

# The problems of being passive

Evaluating the merits of an index investment strategy

*In the investment management industry, indexing has received little attention from investors compared with active management. ALEX FRINO and DAVID R. GALLAGHER evaluate the role of index fund managers, contrast the difficulties facing active and passive managers and investigate their relative performances.*



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Indexing is at the very core of modern finance. However, in world capital markets, most institutional and retail investor assets have been concentrated in active portfolio management services, where investors believe markets are less than perfectly efficient in the pricing of securities, and that returns in excess of the benchmark are achievable. Indeed, despite evidence that the average active fund underperforms market indexes, investors have continued their pursuit of active management.

Indexing has only recently begun to gather momentum, both in terms of funds under management and the number of investment managers offering passively managed portfolio services. For example, Australia now has 22 institutions offering clients some form of index investment management and assets exceed \$70 billion, having grown in the year to December 1999 by more than 47%.

Despite this, there has been little empirical research in Australia evaluating the

performance of passively managed funds. One possible reason for this lack of investigation is the perception that index performance is easily achievable, a view indicating little understanding of the potential difficulties index managers may experience.

Index managers are expected to experience performance replication difficulties because of the absence of a level playing field between the benchmark index and an index manager's actual portfolio. This is due to the performance of the index being calculated on the basis of a "paper" portfolio that exhibits no market frictions. The index's "paper" portfolio assumes trading can occur at any time and without cost. In contrast, a "real" portfolio faces market frictions — for example, index managers may face delays in re-balancing their portfolios to mimic the index when fund cashflows arise, and transaction costs (eg, brokerage, stamp duties) are incurred in trading securities. While ultimately index funds are found to perform broadly in line with their target benchmarks, variation does exist across

some index managers in terms of fund tracking error.

### THEORETICAL ORIGINS OF INDEXING

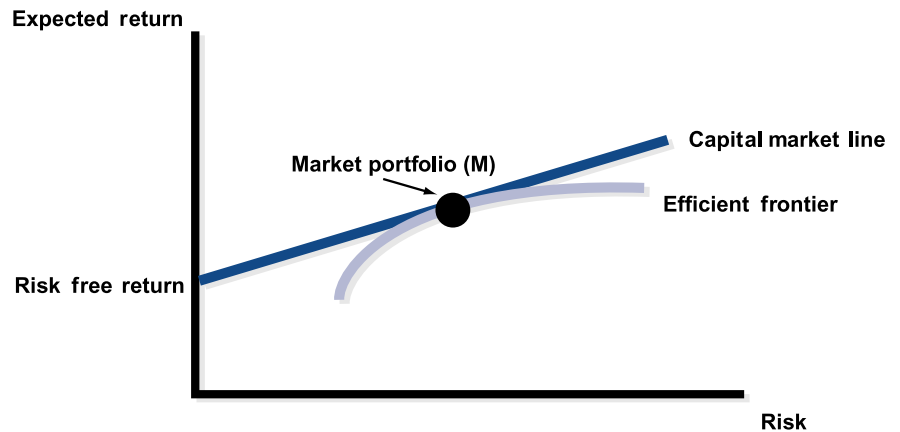
The theoretical origins of index investment management date back to the foundations of modern portfolio theory in 1952, and the development of the capital asset pricing model (CAPM) in 1964 by Harry Markowitz and William F. Sharpe. One of the principal assumptions of the CAPM is that investors hold only two types of assets in achieving efficient or optimal portfolios — risk-free money market securities (for example, treasury notes) and the market portfolio of risky assets.<sup>1</sup> The market portfolio is defined as a composite of all risky assets weighted according to each asset's market value as represented in the total market.

While there is considerable difficulty in identifying and measuring all risky assets, broad equity indexes such as the S&P 500 index in the United States or the All-Ordinaries accumulation index in Australia have typically been used as the market portfolio proxy.

Assuming that the market portfolio proxy or index is mean-variance efficient (where M lies on the upper half of the efficient frontier in Figure 1 and is tangential to the capital market line), the CAPM implies that investors hold portfolios that provide the highest expected return for given levels of risk. While investors may vary the composition weights of their portfolios between risk-free money market securities and a broad-based equity market portfolio, the theory argues that investors are best served when implementing the following portfolio strategy. In other words, investors who are return-maximising and risk-averse should have exposure to all risky assets in exactly the same combinations existing in the market portfolio proxy.

