

The Index Tracking Strategies of Passive and Enhanced Index Equity Funds

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ABSTRACT

This study represents the first empirical examination of the daily trading and portfolio configuration strategies of index and enhanced index equity funds. We find index and enhanced funds earn returns and exhibit risk commensurate with underlying indices. Relative to index funds, enhanced index funds are found to incur lower trading costs. We document that index and enhanced index funds experience significantly higher trade difficulty during index revision periods. In terms of portfolio configuration, in cases where index and enhanced funds do not perfectly mimic the underlying benchmark, both fund types exhibit a greater propensity to overweight stocks with higher liquidity, larger market capitalization and higher past performance. Similar criteria are also documented for enhanced funds' holdings outside the benchmark. For non-index constituents, enhanced funds exhibit a higher propensity to ride 'winners' and sell 'losers'.

JEL classification: G23

Keywords: Passive funds; Enhanced index funds; Tracking Error; Index funds; Portfolio configuration; Index revisions; Trading strategies.

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I. INTRODUCTION

The growth in passive or index investment management has been significant over the last decade. By the end of the year 2000, total assets benchmarked to the S&P 500 index in the U.S. exceeded US\$1 trillion. A similar experience of exponential growth rates have been recorded across other Western economies, including the U.K., Canada and Australia. In addition to open-end index fund management, there has also been a proliferation in both the number and type of Exchange-Traded Funds (or ETFs), which are index-related instruments traded on an Exchange that also aim to provide investors with commensurate risk and return to the underlying benchmark portfolio.¹

The substantial growth in assets benchmarked to market indices has in part arisen due to actively managed mutual funds (on average) underperforming the market after costs.² However, Gruber (1996) also highlights a continuing puzzle surrounding the substantial growth of actively managed mutual funds as well, particularly given the fact that index funds perform in line with their risk-return objectives at low cost, offer investors with diversification benefits, and provide increased tax efficiency – given indexing represents a buy-and-hold investment strategy. An alternative investment product to index funds which exhibits very similar features to an index strategy is enhanced index funds. Enhanced funds execute investment strategies that are essentially index-oriented, however the enhanced index manager is permitted to engage in limited (risk-controlled) active strategies that offer return enhancements relative to the benchmark return.³

Interestingly, while index funds benchmarked to both highly liquid and common indices should hold the same constituent securities in almost identical weights (assuming full replication), Elton,

¹ Exchange-Traded Funds (or ETFs) are investment products that trade in a similar manner to listed securities on an Exchange. Common ETFs include Standard and Poor's Depository Receipts (or Spiders), MSCI iShares (also known as World Equity Benchmark Shares (WEBS)) and the Nasdaq QQQ's.

² Researches documenting the inability of the average active mutual funds to outperform the market include Sharpe (1966), Jensen (1968), and Gruber (1996). In recent times, there has been some controversy concerning empirical evidence that finds support for active management (i.e. ability to earn significantly positive risk-adjusted returns) – this includes Chen, Jegadeesh and Wermers (2000) and Wermers (2000).

³ Common return enhancement strategies engaged in by enhanced index managers include participation in IPOs and placements, trading in stocks associated with Index revisions prior to the effective change date, the use of futures contracts, participating in dividend reinvestment plans, switching between similar stock attributes based on stock valuations (i.e. pairs trading), arbitrage between different security types (e.g. preference shares versus ordinary shares), and acting as an offeror of liquidity to other market participants.

Gruber and Busse (2004) find that significant variation exists for S&P 500 index mutual funds in terms of their fees and returns; where the magnitude of the return difference is more than two percent per annum. In terms of exchange-traded funds, Elton, Gruber, Comer and Li (2002) report that Standard and Poor's Depository Receipts (also known as 'Spiders') underperform S&P 500 index funds by 18 basis points per annum. They find performance variation from the benchmark arises due to differences in management fees and non-interest earnings on dividends. While index investors may consider index funds as a homogenous commodity, at face value the evidence suggests investors may need to exercise important judgments concerning the management of index-linked products offered by competitor institutions. This is because index fund performance, risk, expenses, liquidity, turnover, portfolio replication technique, as well as the underlying liquidity of the benchmark, are all expected to be important determinants of how index funds meet their investment objectives. Despite the differences in index fund characteristics, Elton, Gruber and Busse (2004) show that a number of factors related to fund risk, return, expenses, and tax efficiency can be easily forecast from past information.⁴ Our paper extends the literature by providing a deeper understanding of the different trading strategies implemented by index and enhanced index fund managers, the types of securities held in index portfolios and the portfolio configuration properties of both index and enhanced index management.

While index funds have been documented to meet their overall risk-return objectives, recent research has highlighted the challenges that confront passive portfolio managers in their attempts to perfectly replicate the underlying benchmark index (see Frino and Gallagher (2001, 2002)). Theoretically, the management of index portfolios is straightforward and requires investment in all index constituent securities in the same weights as the index (known as a 'full replication' strategy). However in reality, an open-end index fund cannot perfectly mimic the benchmark portfolio across time, and as a result, tracking error in performance will be unavoidable. Previous studies articulate that one of the important reasons why tracking error arises is because the underlying index represents a

⁴ Elton, Gruber and Busse (2003) also find that while there is a relationship between cash flows and index fund performance, new cash inflows are not invested in a rational manner – i.e. fund flows are allocated to index funds that don't necessarily exhibit the most preferable characteristics.

mathematical calculation derived from a portfolio of securities that are not subject to the same market frictions incurred by index managers.⁵ In the event that the benchmark constituents experience replacement, the index assumes that the benchmark portfolio's new weights to each stock can be achieved instantaneously and at zero cost. This assumption does not take into account that index managers are required to physically transact in stocks to re-align their portfolios with the underlying benchmark. Market frictions will therefore give rise to tracking error, and exact index performance cannot necessarily be guaranteed.

In light of the market frictions faced by index managers, this study represents an important and original investigation of three critical issues facing index fund managers in their pursuit of index replication; namely index tracking strategies related to index revision periods, transaction costs associated with index portfolio management, and the portfolio design implemented by index-mimicking funds. The study also provides a direct comparison between passive index funds and enhanced index funds. Enhanced (or risk-controlled) index funds have not been previously examined in the literature to-date. An important contribution of this study is that our analysis examines the operation of index and enhanced index funds using a unique database of the daily portfolio holdings and trades of a sample of institutional Australian equity managers.

One important market friction facing index fund managers exists when a reconstitution of the benchmark is performed by an Index Committee. Studies examining the impact of index additions and deletions have been an active area of analysis since the mid 1980s.⁶ Previous research has focused on aggregate market activity surrounding the announcement dates of stocks both entering and leaving market indices, and many studies have documented significant abnormal returns that are achievable from a supposed "information free" announcement by an Index Committee. While this demand/supply imbalance has mainly been attributed to index managers (who are required to trade as a means of re-weighting their portfolios), a direct examination of index funds' behavior surrounding index changes

⁵ Authors addressing the issue of market frictions and difficulties in replication of indexes include Chiang (1998), Frino and Gallagher (2001, 2002), and Frino, Gallagher, Neubert and Oetomo (2004).

⁶ Studies examining this area include Harris and Gurel (1986), Shleifer (1986), Lynch and Mendenhall (1997), Beneish and Whaley (1996, 2002), Madhavan and Ming (2002), and Denis, McConnell, Ovtchinnikov and Yu (2003). Chan and Howard (2002) provide Australian evidence associated with Index revisions.

remains an important gap in the literature. Specifically, an examination of the actual trading strategies of index and enhanced index portfolio managers in timing their rebalancing decisions represents an opportunity to examine how market frictions and potential order imbalances are mitigated. This is important, given that changes to index constituents have been documented to be an important driver of tracking error in index fund returns.⁷ During index changes, both index and enhanced index funds are required to rebalance their portfolios at the effective date to re-align their portfolios with the reconstituted benchmark. The literature identifies that the index reconstitution procedure causes excess demand (and lower floating supply) of newly added stocks, leading to significant price movements surrounding the index change.

In light of the difficulties faced by index managers around index reconstitution dates, Blume and Edelen (2002) find that index managers can indeed benefit from executing less rigid replication strategies in periods surrounding index revisions. Our evidence provides further support to Blume and Edelen (2002), showing the increased flexibility typically exercised by enhanced index managers leads to lower temporary price impacts. This arises because enhanced funds trade stocks well prior to the effective index change, and therefore, this enables them to significantly reduce their execution costs relative to index funds. Despite this cost differential between index and enhanced index portfolios, both fund types experience significantly higher transaction costs during index revision periods. This occurs due to the significantly higher trade difficulty reflecting excess demand (supply) around the index inclusion (exclusion) date. Given this greater flexibility, we also find that enhanced index funds generate significantly higher realized and total gains during index revision periods relative to index funds, which is likely to be related to enhanced index managers attempting to provide investors with some return compensation – given the reduced flexibility and increased costs associated with index revision periods.

While the relation between fund performance and trading expenses has been examined by previous studies of active mutual funds, little documentary evidence is available concerning passive

⁷ See Chiang (1998), and Frino, Gallagher, Neubert and Oetomo (2004).

funds.⁸ Both index and enhanced index fund performance will be sensitive to transaction costs, particularly when these funds are required to be disciplined in rebalancing their portfolios to mimic the benchmark index. Accordingly, the issue of trading costs for index and enhanced index funds represents an important area of research. In the event of either index constituent changes, liquidity flows between the fund and the investor, dividend payments, or other endogenous factors, portfolio managers of open-end passive funds will be required to rebalance their portfolios to achieve re-alignment with the market index.⁹ The liquidity of stocks comprising the benchmark, as well as the index replication strategy adopted by the index manager, will represent important determinants of transaction costs incurred by index funds. Specifically, Keim (1999) examines the small-cap ‘9-10’ passive fund managed by Dimensional Fund Advisors, and identifies that by not following a pure index strategy, as well as implementing a more patient trading strategy as a means of avoiding excessive trading costs, significant performance benefits have accrued to investors in the fund. Consistent with Keim (1999), we document that enhanced index funds also execute more patient trading strategies relative to index funds, which leads to both lower trading costs and higher returns.

The composition of an index fund portfolio, including the stock weights held by a fund relative to the benchmark, is an important determinant of investment performance and tracking error. Indeed, the asset allocation for multiple asset class portfolios has also been shown to be an important determinant of the total return achieved by portfolio managers.¹⁰ In terms of sector specialist funds, Wermers (2000) also finds evidence that a mutual fund managers’ stock picking talent is a significant determinant of a fund’s overall performance. In terms of passive funds, Keim (1999) documents that the investment rule implemented by the ‘9-10 Fund’ is a significant factor explaining how the fund provided investors with an annual 2.2 percent premium to the 9-10 benchmark. Therefore the portfolio management process adopted, including the types of assets held and the security weights relative to the market index, will be important determinants of aggregate return. Employing the methodology

⁸ Elton, Gruber, Das, Hlavka (1993), Carhart (1997), Dahlquist, Engstrom and Soderlind (2000).

⁹ See Buetow, Sellers, Trotter, Hunt and Whipple (2002) for a discussion of the advantages of disciplined portfolio rebalancing.

