A New Perspective on the Performance of New Zealand Actively Managed Funds*

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Abstract

The returns on New Zealand equity holdings of New Zealand actively managed funds from 2010 to 2017 provide little evidence of risk-adjusted outperformance and stock-picking skill. These exposures yield pre-cost returns that have a nearly perfect correlation with the market index and an insignificant alpha of 0.05% per month. Funds show little tendency to bet on any of the main characteristics known to predict stock returns, such as size, book-to-market and momentum. While we observe some variation in performance for funds with different characteristics, we observe no outperformance across these different characteristics either. In addition, we show that the average Active Shares and Tracking Errors are low, suggesting that the majority of funds hold New Zealand equity portfolios that closely mimic the market index.

JEL classification: G11; G23
Key words: Mutual funds; Performance measurement; Active management; Portfolio holdings.

1. Introduction

The New Zealand mutual funds industry has seen a considerable growth over the last decade with institutional investors playing a greater role in the market. According to the 2016 JBWere Foreign Ownership survey,[1] the share of NZ common equity held by NZ managed funds has increased from 15.6% of total market value in 2005 to 21.5% in 2016. Given the significant proportion of assets under management[2] and the important role of professional investment firms in providing investment services, performance measurement is critical to determine whether the investment objectives of investors are being met. This is particularly so for funds which are classified as 'actively managed'. In such a case, investors expect active managers to provide returns that exceed passive returns, after fees and expenses.

Even though active funds claim the ability to outperform (Scobie, 2017), existing studies on fund performance in New Zealand document that active management does not outperform the market after deducting fees and expenses (Bauer et al., 2006; Fowler et al., 2010; Frijns and Tourani-Rad, 2015). However, most of the previous research examines performance using fund returns. This complicates performance measurement and the identification of stock-picking skills, as funds invest in various asset classes and have both national and international exposures, and so selection of an appropriate benchmark can be difficult. By making use of holdings data, we can resolve this issue by zooming in solely on the domestic equity portion of NZ-based investment funds and assess whether there is evidence of skills in the selection of NZ equities. While various studies have made use of portfolio holdings to investigate fund performance in other markets, such as the U.S. market (Da et al., 2010; Lewellen, 2011; Busse

[1]https://www.jbwere.co.nz/assets/Uploads/JBWere-2016-Foreign-Ownership-Survey.pdf
[2]About $26 billion as of September 2016.

and Tong, 2012; Anand et al., 2013) or Australia (Bennett et al., 2016), to the best of our knowledge, ours is the first to study New Zealand mutual funds using portfolio holdings data.

In this study, we assess the ability of New Zealand actively managed funds to generate risk-adjusted outperformance using portfolio holdings data. Specifically, we focus on the NZ equities held by NZ actively managed funds, and address the question whether NZ mutual fund managers have the ability to generate risk-adjusted outperformance in their domestic equity allocations.[3] Using monthly holdings data for the period September 2010 to February 2017, we find no evidence of outperformance over market benchmarks such as the NZX50, NZXAll, NZX50P and over stock portfolios with similar characteristics. The aggregate portfolio held by active fund managers has a return correlation of 97.3% with the NZX50 index and a beta that is insignificantly different from one. In addition, we do not find evidence of outperformance before costs and fees based on the CAPM, Fama and French (1993) three-factor model and the Carhart (1997) four-factor model. This suggests that the aggregate portfolio of actively managed domestic equities closely tracks the market index without generating any additional returns.

As our main result focuses on the aggregate portfolio of all actively managed funds, we assess whether there is perhaps skill among funds with specific characteristics. To do this, we group funds based on fund size, size of local holdings, type of fund provider (banks, insurance companies or investment companies), past returns and fees and assess whether there is any evidence of outperformance within specific fund types. We find virtually no evidence of risk-

[3]We focus on the NZ equity part of NZ actively managed funds as we expect a domestic fund manager to be most informed about the local equity market rather than a foreign equity market. Indeed, in their sample of European mutual funds, Banegas et al. (2013) show that local fund managers are more skilled than Pan-European funds managers. In addition, NZ fund managers may generate outperformance in their bond strategy. However, with corporate bond generally having a much lower volatility than equities, generating substantial outperformance in a bond strategy is difficult.

adjusted outperformance across the different categories (only funds with relatively small NZ holdings have a positive alpha that is significant at the 10% level).

Subsequently, we assess whether funds engage in any stock-picking or market timing by considering the Active Share (Cremers and Petajisto, 2009) and Tracking Error. We find that the Active Share is 26.4%, close to the threshold of Cremers and Petajisto (2009), who label funds with Active Shares of less than 20% as pure index trackers. The Tracking Error is also low at 2.8% for the aggregate portfolio. Similar results are obtained for funds sorted into different characteristics, and suggests that NZ actively managed funds engage little in stock selection and market timing in their NZ equity allocation.

In a direct test to examine stock-picking skill, we assess whether changes in the weights in a particular stock are related to future returns in that stock. We find no evidence of any stock-picking skill. In fact this analysis reveals that NZ active managers engage in return chasing behavior, by increasing allocations to stocks that have performed well in the previous month.

Overall, our study documents that active fund managers in aggregate do little more than hold the market portfolio, presumably generating considerable costs and fees in the process of doing so. Despite funds being actively managed, these funds earn almost identical pre-cost returns to the market. An important implication from an investor point of view is that there is no additional return to be obtained from NZ actively managed funds in their domestic equity strategy, and hence investors should be very cautious when managers claim to have abilities to outperform. In addition, investors should be wary of any fees that may be charged for active management of these strategies.