Indeed, the Efficient Markets Hypothesis has lent support to the indexation argument, as most empirical studies have found the average active fund unable to outperform passive benchmarks. In other words, these studies have concluded that on average, active funds are unable to use their security-selection and market-timing activities to provide investors with superior risk-adjusted returns.

FIGURE 1 Capital market line



This is not to say that some active managers have been unable successfully to implement their investment processes to outperform market indexes. Overall, however, active management has not provided returns above the market average or index. This should not be a surprising result, as the index or market return is a market capitalisation-weighted computation of the average return available in the market.

Given the higher transaction costs associated with an active investment management strategy compared with an index approach, Sharpe argues in his 1991 paper "Arithmetic of Active Management" that the average active dollar invested must underperform the average passive dollar after management expenses. By definition, active management must be a zero-sum game, where for every winner there exists a loser. While this logic holds at the macro level, one limitation of the argument is the possibility that the active investment manager may not be truly representative of the average active dollar invested. However, Sharpe's argument still appears to have merit, as institutional investors dominate the market in terms of the size of assets they control. Again using intuition, if the entire market index represents securities held by both active and index investors, the larger the proportion of index investors, the more difficult it becomes for active managers to outperform the benchmark index and the wider the divergence in performance among active managers.

### POTENTIAL DIFFICULTIES FACING ACTIVE MANAGERS

As a result of active institutional managers undertaking the costly research function in the identification of mispriced securities, the very nature of an active portfolio management strategy will result in substantially higher trading than with an index portfolio strategy. The transaction costs associated with an active portfolio strategy include both explicit and implicit costs, which has ramifications for the success or otherwise of the strategy.

#### Explicit costs

These trade costs represent the expenses incurred by managers in the execution of an order to buy or sell securities. The main explicit costs incurred in trade execution are brokerage commissions and taxes levied by government (stamp duty).

#### Implicit costs

Implicit trading costs are more difficult to quantify and include bid-ask spreads, market impact costs and opportunity costs in the execution of a trade. Ideally, an informed active manager attempts to transact as quickly as possible, on the understanding that valuable information decays over time, and thereby incurring the bid-ask spread as a cost of trading.

Opportunity costs may also arise where an informed active manager experiences either a delay in trading (where the price subsequently moves against the manager) or

an inability to trade the desired quantity of securities. Institutional managers also face potential market impacts in trading where the active manager's trading moves stock prices in the direction of the trade, meaning market impact costs are positively related to order size.

#### **Uninformed, liquidity-motivated trading**

Another potential difficulty institutional managers may experience in the pursuit of active returns arises from uninformed, liquidity-motivated trading. Edelen (1999) postulates that active managers decide on their target optimum portfolio on the basis of information they hold. If an active manager experiences a substantial cashflow, the actual portfolio will deviate from the optimum configuration as the manager is forced to trade securities at prices that may have an adverse effect (ie, dilution effect) on portfolio performance.

#### **Capital gains tax liabilities**

Active management will involve significantly more trading in securities than is the case with indexing, and this has implications for the potential capital gains tax liabilities. Depending on the style of the active equity fund manager and the information available about company fundamentals, it is highly likely the portfolio will be turned over within a three-year time frame. The greater trading frequency will increase the potential capital gains assessable for tax purposes, which can materially affect the returns to investors.

While index funds will also crystallise capital gains tax liabilities as a result of portfolio rebalancing, the magnitude of the tax liability would be significantly lower.

#### **POTENTIAL DIFFICULTIES IN AN INDEX PORTFOLIO**

Theoretically, the management of an index portfolio by an investment manager is straightforward, simply requiring investment in each security in the index in the same proportion as the stock's weighting in the benchmark (known as a "full replication" strategy). Alternatively, index managers may adopt non-replication techniques such as stratified sampling or optimisation, where portfolios are constructed using fewer securities than are represented in the index. Nevertheless, the risk characteristics of the

index closely match the underlying index fund portfolio.

However, the day-to-day management of index portfolios is not as straightforward as may appear at first glance. It is extremely likely that index funds will have difficulties in replicating exactly the performance of the target benchmark. As a result, tracking error arises. This is due to the fact that an index represents a mathematical calculation derived from a portfolio of securities that is not subject to the same market frictions experienced by actual index funds. Index funds must physically transact securities to replicate the returns of the benchmark. In contrast, the index assumes rebalancing may occur at any time and without cost.

