

**Rankings for Australian Managed Funds:
Contrariness and Performance Index Failure**

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Abstract The paper examines the persistence of return performance for Australian managed funds. Our first finding is that return performance is unstable with a strong tendency for top-performing funds to become bottom-performing funds, and vice versa. Our second finding is that the classical measures of fund performance (Sharpe and Treynor indices) provide a more stable measure of performance, but, significantly, that such stability results from the inherent insensitivity of the performance measures to either improvements or deteriorations in a fund's return performance. We thereby are led to question the insightfulness of these standard performance indices. In seeking to clarify these issues, we apply both a Spearman rank correlation and an innovative Bayesian approach in rating Australian funds over the period of 1998-2004.

Keywords: *fund rankings, Bayesian analysis, Sharpe index*

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Introduction

The extent to which managed fund performance is predictable remains unclear. Although there appears to be some momentum to fund performance, as is consistent with findings of stock momentum individually, the general view is that fund ratings are unable to predict future performance. For example, a number of authors report that Morningstar U.S. ratings of managed funds have poor predictive value (Detzel and Gagne, 1999; Blake and Morey, 2000; Lashgari and Wahab, 2003; Morey, 2005). A similar finding is found in relation to Morningstar Australian ratings by Geranns (2006).

In the seven-year period of 1998-2004, we observe that Australian funds that traded throughout the period were on average competitive with market performance. However, higher-performing funds dramatically outperformed lower-performing funds. This observation has motivated our investigation into whether out-performing funds can be relied on to repeat their successes (and whether under-performing funds can be relied on to repeat their failures).

Our approach complements that of Geranns (2006) for Australian funds. Rather than performing macro econometric regressions of return performances on prior ratings, however, our approach is focused on manifesting the stability of fund performances as it derives directly from the micro performances of individual funds. To this end, we analyze the constitution of *concurrent* levels of persistence and reversibility amongst funds (which tend to cancel with each other in more overall assessments) across periods of *contrasting* market performance (rather than allow the

analysis to be governed by performances over periods for which a ‘same as before’ management strategy is likely to sustain a given level of performance). To this end, econometric regressions aimed at revealing concurrent occurrences of persistence and reversibility are not always insightful. A Spearman rank correlation analysis, for example, provides a measure of ratings stability, but does not allow us to distinguish between concurrent trends of direction within the rankings of funds. To capture such possibilities, we complement a Spearman rank correlation analysis with a Bayesian-type analysis that allows for an assessment of performance stability applied to isolated segments of the ratings. Following such a Bayesian approach, we are, for example, able to address the probability that *combinations* of observed persistence and reversibility in ratings are the outcome of management performance, as opposed to a level of chance. In order to be able to identify the persistence of fund performances over periods of contrasting market performance, we divide the historical interval of our data into distinct interval trends of bear and bull market performances, and proceed to analyze the persistence of fund management performances across such intervals.

Our main results are as follows. We find that the tendency of funds to reverse their relative return performances (big winners become big losers, and big losses become big winners) is highly pronounced over changing market conditions, and is overall greater than the tendency to persist in delivering similar performance. This tendency of top-performing funds to become bottom-performing funds, and vice versa, ensures that effective predictions are inherently difficult. The rankings of funds on their Sharpe index are observed to be more stable. We reveal, however, that this may be a logical outcome of how the Sharpe index is defined, with an inherent insensitivity to either improvements or deteriorations in return performance.

The rest of the paper is organized as follows. In Section 2, we provide a background to the study and present fund performances derived from the Morningstar Australian data base along with performance statistics. Section 3 outlines the methodology used in the analysis. Section 4 presents the results from the analysis and Section 5 concludes the paper.

2. Background to the Study

The evidence for persistence in U.S. mutual fund performance is varied. Momentum studies of fund performances largely support the conclusion of levels of persistence. For example, Hendricks, Patel and Zeckhauser (1993), Goetzmann and Ibbotson (1994), and Brown and Goetzmann (1995) find evidence of persistence over short-term horizons of one to three years. Grinblatt and Titman (1995), Elton, Gruber, Das and Hlavka (1993) and Elton, Gruber, Das and Blake (1996) document mutual fund return predictability over longer horizons of five to ten years, which is attributed to manager awareness and stock-picking talent. Some contrary evidence, however, comes from Jensen (1969), who finds no evidence for persistence in fund performances. These findings are mirrored by Carhart (1997).

Studies that relate to the ability of ratings of managed funds to predict performance are less positive. The most prestigious rating agency for managed funds is Morningstar. The ability of Morningstar (U.S.) ratings to predict performances has been investigated by a number of authors. Detzel and Gagne (1999) examine Morningstar ratings of U.S. equity funds between 1992 and 1997. Their study compares year-end fund ratings with the following 1-, 2- and 3-year total returns, and finds no evidence of the predictive power of ratings. Blake and Morey (2000) find that although Morningstar ratings have the ability to predict poorly performing funds,

there was only weak evidence to support an ability of five-star funds to outperform lower-rated funds. This is consistent with Lashgari and Wahab (2003) who find predictive power in Morningstar downgrades but not upgrades. Morey (2005) actually finds a significant reduction in the performance of funds three years after they receive a five-star rating. Khorana and Nelling (1998) observe a trend of increasing average returns for higher-rated funds. However, their results are based on broad averages that hide the performance of individual funds. For Australian funds, Gerrans (2006) finds no evidence to support the view that Morningstar five-star funds subsequently outperform lower-rated funds.

Our sample period for the Australian study represents a compromise between maximizing the period length and maximizing the number of funds with continuous statistics for the whole period. In the end, we chose a seven-year period, resulting in a sample of 74 funds traded across the period comprising the categories (1) domestic equity including property (46 funds), international equity (20 funds) and fixed income (8 funds). The data are taken from the Morningstar reports for the period of 1998-2004 (an excellent introduction to the history of Morningstar Australia and the development of its offerings is provided by Gerrans, 2006).

We partition the data over the period of 1998-2004 into three periods: 1998-2000, 2001-2003 and the year 2004. The division is aimed at observing the performance of funds against a period of reasonably strong growth in the market (averaging approximately 8% per annum, 1998-2000), followed by a period of market downturn (averaging approximately 1% per annum, 2000-2003), followed by a year of sharp market rebound (approximately 23% for 2004). The performance rankings are summarized in relation to fund return performance (all funds) in Table 1; and in Tables 2, 3 and 4, for funds designated “Australian domestic equity” “international

equity” and “fixed income” funds, respectively. In each case, the rankings are averaged over 1998-2000 (3 years), 2000-2003 (3 years) and 2004 (one year). The performance rankings are summarized in relation to their Sharpe index in Table 5 (all funds) (a non-entry occurs when the Sharpe ratio has at least one negative value over the period, since averaging over such a value is without real meaning).

Tables 1 - 5 possibly about here

Over the period of 1998-2000, the average return for the funds in Table 1 was 11.5% per annum (Panel B), while the Australian S&P 200 index increased by approximately 8% per annum (with a yield on 1-3 year treasury bonds at approximately 5.25% per annum). The rewards for choosing the very top-performing portfolios in this period are rather dramatic. In Table 1 (Panel A), the top-performing fund over 1998-2000 averaged 32% return per annum and the average for the top 10 funds was 22% (Panel B). In contrast, the lowest-performing fund over that period returned approximately 0%, and the average return for the bottom ten funds was 4.5%.

