New Zealand Mutual Fund Performance

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ABSTRACT

This study presents an overview of the New Zealand mutual fund industry and investigates mutual fund performance using a survivorship bias controlled sample of 143 funds over the 1990-2003 period. The latter is done using the Ferson & Schadt (1996) conditional multi-factor model and the Carhart (1997) four-factor asset-pricing model. In addition, we investigate whether New Zealand fund managers exhibit "hot hands", persistence in performance. Finally, the influence of fund characteristics on risk-adjusted performance is considered. Our overall results suggest that New Zealand mutual funds have not able to provide out-performance. Alphas for equity funds are insignificantly different from zero, while balanced funds under-perform significantly. In the short term, we find significant evidence of return persistence for all funds. This persistence however is driven by "icy hands", instead of "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

Key words: *Mutual Funds, Performance evaluation*

JEL Classification: *G12, G20, G23*

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1. INTRODUCTION

The purpose of this paper is to provide a comprehensive investigation of the performance of mutual funds in New Zealand by using a large survivor-bias free database and the application of elaborate performance measurement techniques. We explore further whether New Zealand funds exhibit persistence in performance.

The majority of earlier studies [Sharpe (1966), Jensen (1968)] concluded that the net performance of mutual funds (after expenses) is inferior to that of a comparable passive market proxy. During the late 80s and early 90s, however, some contrasting findings appeared. Grinblatt & Titman (1989, 1992) and Ippolito (1989), for instance, found mutual fund managers did possess enough private information to offset the expenses they incurred. Furthermore, Hendricks, Patel & Zeckhauser (1993), Goetzmann & Ibbotson (1994) and Brown & Goetzmann (1995) found evidence of persistence in mutual fund performance over short-term horizons. Carhart (1997), however, argued that this effect is mainly attributable to simple momentum strategies, and not to superior fund management.

Malkiel (1995) and Gruber (1996) observed that most of the older studies are subject to survivorship bias. When they adjusted for this effect, it was found that mutual funds on average under-performed the market proxy by the amount of expenses they charge the investor. Investing in a low cost index fund accordingly is preferred over choosing an actively managed fund.

Aacademic studies on the New Zealand mutual fund market are scant. Boustridge and Young (1996), employing Sharpe ratio, examined the risk-adjusted performance of NZ funds from 1989 to 1995 and found more than 80% of active fund managers underperformed their benchmarks. Vos, Brown and Christie (1995) examined fourteen equity funds available in New Zealand between 1988 and 1994 as part of a combined study of New Zealand and Australia and found no evidence of short-term performance persistence in New Zealand. This was supported by Boustridge and Young (1996) who found that selecting funds on the basis of past performance does not guarantee future performance for NZ funds.

Our study goes beyond these studies and investigates 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) while taking into account survivorship bias. The main contribution of our study, in addition to a large survivorship bias corrected database, lies in the use of more elaborate performance measurement techniques. More specifically, we build on the work of Carhart (1997) and Ferson & Schadt (1996) and introduce conditional multi-factor models for the New Zealand market. The remainder of this paper is organized as follows. In Section 2, we describe our 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

2.1 New Zealand Mutual Fund Market

Table 1 presents the characteristics of the major global mutual fund markets and those of New Zealand. The total size of the New Zealand market is less than US $10 billion and it is by far the smallest among those reported. One reason for this is due to the accessibility of Australian mutual funds to investors in New Zealand, where the market is much larger and offers a wider range of alternatives. The size of the retail funds and the number of funds are again well below the international averages.

[Table 1: Characteristics of Major Mutual Fund Markets]

2.2 Mutual Fund Data

Using Morningstar, we identified all retail equity and balanced mutual funds for the period 01/1990 till 09/2003. Furthermore, we divided funds into investment categories based on their regional focus (domestic versus international) and strategy (equity versus balanced). We restrict our sample to retail funds with at least 12 months of data. Return data was 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 which 30 are domestic equity, 63 international equity and 50 multi-sector, respectively. As reported in Table 2 the size, expense ratio and the age of all three categories are comparable.