Due to the assumptions of the index, tracking error in index fund performance may arise because of the following factors:

- Transaction costs — the existence of market frictions will make it difficult for index funds to position their portfolios to perfectly mimic the index without cost. The magnitude of transaction costs incurred by passive funds will be determined by the level of trading engaged in by the portfolio manager in mimicking the index and the liquidity of the underlying benchmark.
- Index volatility — if an index fund is perfectly aligned with the index, then, *ceteris paribus*, market movements will not result in tracking error. However, where the alignment is not exact (as in many cases), the higher the volatility of the benchmark, the higher the expected tracking error.
- Cashflow movements — capital flows between index funds and investors cause flow-induced trading. New funds must be invested quickly across index securities. The size and timing of the cashflows may cause tracking error in index performance, given the additional costs incurred through trading. On the other hand, if new cash is not rapidly invested in index securities, tracking error results.
- Dividends — when a listed company in an index goes ex-dividend, the index incorporates the dividend at the ex-dividend date; however, the index fund may experience a delay in receiving the cash. Due to the

likelihood that the index includes the dividends of a stock before the fund receives the actual distribution, tracking will error occur, as the portfolio cannot be in exact alignment with the benchmark.<sup>2</sup>

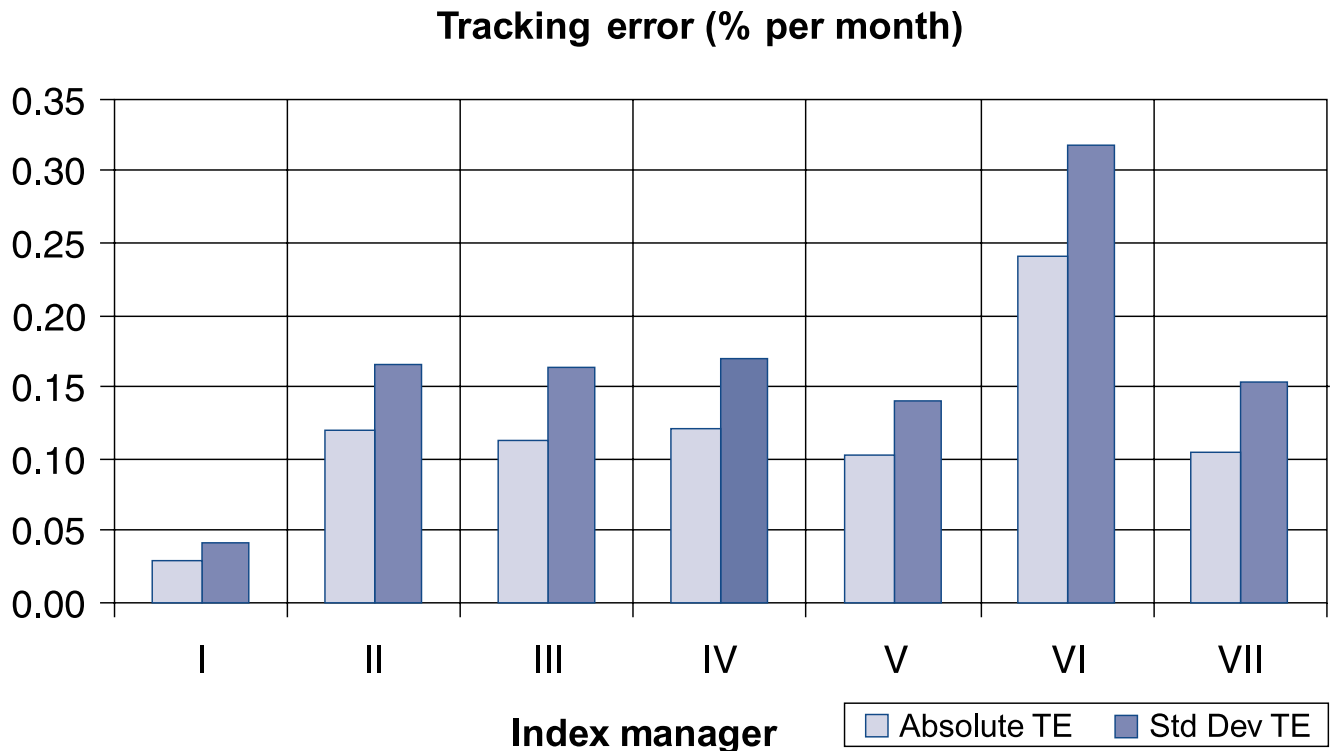
- Index changes — where index securities are the subject of corporate restructuring, such as a merger or takeover, or when the composition of the index is altered by additions or removals, tracking error may arise. For example, if the shares of a company in the index are being acquired by another company which is not in the index, a delay may occur between the time the index fund receives the cash settlement and when the target firm is removed from the index. In addition, periodical changes to the index can also make it difficult for an index fund to replicate the benchmark. "Front-running" by market participants, who pre-empt index changes, can also have an impact on index funds.<sup>3</sup> The price premium factored into stocks ahead of their inclusion in an index and the potential order imbalance that occurs when index funds attempt to acquire the securities at the effective date may also result in tracking error.

