New Zealand mutual funds: measuring performance and persistence in performance

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Abstract

The present study investigates the performance of New Zealand mutual funds using a survivorship-bias controlled sample of 143 funds for the period of 1990–2003. Our overall results suggest that New Zealand mutual funds have not been able to provide out-performance. Alphas for equity funds, both domestic and international, are insignificantly different from zero, whereas balanced funds underperform significantly. There is no evidence of timing abilities by the fund managers. In the short term, significant evidence of return persistence for all funds is observed. This persistence, however, is driven by 'icy hands' rather than 'hot hands'. Finally, we find the risk-adjusted performance for equity funds to be positively related to fund size and expense ratio and negatively related to load charges.

1. Introduction

The performance of mutual funds has been examined widely in the published finance literature both theoretically and empirically. The majority of earlier studies

(Sharpe, 1966; Jensen, 1968) conclude that the net performance of mutual funds (after expenses) is inferior to that of a comparable passive market proxy. During the late 1980s and early 1990s, however, some contrasting findings appeared. Grinblatt and Titman (1989, 1992), Ippolito (1989) and more recently Wermers (2000), for instance, find that mutual fund managers did possess enough private information to offset the expenses they incurred. Furthermore, Hendricks *et al*. (1993), Goetzmann and Ibbotson (1994) and Brown and Goetzmann (1995) find evidence of persistence in mutual fund performance over short-term horizons. Carhart (1997), however, argues that this effect is mainly attributable to simple momentum strategies, and not to superior expertise of fund managers.

Academic studies on the New Zealand mutual fund market are scant. Vos *et al*. (1995), the only published study to the best of our knowledge, examines 14 equity funds available in New Zealand between 1988 and 1994 as part of a combined study of New Zealand and Australia and finds no evidence of short-term performance persistence in New Zealand. We investigate New Zealand mutual fund performance during a longer and more recent time period (1990–2003) for more funds (143) with different kinds of investment objectives (domestic, international and balanced), taking into account survivorship bias. The main contribution of our study lies in the use of more elaborate performance measurement techniques. More specifically, we build on the work of Carhart (1997) and Ferson and Schadt (1996) and apply conditional multifactor models for the New Zealand market. The remainder of this paper is organized as follows. Section 2 describes the data. Section 3 presents the empirical results. In section 4, we test the persistence hypothesis and in Section 5, we discuss the impact of fund characteristics on their relative performance. Section 6 concludes the paper.

2. Data

The total size of the New Zealand fund market is less than $US10 billion and is one of the smallest markets in the world. One reason for this is the accessibility of Australian mutual funds to the investors in New Zealand, where the market is much larger and offers a wider range of alternatives.

2.1. Mutual fund data

Using Morningstar, we identified all retail equity and balanced mutual funds for the period January 1990 till September 2003. Furthermore, we divided funds into investment categories based on their regional focus (domestic *vs* international) and strategy (equity *vs* balanced). We restrict our sample to retail funds with at least 12 months of data. Return data were then collected from Morningstar New Zealand. All returns are inclusive of any distributions, net of annual management fees and in New Zealand dollars. This leads to a total sample of 143 open-ended mutual funds, of

Table 1
Summary statistics on New Zealand mutual funds 1990:01–2003:09

	Excess return	Standard deviation	Size	Expense ratio	Age in years	Number of funds
Investment objective						
Domestic equity	−1.61	13.19	23	1.21	8.0	30
International equity	−3.70	9.47	22	1.29	7.5	63
Multisector	−2.25	5.10	18	1.26	7.4	50
All funds	−2.75	9.13	21	1.26	7.5	143

Table 1 reports summary statistics of the funds in our sample. We group funds by investment objective. Fund returns are calculated based on an equally weighted portfolio of all funds in a particular objective. The return data are annualized with re-investment of all distributions, based on NZ$. All returns are net of expenses and before taxes. Average fund size is based on net asset value at the end of 2003 and in millions of $NZ. Expense ratio is expressed as a percentage of the assets invested. Age is the average number of years the fund is in existence. Source: Morningstar New Zealand.

which 30 are domestic equity, 63 international equity and 50 multisector, respectively. As reported in Table 1 the size, expense ratio and the age of all three categories are similar.

