_t which is a dummy variable; $d_t = 0$ if $r_t^I - r_t^F \geq 0$, and $d_t = 1$ otherwise. Residuals of these OLS regressions have been adjusted for heteroskedasticity and correlation using the Newey-West method. The regression analysis in (4) allows us to test the following hypotheses:

Hypothesis 2: if there is market timing in exclusive indices that makes it possible to profit from an up market, we should observe a γ significantly higher than 1. In fact, γ represents the up market beta.

Hypothesis 3: if there is market timing in exclusive indices that makes it possible to reduce the exclusive index exposure to a down market, we should observe a λ significantly higher than zero. In fact, (γ -λ) represents the down market beta.

If there market timing inherently exists in exclusive indices, then we will observe that the exclusive index performance breaks down into two components: its outperformance in upward markets (γ>1) and its underperformance in downward markets (λ>0). The results in Table 7 largely support Hypothesis 2. In 29 cases, γ is higher than 1, meaning that the performance of exclusive indices is amplified in upward markets. There is also some support for Hypothesis 3. In 7 cases, λ is significantly positive. This means that for some indices the market-timing component significantly mitigates the negative performance of exclusive indices during downbeat markets. We estimate the Wald test for the null hypothesis that beta is γ is larger than 1 ***and*** λ larger than zero. This test suggests that in 23 cases at a 5% significance level we can reject the hypothesis that there is no market timing characterising exclusive index performances.

Now, the main question is what kind of investment strategy is disguised in exclusive indices? As we will discuss below, the exclusive index rules implicitly look like recognised investment strategies such as momentum, autocorrelation and the limitation of tail risks through implicit stop losses.

Passive versus active indices

The results presented above show that exclusive indices are to a large extent at odds with the definition of passive investments. We have observed that exclusive indices incorporate market timing, making their performance state-dependent and variable over time. In this part of the paper, we attempt to construct a truly passive index. Such an index can be then used as a pure benchmark to measure the contribution to the market performance coming

from the implicit trading strategy related to construction and rebalancing rules. To do this, we take the MSCI country indices - an exclusive, large cap type of index family whose historic index components are readily available for a period of six years and five months. We use this sample period for two reasons. First, Datastream makes data on the MSCI components available from January 1995 on. Second, MSCI announced in June 2001 an important change: a new "MSCI Enhanced Methodology" (MSCI, 2001A) based, amongst others, on free-float instead of market capitalisation, wider coverage and more emphasis on sector representation (for more details, see MSCI, 2001B). By using a sample period from January 1995 to May 2001, any influence or bias due to this methodology change is avoided. It is worth noting that this sample period is a well-defined and prolonged bull period. We thus expect an active index to outperform its corresponding passive index.

We first analyse how the index components of the MSCI country indices have changed over time. Table 8 shows the total number of components per country and, given the limited number of stocks, the high degree of exclusiveness of this index family. Also, Table 8 shows the proportion of stocks that has remained in the index throughout the five-year period analysed. This proportion varies from 43% (Argentina) to 74% (Japan) or, in terms of capitalisation, from 59% (Australia) to 93% (Switzerland)[13]. We then look into the reasons behind the exclusion of stocks from the index. Technical factors such as delistings, conversions or mergers can lead to the exclusion of stocks - factors that would also reasonably apply to a passive index[14]. We find that between 12% (Switzerland) and 75% (Japan) of all exclusions are due to index selection rules rather than technical factors.

We then constitute passive indices where the initial index constituents are held constant over time. The resulting country indices are still very exclusive, but now passive, indices that follow a buy and hold strategy[15]. Table 9 compares the index performance of the dynamic MSCI country index as published by Morgan Stanley against the newly calculated passive index with constant constituents. For all of the 10 countries, the original dynamic MSCI has outperformed the passive index. While the average MSCI return for the period analysed was 74% for the dynamic indices, it was only 50% for the passive indices. It is also interesting to note that where the dynamic asset selection is the smallest (Switzerland), the outperformance of the dynamic index in comparison to the passive index is also the smallest. Conversely, the highest proportion of dynamic asset selection (Japan, Brazil) is associated with some of the strongest outperformance.

To check the sensitivity and robustness of our results with respect to the definition of passive portfolio, two main definitions of passive index are considered. The former is a more conservative definition since it holds the initial index components and weights constant. The latter is known as the "Passive with Reinvestment" performance. This strategy is calculated by reinvesting the amounts corresponding to the last traded prices of the excluded components in the subsequent year in proportion to the market capitalisation weights. Table 10 shows that the performance of a "passive with reinvestment" index component is comparable overall to a pure "passive" index performance. In cases, the dynamic selection and rebalancing procedure driving the original MSCI indices has largely outperformed the passive index.

This strong general outperformance of the original dynamic indices is due not to the initial asset selection, which was identical, but to the active rebalancing of the index

[13] As a further illustration of how dynamic the constituents of exclusive indices are, Foster and Kaplan (2001) found that in 1997 only 74 companies out of 500 had remained in the S&P 500 over the preceding 40 years.

[14] One can argue that delisting is often due to a depreciation of a company's market value. This claim would further strengthen our argument.

[15] A truly all-inclusive index by definition follows a similar passive buy-and-hold strategy, as all assets that are part of a market are included and held during all times, from the IPO of a company to its disappearance.

constituents over time. In other words, it is the stock selection (and exclusion) criteria applied over time which caused the outperformance of the dynamic indices.

Possible reasons behind the outperformance of exclusive and dynamic indices

As the degree of exclusiveness of an index is intrinsically linked to the dynamics of its underlying constituents, the general point can be made that the more exclusive an index, the more its constituents are subject to change. The relation between exclusive versus all-inclusive should also apply for dynamic versus passive indices. The performance comparisons above suggest that dynamic indices outperform (underperform) passive indices over upward (downward) periods.