Our study contributes to a large body of literature on performance measurement and assessment of fund managers (Sharpe, 1966; Jensen, 1968; Hendricks et al., 1993; Carhart, 1997; Chen et al., 2004; Barras et al., 2010, inter alii). Many studies on the performance of mutual funds are returns-based studies. These studies compare the returns of a fund to a relevant benchmark index or against a suitably defined peer group of competing fund managers (e.g. Carhart, 1997; Barras et al., 2010; Fama and French, 2010). Generally speaking, the majority of the returns-based studies find limited evidence of persistence in outperformance among US domestic equity funds once properly controlling for known risk factors, and in some case (e.g. Carhart, 1997) find persistence in underperformance.

The returns-based evidence for the New Zealand mutual fund industry is pretty much in line with the US observation. Bauer et al. (2006) examine the performance of 143 New Zealand mutual funds over the period 1990-2003 and document that the alphas for equity funds are not significantly different from zero. Fowler et al. (2010) examine the performance of New Zealand actively managed funds for the period 1999-2006. They find that actively managed funds barely earn their fees and that passive investments might do just as well or better. Frijns and Tourani-Rad (2015) investigate the performance of KiwiSaver growth funds for the period 2007-2013. Similar to previous studies, they find no evidence of risk-adjusted outperformance of these funds, and in several cases, document significant underperformance.

While the above studies allude to limited evidence on the ability of active managers to generate risk-adjusted outperformance, they are based on returns data which aggregate performance across all asset classes with varying exposures. This may lead to benchmark selection issues (particularly for funds with international exposures) which may obscure the fund manager's true stock-picking skills. To deal with this issue, more recent studies focus on using portfolio

holdings data to determine how funds trade and to more precisely measure fund skill (e.g. Cremers and Petajisto, 2009; Chen et al., 2010; Lewellen, 2011; Bennett et al., 2016).[4] In short, holdings data would enable suitable performance measurement by researchers and industry analysts by allowing them to analyze trading activity.

Unlike the United States, New Zealand (like Australia) does not have a mandatory disclosure regime related to portfolio holdings data (see Brown and Gregory-Allen (2012) for a discussion on the need for mandated portfolio disclosure). While fund managers may provide institutional investors and asset consultants with periodic portfolio holdings, there remains no formalized/legal requirement to disclose portfolios.[5] However, Morningstar records holdings that have been voluntarily disclosed proactively by funds. Based on the market capitalization of funds, we obtain disclosure data for more than 65% of New Zealand mutual funds. This 65% constitutes a lower bound as it consider all assets under management, including fixed income and foreign investment allocations, and hence the market value of disclosed NZ equities will be higher than this conservative lower bound. We use these holdings data to assess the performance of the portfolios held by active fund managers, hence allowing us to assess fund managers' stock-picking skill for the lion share of NZ actively managed equities. The current paper therefore complements existing return-based studies on the New Zealand market by using holdings data and provides much needed research on this market that has received relatively little attention.

[4]Fowler et al. (2010) find evidence that New Zealand fund managers deviate from their stated investment objectives, with equity-oriented funds providing returns that are significantly different from equity returns. Lack of information about the asset allocation of the fund offers further support in assessing performance using portfolio holdings data.

[5]In 2010, the Ministry of Economic Development in New Zealand started a discussion on changes to the governance of KiwiSaver schemes, including a mandatory holdings disclosure regulation. The periodic disclosure regulation came into force on 1 July 2013 but was eventually revoked on 1 December 2014.

The remainder of this paper is structured as follows. Section 2 describes the methodologies used in this study to assess performance. Section 3 details the data and provides descriptive statistics. We report our findings in Section 4. Section 5 concludes.

2. Methodology

To investigate the risk-adjusted performance of NZ-based investment funds, we compare the returns of the New Zealand portion of the portfolios held by actively managed funds with the returns of several NZ market capitalization weighted stock market indices.

The first model we consider compares the performance of the portfolio of NZ-based actively managed funds with the market index. Specifically, we estimate the following CAPM regression,

$$r_t = a + br_{mt} + \varepsilon_t, \tag{1}$$

where r_t is the return on the aggregate NZ equity portfolio of actively managed funds in excess of the risk-free rate (in line with Bauer et al. (2006) and Frijns and Tourani-Rad (2015) we use the 90-day bank bill rate), and r_{mt} is the return on the NZ market index in excess of the risk-free rate. The coefficient a captures the risk-adjusted performance relative to the market index and b captures the exposure of the portfolio relative to the market index.

The CAPM assumes that only market risk is priced. However, in addition to the market risk, there are other well-established factors that affect stock returns, and therefore the performance of investment funds. Fama and French (1993) posit that the cross-section of average returns

can be explained by two additional factors: (1) a size factor, and (2) a book-to-market factor. We therefore augment the CAPM with these factors and estimate the so-called Fama and French (1993) 3-factor model,

$$r_t = \alpha + br_{mt} + sSMB_t + hHML_t + \varepsilon_t, \quad (2)$$

where SMB_t is the NZ size factor, constructed as the zero-investment portfolio that is long in small caps and short in large caps, and HML_t is the NZ book-to-market factor, constructed as the zero-investment portfolio that is long in high book-to-market stocks and short in low book-to-market stocks. The coefficient s measures the exposure of the portfolio to the size factor, where a positive coefficient indicates that the portfolio tilts towards small caps, and vice versa. The coefficient h measures the exposure to the book-to-market factor, where a positive coefficient implies that the portfolio tilts towards high book-to-market firms (value stocks), and vice versa. The intercept, a, again provides a measure for risk-adjusted performance of the portfolio after controlling for market risk, the size and the book-to-market effects.

Another well-established factor that is known to explain mutual fund returns is momentum. Carhart (1997) introduces a 4-factor model which includes the previous three factors plus an additional factor to capture the momentum effect (see Jegadeesh and Titman, 1995). As such, we consider the following 4-factor model,

$$r_t = a + br_{mt} + sSMB_t + hHML_t + mMOM_t + \varepsilon_t, \quad (3)$$

where MOM_t is the NZ momentum factor, constructed as the zero-investment portfolio that is long in best performing stocks and short in worst performing stocks. The coefficient m

measures the exposure of the fund to the momentum factor, where a positive coefficient indicates that the portfolio tilts towards 'winner' stocks, and vice versa.