As pointed out by Brown *et al.* (1992), leaving out dead funds leads to an overestimation of average performance. To limit a possible survivorship bias we also include funds that were closed down at any point during the sample period. This information was provided by Morningstar.[1] Dead funds were included in the sample until they disappeared, after which the portfolios are reweighted accordingly. Table 2 presents returns on all funds (dead + surviving) in column 2 and the return on surviving funds in column 5. Column 8 points out the difference in the return on the surviving funds and the return on the whole sample. Restricting our sample to surviving funds would result in overestimation of average returns by 0.26 per cent per annum.[2]

2.2. Benchmark data

The main source for constructing our equity benchmark indices is Worldscope. In comparison to MSCI, Worldscope covers up to 98 per cent of a countries market capitalisation, whereas MSCI serves mainly as a large cap proxy.[3] For the Carhart

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[1] Although Morningstar does a reasonable effort to track and document funds that disappeared, we obviously cannot assume the sample to be 100 per cent free of survivorship bias, as no study on mutual funds can.

[2] It is interesting to note that the relative performance of dead funds deteriorates strongly in the last 6 months before termination.

[3] Alternatively, we used the relevant MSCI indices. Based on the results not reported in the present paper we conclude the choice of index did not have any influence on our results.

Table 2
Survivorship bias

	All funds			Surviving funds			Survivor bias
	Excess return	Standard deviation	Number of funds	Excess return	Standard deviation	Number of funds	
Investment objective							
Domestic equity	−1.61	13.19	30	−1.53	13.24	19	0.08
International equity	−3.70	9.47	63	−3.22	10.53	39	0.48
Multisector	−2.25	5.10	50	−2.08	5.21	37	0.17
Total	−2.75	9.13	143	−2.49	9.62	95	0.26

Table 2 provides an estimate of the survivorship bias in our sample. Columns 2–4 report summary statistics on the all fund sample, which includes dead funds. Columns 5–7 report summary statistics on the surviving funds only. In column 8, the survivorship bias is reported by subtracting the all funds sample from the surviving sample. We group funds by investment objective. Fund returns are calculated based on an equally weighted portfolio of all funds in a particular objective. The return data are annualized with re-investment of all distributions, based on $NZ. All returns are net of expenses and before taxes.

(1997) four-factor model, we consider all stocks in the Worldscope universe for each region (domestic and international). For the excess market return we select all stocks in the Worldscope universe that have a market capitalization of at least $NZ 5 million, minus the New Zealand 90 day bank bill rate. We then rank all stocks based on size and assign the bottom 20 per cent of total market capitalization to the small portfolio. The remaining part goes into the large portfolio. Small minus big (SMB) is the difference in return between the small and large portfolios. For the high minus low (HML) factor all stocks are ranked on their book-to-market ratio. Following Fama and French (1992), we then assign the top 30 per cent of market capitalization to the high book-to-market portfolio and the bottom 30 per cent to the low book-to-market portfolio. HML is obtained by subtracting the low from the high book-to-market returns. These factor portfolios are value-weighted and rebalanced annually. The momentum factor portfolio is formed by ranking all stocks on their prior 12 month return. The return difference between the top 30 per cent and bottom 30 per cent by market capitalization then provides us with the momentum factor returns (Mom). This procedure is repeated every month to get to a rolling momentum factor.

Balanced funds combine investments in several asset classes to create a widely diversified portfolio. In our sample, we detect that more than 90 per cent of the asset allocation falls in five categories; namely, New Zealand equity, New Zealand bonds, international equity, international bonds and cash.[4] Therefore, we will use a four-factor model for balanced funds containing both equity and bond indices.[5] Next to

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[4] Investment in property is less than 3 per cent. The exact classification figures are available upon request from the authors.

[5] Cash is captured by the risk-free rate.

Table 3
Capital asset pricing model results

	Alpha	Market	R^2_{adj}	Distribution significant alphas		
				−	0	+
Investment objective						
Panel A: Equity funds						
Domestic equity	− 1.16	0.68***	0.87	23%	70%	7%
International equity	− 2.93***	0.59***	0.81	19%	79%	2%
Panel B: Balanced funds						
Multisector	−2.15***	0.23***	0.64	71%	29%	0%

The table reports the results of the estimation of equation (1) for the 1990:01–2003:09 period. Reported are the ordinary least squares estimates for each investment objective.