¹⁰ Blake, Lehmann and Timmerman (1999).

outlined by Chen, Jegadeesh, and Wermers (2000), our analysis demonstrates that the passive funds are more likely to overweight stocks with higher liquidity, larger market capitalization, and higher past performance (or price momentum). The converse is also the case for stocks that are underweighted relative to the index.¹¹ Decomposing the equity portfolio holdings of enhanced index funds, our study finds that enhanced managers indeed hold securities that are not constituents of the benchmark index. Comparing these stocks to the population of stocks that are listed on the Australian Stock Exchange (ASX), our results show that the non-index holdings of enhanced index managers exhibit a strong propensity to hold stocks with higher liquidity, larger market capitalization and higher past returns. Consistent with Jegadeesh and Titman (2001 and 2002), our findings indicate that enhanced index fund managers are reliant on momentum trading, and are also highly sensitive to transaction costs. In addition, we report evidence that enhanced index funds adopt trading behavior which is inconsistent with Odean's (1998) disposition hypothesis. Enhanced index funds are found to exhibit a higher propensity to ride 'winner' stocks and liquidate 'loser' securities.

The remainder of the paper proceeds as follows. Section II describes the sample of index and enhanced index funds employed in the study. Section III analyses the trading activities of the funds, and this is followed by an examination of the portfolio configuration strategies adopted by index mimicking portfolio managers. The final section concludes the paper.

II. DATA

This study examines the daily holdings and trades of 8 passive funds offered by 5 institutional providers contained in the *Portfolio Analytics Database*.¹² In order to ensure representativity, this paper examines the time period when all 8 funds are continuously in operation – which is the three-year period 2 January 1999 to 31 December 2001. The data consists of 34,638 daily institutional

¹¹ This finding is consistent with the findings of Goetzmann and Massa (2003) which suggests that index funds investors purchases (sells) shares after an upwards (downwards) market movements.

¹² Due to strict confidentiality and the agreements entered into with the fund managers, we are prevented from identifying the participating institutions.

trades, where 19,645 trades are executed by index funds and 14,993 trades by enhanced index funds. Trade, quote and stock information are obtained from the ASX Stock Exchange Automated Trading System (SEATS) provided by the Securities Industry Research Centre of Asia-Pacific (SIRCA).

Table 1 reports descriptive statistics of the index and enhanced index funds examined in this study. As expected, Table 1 shows the average monthly return and average monthly excess return of enhanced index funds are significantly higher than index funds. The average monthly excess return represents the funds' average return net of the benchmark return. Our results also show enhanced funds exhibit significantly higher tracking error relative to index funds. Two measures of tracking error are employed – Absolute Tracking Error and Standard Deviation of Tracking Error. Absolute Tracking Error measures the absolute difference in returns between the index and enhanced index portfolios and benchmark index, while the Standard Deviation of Tracking Error measures the variability (standard deviation) of the arithmetic difference in returns between the index portfolio and the underlying benchmark. Enhanced funds' excess returns exhibit higher tracking error variation, witnessed by the higher standard deviations for the funds' excess returns.

<INSERT TABLE 1 ABOUT HERE>

The data collection procedure employed leads to the possibility that our sample might be susceptible to both survivorship and selection bias. Each index and enhanced index manager operating in Australia was asked to provide both their largest and (where appropriate) second largest, institutional pooled investment product. The collection procedure being at a fixed point in time leads to the acquisition of data from only surviving fund management institutions. Therefore, the sample used in this study has the standard survivorship-bias problem that has arisen in the majority of empirical studies examining mutual fund performance.¹³ However, the impact of survivorship bias for our sample is expected to be limited for a number of reasons. First, the impact of survivorship bias

¹³ Studies that examine mutual fund survivorship bias include Brown, Goetzmann, Ibbotson and Ross. (1992) Brown, Goetzmann, Ibbotson. (1999), Carpenter and Lynch (1999) and Elton, Gruber and Blake (1996).

should be constrained by the limited evaluation period employed in this study. Carhart, Carpenter, Lynch and Musto (2002) demonstrate that the extent of survivorship bias increases with the length of the sample period. Second, the passive strategy employed by our sample means that the probability of failure should be smaller for passive funds than for actively managed funds, given that active managers have a higher performance hurdle – to outperform the market using private information. Indeed, Elton, Gruber and Blake (1996) argue that the impact of survivorship bias is more pronounced when examining mutual funds that exhibit higher risk. Third, and most importantly, we also have historical monthly returns data from Mercer Investment Consulting that includes the performance histories of all institutional funds (both surviving and non-surviving) in the Australian market. From the Mercer database we find no pooled institutional index or enhanced index equity funds in Australian equities was the subject of termination during the period of our study.

However, while we have a high degree of confidence that the sample contains no survivorship bias, given that participation of the fund managers in this study was on a voluntary basis, our sample might still suffer from selection bias. Selection bias may arise due to the better performing institutions being the most compliant and cooperative participants. However, there are a number of reasons which we believe mitigates the selectivity bias of funds comprising our sample. First, the selection criterion adopted should limit the fund manager's opportunity of providing fund information selectively, as we specifically requested information for each manager's largest pooled index and/or enhanced index equity fund. Second, given the existence of economies of scale in managing passive portfolios, investment managers offering pooled institutional passive funds typically only offer one product. Although investment managers may well have a number of other individually managed accounts operated on the behalf of larger clients, we were unable to acquire such data. Our telephone discussions with the managers indicate that the pooled funds comprising the sample are highly representative of each manager's portfolio management process. While this is likely to be the case, in order to ensure robustness of the data we compare the funds in our sample to the index and enhanced

index equity funds for which we do not have daily portfolio holdings and trade data. This data is sourced from the Mercer database.

We find that our sample is highly representative of institutional providers of passively managed equity funds in Australia. The Mercer data shows that of the 8 funds comprising our sample, we have information for 5 of the 7 index fund providers, and 3 of the 5 enhanced index fund managers.¹⁴ In terms of the total size of pooled passively managed funds, the cumulative market share of all managers in our sample is 76.2 percent. The total assets under management of the index and enhanced index funds as at 31 December 2001 is A\$6.5 billion and A\$3.3 billion, respectively.¹⁵ In addition, we examine the potential selectivity bias of our sample with respect to the performance of the other index and enhanced index equity funds available in the institutional market. Given the number of investment management providers is very small, coupled with our need to maintain confidentiality of the sample constituents, we are unable to report individual fund alphas and tracking errors outside our sample in order to preserve anonymity of the funds. However, we find that on the basis of the performance of funds in the period, our sample is indeed representative of the Australian index and enhanced index fund industry.

In terms of the sample period examined, two different benchmark index regimes were in operation. On 3 April 2000, ASX restructured its primary index, namely the Australian All Ordinaries Index (AOI). This occurred through the sale of their index services business to Standard and Poor's (S&P). The original AOI, which had been operating as Australian's primary financial index for two decades, was originally created as a way of measuring general market movements rather than to measure portfolio performance. Subsequently, S&P reconstituted the AOI and introduced a series of new indices for the Australian equities market.¹⁶ In this study, the term index reconstruction denotes the change from the ASX/AOI regime to the S&P/ASX regime. All the funds examined in this study

¹⁴ The funds are classified as index and enhanced index funds on the basis of each managers' self-stated classification. The classification is ultimately determined given the manager's expected (*ex-ante*) tracking error.

¹⁵ Rainmaker (2002) estimates the total assets passively managed in Australian equities is around A\$25 billion as at 31 December 2001. This indicates that other funds, including individual private accounts, which are not included in our sample is approximately 60 percent.

¹⁶ For institutional details, please see Appendix A.

are benchmarked against the AOI index prior to the index reconstruction. Following the index reconstruction, 3 funds are benchmarked to the S&P/ASX 200 and 5 funds are benchmarked against the S&P/ASX 300.

III. FUND TRADING ACTIVITIES

A. Index Revisions

This section presents the first empirical evidence on index and enhanced index funds' rebalancing strategies during index revisions using the funds' daily trade data. The index revision period is defined as the 30 trading day window on each side of the index revision date. The choice of a 30 trading day window is determined by the insignificant excess returns experienced by Australian stocks that are involved in index revision beyond $t = -30$ and $t = 30$, given the evidence presented by Chan and Howard (2002).¹⁷ The funds' holding of the stock as at $t = 30$ is utilized as the benchmark and assumed to be the desired level of holding. On each index revision date, the accumulated and the daily trade value relative to the funds' holding of the stock as at $t = 30$ is computed.

$$\%Trade_t = \frac{TradeValue_t}{HoldingValue_{t=30}} * 100\% \quad (1)$$

$$Cum_t = \sum_{t=30}^{30} \frac{TradeValue_t}{HoldingValue_{t=30}} * 100\% \quad (2)$$

In order to avoid potential bias caused by the index reconstruction event, any index revisions that take place within 5 trading days pre-and-post the index reconstruction date are excluded from the sample.

<INSERT FIGURE 1 ABOUT HERE>

<INSERT FIGURE 2 ABOUT HERE>

¹⁷ The analysis is also performed using the conventional method of an event study based on 60 days on each side of the event date, and the empirical results are consistent. These results are not reported, but are available upon request.

<INSERT TABLE 2 ABOUT HERE>

Figures 1 and 2 depict the trading activities during the index inclusion and exclusion periods respectively while Table 2 reports the results. For index inclusions, index funds commenced their trading activities at $t = -5$, but, more than 50% of the purchases are executed between $t = -1$ and $t = 0$. This is consistent with the investment mandates of index funds. However, Enhanced index funds' trading activities during the index inclusion periods are more dispersed. Enhanced funds' significantly increased their trading activities from as early as $t = -15$. Given that the index revision announcements are generally made at $t = -10$, this result indicates that enhanced index funds speculate on which stocks that are to be included in the benchmark, and acquire these stocks prior to the index change announcement.¹⁸ In addition, significant trading activities are documented for both types of funds on $t = +22$ indicating that some funds execute their purchases well after the event date to avoid excessive trading costs that are due to the temporary price pressure associated with index inclusion.

With respect to index exclusions, index funds exhibit significant trading activities from $t = -7$ while enhanced index funds exhibit significant trading activities from $t = -15$. The trading activities during index exclusion after $t = 0$ however, are minimal. Considering that index exclusion covers corporate events such as bankruptcies and takeovers, this finding is anticipated as these stocks are delisted after $t = 0$ and therefore, it is no longer possible to trade the stocks.¹⁹

<INSERT TABLE 3 ABOUT HERE>

Table 3 reports the index and enhanced index funds' trading activities on the largest 5% of stocks (by index weight) associated with index revisions. Significant trading activities are only

¹⁸ For institutional details, see Appendix A.