3. Data

In this section, we discuss the data employed in this study. We first discuss the holdings data that are obtained from Morningstar. Second, we discuss the returns data, along with the portfolio and factor construction approach we follow.

3.1. Portfolio holdings data

Portfolio holdings data for NZ actively managed funds are obtained from Morningstar.[6] Specifically, we obtain monthly holdings data that are disclosed by NZ actively managed funds. We limit our sample to the period September 2010 to February 2017 when portfolio holdings information is more readily available. From the list of actively managed funds, we focus on those funds that have a NZ equity allocation, hence this includes NZ equity funds and balanced funds, and funds with international allocations but some proportion in NZ equities. We exclude funds of funds as their holdings are already considered through the underlying funds. In total, there are 134 NZ funds that fulfil our criteria, consisting of 58 managed (open-end) funds and 76 retirement (including KiwiSaver) funds.

INSERT TABLE 1 HERE

[6]We use the variable 'Index Fund' in Morningstar to distinguish between active and passive funds. To prevent survivorship bias we consider both live and dead funds.

Table 1 presents summary statistics for the portfolio holdings data. In Panel A, we report holdings by fund type (managed and retirement funds). As can be seen, the average number of NZ stocks held by NZ-based funds is 30. We observe that these funds, on average, invest 51% of their equity holding in NZ equities, or about 42% of their total asset under management. When we consider managed and retirement funds separately, we observe that the retirement funds have a broader allocation to NZ equities, investing in, on average, 34 stocks versus 28 stocks for the managed funds. As a percentage of total assets, managed funds allocate a substantially larger percentage to NZ equities than retirement funds, 48% versus 34%, respectively. This relatively low percentage of total assets allocated to NZ equities of retirement funds is likely a consequence of the default investment option in the KiwiSaver scheme, which predominantly invest in fixed income securities.

In Panel B, we report portfolio holdings by year. The average number of stocks held by New Zealand based equity funds increases over time from 19 in 2010 to 35 in 2017. However, the percentage holdings in NZ equities has decreased over time from 63% in 2010 to 47% in 2017. In addition, the value of local holdings as a percentage of total asset under management has also decreased from 56% to 36%. These numbers suggest that NZ-based funds, on average, have increased their exposure to international equity markets.

3.2. Returns Data

To assess the performance of the funds in our sample, we construct a value-weighted portfolio based on the actual reported holdings of each mutual fund. We compute the value weights of all funds in each stock, *i*, as,

$$w_{it} = \frac{\sum_j v_{ijt}}{\sum_{i,j} v_{ijt}}, \tag{4}$$

where V_{ijt} is the dollar value that fund *j* invests in stock *i*. To compute the return on the value-weighted portfolio, we match the holdings data with stock-level data obtained from DataStream. We then construct a (value-weighted) portfolio based on these holdings and measure the portfolio return. The weight applied to each stock is as per the prior month end; thus, forward-looking monthly returns (as per Lewellen, 2011) are calculated as,

$$R_{t+1} = \sum_i w_{it} R_{it+1}, \tag{5}$$

where R_{it} is the return of stock *i* in month *t*, and R_t is the value-weighted portfolio return of NZ equities held by NZ actively managed funds. As these returns are calculated based on portfolio holdings, they exclude fees such as transaction costs and management expenses.

As detailed in Section 3, performance is evaluated by comparing the excess return of this portfolio (in excess of the 90-day bank bill rate obtained from DataStream) to the excess returns of the market. In this case we use three main indices in NZ to proxy for the market return, the NZX All index, the NZX50 index and the NZX50 portfolio index.[7] Data for these indices are obtained from Datastream.

In our analysis, we also control for other factors such as Size, Book-to-Market (BM) and Momentum. As these factors are not readily available for the New Zealand market, we construct these factors manually, following the methodology of Fama and French (1993) and modifications based on Bauer et al. (2006) and Frijns and Tourani-Rad (2015) implemented to

[7]The S&P/NZX 50 portfolio index has the same constituents as the S&P/NZX 50 Index, but with a 5% cap on float-adjusted market capitalization. The capped methodology is designed to provide exposure to a diversified portfolio that is more aligned with what investors may hold.

deal with the small cross-section of the NZ market. We first screen all listed NZ stocks at the end of each calendar year from 2010 to 2017. A stock must have a price record at the end of the year and publicly available accounting data for June of that year to be included in the factor portfolios. In line with common practice, we exclude foreign companies, unit trusts, and stocks with negative BM ratios (see, e.g., Fama and French, 1993; Gaunt, 2004; Nartea et al., 2009). Accounting and stock market data are obtained from Datastream.

To construct the size factor, stocks are ranked by size (market capitalization as of December each year) and sorted into two groups. We exclude companies with less than $5 Million in market capitalization as per Bauer et al. (2006). From these companies, the 20 percent of smallest stocks are assigned to the small portfolio whereas the 80 percent of the largest stocks are assigned to the large portfolio. The SMB factor is then constructed by computing the difference between the small and large cap portfolio.

For the Book-to-Market factor, we follow a similar approach. Stocks are independently ranked by Book-to-Market ratio (shareholder equity divided by market capitalization as of December that year). The 30 percent of stocks with the highest Book-to-Market value are assigned to the high Book-to-Market portfolio, whereas the 30 percent of stocks with the lowest Book-to-Market value are assigned to the low Book-to-Market portfolio. The HML factor is then computed as the difference between the high minus low portfolio. Both SMB and HML factors are value-weighted portfolios that are rebalanced annually.