In the period of steep downturns for fund performances over the subsequent three-year period 2001-2003, the average portfolio performance was a mere 1.4% per annum (ranging from a positive 21% per annum for the top-performing fund – which was ranked 37th with a return of 10% for the 1998-2000 period – down to a negative 20% per annum for the lowest-performing fund – which was ranked 5th with a return of 19% for the 1998-2000 period). In this period the Australian S&P 200 index increased by approximately only 1% per annum (with a 1-3 year treasury bond rate at approximately 5.4%). Notwithstanding, the poor average returns for the funds in Table 1 are typically the outcome of their exposures to abysmally low returns on international equities – which averaged a negative 12% per annum in this period

(Panel B of Table 3). In fact, the average return on domestic equity funds was a fairly reasonable 7% per annum, down from 12% over the period of 1998-2000 (Panel B of Table 2).

In 2004, the average fund performance increased to 21.5%. The Australian S&P 200 index 200 increased by approximately 23% (with the 1-year treasury bond rate at approximately 5.4%). The top-performing fund for that year returned an impressive 66% (ranked 48th with a return of 3% per annum for the period 2001-2003, and ranked 3rd with a return of 29% per annum for the previous three-year period of 1998-2000). Two funds tied with a 4% return as the lowest-performing funds for 2004 (one fund was ranked 35th with a return of 4% per annum for the period of 2001-2003, and ranked 70th with a return of 5% per annum for the previous three-year period of 1998-2000; the other fund was ranked 69th with a return of -15% for the period of 2001-2003, but ranked 7th with a return of 17% for the period of 1998-2000).

The observations for fund performance may be further compared and contrasted with their Sharpe indices (SI) as calculated by Morningstar:

$$SI_f = \frac{R_f^e}{\sigma_f} \quad (1)$$

where R_f^e is the fund's average monthly return in excess of the risk-free rate over the designated period, and σ_f is a measure of the standard deviation of the fund's excess monthly returns (R^e) over the period. The Sharpe indices averaged over the periods 1998-2000, 2001-2003, and 2004 (and for comparison, also for 2002-2004) are presented in Table 5. For the period of 1998-2000, the highest value of the index is 5.3. The tenth-highest fund Sharpe index is 2.9, with values decreasing more or less continuously to a negative value for the lowest performing funds (a zero Sharpe index

is applied to a fund that has a negative value in at least one of the three years of the period). For the period of 2001-2003, the Sharpe indices are negative for international equity funds. For domestic equity funds in this period, the indices range from 1.4 down to zero, with 18 of the 46 domestic equity funds having a negative value. For the year 2004, the Sharpe indices again range from just over 5 down to about 3 for the 10th ranked fund, and thereafter down to zero.

3. Methodological Approach

A Spearman rank correlation allows for statements to be made regarding persistence in the overall ranking of funds. A Bayesian approach, however, allows for the testing of hypotheses of persistence and reversal of performance in relation to particular groupings of funds. In the present study, a hypothesis is assigned a “posterior” probability based on the relationship of performances averaged over the period of 1998-2000 as compared to the performances averaged over the period of 2000-2003. This probability is then “updated” by comparing performance for the period of 1998-2000 to performance for the year 2004. As stated, the division of fund performances into these periods is motivated by our focus on fund performance persistence over periods of market reversals and instability.

We consider two series of competing hypothesis: (1) a “persistence” [PERST] hypothesis and (2) an “unpredictability” or randomness [RAND] hypothesis, in relation to the re-ranking of funds through time. Here, persistence [PERST] might be defined as “X% or more of the funds in the top M% at the initial ranking will be in the top N% at the second ranking due to persistence in performance.” The hypothesis of persistence [PERST] in reversibility is similarly defined as “X% or more of the funds in the top M% at the initial ranking will be in the bottom N% at the second ranking

due to reversibility in performance.” The hypothesis of randomness [RAND], by comparison, simply denies that changes in performance are predictable. The probability that a persistence hypothesis holds given an initial ranking (OBS) – which is to say, the conditional probability P[PERST | OBS] – is determined by the Bayes formula as:

$$P [\text{PERST} | \text{OBS}] = \frac{P [\text{OBS} | \text{PERST}].P[\text{PERST}]}{P [\text{OBS} | \text{PERST}]. P[\text{PERST}] + P [\text{OBS} | \text{RAND}]. P[\text{RAND}]} \quad (2)$$

P[PERST] and P[RAND] are the prior understood probabilities of “persistence” and “randomness,” and P[OBS | PERST] and P[OBS | RAND] are the probabilities of the outcome observations allowing such prior probabilities. To see how the Bayesian equation can be applied, suppose that the outcome observation (OBS) is that from the initial ranking of funds, X funds from the top 10 are in the top 10 at the second ranking. The left-hand side of the above equation gives the probability in favor of our persistence hypothesis given this outcome. However, the right-hand side of the equation requires our *prior* probabilities of the two competing hypotheses – P[PERST] and P[RAND] – which are the parameters we are seeking to evaluate. The neutral position allows that at this stage they each be assigned a probability of 0.5. On this basis, we proceed to calculate the conditional or *posterior* probability P[PERST | OBS] (the left-hand side of the equation) that the persistence hypothesis holds. The opposing hypothesis of randomness or unpredictability has probability 1 – P[PERST | OBS]). Progressing to a third ranking, the required probabilities P[PERST] and P[RAND] in the Bayes equation are “upgraded” by assigning the previously determined *posterior* probabilities P[PERST | OBS] and P[RAND | OBS]

to them. In the right-hand side of the equation, we calculate the probability that the observed ranking outcome occurs conditional on the persistence hypothesis: $P[\text{OBS} \mid \text{PERST}]$. We also calculate the probability that the outcome occurs conditional on the hypothesis that the rankings are unpredictable: $P[\text{OBS} \mid \text{RAND}]$.

In the present analysis, aimed at testing hypotheses of persistence, we shall first upgrade the conditional probabilities $P[\text{PERST} \mid \text{OBS}]$ and $P[\text{RAND} \mid \text{OBS}]$ by comparing the rankings over the period of 1998-2000 to those of 2000-2003. We then assess the final posterior probabilities $P[\text{PERST} \mid \text{OBS}]$ and $P[\text{RAND} \mid \text{OBS}]$ by comparing the final 2004 rankings with the rankings over the period of 1998-2000.

4. Persistence and Reversibility of Fund Return Performance:

A Spearman Rank Correlation–Bayesian Analysis

In this section, we apply both (a) a Spearman rank correlation and (b) a Bayesian examination in order to test the hypotheses of “persistence” and “randomness” for fund return performance over the period of 1998-2004. We do this for (i) the full sample (of 74 funds), as well as for the sample partitioned as (ii) Australian domestic equity funds, (iii) international equity funds, and (iv) fixed income funds.

(i) Persistence of the performance ranking of 74 funds (Table 1)

We combine the insights of (a) a Spearman rank correlation and (b) a Bayesian analysis:

(a) Spearman rank correlation analysis

The Spearman correlation provides an overall measure of persistence in the table rankings. The Spearman rank correlation between the rankings averaged over the period of 1998-2000 and the final 2004 rankings was 10.6%, implying a very low correlation of rankings across the overall period of 1998-2004. We note, however,

that the Spearman rank correlation between the rankings averaged over the period of 1998-2000 and 2000-2003 was a negative 35%, while the Spearman rank correlation between rankings over the period of 2000-2003 and the final 2004 rankings was a positive 59%. Further, for the sequence of Spearman correlations over the individual years in Table 6 – 1998-1999, 1999-2000, 2000-2001, 2001-2002, 2002-2003, 2003-2004 – we observe that the general trend over the period of 1998-2000 is for a strong reversal of the rankings, followed by a strong persistence of rankings during the period 2000-2002, which then weakens over the period of 2002-2003 before strengthening again over the of period 2003-2004.