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \varepsilon_{it}, \tag{1}$$

where R_t is the fund return, R_{ft} is the risk-free rate and R_{mt} is the return on the relevant benchmark. All returns are in $NZ, net of costs and before taxes. All alphas are annualized. *** Significant at the 1% level. **Significant at the 5% level. * Significant at the 10% level.

the domestic and international equity market indices from Worldscope described above, we include both a domestic and an international bond index. We use the NZ Government Bond index and JP Morgan World Government Bond index. All provided by Datastream and in $NZ.

3. Empirical results

3.1. Single-factor performance model

We first use the traditional capital asset pricing model (CAPM) based single index model, where the intercept, α_i, gives the Jensen alpha, which is interpreted as a measure of outperformance or underperformance relative to the used market proxy.[6] Formally,

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \varepsilon_{it}, \tag{1}$$

where R_{it} is the return on fund i in month t, R_{ft} is the return on the 90 day bank bill in month t, R_{mt} is the return on the relevant equity index in month t and ε_{it} an error term. Table 3 presents the results of applying equation (1) to our data. We report Jensen's

[6] See Jensen (1968).

alpha for both domestic and international equity funds in Panel A and for balanced funds in Panel B of Table 3, respectively.

The single factor analysis based on Jensen alpha provides the same picture for all three categories of funds: they are all negative and for international and multisector funds are highly significant. All funds are exposed to the estimated market risk, although as expected the coefficient for the balanced funds is much smaller as they include fixed-income instruments.

We further estimate equation (1) for each fund individually. The last 3 columns of Table 3 present the distribution of individually estimated α's. We report the percentage of significantly positive alphas (+), significantly negative alphas (−) and alphas that are insignificantly different from zero (0). It is remarkable to observe around 70 to 80 per cent of both international and domestic equity funds generate alphas close to zero and more than 70 per cent of balanced funds provide significantly negative alphas.

3.2. Market timing model

The published mutual fund literature generally makes a distinction between security selection and market timing skills on the part of fund managers. Whereas the former one-factor model does measure selection it does not take into account the possibility that managers might change their investment strategies, which in turn causes changes in systemic risk. We, therefore, extend the one-factor model by adding a quadratic factor that is supposed to capture the possible non-linearity of fund portfolio and market returns. This model was originally proposed by Treynor and Mazuy (1966) and takes the following form:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \beta_{iT}(R_{mt} - R_{ft})^2 + \varepsilon_{it}. \tag{2}$$

The alpha in equation (2) now measures a fund's security selection ability, whereas β_T indicates a fund's market timing ability. Specifically, a significantly positive β_{iT} is consistent with superior market timing. In Panel A of Table 4, we report the results of applying equation (2) to the equity funds in our sample.[7]

Based on the results in Panel A we cannot detect significant timing ability as the timing coefficient for both equally weighted portfolios is insignificant. Estimating equation (2) for all individual funds confirms this finding: only approximately 10 per cent of all funds exhibit significant timing abilities. More interestingly, our earlier conclusions with respect to the alpha estimates remain valid. Domestic equity

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[7] We refrain from applying the timing model to our balanced funds as the interpretation of this is less clear. Timing is usually considered to be the decision by a manager to be in or out of the equity market. For balanced fund timing models with both equity and bond indices this is not useful.

Table 4
Timing abilities of equity funds

Panel A: Treynor and Mazuy model

	Four-factor alpha	Market	Timing β_T	R^2_{adj}	Distribution significant timing coefficients		
					−	0	+
Investment objective							
Domestic equity	−1.16	0.68***	0.00	0.87	0%	90%	10%
International equity	−2.06**	0.63***	−0.02	0.82	6%	91%	3%

Panel B: Cubic model

	Four-factor alpha	Market	Timing β_T	Cubic timing β_C	R^2_{adj}	Distribution significant cubic timing coefficients		
						−	0	+
Investment objective								
Domestic equity	−1.40	0.71***	0.00	0.00	0.87	10%	90%	0%
International equity	−2.13**	0.61***	−0.02	0.01	0.82	11%	89%	0%

Table 4 presents the results of the following 2 timing models for the 1990:01–2003:09 period:
  Treynor and Mazuy:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \beta_{iT}(R_{mt} - R_{ft})^2 + \varepsilon_{it}. \tag{2}$$

  Cubic timing:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \beta_{iT}(R_{mt} - R_{ft})^2 + \beta_{iC}(R_{mt} - R_{ft})^3 + \varepsilon_{it}. \tag{3}$$

R_t is the fund return, Rf_t is the risk-free rate and Rm_t is the return on the relevant benchmark. All returns are in $NZ, net of costs and before taxes. All alphas in the table are annualized. *T*-statistic are heteroskedasticity consistent.

funds provide insignificant alphas, whereas international equity funds still underperform significantly after a quadratic timing factor has been added.