[Table 2: Summary Statistics on New Zealand Mutual Funds 1990:01 – 2003:09]

As pointed out by Brown, Goetzmann, Ibbotson and Ross (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 at any point during the sample period. This information was provided by Morningstar. Dead funds were included in the sample until they disappeared, after which the portfolios are re-weighted accordingly. Table 3 presents returns on all funds (dead + surviving) in column 1 and the return on surviving funds in column 4. Column 7 finally is the return on the surviving funds minus the return on the all fund sample. Restricting our sample to surviving funds would lead us to overestimate average returns by 0.26% per annum.

[Table 3: Survivorship bias]

In order to obtain a more detailed picture of the performance of the dead funds, we calculated the average cumulative monthly relative returns for all dead funds for two years prior to their termination. We do this by comparing the return on the individual dead funds to the return on all other funds during the last two years of their existence. As shown in Figure 1, the relative performance of dead funds deteriorates most strongly during the last 6 months before termination.

[Figure 1: Cumulative Relative Performance Prior to Termination]

2.3 Benchmark Data

The main source for constructing our equity benchmark indices is Worldscope. In comparison to MSCI, Worldscope covers up to 98% of a countries market capitalisation, while MSCI serves mainly as a large cap proxy.[1] For the Carhart (1997) 4-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

[1] Alternatively we used the relevant MSCI indices. Based on results not reported in the paper we conclude this did not have an influence on our results.

capitalization of at least $NZ5 million, minus the New Zealand 90-day bank bill rate. We then rank all stocks based on size and assign the bottom 20% of total market capitalization to the small portfolio. The remaining part goes into the large portfolio. SMB is the difference in return between the small and large portfolios. For the HML factor all stocks are ranked on their book-to-market ratio. Following Fama and French (1992) we then assign the top 30% of market capitalization to the high book-to-market portfolio and the bottom 30% 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 constructed value-weighted and re-balanced annually. The momentum factor portfolio is formed by ranking all stocks on their prior 12-month return. The return difference between the top 30% and bottom 30% by market capitalization then provides us with Mom, the momentum factor returns. This procedure is repeated every month to get to a rolling momentum factor.

For the balanced funds in our sample we make use of both equity and bond indices, to reflect their diverse investment objective. Next to the domestic and international equity market indices from Worldscope described above, we include both a domestic and an international bond index. More specifically, 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 Model

We firstly employ the traditional CAPM based single index model, where the intercept, α_i, gives the Jensen alpha, which is interpreted as a measure of out- or under-performance relative to the used market proxy.[2] Formally,

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

where R_{it} is the return on fund i in month t, R_{ft} the return on the 90-day bank bill in month t, R_{mt} the return on the relevant equity index in month t and ε_{it} an error term.

[2] See Jensen (1968)

Table 4 presents the results of applying equation (1) to our data. We report Jensen's alpha for both domestic and international equity funds in Panel A and for balanced funds in Panel B of Table 4 respectively.

[Table 4: Results CAPM model]

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 multi-sector funds 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 4 present the distribution of individually estimated α's. We report the percentage of significantly positive α's (+), significantly negative α's (-) and α's which 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 α's close to zero and more than 70 per cent of balanced funds provide negative α's with no out-performance.

3.2 Multi-factor 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 multi-factor model to account for all possible investment strategies. Recent literature on the cross-sectional variation of stock returns (see, e.g. Fama & French (1993, 1996) and Chan, Jegadeesh & Lakonishok (1996)) raises questions on the adequacy of a single index model to explain mutual fund performance. The Fama & French (1993) 3-factor model is considered to give 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 variation in momentum-sorted portfolio returns. Therefore, Carhart (1997) extends the Fama-French model by adding a fourth factor that captures the Jegadeesh & 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,

$$R_{it}-Rf_t= \alpha_i + \beta_{0i} (Rm_t - Rf_t)+ \beta_{1i}SMB_t + \beta_{2i}HML_t + \beta_{3i} Mom_t + \varepsilon_{it} \quad (2)$$

where

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

Panel A Table 5 summarizes the results of applying the multi-factor 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 type of funds are growth-oriented. Fourth, while 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.[3]

[Table 5: Multi-Factor Model]

For the balanced funds the following performance model is applied:

$$R_t-Rf_t= \alpha + \beta_0 (Rm_{NZ\ equityt} - Rf_t) + \beta_1 (Rm_{NZ\ bondt} - Rf_t) + \beta_2 (Rm_{World\ Equityt} - Rf_t) + \beta_3 (Rm_{World\ Bondt} - Rf_t) + \varepsilon_{it} \quad (3)$$

