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Are $N+1$ heads better than one? The timing and selectivity of Australian-managed investment funds

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Abstract

Many studies find that mutual funds exhibit differential and persistent performance. This differential performance could arise from superior managerial decisions regarding security selection, market timing, or both. We directly test security selection and market timing ability using opposing decision-making models, the classical and behavioural decision-making theories. Empirical results are consistent with the classical decision-making theory and the efficient market hypothesis (EMH). © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

Fund managers collect critical information in a variety of ways. Some managers employ statistical models that integrate theoretically derived or empirically derived quantitative relationships between market factors and stock performance (e.g.,

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Slovic, 1972). Other mutual fund managers collect information on such diverse subjects as insider trading, mergers and acquisitions, the effect of stock splits, or the prediction of stock prices and earnings (e.g., Lorie, 1966). The decision to purchase or liquidate securities may also be driven by other topical measures, such as book-to-market and P/E ratios, recent performance (momentum or contrarian strategies), dividend yields, or value vs. growth. Finally, quantitative and qualitative information is then integrated, and the mutual fund investment decisions are made by the fund manager(s).

In Australia, as in many other markets, the investment decisions made in many mutual funds (commonly known as 'managed investment funds') are made not by individual managers, but by groups or teams of managers. However, little research has been conducted addressing the similarities and differences in performance outcomes when a team of decision-makers manages the mutual fund rather than an individual decision-maker. This is an important line of inquiry since classical decision-making theory and behavioural decision-making theory are at odds concerning expected performance outcomes. Thus, our research question is "Will the performance outcomes of a team of mutual fund managers differ from those of an individual mutual fund manager?"

Much of the extant research on individual vs. group decision-making, and its relationship to performance, has been completed in the context of a laboratory setting (e.g., Hogarth and Reder, 1987; Zeckhauser, 1987). Typically, subjects were undergraduate and/or graduate students asked to make decisions based on the reading of carefully crafted pilot-tested scenarios (e.g., Kameda and Davis, 1990; Gigone and Hastie, 1997). Missing from this literature are studies of high-level decision-makers and analysts in their natural working environment (e.g., Slovic, 1972). Our research differs in that we will test our research question using field data gathered from 148 Australian mutual funds managed by both individuals and teams.

This paper is structured as follows. In the next section, we provide a brief discussion of the Australian mutual funds market. Section 3 comprises a review of two relevant areas of literature relating to: (1) mutual funds performance and (2) classical and behavioural decision-making. The latter literature suggests that there are differences in the quality of decisions made by individuals and teams. Based on this review, a testable hypothesis is developed. Next, our testing methodology is outlined in Section 4. Results of the analysis and their implications are presented in Section 5. Finally, concluding comments are presented in Section 6.

2. Australian mutual funds industry

Although still a relatively new industry, the Australian mutual funds industry accounts for a higher proportion of Australians' wealth than does the banking sector. The Australian Investment Managers' Association (AIMA) reports that, as of 30 June 1996, estimated funds under management were in the vicinity of $A320–325 billion as compared to about $A280 billion held with banks as of 31 December 1995. Anecdotal evidence suggests that the gap between the two has since widened.

A graphical overview of the Australian mutual funds industry is provided as Fig. 1. The industry can be divided into two broad categories of funds–wholesale and retail. The distinction between the two categories lies in the sources of funds and in legislative disclosure requirements. In economic terms, the wholesale category is more than three times the size of the retail category, since it is made up of superannuation funds (the equivalent of pension or retirement funds overseas), government funds and some large institutional investors. Within the wholesale market, superannuation funds dominate, accounting for around 75% of funds under management industry-wide.

A characteristic of the Australian funds market that is common to many overseas markets is the availability of a large selection of alternative mutual fund (investment) objectives. For example, investors can choose from a range of fund objectives, such as income or growth, protected or stable, and domestic or international.

Due to the very specific and substantial legislative requirements applicable to the superannuation industry, these funds will not be considered in this study. Instead, the focus will be on retail funds, which are managed investment funds in

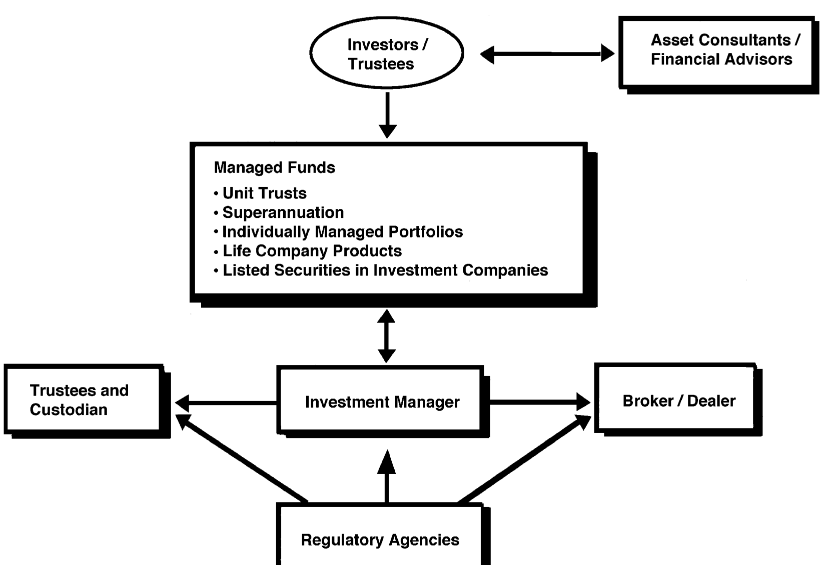

Fig. 1. Graphical representation of the Australian mutual funds industry.

the more traditional sense, raising funds from, and investing on behalf of, individual and corporate investors. Additional details are provided in Section 4.