  Although the quadratic timing model is widely used, several studies question the validity of it. For instance, Jagannathan and Korajczyk (1986) provide several specification tests based on higher moments. Specifically, they augment the quadratic timing model by an additional cubic term:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \beta_{iT}(R_{mt} - R_{ft})^2$$
$$+ \beta_{iC}(R_{mt} - R_{ft})^3 + \varepsilon_{it}. \tag{3}$$

If β_C is significant, it is argued that the quadratic timing model is misspecified. Hallahan and Faff (1999) and Holmes and Faff (2004) apply the cubic model to Australian funds and indeed find results that question the validity of the quadratic model for Australian funds. Therefore, we run equation (3) for our equity funds and

report these results in Panel B of Table 4. The cubic timing factor is insignificant for both equally weighted portfolios. Also, the quadratic factor remains insignificant. This is again supported by individual regressions as only approximately 10 per cent of individual β_C's are significant. These results indicate that for New Zealand funds the quadratic model is not severely misspecified. Therefore, we use the quadratic model to reach our conclusion that New Zealand equity funds do not provide evidence in favour of market timing abilities. Our observations with respect to the alpha estimates again remain valid.

3.2. Multifactor performance models

CAPM-based models assume that a fund's investment behaviour can be estimated using a single market index. Because of the wide diversity of stated investment styles, ranging from growth to small cap, it is preferable to use a multifactor model to account for all possible investment strategies. Recent published literature on the cross-sectional variation of stock returns (see, e.g. Fama and French 1993, 1996; Chan *et al.*, 1996) raises questions on the adequacy of a single index model to explain mutual fund performance. The Fama and French (1993) three-factor model is considered to produce a better explanation of fund behaviour. In addition to a value-weighted market proxy, this model includes two additional risk factors, size and book-to-market. Although this model already improves average CAPM pricing errors, it is not able to explain the cross-sectional variations in momentum-sorted portfolio returns. Therefore, Carhart (1997) extends the Fama–French model by adding a fourth factor that captures the Jegadeesh and Titman (1993) momentum anomaly. The resulting model is consistent with a market equilibrium model with four risk factors, which can also be interpreted as a performance attribution model, where the coefficients and premia on the factor-mimicking portfolios indicate the proportion of the mean return attributable to four basic strategies. Formally,

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\begin{aligned}
R_{it} - Rf_t = \alpha_i + \beta_{0i}(Rm_t - Rf_t) + \beta_{1i}\mathrm{SMB}_t + \beta_{2i}\mathrm{HML}_t \\
+ \beta_{3i}\mathrm{Mom}_t + \varepsilon_{it},
\end{aligned}
\tag{4}
$$

where

$R_{it} - Rf_t =$ the excess fund return,
$Rm_t - Rf_t =$ the value weighted excess return on the market portfolio,
$\mathrm{SMB} =$ the difference in return between a small cap portfolio and a large cap portfolio,
$\mathrm{HML} =$ the difference in return between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks, and
$\mathrm{Mom} =$ the difference in return between a portfolio of past winners and a portfolio of past losers.

Table 5
Multifactor model

Panel A: Equity funds

	Four-factor alpha	Market	SMB	HML	Mom	R^2_{adj}	Distribution significant alphas		
							−	0	+
Investment objective									
Domestic equity	−1.02	0.74***	0.19***	−0.05***	−0.03**	0.92	23%	70%	7%
International equity	−1.07	0.63***	0.21***	−0.05**	0.03*	0.85	19%	79%	2%

Panel B: Balanced funds

	Four-factor alpha	NZ equity	NZ bond	World equity	World bond	R^2_{adj}	Distribution significant alphas		
							−	0	+
Investment objective									
Multisector	−2.21***	0.15***	0.22***	0.17***	0.00	0.87	66%	34%	0%

