

# The persistence of performance of South African unit trusts

C. Firer\*

Graduate School of Business, University of Cape Town, Private Bag  
Rondebosch 7700, Republic of South Africa  
cfirer@gsb.uct.ac.za

J.P. Beale, M.D. Edwards, J.N. Hendrie and D.C. Scheppening

School of Management Studies, University of Cape Town,  
Private Bag, Rondebosch 7700, Republic of South Africa

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This study examines persistence of performance in South African general equity and fixed income unit trusts over the period January 1989 to December 1999. The formation and holding periods studied ranged from one quarter to two-years. Significant persistence was found for most combinations of formation and holding periods for risk-adjusted equity unit trusts. It is suggested that choosing equity unit trust winners from the previous two-years and holding them for the next two-years may be the best long-term strategy to adopt. The fixed income unit trusts showed far less significant persistence than the equity unit trusts with loser-loser persistence predominating.

\*To whom all correspondence should be addressed.

## Introduction

The South African unit trust industry has experienced immense growth over the last twenty years. The first unit trusts in South Africa were launched in the mid-sixties. Fifteen years later there were only 12 funds in existence. Since then the number of funds and total assets managed by these funds has grown exponentially, and by the end of 1999 there were 271 funds in existence with a combined market capitalisation of R108 billion.

It is common cause that investors place great importance on historical returns when choosing unit trusts. Such actions contradict the weak form of the Efficient Market Hypothesis. This study adds to the growing literature on persistence of performance by investigating the ability of unit trusts to retain their ranks as winners or losers from one time period to another.

## Literature review

In the USA there has been considerable interest in the question of persistence of performance in the mutual fund industry. In an early study Jensen (1968) observed some persistence in fund performance between one decade and the next. Grinblatt and Titman (1992) found long-term persistence in risk-adjusted returns, when using a five-year formation period and the adjacent five-years as the holding period. Hendricks, Patel and Zeckhauser (1993) using shorter formation periods found that funds that ranked well in the last two to four quarters continued to do well in the next one to eight quarters. The strongest persistence was evident using a one-year formation period. They suggested

three reasons for the presence of short-term as opposed to long-term persistence in their data, namely that managers' salaries and fees rise to capitalise on demands arising from recent successes, that managerial urgency and drive decreases once reputations are established and that successful performers attract volumes of new funds.

Elton, Gruber and Blake (1993) split their 10-year sample into two five-year periods and into three three-year periods. Some evidence of persistence was found. However, their sample contained survivorship bias. They found no evidence of persistence when a smaller unbiased sample drawn from their original sample was used.

Using two-year, one-year and monthly formation and holding periods, Goetzmann and Ibbotson (1994) claimed to improve on the robustness of previous persistence studies. They studied 275 surviving funds from 1976-1988. Funds were ranked and classified as 'winners' or 'losers', depending on whether their returns were above or below the median return. Using contingency tables, they found persistence of the top performing mutual funds across all of these periods.

Malkiel (1995) extended Goetzman and Ibbotson's sample to 1991 and incorporated non-surviving funds. His results supported persistence during the 1970s where he documented both a 'hot hands' phenomenon (winner-winner persistence), as well as 'cold hands' phenomenon (loser-loser persistence). However, the results showed no significant persistence in performance when the tests were repeated using 1980s data.

Brown and Goetzmann (1995) using one-year holding and formation periods, classified winners and losers according to whether their returns were above or below the median. These results supported Malkiel's finding that persistence of performance is strongly dependent on the time period being studied. They found that risk-adjusting their sample of returns did not really affect the pattern of persistence that was found using the non risk-adjusted returns.

Kahn and Rudd (1995) tested for persistence in equity and fixed income funds, using three-year holding and formation periods. They found no persistence in the equity funds, but strong loser-loser persistence in the fixed income funds. In the same year Volkman and Wohar (1996) found some evidence that medium sized funds exhibited positive persistence of performance, whereas small and large funds exhibited negative persistence.