3. Literature review

3.1. Mutual fund performance

One of the earliest studies that document persistent performance in mutual funds is Sharpe (1966). He examined the net return of thirty-four mutual funds and compared their relative performance, and that of a market index, the Dow Jones Industrial Average (DJIA). Sharpe drew several interesting conclusions. First, he concluded that relative performance differences exist, and that this relative performance persists over time. Therefore, knowing the past relative performance can enhance an investor's probability of selecting a future winner.

Carlson (1970) extended the previous work by examining performance of mutual funds relative to six indices, finding that performance depends on the index used, the type of fund, and the period of study. From this, he concluded that funds should be grouped by investment objective before examining performance. His examination of diversified common stock funds suggests that differential performance exists and generally persists from one 5-year period to the next.

Goetzmann and Ibbotson (1994) investigated the persistence of raw returns and returns adjusted for risk. Risk adjustment was accomplished by using the market model with the S&P 500 index as the market proxy. They found that performance was persistent using either raw or risk-adjusted returns. Additionally, these results were robust to fund style.

Brown and Goetzmann (1995) extended previous analysis by using a sample that consisted of defunct and surviving funds. They found that relative performance persists for both winners and losers for both raw and risk-adjusted returns, even after controlling for investment objective. Additionally, they did not find this result to be sensitive to the selected benchmark, as both the S&P 500 and an index of equally weighted mutual fund returns produced similar results. They concluded that historical performance data could be used as a guide to future relative performance.

Studies of international fund performance, in general, and Australian fund performance, in particular, are less well established. Recently, increased emphasis has been given to this important area to ascertain similarities and differences between those funds and U.S. funds. Early studies of Australian funds by Bird et al. (1983) and Praetz (1976) find that funds earn returns commensurate with their risk and that sustained superior performance is not exhibited. Similarly, Robson (1986) studied Australian funds and concluded that fund performance under performed the market and that there was no consistency in relative performance.

However, a more recent study of the performance of Australian rollover funds and found some evidence of persistent performance of risk-adjusted returns (Hallahan, 1999).

3.2. Extant studies of timing and selectivity

One possible explanation for superior risk-adjusted returns is that the manager(s) possess and utilise superior market timing or security selection ability. Treynor and Mazuy (1966) were the first to examine the timing and selectivity of mutual fund managers. Their major contribution is showing that if managers possess and utilise superior timing ability, the characteristic line will be nonlinear. This occurs because managers may change the ratio of debt to equity or the average volatility of equities in the portfolio. Further, to measure the success of managers timing ability, Treynor and Mazuy (1966) use a quadratic equation, Eq. (1):

$$R_{i,t} = \alpha_i + \beta_i(R_{\mathrm{m},t}) + \gamma_i(R_{\mathrm{m},t})^2 + \varepsilon_{i,t}, \tag{1}$$

where $R_{i,t}$ is the excess return on fund i, α_i is the measure of selectivity (risk-adjusted return), β_i is the systematic risk of fund i, $R_{\mathrm{m},t}$ is the excess return on the market, γ_i is the measure of timing ability, $R^2_{\mathrm{m},t}$ is the squared excess return on the market, and $\varepsilon_{i,t}$ is the random error term.

Treynor and Mazuy find that none of the 57 funds that they examine exhibits timing ability. However, they used annual data and they state that the study would miss any success managers may have had with more frequent changes in risk designed to time the market.

Viet and Cheney (1982) examine timing ability by evaluating changes in systematic risk during bull and bear markets. A successful timing strategy would be to increase the beta during bull markets and decrease the beta during bear markets. Since the definition of bull and bear markets is imprecise, they use four different methods of classifying the market as bull or bear. As expected, results are sensitive to the classification of a bull or bear market. However, they find that very few funds exhibit timing. Of those that do, 73% exhibit perverse timing ability. What is left unanswered is the source of the timing ability of the few funds that are successful at market timing.

Lee and Rahman (1990, 1991) examine the monthly returns of 93 funds and find that 10 funds exhibit selection and timing skill, four exhibit selection skill, but no timing skill, and five funds exhibit timing skills, but no selection skill. However, the source of the skill is not identified.

Henriksson and Merton (1981), Merton (1981) and Henriksson (1984) propose an alternative model to examine timing and selectivity. The Henriksson–Merton (HM) model may be considered to be superior because it assumes that forecasters may only be able to forecast whether market returns will exceed the risk-free rate.

Therefore, the HM model retains a two-factor structure, but it replaces the second factor (a squared risk premium) with a variable of max (0, R_m) where R_m is the excess return on the market. Formally, the model can be expressed as

$$R_{i,t} = \alpha_i + \beta_i(R_{m,t}) + \gamma_i(R_{m,t})D + \varepsilon_{i,t}, \tag{2}$$

where $R_{i,t}$ is the excess return on fund i, α_i is the measure of selectivity (risk-adjusted return), β_i is the systematic risk of fund i, $R_{m,t}$ is the excess return on the market, γ_i is the measure of timing ability, D is a dummy variable, which takes on a value of 1 if the market return exceeds the risk-free rate, and $\varepsilon_{i,t}$ is the random error term.