To investigate the momentum effect, we again rank stocks at the end of each year but this time according to their 11-month past returns lagged one month. This is consistent with the common practice of skipping a month between stock ranking and the investment period. The 30 percent

of stocks with the highest cumulative returns are assigned to the 'winners' portfolio, whereas the 30 percent of stocks with the lowest cumulative returns are assigned to the 'losers' portfolio. The MOM factor is then computed as the difference between the 'winners' minus 'losers' portfolio.

Table 2 reports the annualized excess fund returns and the market returns over the New Zealand 90-day Bank Bill rate, the SMB, HML and MOM factors. The portfolio based on all actively managed funds yields a return of 11.1% p.a. over the risk-free rate. On average, retirement funds perform better than managed funds with annual returns of 11.6% versus 10.7%, respectively. The portfolio return has a standard deviation of 9.3%, a slightly positive skewness, and a kurtosis of around 3, suggesting that the distribution is close to normal.

The second block of results in Table 2 shows summary statistics for the market indices used in this study. We note that the equity strategy of the funds is slightly higher than the returns of NZX50 and NZXAll indices (10.4% and 10.2%, respectively), and is comparable to the average return of the NZX50P index (11.2%). We further note that the actively managed funds have slightly higher standard deviations relative to the indices, which can be due to the fact that the funds are underdiversified relative to the indices or due to the active risk that funds take.

INSERT TABLE 2 HERE

For the factors, we observe that the *SMB* factor has a negative return of -2.1% p.a. over the sample period, suggesting that small caps underperformed large caps. The *HML* factor has a positive annual return of 5.3% p.a., indicating that over the sample period, value stocks outperformed growth stock. Finally, the *MOM* factor has a positive return of 2.1% p.a.,

suggesting that a trading strategy of buying winner stocks and selling loser stocks will yield positive returns. However, we do note that these factor returns are insignificant over the sample period considered.

4. Empirical Results

In this section, we assess the risk-adjusted performance of New Zealand investment funds, by comparing the returns of the portfolio of actively managed funds with various benchmarks. We further assess whether actively managed funds deviate substantially from the market portfolio.

4.1. Fund performance

To assess the relative performance of New Zealand actively managed funds, we start by looking at the performance of the funds relative to several benchmarks. Our main comparisons are the NZX50, NZXAll, and the NZX50P. In addition, we use the return of a portfolio of stocks with similar characteristics to the individual stocks in the fund's holdings as a benchmark.[8] We then subtract the returns of a comparison or benchmark portfolio from these hypothetical fund returns. The time series average and test statistics are computed over the sample period.

In Table 3, we report the excess returns relative to the various benchmarks. Over the sample period, excess returns are positive against the NZX50 and NZXAll, and negative against the NZX50P and the characteristic-based benchmark portfolios (CS Alpha). However, none of these excess returns are significant, suggesting that the performance of New Zealand actively

[8]This characteristic sensitivity (CS) approach was introduced by Daniel et al. (1997). The idea of this approach is to compare the returns of individual stocks in the holdings with the returns of stock portfolios having similar characteristics. For the New Zealand market, we form benchmark portfolios under a 3 x 3 x 3 sort based on size, book-to-market and momentum. The returns of each of these portfolios are calculated by value-weighting the stocks in the portfolio.

managed funds could have been replicated, on average, by simply investing in the market portfolios or purchasing stocks with the same size, book-to-market, and momentum characteristics.

INSERT TABLE 3 HERE

Next, we conduct formal analyses of performance using the asset pricing models detailed in the previous section. In Table 4, we report the estimation results for Equation (1). In Panel A, the excess portfolio returns are compared to the NZX 50 index. The first column in each panel shows the results for a, the risk-adjusted outperformance over the market index. For the *Aggregate* portfolio, we observe that a is positive at 0.05% per month (0.60% p.a.), but insignificant. This suggests that there is no statistical evidence for outperformance of actively managed funds relative to the New Zealand market index. The coefficient b, which measures the degree of market risk, is close to and not significantly different from one, suggesting that the portfolio mimics the market portfolio very closely. This is further confirmed by the adjusted R^2 which is high at 95%, indicating that market returns strongly explain the returns of the portfolio of actively managed funds. The evidence from portfolios constructed using the managed and retirement funds shows similar results, albeit that retirement funds have slightly better outperformance than managed funds. Both alphas, however, are insignificant.

INSERT TABLE 4 HERE

Panel B reports the results in comparison with the NZXALL index. Against the NZXALL index, estimated a's are positive but insignificant for the three portfolios. Again, the exposures of the portfolios relative to the market index are not significantly different from one. In

addition, the adjusted R^2's are close to 90%. Panel C reports the results, where the NZX50P index is used as a proxy for the market index. We again find the a coefficients to be negative and insignificant, market exposures that are not significantly different from one, and very high adjusted R^2's. In sum, Table 4 suggests that NZ-based actively managed funds have returns on their NZ equity strategies that track the returns on market indices very closely. We do not find evidence supportive of the notion that actively managed funds are able to generate significant outperformance relative to these indices.

Table 5 reports the regression results for the three-factor model (Equation (2)). The results show that against the NZX50 and NZXALL indices, the alphas are positive while against the NZX50 portfolio, the alpha is negative. However, none of the alphas are significant. As with the CAPM results, the coefficients b are close to one, suggesting that these portfolios follow the market index closely. For the SMB, we find that the coefficients s are positive but insignificant, suggesting that investment funds do not follow a size-based strategy. Similarly, for the HML factor, we find that coefficients are positive across all funds, except for one. However, again none of these coefficients are significant, suggesting that investment funds do not follow a specific growth or value strategy.