The table reports the results of the estimation of equations (4) and (5) for the 1990:01–2003:09 period.
For the equity funds we estimate

$$R_{it} - Rf_t = \alpha + \beta_0(Rm_t - Rf_t) + \beta_1 \text{SMB}_t + \beta_2 \text{HML}_t + \beta_3 \text{Mom}_t + \varepsilon_{it}. \tag{4}$$

For the balanced funds we estimate

$$R_t - Rf_t = \alpha + \beta_0(Rm_{\text{NZ equity}t} - Rf_t) + \beta_1(Rm_{\text{NZ bond}t} - Rf_t) + \beta_2(Rm_{\text{World Equity}t} - Rf_t)$$
$$+ \beta_3(Rm_{\text{World Bond}t} - Rf_t) + \varepsilon_{it}. \tag{5}$$

R_t is the fund return, Rf_t is the risk-free rate, Rm is the return on the total Universe according to Worldscope, and SMB and HML are the factor-mimicking portfolios for size and book-to-market. Mom is a factor-mimicking portfolio for the 12-month return momentum. All alphas in the table are annualized. *T*-statistics are heteroskedasticity consistent. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Panel A of Table 5 summarizes the results of applying the multifactor model to domestic and international equity funds. First, after controlling for market risk, size, book-to-market and momentum we find alphas insignificantly different from zero. Second, both types of equity funds are relatively more exposed to small caps. Third, both types of funds are growth oriented. Fourth, although international funds are momentum driven, domestic funds exhibit a reverse pattern. These results are robust to the inclusion of a bond index and the inclusion of a separate New Zealand equity index (international funds) to take a potential home bias into account.[8]

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[8] These results are available upon request from the authors.

The multifactor model for balanced funds applied is as follows:

$$R_t - Rf_t = \alpha + \beta_0(Rm_{\text{NZ equity}t} - Rf_t) + \beta_1(Rm_{\text{NZ bond}t} - Rf_t)$$
$$+ \beta_2(Rm_{\text{World Equity}t} - Rf_t) + \beta_3(Rm_{\text{World Bond}t} - Rf_t) + \varepsilon_{it}, \quad (5)$$

where R_t is the fund return, Rf_t is the risk-free rate, $Rm_{\text{NZequity}t}$ is the return on the Worldscope New Zealand equity market, $Rm_{\text{NZbond}t}$ is the return on New Zealand Government bond index, $Rm_{\text{WorldEquity}t}$ is the return on the Worldscope world equity market index and, $Rm_{\text{WorldBond}t}$ the return on the JP Morgan World Government bond index.[9]

The results are reported in Panel B of Table 5. We observe a significant underperformance of 2.21 per cent per annum for the balanced funds. Furthermore, these funds display significant exposure to domestic bond and equity indices as well as the world equity index but not to the world bond index.

3.3. Conditional multifactor performance model

It is acknowledged that biases can arise if managers trade on publicly available information. If dynamic strategies are used by managers then average alphas calculated using a fixed beta estimate for the entire performance period are unreliable. Chen and Knez (1996) and Ferson and Schadt (1996) propose a conditional performance measurement. Consider the following case where Z_{t-1} is a vector of lagged predetermined instruments. Assuming that the beta for a fund varies over time, and that this variation can be captured by a linear relation to the conditional instruments, then $\beta_{it} = \beta_{i0} + B_i' Z_{t-1}$, where B_i' is a vector of response coefficients of the conditional beta with respect to the instruments in Z_{t-1}. For a single index model the equation to be estimated then becomes

$$R_{it} - Rf_t = \alpha_i + \beta_{i0}(Rm_t - Rf_t) + B_i' Z_{t-1}(Rm_t - Rf_t) + \varepsilon_{it}. \quad (6)$$

This equation can easily be extended to incorporate multiple factors, which results in a conditional four-factor model with time-varying betas. Whereas Sawicki and Ong (2000) and Gallagher and Jarnecic (2004) provide evidence on the added value of conditional performance measures for Australian funds, to our knowledge this is new to New Zealand mutual fund studies. The instruments we use are publicly available and proven to be useful for predicting stock returns by several previous studies.[10] We introduce (i) the 90 day bank bill rate, (ii) the dividend yield on the market index and

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[9] The Worldscope World equity index excludes New Zealand equity to avoid multicollinearity.

[10] Pesaran and Timmerman (1995) discuss several studies that emphasise the predictability of returns based on interest rates and dividend yields.