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

Where R_t is the fund return, Rf_t the risk-free rate, $Rm_{NZ\ equityt}$ the return on the Worldscope New Zealand equity market, $Rm_{NZ\ bondt}$ the return on New Zealand Government bond index - $Rm_{World\ Equityt}$ the return on the Worldscope World equity market index and, $Rm_{World\ Bondt}$ the return on the JP Morgan World Government bond index.[4]

The results are reported in Panel B Table 5. We observe a significant underperformance of 2.21% 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 multi-factor 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 & Knez (1996) and Ferson & Schadt (1996) propose a conditional performance measurement. Consider the following case were $\mathbf{Z}_{t-1}$ is a vector of lagged pre-determined 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 $\beta_{it} = \beta_{i0} + \mathbf{B'}_i \mathbf{Z}_{t-1}$, where $\mathbf{B'}_i$ is a vector of response coefficients of the conditional beta with respect to the instruments in $\mathbf{Z}_{t-1}$. For a single index model the equation to be estimated then becomes

$$R_{it}-Rf_t= \alpha_i + \beta_{i0} (Rm_t - Rf_t)+ \mathbf{B'}_i \mathbf{Z}_{t-1}(Rm_t - Rf_t) + \varepsilon_{it} \qquad (4)$$

This equation can easily be extended to incorporate multiple factors, which results in a conditional 4-factor model with time-varying betas. The instruments we use are publicly available and proven to be useful for predicting stock returns by several previous studies.[5] Introduced are (1) the 90-day bank bill rate, (2) dividend yield on the market index and (3) the slope of the term structure. All instruments are based on local values and lagged 1 month.

[4] The Worldscope World equity index excludes NZ equity to avoid multi-collinearity.
[5] Pesaran and Timmerman (1995) discuss several studies that emphasize the predictability of returns based on interest rates and dividend yields.

Table 6 presents the results of the conditional 4-factor model for our sample. While 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% level (see Wald test statistics in column 6), indicating 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.

[Table 6: Unconditional versus Conditional performance evaluation]

3.4 Management fees

We have so far considered mutual fund returns net of costs. This means management fees were already deducted from the fund's return.[6] From existing 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 under-perform the market by the amount of fees they charge the investor. To examine 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 under-perform, though insignificantly. These results indicate that New Zealand mutual funds are quite able to follow general indices but charge too high fees to deliver out-performance.

(Table 7: Performance after and before management fees are deducted)

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 finance literature. Hendricks, Patel & Zeckhauser (1993) and Brown & Goetzmann (1995) find evidence of persistence in mutual fund

[6] Loads however are not considered.

performance over short-term horizons where Grinblatt & Titman (1992) and Elton, Gruber, Das & Blake (1996) document mutual fund return predictability over longer horizons. Carhart (1997) shows that this "hot hands" effect is mainly due to 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 New Zealand market, we rank all funds within a specific category, based on past 6-, 12- and 24-month return. The 1/3 of funds with the highest previous period return (selection period) go into portfolio 1 (Winners) and the 1/3 funds with the lowest past period return go into portfolio 3 (Losers). The remaining 1/3 of funds go into portfolio 2. These 3 equally weighted portfolios are then held for their respective periods (6, 12, or 24 months), performance period, 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 3 portfolios. Funds that disappear during the year are included until they disappear, after which portfolio weights are re-adjusted accordingly.

[Table 8: Mutual fund persistence based on 6-month lagged return]

[Table 9: Mutual fund persistence based on 12-month lagged return]

[Table 10: Mutual fund persistence based on 24-month lagged return]

Tables 8, 9 and 10 report the result of this exercise. For each Table column two presents the excess returns on the 3 ranked portfolios. Overall, we observe that for almost all periods (6, 12 and 24 months) and both investment objectives (equity and balanced) portfolio 1 outperforms portfolio 3. This indicates strong 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 4-factor model (columns 4-9) and conditional 4-factor model (columns 10-11). 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.

Expanding the horizon to 12 and 24 months does not affect the significant persistence for domestic equity funds. International equity and balanced funds however show much weaker persistence at a 12 and 24 month horizon. With respect to style it appears that, on average, winners are significantly more exposed to small caps and positive momentum, compared to losers. This in line with the results of Carhart (1997) for US funds.