Table 6 about here

(b) Bayesian analysis

To further understand the structure of the re-ranking over time, we turn to a Bayesian analysis. A Bayesian analysis allows us to test a hypothesis that may in the first instance have been prompted by a more casual inspection of the data. Thus, we observe that as many as 6 funds in the top 20 for the period of 1998-2000 appear in the bottom 20 in the year 2004. We must thus ask with what level of certainty can we attest that we are witnessing a level of “persistence” in reversibility of performances, as opposed to a level of “unpredictability” in reversibility of performances. Stated alternatively, what is the probability that a causal phenomenon of “big winners becoming big losers,” is underlying our observations? To answer, we consider the “persistence” hypothesis [PERST] as “6 or more of the funds in the top 20 in the period of 1998-2000 will appear in the bottom 20 in a subsequent period as the outcome of persistence in the reversal of performances” (big winners become big losers) (with the alternative probability of unpredictability or randomness in regard to reversibility, $P[\text{RAND}] = 1 - P[\text{PERST}]$). We have the observation [OBS] as “6 or

more of the funds in the top 20 in the period of 1998-2000 appear in the bottom 20 in a subsequent period,” which holds for both the period of 2000-2003 and the year 2004 (Table 1) in relation to the rankings for the period of 1998-2000. The probability of such observation allowing a random shuffling of the ranking of the funds, $P[\text{OBS}|\text{RAND}]$ can be calculated from the principles of probability. This is demonstrated in the appendix, the results of which are presented in Table 7. In this case, we have $P[\text{OBS}|\text{RAND}] = 47\%$ (from Panel A of Table 7). The Bayesian calculations for the probability of persistence in reversibility, $P[\text{PERST}]$ and unpredictability of reversibility, $1 - P[\text{PERST}]$, are then:

First pass: Bayesian analysis for rankings in the period of 2000-2003 in relation to rankings in the period of 1998-2000

$P[\text{OBS} \text{PERST}] =$	100%	
$P[\text{PERST}] =$	50%	prior probability
$P[\text{OBS} \text{RAND}] =$	47%	probability from Panel A of Table 7
$P[\text{RAND}] =$	50%	prior probability

Bayes analysis (equation 2):

$P[\text{PERST} \text{OBS}] =$	68%	$= (1*0.50) / (1*0.50 + 0.47*0.50)$
$P[\text{RAND} \text{OBS}] =$	32%	$= 1 - 0.68$

Second pass: Bayesian analysis for rankings in the year 2004 in relation to rankings in the period of 1998-2000

$P[\text{OBS} \text{PERST}] =$	100%	
$P[\text{PERST}] =$	68%	probability from first pass
$P[\text{OBS} \text{RAND}] =$	47%	probability from Panel A of Table 7
$P[\text{RAND}] =$	32%	probability from first pass

Bayes analysis (equation 2):

$P[\text{PERST} \text{OBS}] =$	82%	$= (1*0.68) / (1*0.68 + 0.47*0.32)$
$P[\text{RAND} \text{OBS}] =$	18%	$= 1 - 0.82$

Table 7 about here

Thus the Bayesian analysis implies that there is an 82% probability that at least 30% of funds (that is, 6 or more funds) have reversed from being top 20 performers in the period of 1998-2000 to bottom 20 performers in the year 2004 as the outcome of persistence in the reversal of rankings.

Additionally, we observe that 7 of the funds in the bottom 20 in the period of 1998-2000 are in the top 20 for the period of 2000-2003 and 4 are in the top 20 for the

year 2004. So we must again ask, what is the probability that we are observing persistence of reversal in the rankings? To answer, we define P[PERST] as the probability that “4 or more of the funds in the bottom 20 in the period of 1998-2000 will appear in the top 20 in a subsequent period as the outcome of persistence in reversal of performances.” The Bayesian calculations in this case are:

First pass: Bayesian analysis for rankings in the period of 2000-2003 in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	50%	prior probability
P[OBS RAND]=	87%	probability from Panel A of Table 7
P[RAND]=	50%	prior probability

Bayes analysis (equation 2):

P[PERST OBS]=	53.5%	= (1*0.50) / (1*0.50 + 0.87*0.50)
P[RAND OBS]=	46.5%	= 1 - 0.535

Second pass: Bayesian analysis for rankings in the year 2004 in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	53.5%	probability from first pass
P[OBS RAND]=	87%	probability from Panel A of Table 7
P[RAND]=	46.5%	probability from first pass

Bayes analysis (equation 2):

P[PERST OBS]=	57%	= (1*0.535) / 1*0.535 + 0.87*0.465)
P[RAND OBS]=	43%	= 1 - 0.57

The probability of 57% represents a modest reinforcement of our initial supposition (50%) that at least 20% of funds (that is, 4 or more funds) have reversed from bottom-20 performers in the period of 1998-2000 to being top-20 performers in the year 2004 as the outcome of persistence in the reversal of rankings.

Of the funds in the top 20 in the period of 1998-2000, 2 appear in the top 20 for the period of 2000-2003, and 5 appear for the year 2004. The probability Table 7 (Panel A) tells us that the probability for 2 funds appearing in the top 20 by chance alone is 99%, and the probability for 5 funds is 70%. In effect, we have little evidence for positive persistence. For the funds in the bottom 20 in the period of 1998-2000, only 1 appears in the bottom 20 for the period of 2000-2003, although 8 appear for the year 2004, which overall suggests little evidence of persistence.

In summary, we can say that our observations provide significant evidence of a tendency for previously high-performing funds to fall hard, and for highly under-performing funds to bounce up, while providing essentially no evidence for positive persistence in the rankings of funds. Such findings are broadly consistent with the findings of Morey (2005) for the U.S.

The Bayesian analysis therefore confirms the possibility of reversibility in the rankings of funds as was suggested by the Spearman rank correlation. As a further robustness test, we turn to consider the patterns of persistence when we partition the funds as (1) Australian domestic equity funds, (2) international equity funds, and (3) fixed income funds. Tables 2-4 replicate the return performance ranking of funds as “domestic equity,” “international equity,” and “fixed income” funds.

(ii) Persistence of the performance ranking of 46 Australian domestic equity funds

(Table 2)

We combine the insights of (a) a Spearman rank correlation and (b) a Bayesian analysis:

(a) Spearman rank correlation analysis

The Spearman rank correlation between the rankings averaged over the period of 1998-2000 and the final 2004 rankings was a positive 9.7%. However, the Spearman rank correlation between the rankings averaged over the period of 1998-2000 and 2000-2003 was a negative 28%, and between the rankings averaged over the period of 2000-2003 and the final 2004 rankings was a positive 33%. The pattern of negative correlation of rankings (negative 28%) followed by positive correlation (33%) with a low overall correlation (9.7%) is similar to the outcome correlations in the previous sub-section for the total (74) sample of funds.

(b) Bayesian analysis

We observe that 2 top-10 funds for 1998-2000 maintained their top 10 status for the period of 2001-2003 and 4 maintained this status in the year 2004. We must thus ask, do such observations imply a positive persistence of ranking performances? The Bayesian calculations would be as follows.

First pass: Bayesian analysis for rankings in the period of 2000-2003 in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	50%	prior probability
P[OBS RAND]=	71%	probability from Panel B of Table 7
P[RAND]=	50%	prior probability

Bayes analysis (equation 2):

P[PERST OBS]=	58.5%	= (1*0.50) / (1*0.50 + 0.71*0.50)
P[RAND OBS]=	41.5%	= 1 - 0.585

Second pass: Bayesian analysis for rankings in the year 2004 in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	58.5%	probability from first pass
P[OBS RAND]=	71%	probability from Panel B of Table 7
P[RAND]=	41.5%	probability from first pass

Bayes analysis (equation 2):

P[PERST OBS]=	66.5%	= (1*0.585) / (1*0.585 + 0.71*.0.415)
P[RAND OBS]=	33.5%	= 1 - 0.665

Thus a Bayesian analysis implies there is a 66.5% probability that at least 20% of funds (that is, 2 or more funds) from the top-10 performers in the period of 1998-2000 maintained their top-10 status in the year 2004 as the outcome of persistence of performance. With certain symmetry, however, we also observe that 4 funds from the top 10 for 1998-2000 were in the bottom 10 for the period of 2001-2003, with 2 in the bottom 10 for the year 2004. This leads to the question of whether such observations imply a persistence of reversal in the ranking performances. The Bayesian calculations remain as above. Thus, with equal probability as above (66.5%), at least 20% of funds (that is, 2 or more funds) from the top-10 performers in the period of 1998-2000 were regulated to bottom-10 status in the year 2004 as the outcome of persistence of reversal in the ranking performances. In other words, for top-10

Australian domestic equity funds, both persistence in top-10 performance and reversal to bottom-10 performance appear equally likely.