INSERT TABLE 5 HERE

In Table 6, we report the results of the four-factor model in Equation (3). The coefficients m are negative and significant when we compare the portfolio with the NZX50 and NZX50P indexes, suggesting that investment funds do not follow a strategy of buying past winner, but focus on a strategy that buys past losers. However, we note that the inclusion of the momentum factor has no material impact on the results previously presented, i.e. the alphas from the four-

factor model remain insignificant, betas are indistinguishable from one and adjusted R^2's remain virtually the same. These results again highlight the inability of actively managed funds to outperform the market index on aggregate.

INSERT TABLE 6 HERE

4.2. Fund Characteristics and Outperformance

Section 4.1 documents that a portfolio made up of the NZ equity allocations of NZ-based investment funds tracks the NZ market indices closely and is not able to outperform these market indices. However, the finding that the aggregate portfolio, on average, does not beat the market does not prove that NZ-based mutual funds have no stock-picking skills. Indeed, if some of the active funds outperform at the expense of others, we would expect the overall portfolio to show no outperformance. Hence, an important follow-up question is whether particular types of funds have stock-picking ability, even if the industry overall does not. To address this question, we categorize funds based on several characteristics, and assess the performance of these funds. The characteristics we consider are fund size (to assess whether funds benefit from economies of scale), local holdings size, business type, past returns, and fees.

In Table 7, we sort funds into the different categories and report the performance relative to the NZXAll index.[9] We focus on the aggregate holdings across all the funds within the group, which includes managed and retirement funds. The last column in the table reports the fraction of funds in each group.

[9]We obtain similar results to those presented in this paper when using the other market indexes, but do not present these for the sake of brevity. These results can be provided on request.

INSERT TABLE 7 HERE

In Panel A, we report results for portfolios based on average fund size, where Large represents the top one third of funds with highest assets under management, etc. We observe that medium- and small-sized funds earn better returns than large funds. For the medium-sized funds, we observe that the CAPM, three- and four-factor alphas are around 0.12% per month, whereas for the small-sized funds, the alphas are between 0.04% and 0.06%. However, in line with the results presented in Tables 4 to 6, we find that funds of different size almost perfectly replicate the market indices, with market betas indistinguishable from one and adjusted R^2's around 90%. In addition, no evidence is found for exposures to either SMB or HML while a negative exposure to momentum is observed across all size categories.

In Panel B, we group the portfolios by their value of local holdings. The idea behind this is that funds with large NZ equity holdings will have better industry knowledge. Hence, the size of local holdings may contribute to fund performance. We observe that funds with less exposure to the local market perform better than funds that have greater exposure. In particular, funds with small local holdings have a positive and significant (at the 10% level) monthly return of 0.22% (based on the CAPM), which seems to be explained by a small tilt towards value stocks. In contrast, funds with large local holdings have an insignificant monthly return of 0.01%.

In Panel C, we group funds by business type (we focus on investment funds provided by banks, insurance companies and investment companies). Overall, we observe that the investment strategy of banks appears to have the best performance, with a CAPM alpha of 0.09%, a three-factor alpha of 0.07% and a four-factor alpha of 0.08% per month. However, again none of

these alphas are significantly different from zero. None of the alphas for banks, investment, nor insurance companies is individually significant.

In Panel D, we group funds by past returns to assess whether past winners have better stock-picking skills than past losers. We observe that funds with a high past returns earn a somewhat better performance than funds with lower past returns. However, funds with medium past returns seem to outperform the other two, but again none of the alphas are significant. These results indicate that past performance is not persistent.

Finally, we group funds by management fees in Panel E. The results suggest that funds with the highest fees (higher than 1.5%) perform the worst as the alphas are negative. It is the funds with medium fees (between 1% and 1.5%) which are the best performer with a CAPM alpha of 0.04%, a three-factor alpha of 0.03% and a four-factor alpha of 0.04% per month. Again, none of the alphas are significant.

The basic conclusion from Table 7 is that while we observe some small differences across funds with different characteristics, there is virtually no evidence of funds with specific characteristics outperforming the market based on the various benchmark models. The results suggest that the majority of groups hold portfolios that closely mimic the market.

4.3. Deviations from the market portfolio

The previous subsection demonstrated that there is little evidence on outperformance of funds with different characteristics, and that all fund types closely track the market index. In this section, we specifically address the question of how closely funds track benchmark returns.

We particularly examine whether an active equity fund manager attempts to outperform the fund's benchmark by taking positions that are different from the benchmark. The motivation for this analysis comes from the fact that an active manager can only add value relative to the index by deviating from it. This deviation may come in two ways, through stock selection, factor timing, or both. Stock selection involves picking stocks that the manager expects to outperform their peers. Factor timing involves taking time-varying positions in broader factor portfolios according to the manager's views of their future returns. These two dimensions reflects the degree that a fund deviates from its benchmark, which is necessary in assessing active management.

We follow Cremers and Petajisto (2009) to quantify an active manager's effort to engage in stock selection or factor timing. For stock selection, we compare the holdings of a mutual fund with the holdings of its benchmark index. This approach is labeled *Active Share* and is constructed as follows:

$$Active\ Share_t = \frac{1}{2}\sum_{i=1}^{N}\left|w_{fund,it} - w_{index,it}\right|, \quad (6)$$

where $w_{fund,it}$ and $w_{index,it}$ are the portfolio weights of asset i in the aggregate fund and in the index, respectively.[10] We compute the Active Share of the aggregate portfolio of all funds with respect to the three market indexes (NZXALL, NZX50 and NZX50P) and, as per Cremers and Petajisto (2009), assign the index with the lowest Active Share as the aggregate fund's benchmark. According to Cremers and Petajisto (2009), funds with an Active Share less than 20% are considered passive index tracking funds, as their holdings deviate very little from the

[10] In our case, we compute the sum across stock positions only, as we apply the measure exclusively to all-equity portfolios.

benchmark index. In contrast, a high Active Share (between 60% and 100%) indicates that the fund has holdings which are very different from the benchmark index.