The question now of course is why. Is it the subjective stock selection and exclusion decisions of the respective index provider which are responsible for the outperformance, or is it the mechanistic index rules that produce the superior performance? While we certainly do not wish to underestimate the index providers' stock picking capacities, we believe the latter analysis provides more insight into this question.

Within the given market definition of an index (geographic or other), index constituents are largely determined by mechanistic or predefined criteria or principles. These relate in particular to market capitalisation or related factors such as free float, liquidity or price volatility around the threshold level of market value at which a stock becomes eligible for inclusion or exclusion. Excluding technical events such as IPOs, mergers or capital increases, the market capitalisation depends directly on the performance of the stock itself. Falling relative stock prices can therefore lead directly to the exclusion of a stock from an exclusive index. In the same way, a good stock performance in relative terms can qualify a hitherto excluded stock for inclusion.

Because historic stock price performance becomes the decisive criterion for the dynamic rebalancing of index constituents, indices adopt trend following investment and divestment rules. They correspond to phenomena such as autocorrelation of returns, momentum and the limitation of tail risks through implicit stop-loss strategies.

The analogy with the empirical literature on returns characterised by momentum is straightforward. There are two main momentum effects documented in the literature, the "contrarian" and "continuation" effects. In the "contrarian" effect, the past losers in the last 3 – 5 years have bigger average returns than past winners (see DeBondt and Thaler (1985)). In the "continuation" effect, recent winners (stocks with high returns in the months) outperform recent losers (see Jagadeesh and Titman (1993)). These two patterns have been extensively analysed. The main findings are that the long-run "contrarian" patterns disappeared in the last decade whereas the short-run "continuation" effect still constitutes a significant market anomaly (see e.g. Schwert (2003)). Jegadeesh and Titman (2001) confirm the profitability of short-term momentum strategies in the 1990s and provide behavioural explanations for this evidence. Rouwenhorst (1998) shows that international equity markets also exhibit short-term return continuation and provides international evidence on the profitability of momentum strategies.

The short-run "continuation" effect is precisely the rationale underlying the implicit active strategy behind the selective indices. The timing of the short-run momentum and that of the maintenance index rules are also equivalent (i.e. monthly, quarterly or semi-annually). In the same spirit of the short-run "continuation" effect, selective indices dynamically adjust their constitution by including and allocating more weight in the recent winners and

penalising the recent losers. The momentum strategies can be also seen as an example of "technical trading" focused on price trends that ignore company fundamentals and analyst recommendations.

The rules which define the constitution and dynamic changes of index constituents do not only correspond to momentum strategies. The inherent trading strategy in the index construction also has similarities with other trading strategies focused on risk protection. In fact, exclusive market indices embody minimum market capitalisation requirements. Such market capitalisation thresholds represent implicit stop-loss strategies that exclude falling stocks and replace them with rising ones. This is a much wider and more compelling effect than the survivorship bias. The exclusion of falling stocks can be seen as a downside risk protection against severe price drops of individual index components. In short, exclusive indices do not only tend to buy the winners, they also cut their exposure to losers by adopting a market capitalisation-based stop loss strategy.

Implications for an asset manager

The first implication for an asset manager is that he or she has to be aware of the implicit trading strategy behind index construction. This is a simple but important consequence. The asset manager can then consciously decide whether to accept – and how to handle – the implicit trading strategy hidden in some market indices.

All the main aspects of the investment process are affected by the implicit index strategy: client analysis (determination of risk-return profile, investment horizon, and other investment guidelines such as liquidity requirements, currency, tax aspects), benchmark construction (or strategic asset allocation), timing (or tactical asset allocation), selection (or stock picking), performance measurement and attribution, and risk management.

For final investors, the presented findings imply that index-based investment does not necessarily represent what it appears to be and that many indices used for replication and benchmarking entail a much more active investment style than is apparent. Investors seeking a truly a passive investment strategy should therefore aim to replicate an all-inclusive type of index such as the Wilshire 5000 – and accept the higher replication costs. Investors who are only seeking a benchmark for an active investment mandate might also be better served by such an index - and in this case at no additional cost. In general, much more attention should be paid to index rules. For instance, the timing of the reconstitution and rebalancing of market indices should be consistent with the length of the investor's investment horizon.

The hidden but implicit active strategy of some indices can also pose agency problems in the asset manager - client relationship. A vague definition of a benchmark may have a significant impact on the final performance. As shown above, index twins may provide different performances, depending on which index twin is used. This argument applies for the ex-ante and ex-post performance.

Tactical asset allocation and stock picking are also considerably affected by inherent active strategies. One of the main implications for portfolio managers is that momentum strategies are directly or indirectly an integral part of the asset selection, exclusion and weighting decision. For enhanced index strategies, these might not only apply to the marginal stocks which are about to be included or excluded but to the entire investment universe. Moreover, in order to enhance the stock picking performance, an asset manager could have an incentive to anticipate index rebalancing. Asset managers with a top-down approach typically possess macroeconomic forecasts. It would be straightforward for those managers to use

exclusive / inclusive indices from an opportunistic viewpoint. In a perspective of bull (bear) markets, an inclusive (exclusive) index can be conceived more as the benchmark and the exclusive (inclusive) index as an active strategy.