¹⁹ The results are consistent when the analyses are performed separately for the pre and post index reconstruction periods. These results are not reported but are available upon request.

documented on the effective dates. This is anticipated as stocks from this category are those that are associated with Initial Public Offerings (IPOs), spin-offs, demutualisations, bankruptcies, mergers or takeovers. With the exception of bankruptcies, institutional investors would be expected to have completed a large proportion of their trading activities on these large stocks prior to the event date rather than on the effective date for index revisions.²⁰ We also perform robustness tests that examine the pre- and post- index reconstruction periods separately (i.e. on either side of the event date) and consistent results are found.²¹

We also employ an approach similar to Odean (1998) in order to compute the returns generated by index and enhanced index funds during index revision periods. The funds' gains and losses are not computed separately, but rather the funds' returns which take a positive value for gains and a negative value for losses are used.

$$RelativeRealisedGain = \frac{\sum_{t=-30}^{t=30} RealisedGains_t}{TotalHoldingValue_{t=30}} \quad (3)$$

$$RelativeUnrealisedGain = \frac{\sum_{t=-30}^{t=30} UnrealisedGains_t}{TotalHoldingValue_{t=30}} \quad (4)$$

$$RelativeTotalGain = \frac{\sum_{t=-30}^{t=30} [RealisedGains_t + UnrealisedGains_t]}{TotalHoldingValue_{t=30}} \quad (5)$$

<INSERT TABLE 4 ABOUT HERE>

The results reported in Table 4 demonstrate that, for index funds, all three measures of returns are not significantly different from zero for the inclusion periods. During index inclusion periods, enhanced index funds generate significant and positive realized gains. The realized and total gains

²⁰ Generally, there are time lags between the corporate actions and the index revision dates.

²¹ The results are not reported, but are available upon request.

generated by enhanced index funds are significantly higher than those of the index funds. Hence, the early trading activities of the enhanced index funds are formulated not only to avoid excess costs of trading but also to ride the temporary returns associated with this type of stock during index inclusion periods. During index exclusion periods however, both types of funds generate significant unrealized and total losses. Nonetheless, the enhanced funds' losses are significantly lower than those of the index funds. In order to ensure the robustness of the results, the analyses are partitioned for the pre and post index reconstruction periods and the results are consistent.²²

B. Trading Strategies

This section examines the trading strategies implemented by index funds relative to enhanced index funds. Keim (1999) identifies trading strategy as a primary driver of the 9-10 fund's outperformance. The failure of a fund to implement effective trading strategies translates into excessive transaction costs, which directly erodes the fund's aggregate return and therefore performance.

Following CRSP's (Centre for Research in Security Prices) definition of portfolio turnover, this study measures annualized turnover as the ratio between (a) the minimum market value of buys/sells for the fund and (b) the average fund size over the year. This definition is an attempt to control for turnover which is otherwise associated with the fund's growth or decline in assets that is due to investor inflows/outflows.

$$Turnover_t = \frac{\min \left[\sum_{t=1}^{365} Purchase_t, \sum_{t=1}^{365} Sales_t \right]}{\left[\sum_{t=1}^{365} FundSize_t \right] / 365} * 100\% \quad (5)$$

Table 5 reports a turnover of 6.47 percent for index funds while enhanced index funds exhibit turnover of 12.26 percent per annum. The higher turnover by enhanced index funds signifies that these funds are more prepared to engage in active trading activities.

²² The results are not directly reported, but are available upon request.

<INSERT TABLE 5 ABOUT HERE>

Examining the dollar value of index fund trades relative to fund size, Table 5 demonstrates significantly smaller portfolio asset values are transacted by enhanced index funds than is the case for index funds.²³ Enhanced index fund trades for stocks involved in index revisions are also smaller than those of index funds during both index revision and non-revision periods. We also find that during index revision periods, index fund trades are of a smaller relative magnitude than those trades executed outside of index revision periods.

<INSERT TABLE 6 ABOUT HERE>

In order to further analyze index and enhanced index funds' trading strategies, the trade packaging methodology of Chan and Lakonishok (1995) is adopted. A buy (sell) package is constructed by including the portfolio's successive purchases (sales) of the stock via the same broker. The package ends when the portfolio stays out of the market for the stock for 5 consecutive days.²⁴ The results reported in Table 6 (Panel A) demonstrate that enhanced index funds' trade packages consist of a significantly larger number of trades than those of index funds. The average number of trades per package is 1.37 trades for enhanced index funds and 1.35 trades for index funds. During index revision periods, index and enhanced index fund packages consist of a larger number of trades (1.82 trades and 2.12 trades for index and enhanced funds respectively).

Table 6 (Panel B) reports the average number of days required to complete the index and enhanced funds trade packages are 1.14 and 1.26 days respectively. This result is lower than that

²³ The trade values are deflated by fund size in order to avoid any bias caused by the larger dollar value per trade executed by larger funds.

²⁴ Robustness tests were also performed based on 7 day packages and end of day packages. These results are not directly reported, but are available upon request. Trade packages that took more than 21 trading days to execute are deleted from the sample. Similarly, trade packages that are smaller than \$10,000 are deleted from the sample. These filters were imposed to eliminate potential non-representative trades.

reported by Keim and Madhavan (1997), who find average completion rates being 1.80 days and 1.65 days for purchases and sales respectively. The lower time required for completion reflects the absence of information in index and enhanced index funds trades and therefore a lower level of trade difficulty. The higher time required by enhanced index funds to complete their trades relative to the index funds is caused by the higher tolerance for tracking error assumed by enhanced index funds. During index revision periods, the average completion rates for index and enhanced index funds are increased to 1.23 and 1.39 days respectively.

The results reported in Tables 5 and 6 demonstrate that enhanced index funds break their trade packages into smaller parcels and execute their trades more patiently in an attempt to minimize market impact costs. Trading of stocks involved in index revisions is also shown to be more difficult due, to higher demand for these stocks. Consequently, both types of funds implement more patient trading strategies when trading stocks associated with index revision events. This is evident as trades during index revision periods exhibit higher number of trades per package, smaller dollar value per trade and longer completion time. The results reported in Tables 5 and 6, however, could be biased if enhanced funds exhibit a higher likelihood of trading smaller stocks (which themselves exhibit lower liquidity and higher trade difficulty). The findings reported in Table 6 (Panel C) contradict this hypothesis. There is no variation in the average market capitalization of stocks traded by index and enhanced index funds.

C. Transaction Costs

Based on the findings presented in the previous section, enhanced index funds are expected to exhibit lower transaction costs and smaller trades during index revision periods are expected to exhibit higher costs. This section examines the determinants of passive funds transaction costs by adopting the methodology of Chan and Lakonishok (1995). Three measures of trading costs are computed: *Open to Trade*, *Trade to Close* and *Open to Close*.

$$Open\ to\ Trade = \theta \frac{(Price - Open)}{Open} \quad (7)$$

$$Trade\ to\ Close = \theta \frac{(Price - Close)}{Close} \quad (8)$$

$$Open\ to\ Close = \theta \frac{(Close - Open)}{Open} \quad (9)$$

θ denotes a dummy variable that takes the value of 1 for purchase packages and -1 for sale packages. *Price* is defined as the volume weighted average gross unit price of all the trades in the package. The study by Frino, Mollica and Walter (2003) demonstrates that the use of opening and closing price as the benchmark for trading costs suffers from bid-ask bias. This bias is caused by the higher likelihood of the closing price to be executed at the ask price. Therefore, the midpoint of the opening (*Open*) and the closing (*Close*) quotes are used as the benchmark. The *Open to Trade* and the *Trade to Close* measures capture the total and temporary costs associated with passive funds' trades respectively while the *Open to Close* measure captures the permanent cost of passive funds' trades.

<INSERT TABLE 7 ABOUT HERE>

Table 7 (Panel A) reports the dollar value of the trade packages. Enhanced funds' trade packages during index revision periods are smaller than non-index revision periods. Conversely, index funds' trade packages are larger during index revision periods than during non-index revision periods. This finding further confirms that, during index revision periods, where trading is more difficult due to the higher excess demand, enhanced index funds are more likely to engage in more patient trading strategies in order to avoid excessive trading costs. Table 7 (Panel B) shows the total cost associated with index fund purchases (sales), measured by *Open to Trade*, is 25.59 (20.72) basis points. These results are comparable to the magnitude reported by Keim and Madhavan (1997) who document an average implicit total cost of 23 basis points for U.S index funds. Additionally, the results from Table 7 (Panel B) demonstrate that enhanced funds' trades induce lower total and temporary price impacts

relative to index funds' trades. This finding is consistent with our findings in the previous section, where enhanced index funds implement more patient trading strategies, and therefore incur lower market impact costs.

Reflecting the higher difficulty associated with trading stocks that are involved in index revisions, the results presented in Table 7 (Panel B) demonstrate that trades executed during such periods incur higher transaction costs. The total and temporary costs of index fund purchases (sales) during index revision periods are 76.22 (52.09) and 43.59 (28.90) basis points respectively, which are significantly higher than the 30.17 (26.89) and 12.15 (9.23) basis points documented for the non-index revision periods. Enhanced index funds exhibit total and temporary transaction costs for purchases (sales) of 46.87 (35.76) and -8.71 (-27.59) basis points respectively for index revision periods and 18.62 (13.10) and 0.24 (5.06) basis points respectively for non-revision periods. The negative temporary costs measured by *Trade to Close* documented for enhanced funds' trades during index revision periods is consistent with our previous finding – that enhanced index funds are able to earn positive and significant returns during index revision periods. According to Table 7 (Panel A), the higher transaction costs during index revision periods reflect the presence of higher trade difficulty, and this is induced by the larger trade packages executed during these periods.

A joint test analysis is performed in order to simultaneously examine the determinants of transaction costs incurred by index and enhanced index funds. In order to perform a joint test analysis on the determinants of passive funds' transaction costs, the following regression is estimated:

$$\begin{aligned} \text{Execution Costs} = & \alpha_0 + \alpha_1 Rm + \alpha_3 BAS + \alpha_4 \ln(\text{Complexity}) + \alpha_5 \ln(\text{MarketCap}) + \alpha_6 D\text{Enhanced} \\ & + \alpha_7 D\text{Revision} + \sum_{k=2}^{45} \text{Broker Effects}_k + \sum_{l=2}^{24} \text{Industry}_l \end{aligned} \quad (10)$$

Execution Costs represent one of the three measures of transaction costs, *Open to Trade*, *Trade to Close* and *Open to Close* and *Rm* denotes the market return. The Sydney Futures Exchange (SFE) SPI 200 (Share Price Index Contract), which represents the futures market index corresponding to the underlying S&P/ASX 200, is utilized as the measure of market return. The preference for SFE SPI 200 over the conventional measure of market return for the S&P/ASX 200, is driven by the higher liquidity

of the SFE SPI 200 futures index. The higher liquidity reduces the potential bias induced by non-synchronous trading. *BAS* denotes the relative time-weighted bid-ask spread. Following Chan and Lakonishok (1995), the measure of *Complexity* is calculated as the ratio between the trade size and the average daily trading volume of the stock for the past 20 days. $\ln(\text{MarketCap})$ denotes the natural logarithm of the stock's market capitalisation value. *DEnhanced* represents a dummy variable that takes the value of 0 if the trades originated from index funds and 1 if the trades originated from enhanced index funds. *DRevision* is a dummy variable that takes the value of 1 if the trade takes place during index revision periods and 0 otherwise. The study also considers the extent to which execution costs are related to individual brokers, as well as the industry classification of stocks listed on ASX. Consistent with Aitken and Frino (1996), *Broker Effects_k* represents a set of dummy variables that take the value of 1 if the package is transacted by broker *k* and 0 otherwise. *Industry_l* represents a set of industry dummy variables from the ASX.²⁵

<INSERT TABLE 8 ABOUT HERE>

The results reported in Table 8 are consistent with Chan and Lakonishok (1995). Bid-ask spread is found to be positively related to both index and enhanced index funds' trading costs. Trade complexity and firm size are found to be positively and negatively related to both index and enhanced index funds' trading costs, respectively. Larger trade sizes are found to exhibit higher trade difficulty and therefore higher transaction costs. Trades executed in larger securities are found to exhibit lower trade difficulty, due to the higher liquidity associated with these stocks. Therefore, these trades exhibit lower transaction costs. Enhanced index funds' trades incur significantly lower total and temporary costs due to the more patient trading strategy implemented. Trades executed during index revision periods also incur higher total costs, reflecting the higher difficulty associated with trading these stocks. The significantly lower temporary cost associated with trades during index revision periods is

²⁵ Refer to Appendix B for a list of the industry dummy variables.

induced by the excess returns on these stocks during these periods. Contradicting the findings from active funds' trades, broker and industry effects do not appear to be significant determinants of both index and enhanced index funds' total and permanent costs.²⁶ These results reconfirm the absence of information from passive funds trades. However, there is some evidence indicating that the variables affect the magnitude of temporary cost incurred by passive funds. Therefore, broker and industry effects contribute only to passive funds' temporary costs through the variation in the brokers' trading ability.