It has to be noted that the documented persistence in performance is mainly driven by icy hands, instead of hot hands. This means that funds that under-perform (significantly negative alpha) in one period are most likely to under-perform in the next period. Investors should therefore avoid these funds. On the other hand, evidence of persistently out-performing funds (significantly positive alpha) is absent. All of 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.[7]

Finally, we plot the cumulative performance of a 6 month return chasing strategy for all three categories of funds in Figure 2. While the domestic equity and multi-sector provide rather steady persistence returns on a year by year basis, the international equity persistence returns speed up considerably after 1997.

[Figure 2: Cumulative Performance from 6 months Return-Chasing Strategy]

5 THE INFLUENCE OF FUND CHARACTERISTICS ON RISK-ADJUSTED PERFORMANCE

In general mutual fund managers claim that expenses do not reduce performance, since 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 we use is as follows:

$$\alpha_i = c_0 + c_1 \text{Log size}_i + c_2 \text{Expense ratio}_i + c_3 \text{Log age}_i + c_4 \text{Load}_i + \varepsilon_i \qquad (5)$$

where

α_i = conditional 4-factor alpha for fund i

Log size_i = Log of total fund assets for fund i

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

Expense ratio$_i$ = Expense ratio for fund i

Log age$_i$ = Log of Fund i's age in number of years

Load$_i$ = Dummy to indicate load charges (entry/exit)

The results in Table 11 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 & 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.

[Table 11: The influence of fund characteristics on risk-adjusted performance]

6 CONCLUSIONS

This study investigates the New Zealand mutual fund industry. More specifically we test the performance of a sample of 143 mutual funds over the 1990-2003 period. Our main conclusions are six-fold. First, we document an average survivorship bias of 0.26% per year for New Zealand equity and balanced funds. Second, we find the relative performance of dead funds deteriorate strongly in the last 6 months prior to termination. Third, the 4-factor alphas for equity funds are insignificantly different from 0, while balanced funds under-perform significantly. Fourth, we find strong evidence for short-term (6-month) persistence in risk-adjusted returns for all funds. While domestic equity funds also deliver significant persistence up to 24 months, international equity and balanced funds show weaker persistence at a 12 and 24 month horizon. Fifth, the documented persistence in performance is mainly driven by icy hands, instead of hot hands. This means that funds that under-perform in one period are likely to be under-performing funds in the next period. Investors should therefore avoid these funds. On the other hand, 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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Table 1: Characteristics of Major Mutual Fund Markets

	Total assets	Number of Funds	Average Size	Asset allocation (in %) Equity	Bond	Money	Balanced	Other
World	**13,957,000**	**54,015**	**258**	**42%**	**22%**	**23%**	**9%**	**2%**
Americas	**7,969,224**	**13,921**	**572**	**49%**	**17%**	**26%**	**7%**	**1%**
Brazil	171,569	2,805	61	7%	60%	3%	30%	0%
Canada	338,369	1,887	179	49%	11%	12%	17%	11%
United States	7,414,084	8,126	912	50%	17%	28%	5%	0%
Europe	**4,592,582**	**27,987**	**164**	**32%**	**29%**	**21%**	**14%**	**5%**
France	1,148,446	7,902	145	23%	18%	36%	20%	3%
Germany	276,319	1,050	263	44%	31%	16%	9%	0%
Italy	478,734	1,012	473	20%	40%	24%	14%	2%
Luxemburg	1,104,112	6,578	168	32%	45%	9%	7%	7%
Spain	255,344	2,471	103	34%	29%	27%	10%	0%
United Kingdom	396,523	1,692	234	75%	17%	0%	8%	0%
Asia Pacific	**1,361,298**	**11,641**	**117**	**42%**	**23%**	**17%**	**5%**	**13%**
Australia	518,411	6,745	77	37%	9%	21%	0%	33%
Hong Kong	255,811	963	265	62%	24%	5%	8%	1%
Japan	349,148	2,617	133	57%	32%	11%	0%	0%
New Zealand	9,641	563	17	18%	19%	6%	34%	23%
Taiwan	76,205	401	190	12%	83%	0%	5%	0%

Notes:
Table 1 presents the characteristics of the major global mutual fund markets. All figures are obtained from FEFSI and are as of December 31, 2003. The first column presents the total market value (million US dollar). The second column is the number of funds, the third column is the average size and the last 5 columns show the asset allocation of all mutual funds.