(iii) Persistence of the performance ranking of 20 international equity funds (Table 3)

We combine the insights of (a) a Spearman rank correlation and (b) a Bayesian analysis:

(a) Spearman rank correlation analysis

The Spearman rank correlation between the rankings averaged over the period of 1998-2000 and the final 2004 rankings is a negative 18%. This may be understood in terms of a Spearman rank correlation between the rankings averaged over the period of 1998-2000 and 2000-2003, as a hugely negative 78%, and a correlation between rankings averaged over the period of 2000-2003 and the final 2004 rankings as a positive 33%.

(b) Bayesian analysis

We observe that for the funds in the top half of rankings for the period of 1998-2000, more than half are in the bottom half of rankings for the subsequent period of 2000-2003 and the year 2004. A Bayesian analysis for the probability that at least half of the funds in the top 10 in the period of 1998-2000 are relegated to the bottom 10 in a subsequent period as a result of reversal persistence, with at least half of the funds in the bottom 10 thereby promoted to the top 10, is as follows.

First pass: Bayesian analysis for rankings in the period of 2000-2003 in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	50%	prior probability
P[OBS RAND]=	67%	probability from Panel C of Table 7
P[RAND]=	50%	prior probability

Bayes analysis (equation 2):

P[PERST OBS]=	60%	$= (1*0.50) / (1*0.50 + 0.67*0.50)$
P[RAND OBS]=	40%	$= 1 - 0.60$

Second pass: Bayesian analysis for rankings in the year 2004

in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	60%	probability from first pass
P[OBS RAND]=	67%	probability from Panel C of Table 7
P[RAND]=	40%	probability from first pass

Bayes analysis (equation 2):

P[PERST OBS]=	69%	= $(1*0.60) / (1*0.60 + 0.67*0.40)$
P[RAND OBS]=	31%	= $1 - 0.69$

Thus the Bayesian analysis implies that there is a 69% probability that at least 50% of funds have reversed from being top-half performers in the period of 1998-2000 to being bottom-half performers in the year 2004 as the outcome of persistence in the reversal of rankings, and similarly for the reversal of bottom-half performers.

(iv) Persistence of the performance ranking of 8 fixed income funds (Table 4)

(a) Spearman rank correlation analysis

The Spearman rank correlation between the rankings averaged over the period of 1998-2000 and 2000-2003 was a positive 36%, and between the rankings averaged over the period of 2000-2003 and the final 2004 rankings was a positive 60%. The Spearman rank correlation between the rankings averaged over the period of 1998-2000 and the final 2004 rankings was a positive 71%. Thus, as expected for fixed income securities, the persistence of performance is sharply positive. No Bayesian analysis was performed for the limited sample

5. Persistence of Rankings on the Sharpe Indices of Funds (Table 5)

The Spearman rank correlation between the 1998-2000 ranked Sharpe indices and the 2004 rankings was 26%. (Over the three-year period of 2001-2003, 43 of the Sharpe indices are negative and hence assigned an equal value of zero. Notwithstanding, the correlation between the ranked Sharpe indices for funds averaged for the three-year

period of 1998-2000 and the period of 2001-2003 is -1.8%, and between the 2001-2003 Sharpe index rankings and the 2004 rankings is a positive 59%.)

The overall correlation of 26% is more than double the strength of the Spearman rank correlation of 10.6% encountered for the total sample rankings based on return performances (in sub-section (i) of the previous section). Confirming this observation, we find that 5 of the funds in the top 20 for the period of 1998-2000 retained their status as top-20 ranking funds for the period of 2000-2003, while 7 of the funds in the top 20 for the period of 1998-2000 retained their status as top-20 ranking funds for the year 2004. The Bayesian analysis for the probability that at least 25% (5 or more funds) in the period of 1998-2000 retained their top 20 status as an outcome of persistence in fund rankings is as follows.

First pass: Bayesian analysis for rankings in the period of 2000-2003 in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	50%	prior probability
P[OBS RAND]=	70%	probability from Panel A of Table 7
P[RAND]=	50%	prior probability

Bayes analysis (equation 2):

P[PERST OBS]=	59%	= (1*0.50) / (1*0.50 + 0.70*0.50)
P[RAND OBS]=	41%	= 1 - 0.59

Second pass: Bayesian analysis for rankings in the year 2004 in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	59%	probability from first pass
P[OBS RAND]=	70%	probability from Panel A of Table 7
P[RAND]=	41%	probability from first pass

Bayes analysis (equation 2):

P[PERST OBS]=	67%	= (1*0.59) / (1*0.59 + 0.70*0.41)
P[RAND OBS]=	33%	= 1 - 0.67

In other words, there is a 67% probability that that at least 5 of the funds in the top 20 for the period of 1998-2000 retained their top 20 status in the year 2004 as an outcome of persistence in rankings. The level of persistence at the lower level of rankings is even more pronounced. As many as 8 of the funds in the bottom 20 for the period of 1998-2000 remain in the bottom 20 for the year 2004. The probability

that 8 bottom 20 funds retain such status as the outcome of a random shuffling would only be 11% (Panel A, Table 7). (Since so many of the Sharpe indices are negative or the period of 2000-2003, and hence ranked joint 32nd, with zero value, a Bayesian analysis was not performed.)

Only 3 funds for the period of 1998-2000 reversed their status either from top-20 ranking funds to bottom-20 ranking funds, or from bottom-20 ranking funds to top-20 ranking funds in 2004. The Bayesian analysis for the probability of such reversibility is as follows.

First pass: Bayesian analysis for rankings in the period of 2000-2003 in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	50%	prior probability
P[OBS RAND]=	96%	probability from Panel A of Table 7
P[RAND]=	50%	prior probability

Bayes analysis (equation 2):

P[PERST OBS]=	51%	= (1*0.50) / (1*0.50 + 0.96*0.50)
P[RAND OBS]=	49%	= 1 - 0.51

Second pass: Bayesian analysis for rankings in the year 2004 in relation to rankings in the period of 1998-2000

P[OBS PERST] =	100%	
P[PERST]=	51%	probability from first pass
P[OBS RAND]=	96%	probability from Panel A of Table 7
P[RAND]=	49%	probability from first pass

Bayes analysis (equation 2):

P[PERST OBS]=	52%	= (1*0.51) / (1*0.51 + 0.96*0.49)
P[RAND OBS]=	48%	= 1 - 0.52

The probability of 52% represents a very low reinforcement from our initial supposition of 50%. In effect, the finding is that any prior assumption we wish to make for reversibility cannot be substantially contradicted by the data.

It is evident that rankings based on the Sharpe ratio enjoy a much higher level of stability than do the rankings based on absolute return performances. An important observation, however, is that the greater stability is likely a direct outcome of how the index is defined. To see that this is so, consider a hypothetical Fund A with return performance over three periods of 20%, 10% and 30%, respectively (row 1, Table 8).