Table 6
Unconditional versus conditional performance evaluation

	Unconditional four-factor alpha	R^2_{adj}	Conditional four-factor alpha	R^2_{adj}	Wald (p-value)	Distribution significant alphas		
						−	0	+
Panel A: Equity funds								
Investment objective								
Domestic equity	−1.02	0.92	0.11	0.93	0.011	10%	73%	17%
International equity	−1.07	0.85	−0.32	0.87	0.002	3%	94%	3%
Panel B: Balanced funds								
Investment objective								
Multisector	−2.21***	0.87	−1.67***	0.89	0.000	24%	76%	0%

This table presents the results from the unconditional (columns 2 and 3) and conditional (columns 4 and 5) performance model. The results from the unconditional model are imported from Table 5 column 2, the conditional model results stem from the multifactor version of equation (6). Here we allow the market, SMB, HML and Mom betas to vary over time as a function of (i) the 3 month T-bill rate, (ii) the dividend yield and (iii) the slope of the term structure. The last column of Table 6 provides results for the heteroskedasticity-consistent Wald test to examine whether the conditioning information adds marginal explanatory power to the unconditional model. All alphas are annualized. *** Significant at the 1% level.

(iii) the slope of the term structure. All instruments are based on local values and are lagged 1 month.

Table 6 presents the results of the conditional four-factor model for our sample. Whereas column 2 repeats the unconditional alphas from Table 5, the conditional alphas are reported in column 4. In all cases the hypothesis of constant betas can be rejected at the 5 per cent level (see Wald test statistics in column 6), indicating a strong time-variation in betas. The conditional alphas, however, confirm our previous observations: alphas for equity funds are insignificant and for balanced funds significantly negative.

3.4. Management fees

We have so far considered mutual fund returns net of costs; that is, management fees were already deducted from the fund's return.[11] From the existing published literature, we know that most mutual funds are able to follow the market, with alphas insignificantly different from zero. Once management fees are deducted, funds underperform the market by the amount of fees they charge the investor. To examine

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[11] Loads, however, are not considered.

Table 7
Performance after and before management fees are deducted

Investment objective	After fees alpha	Before fees alpha
Domestic equity		
Unconditional	−1.02	0.19
Conditional	0.11	1.32
International equity		
Unconditional	−1.07	0.22
Conditional	−0.32	0.97
Multisector		
Unconditional	−2.21***	−0.95
Conditional	−1.67***	−0.41

Table 7 gives both unconditional and conditional alphas after costs are deducted (column 2) and before (column 3) costs are deducted from fund returns. All alphas are annualized. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

the influence of fees on New Zealand mutual fund performance, we first present average alphas (after costs) for both the unconditional and conditional model. In Table 7 column 3 we report our earlier findings. If we now add back management fees to fund returns and repeat our analysis as reported in column 3, we observe the average alphas before costs are deducted. Equity funds now exhibit positive alphas based on the models that are adapted. Only balanced funds still underperform, although insignificantly. These results indicate that New Zealand mutual fund managers are quite able to follow general indices but charge too high fees to deliver out-performance.

4. Persistence

The hypothesis that mutual funds with an above average return in one period will also have an above average return in the next period is called the hypothesis of persistence in performance. This topic has been well documented in the published finance literature. Hendricks *et al*. (1993) and Brown and Goetzmann (1995) find evidence of persistence in mutual fund performance over short-term horizons whereas Grinblatt and Titman (1992), Elton *et al*. (1996) and Allen and Tan (1999) document mutual fund return predictability over longer horizons. Carhart (1997), however, shows that the 'hot hands' effect is mainly a result of persistence in expense ratios and the pursuing of momentum strategies. Contrary evidence comes from Jensen (1968), who does not find predictive power for alpha estimates. The importance of persistence analysis is stressed by Sirri and Tufano (1998) who document large money inflows into last year's top performers and extractions from last year's losers. Finally, Zheng (1999) finds that this newly invested money is able to predict future fund performance, in that portfolios of funds that receive more money, subsequently, perform significantly better than those that lose money.