The presence of hidden active strategies highlights the advantage of measuring the investment performance in absolute instead of relative terms. Performance decomposition (or performance attribution) plays an important role for active managers. In this respect, it is worth noting that those hidden strategies primarily affect selection or stock picking. Brinson, Hood and Beebower (1986) propose a simple method for decomposing an asset manager's performance relative to its benchmark. Brinson et al. show that the main performance contribution comes from the strategic asset allocation (80-90%) and only a minor part from the tactical asset allocation and selection (10-20%). Our results suggest that tactical asset allocation and selection are even less important since their contribution is largely affected by the index "active" strategy.

The use of derivatives can be helpful to immunise or leverage the hidden active strategy of selective indices. The theory on derivatives suggests that a long (short) position on a selective index can be offset with a short (long) position on its derivatives, typically futures contracts. Other derivatives could also be employed, typically options and swaps.

Conclusion

With the ever-increasing popularity of so-called passive investment management and the all-pervasive use of equity market indices as benchmarks, major index providers such as Standard and Poors, Dow Jones or Morgan Stanley have become, in an indirect way, the world's biggest investment managers. Given the way the most widely used indices are constituted, however, it would be a mistake to consider investments which replicate the performance of those indices as a form of passive investment management.

The easier replication of exclusive indices magnetizes passive investment to a significant extent. Our research digs more deeply into the index construction and rebalancing methodology and finds that an exclusive index should not be synonymous with passive investment. Not only do exclusive indices systematically differ from their more inclusive peers, but their performance is biased by a market-timing component. Thus, exclusive indices tend to outperform (underperform) inclusive ones in upward (downward) markets. This bias is due to the set of rules governing the constituents' selection and the rebalancing procedure. These rules act in the same way as momentum and stop-loss strategies.

On an aggregate level, exclusive indices appear to behave in a time-varying and pro-cyclical fashion. Inherent active rules can be shown to have boosted market performance (as reported by the most popular indices) during bull periods and to have exacerbated losses during negative trends. Here, we have discussed the main implications for asset managers. However, this issue may also warrant the attention of macroeconomists.

Figure 1: Outperformance and under performance of Selective Indices during Bull and Bear Markets

This graph shows the cumulative outperformance of three selective US stock market indices with respect to more inclusive indices. The three index pairs are the S&P 100 and 500 index, the Russell 200 and 3000 index, and the Wilshire 750 and All-Share index. The selective indices include only the 100, 200, and 750 largest companies listed on the US stock markets, respectively for the S&P 100, Russell 200, and Wilshire 750. The more inclusive indices comprise the 500, 3000 and all securities covered by the S&P, Russell, and Wilshire index providers, respectively. Returns are calculated on a logarithmic and continuously compounded basis. The cumulative performance over the bull (bear) period is the sum of monthly returns from 1/1/1996 to 3/31/2000 (4/1/2000 to 12/31/2003).