Suppose also that the standard deviation of the market's returns over the three periods is 10% and that the correlation coefficient of Fund A with the market is, say, 0.9. We would thereby calculate the standard deviation for Fund A as 8.16% with beta as 0.74 ($0.9 \times 0.0816 / 0.10$). The ratio of average return to standard deviation for Fund A is then 2.45 ($0.20 / 0.0816$), with a ratio of average return to beta of 0.27 ($0.2 / 0.74$). If the risk-free rate were 0%, 2.45 and 0.27 would be the Sharpe and Treynor (excess fund return divided by fund beta) indices, respectively. With a risk-free rate of 4%, the Sharpe index is 1.96 [$(0.20 - 0.04) / 0.0816$] (Table 8). Now consider Fund B with an identical portfolio to Fund A, but which, due to excessive management incentive fees, provides only half the above returns to its clients (that is, 10%, 5% and 15%, as in the final row of Table 8). The average return, the standard deviation and the calculated beta for Fund B are therefore halved. The result is that both the Sharpe and Treynor indices (assuming a 0% risk-free rate) remain unchanged from those of Fund A. With a risk-free rate of 4%, the ratios do change, as presented in Table 8. But note in Table 8 that against a halving of returns, the Sharpe and Treynor indices for Fund B retain approximately 75% of the values of Fund A. This feature of the Sharpe and Treynor indices does not appear to have been commented on in the literature. An inherent insensitivity of a performance indicator to underlying return performance, however, is clearly not ideal. The implication is that ratings based on the indices have a corresponding inherent stability, but by the same token, a restricted meaningfulness in relation to return performances.

Table 8 about here

6. Conclusion

In the seven-year period of 1998-2004, Australian funds that traded throughout the period were on average competitive with market performance. However, higher-

performing funds dramatically outperformed lower-performing funds. This observation has motivated our investigation into whether out-performing funds can be relied on to repeat their successes. We have concluded that funds that out-performed in one period were at least as likely to under-perform as they were to out-perform in a subsequent period of changing market conditions. Similarly we find that under-performing funds in one period were at least as likely to out-perform as to under-perform under changing market conditions. It therefore appears that in investing in a random Australian fund, an investor was effectively investing in the average performance of the funds, but simultaneously assuming substantial risk in terms of the variability of the outcome return performance across funds.

Given such reversibility in return performance, it is perhaps not surprising that Morningstar ratings have generally proven to be poor predictors of future performance for Australian funds (as is the case for U.S. funds). The ratings based on the Sharpe index have provided greater stability. We have observed, however, that to the extent that such stability is the outcome of the index's insensitivity to changes in underlying return performances, the Sharpe index is actually failing to reflect the return performance of funds.

The issue of fees has not been addressed in the study. Although the performances reported have been net of ongoing management fees, they do not allow for entry and exit fees, which may be substantial (averaging approximately 3% for both fund entry and exit). Given the unpredictability of fund performance as we have reported it, a comparison of a fund's total fee structure would appear to be warranted by investors.

Appendix

The probability that N or more of funds from a given selection of M funds will appear in a given ranking of M* funds on a random shuffling of a total of Z funds.

Table 7 presents the outcome of the calculations as they follow from the principles of probability.¹ To illustrate the calculations, suppose we have a ranking of 100 funds and that we wish to calculate the probability that 4 or more of the top-20 funds (20%) would appear in the bottom-40 ranking of funds on a random shuffling.² The stages of calculation are as follows:

First, we calculate the probability that precisely 3 of the top 20 of funds might appear in the bottom-40 ranking of funds on a random shuffling. The argument for the calculation is as follows:

1) there are $(20 \cdot 19 \cdot 18) / (3 \cdot 2)$ (=1,140) ways of choosing a combination of 3 funds from 20 funds.

2) for *each* of the above combinations, there are $(40 \cdot 39 \cdot 38)$ (= 59,280) ways of allocating that combination in the bottom ranking of 40 funds.

3) for *each* above allocation, there are $80 \cdot 79 \cdot \dots \cdot 44$ (a product of 37 numbers) ($= 1.18 \cdot 10^{66}$) ways of allocating the remaining *non-top-20* funds so as to fill in the remaining 37 slots in the bottom ranking of 40 funds.

4) for *each* above allocation, there are $60 \cdot 59 \cdot \dots \cdot 1$ ($= 8.3 \cdot 10^{81}$) permutations of the top ranking 60 funds.

5) the total number of qualifying permutations is therefore:

$$1,140 * 59,280 * 1.18 * 10^{66} * 8.3 * 10^{81} = 6.7 * 10^{155}.$$

¹ The underlying calculations are available as a spread-sheet from the author on request.

² The same calculations would hold equally for the top-40 ranking or any other ranking of 40 funds.

6) the total number of permutations of 100 funds is $100 \times 99 \times \dots \times 1 = 9.3 \times 10^{157}$.

7) dividing 6.7×10^{155} by $9.3 \times 10^{157} = 0.0071$ (.71%) is the probability that precisely 3 of the top-20 of funds appear in the bottom-40 ranking of funds on a random shuffling.

Likewise, we calculate the probabilities that precisely 2, 1 and 0 funds from the top 20 of funds might appear in the bottom-40 ranking of funds on a random shuffling. Following the calculation as above, the probabilities are, respectively, 0.0013 (.13%), 0.00015 (.015%) and 0.0000078 (.00078%).

Adding: $0.0071 + 0.0013 + 0.00015 + 0.0000078 = 0.0086$, less than a 1% probability. In other words, there would be a greater than 99% probability that 4 or more of funds from the top-20 (of a ranking of 100 funds) would appear in the bottom-40 by random shuffling.

Table 1: The Sample (74 funds)

The rankings in Panel A are: over 1998-2000 (columns 4 and 5, for the average fund return and ranking over that period), over 2001-2003 (columns 6 and 7, for the average fund return and ranking over that period) and for year 2004 (columns 8 and 9, for the average fund return and ranking over that year). The funds are designated as either “domestic equity” (DE), “international equity” (IE) or “fixed income” (FI). Panel B provides summary statistics for average, top 10 and bottom 10 performances over the designated periods.

PANEL A
Column

1	2	3	4	5	6	7	8	9
Product code	Product name		Return (%) 1998-2000	R A N K	Return (%) 01- 03	R A N K	Return (%) 2004	R A N K
4437	CFS MIF – Developing Companies	DE	32	1	11	8	20	45
3672	CFS MIF – Future Leaders Fund	DE	31	2	0	53	29	19
4548	CFS MIF – Geared Share Fund	DE	29	3	3	48	66	1
3413	Goldman Sachs JBWere Emerging Leaders Fund	DE	26	4	4	40	39	3
4542	ABN AMRO – Global Equity Fund	IE	19	5	-20	74	7	64
5479	ABN AMRO – Europe Equity Fund	IE	18	6	-18	73	8	62
4621	CFS MIF – Global Share Fund	IE	17	7	-15	69	4	73
4577	Zurich Managed Investment – International Shares	IE	17	8	-14	66	10	55
1598	CFS MIF – Imputation Fund	DE	17	9	3	45	25	33
4790	Fiducian – International Shares Fund	IE	17	10	-8	57	9	60
326	Perpetual WFI – Perpetual's Int'l Share fund	IE	16	11	-17	72	11	51
4792	Fiducian – Australian Smaller Companies Shares Fund	DE	16	12	14	4	36	5
3352	UBS – Australian Share Fund	DE	16	13	7	22	27	24
3790	Perpetual's Investor Choice Fund – Int'l Shares	IE	16	14	-17	71	11	52
1549	Australian Unity Leaders Imputation Trust	DE	15	15	3	42	25	34
296	Merrill Lynch – Equity Fund	DE	15	16	0	54	32	9
449	Merrill Lynch – International Share Fund	IE	14	17	-14	67	10	54
32	Advance International Sharemarket Fund	IE	14	18	-10	59	10	53
4057	CFS – Count First Australian Share Fund	DE	14	19	5	33	25	38
1682	IOOF/Perennial Flexi Trust – International Fund	IE	14	20	-11	61	9	58
428	INVESCO – Global Matrix Fund Hedged	IE	14	21	-12	62	21	42
1793	Challenger – Australian Share Income Fund	DE	13	22	4	39	26	29
4704	ClearView Mgd Inv – Australian Shares Growth	DE	13	23	2	49	25	32
1600	CFS MIF – Australian Share Fund	DE	13	24	3	47	26	28
3788	Perpetual's Investor Choice Fund - Australian Shares	DE	13	25	9	15	32	10
5027	STL – Premium Equity Fund	DE	12	26	3	43	26	29
3353	UBS - International Share Fund	IE	12	27	-9	58	9	56
510	Goldman Sachs JBWere International Fund	IE	12	28	-14	68	9	61
4690	Challenger – Imputation Trust	DE	12	29	8	19	24	39
12163	Russell Australian Share Fund – Class A	DE	12	30	5	32	28	21
2528	Ipac Strtgc Invest Srv - International Shares	IE	12	31	-14	65	7	67
1820	Perpetual WFI Perpetual's Industrial Shares	DE	12	32	9	16	30	16
33	Advance Imputation Fund	DE	12	33	6	29	20	43
3789	Perpetual's Investor Choice Fund – Industrial Shares	DE	11	34	9	17	30	15
433	INVESCO – Asian Share Fund	IE	11	35	-10	60	9	59
5242	Advance Imputation Fund NEF	DE	11	36	5	30	20	46