Table 2: Summary Statistics on New Zealand Mutual Funds 1990:01 – 2003:09

	Excess Return	Standard deviation	Size	Expense Ratio	Age in years	# 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
Multi-sector	-2.25	5.10	18	1.26	7.4	50
All funds	-2.75	9.13	21	1.26	7.5	143

Notes:
Table 2 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 annualised with reinvestment of all distributions, based on NZ$. All returns are net of expenses and before taxes. Average fund size is based on NAV at the end of 2003 and in millions of NZ$. 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.

Table 3: Survivorship bias

	All Funds			*Surviving funds*			*Survivor bias*
	Excess Return	Standard deviation	# of Funds	Excess Return	Standard deviation	# 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
Multi-sector	-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

Notes:
Table 3 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 annualised with reinvestment of all distributions, based on NZ$. All returns are net of expenses and before taxes.

Table 4: Results CAPM model

Panel A: Equity Funds

	Alpha	Market	R^2_{adj}	Distribution Significant Alphas		
				-	0	+
Investment Objective						
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

	Alpha	Market	R^2_{adj}	Distribution Significant Alphas		
				-	0	+
Investment Objective						
Multi-sector	-2.15***	0.23***	0.64	71%	29%	0%

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

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

Where R_t is the fund return, Rf_t the risk-free rate and Rm_t the return on the relevant benchmark. All returns are in NZ$, net of costs and before taxes. All alphas are annualised.

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Table 5: Multi-Factor Model

Panel A: Equity Funds

	4-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

	4-factor Alpha	NZ Equity	NZ Bond	World Equity	World Bond	R^2_{adj}	Distribution Significant Alphas -	0	+
Investment Objective									
Multi-sector	-2.21***	0.15***	0.22***	0.17***	0.00	0.87	66%	34%	0%

Notes:
The table reports the results of the estimation of equation (2) and (3) for the 1990:01 – 2003:09 period.
For the equity funds we estimate:

$$R_t - Rf_t = \alpha + \beta_0 (Rm_t - Rf_t) + \beta_1 SMB_t + \beta_2 HML_t + \beta_3 Mom_t + \varepsilon_{it} \quad (2)$$

For the balanced funds we estimate:

$$R_t - Rf_t = \alpha + \beta_0 (Rm_{NZ\ equityt} - Rf_t) + \beta_1 (Rm_{NZ\ bondt} - Rf_t) + \beta_2 (Rm_{World\ Equityt} - Rf_t) + \beta_3 (Rm_{World\ Bondt} - Rf_t) + \varepsilon_{it} \quad (3)$$

Where R_t is the fund return, Rf_t the risk-free rate, Rm the return on the total Universe according to Worldscope, and SMB and HML 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 annualised. T-stats are heteroskedasticity consistent.
*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Table 6: Unconditional versus Conditional performance evaluation

Panel A: Equity Funds

	Unconditional 4f-alpha	R^2_{adj}	Conditional 4f-alpha	R^2_{adj}	Wald (p-value)	Distribution Significant Alphas -	0	+
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

	Unconditional 4f-alpha	R^2_{adj}	Conditional 4f-alpha	R^2_{adj}	Wald (p-value)	Distribution Significant Alphas -	0	+
Investment Objective								
Multi-sector	-2.21***	0.87	-1.67***	0.89	0.000	24%	76%	0%

Notes:
This Table presents the results from the unconditional (column 2 and 3) and conditional (column 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 (4). Here we allow the market, SMB, HML and Mom betas to vary over time as a function of (1) the 3 month T-bill rate, (2) dividend yield and (3) 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 annualised.

*** Significant at the 1% level

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
Multi-Sector		
unconditional	-2.21***	-0.95
conditional	-1.67***	-0.41

Notes:
This table 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 annualised.