Studies of timing and selectivity are not restricted to U.S. funds. Cumby and Glen (1990) examine a sample of international funds and find perverse timing using the Treynor and Mazuy (1966) method. Australian funds studies produce similar results. Sinclair (1990) uses the Henriksson–Merton model to investigate the performance of Australian funds and finds that many funds attempt to time the market, but those attempts result in perverse timing. Sawicki and Ong (2000) use the unconditional Treynor and Mazuy (1966) method to investigate Australian funds and a modification that permits using conditioning variables. In both instances, they report perverse timing. Conversely, Hallahan and Faff (1999) find sparse evidence of timing ability.

Identifying the source of skill is of vital importance to investors if it can improve their odds of picking a future winner. Additionally, many studies (e.g., Sirri and Tufano, 1992; Capon et al., 1996; Chevalier and Ellison, 1997) suggest that past performance affects fund selection and that U.S. funds with higher returns elicit more net new money inflows. Sawicki (2000) finds similar results for Australian funds using a variety of measures for past performance. Therefore, identifying the determinants of performance is also vital for management companies since it could become a source of competitive advantage.

Recent literature recognises the vital importance of examining managerial characteristics to ascertain common factors that explain superior outcomes since these outcomes are associated with investment management talent. Chevalier and Ellison (1999) examine managerial attributes, such as the manager's age, tenure, the required SAT of the managers' undergraduate institution, and if the manager has an MBA degree. Their findings, as well as those of Golec (1996), suggest that managerial attributes influence performance outcomes.

As influential as individual managerial characteristics may be, many of the security selection and asset allocation decisions for a mutual fund are not made by individual managers, but by groups or teams of managers. Yet, little research has been conducted addressing the similarities and differences in performance outcomes when the mutual fund is managed by a team of decision makers rather than by an individual decision maker. Could performance be driven by the management structure of the fund? While studies on U.S.-managed funds abound, little research exists on the timing and selectivity of Australian-managed funds. Additionally, little investigation has been conducted to ascertain the source of these benefits when they have been detected. One plausible explanation for documented superior performance can be found in the decision-making literatures. Decision-making literatures propose two theories that may offer insight into the source of timing and selectivity of mutual funds. Those theories are the foundation for our null and alternate hypothesis.

3.3. The classical decision-making theory perspective

The classical decision-making model, as espoused by standard finance proponents has been used extensively in research conducted in business, economics, finance, and management science (e.g., Fiegenbaum, 1990). An extension of this model, the expected utility model (e.g., von Neumann and Morgenstern, 1944), assumes that decision-makers have a utility function that describes the overall cost and benefit obtained from a specific choice (see Schoemaker, 1982, for a summary). The classical perspective argues that decision makers are knowledgeable, self-interested, and rational with access to all the information necessary to make valid decisions (Evensky, 1997). From this perspective, differing alternatives to the same problem should lead to the same maximising choice and optimal performance outcome, whether the decision is made by an individual, group, or organisation (e.g., Arrow, 1987). Thus, we could expect that individual decision-makers and group decision-makers would not vary in their performance outcomes. This discussion of the classical decision-making model leads us to our hypothesis (stated in the null):

Hypothesis 1. The timing and selectivity of a mutual fund managed by a team of managers will not differ significantly from that of a mutual fund managed by an individual manager, ceteris paribus.

However, the study of human choice raises many questions that are left unanswered by the basic assumptions of classical decision-making theory (e.g., Hogarth and Reder, 1987; Statman, 1999; Thaler, 1999). For example, Barber and Odean (1999) found that investors traded more actively when self-confidence was high and less actively when they had suffered losses, such that they tended to sell their winners and hold their losers. Should the study of managerial decision-making be restricted to market-level behaviour? Should researchers focus only on the final state of wealth? What type of data is relevant to the research questions of interest? The behavioural decision-making model, as championed by behavioural finance adherents (e.g., Barber and Odean, 1999; Olsen, 1998), advocates the introduction of value-expressive characteristics, such as frame susceptibility and varying attitudes toward risk. Thus, this paradigm offers a contrasting perspective for the study of human choice behaviour.

3.4. The behavioural decision-making theory perspective

Early research in behavioural decision-making focused on individuals in a non-coacting group setting or ad hoc groups where interaction was limited (e.g., Hill, 1982). Findings imply that the superiority of groups over individuals was largely based on the pooling of pieces of information and the integration of these pieces to form a solution. The early research was extended to the study of individual decision-makers in the context of a group decision. Results suggested that, as proposed by the persuasive argument model (e.g., Vinokur, 1971; Burnstein and Vinokur, 1977), individuals operating in a group decision-making environment may be subject to the group polarisation and risky shift phenomena. Still other studies (e.g., Sniezek and Henry, 1989; Vollrath et al., 1989) compared individual and group decisions and found that groups recall and recognise relevant information better than individuals.