Elton, Gruber and Blake (1996) also tested three-year formation and holding periods, and found that selecting the top decile in the formation period, instead of the bottom or average decile, yielded superior performance. These results were improved by using one-year formation periods.

Finally, a study by Porter and Trifts (1998) on the performance of specific fund managers suggested that superior past performance was not indicative of future performance, but that poor performance tends to persist.

This brief review of US studies reflects the wide range of findings on the question of persistence of performance of unit trusts. Some research indicates winner persistence, some a loser persistence and some a size effect. Survivorship bias is shown to affect findings and the importance of using risk-adjusted returns is noted.

Prior studies on persistence of performance by South African unit trusts are now reviewed.

At the time of the earliest South African studies on unit trusts (Kerbel, 1974; Du Plessis, 1974), only six funds had been in existence for five years or more. Their work has little relevance today.

Gilbertson (1976) studied the performance of eleven unit trusts over the period 1970 to 1976. He showed that on average the unit trusts earned 1,1 percent less than the market on a risk-adjusted basis. Gilbertson used the Jensen alpha to calculate excess returns over the JSE All Share Index. Only two unit trusts outperformed the market but this out performance was not statistically significant. Gilbertson concluded that his findings were consistent with the strong form of the Efficient Market Hypothesis.

Taylor (1977) studied the performance of ten unit trusts over the same period as Gilbertson using the Sharpe, Jensen and Treynor measures. On average he found that the funds earned 2,4 percent less than the market on a risk-adjusted basis, but these results were not statistically significant at the 5 percent level. Taylor's results were subject scrutiny by Knight and Firer (1989) who highlighted the fact that the betas calculated were not stable or stationary. For this

reason, the studies using CAPM based tests (the Jensen and Treynor measures) should be treated with caution.

Gilbertson and Vermaak (1982) used the entire universe of eleven unit trust funds (consisting of seven general equity, two resource, one sector and one index-tracking fund) that were in existence for the eight-year period from 1974 to 1981. As only funds that existed for the full eight years were included, it may appear that survivorship bias is present. However, prior to June 1998 no South African unit trusts had merged and to date no unit trusts have been liquidated. Another type of bias could be introduced by the exclusion of funds which started during the eight years studied. Although they tested primarily for abnormal performance of unit trusts (on average they found that the unit trusts underperformed the ALSI by 2 percent), secondary testing was done to ascertain whether there was persistence of performance. They found no statistically significant correlation at the 5 percent level, indicating no persistence in performance.

Knight and Firer (1989) updated the Gilbertson and Vermaak (1982) study. They studied ten of the eleven unit trusts in existence from January 1977 to December 1986. (One fund was excluded from their sample because the trust's objective was changed in 1984, hence changing its risk profile). They found that some of the unit trusts outperformed the market on a non-risk adjusted basis. On average, however, the unit trusts earned returns of about 2 percent less than the market.

Risk-adjusted testing was performed using the Jensen alpha, and the Treynor and Sharpe measures. The beta estimates were found to be both stable and stationary. The results of the risk-adjusted testing established that five funds managed to significantly outperform the market index at the 5 percent level. They observed that some persistence did exist amongst the two top funds. They found some evidence (at the 5 percent level) of consistency in rankings between the first and second five-year periods.

Biger and Page's (1993) study, using single and multi-factor models to calculate alpha coefficients, showed no correlation between rankings based on the different models. This result indicated the importance of the choice of benchmark in performance studies.

In order to avoid this problem, Garvin (1995), using Grinblatt and Titman's (1993) benchmark-free methodology, studied 32 equity unit trusts' performance to the end of 1992. He found no evidence of persistence of performance. Nicholson (1996) found results consistent with those of Garvin (1995) for the ten years ending in 1995.

Meyer (1998) studied the persistence of performance of unit trusts over the ten-year period of 1985 to 1995. She used two data samples, the first being the same as that used by Nicholson (1996), and the second a larger data set containing the 33 funds in existence from July 1990 to June 1995.