To investigate whether persistence in mutual fund performance is also present in the New Zealand market, we rank all funds within a specific category, based on past 6, 12 and 36 month return. The one-quarter of funds with the highest previous period return (selection period) go into portfolio 1 (Winners) and the one-quarter of funds with the lowest past period return go into portfolio 4 (Losers). The remaining of funds go into two middle portfolios. These four equally weighted portfolios are then held for their respective periods (6, 12 or 36 months) before we rebalance them again based on their last return. This is continued throughout the sample period until we get a time series of monthly returns on all four portfolios. Funds that disappear during the year are included until they disappear, after which portfolio weights are re-adjusted accordingly.

Table 8 reports the result of this exercise; column 2 presents the excess returns on the four ranked portfolios. Overall, we observe that for both investment objectives (equity and balanced) portfolio 1 outperforms portfolio 4. This indicates evidence for persistence in raw fund returns. To rule out possible different levels of risk and time variation in risk we subsequently apply the unconditional one-factor model (columns 4 and 5), unconditional four-factor model (columns 6 and 7) and conditional four-factor model (columns 8 and 9). This analysis confirms our previous observations. At a 6 month horizon we find a significantly positive spread of winners over losers for both equity and balanced funds.[12]

It has to be noted that the documented persistence in performance is mainly driven by icy hands, instead of hot hands indicating that funds that underperform (significantly negative alpha) in one period are most likely to underperform in the next period. Investors should therefore avoid these funds. However, evidence of persistently out-performing funds (significantly positive alpha) is absent. Our findings are robust to the inclusion of a bond index and the inclusion of a separate New Zealand equity index (international funds) to take a potential home bias into account.[13]

5. Fund characteristics and performance

In general, mutual fund managers claim that expenses do not reduce performance, because investors are paying for the quality of the manager's information. So if management expenses are high one would expect returns to increase as well, relative to a low cost fund. To evaluate this claim we measure the marginal effect of expense ratio and other relevant variables on risk-adjusted performance. The model used is as

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[12] Expanding the horizon to 12 and 36 months however weakens the results substantially. It seems persistence is short lived and disappears at longer horizons. This is in line with the findings by, for instance, Brown and Goetzmann (1995). The results for 12 to 36 months are not reported to conserve journal space but they are available from the authors upon request.

[13] This information is available upon request from the authors.

Table 8
Mutual fund persistence based on 6 month lagged return

Panel A: Equity funds

Domestic equity	Excess return	Standard deviation	Unconditional one-factor model		Unconditional four-factor model		Conditional four-factor model		Wald
Portfolio			Alpha	R^2_{adj}	Alpha	R^2_{adj}	Alpha	R^2_{adj}	*p*-value
1 (winners)	0.46	13.51	0.96	0.77	1.34	0.85	1.67	0.86	0.056
2	−1.38	13.42	−0.87	0.80	−1.31	0.83	−0.21	0.84	0.039
3	−1.51	13.22	−1.01	0.88	−1.74*	0.89	−0.22	0.89	0.008
4 (losers)	−1.91	14.21	−1.42**	0.82	−1.77**	0.87	−1.12*	0.88	0.046
1–4 spread	2.37	6.14	2.38**	0.00	3.10**	0.08	2.79**	0.17	0.008

International equity	Excess return	Standard deviation	Unconditional one-factor model		Unconditional four-factor model		Conditional four-factor model		Wald
Portfolio			Alpha	R^2_{adj}	Alpha	R^2_{adj}	Alpha	R^2_{adj}	*p*-value
1 (winners)	−0.01	10.34	−0.09	0.64	2.55	0.68	3.29*	0.69	0.000
2	−2.37	10.02	−2.44**	0.79	−0.84	0.81	−0.24	0.82	0.000
3	−4.77	9.21	−4.92***	0.67	−3.17**	0.71	−1.90	0.79	0.016
4 (losers)	−6.84	11.63	−6.32***	0.48	−4.87**	0.52	−3.23*	0.64	0.008
1–4 spread	6.83	9.51	6.23***	0.00	7.42***	0.05	6.52***	0.15	0.006