3791	Perpetual's Investor Choice Fund – Small Co Shares	DE	10	37	21	1	37	4
3458	Advance Australian Shares Multi-Blend Fund	DE	10	38	3	46	26	31
3983	Macquarie Master – Property Securities Fund	DE	10	39	11	5	33	8
4575	Zurich Managed Investment – Australian Shares	DE	10	39	3	44	21	41
1681	IIOF/Perennial Flexi Trust – Growth Shares Fund	DE	10	41	2	51	26	26
22	Advance Sharemarket Fund	DE	10	42	7	21	24	40
2270	CFS MIF – Property Securities Fund	DE	10	43	10	9	34	7
2953	UBS – Property Securities Fund	DE	10	44	16	2	36	6
4791	Fiducian – Property Securities Fund	DE	10	45	11	6	31	12
4789	Fiducian – Australian Shares Fund	DE	9	46	6	24	26	25
3877	Parker Asset – Enhanced Leaders Trust	DE	9	47	6	26	15	47
5028	STL – Premium Property Fund	DE	9	48	10	10	29	18
3104	Macquarie – Lazard International Share Trust	IE	9	49	-13	64	8	63
366	Australian Unity Property Securities Fund Growth	DE	9	50	15	3	60	2
2616	INVESCO – Australian Share Fund	DE	9	51	4	36	32	11
3681	Advance International Shares Multi-Blend Fund	IE	9	52	-15	70	9	57
3105	Macquarie – Lazard Asia Pacific Share Trust	IE	9	53	-5	56	12	49
305	Challenger – Select Australian Share Fund	DE	9	54	6	23	27	23
783	Australian Unity International Sharemarket Trust	IE	8	55	-13	63	7	66
3350	UBS – Inflation-Linked Bond Fund	FI	8	56	6	25	12	50
1676	Australian Unity Property Securities Fund Ordinary	DE	8	57	10	12	28	22
3792	Perpetual's Investor Choice Fund – Property Sec	DE	8	58	10	11	29	17
2966	INVESCO – Australian Smaller Companies Fund	DE	8	59	8	18	29	20
367	Australian Unity Property Securities Fund Income	DE	7	60	7	20	14	48
2525	Ipac Strtgc Invest Srv – Australian Shares	DE	7	61	2	50	25	35
1680	IIOF/Perennial Flexi Trust – Property Fund	DE	7	62	9	13	31	13
3414	Goldman Sachs JBWere Resources Fund	DE	7	63	11	7	20	44
905	Advance Property Securities Fund	DE	6	64	9	14	31	14
2579	UBS – Australian Bond Fund	FI	6	65	6	28	7	65
5026	STL – Premium Fixed Interest Fund	FI	6	66	4	38	6	70
1678	IIOF/Perennial Flexi Trust – Fixed Interest Fund	FI	6	67	5	31	6	68
4128	Advance Australian Fixed Interest Multi-Blend Fund	FI	5	68	4	41	5	71
3680	Australian Unity Defined Income Trust	FI	5	69	4	34	5	72
572	Macquarie – Gilt Edge Bond Trust	FI	5	70	4	35	4	74
2523	Ipac Strtgc Invest Srv – Australian Fixed Interest	FI	5	71	4	36	6	69
1635	Challenger – Socially Responsive Investment Fund	DE	3	72	6	27	25	37
3103	Macquarie – Active Australian Equities Trust	DE	3	73	-1	55	25	36
3106	Macquarie – Emerging Markets Share Trust	IE	0	74	1	52	26	27

PANEL B

AVERAGE RETURN OF FUNDS (%)	11.5	1.4	21.5
AVERAGE RETRUN OF TOP-10 FUNDS (%)	22	13	41
AVERAGE RETURN OF BOTTON-10 FUNDS (%)	4.5	-16	6
AVERAGE RETURN ON AUSTRALIAN S&P 200 INDEX (%)	8	1	22.75
AVERAGE YIELD ON 1-3 YEAR TREASURY BONDS (%)	5.25	5.4	5.4

Table 2: Domestic Equity Funds

The rankings in Panel A are for Australian domestic equity funds over 1998-2000 (column 3), over 2001-2003 (column 4) and for the year 2004 (column 5). Panel B provides summary statistics for average, top-10 and bottom-10 performances over the three designated periods.

		PANEL A		
Column 1	2	3	4	5
ProdCode	Product Name	Rank 1998- 2000	Rank 2001- 2003	Rank 2004
4437	CFS MIF – Developing Companies	1	8	43
3672	CFS MIF – Future Leaders Fund	2	44	19
4548	CFS MIF – Geared Share Fund	3	40	1
3413	Goldman Sachs JBWere Emerging Leaders Fund	4	33	3
1598	CFS MIF – Imputation Fund	5	37	32
4792	Fiducian – Australian Smaller Companies Shares Fund	6	4	5
3352	UBS – Australian Share Fund	7	22	24
1549	Australian Unity Leaders Imputation Trust	8	34	33
296	Merrill Lynch – Equity Fund	9	45	9
4057	CFS – Count First Australian Share Fund	10	30	37
1793	Challenger – Australian Share Income Fund	11	32	28
4704	ClearView Mgd Inv – Australian Shares Growth	12	41	31
1600	CFS MIF – Australian Share Fund	13	39	27
3788	Perpetual's Investor Choice Fund – Australian Shares	14	15	10
5027	STL – Premium Equity Fund	15	35	29
4690	Challenger – Imputation Trust	16	19	38
12163	Russell Australian Share Fund – Class A	17	29	21
1820	Perpetual WFI Perpetual's Industrial Shares	18	16	16
33	Advance Imputation Fund	19	27	41
3789	Perpetual's Investor Choice Fund – Industrial Shares	20	17	15
5242	Advance Imputation Fund NEF	21	28	44
3791	Perpetual's Investor Choice Fund – Small Co Shares	22	1	4
3458	Advance Australian Shares Multi-Blend Fund	23	38	30
3983	Macquarie Master – Property Securities Fund	24	5	8
4575	Zurich Managed Investment – Australian Shares	25	36	40
1681	IOOF/Perennial Flexi Trust – Growth Shares Fund	26	43	26
22	Advance Sharemarket Fund	27	21	39
2270	CFS MIF – Property Securities Fund	28	9	7
2953	UBS – Property Securities Fund	29	2	6
4791	Fiducian – Property Securities Fund	30	6	12
4789	Fiducian – Australian Shares Fund	31	24	25
3877	Parker Asset – Enhanced Leaders Trust	32	25	45
5028	STL – Premium Property Fund	33	10	18
366	Australian Unity Property Securities Fund Growth	34	3	2
2616	INVESCO – Australian Share Fund	35	31	11
305	Challenger – Select Australian Share Fund	36	23	23
1676	Australian Unity Property Securities Fund Ordinary	37	12	22
3792	Perpetual's Investor Choice Fund – Property Sec	38	11	17
2966	INVESCO – Australian Smaller Companies Fund	39	18	20
367	Australian Unity Property Securities Fund Income	40	20	46
2525	Ipac Strtgc Invest Srv – Australian Shares	41	42	34