She found persistence of performance over successive one, two and four-year formation periods. However, her results indicated that a repeat-loser phenomenon was more prevalent and that the repeat-winner phenomenon was only demonstrated over successive two-year periods and were, therefore not consistent with either those of Garvin (1995) or Nicholson (1996).

The requirements of beta stability and stationarity were not addressed in Meyer's study and hence her risk-adjusted results should be treated with caution. She did, however, find little difference between the results using the risk-adjusted and non risk-adjusted techniques.

Finally, Von Wielligh and Smit (2000) reported finding both short and long-term persistence amongst the poorer performing general equity funds.

Clearly both the international and local persistence studies are inconclusive. Shorter term studies indicate a possible (weak) link between past and future performance, but the specific time period analysed, its length and testing methodology employed, influence the conclusions which are drawn.

A major difference between the US mutual fund industry and its South African counterpart is the size of the industries as a whole and the number of funds available. This difference has made local research difficult, due to small sample sizes and a shorter performance history.

Other than Meyer's (1998) second sample which consisted of 33 funds, which was only studied for a five-year period, most SA studies reported to date have suffered from the problem of small data samples and thus it was felt that, given the growth of the unit trust industry during the late 1990s (Meyer's study was capped at the end of 1995), the problem of persistence of performance was worth revisiting in 2000.<sup>1</sup>

## Data and methodology

The database, obtained from Old Mutual Asset Managers, consisted of monthly repurchase prices and dividend/interest information for the period January 1989 to December 1999 for 43 unit trusts in the general equity category and 35 bond and fixed income unit trusts.<sup>2</sup> The risk-free rate was proxied by the monthly money market rate supplied by Inet-Bridge and was converted to a continuously compounded rate.<sup>3</sup>

<sup>1</sup>The Von Wielligh and Smit (2000) study was published after the empirical work reported in this paper was completed.

<sup>2</sup>Considerable effort was invested in checking the accuracy of the data collected. The buy-sell spreads were calculated at the end of each month and compared over time. Significant fluctuations in the spread from one month to the next were investigated and the prices corrected using price information from other sources

<sup>3</sup>Because T-bills have ranked as liquid assets for banks since 1965, Firer and McLeod (1999:12) suggest that the NCD rate as a risk-free proxy.

The exact date of re-investment of dividend/interest income was established prior to calculating returns. From the monthly repurchase prices, continuously compounded monthly returns were calculated. Quarterly, half-yearly, yearly and two-yearly continuously compounded returns were then obtained. The half-yearly, yearly and two-yearly returns were calculated on a rolling basis using quarters from 1 January 1989 to 31 December 1999.

Different combinations of the basic quarterly data were chosen in order to investigate whether formation periods of particular lengths optimally predicted the returns in a variety of holding periods. Using formation periods and holding periods which are not always equal in length can be useful in identifying persistence (Elton *et al.*, 1996). The testing periods for this study are rolled forward one quarter at a time, and all the different permutations are repeated each quarter. This greatly improves the robustness of the study as the overlapping periods substantially increase the amount of data available for testing. This results in a more thorough measure of persistence than the simple time periods used in the earlier studies.

Formation and holding periods of three months, six months, one year and two years were studied. For each formation period, portfolio returns were calculated for all of the holding periods.

Winner-loser contingency table tests similar to those used by Kahn and Rudd (1995) formed the basis of the test for over- or under-performance. Unit trust returns were ranked and then assigned to quartiles in the formation and holding periods. Returns falling exactly on the quartile return were placed in the upper of the two quartiles on which they bordered. Persistence was then investigated by testing whether in the holding period, unit trusts significantly repeated their performance in terms of their quartile rank in the formation period. Returns above the upper quartile were labelled 'Winner', those above the median but below the upper quartile were labelled 'Above', those below the median but above the lower quartile were labelled 'Below' and those below the lower quartile were labelled 'Loser'.