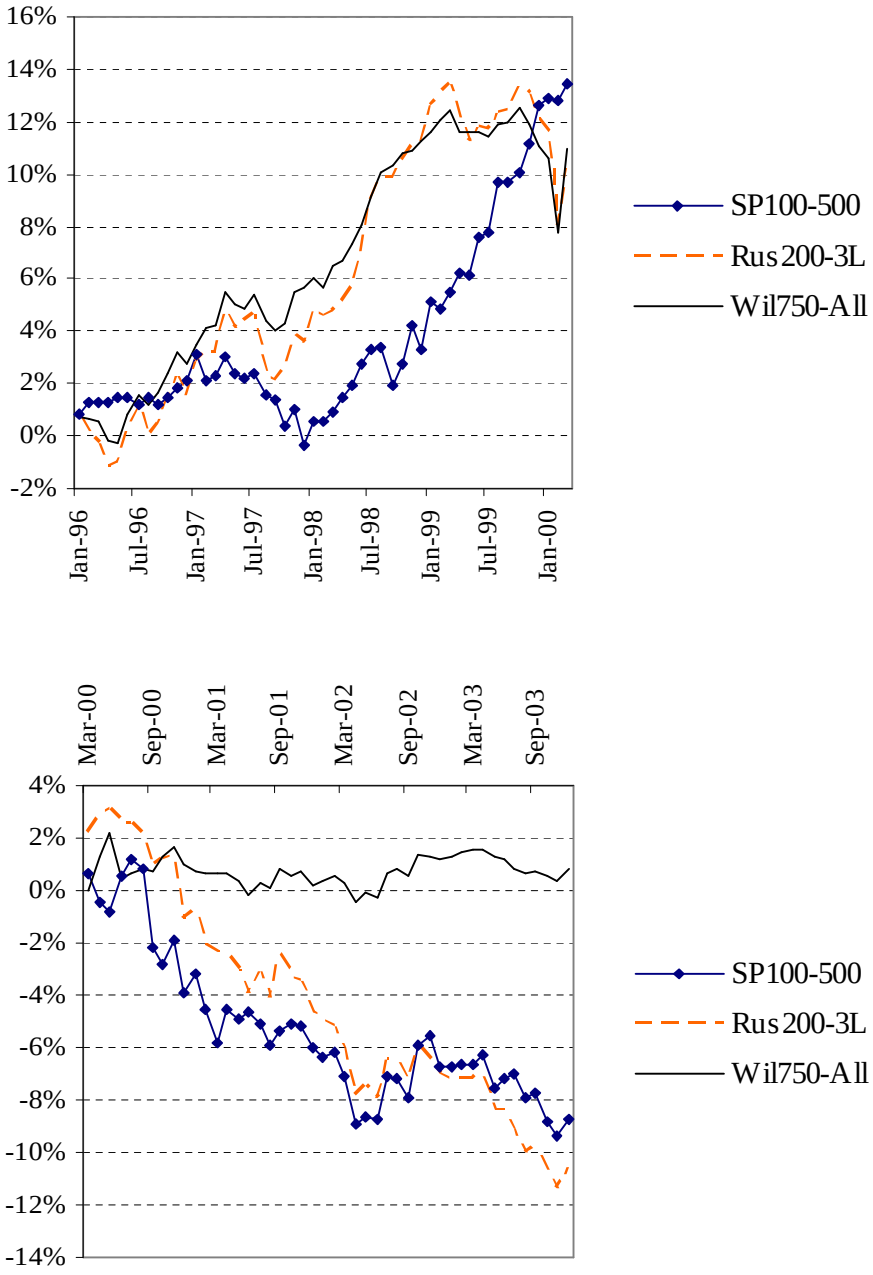

Table 1: Main characteristics of equity market indices.
This table summarises the main information on the major equity market indices. It shows the names and characteristics (where applicable) of the exclusive and inclusive definitions of these indices. No style indices are considered. The first column shows the name of the index provider. The other columns show the main characteristics of the index construction and maintenance rules.

Index provider	Types	Criteria	Membership	Weighting	Adjustments
Dow Jones Averages Indices	Highly selective sector indices	U.S. companies that are leaders in their industries	Components are selected at the discretion of the editors of *The Wall Street Journal*.	Price weighted method adjusted for corporate events (e.g. splits, spin-offs)	Discretionary
Dow Jones Global Indices	Global Indices: World, Region, Country, and Sector Indexes	Constructed to cover 95% of market capitalisation	Geographical or sector classification	Float-adjusted market capitalisation	Systematic and predefined rules
Dow Jones Titans Indices	Highly selective indices	The world's 30 biggest and best-known companies	Largest and most-trusted market leaders in 18 sectors (ICB classification).	Designed to incur minimal expenses, high liquidity and low turnover.	Discretionary – chosen by the index committee
Dow Jones Wilshire	Wilshire 750 And All-Equities	Market capitalisation, trading volume, institutional holdings	U.S.-headquartered companies; common stocks, REIT or limited partnership	Weighted by float-adjusted market capitalisation	Universe defined in June, but stocks are added and deleted on the 3rd Friday of each month.
Morgan Stanley Capital International Inc. (MSCI)	Country, Region, Sector indices	Market capitalisation; liquidity; length of trading; free-float	All listed equity securities classified in broad, investible, prime and small markets. GICS® applies.	Float-adjusted market capitalisation.	Semi-annual revisions to reconstitute the index universe (end of May and November); quarterly changes of the investible market index. Immediate implementation of event-related changes
Paris Bourse	CAC 40; SBF 120 and 250	Market capitalisation and liquidity (measured by turnover, volume, bid-ask spread and volatility)	40 or 250 French companies listed on the Paris Stock Exchange	Weighted by capitalisation-weighted value ratio	
Russell	Russell 50, 200, 1000, 2000, and 3000.	Market capitalisation and minimum requirements such as stocks trading above $1.00	Stocks incorporated in the United States	Weighted by market capitalisation.	The universe is defined by the end of May. Final membership list disclosed on 1 July.

S&P / Citigroup	Primary (PMI) and Broad (BMI) Market Index for 26 regions or countries	BMI is the flagship All-Share index; PMI includes the top 80% of the BMI in each country	Market capitalisation greater than USD 100 million	Float-adjusted market capitalisation	Annual re-construction in June but additions / deletions monthly. Immediate implementation of event-related changes
Standard & Poor's Global Indices	29 countries; among others: S&P Global 100 and 1200	Capitalisation; float adjustments; liquidity; company analysis	Number of constituents is fixed. Sector classification based on GICS®. Several criteria determine domicile.	Weighted by float-adjusted market capitalisation	Index committee decides. All share changes over 5% are done at the effective date. Otherwise, on the 3rd Friday of March, June, September and December
Standard & Poor's US Indices	S&P 100, 500, 1000, Composite 1500, Mid-Cap 400, Small-Cap 600, and Equal Weight Index	Capitalisation (given thresholds); float adjustments; liquidity; Company analysis.	Fixed number of constituents. GICS® Sector classification. US companies. "Adequate liquidity and reasonable per-share price"	Weighted by float-adjusted market capitalisation	When needed. There is no annual reconstitution. All share changes over 5% are done at the effective date. Otherwise, weekly changes apply
Swiss Stock Exchange	Swiss Market Index (SMI) and Swiss Performance Index (SPI)	SMI is a blue-chip index. It is made up of a maximum of the 30 largest stocks. SPI contains large- and mid-cap stocks. SMI is not adjusted for dividends	All SWX traded equity securities of companies domiciled in Switzerland or the Principality of Liechtenstein	Market capitalisation with a minimum free-float requirement	Index committee decides index adjustments in April and October. Extraordinary changes immediately apply.
Tokyo Stock Exchange	Topix 30, 100, 500 and 1000	Domestic common stocks listed on the 1st Section of TSE	Most liquid and largest capitalisation	Price weighted with adjustments for liquidity	In April (additions), in October (additions and deletions)

Table 2: Exclusive type of indices *versus* more inclusive type of indices.
This table shows the comparative performance between more exclusive and inclusive equity indices for various index providers. The performance is measured in terms of total returns and annualised Sharpe ratio. Returns are calculated in local currencies. The index providers are listed in the first column. The second column shows the reference region or country of market indices. The third column refers to the beginning of the investment horizon. The beginning of the investment horizon is determined by the most recent inception date of the exclusive and inclusive index. The end of the investment horizon is homogenously set at the end of 2004. Columns five and six (seven and eight) show the performance over bull (bear) periods. A bull (bear) period occurs when the monthly return is higher than (lower than or equal to) zero.