#### **PERFORMANCE OF AUSTRALIAN EQUITY INDEX FUNDS**

We examined the performance of Australian equity index fund managers benchmarked to the All-Ordinaries accumulation index (AOAI), where the funds existed in the period July 1989 to March 1999. Three of the managers (Managers 1-3) adopted portfolio management strategies consistent with a full-replication approach and the other four passive funds (Managers 4-7) adopted either stratified sampling or optimisation techniques.

The objectives of the study were to evaluate the magnitude of tracking error over time and to determine whether index funds performed adequately in line with the benchmark. Tracking error is a measure of the extent to which the returns earned by the fund differ from the returns of the target index. If index funds were able to mimic perfectly the performance of the index, tracking error would be zero. In terms of risk-adjusted performance

FIGURE 2 Tracking error of Australian equity index fund managers



measures, index funds should exhibit zero alpha (performance above the index) and systematic risk equal to the index (that is, equal to 1). Monthly returns before management expenses and tax were obtained for the seven managers, whose combined assets totalled close to \$5 billion. Where possible, returns were checked against data provided by asset consultants William M. Mercer to help ensure data integrity.

The first measurement of tracking error involved calculating the absolute difference in monthly returns between the index fund and the benchmark (Figure 1). The absolute measure is important as it accounts for the divergence in performance over time. For example, if an index manager outperforms the benchmark in one month by  $x\%$  and underperforms the index in the next month by  $x\%$ , the outperformance and underperformance does not hide the fact that tracking error exists.

Second, we measure tracking error as the standard deviation of returns differences between index funds and the AOAI, which is the traditional approach used in industry

(Figure 2). Last, an evaluation of each index fund's risk-adjusted performance is considered using the CAPM framework (Figure 3), where alpha is estimated using ordinary least-squares regression. The index fund and benchmark index returns are measured in excess of the equivalent one-month treasury yield.<sup>4</sup> Performance is measured as follows: where:

$R_{pt}$  = the return of fund  $p$  in period  $t$ ;  
 $\alpha_p$  = the average risk-adjusted return of fund  $p$  in the period, also known as alpha;  
 $\beta_p$  = systematic risk of the fund;  
 $R_{mt}$  = the return on the market portfolio in period  $t$ ; and  
 $\varepsilon_{pt}$  = the residual return of fund  $p$  not accounted for by the model.

$$R_{pt} = \alpha_p + \beta_p R_{mt} + \varepsilon_{pt}$$

Figure 2 documents the tracking error of equity index funds. The results show that the average index fund exhibits tracking error greater than 10 basis points per month. Five of the seven managers have tracking error broadly in line with one another; however, Managers 1 and 4 record significantly lower