Two of the equity funds were discontinued at a quarter-end during the period of the study, one in June 1998 and the other in March 1999. If, for the specific formation and holding period being analysed, these funds were not in existence for the full time period, they were excluded from the sample in that instance. This may have introduced some measure of survivorship bias as discussed by Malkiel (1995) and Brown and Goetzmann, (1995)<sup>4</sup>.

Counts were made of the number of funds which remained in the top quartile, the number of funds that dropped from the top quartile to the second, third and bottom quartiles, for rolling time periods. These counts were summed over all of

<sup>4</sup>Using a test suggested by Malkiel (1995), mean fund returns were compared for the whole sample of funds and those still in existence at the end of the study period. No significant difference in mean returns was found. Survivorship bias was thus adjudged not to be of significance in the study.

the rolling periods for each formation - holding period combination, and summarised as four by four contingency tables. Sixteen tables (one for each of the sixteen permutations of the formation and holding periods) were produced for the equities sector and a like sixteen for the fixed income sector. The counts in each cell of the contingency table were tested using the chi-squared statistic to establish the goodness of fit between the observed counts, and counts that might have been expected if period to period performance was random.

In order to boost the number of observations falling into each cell, since the number of funds in this study was relatively small especially in comparison to US studies, the tests were repeated by dividing the performance ranks into two groups instead of quartiles. If a return fell on or above the median, it was labelled 'Winner' and if it fell below the median, it was labelled 'Loser'. A chi-squared test using one degree of freedom was applied to the two by two contingency tables (referred to as Winner-Loser tables) for each formation - holding period combination.

The persistent winners were then studied to see how much of the overall persistence was explained. As the chi-squared statistic is the sum of the differences between the expected and observed values for each frequency in the contingency table, the percentage of the overall chi-squared statistic explained by each of differences between the observed and expected values was noted. Similarly, the percentage of the overall persistence explained by the persistent losers was established.

In order to avoid the beta stationarity and stability problems.<sup>5</sup> Sharpe's performance index (Sharpe, 1966):

$$S_p = (r_p - r_f) / \sigma_p$$

where

$(r_p - r_f)$  = the average fund excess return above the risk free rate, and

$\sigma_p$  = the total volatility of the fund over time.

was used to risk adjust the unit trust returns

Since the use of this measure presupposes well-diversified funds, only the general equity funds were risk-adjusted. The fixed income funds, which are by nature not well diversified were excluded from the risk-adjusted return testing.

Using the nominal returns from the data set, Sharpe measures for quarters, rolling half-year, one-year and two-year periods were calculated for each equity fund. The standard deviations for the Sharpe measures were based on the 36 months directly prior to the time period being studied. This further decreased the number of funds that could be used as those that did not exist for 36 months could not be included.

The Sharpe measures were ranked by splitting them into quartiles in the formation and holding periods, in the same manner that the non risk-adjusted returns were studied. Persistence was then investigated by testing whether in the holding period, unit trusts significantly repeated their risk-adjusted performance in terms of their quartile rank in the formation period. Once again, for each formation-holding period permutation, rank movement frequency tables were drawn up and summarised as sixteen four by four contingency tables.

The tests were repeated using medians instead of quartiles, in order to obtain larger sample sizes in each of the cells of the contingency tables.

## Results

As discussed above, sixteen summary chi-square contingency tables were derived, one for each combination of formation and holding period. The observed frequencies in each of the cells in each table were compared to the expected frequencies, based on the assumption that if there was no persistence of performance, funds should fall into each of the cells on a random basis. For each table a chi-squared statistic was calculated. The chi-squared statistic and the corresponding P-values are shown in Table 1 for the various combinations of formation and holding periods.

The chi-squared statistics and their relative P-values for the various combinations of formation and holding periods when split into quartiles are shown in Table 1. The derivation of the chi-squared value of 33,62 for the top left hand cell in Table 1 is illustrated in Table 2.