These findings suggest that teams of decision-makers have a greater number of resources than individual decision-makers (e.g., Hill, 1982), resulting in a greater number of alternatives to specific decisions (e.g., Shaw, 1932). Tindale (1993) further suggests that a shared belief system is one factor that may help to decrease uncertainty, resulting in reduced error bias. This discussion of the behavioural decision-making literature implies that the performance of a mutual fund managed by a team of mutual fund managers will be significantly greater than that of a mutual fund managed by an individual manager. In contrast to the hypothesis supported by the classical decision-making literature, the behavioural finance paradigm posits that data perception, selection, weighting, and manipulation may vary considerably among and between fund managers (e.g., Olsen, 1998). Thus, the alternative hypothesis implies that portfolios managed by teams will out perform portfolios managed by individuals, and could explain the recent findings of persistent performance discussed earlier.

4. Methodology

4.1. Data

To select the sample for analysis, a list of mutual funds that were in operation during the period 1 June 1993 through 31 May 1998 was obtained from the Morningstar Downunder (formerly the FPG Research database). For this study, funds selected for analysis were from the "Multisector Trusts" investment objective classification. These funds are similar to "balanced" funds in that they contain equity and debt securities. Investment objective classifications are external to the individual funds and are based upon the legal constraints placed upon portfolio managers by each fund's prospectus. Restricting our analysis to a group of funds within a common investment objective is potentially important, since funds sharing the same objectives have similar characteristics (e.g., McDonald, 1974). Bowen and Statman (1997), Brown and Goetzmann (1997), and others (e.g., Grinblatt and Titman, 1992; Goetzmann and Ibbotson, 1994; Brown and Goetzmann, 1995) show the importance of restricting analysis to funds sharing similar characteristics for true performance evaluation. Therefore, we follow the practice of comparing performance within an investment objective classification.

Our sample of 148 funds comprises every fund that was in operation at some time in the sample period. That is, we include those funds not in operation for the full 60 months. This complete sample was selected to minimise the impact of two possible sources of sample bias: "survivorship" bias and "omission" bias. Studies, such as Brown et al. (1992), show that survivorship bias exists when extinct mutual funds are excluded when studying performance. Prima facie, this bias is unlikely to be as serious in the present study as, for example, in a study examining whether managers could outperform an unmanaged index. However, had we not included funds that became extinct during the sample period, survivorship bias could potentially have had some impact on our results so it was best avoided.

Similarly, "omission" bias would exist if newer funds were excluded from analysis. This bias is potentially important since Arteaga et al. (1998) found that return bias could be created through mutual fund "incubation." The idea is that seed money could be used to create multiple funds, each taking multiple successive "bets" in an uncertain world. After the outcomes are known, winning funds would be marketed and losing funds dropped. If incubation exists, retaining these funds may impact upon our results since this bias potentially exists. If incubation does not exist, omission bias would not be expected to affect our results.

To examine the impact of the managerial structure of the fund on performance, it was necessary to learn how each fund was managed. Our classification system follows that of Morningstar for U.S. funds. First, for funds managed by an individual or where a single individual is the primary decision-maker, we classified these as managed by an individual. Second, if two or more managers manage together or the team approach is strongly promoted we classified these as team-managed. The key distinction is how the investment decision is actually made. Frequently, several people are involved in some aspect of investment decisions. It is common for analysts to provide research and recommendations concerning a stock to a manager. If the fund is managed by an individual, the individual reviews the research and makes the decision. However, if the fund is managed by a team, the decision becomes one of consensus. Making the determination of management structure required consulting a combination of sources including Morningstar Downunder (formerly FPG Research database, ASSIRT), and numerous asset consultants. Asset consultants that were knowledgeable about the internal operation of the funds were invaluable in categorising funds into the management structure given our criteria and their understanding of the fund internal operation. This process resulted in 71 funds classified as one-manager funds and 77 classified as team-managed. The FPG Research database number of the fund sample used in this study, and our classification of team or individually managed is presented in Appendix A.

It became clear that the funds management markets in the U.S. and Australia are quite different from each other. Several stylised facts emerge. First, a smaller proportion of Australian funds are individually managed compared to U.S. funds. Second, many Australian fund managers do not like their funds to be seen as dominated by an individual decision-maker, preferring to emphasise team decision-making. This is quite different from the findings of Prather and Middleton (2001) for U.S. funds.

4.2. Computation of returns

The returns obtained from each fund were computed and an equally weighted "index return" was formed. Continuously compounded monthly net returns are computed for each fund by taking the natural logarithm of the change in value over the holding period for each of the 60 months in the sample, using Eq. (3):

$$R_{i,t} = \ln \frac{\text{value}_{i,t}}{\text{value}_{i,t-1}}, \tag{3}$$

where $R_{i,t}$ is the return on fund i during the period t, and $\text{value}_{i,t}$ is the value of an investment in fund i at time t.

Values of hypothetical investments made in these funds are computed, assuming all capital gains and dividend distributions are reinvested. Returns for the individually managed and team-managed subsamples are computed by summing the returns of the individual funds within the relevant management category, and computing their average monthly return using Eq. (4):

$$R_{i,t} = \frac{\sum_{i}^{n} R_{i,t}}{n}. \tag{4}$$

This has resulted in the development of two sets of equally weighted index returns (one for funds classified as managed by an individual manager, the other for funds that are managed by a team). The All Ordinaries Accumulation Index (AOAI) is used as the market proxy, and 13-week Treasury Notes as the risk-free rate.

4.3. Performance evaluation

In order to ascertain possible differential timing and selectivity performance of team-managed and individually managed funds, we use the procedure of Treynor and Mazuy (1966) to compare each set of funds to the All Ordinaries Index. The model is specified in Eq. (1).