				Bull Periods		**Bear Periods**	
Index Provider	Region / Country	Inception		Exclusive Index	Inclusive Index	Exclusive Index	Inclusive Index
				S&P 100	S&P 1200	S&P 100	S&P 1200
Standard & Poors	Global	Dec-89	Performance	39.4%	37.3%	-44.9%	-43.0%
			Sharpe ratio	4.81	4.93	-4.20	-4.12
				Wilshire 750	Wilshire All Equities	Wilshire 750	Wilshire All Equities
Wilshire	USA	Jun-78	Performance	43.9%	41.9%	-40.7%	-44.9%
			Sharpe ratio	5.01	4.98	-3.33	-3.51
				FTSE 100	FTSE All Share	FTSE 100	FTSE All Share
FTSE	UK	Dec-78	Performance	43.3%	42.0%	-47.0%	-48.6%
			Sharpe ratio	4.74	4.70	-3.37	-3.35
				SMI*	SPI*	SMI*	SPI*
Swiss SE	Switzerland	Dec-93	Performance	45.0%	42.3%	-56.7%	-54.1%
			Sharpe ratio	4.68	4.84	-3.74	-3.76
				Topix 30	Topix 500	Topix 30	Topix 500
Tokyo SE	Japan	Dec-90	Performance	58.0%	47.6%	-54.9%	-49.2%
			Sharpe ratio	3.59	4.64	-4.49	-5.11
				TSE 35	TSE Compos.	TSE 35	TSE Compos.
Toronto SE	Canada	Aug-88	Performance	42.2%	39.2%	-38.3%	-41.2%
			Sharpe ratio	4.92	4.91	-3.31	-3.34
				CAC 40	SBF 250	CAC 40	SBF 250
Paris Bourse	France	Dec-90	Performance	51.0%	47.8%	-63.0%	-54.7%
			Sharpe ratio	4.59	4.58	-4.73	-4.09

*The SMI has outperformed the SPI despite the fact that the former is a price index and the latter a total return index.

Table 3: Performance comparison of different index families for the US stock market. The upper part of this table shows the index performance over a representative bull market period (January 1995 to March 2000) while the lower part shows the index performance over a representative bear market period (March 2000 to March 2003). The columns headed "Performance" and "Return p.a." show the total returns over the sample periods and on an annual basis. The column headed "Return SD annualised" shows the standard deviation of returns on an annual basis. The column headed "Sharpe ratio" shows the investment performance adjusted for risk, i.e. return divided by return standard deviation.

BULL MARKET

	Performance	Return p.a.	Return SD annualised	Sharpe ratio
S&P 100	133.6%	25.0%	15.3%	1.641
S&P 500	118.3%	22.5%	14.5%	1.549
S&P 1500	115.5%	22.0%	14.5%	1.514
RUSSELL 1000	118.2%	22.9%	14.5%	1.582
RUSSELL 3000	114.3%	22.5%	14.4%	1.563
WILSHIRE 750	129.8%	26.0%	14.6%	1.775
WILSHIRE 2500	125.1%	25.4%	14.6%	1.744
MSCI USA	122.3%	25.3%	14.7%	1.726
DJIA	104.7%	22.0%	15.6%	1.408

BEAR MARKET

	Performance	Return p.a.	Return SD annualised	Sharpe ratio
S&P 100	-64.2%	-20.8%	19.3%	-1.076
S&P 500	-56.9%	-19.0%	17.8%	-1.066
S&P 1500	-53.0%	-17.7%	17.7%	-0.997
RUSSELL 1000	-57.2%	-19.6%	18.2%	-1.081
RUSSELL 3000	-55.9%	-19.7%	18.2%	-1.081
WILSHIRE 750	-55.2%	-20.1%	18.3%	-1.096
WILSHIRE 2500	-53.3%	-20.0%	18.4%	-1.088
MSCI USA	-61.0%	-23.6%	17.8%	-1.328
DJIA	-31.2%	-12.5%	18.2%	-0.687

Table 4: Differences in performance among different US stock market indices. This table shows the significance levels of the two-tailed *t*-statistics to assess a similar performance between pairs of US stock market indices. The upper part of this table shows the *t*-stat for the index performance over a representative bull market period (January 1995 to March 2000) while the lower part shows the index performance over a representative bear market period (March 2000 to March 2003). A significant confidence level equal to or better than 1% is marked in bold.

BULL MARKET

T-stat	S&P100I	S&PCOMP	S&P1500	FRUSSL1	FRUSSL3	WILT750	WILT250	MSUSAML	DJINDUS
S&P100I									
S&PCOMP	**0.8%**								
S&P1500	1.5%	35.2%							
FRUSSL1	4.0%	99.2%	11.7%						
FRUSSL3	3.6%	48.6%	70.0%	15.9%					
WILT750	58.4%	**0.0%**	**0.0%**	**0.0%**	**0.0%**				
WILT250	35.1%	25.3%	0.8%	3.9%	**0.0%**	19.0%			
MSUSAML	4.3%	8.2%	12.2%	36.0%	23.7%	4.5%	68.2%		
DJINDUS	4.1%	34.6%	47.5%	38.6%	56.5%	11.2%	23.4%	22.9%	
Mean	14.0%	31.5%	22.3%	26.1%	27.3%	11.6%	22.0%	22.5%	29.9%