In addition to the Active Share, we also compute the fund's *Tracking Error* which is the time-series standard deviation of the difference between a fund's return ($R_{fund,t}$) and its benchmark index return ($R_{index,t}$):

$$Tracking\ Error = Stdev\left[R_{fund,t} - R_{index,t}\right]. \quad (7)$$

Tracking Error is widely used in practice to evaluate active portfolio management. A typical active manager strives for an expected return higher than the benchmark index, but at the same time a low Tracking Error to minimize the risk of significantly underperforming the index.

INSERT TABLE 8 HERE

Table 8 reports the results for Active Share and Tracking Error. We report the Active Share against the NZXALL index as this index provides the lowest Active Share and Tracking Error amongst the three indices. Selecting the benchmark that produces the lowest Active Share is in line with Cremers and Petajisto (2009). The result for our aggregate portfolio suggests that the mutual fund sector as a whole gives investor an Active Share of 26.4% with a Tracking Error of 2.8% p.a. (in their sample of US equity funds, Cremers and Petajisto (2009) report tracking errors that, for the majority, are in the range of 0% to 14%). These findings suggest that New Zealand actively managed funds, on average, track the market index very closely.

Similar to Table 7, we split the Active Share and Tracking Error of the aggregate portfolio into various groups based on: (1) fund size, (2) local holdings size, (3) business type, (4) past returns and (5) management fees. Based on fund size, we find that smaller funds are more actively managed than the larger funds. Smaller funds also have a higher Tracking Error (3.2%) compared to larger funds (2.7%). Based on local holdings size, we find similar results, where funds with smaller local holdings are more actively managed than those with larger local holdings. Third, investment companies tend to deviate more from the market compared to insurance companies and banks. Fourth, funds with low past returns have the highest Active Share as well as the highest tracking error compared to other funds. Finally, we observe that funds with medium management fees have the highest active share (28.5%) but the lowest tracking error (2.8%) indicating that these funds display a somewhat better stock-picking skill than others.

Overall, our results show that both Active Share and Tracking Error for the aggregate portfolio are low, implying that the majority of portfolios have holdings that deviate very little from the market index. Our findings provide little evidence of active management, either in terms of stock-picking or market timing.

4.4. Can mutual funds predict winners?

The previous sections have shown that the investment strategies of NZ-based mutual funds largely track benchmark returns and that Active Shares of these funds are relatively low. In this section, we address the question of stock-picking skills of mutual funds even more directly by considering whether the weights that active funds allocate to stocks have any predictive power over future returns of these stocks. Specifically, we estimate the following regression,

$$\Delta w_{it} = c + \gamma_1 R_{it+1} + \gamma_2 R_{it} + \gamma_3 R_{it-1} + \gamma_4 N_{it} + \varepsilon_t, \quad (8)$$

where Δw_{it} is the monthly change in the allocation of the active funds to stock *i*. We regress the change in this weight on the future, current and lagged return of stock *i*.[11] We also control for the disclosure frequency, N_{it}, as not all funds disclose holdings on a monthly basis and non-disclosure will affect the monthly weights we compute from the holdings data. If actively managed funds have any stock-picking skills and can predict future winners, then we should observe that γ_1 is positive. If funds chase past returns then we should observe that γ_3 is positive. As observations in this regression have both a time series and a cross-sectional dimension, we estimate Equation (8) as a Panel regression with firm and time fixed effects. In addition, we control for clustering in standard errors at the firm level.

Table 9 reports the results for Equation (8). As can be seen, we find that the coefficient on forward-looking returns is insignificant, showing that there is no predictive relation between the weights allocated to specific stock and their future returns. We also do not observe any significant relation between current returns and changes in weights. However, we do observe that there is a positive and significant relation between lagged returns and changes in portfolio weights. This suggests that funds tend to increase their allocations to funds that have performed relatively well in the previous month, and thus that they display return chasing behavior.

INSERT TABLE 9 HERE

[11]In this regression, we would expect a "mechanical" positive relation between contemporaneous changes in weights and returns if a fund follows a simple buy-and-hold strategy, because a positive return for a stock in month *t* would result in a relative weight increase in that month. However, this mechanical effect should not affect the relations between changes in weights and lagged or future returns.

5. Conclusion

In this study, we examine the performance of NZ actively managed funds using portfolio holdings data. We focus on the returns of the aggregate NZ equity portfolio held by NZ active fund managers and compare them with the returns of market benchmarks such as the NZX50, NZXAll, NZX50P, as well as the returns of stock portfolios with similar characteristics. We further use the CAPM, three- and four-factor models to measure risk-adjusted performance. Our findings suggest that the aggregate portfolio held by active fund managers is highly correlated with the main New Zealand stock market indexes with portfolio betas that are statistically indifferent from one. We find no evidence of outperformance for this aggregate portfolio before costs and fees, with a CAPM alpha of 0.05%, three-factor alpha of 0.05% and four-factor alpha of 0.06% per month. We therefore concur with previous studies that New Zealand active portfolio managers do not possess stock-picking skill. Funds with specific characteristics appear to demonstrate better performance than others, but alphas remain insignificant. These findings suggest that while some managers have better skills than others, their funds do not outperform the market.

Further analysis reveals that funds have relatively low Active Shares, close to the cut-off point of what Cremers and Petajisto (2009) refer to as passive index trackers, and tracking errors seem to be relatively low as well. This shows that active funds deviate their holdings relatively little from the actual market portfolio. In an even more direct test to examine stock-picking skills, we assess whether future stock returns are related to changes in weights, but find no relation between future returns and changes in portfolio weights. In fact, our results suggest that active funds engage in return chasing behavior, increasing the weights in stocks that have performed well in the previous month.