1680	IOOF/Perennial Flexi Trust – Property Fund	42	13	13
3414	Goldman Sachs JBWere Resources Fund	43	7	42
905	Advance Property Securities Fund	44	14	14
1635	Challenger – Socially Responsive Investment Fund	45	26	36
3103	Macquarie – Active Australian Equities Trust	46	46	35

PANEL B

AVERAGE RETURN OF FUNDS (%)	12	7	29
AVERAGE RETURN OF TOP-10 FUNDS (%)	21	13	41
AVERAGE RETURN OF BOTTOM-10 FUNDS (%)	6	-1	20
AVERAGE RETURN ON AUSTRALIAN S&P 200 INDEX (%)	8	1	22.75
AVERAGE YIELD ON 1-3 YEAR TREASURY BONDS (%)	5.25	5.4	5.4

Table 3: International Equity Funds

The rankings in Panel A are for international equity funds over 1998-2000 (column 3), over 2001-2003 (column 4) and for the year 2004 (column 5). Panel B provides summary statistics for average, top-10 and bottom-10 performances over the designated periods.

PANEL A

Column 1	2	3	4	5
ProdCode	Product Name	Rank 1998- 2000	Rank 2001- 2003	Rank 2004
4542	ABN AMRO – Global Equity Fund	1	20	17
5479	ABN AMRO – Europe Equity Fund	2	19	15
4621	CFS MIF – Global Share Fund	3	15	20
4577	Zurich Managed Investment – International Shares	4	12	8
4790	Fiducian – International Shares Fund	5	3	13
326	Perpetual WFI – Perpetual's Int'l Share Fund	6	18	4
3790	Perpetual's Investor Choice Fund – Int'l Shares	7	17	5
449	Merrill Lynch – International Share Fund	8	13	7
32	Advance International Sharemarket Fund	9	5	6
1682	IOOF/Perennial Flexi Trust – International Fund	10	7	11
428	INVESCO – Global Matrix Fund Hedged	11	8	2
3353	UBS – International Share Fund	12	4	9
510	Goldman Sachs JBWere International Fund	13	14	14
2528	Ipac Strtgc Invest Srv – International Shares	14	11	19
433	INVESCO – Asian Share Fund	15	6	12
3104	Macquarie – Lazard International Share Trust	16	10	16
3681	Advance International Shares Multi-Blend Fund	17	16	10
3105	Macquarie – Lazard Asia Pacific Share Trust	18	2	3
783	Australian Unity International Sharemarket Trust	19	9	18
3106	Macquarie – Emerging Markets Share Trust	20	1	1

PANEL B

AVERAGE RETURN OF FUNDS (%)	13	-12	10
AVERAGE RETURN OF TOP-10 FUNDS (%)	16	-9	13
AVERAGE RETURN OF BOTTOM-10 FUNDS (%)	10	-16	8

Table 4: Fixed Income Funds

The rankings in Panel A are for fixed income funds over 1998-2000 (column 3), over 2001-2003 (column 4) and for the year 2004 (column 5). Panel B provides the average performances over the three designated periods.

		PANEL A		
Column 1	2	3	4	5
ProdCode	Product Name	Rank 1998- 2000	Rank 2001- 2003	Rank 2004
3350	UBS – Inflation-Linked Bond Fund	1	1	1
2579	UBS – Australian Bond Fund	2	2	2
5026	STL – Premium Fixed Interest Fund	3	7	5
1678	IOOF/Perennial Flexi Trust – Fixed Interest Fund	4	3	3
4128	Advance Australian Fixed Interest Multi-Blend Fund	5	8	6
3680	Australian Unity Defined Income Trust	6	4	7
572	Macquarie – Gilt Edge Bond Trust	7	5	8
2523	Ipac Strtgc Invest Srv – Australian Fixed Interest	8	6	4
		PANEL B		
AVERAGE RETURN OF FUNDS (%)		6	5	6

Table 5: The Sharpe Indices (74 funds)

The Sharpe indices are averaged over the periods of 1998- 2000, 2001-3003, 2004, and for the period of 2002-2004. The funds are designated as either “domestic equity” (DE), “international equity” (IE) or “fixed income” (FI).

code	Fund name		Sharpe Index 1998- 00	R A N K	Sharpe Index 01-03	R A N K	Sharpe Index 2004	R A N K	Sharpe Index 02-04	R A N K
3672	CFS MIF – Future Leaders Fund	DE	5.3	1			2.31	34	0.33	35
3413	Goldman Sachs JBWere Emerg'g Leaders Fund	DE	4.4	2			5.21	1	0.47	25
4437	CFS MIF – Developing Companies	DE	4.0	3	0.3	17	1.53	44	0.59	20
4548	CFS MIF – Geared Share Fund	DE	3.4	4			2.19	37	0.37	31
3352	UBS – Australian Share Fund	DE	3.3	5	0.13	24	2.9	14	0.52	22
1598	CFS MIF – Imputation Fund	DE	3.2	6			2.28	36	0.22	42
4577	Zurich Managed Investment – International Shares	IE	3.1	7			0.57	52		
4790	Fiducian – International Shares Fund	IE	3.0	8			0.36	59		
4542	ABN AMRO – Global Equity Fund	IE	3.0	9			0.16	66		
4792	Fiducian – Australian Smaller Comps Shares Fund	DE	2.9	10	0.76	4	3.83	3	1.51	3
1549	Australian Unity Leaders Imputation Trust	DE	2.8	11			2.8	17	0.28	38
296	Merrill Lynch – Equity Fund	DE	2.8	12			3.23	7	0.13	46
326	Perpetual WFI – Perpetual's Int'l Share Fund	IE	2.7	13			0.59	51		
4621	CFS MIF – Global Share Fund	IE	2.7	14						
4690	Challenger – Imputation Trust	DE	2.7	15	0.24	19	2.12	39	0.69	18
4057	CFS – Count First Australian Share Fund	DE	2.7	16			2.43	29	0.35	33
4704	ClearView Mgd Inv – Australian Shares Growth	DE	2.7	17			2.78	18	0.27	39
3790	Perpetual's Investor Choice Fund – Int'l Shares	IE	2.5	18			0.57	52		
3350	UBS – Inflation-Linked Bond Fund	FI	2.5	18	0.23	20	1.17	48	0.63	19
3788	Perpetual's Investor Choice Fund–Australian Shares	DE	2.4	20	0.36	13	2.78	18	0.96	11
1820	Perpetual WFI Perpetual's Industrial Shares	DE	2.4	21	0.35	14	3.14	8	0.94	12
5479	ABN AMRO – Europe Equity Fund	IE	2.3	22			0.22	64		
1682	IOOF/Perennial Flexi Trust – International Fund	IE	2.2	23			0.34	60		
1600	CFS MIF – Australian Share Fund	DE	2.2	24			2.17	38	0.27	39
3789	Perpetual Investor Choice Fund – Industrial Shares	DE	2.1	25	0.33	15	3.13	9	0.94	12
3353	UBS – International Share Fund	IE	2.1	26			0.42	58		
5027	STL – Premium Equity Fund	DE	2.1	27			2.65	24	0.37	31
449	Merrill Lynch – International Share Fund	IE	2.0	28			0.51	55		
1793	Challenger – Australian Share Income Fund	DE	2.0	29			1.7	43	0.22	42
4575	Zurich Managed Investment – Australian Shares	DE	1.7	30			2.48	27		
33	Advance Imputation Fund	DE	1.7	31	0.07	30	2.41	30	0.3	37
510	Goldman Sachs JBWere International Fund	IE	1.7	32			0.26	63		
32	Advance International Sharemarket Fund	IE	1.6	33			0.46	57		
2528	Ipac Strtgc Invest Srv – International Shares	IE	1.6	34			0.12	69		
3983	Macquarie Master – Property Securities Fund	DE	1.6	35	0.82	3	3.08	11	1.38	4
3791	Perpetual's Investor Choice Fund –Small Co Shares	DE	1.6	36	1.31	2	3.46	5	1.89	2
1681	IOOF/Perennial Flexi Trust – Growth Shares Fund	DE	1.5	37			2.51	26	0.09	48
428	INVESCO – Global Matrix Fund Hedged	IE	1.5	37			1.92	41		
2953	UBS – Property Securities Fund	DE	1.4	39	1.4	1	4.29	2	1.95	1
5242	Advance Imputation Fund NEF	DE	1.4	40	0.04	31	2.32	32	0.25	41
2270	CFS MIF – Property Securities Fund	DE	1.4	41	0.71	6	2.55	25	1.26	6
3877	Parker Asset – Enhanced Leaders Trust	DE	1.3	42	0.08	29	1.23	47	0.13	46