From Table 1 it can clearly be seen that there is wide-scale persistence, significant at the 1 percent level, for all the combinations of formation and holding periods. The distribution in the size of the chi-squared statistic across the combinations of formation/holding periods is shown in Figure 1.

The contingency tables were then restated, splitting the risk-adjusted returns into winners and losers as opposed to quartiles. The results, shown in Table 3, indicate that the persistence found when testing the data in quartiles remains, when the data is tested in halves. In addition persistence above and below the median exists, regardless of the length of time used to form a portfolio or hold a portfolio.

The quartile summary tables were further investigated to get additional insight into the origin of the observed persistence. The percentages shown in Table 4 give the contribution of the winner-winner and loser-loser categories to the chi-squared statistic.

<sup>5</sup>A sample of 10 of the equity funds that were in existence for the full time period were tested for beta stationarity and stability. The results indicated that the betas were neither stable nor stationary.

**Table 1: Results of the quartile summary tables for general equity funds for the different formation and holding periods**

Formation Period	Holding Period			
	Quarter	Half-Year	Year	2 Years
Quarter	33,62 (0,0039)	55,88 (0,0000)	39,90 (0,0004)	37,74 (0,0012)
Half-Year	74,57 (0,0000)	54,48 (0,0000)	39,70 (0,0005)	45,10 (0,0000)
Year	52,97 (0,0000)	44,45 (0,0000)	40,73 (0,0003)	55,33 (0,0000)
2 Years	30,76 (0,0095)	31,82 (0,0068)	53,93 (0,0000)	56,14 (0,0000)

( $\chi^2$  statistic with P-value in brackets; all cells are significant at the 1% level)

**Table 2: Equity quartile summary table for 1 January 1989 to 31 December 1999: quarter predicting quarter**

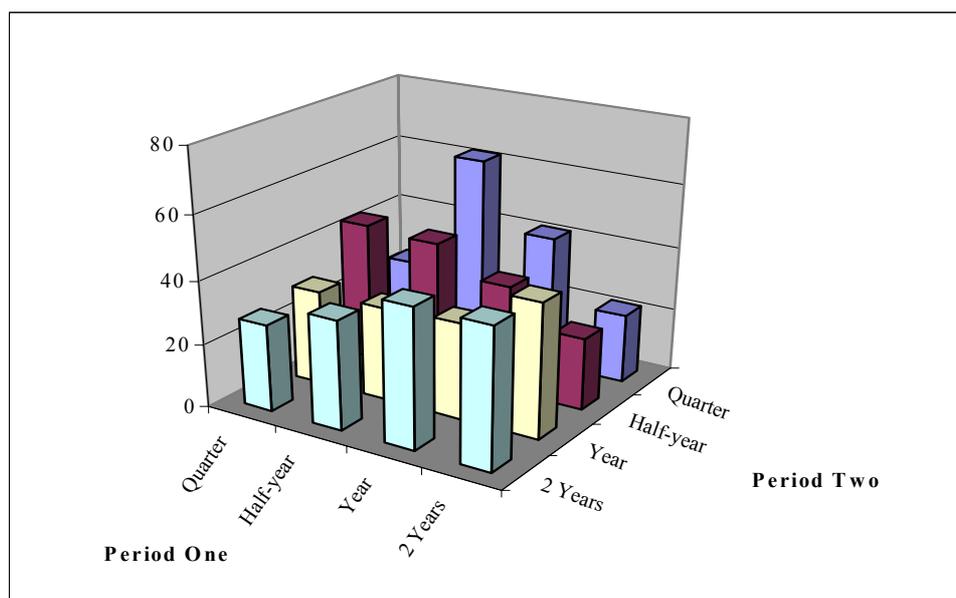
Formation Period		Holding Period			
		Winner	Above	Below	Loser
Formation Period	Winner	64	39	35	40
	Above	46	53	34	29
	Below	33	40	39	42
	Loser	35	30	46	63

( $\chi^2$  statistic: 33,62)