We also slightly modify this timing model by comparing the equally weighted index returns of team-managed and individually managed funds. This is similar to the procedure used by Robson (1986) for studying Australian funds, Agarwal and Prather's (1997) examination of load and no-load funds and Prather and Middleton's (2001) examination of team-managed and individually managed U.S. funds. This simply involves substituting the index of excess returns of individually managed funds for the market proxy. This permits direct comparison of the average relative performance of team and individually managed funds. Eq. (5) presents this model:

$$R_{\text{team},t} = \alpha_{\text{team}} + \beta_{\text{team}}(R_{\text{ind},t}) + \gamma_{\text{team}}(R_{\text{ind},t})^2 + \varepsilon_{\text{team},t}, \tag{5}$$

where $R_{\text{team},t}$ is the excess return on the team-managed fund subsample during period t, $R_{\text{ind},t}$ is the excess return on the individually managed fund sample during period t, α is the estimated excess risk-adjusted return for the team-managed funds (selectivity measure), β is the systematic risk coefficient for the team-managed funds, and γ is the timing measure for the team-managed funds.

There are several reasons for our modification. First, our central question is not whether active management is beneficial. The question is whether a group making active management decisions will outperform an individual making the same type of decision. Therefore, direct comparison of timing ability, stock-selection ability and relative risk is desired. More formally, it permits directly testing the following hypotheses: H_o: $\alpha_{\text{team}} = \alpha_{\text{ind}}$; H_o: $\beta_{\text{team}} = \beta_{\text{ind}}$; H_o: $\gamma_{\text{team}} = \gamma_{\text{ind.}}$ The second reason for the modification is that funds with similar objectives are likely to have portfolios more similar in composition to each other than to any arbitrarily selected market proxy. Thus, the securities that make up these portfolios are likely influenced by the same macroeconomic factors. If the same macroeconomic factors affect the returns of these portfolios, the correlation of returns for funds sharing similar objectives should be higher than the correlations with the All Ordinaries Index. This should produce a better model fit (higher coefficient of determination). An additional benefit of comparing these index returns is that it mitigates potential nonlinearities in the security market line reported by Sharpe (1992) since it restricts evaluation to a smaller segment of the security market line proxy (β closer to one).

Interpretation of the results of the modified model is straightforward. If α is insignificantly different from zero, the results would suggest that no difference in stock-selection ability exists between team-managed funds and those managed by an individual. This would support the classical decision-making theory (Hypothesis 1). Alternatively, if α is significantly greater than zero, the excess risk-adjusted returns of team-managed funds are sufficient to conclude that management teams add value to investors by making superior stock-selection decisions. This finding would support the behavioural decision-making theory. Finally, if α is significantly less than zero, the negative excess risk-adjusted returns of team-managed funds are sufficient to conclude either that management teams make inferior stock-selection decisions compared to individuals or that the marginal costs of making those decisions exceed their marginal benefits. If γ is insignificantly different from zero, the results would suggest that no difference in timing ability exists between team-managed funds and those managed by an individual. This would support the classical decision-making theory (Hypothesis 1). Alternatively, if γ is significantly greater than zero results would suggest that management teams add value to investors by making superior market timing decisions. This finding would support the behavioural decision-making theory. Finally, if γ is significantly less than zero results would suggest that management teams make inferior market timing decisions than individuals. Examining β permits comparison of the relative risk of team-managed funds to those of funds managed by individuals. To ascertain whether β is different from one statistically, a t-test can be used to compute a t-statistic $[t = (\beta - 1)/s_e \beta]$.

As a test of robustness of differential timing and selectivity performance, we use the procedure of Henriksson and Merton (1981), Merton (1981) and Henriksson (1984) (Eq. (2)). Again, we also slightly modify the timing model by comparing the excess returns of equally weighted index returns of team-managed and individually managed funds to compare the average relative performance. Interpretation of this model is identical to the modified timing model presented in Eq. (5). Eq. (6) presents this model:

$$R_{\text{team},t} = \alpha_{\text{team}} + \beta_{\text{team}}(R_{\text{ind},t}) + \gamma_{\text{team}}(R_{\text{ind},t})D + \varepsilon_{\text{team},t}, \qquad (6)$$

where $R_{\text{team},t}$ is the excess return on the team-managed fund subsample during period t, $R_{\text{ind},t}$ is the excess return on the individually managed fund sample during period t, α is the estimated excess risk-adjusted return for the team-managed funds (selectivity measure), β is the systematic risk coefficient for the team-managed funds, D is a dummy variable, which takes on a value of one if the market return exceeds the risk-free rate, and γ is the timing measure for the team-managed funds.

5. Empirical results

Timing and selectivity results computed against the All Ordinaries Accumulation Index are presented in Table 1. Model fit is high and β is positive and statistically significant. To examine timing and selectivity of the team-managed and individually managed funds (multisector trusts), the magnitude and significance of α and γ are the keys. In both management structures, γ is negative.