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Table 8: Mutual fund persistence based on 6-month lagged return

Panel A: Equity Funds

Domestic Equity			Unconditional 4-factor model						Conditional 4f		Wald
Portfolio	Excess return	Stdev	Alpha	Market	SMB	HML	Mom	R^2_{adj}	Alpha	R^2_{adj}	P-value
1 (winners)	-0.36	13.41	0.98	0.75***	0.26***	-0.03*	-0.02	0.87	1.75	0.88	0.005
2	-2.05	13.63	-1.88*	0.75***	0.14***	-0.05**	-0.04**	0.89	-0.37	0.90	0.003
3 (losers)	-3.00	13.67	-2.65**	0.74***	0.18***	-0.04**	-0.06**	0.86	-0.84	0.87	0.007
1-3 spread	**2.64**	**5.78**	**3.63****	**0.01**	**0.08*****	**0.01**	**0.04****	**0.05**	**2.59****	**0.10**	**0.007**

International Equity			Unconditional 4-factor model						Conditional 4f		Wald
Portfolio	Excess return	Stdev	Alpha	Market	SMB	HML	Mom	R^2_{adj}	Alpha	R^2_{adj}	P-value
1 (winners)	-1.83	10.19	1.39	0.59***	0.23***	0.03*	0.07***	0.70	2.46****	0.70	0.814
2	-4.29	9.32	-1.71*	0.59***	0.16***	0.06***	0.04*	0.82	-1.43	0.85	0.000
3 (losers)	-6.87	10.96	-4.39****	0.58***	0.16**	0.14***	0.00	0.55	-3.31****	0.67	0.000
1-3 spread	**5.04**	**8.89**	**5.78****	**0.01**	**0.07***	**-0.11****	**0.07****	**0.04**	**5.77****	**0.13**	**0.007**

Panel B: Balanced Funds

Multi-sector			Unconditional 4-factor model						Conditional 4f		Wald
Portfolio	Excess return	Stdev	Alpha	NZ equity	NZ bond	World equity	World bond	R^2_{adj}	Alpha	R^2_{adj}	P-value
1 (winners)	-1.38	5.39	-1.41**	0.18***	0.21***	0.13***	0.03**	0.78	-0.93****	0.81	0.000
2	-2.42	5.09	-2.37**	0.15***	0.22***	0.17***	0.00	0.84	-1.55****	0.88	0.000
3 (losers)	-2.94	5.56	-2.82**	0.14***	0.21***	0.20***	0.00	0.77	-2.67****	0.79	0.017
1-3 spread	**1.57**	**3.22**	**1.41****	**0.04****	**0.00**	**-0.07****	**0.04****	**0.04**	**1.74****	**0.15**	**0.002**

All funds are ranked based on their previous 6-month return. The portfolios are equally weighted and weights are readjusted (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 3. Columns 4 through 9 present the results for the unconditional model and column 10 and 11 for the conditional 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: Mutual fund persistence based on 12-month lagged return

Panel A: Equity Funds

Domestic Equity			Unconditional 4-factor model						Conditional 4f		Wald
Portfolio	Excess return	Stdev	Alpha	Market	SMB	HML	Mom	R^2_{adj}	Alpha	R^2_{adj}	P-value
1 (winners)	-1.18	12.78	0.26	0.70***	0.20***	-0.01	0.00	0.84	1.49	0.84	0.388
2	-1.70	13.71	-1.28	0.76***	0.15***	-0.03**	-0.04**	0.89	0.03	0.90	0.012
3 (losers)	-2.70	14.11	-2.86**	0.77***	0.16***	-0.06**	-0.08**	0.89	-1.18	0.90	0.000
1-3 spread	**1.52**	**5.47**	**3.12****	**-0.07****	**0.04***	**0.05*****	**0.09*****	**0.19**	**2.67****	**0.25**	**0.014**

International Equity			Unconditional 4-factor model						Conditional 4f		Wald
Portfolio	Excess return	Stdev	Alpha	Market	SMB	HML	Mom	R^2_{adj}	Alpha	R^2_{adj}	P-value
1 (winners)	-4.19	10.33	-0.27	0.61***	0.26***	0.06*	0.14***	0.72	-0.06	0.74	0.004
2	-4.28	9.41	-1.79	0.58***	0.15***	0.07**	0.04*	0.77	-0.95	0.78	0.046
3 (losers)	-4.30	10.61	-2.35**	0.52***	0.16**	0.11*	-0.05*	0.50	-1.36	0.65	0.000
1-3 spread	**0.11**	**9.18**	**2.08***	**0.09****	**0.10**	**-0.05**	**0.19*****	**0.16**	**1.30**	**0.27**	**0.000**