**Table 3: Results of the summary tables for general equity funds, the different formation and holding periods using medians**

Formation Period	Holding Period			
	Quarter	Half-Year	Year	2 Years
Quarter	14,21 (0,0002)	34,13 (0,0000)	19,33 (0,0000)	15,15 (0,0001)
Half-Year	35,81 (0,0000)	29,76 (0,0000)	14,47 (0,0001)	11,36 (0,0007)
Year	27,86 (0,0000)	22,11 (0,0000)	21,36 (0,0000)	30,81 (0,0000)
2 Years	8,44 (0,0037)	11,36 (0,0007)	16,01 (0,0001)	15,91 (0,0001)

( $\chi^2$  statistic with P-value in brackets; all cells are significant at the 1% level)



**Figure 1: Equity risk-adjusted chi-squared values**

**Table 4: The percentage of persistence in the risk-adjusted quartile table explained by winner-winners and loser-losers**

Formation Period	Holding Period	Winner-Winner	Loser-Loser	D <sup>2</sup> stat (P-value)
Quarter	Quarter	17,2%	20,5%	33,62 (0,0039)
Quarter	Half-Year	20,2%	17,8%	55,88 (0,0000)
Quarter	Year	19,7%	10,6%	39,90 (0,0004)
Quarter	2 Years	24,0%	17,2%	37,74 (0,0012)
Half-Year	Quarter	26,0%	17,5%	74,57 (0,0000)
Half-Year	Half-Year	24,9%	11,2%	54,48 (0,0000)
Half-Year	Year	30,2%	20,8%	39,70 (0,0005)
Half-Year	2 Years	21,6%	21,9%	45,10 (0,0000)
Year	Quarter	33,5%	10,7%	52,97 (0,0000)
Year	Half-Year	29,5%	9,6%	44,45 (0,0000)
Year	Year	22,7%	9,5%	40,73 (0,0003)
Year	2 Years	20,8%	0,8%	55,33 (0,0000)
2 Years	Quarter	22,9%	20,8%	30,76 (0,0095)
2 Years	Half-Year	24,2%	1,2%	31,82 (0,0068)
2 Years	Year	19,0%	0,4%	53,93 (0,0000)
2 Years	2 Years	35,8%	1,7%	56,14 (0,0000)

(The percentage that each observational frequency contributes to the  $\chi^2$  statistic)

As the quartile table has sixteen cells, these percentages are compared to a value of 6,25 percent, the expected value for each cell. It can clearly be seen that winner-winners account for a high proportion of the persistence in the contingency table with figures ranging from 17,2 percent to 35,8 percent.

The periods which show the greatest winner-winner persistence are two-years predicting two-years (35,8 percent), one-year predicting a quarter (33,5 percent) and a half-year predicting a half-year (30,2 percent). Loser-loser persistence appears highest at the lower formation-holding period combinations.

The results from the study of fixed income funds were not quite as dramatic. Table 5 shows the persistence for the different combinations of formation and holding periods, when the fixed income funds are split into quartiles.

These results indicate that there is also evidence of persistence in the fixed income unit trust sector. Many of the shorter time period results show less persistence than for equities, and the persistence is not significant for many of the medium-term permutations. Using formation periods of half a year, one year and two years to predict two-years shows high levels of persistence as does using two years to predict one year.

There are fewer data points for the fixed income funds than for the equity funds, therefore it is important to examine whether or not the persistence is maintained when simply splitting the data into winners and losers. The results for the varying formation and holding periods are given in Table 6.