IV. PORTFOLIO CONFIGURATION

Portfolio configuration, which defines the composition of the fund's portfolio with reference to the stocks held, is a critical element contributing to fund performance and tracking error (Keim, 1999). This section compares the portfolio design of both index funds and enhanced index funds. As expected, the results reported in Table 9 document higher absolute deviation from benchmark amongst enhanced index funds relative to index funds. The deviation from benchmark is defined as the difference between the portfolio's actual weights in a stock within the overall portfolio relative to the stock's weight in the underlying benchmark index. A fund's daily absolute deviation from benchmark is defined as the sum of the absolute value of the deviation from benchmark of all the stocks held by the fund on the day. By construction, the sum of the deviation from benchmark of all the stocks held by the fund on any one day is equal to zero. The average daily absolute deviation from benchmark of the index funds is 6.63 percent which is significantly lower than the 12.22 percent exhibited by the enhanced index funds. However, the index funds exhibit an average daily absolute deviation from benchmark variance of 0.24 percent which is significantly higher than 0.09 percent exhibited by enhanced index funds.²⁷ The index funds' average daily absolute deviation from benchmark ranges

²⁶ See Aitken and Frino (1996) and Chan and Lakonishok (1997).

²⁷ The difference between variances is tested using the variance ratio.

from 2.43 to 11.46 percent, while enhanced funds' average daily absolute deviation from benchmark ranges between 12.35 to 13.13 percent.

<INSERT TABLE 9 ABOUT HERE>

Examining the proportion of each asset type held by the passive funds, the results in Table 9 demonstrates that both index and enhanced index funds hold more than 98 percent of their portfolios in equity securities. Enhanced index funds however, allocate a significantly higher proportion of their portfolios to holdings of futures contracts. Index funds allocate 1.12 percent of their portfolio to futures contracts, while enhanced index funds hold more than 1.43 percent of their portfolios in SPI futures. Only 0.01 percent of the index funds' portfolio is composed of warrants, stock options, convertible notes and other security types, while enhanced index funds allocate 0.04 percent of their portfolios to non equity and non futures instruments.

Interestingly, examining the number of stocks held, it is documented that the enhanced index funds are holding a larger number of stocks from the constituents of their benchmark index. On average, index funds' portfolios are made up of 219.77 and 225.13 stocks for both the pre and post index reconstruction periods respectively. Index fund portfolios only include stocks from the constituents of their benchmark indices. The enhanced index funds' portfolios consist of 231.77 and 231.69 stocks from the constituent of their benchmark index for the pre- and post- index reconstruction periods, respectively. The enhanced index funds hold 23.41 and 20.40 stocks that are non-index constituents for the pre- and post- index reconstruction periods. However, these holdings represent only 0.85 and 0.44 percent of the total value of their portfolios respectively. Non-index holdings represent the funds' holdings that are non-constituents of the benchmark index. Stocks subject to index revisions are excluded from this category 30 days prior to the index revision date.

A. Over- and-Underweighting Relative to Benchmark Weight

This section profiles the characteristics of stocks that are over-or-underweighted by passive funds using the method developed by Chen, Jegadeesh, and Wermers (2000). The stocks held in both index and enhanced index funds portfolios are examined based on their liquidity, size, book-to-market and momentum. The measure for liquidity is defined as the ratio between the average number of shares traded at the last quarter relative to the total number of shares outstanding for the stock in the last quarter. Stock size is measured as the market capitalisation of the stock in the last quarter. A stock's book-to-market value is calculated as the book value of the company's assets relative to the stock's market capitalisation as at the previous quarter. Finally, momentum is proxied as the buy-and-hold returns of the stock for the prior 12 months using the methodology of Chen, Jegadeesh and Wermers (2000).²⁸ Consistent with Chen, Jegadeesh and Wermers (2000), each of the stocks are ranked based on the four characteristics separately. The ranking represents the stock's percentile rank relative to all stocks that are included in the benchmark index. By construction, the average score for all stocks in the benchmark index is 50.

The results reported in Table 9 demonstrate that stocks that are over-weighted by index funds exhibit scores that are significantly higher than 50 in liquidity, size and momentum and significantly lower than 50 for book-to-market ratio. These findings demonstrate a higher preference towards more liquid, larger and growth oriented stocks and with higher past returns by index funds. With the exception of the book-to-market ratio, the converse is true for the underweighted stocks. Stocks that are overweighted by the enhanced index funds exhibit higher market capitalisation, lower book-to-market and higher past returns than those that are overweighted by enhanced index funds. With the exception of the book-to-market ratio, the converse is found to be true for underweighted stocks. There is weak evidence indicating that the stocks that are underweighted by index funds exhibit higher liquidity than those that are underweighted by enhanced index funds. However, the result is not statistically significant for overweighted stocks.

²⁸ The stocks' buy and hold returns for the last 6 months are also calculated for robustness tests. The results are also consistent.

B. Non-Index Holding

Table 9 documents that enhanced index fund holdings of non-index constituents in both the pre and post revision period represent 0.85% and 0.44% of the funds' portfolios. Table 10 demonstrates that these stocks generate a daily return of 0.13%. Hence, while the amount invested in these stocks is minimal, the decision to have exposures to non-index holdings generates significant excess returns for the portfolios. Given the high returns associated with this class of stocks, this section profiles the characteristics of the stocks held by enhanced index funds that are non-index constituents.

<INSERT TABLE 10 ABOUT HERE>

Relative to the stocks from the benchmark index, Table 10 shows that enhanced index funds' non-index holdings exhibit lower liquidity, smaller market capitalisation and lower past returns. These findings are expected, given the requirements that must be satisfied in order for a stock to be eventually included in the benchmark index. The result for the book-to-market ratio however, is not statistically significant. Hence, for a more meaningful comparison, these stocks are compared against all of the stocks that are listed on the ASX but are excluded from the benchmark index. Enhanced index funds' non-index holdings comprise stocks with higher liquidity, larger market capitalisation, better past performance and lower book-to-market value.

Chen, Jegadeesh and Wermers (2000) argue that fund trades represent a stronger opinion than holdings as the latter might be effected by non-performance related issues such as capital gains taxes and transaction costs. Relative to stocks that are listed on the ASX, but not constituents of the benchmark index, when purchasing stocks that are outside the index constituent enhanced funds exhibit a higher preference for stocks with higher liquidity, larger market capitalisation, lower book-to-market value, and higher past returns. With the exception of the market capitalisation value and the book-to-market value, the converse is true for sales. The higher than average market capitalisation for both purchases and sales indicate enhanced index funds limit their trading activities to these types of

stocks that are the largest from this category. The lower than average book-to-market values indicate that, with respect to stocks that are not benchmark constituents, enhanced funds exhibit a preference for growth rather than value-oriented stocks. Comparing the characteristics of stocks that fall outside the benchmark index that are purchased and sold by enhanced index funds, it is evident that the purchased stocks exhibit higher liquidity, lower book-to-market value and higher momentum. The results from the joint test reported in Table 11 exhibit consistent results.

<INSERT TABLE 11 ABOUT HERE>

C. Trading Behaviour and Non-Index Holdings

Extending the findings of the previous section, this section examines the gains and losses generated by enhanced funds on the stocks that are not included in the benchmark index using Odean's (1998) approach. The PGR (Proportion of Gains Realised) and the PLR (Proportion of Losses Realised) are calculated as follow:

$$PGR = \frac{RealisedGains}{RealisedGains + UnrealisedGains} \quad (11)$$

$$PLR = \frac{RealisedLosses}{RealisedLosses + UnrealisedLosses} \quad (12)$$

The results reported in Table 10 demonstrate that enhanced funds' holdings of stocks that are outside the benchmark index, the mean value of the PLR (2.5 percent) is significantly higher than the PGR (4.5 percent). This result is inconsistent with the disposition theory, which states that investors are more likely to hold onto loser stocks too long and to sell out of their winning stocks too early. Our results show that enhanced index funds are more likely to ride their winners and to sell their loser stocks.

V. CONCLUSION

This study provides both an original and important examination of the index tracking strategies of index and enhanced index portfolio managers with reference to a sample of funds' daily portfolio holdings and trades. Our study is motivated given the challenges arising from managing open-end index and enhanced index funds, particularly in light of the existence of market frictions that make tracking error in performance unavoidable. Our research contributes to a better understanding of the passive portfolio management process by examining the impact of index changes on both index and enhanced index funds, measuring the implicit transaction costs associated with passive investment management, and documenting the portfolio designs implemented by index-tracking funds.

In terms of the daily transactions and holdings of index and enhanced index funds during index revision periods, in order for funds to avoid excess trading costs (given temporary price pressure associated with index revisions), we document that enhanced index funds commence their trading activities well prior to the effective date of an index change. This strategy yields enhanced index funds significantly higher total and realised returns during index inclusion periods. We also find evidence that enhanced funds implement more patient trading strategies relative to index funds, where enhanced index funds partition their trades into smaller parcels which are executed over longer time intervals. Consequently, the trading costs incurred by the enhanced index funds are significantly lower than index funds. Consistent with higher trade difficulty experienced during index revision periods, we document that both index and enhanced index fund trades incur significantly higher trading costs during index revision periods.

Stocks that are held as overweight positions relative to the benchmark by index funds exhibit higher liquidity, market capitalisation and past performances. The converse true for the stocks held as underweight positions relative to the benchmark. In the case of stocks that are listed on the ASX but are not index constituents, we find that enhanced index funds exhibit a higher propensity to invest in stocks with higher liquidity, larger market capitalisation and higher past returns. Interestingly, we also

identify that enhanced index fund trading strategies for non-benchmark constituents is consistent with rational behaviour, where managers sell 'loser' stocks early and ride 'winner' stocks.

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APPENDIX A. INSTITUTIONAL DETAILS

This section outlines the institutional details of the benchmarks for the two regimes pre- and post- the S&P/ASX index reconstruction event. The index reconstruction event took place at 3 April 2000. Prior to the index reconstruction event, all funds sampled in this study were benchmarked against the ASX All Ordinaries Index (AOI). Following the index reconstruction events, 3 of the funds in our sampled are benchmarked against the S&P/ASX 200 and 5 of the funds are benchmarked against the S&P/ASX 300.