BEAR MARKET

T-stat	S&P100I	S&PCOMP	S&P1500	FRUSSL1	FRUSSL3	WILT750	WILT250	MSUSAML	DJINDUS
S&P100I									
S&PCOMP	25.3%								
S&P1500	14.7%	3.5%							
FRUSSL1	40.3%	93.4%	14.7%						
FRUSSL3	32.7%	76.9%	24.9%	53.1%					
WILT750	21.2%	50.3%	51.7%	27.6%	56.6%				
WILT250	20.7%	38.8%	95.1%	15.1%	4.0%	41.4%			
MSUSAML	57.4%	3.7%	2.1%	40.6%	27.6%	12.7%	14.6%		
DJINDUS	2.4%	3.2%	6.2%	3.4%	5.7%	7.1%	10.2%	1.6%	
Mean	26.8%	36.9%	26.6%	36.0%	35.2%	33.6%	30.0%	20.1%	5.0%

Table 5: Returns of the S&P/Citigroup indices for several countries. The S&P/Citigroup provides pairs of equity market indices for various countries and regions. The exclusive index is called the Primary Market Index (PMI). It represents the largest capitalisations, i.e. the top 80% of the available capital in a given market. The more inclusive index is called the Broader Market Index (BMI) and represents all the quoted shares. The first column shows the reference country of the market index. The second column refers to the inception date of the index. The end date of the sample period is 31.12.2004 for all indices. The third (fifth) column shows the annualised outperformance of the PMI with respect to BMI over bull (bear) markets. A positive (negative) return of the BMI defines a monthly bull (bear) period. Returns are calculated in local currencies apart from in those regions labelled with $ and €. The fourth (sixth) column shows the PMI outperformance in terms of the annualised information ratio over bull (bear) periods. The last row shows the frequency in % of the outperformance of the PMI over the BMI.

		Outperformance PMI over **bull** markets		Outperformance PMI over **bear** markets	
Country	Inception date	Return	IR	Return	IR
AUSTRALIA	30.06.89	1.1%	9.2	-2.6%	-67.4
AUSTRIA	30.06.89	2.2%	6.5	-2.2%	-15.2
BELGUIM	30.06.89	-0.3%	8.2	-2.4%	-6.3
CANADA	30.06.89	0.8%	2.6	-0.9%	-1.7
CZECH REPUBLIC	31.08.01	5.3%	6.7	-13.5%	-4.7
DENMARK	30.06.89	1.7%	2.1	-4.3%	-18.7
FINLAND	30.06.89	3.7%	1.5	-17.3%	-3.7
FRANCE	30.06.89	1.4%	4.5	-2.5%	-30.3
GERMANY	30.06.89	2.8%	2.4	-5.3%	-5.5
GREECE	30.04.00	-1.4%	-5.0	0.0%	0.0
HONG KONG	28.02.91	3.2%	4.0	-1.1%	18.5
HUNGARY	31.01.97	12.6%	37.1	3.3%	-8.1
IRELAND	30.06.89	2.7%	3.1	-3.7%	-4.8
ITALY	30.06.89	4.8%	-7.1	0.8%	3.0
JAPAN	30.06.89	0.2%	-1.2	-1.5%	-8.3
ASIA PAC. ($)	30.06.89	1.3%	-5.0	-0.1%	-0.3
EMERGING MARKETS ($)	31.01.95	2.1%	6.7	0.7%	1.2
EMU COUNTRIES (€)	28.02.99	0.1%	0.2	-3.8%	-7.9
EUROPE (€)	28.02.99	0.5%	3.8	0.0%	0.6
NORTH AMERICA ($)	30.06.89	-0.7%	-1.6	0.3%	-3.1
NORWAY	30.06.89	-0.7%	-10.9	-0.1%	0.7
NETHERLANDS	30.06.89	1.5%	4.2	-1.5%	-3.9
NEW ZEALAND	30.06.89	2.3%	3.3	-3.7%	-3.7
PORTUGAL	31.08.98	-0.2%	-0.8	-2.9%	-2.8
SCANDANAVIA (€)	28.02.99	5.9%	3.7	-9.7%	-4.7
SOUTH KOREA	31.08.01	9.7%	-8.7	8.0%	15.6
SLOVENIA	31. 01.01	8.9%	9.6	0.1%	0.1
SINGAPORE	30.06.89	-1.2%	-32.6	-7.5%	-11.3
SPAIN	30.06.89	2.9%	4.8	-1.9%	-2.0
SWITZERLAND	30.06.89	1.5%	2.4	-0.4%	1.2
SWEDEN	30.06.89	2.5%	3.2	-4.3%	-3.0
UNITED KINGDOM	30.06.89	2.0%	13.2	1.9%	-5.2
UNITED STATES	30.06.89	-0.7%	-1.6	0.3%	-2.6
WORLD ($)	30.06.89	0.4%	3.4	0.0%	0.2
Mean		2.4%	1.4	-2.2%	-5.2
Nbr of times PMI>BMI		80%	71%	26%	26%

Table 6: Regression analysis for market timing. Using the S&P/Citigroup index data, we estimate the market model (columns 3-6) and market timing (columns 7-11) assuming that the Primary Market Index (PMI) is the managed portfolio and the Broader Market Index (BMI) is its benchmark or market portfolio. The (log) excess return of the PMI and BMI with respect to the riskless asset in month t are denoted as $r_{t,PMI}$ and $r_{t,BMI}$. The OLS regressions are the following:

Market Model: $r_{t,PMI} = a + b r_{t,BMI} + e_t$

Market Timing: $r_{t,PMI} = a + g r_{t,BMI} - l d_t r_{t,BMI} + e_t$

Where d_t is a dummy variable, $d_t = 1$ if $r_{t,BMI} > 0$, zero otherwise. The first and second columns show the reference country and number of observations. The sixth (eleventh) column shows the Chi-square value of the Wald test for the null hypothesis that beta is equal to 1 (γ=1 and λ=0). ***, **, * mean a significance level of 1, 5, and 10%.