Table 1
Treynor–Mazuy regressions using the all ordinaries as a market proxy
$R_{i,t} = \alpha_i + \beta_i(R_{m,t}) + \gamma_i(R_{m,t})^2 + \varepsilon_{i,t}$

Management category	R^2	α	β	γ
Team-managed	0.891	0.0010 (0.931)	0.449*** (21.176)	−0.315 (−0.849)
Individual	0.866	0.0011 (1.010)	0.419*** (18.635)	−0.578 (−1.468)

***, **, and * Denotes significance at the 1%, 5%, and 10% level, respectively.

However, since neither coefficient is statistically significant, we are unable to conclude that either group of funds exhibits any timing ability. Additionally, the measure of selectivity (α) is statistically insignificant. Therefore, we are unable to detect any timing ability or selectivity ability on average for either of these two groups of funds (multisector trusts). This supports the classical decision-making theory and the efficient market hypothesis (EMH) for this sample of funds. Note that the β's are approximately 0.4 suggesting low systematic risk (compared to the All Ordinaries Index) and that the estimated systematic risk of team-managed funds is slightly larger than that of funds managed by an individual.

We now attempt to discern true differences in the timing or selectivity performance of funds managed by teams from those managed by individuals in the same investment objective group by using an index of individually managed fund excess returns and regressing those returns, and their square, on the index of team-managed fund excess returns. Table 2 presents the results. As expected, the coefficient of determination is higher than that found by using the All Ordinaries Index, which suggests a better model fit. However, both α and γ are statistically insignificant, suggesting that there is no detectable difference between the timing ability or selectivity ability of teams and individuals. Note that the β is now slightly greater than one, suggesting that the estimated systematic risk of team-managed funds is slightly larger than that of funds managed by an individual. However, the *t*-statistic computed to test whether the difference in β's is statistically significant is 0.42, suggesting that the difference is not significant. These results are consistent with the classical decision-making theory and the efficient market hypothesis (EMH).

Table 2
Treynor–Mazuy regression of team-managed fund returns returns of individually managed funds
$R_{team,t} = \alpha_{team} + \beta_{team}(R_{ind,t}) + \gamma_{team}(R_{ind,t})^2 + \varepsilon_{team,t}$

Dependent variable	R^2	α	β	γ
Team-managed	0.937	0.0004 (0.437)	1.015*** (28.150)	0.145 (0.100)

***, **, and * Denotes significance at the 1%, 5%, and 10% level, respectively.

Table 3
HM regressions using the All Ordinaries as a market proxy
$R_{i,t} = \alpha_i + \beta_i(R_{m,t}) + \gamma_i(R_{m,t})D + \varepsilon_{i,t}$

Management category	R^2	α	β	γ
Team-managed	0.887	0.0013 (0.969)	0.478*** (12.527)	−0.053 (−0.817)
Individual	0.859	0.0015 (1.062)	0.466*** (11.461)	−0.086 (−1.228)

***, **, and * Denotes significance at the 1%, 5%, and 10% level, respectively.

As a check on the robustness of our results, we repeat the timing tests above using the model in Henriksson and Merton (1981), Merton (1981) and Henriksson (1984) (Eq. (2)). As in Table 1, Table 3 reports the results of the timing tests employing the All Ordinaries as a proxy, but this time using the HM test. The interpretation is identical to that discussed above for the TM model. Results suggest that there is insufficient evidence to reject the null hypothesis that teams do not make better timing or selection decisions than individual managers make since neither α nor γ differ from zero statistically. Again, neither team-managed nor individually managed funds exhibit significant selection or timing ability in this sample.

Our next test repeats the tests reported in Table 2, but again using the HM model. Table 4 shows that there is insufficient evidence to reject the null hypothesis that teams do not make better timing or selection decisions than individual managers since neither α nor γ differ from zero statistically. In addition, systematic risk is not significantly different between to two groups since the *t*-statistic for the hypothesis that $\beta = 1$ is 0.14. Therefore, all tests with this sample suggest that there is no difference between the performances of funds managed by teams or individuals, which supports the classical decision making perspective.

Another way of examining performance is to compare the raw returns of funds in each management structure. Table 5 presents those results. Funds managed by a team have slightly higher average monthly returns (0.0080) than those managed by an individual (0.0076), but they also have higher total risk (0.0191), as measured by standard deviation, than funds managed by an individual (0.0183). Using a

Table 4
HM regression of returns of funds managed by teams on returns of funds managed by individuals
$R_{team,t} = \alpha_{team} + \beta_{team}(R_{ind,t}) + \gamma_{team}(R_{ind,t})D + \varepsilon_{team,t}$

Dependent variable	R^2	α	β	γ
Team-managed	0.935	0.0003 (0.316)	1.009*** (15.936)	0.010 (0.086)

***, **, and * Denotes significance at the 1%, 5%, and 10% level, respectively.

Table 5
Descriptive statistics and paired sample *t*-test

Management category	Mean monthly return	Standard deviation	*N*	*t*-Statistic	*p*-Value
Team-managed	0.00804	0.01910	60	0.712	0.479
Individual	0.00760	0.01830	60		

two-sided paired sample *t*-test, we are not able to reject the null hypothesis of equal returns since the *t*-statistic is 0.712 and the *p*-value is 0.479. As a robustness test, we also performed a Wilcoxon-Signed Ranks Test ($p < 0.531$) and a Sign Test ($p < 0.519$). Neither test could reject the null hypothesis of equal returns.