Panel B: Balanced Funds

Multi-sector			Unconditional 4-factor model						Conditional 4f		Wald
Portfolio	Excess return	Stdev	Alpha	NZ equity	NZ bond	World equity	World bond	R^2_{adj}	Alpha	R^2_{adj}	P-value
1 (winners)	-1.85	5.12	-1.90**	0.17***	0.22***	0.14***	0.02*	0.81	-1.36**	0.83	0.006
2	-2.47	5.47	-2.46**	0.17***	0.23***	0.17***	0.02*	0.85	-1.87**	0.87	0.002
3 (losers)	-2.22	5.38	-2.06**	0.15***	0.18***	0.18***	-0.02	0.76	-1.63**	0.80	0.000
1-3 spread	**0.37**	**2.92**	**0.16**	**0.02**	**0.04**	**-0.04****	**0.04****	**0.04**	**0.23**	**0.18**	**0.000**

All funds are ranked based on their previous 12-month return. The portfolios are equally weighted and weights are readjusted (monthly) whenever a fund disappears. Funds with the highest previous 12-month return go into portfolio 1 and funds with the lowest go into portfolio 3. Columns 4 through 9 present the results for the unconditional model and column 10 and 11 for the conditional 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 10: Mutual fund persistence based on 24-month lagged return

Panel A: Equity Funds

Domestic Equity			Unconditional 4-factor model						Conditional 4f		Wald
Portfolio	Excess return	Stdev	Alpha	Market	SMB	HML	Mom	R^2_{adj}	Alpha	R^2_{adj}	P-value
1 (winners)	3.37	12.86	0.76	0.73***	0.15***	-0.04**	-0.01	0.86	0.71	0.89	0.000
2	2.80	13.45	0.66	0.65***	0.14***	0.00	-0.08**	0.77	1.33	0.72	0.007
3 (losers)	1.58	13.67	-1.93**	0.73***	0.13***	-0.06**	-0.10**	0.92	-1.53****	0.93	0.005
1-3 spread	**1.79**	**5.00**	**2.69****	**0.00**	**0.02**	**0.02**	**0.09*****	**0.14**	**2.25****	**0.26**	**0.003**

International Equity			Unconditional 4-factor model						Conditional 4f		Wald
Portfolio	Excess return	Stdev	Alpha	Market	SMB	HML	Mom	R^2_{adj}	Alpha	R^2_{adj}	P-value
1 (winners)	-2.63	11.79	0.25	0.71***	0.17***	0.03	0.05*	0.76	0.92	0.80	0.000
2	-4.01	9.83	-1.05	0.56***	0.23***	0.00	0.04*	0.70	-0.63	0.72	0.021
3 (losers)	-5.95	10.70	-2.67*	0.60***	0.24***	0.15**	0.04*	0.62	-1.78	0.67	0.000
1-3 spread	**3.32**	**8.14**	**2.92****	**0.11****	**0.07***	**-0.12****	**0.01**	**0.11**	**2.70***	**0.30**	**0.000**

Panel B: Balanced Funds

Multi-sector			Unconditional 4-factor model						Conditional 4f		Wald
Portfolio	Excess return	Stdev	Alpha	NZ equity	NZ bond	World equity	World bond	R^2_{adj}	Alpha	R^2_{adj}	P-value
1 (winners)	-1.21	5.37	-2.20**	0.15***	0.23***	0.19***	0.00	0.78	-2.14****	0.81	0.000
2	-1.24	5.00	-2.22**	0.15***	0.21***	0.18***	0.00	0.83	-1.75****	0.86	0.000
3 (losers)	-0.93	5.05	-1.97**	0.16***	0.23***	0.14***	0.00	0.76	-1.66****	0.77	0.017
1-3 spread	**-0.28**	**3.38**	**-0.23**	**-0.01**	**0.00**	**0.05***	**0.04**	**0.17**	**-0.48**	**0.10**	**0.000**