Country	Obs	α	β	Ad R2	H_0: β=1	α	γ	λ	Ad R2	H_0: γ=1, λ=0
AUSTRALIA	186	0.000	1.036***	0.988	15.96***	-0.001	1.054***	0.038	0.988	19.28***
AUSTRIA	186	0.001	1.020***	0.987	1.09	0.000	1.026***	0.011	0.987	4.20
BELGUIM	186	0.000	1.021***	0.986	5.54**	-0.001	1.030***	0.016	0.986	2.93**
CANADA	186	0.000	1.023***	0.982	5.09**	0.000	1.008***	-0.026	0.982	2.87**
CZECH REP.	40	-0.002	1.122***	0.964	16.73***	-0.001	1.115***	-0.020	0.963	16.23***
DENMARK	186	-0.001	1.048***	0.983	19.40***	-0.002*	1.074***	0.051	0.983	20.52***
FINLAND	186	-0.002*	1.123***	0.984	34.53***	0.002	1.071***	-0.106**	0.985	42.56***
FRANCE	186	0.000	1.026***	0.992	7.66***	-0.001	1.037***	0.021	0.992	12.64***
GERMANY	186	0.000	1.063***	0.995	88.55***	0.000	1.081***	0.032	0.995	100.54***
GREECE	57	0.002	0.976***	0.990	2.75*	0.000	1.012***	0.061*	0.990	6.53**
HONG KONG	167	0.000	1.006***	0.991	0.30	-0.001	1.023***	0.035**	0.991	4.38
HUNGARY	96	0.002*	1.029***	0.987	5.99***	0.000	1.059***	0.055**	0.987	12.47***
IRELAND	186	-0.001	1.050***	0.971	14.20***	-0.002	1.071***	0.041	0.971	17.68***
ITALY	186	0.000	1.008***	0.993	0.70	0.001	0.992***	-0.037	0.993	3.60
JAPAN	186	0.000	1.004***	0.988	0.16	0.001	0.990***	-0.026	0.988	0.90
ASIA PAC.	186	0.000	1.004***	0.992	0.28	0.001	0.988***	-0.032	0.992	1.78
EMERG. MKTS	120	0.000	1.021***	0.997	8.12***	0.000	1.018***	-0.005	0.997	8.68***
EMU COUNT	71	0.000	1.035***	0.995	9.58***	-0.001	1.042***	0.012	0.995	10.26***
EUROPE	71	-0.001*	1.004***	0.992	0.09	-0.002*	1.030***	0.043	0.992	2.46
NORTH AME.	186	0.000	0.993***	0.984	0.61	-0.001*	1.023***	0.058**	0.984	4.72*
NORWAY	186	0.000	0.986***	0.983	1.17	0.000	0.991***	0.009	0.983	1.17
NETHERLANDS	186	0.001	1.024***	0.988	6.88***	0.001	1.020***	-0.007	0.988	7.47**
NEW ZEALAND	186	0.000	1.052***	0.977	9.18***	0.000	1.037***	-0.030	0.977	9.27***
PORTUGAL	77	-0.001	1.026***	0.980	1.21	0.000	0.989***	-0.065	0.980	5.67**
SCANDAN.	71	-0.002*	1.100***	0.994	64.58***	-0.001	1.092***	-0.016	0.994	76.32***
SOUTH KOREA	41	0.000	1.011***	0.992	0.40	-0.002	1.038***	0.056	0.992	2.05
SLOVENIA	27	0.000	1.108***	0.980	23.62***	0.001	1.096***	-0.041	0.979	28.60***
SINGAPORE	186	0.000	1.024***	0.992	6.93***	0.001	1.007***	-0.031	0.992	10.14***
SPAIN	186	0.000	1.043***	0.989	7.61***	0.000	1.039***	-0.008	0.989	8.96***
SWITZERLAND	186	0.001	1.010***	0.984	0.60	-0.001	1.057***	0.085***	0.985	13.07***
SWEDEN	186	0.000	1.051***	0.992	22.52***	0.001	1.035***	-0.031	0.992	23.06***
UNITED KING.	186	0.000	0.996***	0.982	0.08	-0.001*	1.035***	0.071**	0.982	4.27
US	186	0.000	0.992***	0.983	0.64	-0.001*	1.025***	0.062**	0.983	5.33**
WORLD	186	0.000	1.001***	0.991	0.02	-0.001	1.017***	0.029	0.991	1.70

Table 6: Sector analysis

This table shows the comparative performance between global Dow Jones (DJ) super-sector indices from 1 January 1992 to 31 December 2004. The first and second column list the DJ Titans (DJT) and DJ Total Market (DJTM) global indices according to the super-sector classification (GICS® system). The DJT indices include only the 30 largest international companies. The DJTM indices are calculated on the same basis as the DJT but are more comprehensive. The performance is measured in terms of total excess returns of the DJT on the DJTM indices and the annualised information ratio. Columns 3-4 (5-6) refer to bull (bear) periods. A positive (negative) return of the DJTM determines a monthly bull (bear) period. The last row shows the sum of the total DJT excess returns and the sum of annualised information ratios.