A. AOI Inclusion and Exclusion Criteria Prior to the Index Reconstruction²⁹

Prior to the index reconstruction, the AOI is an open-end index that serves as a market indicator index which measures the overall performance of Australian market. The number of companies listed on the index ranges from 235 to 320 companies between 1991 and 1999. The open-end approach implemented by AOI contrast with the S&P 500 index, which is closed-end index where at any point in time, the index comprises up to 500 stocks.

In order to be included into the AOI, a company must satisfy the market capitalization and liquidity criteria imposed by the exchange. The market capitalization criterion requires the candidate to exhibit a market capitalization that is higher than 0.022% of the total domestic market capitalization. At 1 July 1998, the liquidity criterion of the AOI was revised. Prior to this, all candidates are required to exhibit turnover above 0.5% of their quoted shares per month for 6 consecutive months prior to be included into the Index. After 1 July 1998, all candidates are required to exhibit monthly median liquidity (relative to the ASX median market liquidity) of at least 50%.

The revision on the constituent of the AOI is performed on monthly basis. Stocks that have undergone mergers, takeovers or liquidation and no longer exist as publicly listed companies are excluded from the Index. Stocks that no longer satisfy the market capitalization and liquidity criteria

²⁹ This section relies heavily on Chan and Howard (2002) and the 'Review of the All Ordinaries Index', ASX Consultation Paper, January 1999.

are also excluded from the constituent of the Index. Companies with market capitalization below 0.015 percent of the total market capitalization for 6 months periods are removed from the index.³⁰ Prior to 1 July 1998, companies that failed to fulfill the minimum liquidity level of 0.2 percent are excluded while post 1 July 1998, companies with relative liquidity below 33%, 25%, 17% are down-weighted by the factor of 75%, 50% and 25%. Companies with relative liquidity of less than 12.5 percent after being down-weighted are subjected for removal.

B. Institutional Details of Australian Equity Indices Post AOI Restructuring³¹

Following the index reconstruction, a series of S&P/ASX indices were introduced, namely, S&P/ASX 20, S&P/ASX 50, S&P/ASX 100, S&P/ASX 200, S&P/ASX 300, S&P/ASX MidCap 50, S&P/ASX Small Ordinaries Index and S&P/ASX All Ordinaries. In our sample, 3 funds are benchmarked against the S&P/ASX 200 and 5 funds are benchmarked against the S&P/ASX 300. Additionally, the AOI is transformed to a close-end index, comprising of the 500 largest companies by market value. With the exception of the foreign domiciled companies, the liquidity requirement was dropped. The new AOI accounts for around 99% of the total market value of stocks listed in the ASX and the Index is reviewed on an annual basis.

The ASX/S&P constituted of the 20 largest stocks by market capitalization and accounts for 56% of the total market capitalization of all stocks listed in the ASX. Accordingly, the S&P/ASX 50 index constituted of the 50 largest stocks and accounts for approximately 75% of the total market value of all domestic equities in the ASX. The index is reviewed on a quarterly basis.

The S&P/ASX 100 is introduced as the primary equity index for large capitalization stocks and its constituent is reviewed by the S&P Australian Index Committee. The S&P/ASX 200 is recognized as the investible benchmark, which comprised of all the stocks in the S&P/ASX 100 and 100 additional stocks. The S&P/ASX 300 is introduced to provide a more in depth coverage and the index

³⁰ Companies with market capitalisation below 0.2% of the total market capitalisation for a period of 3 months are also removed from the index.

³¹ This section relies heavily on the “Understanding Indices”, Standard and Poor’s, December 2002.

comprised of all stocks in the S&P/ASX 200 and 100 additional stocks. The S&P/ASX 100 and 200 indices cover approximately 85 percent and 90 percent of the total market capitalization respectively while the S&P/ASX 300 Index represents around 91 percent of the total market capitalization of stocks listed in the ASX.

The S&P/ASX Midcap 50 Index and the S&P/ASX Small Ordinaries Index accounts for around 10% and 6% of the total market capitalization of the Australian market (as at 30 June 2002) respectively. The S&P/ASX Midcap 50 Index constituted of the 50 stocks in the S&P/ASX 100 Index that are excluded from the S&P/ASX 50 Index. The S&P/ASX Small Ordinaries comprised stocks in the S&P/ASX 300 but are not included in the S&P/ASX 200 and the Index aims to fulfill the need for a benchmark index that covers the small-cap universe.

The S&P/ASX indices are managed by the S&P Australian Index Committee and serves as the performance benchmark indices. Therefore, the constituents of the indices are required to exhibit sufficient liquidity, free float, and market capitalization. Stocks that are subjected to acquisition, insufficient market capitalization, insufficient liquidity, liquidation and company restructuring stand as candidates for deletion from the indices. Replacements to the deleted stocks are selected by the S&P Australian Index Committee and are made based on candidates' market value and liquidity. Additionally, IPO (Initial Public Offerings) may also be eligible for inclusion. Constituents of the indices are reviewed on a quarterly basis at the end of February, May, August, and November and on an as-needed basis. Announcements to the index revisions are made on the 15th of March, June, September and December.

TABLE 1**Performance Comparison between Index and Enhanced Index Funds*****Panel A: Fund Descriptive Information***

		Index	Enhanced Index
Number of Funds		5	3
Fund Size	Mean	1.30bn	1.11bn
	Median	1.23bn	1.11bn
	SD	0.69bn	0.49bn
Period of Observation		Jan 99 to Dec 01	Jan 99 to Dec 01

Panel B: Fund Performance

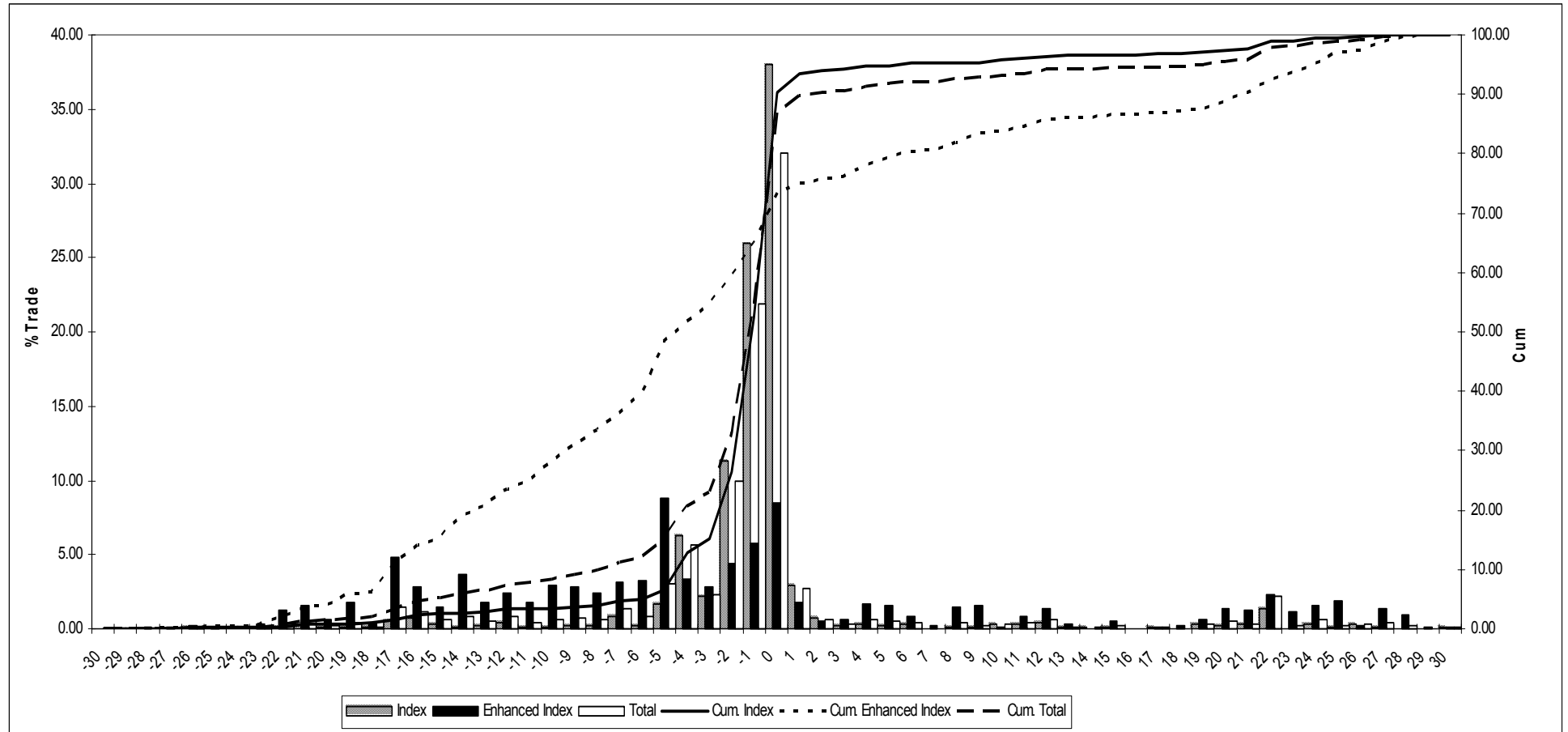
		Index	Enhanced Index	Enhanced Index – Index
Monthly Fund Return	Mean	0.90%	0.97%	0.07%*
	Median	0.92%	1.06%	
	SD	3.47%	3.45%	
Average Monthly Fund Excess Return	Mean	0.01%	0.09%	0.08%**
	Median	0.005%	0.09%	
	SD	0.05%	0.15%	
Alpha (per month)		-0.01	-0.02	
Beta		1.01	1.02	

Panel C: Tracking Error Measures

		Index	Enhanced Index	Enhanced Index – Index
<i>Absolute Measures</i>				
Average Monthly Abs Tracking Error	Mean	0.05%	0.18%	0.13%***
	Median	0.05%	0.14%	
	SD	0.03%	0.09%	
<i>Non-Absolute Measures</i>				
Average Monthly SD Tracking Error	Mean	0.06%	0.21%	0.15%*

Table 1 reports descriptive statistics for the index and enhanced index fund sample utilizing monthly returns data. Panel A reports the funds' descriptive information. The sample comprises 8 portfolios, representing 5 index funds and 3 enhanced funds in the period 1 January 1999 and 31 December 2001. The average fund size for index funds is AUD\$1.30bn and the average fund size for enhanced index funds is AUD\$1.11 billion at 31 December 2001. Panel B reports the funds' performance. Using the single index model, the average index and enhanced index funds' alphas and betas are documented. Panel C reports the measures of tracking error, using both absolute and non-absolute definitions of return differences to benchmark. The monthly observations demonstrate that enhanced index funds exhibit significantly higher average monthly return, average monthly excess return, average monthly absolute tracking error and average monthly standard deviation of tracking error. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