Our study shows that NZ active fund managers on aggregate do little more than hold the market portfolio, presumably generating significant costs and fees in the process. Despite funds being actively managed, these funds earn almost identical pre-cost returns to funds which passively hold the market portfolio. These findings are concerning given the fact these funds are domiciled in New Zealand and fund managers are generally understood to have the best understanding of the local market. A direct implication of this is that investors in NZ mutual funds should be very wary of self-proclaimed investment skill and fees charged that are beyond the level of fees that one would expect to pay for a passively managed fund.

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Table 1. Descriptive Statistics

This table provides summary statistics of the portfolio holdings data. Panel A reports holdings information by fund type and Panel B reports the holdings information over time. *#funds* is the number of funds, *#Stocks* is the average number of stocks for each fund, $Holdings_{NZ\ Equity}$ is the average holdings value in NZ equities, $Holdings_{Equity}$ is the average holdings value in equities and $Holdings_{Total}$ is the average total asset value across funds.

Panel A. Holdings by fund type

Fund type	*#funds*	*#Stocks*	$Holdings_{NZ\ Equity}$ *('000)*	$Holdings_{Equity}$ *('000)*	$\frac{Holdings_{NZ\ Equity}}{Holdings_{Equity}}$	$Holdings_{Total}$ *('000)*	$\frac{Holdings_{NZ\ Equity}}{Holdings_{Total}}$
All Funds	134	30	$ 44,234	$ 102,026	51%	$ 172,185	42%
Open-End Funds	58	28	$ 51,663	$ 77,355	55%	$ 100,162	48%
Pension Funds	76	34	$ 31,456	$ 132,450	47%	$ 266,675	34%
Median across funds		30	$ 44,316	$ 98,331	48%	$ 158,080	40%
Min across funds		19	$ 29,284	$ 46,060	43%	$ 58,118	25%
Max across funds		40	$ 62,446	$ 177,093	72%	$ 327,489	64%

Panel B. Holdings over time

Year	*#funds*	*#Stocks*	$Holdings_{NZ\ Equity}$ *('000)*	$Holdings_{Equity}$ *('000)*	$\frac{Holdings_{NZ\ Equity}}{Holdings_{Equity}}$	$Holdings_{Total}$ *('000)*	$\frac{Holdings_{NZ\ Equity}}{Holdings_{Total}}$
2010	22	19	$ 44,354	$ 58,532	63%	$ 62,624	56%
2011	43	24	$ 39,236	$ 54,567	63%	$ 68,924	52%
2012	47	29	$ 33,006	$ 58,384	47%	$ 91,428	41%
2013	49	29	$ 41,539	$ 88,359	48%	$ 139,537	41%
2014	91	32	$ 46,841	$ 118,398	49%	$ 196,655	39%
2015	75	35	$ 50,071	$ 143,756	49%	$ 254,971	38%
2016	103	37	$ 52,392	$ 151,881	46%	$ 293,554	34%
2017	46	35	$ 57,911	$ 169,889	47%	$ 319,536	36%

Table 2. Summary Statistics (annual excess returns over New Zealand 90-day Bank Bill)

This table reports average (value-weighted) annual excess returns, standard deviation and t-statistics for the aggregate portfolios held by investment funds and for the market indexes and the size, book-to-market, and momentum factors.

Portfolio	Average	Std. dev	t-stat (NW)	Skewness	Kurtosis
Aggregate Portfolio	11.1%***	9.3%	(3.05)	0.11	3.02
Open-End Funds	10.7%***	9.3%	(2.90)	0.12	3.02
Pension Funds	11.6%***	9.4%	(3.23)	0.10	3.02
NZRM (NZX50)	10.2%***	8.9%	(2.94)	0.20	3.21
NZRM (NZXALL)	10.4%***	8.7%	(2.89)	0.03	3.11
NZRM (NZX50P)	11.2%***	8.7%	(3.35)	0.25	3.39
NZSMB	-2.1%	14.5%	(-0.38)	0.04	2.49
NZHML	5.3%	11.2%	(1.03)	-0.18	4.13
NZMOM	2.1%	14.6%	(0.37)	-0.62	4.20

Table 3. Fund returns relative to various benchmarks

This table reports the average fund excess returns (annualized) relative to various benchmarks. The time-series average and test statistics (in parentheses) are computed over the sample period from September 2010 to February 2017.

Year	Excess (NZX50)	Excess (NZXAll)	Excess (NZX50P)	CS Alpha
2010	-1.6%	1.9%	-3.2%	-12.4%
2011	0.8%	1.6%	-1.9%	-0.3%
2012	2.8%	3.7%	1.0%	2.8%
2013	1.6%	0.0%	0.0%	-1.8%
2014	3.0%	0.7%	3.5%	4.6%
2015	-2.7%	-3.2%	-2.8%	-7.0%
2016	0.8%	2.0%	0.0%	5.5%
2017	-1.0%	-7.4%	-0.3%	-13.0%
Mean	0.85%	0.63%	-0.19%	-0.40%
t-stat	(1.02)	(0.58)	(-0.20)	(-0.09)

Table 4. Results from CAPM

This table reports regression results from Equation (1). The benchmark is the New Zealand market indexes. a measures the risk-adjusted performance relative to the benchmark, b measures the coefficient for the market excess return and R^2_{Adj} measures the goodness of fit. Figures in parentheses are Newey-West corrected t-statistics. * denotes significance at the 10% level.