		Bull Markets		Bear Markets	
Name	Name	Return	IR	Return	IR
DJT AUTO & PARTS	DJTM AUTO & PARTS	10.7%	0.316	6.7%	0.264
DJT BANKS	DJTM BANKS	53.1%	0.353	-106.8%	-0.432
DJT BASIC RESOUR	DJTM BASIC RESOUR	17.8%	0.310	-20.6%	-0.386
DJT TRAVEL & LEIS	DJTM TRAVEL & LEIS	-57.9%	-0.315	74.2%	0.415
DJT CHEMICALS	DJTM CHEMICALS	14.8%	0.343	-1.3%	-0.067
DJT CON & MAT	DJTM CON & MAT	27.1%	0.369	-14.6%	-0.335
DJT OIL & GAS	DJTM OIL & GAS	-10.3%	-0.345	11.3%	0.378
DJT FOOD & BEV	DJTM FOOD & BEV	16.3%	0.332	-1.3%	-0.073
DJT FINANCIAL SVS	DJTM FINANCIAL SVS	40.8%	0.348	-24.8%	-0.411
DJT HEALTH CARE	DJTM HEALTH CARE	22.2%	0.325	-24.0%	-0.419
DJT INDS GDS & SVS	DJTM INDS GDS & SVS	10.7%	0.258	3.0%	0.109
DJT INSURANCE	DJTM INSURANCE	25.1%	0.356	-29.5%	-0.420
DJT MEDIA	DJTM MEDIA	-7.3%	-0.237	6.3%	0.308
DJT PERS & H/H GDS	DJTM PERS & H/H GDS	-40.6%	-0.265	55.0%	0.413
DJT RETAIL	DJTM RETAIL	13.7%	0.280	-5.2%	-0.153
DJT TELECOM	DJTM TELECOM	6.3%	0.265	-6.7%	-0.317
DJT TECHNOLOGY	DJTM TECHNOLOGY	4.5%	0.132	31.5%	0.406
DJT UTILITIES	DJTM UTILITIES	-5.2%	-0.178	-32.0%	-0.409
	Sum	141.8%	2.647	-78.7%	-1.130

Table 8: Changes in the MSCI index components from January 1995 to May 2001.
This table shows the changes in the index components of the MSCI country indices. The first column shows the reference country of each index. The second and third columns show the total number of components in January 1995 and May 2001. The fourth and fifth columns show the number of the original components still included in May 2001 and the number of the new index members, respectively. The sixth column shows the total market capitalisation of the original index components in May 2001. The last four columns on the right-hand side show the reasons for the index component exclusions. These include delisting, conversion, M&A or takeover, or an MSCI decision (see 7th to 10th columns respectively).

MSCI Index	Number of components 1995	Number of components 2001	Original components	New Components	Market Cap of original components in MSCI of 2001	Desisted	Conversion	Merger & takeover	MSCI decision
MSCI USA	366	328	218	148	76%	4	0	90	54
			60%	40%		3%	0%	61%	**36%**
MSCI BRAZIL	54	46	25	29	52%	11	0	2	16
			46%	54%		38%	0%	7%	**55%**
MSCI ARGENTINA	23	17	10	13	57%	6	1	1	5
			43%	57%		46%	8%	8%	**38%**
MSCI SWITZER.	42	35	25	17	93%	3	8	4	2
			60%	40%		18%	47%	24%	**12%**
MSCI FRANCE	61	52	37	24	84%	12	1	1	10
			61%	39%		50%	4%	4%	**42%**
MSCI GERMANY	65	48	32	33	81%	3	5	7	18
			49%	51%		9%	15%	21%	**55%**
MSCI UK	136	112	73	63	85%	28	0	14	21
			54%	46%		44%	0%	22%	**33%**
MSCI CANADA	82	68	42	40	80%	2	2	24	12
			51%	49%		5%	5%	60%	**30%**
MSCI AUSTRALIA	47	56	29	18	59%	12	0	0	6
			62%	38%		67%	0%	0%	**33%**
MSCI JAPAN	311	277	230	81	81%	11	0	9	61
			74%	26%		14%	0%	11%	**75%**

Table 9: MSCI index performance compared with a purely passive index performance (January 1995 – May 2001).
This table compares the index performance of some MSCI country indices as published by Morgan Stanley, with a newly calculated passive index. The first column shows the list of the MSCI indices. The second and third columns show the performance in terms of total returns. The passive index is constructed with constant constituents, i.e. by holding the original components over time.

MSCI Index	MSCI Index Return	Passive Index Return
MSCI USA	99%	72%
MSCI BRAZIL	101%	50%
MSCI ARGENTINA	17%	-22%
MSCI SWITZERLAND	106%	92%
MSCI FRANCE	116%	88%
MSCI GERMANY	97%	85%
MSCI UK	64%	49%
MSCI CANADA	88%	65%
MSCI AUSTRALIA	58%	48%
MSCI JAPAN	-6%	-23%
Equally weighted average	74%	50%

Table 10: MSCI USA index performance compared with pure passive indices' performance.
This table shows the total returns of the MSCI US index and two alternative definitions of passive index. The investment horizon extends from January 1995 to May 2001. This time horizon is decomposed in seven sub-periods (six 1-year periods and one 5-month period). The first passive strategy in the fourth column holds the initial index components and weights constant. The second passive strategy in the fifth column is headed "Passive with Reinvestment" performance. This strategy is calculated by reinvesting the amounts corresponding to the last traded prices of the excluded components in the subsequent year in proportion to the market capitalisation weights.

From	To	MSCI USA	Passive	Passive with Reinvestment
1/1/95	31/12/1995	29.8%	25.9%	25.9%
1/2/96	31/12/1996	19.4%	13.6%	14.3%
1/2/97	31/12/1997	27.6%	18.2%	18.3%
1/3/98	31/12/1998	25.3%	16.2%	16.3%
1/4/99	31/12/1999	18.9%	-1.0%	-1.1%
1/5/00	31/12/2000	-14.6%	0.3%	-1.1%
1/5/01	31/5/2001	-4.8%	-0.9%	-2.3%
	Total	101.6%	72.2%	70.2%

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