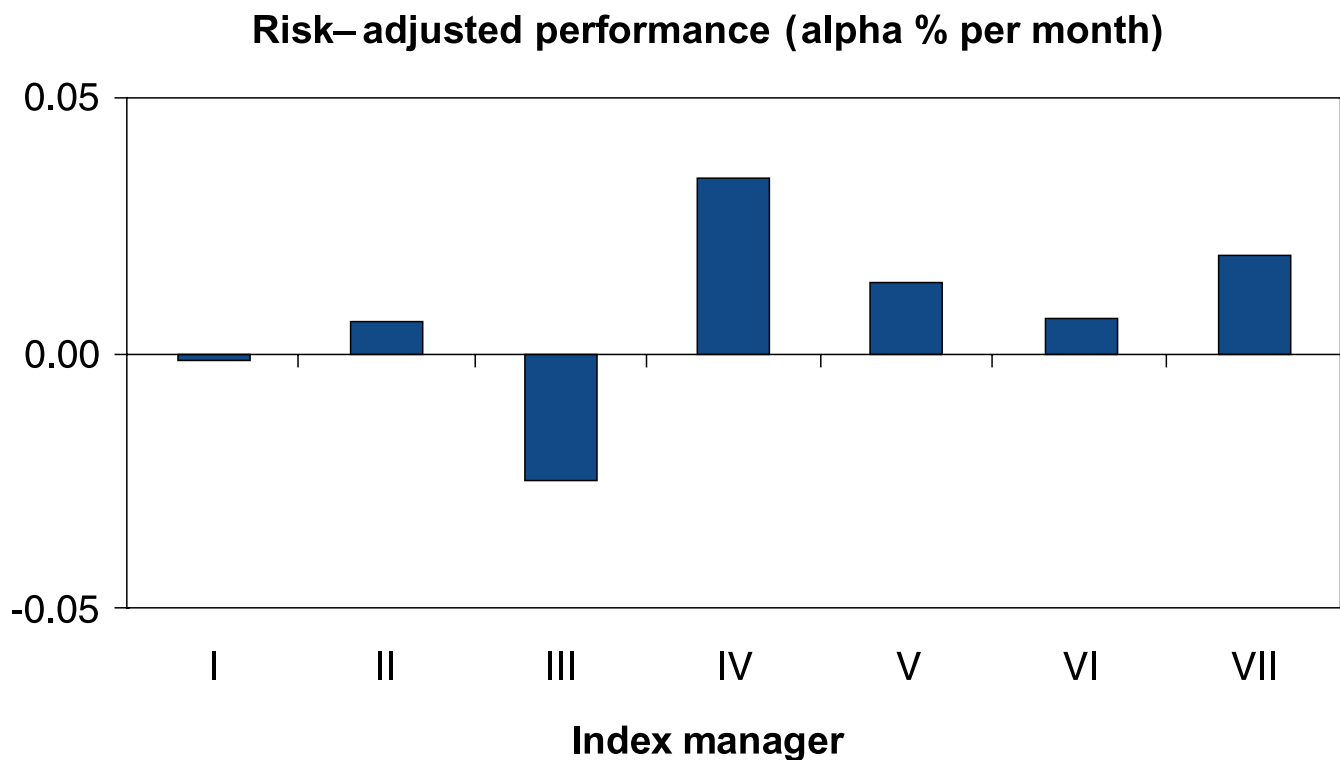
and higher tracking errors on average, respectively. Given the existence of market frictions in replicating the performance of the AOAI, tracking error in performance arises.

Figure 3 shows the risk-adjusted performance of passive AOAI fund managers in the study. If index managers meet their investment objectives, we would expect alpha insignificantly different from zero. While not directly reported, statistical tests indicate that index fund manager alphas are insignificantly different from zero and estimates of systematic (or beta) risk are very close to one. The average alpha earned by index fund managers is 9.3 basis points per annum before management fees — very close to the actual return on the AOAI. We can infer from Figures 2 and 3 that while index managers both underperform and outperform the AOAI each month over time (tracking error), in the long run these return differences mean-revert to almost zero.

#### SUMMARY

The active-versus-index fund management debate has continued for almost four decades, although it has only been in recent times that

FIGURE 3 Risk adjusted performance of index fund managers



index assets under management have grown significantly. While numerous studies both in Australia and globally have investigated the performance of actively managed funds, very little attention has been afforded to the performance of index fund managers.

The assumption that index performance is easily achievable ignores the potential difficulties managers face in constructing portfolios designed to replicate the returns of an index. Market frictions and transaction costs help ensure that tracking error is inherent in performance.

This study highlights the potential difficulties index managers experience and evaluates the extent to which managers incur tracking error in performance. Overall, the results indicate that while tracking error does exist, index managers achieve their risk-return objectives broadly in line with the All-Ordinaries accumulation index.

#### NOTES

1 The CAPM assumes the market portfolio comprises all risky assets including equities,

bonds, real estate and human capital.

2 Most index managers elect to receive dividends in the form of dividend reinvestment plans (DRPs) where possible in order to minimise the effect on performance.

3 For example, in the US in October 1989, Standard and Poor's pre-announced changes to the S&P 500 index where the index change became effective five days after the announcement. This amendment was designed to allow index funds more easily to acquire the securities ahead of their inclusion in the index. Because index funds rebalance portfolios at the day the change becomes effective, this allows risk arbitrageurs the opportunity to sell the stock at a premium to index funds.

4 The 90-day Reserve Bank of Australia treasury note is used and adjusted to reflect a monthly yield.

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