**Table 5: Results of the bond quartile summary tables for the different formation and holding periods**

Formation Period	Holding Period			
	Quarter	Half-Year	Year	2 Years
Quarter	<b>23,31 (0,0055)</b>	19,95 (0,0182)	17,35 (0,0436)	<b>49,18 (0,0000)</b>
Half-Year	<b>30,93 (0,0003)</b>	<b>31,51 (0,0002)</b>	18,11 (0,0339)	<b>65,48 (0,0000)</b>
Year	<b>28,69 (0,0007)</b>	17,24 (0,0451)	<b>21,92 (0,0091)</b>	<b>63,69 (0,0000)</b>
2 Years	<b>28,34 (0,0008)</b>	<b>30,47 (0,0004)</b>	<b>53,71 (0,0000)</b>	<b>64,13 (0,0000)</b>

( $\chi^2$  statistic with P-value in brackets; cells in bold are significant at the 1% level)

**Table 6: Results of the bond summary tables for the different formation and holding periods using medians**

Formation Period	Holding Period			
	Quarter	Half-Year	Year	2 Years
Quarter	<b>9,05 (0,0026)</b>	3,91 (0,0481)	0,93 (0,3341)	<b>24,37 (0,0000)</b>
Half-Year	<b>7,04 (0,0080)</b>	2,01 (0,1563)	0,10 (0,7567)	<b>28,23 (0,0000)</b>
Year	1,49 (0,2221)	0,34 (0,5624)	0,90 (0,3419)	<b>31,51 (0,0000)</b>
2 Years	0,50 (0,4777)	1,40 (0,2372)	3,09 (0,0787)	<b>21,79 (0,0000)</b>

( $\chi^2$  statistic with P-value in brackets; cells in bold are significant at the 1% level)

Persistence remains when using a quarter to predict a quarter, a half-year to predict a quarter, and any period to predict two-years. The other combinations of formation and holding periods do not yield significant persistence, when the data is divided into halves. This suggests that when the data is split into quartiles, the sample may not be large enough to provide reliable results. Therefore the results in Table 5 should be treated with caution.

The results in Table 6 show that there is significant persistence when any formation period is used to predict a two-year holding period. It is surprising that these periods should render significant results when others do not. When tested, it was found that a high proportion of the observed persistence was due to losers remaining losers.

## Conclusions

The aim of this study was to examine persistence in general equity and fixed income unit trust performance over the period January 1989 to December 1999. The data set included all South African general equity and fixed income funds in existence for the period tested.

The formation and holding periods studied ranged from quarters to two-year periods. The results show that past rankings of returns may be useful in predicting future return rankings of unit trusts.

Significant persistence was found for most combinations of formation and holding periods for the equity unit trusts. The strongest overall persistence was found when using a half-year formation period to predict a quarter holding period. For a two-year formation period predicting a two-year holding period, 35,8 percent of the persistence was explained by winner-winner persistence (compared to 26,0 percent for the half-year/ quarter-year strategy). As the overall persistence was relatively strong for this formation-holding period combination, it is suggested that the two-year/two-year strategy may be the best one for investors looking for positive out-performance to follow.

Previous South African research investigating the persistence of equity unit trust performance resulted in conclusions different to those of this study. Gilbertson and Vermaak (1982) found little evidence of persistence. Nicholson (1996), Meyer (1998) and Knight and Firer (1989) did find persistence, but it was not significant at the 5 percent level. The differences in results may be attributed to the larger data set used here, to different methodologies used in testing for persistence and in the risk-adjustment used in this study.

The fixed income unit trusts showed far less significant persistence than the equity unit trusts. When splitting returns into quartiles, about half of the combinations of formation and holding periods showed significant persistence of performance.

Using medians, the strongest persistence occurred in all formation periods predicting two-year holding periods. Most of this persistence is explained by the persistence of inferior unit trusts as opposed to superior unit trusts. This is useful to

investors as it may indicate which fixed income unit trusts to avoid. The only other significant fixed income unit trust persistence arose when using quarter or half-year formation periods to predict quarter holding periods. In summary, the results obtained for the fixed income unit trusts examined were not very conclusive.

The investment implications of this research are only suggestive. Using historical ranking as a guide, investors appear to be able to improve their chances of relative performance in general equity unit trusts and to a lesser degree, fixed income unit trusts. Selection of above average funds based on past performance appears to be possible, but a more detailed analysis, taking switching costs into account, needs to be made.

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