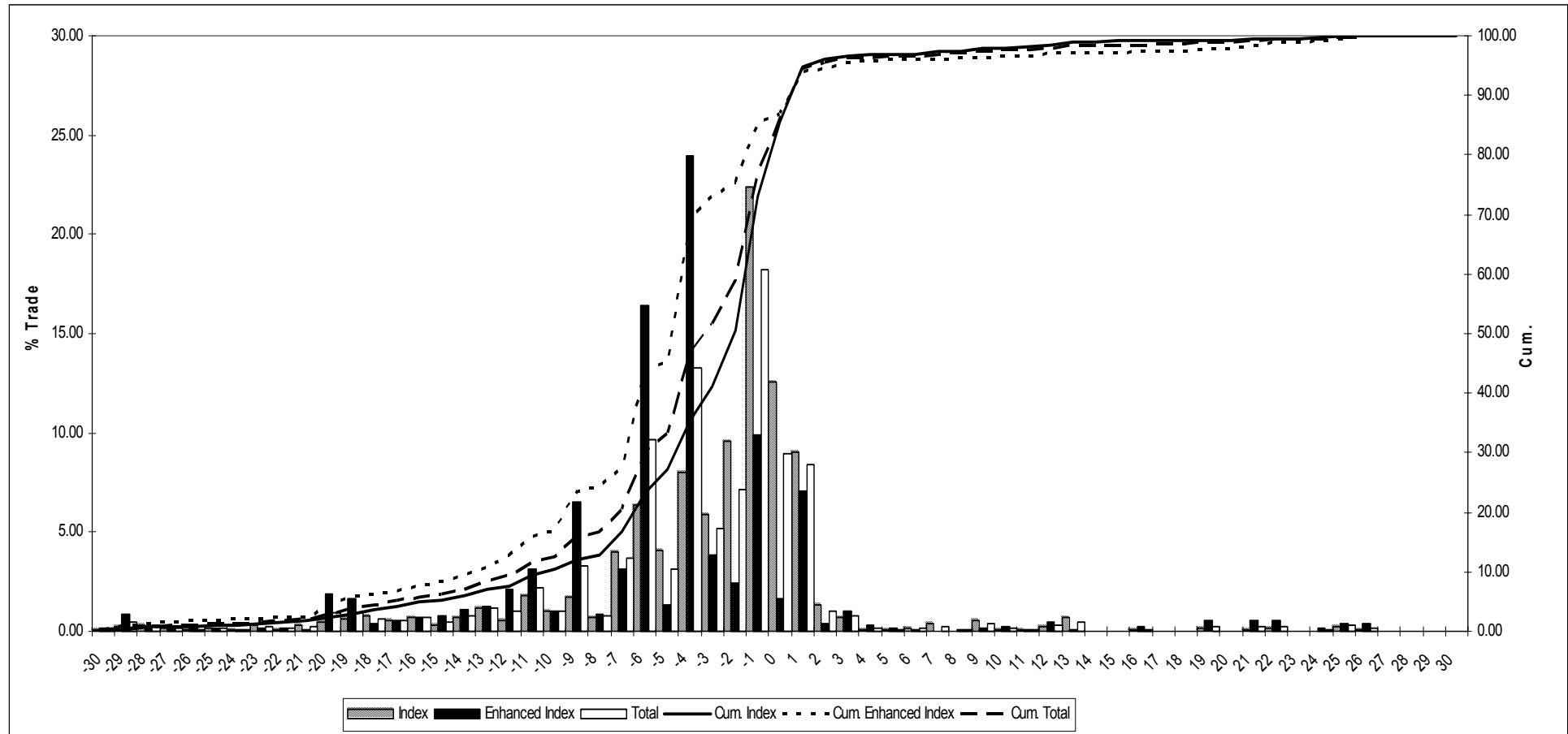
FIGURE 1
Index Revisions (Inclusion)



The Index revision period is defined as 30 days on either side of the revision date (-30 to +30). Funds' holding at the end of the period is defined as the desired level of holding. For each day in the revision period, the accumulated (Cum) and the daily trade value (% Trade) relative to the funds' holding of the stock as of $t = 30$ is computed. Figure 1 reports the trading activities of the index and the enhanced index funds during Index inclusion periods. It is documented that during index inclusions, enhanced index funds exhibit greater probability of executing trading strategies prior to the effective date of the Index change than is the case for index funds.

FIGURE 2

Index Revision (Exclusion)



The Index revision period is defined as 30 days on either side of the revision date (-30 to +30). Funds' holding at the end of the period is defined as the desired level of holding. For each day in the revision period, the accumulated (Cum) and the daily trade value (% Trade) relative to the funds' holding of the stock as of $t = 30$ is computed. Figure 2 reports the trading activities of the index and the enhanced index funds during Index exclusion periods. It is documented that during index exclusions, enhanced index funds exhibit greater probability of executing trading strategies prior to the effective date of the Index change, compared to index funds.

TABLE 2

Trading Activities During Index Revisions

Day	INDEX INCLUSION						INDEX EXCLUSION					
	Index		Enhanced Index		Total		Index		Enhanced Index		Total	
	% Trade	Cum	% Trade	Cum	% Trade	Cum	% Trade	Cum	% Trade	Cum	% Trade	Cum
-30	0.04	0.04	0.00	0.00	0.03	0.03	0.11	0.11	0.19	0.19	0.14	0.14
:	:	:	:	:	:	:	:	:	:	:	:	:
-16	0.72	2.24	2.82*	14.01	1.14***	4.61	0.67	4.92	0.69	7.53	0.68	5.79
-15	0.36	2.60	1.50	15.51	0.59*	5.20	0.31	5.23	0.80**	8.33	0.47	6.26
-14	0.11	2.71	3.68*	19.19	0.83*	6.03	0.67	5.90	1.12	9.45	0.82	7.08
-13	0.25	2.96	1.81*	21.00	0.56**	6.59	1.19	7.09	1.26**	10.70	1.21**	8.29
-12	0.37	3.33	2.43**	23.43	0.79**	7.38	0.52	7.61	2.12	12.82	1.05	9.34
-11	0.08	3.41	1.78**	25.21	0.42**	7.80	1.78	9.39	3.14**	15.96	2.23**	11.58
-10	0.08	3.49	2.93***	28.14	0.66**	8.46	1.05	10.44	1.02	16.98	1.04*	12.62
-9	0.22	3.71	2.87**	31.01	0.75*	9.21	1.72	12.17	6.49**	23.47	3.31*	15.93
-8	0.20	3.91	2.38**	33.39	0.64*	9.86	0.70	12.87	0.87*	24.34	0.76	16.68
-7	0.88	4.80	3.12**	36.51	1.33***	11.19	3.98***	16.84	3.14**	27.47	3.70***	20.38
-6	0.20	5.00	3.21**	39.72	0.80*	12.00	6.34	23.18	16.37*	43.85	9.68*	30.06
-5	1.64**	6.63	8.80***	48.52	3.08***	15.08	4.05***	27.23	1.35	45.20	3.15***	33.21
-4	6.25**	12.88	3.38**	51.91	5.67***	20.75	7.98***	35.21	23.94*	69.14	13.29***	46.50
-3	2.18***	15.06	2.83*	54.74	2.31***	23.06	5.89***	41.10	3.82***	72.96	5.20***	51.70
-2	11.36***	26.42	4.37*	59.11	9.95***	33.01	9.55***	50.65	2.44	75.40	7.18***	58.88
-1	26.02***	52.44	5.73***	64.84	21.93***	54.94	22.40***	73.05	9.92***	85.32	18.25***	77.13
0	37.98***	90.41	8.49***	73.33	32.03***	86.97	12.56***	85.61	1.67***	87.00	8.94***	86.07
1	2.94***	93.35	1.77*	75.10	2.71***	89.67	9.06***	94.68	7.10***	94.10	8.41***	94.49
2	0.68	94.04	0.55	75.65	0.66	90.33	1.32*	96.00	0.36	94.46	1.00**	95.49
3	0.25	94.29	0.61	76.26	0.32	90.65	0.68*	96.68	1.02*	95.47	0.79***	96.28
4	0.36	94.65	1.63	77.90	0.62	91.27	0.08	96.75	0.32	95.80	0.16*	96.44
5	0.21	94.86	1.59	79.49	0.49	91.76	0.08	96.84	0.18	95.98	0.11	96.55
:	:	:	:	:	:	:	:	:	:	:	:	:
22	1.41*	99.03	2.28*	92.61	2.19*	97.94	0.14	99.58	0.52	99.01	0.27	99.39
:	:	:	:	:	:	:	:	:	:	:	:	:
30	0.07	100.00	0.09	100.00	0.07	100.00	0.00	100.00	0.00	100.00	0.00	100.00

The Index revision period is defined as 30 days either side of the revision date (-30 to + 30). Funds' holding at the end of the period is defined as the desired level of holdings in the stock, and therefore represents 100%. For each day in the revision period, the accumulated (Cum) and the daily trade value (% Trade) relative to the funds' holding of the stock as at t = 30 is computed. The *t*-test is used to examine whether the observation for each metric is greater than zero. Table 2 reports the trading activities of the index and enhanced index funds during the index revision periods. The analyses are performed separately for index inclusion and exclusion periods. It is documented that during index inclusions and exclusions, enhanced index funds execute their trades prior the effective date of the Index change than the index funds. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

TABLE 3

Trading Activities For the Largest 5 Percent of Index Revision Events

Day	INDEX INCLUSION						INDEX EXCLUSION					
	Index		Enhanced Index		Total		Index		Enhanced Index		Total	
	% Trade	Cum	% Trade	Cum	% Trade	Cum	% Trade	Cum	% Trade	Cum	% Trade	Cum
-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
:	:	:	:	:	:	:	:	:	:	:	:	:
-16	0.00	4.63	2.05	22.78	0.73	11.06	0.14	4.39	0.36	7.20	0.23	5.51
-15	0.02	4.65	0.00	22.78	0.01	11.07	0.04	4.43	0.11	7.31	0.07	5.58
-14	0.12	4.77	0.00	22.78	0.08	11.15	0.00	4.43	0.46	7.77	0.18	5.76
-13	0.18	4.95	0.00	22.78	0.12	11.26	0.00	4.43	0.97	8.75	0.39	6.15
-12	0.00	4.95	0.00	22.78	0.00	11.26	0.00	4.43	2.94	11.69	1.17	7.33
-11	0.00	4.95	0.00	22.78	0.00	11.26	0.40	4.84	1.71	13.40	0.92	8.25
-10	0.00	4.95	0.20	22.98	0.07	11.33	0.00	4.84	0.00	13.40	0.00	8.25
-9	0.46	5.41	1.88	24.86	0.96	12.29	2.84	7.67	8.54	21.94	5.11	13.36
-8	0.00	5.41	0.00	24.86	0.00	12.29	0.00	7.67	0.62	22.56	0.25	13.60
-7	0.00	5.41	1.18	26.05	0.42	12.71	0.43	8.10	1.10	23.67	0.70	14.30
-6	0.00	5.41	4.55	30.60	1.61	14.32	9.76	17.87	24.11	47.78	15.48	29.78
-5	0.00	5.41	17.06	47.66	6.04	20.36	0.53	18.40	0.00	47.78	0.32	30.10
-4	0.00	5.41	0.00	47.66	0.00	20.36	9.20	27.60	30.92	78.70	17.85 *	47.95
-3	0.96	6.37	3.93	51.59	2.02	22.38	7.80	35.40	2.09	80.79	5.53	53.48
-2	1.29	7.66	0.55	52.14	1.03	23.41	12.60	48.00	3.16	83.94	8.84 *	62.32
-1	10.55	18.21	1.92	54.07	7.49	30.90	41.22 *	89.22	13.39	97.34	30.13 **	92.45
0	60.83 *	79.03	0.00	54.07	39.29 *	70.19	9.00 **	98.22	0.11	97.45	5.46 **	97.91
1	2.25	81.28	0.19	54.25	1.52	71.71	0.33	98.55	0.00	97.45	0.20	98.11
2	0.17	81.45	0.00	54.25	0.11	71.82	0.00	98.55	0.00	97.45	0.00	98.11
3	0.00	81.45	0.00	54.25	0.00	71.82	0.00	98.55	0.00	97.45	0.00	98.11
4	0.00	81.45	0.12	54.37	0.04	71.87	0.00	98.55	0.00	97.45	0.00	98.11
5	0.40	81.84	3.88	58.25	1.63	73.49	0.00	98.55	0.00	97.45	0.00	98.11
:	:	:	:	:	:	:	:	:	:	:	:	:
30	0.49	100.00	0.35	100.00	0.44	100.00	0.00	100.00	0.00	100.00	0.00	100.00