4789	Fiducian – Australian Shares Fund	DE	1.3	43	0.1	27	2.9	14	0.53	21
5028	STL – Premium Property Fund	DE	1.3	44	0.71	6	2.89	16	1.24	7
4791	Fiducian – Property Securities Fund	DE	1.3	45	0.72	5	3.01	13	1.3	5
22	Advance Sharemarket Fund	DE	1.0	46	0.14	23	2.72	23	0.42	28
2616	INVESCO – Australian Share Fund	DE	1.0	47			3.36	6	0.49	23
3458	Advance Australian Shares Multi-Blend Fund	DE	1.0	48			3.09	10	0.35	33
367	Australian Unity Property Securities Fund Income	DE	1.0	49	0.27	18	1.88	42	0.49	23
305	Challenger – Select Australian Share Fund	DE	0.9	50	0.12	25	2.41	30	0.82	15
1676	Australian Unity Property Securities Fund Ordinary	DE	0.8	51	0.5	11	1.53	44	0.79	16
783	Australian Unity International Sharemarket Trust	IE	0.8	52			0.14	67		
5026	STL – Premium Fixed Interest Fund	FI	0.8	53			0.07	70		
3792	Perpetual's Investor Choice Fund – Property Sec	DE	0.8	54	0.71	6	2.75	21	1.24	7
2579	UBS – Australian Bond Fund	FI	0.7	55	0.23	20	0.52	54	0.38	30
433	INVESCO – Asian Share Fund	IE	0.7	56			0.18	65		
3681	Advance International Shares Multi-Blend Fund	IE	0.6	57			0.5	56		
3104	Macquarie – Lazard International Share Trust	IE	0.6	58			0.3	62		
3105	Macquarie – Lazard Asia Pacific Share Trust	IE	0.5	59			0.75	50		
2966	INVESCO – Australian Smaller Companies Fund	DE	0.5	60	0.22	22	2.11	40	0.76	17
2525	Ipac Strtgc Invest Srv – Australian Shares	DE	0.4	61			2.73	22	0.19	45
1678	IIOF/Perennial Flexi Trust– Fixed Interest Fund	FI	0.4	61	0.11	26	0.33	61	0.2	44
366	Australian Unity Property Securities Fund Growth	DE	0.4	63	0.46	12	2.45	28	0.88	14
1680	IIOF/Perennial Flexi Trust – Property Fund	DE	0.4	64	0.53	9	3.47	4	1.22	10
905	Advance Property Securities Fund	DE	0.3	65	0.53	9	3.03	12	1.23	9
3414	Goldman Sachs JBWere Resources Fund	DE	0.2	66	0.32	16	0.86	49	0.42	28
1635	Challenger – Socially Responsive Investment Fund	DE			0.09	28	2.31	34	0.43	27
3103	Macquarie – Active Australian Equities Trust	DE					2.32	32	0.02	49
12163	Russell Australian Share Fund – Class A	DE					2.76	20	0.47	25
3106	Macquarie – Emerging Markets Share Trust	IE					1.52	46	0.31	36
572	Macquarie – Gilt Edge Bond Trust	FI								
2523	Ipac Strtgc Invest Srv – Australian Fixed Interest	FI					0.14	67		
3680	Australian Unity Defined Income Trust	FI								
4128	Advance Australian Fixed Interest Multi-Blend Fund	FI								

Table 6: Spearman Rank Correlations for 74 funds (1998-2004)

The correlations relate to the rankings of funds on their return performances for each year.

Period	Rank Spearman Correlation
1998-1999	-16%
1999-2000	-52%
2000-2001	+55%
2001-2002	+60%
2002-2003	+19%
2003-2004	+66%

Table 7: Probability Tables for Likelihood of Persistent Performances Maintained by Random Shuffling.

Panel A: Probability (%) that a number (N) or more of funds from a specified 20 of 74 funds will appear in a specified 20 of allocations following a random shuffling:									
N= 1	= 2	= 3	= 4	= 5	= 6	= 7	= 8	= 9	= 10
100%	99%	96%	87%	70%	47%	26%	11%	4%	1%
Panel B: Probability (%) that a number (N) or more of funds from a specified 10 of 46 funds will appear in a specified 10 of allocations following a random shuffling:									
N = 1	= 2	= 3	= 4	= 5	= 6	= 7	= 8	= 9	= 10
94%	71%	37%	13%	3%	0.3%	0%			
Panel C: Probability (%) that a number (N) or more of funds from a specified 10 of 20 funds will appear in a specified 10 of allocations following a random shuffling:									
N = 1	= 2	= 3	= 4	= 5	= 6	= 7	= 8	= 9	= 10
100%	100%	99%	91%	67%	33%	9%	1%	0.1%	0%

Table 8: Sharpe and Treynor Indices:

Sensitivity to Change in Return Performance

The returns for Fund A in Row 1, 20%, 10% and 30%, and for Fund B in Row 2, 10%, 5% and 15%, lead to the standard deviation, beta and Sharpe and Treynor indices as presented.

Fund	Return (%)			Average Return (%)	Stdev. (%)	Corr'n with Mkt	Market Stdev. (%)	Beta	Risk Free (%)	Sharpe Index	Treynor Index
	1	2	3								
"A"	20	10	30	20	8.16	0.9	10	0.74	0	2.45	0.27
									4.0	1.96	0.22
"B"	10	5	15	10	4.08	0.9	10	0.37	0	2.45	0.27
									4.0	1.47	0.16

Average Return (%) is the average return of the three period returns in columns 2-4; Stdev. (%) is the standard deviation of the returns; Corr'n with Mkt is the assumed correlation coefficient of the returns with the market; Market Stdev. (%) is the assumed standard deviation of market returns; Beta is the calculated beta; and Risk Free (%) is the assumed risk-free rate. The point to note is that when the risk-free rate is zero, the difference in return performances (between from Fund A and Fund B) has no affect on the calculated Sharpe and Treynor indices. With a risk-free rate of 4.0%, proportional changes in the indices still remain less than the same proportional changes in the underlying performance of the funds (compare the change in Sharpe indices (1.96 to 1.47) and Treynor indices (0.22 to 0.16) with a 50% reduction in return performance (Funds A and B)).

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