One limitation of examining indices of funds and making inferences based upon the results is that outliers could exert undue influence on those results. One source of complication in this type of study arises from the potential impact of incorrect management category classification. Despite painstaking efforts to classify funds correctly, it is possible that the funds do not operate as classified. One source of error in classification could be due to self-selection bias resulting from a fund manager(s) conscious decision that it was in their best interest to be perceived as fitting into one management category over other. Self-selection bias could arise from managers wanting to take sole credit for a superior performance record to maximise the managers' wealth. Conversely, sharing some blame for a poor performance record could lead to self-selection bias toward a team classification. Given the absence of firsthand knowledge, the classifier must rely on information collected from those managers. Therefore, examining the selectivity and timing coefficients of each fund and comparing the properties of the distributions of those coefficients in each management category is worthwhile.

Absent self-selection bias, another interesting question is what the impact of classification error would be and how that error might affect results. From a theoretical standpoint, under the classical decision making theory incorrect classification would not be important since the theory predicts no difference in performance between the two management structures. However, the behavioural decision making theory predicts that teams make better decisions. If the behavioural decision making theory is correct, classifying team-managed funds as managed by an individual may tend to bias the individual manager sample positively. Conversely, classifying individually managed funds as managed by a team may tend to bias the team manager sample negatively. Thus, a bias caused by incorrect classification could possibly lead to failing to reject the null hypothesis of no difference.

To examine these issues, regression analysis was repeated on each fund to estimate the fund's timing and selectivity coefficients. The coefficients of the funds managed by an individual manager and the coefficients of the funds managed by a team were then compared. Of the 71 funds managed by an individual manager, one fund exhibited superior stock-selection ability, one fund exhibited superior timing ability and two funds exhibited perverse timing ability (all at the 5% level). Examination of the team-managed fund sample reveals that of the 77 funds, seven funds exhibited superior stock-selection ability, two funds exhibited market timing ability, and two funds exhibited perverse timing ability. Given our sample of returns, there is little reason to believe that there is an impetus for self-selection bias.

While classification bias remains possible, we believe that it is unlikely that it exerts undue influence on our empirical results. The rational for our belief arises from the individual fund coefficients. Suppose the behavioural decision making theory was correct and teams make better decisions. If enough of the superior team-managed funds were classified as managed by an individual, the hypothesis of no difference could not be rejected. However, since only one fund of 71 exhibited selection ability and another exhibited timing ability, reclassification of that one fund would not materially influence results. It is also possible that funds managed by an individual were incorrectly classified as managed by a team. Since teams should perform better under the theory, this could exert a negative bias on our team-managed fund sample. While we are unable to rule this out, it appears unlikely given that only two funds in the team-managed sample exhibited perverse timing and none exhibited negative selectivity.

Table 6, panel A provides the descriptive statistics for our full sample of funds. Examination of this data suggests the funds managed by an individual exhibit a greater range in timing and selectivity coefficients. One reason that this could exist is that new funds were not excluded from our sample. Since some funds have few observations, some of them generated large coefficients that were not statistically

Table 6
Descriptive statistics of individual fund coefficients

	N	Minimum statistic	Maximum statistic	Mean statistic	Std. deviation statistic
Panel A (full sample)					
ALPHA1	71	−0.012370	0.015360	0.001288	0.004401
ALPHATM	77	−0.002831	0.010080	0.001163	0.002032
GAMMA1	71	−14.373000	5.110000	−0.492145	2.431783
GAMMATM	77	−3.878000	1.405000	−0.266426	0.695987
Panel B (reduced sample)					
ALPHA1	49	−0.003960	0.015360	0.000946	0.003480
ALPHATM	77	−0.002831	0.010080	0.001163	0.002032
GAMMA1	49	−6.962000	1.472000	−0.371240	1.413338
GAMMATM	77	−3.878000	1.405000	−0.266425	0.695987

significant. While this should have little impact in the previous cross-sectional analysis presented earlier, caution must be exercised when making comparisons of coefficients and drawing inferences. To mitigate potential distortion, we eliminated funds with fewer than 16 months of data. Our intention was to prevent a spurious coefficient estimate from driving results. Descriptive statistics for our reduced sample of funds is presented in panel B of Table 6. The deletion of funds with very short histories made a significant difference in the range of the timing and selectivity coefficients of funds managed by an individual manager. No team-managed funds were deleted due to short histories.

To learn whether differences in timing and selectivity coefficients exist between funds managed by an individual manager and funds manager by a team, we performed Wilcoxon-Signed Ranks tests, Sign tests, and *t*-tests on the full and reduced samples. Table 7 provides the distribution of the timing and selectivity coefficients for the two management categories and tests of their differences using the Wilcoxon-Signed Ranks test and Sign test. Results suggest that no difference exists between the estimated coefficients at conventional significance levels. *t*-Test results are also unable to detect a significant difference between the coefficients with a *p*-value for the alpha and gamma coefficients of $p > 0.18$ and $p > 0.57$, respectively.