The Index revision period is defined as 30 days on each side of the effective change date (-30 to + 30) for the largest 5 percent of Index changes by Index weight. Funds' holding at end of the period is defined as the desired level of holding, and therefore represents 100%. For each day in the Index revision period, the accumulated (Cum) and the daily trade value (% Trade) relative to the funds' holding of the stock as at $t = 30$ is computed. The t -test is used to examine whether the observation for each metric is greater than zero. Table 3 reports the trading activities of the index and the enhanced index funds during the index revision periods for the largest 5% revisions. The analyses are performed separately for index inclusion and index exclusion periods. The results demonstrate that both index and enhanced index funds do not resort to early trading strategy for the 5% largest revisions. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

TABLE 4
Gains During Index Revisions

	Index	Enhanced Index	Enhanced Index – Index
<i>Inclusion</i>			
Relative Realised Gain	0.17%	1.91%**	1.75%*
Relative Unrealised Gain	0.42%	1.20%	0.78%
Relative Total Gain	0.59%	3.11%**	2.53%*
<i>Exclusion</i>			
Relative Realised Gain	-0.17%	-0.01%	0.16%
Relative Unrealised Gain	-3.03% ***	-1.97%***	1.06%*
Relative Total Gain	-3.20% ***	-1.98%***	1.22%*
<i>Total</i>			
Relative Realised Gain	-0.04%	0.70%**	0.74%**
Relative Unrealised Gain	-1.68% ***	-0.79%*	0.89%
Relative Total Gain	-1.72% ***	-0.09%	1.63%**

Table 4 reports the realized, unrealized and total gains generated by both index and enhanced index funds during Index revision periods. All three measures of gains are calculated using an approach that is similar to that of Odean (1998). However, unlike Odean's (1998) approach, the measures do not separate between gains and losses. The measures take a positive value for gains and negative value for losses. The *t*-test is used to examine whether the funds' gains are significantly different from zero. The final column tests whether the gains generated by index funds are significantly higher than those of enhanced index funds. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

TABLE 5
Fund Turnover and Average Trading Value

	Total	Index	Enhanced Index	Enhanced Index – Index
Annual Turnover	8.26%	6.47%	12.28%	5.81%**
Average Value of Shares Traded (Total)	3.31	3.44	3.12	-0.32***
Average Value of Shares Traded (Revision)	2.23	2.68	1.64	-1.04***
Average Value of Shares Traded (Non-Revision)	3.43	3.52	3.30	-0.22**
Average Value of Shares Traded (Revision - Non-Revision)	-0.12***	-0.84***	-1.66***	
Inclusion				
Average Value of Shares Traded (Inclusion)	2.49	2.96	1.93	-1.03***
Average Value of Shares Traded (Inclusion - Non-Revision)	-1.00***	-0.56***	-1.19***	
Exclusion				
Average Value of Shares Traded (Exclusion)	1.98	2.42	1.29	-1.13***
Average Value of Shares Traded (Exclusion - Non-Revision)	-1.5***	-1.10***	-2.01***	
Average Value of Shares Traded (Inclusion - Exclusion)	0.51**	0.54***	0.64***	

The funds' turnover is computed using AIMR's (Association for Investment Manager Research) and CRSP's (Centre for Research in Security Prices) definition, which is the ratio between the minimum of the buys and sells of the fund and the average fund size. The average value of shares traded represents the dollar value of the trades relative to the fund size at the time of trade. The average value measures are reported in basis points. Analyses on the average value of shares traded are partitioned for the revision, non-revision, inclusion and exclusion periods. The observations are tested using t-test in order to determine whether they are significantly differs from zero. *Revision – Non-Revision* compares the difference between the mean of the revision periods to that of the non-revision periods. *Inclusion – Non-Revision* and *Exclusion – Non-Revision* examine the difference between the mean of the of the inclusion and the exclusion periods relative to the non-revision periods respectively while the *Inclusion – Exclusion* tests whether the average value of shares traded are higher for the inclusion periods than that of the exclusion periods. *Index – Enhanced Index* compares the difference in the mean value of observations for the index funds and that of the enhanced index funds. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

TABLE 6
Trade Packages

Panel A: Number of Trades per Trade Packages

	Total	Index	Enhanced Index	Enhanced Index – Index
Trades per package (Total)	1.36	1.35	1.37	0.02***
Trades per package (Revision)	2.05	1.82	2.12	0.30*
Trades per package (Non-Revision)	1.33	1.31	1.35	0.04***
Trades per package (Revision – Non-Revision)	0.72***	0.51***	0.77***	
<i>Index Inclusion</i>				
Trades per package (Inclusion)	2.06	1.86	2.12	0.26***
Trades per package (Inclusion - Non Revision)	0.73***	0.55***	0.77***	
<i>Index Exclusion</i>				
Trades per package (Exclusion)	2.03	1.97	2.11	0.14
Trades per package (Exclusion - Non-Revision)	0.7***	0.66***	0.76***	
Trades per package (Inclusion - Exclusion)	0.03	-0.11	0.01	

Panel A reports the number of trades per trade packages. The trades per package capture the number of trades that comprise a trading package. Trade packages are constructed based on the 5-day packaging methodology of Chan and Lakonishok (1995). The observations are tested using *t*-test in order to determine whether they are significantly different from zero. *Revision – Non-Revision* measures the difference between the mean of the Index revision periods to that of the non-Index revision periods. *Inclusion – Non-Revision* and *Exclusion – Non-Revision* examines the difference between the mean of the of the inclusion and the exclusion periods relative to the non-revision periods respectively while the *Inclusion – Exclusion* tests whether the average number of trades that comprise the trade packages are higher for the inclusion periods than that of the exclusion periods. *Index – Enhanced Index* compares the difference in the mean value of observations for index funds and that of enhanced index funds. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

TABLE 6 (CONTINUED)

Trade Packages

Panel B: Number of Days Required to Execute the Trade Packages

	Total	Index	Enhanced Index	Enhanced Index – Index
No of Trading Days per Package	1.19	1.14	1.26	0.12 ***
No of Trading Days per Package (Revision)	1.31	1.23	1.39	0.16 ***
No of Trading Days per Package (Non-Revision)	1.18	1.14	1.24	0.10 ***
No of Trading Days per Package (Revision - Non Revision)	0.13 ***	0.09 ***	0.15 ***	
<i>Index Inclusions</i>				
No of Trading Days per Package (Inclusion)	1.28	1.19	1.38	0.19 **
No of Trading Days per Package (Inclusion - Non Revision)	0.1 ***	0.05	0.14 **	
<i>Index Exclusion</i>				
No of Trading Days per Package (Exclusion)	1.33	1.27	1.41	0.14 ***
No of Trading Days per Package (Exclusion - Non Revision)	0.15 ***	0.13 ***	0.17 ***	
No of Trading Days per Package (Inclusion - Exclusion)	-0.05	-0.08	-0.03	

Panel C: Average Market Capitalization of Stocks Traded

	Total	Index	Enhanced Index	Enhanced Index – Index
Average Market Capitalization	4.21bn	4.21bn	4.21bn	-0.25million

Panel B reports the number of days required to execute the trade packages. The number of trading days per package captures the completion rate of the trade packages. Trade packages are constructed based on the 5 day packaging methodology of Chan and Lakonishok (1995). The observations are tested using t-test in order to determine whether they are significantly differs from zero. *Revision – Non-Revision* compares the difference between the mean of the revision periods to that of the non-revision periods. *Inclusion – Non-Revision* and *Exclusion – Non-Revision* examine the difference between the mean of the of the inclusion and the exclusion periods relative to the non-revision periods respectively while the *Inclusion – Exclusion* tests whether the average number of days required to complete the trade packages are higher for the inclusion periods than that of the exclusion periods. *Index – Enhanced Index* compares the difference in the mean value of observations for the index funds and that of the enhanced index funds. Panel C reports the average market capitalization of stocks traded. The results reported in Panel C do not indicate that there's variation between the size of the stocks traded by the index and enhanced funds. Therefore, this finding indicates that the more patient trading strategies implemented by enhanced funds are not induced by the higher likelihood of enhanced funds to engage in trading smaller stocks that exhibit lower liquidity and therefore, higher trade difficulty. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

TABLE 7
Trading Costs

<i>Panel A: Value of Trade Packages</i>		PURCHASES		SALES	
		Index Funds	Enhanced Index	Index Funds	Enhanced Index
Value of Trade Packages (Non-Revision)	Mean	\$122,350.26	\$307,366.71	\$123,333.46	\$205,788.90
	Median	\$14,395.17	\$63,894.62	\$19,853.37	\$60,825.74
	SD	\$702,334.13	\$1,454,151.30	\$387,254.44	\$1,103,209.00
Value of Trade Packages (Revision)	Mean	\$197,582.14	\$177,062.52	\$172,084.57	\$160,222.12
	Median	\$65,691.21	\$55,211.15	\$23,943.26	\$14,770.50
	SD	\$376,226.06	\$886,576.26	\$838,003.47	\$793,458.52

<i>Panel B: Transaction Costs</i>		PURCHASES			SALES		
		Open to Trade	Trade to Close	Open to Close	Open to Trade	Trade to Close	Open to Close
Total		25.59***	4.91**	20.67***	20.72***	5.93***	14.80***
Total Index		33.60***	14.49***	19.12**	27.85***	9.98***	17.87***
Passive Revision		76.22***	43.59***	32.63**	52.09***	28.90**	23.19**
Passive Non-Revision		30.17***	12.15***	18.03***	26.89***	9.23***	17.66***
Passive (Rev - Non-Revision)		46.05***	31.45***	14.60	25.20**	19.67***	5.53
Total Enhanced Index		21.03***	-0.52	21.56***	14.83***	2.57	12.26***
Enhanced Revision		46.87*	-8.71	55.58***	35.76***	-27.59*	63.35***
Enhanced Non-Revision		18.62***	0.24	18.38***	13.10***	5.06*	8.05***
Enhanced (Revision – Non-Revision)		28.25**	-8.95	37.20***	22.66*	-32.65*	55.30***
Total (Enhanced Index – Index)		-12.57***	-15.01***	2.44	-13.02***	-7.41**	-5.61
(Enhanced Index – Index) Revision		-29.35	-52.30*	22.95	-16.33	-56.49**	40.16
(Enhanced Index – Index) Non-Revision		-11.55***	-11.91***	0.35	-13.79***	-4.18	-9.61**