Panel B: Balanced funds

Multisector	Excess return	Standard deviation	Unconditional one-factor model		Unconditional four-factor model		Conditional four-factor model		Wald
Portfolio			Alpha	R^2_{adj}	Alpha	R^2_{adj}	Alpha	R^2_{adj}	*p*-value
1 (winners)	−0.81	5.29	−0.86	0.61	−1.16**	0.77	−0.73	0.80	0.024
2	−1.74	5.26	−1.78**	0.61	−2.02***	0.82	−1.40**	0.85	0.000
3	−2.54	5.19	−2.57***	0.57	−2.78***	0.77	−1.62***	0.82	0.000
4 (losers)	−2.72	5.62	−2.76***	0.53	−2.90***	0.77	−2.61***	0.79	0.000
1–4 spread	1.91	3.25	1.90***	0.00	1.74**	0.05	1.88**	0.16	0.002

All funds are ranked based on their previous 6 month return. The portfolios are equally weighted and weights are re-adjusted (monthly) whenever a fund disappears. Funds with the highest previous 6 month return go into portfolio 1 and funds with the lowest go into portfolio 4. Columns 4 and 5 present the results for the unconditional one-factor model, columns 6 and 7 the unconditional four-factor model and columns 8 and 9 the conditional four-factor model. The last column provides results for heteroskedasticity-consistent Wald tests to examine whether the conditioning information adds marginal explanatory power to the unconditional model. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 9
The influence of fund characteristics on risk-adjusted performance

	Intercept	Log (size)	Expense ratio	Log (age)	Load	R^2_{adj}
Investment objective						
Panel A: Equity funds						
Domestic equity	−0.63***	0.07***	0.28***	0.05	−0.09***	0.69
International equity	−0.90**	0.09***	0.15*	0.21*	−0.08**	0.18
Panel B: Balanced funds						
Multisector	−0.21	0.02	0.03	0.02	0.13***	0.26

Table 9 reports are the results for the following estimation:

$$\alpha_i = c_0 + c_1 \text{Log size}_i + c_2 \text{Expense ratio}_i + c_3 \text{Log age}_i + c_4 \text{Load}_i + \varepsilon_i, \tag{7}$$

where α_i is the conditional four-factor alpha for fund i, Log size $_i$ is a funds' size in millions of $NZ at the end of 2003, expense ratio$_i$ is the funds' expense ratio (end 2003), Log age$_i$ is a funds' age in number of years and Load$_i$ is a dummy variable that takes the value of 1 if the fund charges a load (entry or exit) and 0 if no load is charged. T-statistics are heteroskedasticity consistent. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

follows:

$$\alpha_i = c_0 + c_1 \text{Log size}_i + c_2 \text{Expense ratio}_i + c_3 \text{Log age}_i + c_4 \text{Load}_i + \varepsilon_i, \tag{7}$$

where

α_i = conditional four-factor alpha for fund i,
Log size$_i$ = Log of total fund assets for fund i,
Expense ratio$_i$ = Expense ratio for fund i,
Log age$_i$ = Log of Fund i's age in number of years, and
Load$_i$ = Dummy to indicate load charges (entry/exit).

The results reported in Table 9 indicate that risk-adjusted performance for equity funds is positively related to fund size and expense ratio and negatively related to load charges. This indicates that New Zealand equity mutual funds can still profit from economies of scale and that funds with higher management fees provide better returns. The latter is in sharp contrast with the general results by Carhart (1997) for US funds and Otten and Bams (2002) for European funds. In line with Morey (2003) for US funds, we observe that having a load decreases the risk-adjusted performance of New Zealand equity funds significantly. Interestingly the opposite is true for balanced funds. The existence of a load charge increases the risk-adjusted performance significantly. This intuitively makes sense as balanced funds are much more sensitive to fund in/out flows of money. Having a load makes the fund less vulnerable to liquidity-motivated trading.

6. Conclusions

The present study investigates the New Zealand mutual fund industry. More specifically, we test the performance and persistence in performance of a sample of 143 mutual funds over the 1990–2003 period. Our main conclusions are sixfold. First, we document an average survivorship bias of 0.26 per cent per year for New Zealand equity and balanced funds. Second, there is no evidence of timing abilities by the fund managers. Third, the four-factor alphas for equity funds are insignificantly different from zero, whereas balanced funds underperform significantly. Fourth, we find strong evidence for short-term (6-month) persistence in risk-adjusted returns for all funds. Fifth, the documented persistence in performance is mainly driven by icy hands, instead of hot hands. This means that funds that underperform in one period are likely to be underperforming funds in the following period. However, evidence of persistently out-performing funds is absent. Sixth, we find that risk-adjusted performance for equity funds is positively related to fund size and expense ratio and negatively related to load charges.

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