As a final test, the nonparametric tests of Table 7 were repeated on the reduced sample and results are presented in Table 8. The Wilcoxon-Signed Ranks test and Sign test are unable to reject the hypothesis that the timing or selectivity

Table 7
Nonparametric tests (full sample)

Panel A (ranks)

Coefficient		*N*	Mean rank	Sum of ranks
ALPHATM-ALPHA1	Negative Ranks	37	34.97	1294.00
	Positive Ranks	34	37.12	1262.00
	Ties	0		
	Total	71		
GAMMATM-GAMMA1	Negative Ranks	39	33.18	1294.00
	Positive Ranks	32	39.44	1262.00
	Ties	0		
	Total	71		

Panel B (test statistics)

Coefficient	ZW[a]	*p*-Value	ZS[b]	*p*-Value
ALPHATM-ALPHA1	−0.092	0.927	−0.237	0.812
GAMMATM-GAMMA1	−0.092	0.927	−0.712	0.476

[a] ZW is the Wilcoxon-Signed Rank test *Z*-statistic.
[b] ZS is the *Z*-statistic for the Sign test.

Table 8
Nonparametric tests (reduced sample)

Panel A (ranks)

Coefficient		*N*	Mean rank	Sum of ranks
ALPHATM-ALPHA1	Negative Ranks	21	25.43	534
	Positive Ranks	28	24.68	691
	Ties	0		
	Total	49		
GAMMATM-GAMMA1	Negative Ranks	29	22.45	651
	Positive Ranks	20	28.70	574
	Ties	0		
	Total	49		

Panel B (test statistics)

Coefficient	ZW[a]	*p*-Value	ZS[b]	*p*-Value
ALPHATM-ALPHA1	−0.781	0.435	−0.857	0.391
GAMMATM-GAMMA1	−0.383	0.702	−1.143	0.253

[a] ZW is the Wilcoxon-Signed Rank test *Z*-statistic.
[b] ZS is the *Z*-statistic for the Sign test.

coefficients differ. Additionally, *t*-test results are also unable to detect a significant difference between the coefficients with a *p*-value for the alpha and gamma coefficients of $p > 0.56$ and $p > 0.40$, respectively. Based on the combined evidence of all tests, we do not believe that sufficient evidence exists to reject the null hypothesis of no difference.

6. Conclusion

Many recent studies of mutual fund performance find that funds exhibit differential performance and that this differential performance persists overtime (e.g., Grinblatt and Titman, 1992; Hendricks et al., 1993; Goetzmann and Ibbotson, 1994; Brown and Goetzmann, 1995). One explanation for this differential performance is that superior fund managers possess security selection ability, timing ability, or both. Alternative explanations, such as Gruber (1996), posit that institutional factors play a role.

Two decision-making theories at odds concerning expected performance outcomes are the classical decision-making theory and the behavioural decision-making theory. From the classical utility theory perspective, differing alternatives to the same problem should lead to the same maximising choice and optimal performance outcome, whether the decision is made by an individual, group, or organisation (e.g., Arrow, 1987). Thus, we could expect that individual decision-makers and group decision-makers would not vary in their performance outcomes. In contrast, the behavioural decision-making theory asserts that when the task is complex and completed under high levels of uncertainty, group members tend to pool and integrate their resources and correct each other's errors (e.g., Hinsz et al., 1997). This results in qualitatively and quantitatively superior performances when compared to the average individual performance (e.g., Hill, 1982).

Since the theories are at odds, the question of whether teams or individuals make superior portfolio management decisions that result in sustained superior risk-adjusted performance is an empirical one. Therefore, we seek to learn whether teams or individuals make better decisions on average. This topic is vitally important since it could provide insight into why some funds may exhibit persistently superior performance. If one type of management structure is superior, it could serve as a source of competitive advantage. To examine this issue, we use monthly continuously compounded net risk-adjusted net returns of 148 multisector trusts during the period June 1993 through May 1998.

Empirical results, computed relative to the All Ordinaries Accumulation Index, suggest that there is no significant raw or risk-adjusted performance difference between multisector trusts managed by teams and those managed by individuals. Therefore, we are unable to ascertain any significant timing or selectivity performance differentials between the two management structures for this sample of funds. This finding supports the classical decision-making theory and the efficient market hypothesis.

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Appendix A. Classification of funds by management category

Panel A: Funds managed by an individual (FPG number)

A00079	A00081	A00155	A00511	A00617	A00730
A00743	A00814	A00929	A01218	A01543	A01546
A01635	A01863	A01993	A02215	A02620	A02621
A02622	A02623	A02632	A02775	A02802	A02803
A02808	A02879	A02882	A02902	A02903	A02904
A02993	A03096	A03205	A03407	A03734	A03787
A03900	A03901	A03916	A03918	A03919	A03920

A03935	A03936	A04023	A04024	A04052	A04087
A04089	A04103	A04204	A04229	A04289	A04366
A04499	A04529	A04530	A04531	A04553	A04572
A04573	A04574	A04705	A04706	A04707	A04711
04767	A04820	A04844	A04845	A04846	

Panel B: Funds managed by a team (FPG number)

A00063	A00209	A00210	A00308	A00332	A00477
A00739	A00854	A01027	A01271	A01408	A01502
A01599	A01635	A01876	A01888	A01889	A01941
A01942	A01943	A02211	A02221	A02251	A02252
A02253	A02254	A02394	A02441	A02442	A02443
A02500	A02501	A02503	A02521	A02530	A02531
A02532	A02539	A02614	A02618	A02619	A02631
A02732	A02733	A02776	A02807	A02811	A02838
A02930	A02992	A03022	A03082	A03095	A03111
A03198	A03199	A03206	A03207	A03358	A03434
A03671	A03902	A03917	A03934	A03993	A04006
A04007	A04056	A04078	A04079	A04088	A04123
A04206	A04267	A04286	A04287	A04288	

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