Table 7 Panel A reports the mean dollar value of trade packages (in A\$). Table 7 Panel B reports the trading costs associated with index and enhanced index funds' trades. All results are reported in costs and basis points. Trades are packaged based on Chan and Lakonishok's (1995) 5-day trading package methodology. The *Open to Trade* measure captures the pre-execution benchmark. This measure is defined as the difference between the trade price and the opening price of the first day of the trade package. *Trade to Close* is a measure of post execution cost, is defined as the difference between the trade price and the close price on the last day of the package. *Open to Close* is measured as the difference between the closing price of the last day of the package and the opening price of the first day of the package. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

TABLE 8
Determinants of Transaction Costs

	Open to Trade		Trade to Close		Open to Close	
	Purchases	Sales	Purchases	Sales	Purchases	Sales
Full Model	6.26	6.78	1.64	1.68	2.38	5.57
Excluding Market Return	5.58***	5.15***	1.15**	1.66	1.01***	4.09***
Excluding Bid-Ask Spread	6.21	6.77	1.64	1.6	2.37	5.55
Excluding Log(Complexity)	5.91	6.76	1.5	1.46	2.35	5.55
Excluding Log(Market Cap)	5.99	4.53***	1.63	1.62	2.36	3.87***
Excluding D Enhanced	3.59***	5.84***	0.83***	1.47	2.37	5.57
Excluding D Revision	6.04	6.34*	1.62	1.52	2.11	5.12*
Excluding Broker Effects	6.19	6.62	1.43*	1.38***	2.18	5.5
Excluding Industry Effects	6.02	6.56	1.53	1.33**	2.32	5.4
Intercept	0.03***	0.06***	$4*10^{-3}$ *	0.01***	0.01***	0.04***
Market Return	0.19***	-0.31***	-0.12***	0.02*	0.25***	-0.24***
Bid-Ask Spread	0.01***	$4*10^{-3}$ *	$8*10^{-4}$	$5*10^{-3}$ ***	$4*10^{-3}$	$-4*10^{-3}$ *
Log(Complexity)	$1*10^{-3}$ ***	$2*10^{-4}$ *	$4*10^{-4}$ ***	$4*10^{-4}$ ***	$2*10^{-4}$ *	$2*10^{-4}$
Log(Market Cap)	-13***	$-3*10^{-3}$ ***	$-1*10^{-4}$	$-3*10^{-4}$ ***	$-3*10^{-4}$ *	$-2*10^{-3}$ ***
D Enhanced	-0.01***	$-5*10^{-3}$ ***	$-3*10^{-3}$ ***	$-1*10^{-3}$ ***	$-5*10^{-4}$	$3*10^{-4}$
D Revision	$4*10^{-3}$ ***	$7*10^{-3}$ ***	$1*10^{-3}$ *	$-2*10^{-3}$ ***	$4*10^{-3}$ ***	0.01***
Broker Effects						
10th Percentile	$-1*10^{-2}$	$-2*10^{-2}$	$-9*10^{-3}$	$-4*10^{-3}$	$-2*10^{-3}$	$-1*10^{-2}$
25th Percentile	$-3*10^{-3}$	$-3*10^{-3}$	$-4*10^{-3}$	$-2*10^{-3}$	$-1*10^{-3}$	$-4*10^{-3}$
50th Percentile	$5*10^{-4}$	$-1*10^{-3}$	$6*10^{-5}$	$-1*10^{-4}$	$3*10^{-3}$	$1*10^{-3}$
75th Percentile	$3*10^{-3}$	$1*10^{-3}$	$2*10^{-3}$	$1*10^{-3}$	$1*10^{-2}$	$4*10^{-3}$
90th Percentile	$8*10^{-3}$	$1*10^{-2}$	$4*10^{-3}$	$1*10^{-2}$	$2*10^{-2}$	$9*10^{-3}$
No of Broker Effects	2	4	8	8	4	5
Significant at 5% LOS						
Industry Effects						
10th Percentile	$-1*10^{-3}$	$-1*10^{-3}$	$2*10^{-4}$	$-1*10^{-3}$	$-3*10^{-3}$	$-2*10^{-3}$
25th Percentile	$-8*10^{-4}$	$-6*10^{-4}$	$8*10^{-4}$	$-8*10^{-4}$	$-2*10^{-3}$	$-2*10^{-3}$
50th Percentile	$-1*10^{-4}$	$5*10^{-4}$	$2*10^{-3}$	$1*10^{-4}$	$-8*10^{-4}$	$-9*10^{-4}$
75th Percentile	$8*10^{-4}$	$1*10^{-3}$	$2*10^{-3}$	$3*10^{-4}$	$-6*10^{-5}$	$4*10^{-4}$
90th Percentile	$2*10^{-3}$	$2*10^{-3}$	$3*10^{-3}$	$5*10^{-4}$	$5*10^{-4}$	$1*10^{-3}$
No of Industry Effects	5	6	7	4	3	6
Significant at 5% LOS						

Table 8 reports the joint test analysis on the determinants of trading costs associated with passive funds' trades. The *open to trade* captures the pre-execution benchmark. This measure is defined as the difference between the trade price and the opening price of the first day of the trade package. *Trade to Close*, a measure of post execution cost, is defined as the difference between the trade price and the close price on the last day of the package. *Open to Close* is measured as the difference between the closing price of the last day of the package and the opening price of the first day of the package. The adjusted R-Squared of each model is compared to the adjusted R-Squared of the full model using F-tests. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

TABLE 9
Portfolio Configuration

	Index	Enhanced Index	Enhanced Index – Index
Mean Abs Deviation from Benchmark	6.63 %	12.22 %	-5.59 %***
Variance Abs Deviation from Benchmark	0.24 %	0.09 %	-0.15 %***
Min Mean Fund's Abs Deviation from Benchmark	2.43 %	12.35 %	
Max Mean Fund's Abs Deviation from Benchmark	11.46 %	13.13 %	
Equity	98.87 %	98.53 %	-0.34 %***
Futures	1.12 %	1.43 %	0.31 %***
Others	0.01 %	0.04 %	0.03 %***
Total	100.00 %	100.00 %	
Average Number of Stocks			
Prior to Index Reconstruction			
Index Holding	219.77	231.77	12.00 ***
Non-Index Holding	0	23.41	23.41 ***
Post Index Reconstruction			
Index Holding	225.13	231.69	6.56 ***
Non-Index Holding	0	20.14	20.14 ***
Average Value Held Relative to Fund Size			
Prior to Index Reconstruction			
Index Holding	100 %	99.15 %	-0.85 %***
Non-Index Holding	0 %	0.85 %	0.85 %***
Post Index Reconstruction			
Index Holding	100 %	99.56 %	-0.44 %***
Non-Index Holding	0 %	0.44 %	0.44 %***
Overweighting			
Liquidity	57.62 ***	57.58 ***	-0.04
Size	70.89 ***	71.54 ***	0.65 ***
Book to Market	45.86 ***	45.33 ***	-0.53 ***
Momentum	51.83 ***	52.19 ***	0.36 ***
Underweighting			
Liquidity	49.89 *	50.08	0.19 *
Size	48.55 ***	47.47 ***	-1.08 ***
Book to Market	46.45 ***	47.24 ***	0.79 ***
Momentum	47.87 ***	47.31 ***	-0.52 ***
Over - Underweighting			
Liquidity	7.73 ***	7.5 ***	
Size	22.34 ***	24.07 ***	
Book to Market	-0.59 ***	-1.91 ***	
Momentum	3.96 ***	4.88 ***	

Abs Drift denotes the absolute value of the difference between the weight of a stock in the portfolio and the weight of the stock in the benchmark index. The difference between the *Variance Abs Drift* of index funds and that of the enhanced index funds are tested using variance ratio. All other comparisons are performed based on the *t*-test. Table 9 reports the proportion of the portfolios invested in equity securities, futures contracts and other assets. For equity holdings, the table reports the proportion held in stocks that are both inside and outside the Index constituents. The table also reports the characteristics of the stocks that are over-and-underweighted by the funds based on the approach of Chen, Jegadeesh and Wermers (2000). * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

Table 10

Non-Index Holdings of Enhanced Index Funds

Panel A: Non-Index Holdings

Average Daily Return of Non-Index Holdings	0.13%**
<i>Ranked against total stocks listed</i>	
Liquidity	39.53***
Size	45.17***
Book to Market	50.17
Momentum	48.02***
<i>Ranked against other Non-Index Holdings</i>	
Liquidity	55.49***
Size	56.73***
Book to Market	43.13***
Momentum	55.34***

Panel B: Trades on Non-Index Holdings

<i>Purchases</i>	
Liquidity	71.06***
Size	73.94***
Book to Market	23.67***
Momentum	67.42***
<i>Sales</i>	
Liquidity	52.86
Size	72.82***
Book to Market	37.04***
Momentum	33.12***
<i>Purchase – Sales</i>	
Liquidity	18.20***
Size	1.12
Book to Market	-13.37***
Momentum	33.11***

Panel C: Realised and Unrealised Gains and Losses of Non-Index Holdings

Proportion of Gains Realised	2.5***
Proportion of Losses Realised	4.5***
PGR - PRL	2.0**

Table 10 Panel A reports the characteristics of the enhanced index funds' holdings that are not included in the benchmark index. The stocks are ranked against all constituent securities in the benchmark index and against stocks that are listed on the ASX (Australia Stock Exchange) but not included in the benchmark index using the ranking methodology developed by Chen, Jegadeesh and Wermers (2000). Panel B reports the characteristics of the stocks that are purchased and sold by the enhanced index fund managers. The analysis is restricted to the enhanced funds' purchases and sales for stocks that are not included in the benchmark index. Panel C reports the proportion of realized and unrealized gains/losses when enhanced index fund managers are trading stocks that are not constituents of the benchmark index. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 0.1% level of significance.

TABLE 11
Joint Tests on Portfolio Configuration

	Index	Enhanced Index	Non-Index Holdings of Enhanced Index
Full Model	0.38	1.59	6.87
Excluding Liquidity	0.35	1.51*	5.46
Excluding Size	0.25***	0.60***	6.81
Excluding Book to Market	0.32*	1.57	6.16
Excluding Momentum	0.36	1.55	4.01*
Intercept	$-5*10^{-5}$	$-3*10^{-4}***$	$-4*10^{-5}$
Liquidity	$6*10^{-7*}$	$1*10^{-6}***$	$8*10^{-7**}$
Size	$1*10^{-6}***$	$5*10^{-6}***$	$4*10^{-7}$
Book to Market	$-8*10^{-7}***$	$-7*10^{-7}$	$-6*10^{-7*}$
Momentum	$5*10^{-7*}$	$9*10^{-7**}$	$7*10^{-7**}$

Table 11 reports the results from the joint test analyses. The difference between a stock's weight in the portfolio and the benchmark index is regressed against the ranking computed for each stock across each of the characteristics as outlined in Chen, Jegadeesh and Wermers (2000). The analyses are performed separately for the index and the enhanced index funds. In addition, for enhanced index funds, the analysis is also performed on the funds' holdings of stocks that are not included in the benchmark index. * denotes significant at 5% level of significance. ** denotes significant at 1% level of significance. *** denotes significant at 1% level of significance.