All funds are ranked based on their previous 24-month return. The portfolios are equally weighted and weights are readjusted (monthly) whenever a fund disappears. Funds with the highest previous 24-month return go into portfolio 1 and funds with the lowest go into portfolio 3. Columns 4 through 9 present the results for the unconditional model and column 10 and 11 for the conditional 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 11: The influence of fund characteristics on risk-adjusted performance

Panel A: Equity Funds

	Intercept	Log (size)	Expense ratio	Log (age)	Load	R^2_{adj}
Investment Objective						
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

	Intercept	Log (size)	Expense ratio	Log (age)	Load	R^2_{adj}
Investment Objective						
Multi-sector	-0.21	0.02	0.03	0.02	0.13***	0.26

Notes:
This table reports are the results for the following estimation:

$$\alpha_i = c_0 + c_1 \text{Log size}_i + c_2 \text{Expense Ratio}_i + c_3 \text{Log age}_i + c_4 \text{Load}_i + \varepsilon_i \quad (5)$$

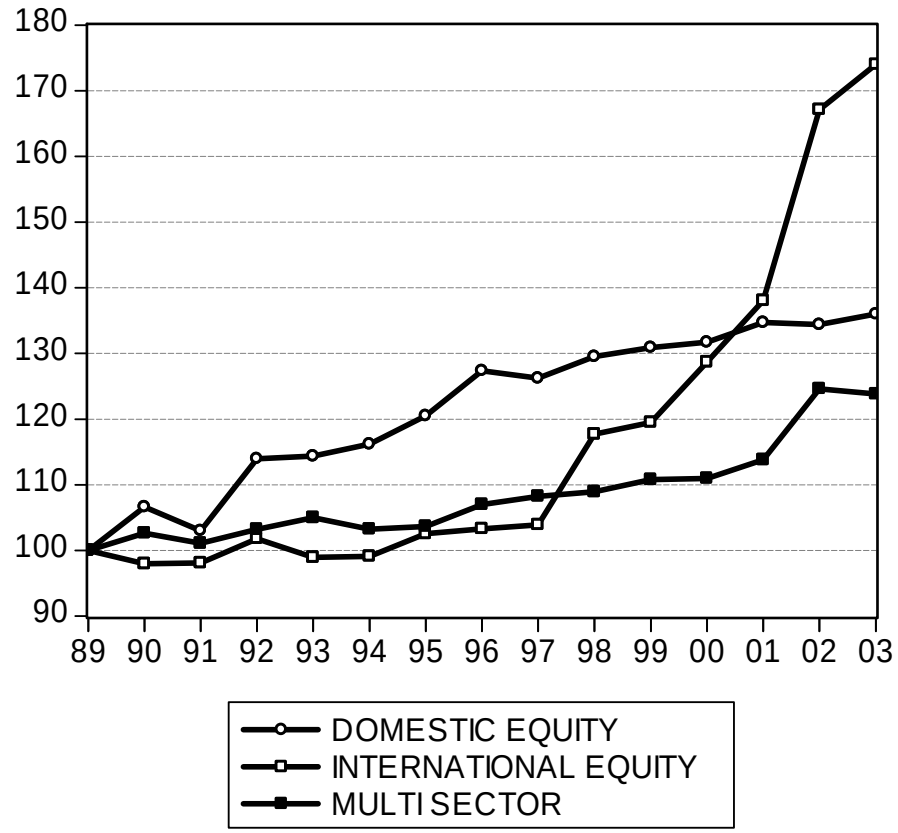
where α_i is the conditional 4-factor alpha for fund i, Log size $_i$ is a funds' size in millions of NZ$ at the end of 2003, expense ratio$_i$ is the funds' expense ratio (end 2003), Log age$_i$ is a funds' age in number of years and Load$_i$ is a dummy variable that takes the value of 1 if the fund charges a load (entry or exit) and 0 if no load is charged. T-stats are heteroskedasticity consistent.

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Figure 1: Cumulative Relative Performance Prior to Termination

Notes:
Figure 1 plots the average cumulative monthly return for all terminated relative to all other New Zealand mutual funds aligned in event time. The event, being the termination of a fund, at point 0.

Figure 2: Cumulative Performance from 6 months Return-Chasing Strategy



Notes:
Figure 2 plots the cumulative performance from a 6 month performance chasing strategy for all three investment objectives. Every six months a portfolio that is long in the past winners and short in the past losers is constructed and held for six months.