Portfolio	a	*t-stat*	b	*Wald test* $(b = 1)$	R^2_{Adj}
Panel A: Against NZX50					
Aggregate Portfolio	0.05%	(0.81)	1.02	(0.79)	0.95
Open-End Funds	0.03%	(0.36)	1.02	(0.56)	0.94
Pension Funds	0.09%	(1.42)	1.02	(1.08)	0.95
Panel B: Against NZXAll					
All Funds	0.03%	(0.50)	1.02	(0.79)	0.91
Open-End Funds	0.00%	(0.11)	1.03	(0.82)	0.92
Pension Funds	0.08%	(0.96)	1.02	(0.63)	0.89
Panel C: Against NZX50P					
All Funds	-0.05%	(-0.63)	1.04	(1.35)	0.93
Open-End Funds	-0.07%	(-0.85)	1.03	(1.00)	0.92
Pension Funds	-0.02%	(-0.20)	1.05*	(1.82)	0.93

Table 5. Results from three-factor model

This table reports regression results from Equation (2). The benchmark is the New Zealand market indexes. a measures the risk-adjusted performance relative to the benchmark market index, b is the coefficient for the market excess return, s is the coefficient for the size factor, h is the coefficient for the book-to-market value factor and R^2_{Adj} measures the goodness of fit. Figures in parentheses are Newey-West corrected t-statistics.

Portfolio	a	*t-stat*	b	*Wald test* $(b = 1)$	s	*t-stat*	h	*t-stat*	R^2_{Adj}
Panel A: Against NZX50									
Aggregate Portfolio	0.05%	(0.77)	1.02	(0.58)	0.009	(0.51)	0.025	(1.18)	0.95
Open-End Funds	0.03%	(0.35)	1.01	(0.40)	0.011	(0.55)	0.017	(0.78)	0.94
Pension Funds	0.08%	(1.33)	1.02	(0.82)	0.007	(0.38)	0.035	(1.56)	0.95
Panel B: Against NZXAll									
Aggregate Portfolio	0.02%	(0.36)	1.02	(0.54)	0.019	(0.84)	0.046	(1.21)	0.91
Open-End Funds	-0.01%	(-0.09)	1.02	(0.60)	0.021	(0.95)	0.038	(1.07)	0.92
Pension Funds	0.06%	(0.78)	1.01	(0.37)	0.018	(0.65)	0.057	(1.33)	0.90
Panel C: Against NZX50P									
Aggregate Portfolio	-0.05%	(-0.57)	1.04	(1.16)	0.014	(0.59)	0.005	(0.14)	0.93
Open-End Funds	-0.07%	(-0.77)	1.03	(0.87)	0.016	(0.59)	-0.003	(-0.10)	0.92
Pension Funds	-0.02%	(-0.19)	1.04	(1.60)	0.012	(0.53)	0.015	(0.45)	0.93

Table 6. Results from four-factor model

This table reports regression results from Equation (3). The benchmark is the New Zealand market indexes. a measures the risk-adjusted performance relative to the benchmark market index, b is the coefficient for the market excess return, s is the coefficient for the size factor, h is the coefficient for the book-to-market value factor, m is the coefficient for the momentum factor and R^2_{Adj} measures the goodness of fit. Figures in parentheses are Newey-West corrected t-statistics. ** denotes significance at the 5% level.

Portfolio	a	*t-stat*	b	*Wald test* $(b = 1)$	s	*t-stat*	h	*t-stat*	m	*t-stat*	R^2_{Adj}
Panel A: Against NZX50											
Aggregate Portfolio	0.06%	(0.92)	1.01	(0.44)	0.008	(0.45)	0.021	(1.05)	-0.025**	(-2.50)	0.95
Open-End Funds	0.04%	(0.52)	1.01	(0.29)	0.010	(0.49)	0.013	(0.65)	-0.023**	(-2.35)	0.94
Pension Funds	0.09%	(1.49)	1.01	(0.63)	0.006	(0.31)	0.030	(1.39)	-0.029**	(-2.30)	0.95
Panel B: Against NZXAll											
Aggregate Portfolio	0.02%	(0.29)	1.01	(0.45)	0.019	(0.80)	0.043	(1.09)	-0.017	(-0.74)	0.91
Open-End Funds	-0.00%	(-0.04)	1.02	(0.52)	0.020	(0.92)	0.036	(0.97)	-0.015	(-0.68)	0.92
Pension Funds	0.07%	(0.71)	1.01	(0.27)	0.017	(0.61)	0.054	(1.19)	-0.021	(-0.81)	0.90
Panel C: Against NZX50P											
Aggregate Portfolio	-0.04%	(-0.45)	1.03	(1.04)	0.013	(0.53)	-0.001	(-0.02)	-0.031**	(-2.39)	0.93
Open-End Funds	-0.06%	(-0.64)	1.03	(0.76)	0.014	(0.54)	-0.008	(-0.26)	-0.029**	(-2.15)	0.92
Pension Funds	-0.01%	(-0.07)	1.04	(1.45)	0.010	(0.46)	0.009	(0.31)	-0.034**	(-2.45)	0.94

Table 7. The cross-section of fund performance

This table reports monthly CAPM, three-factor and four-factor regressions for investment funds grouped by fund size, market value of local holdings, business type, past returns and management fees. a is the funds' alpha. b, s, h and m are the coefficients for the market risk (NZXAll), size, book-to-market value and momentum factors, respectively. %Funds is the fraction of funds in each group. Figures in parenthesis are the Newey-West corrected t-statistics. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Benchmark Index: NZXAll	CAPM				Three-factor						Four-factor							%Funds
	a	*t-stat*	b	R^2_{Adj}	a	*t-stat*	b	s	h	R^2_{Adj}	a	*t-stat*	b	s	h	m	R^2_{Adj}	
Panel A: Group by fund size																		
Large	-0.04%	(-0.46)	1.01	0.91	-0.05%	(-0.56)	1.01	0.03	0.04	0.92	-0.04%	(-0.51)	1.00	0.03	0.04	-0.01	0.92	33.3%
Medium	0.12%	(1.19)	1.01	0.90	0.12%	(1.12)	1.00	0.02	0.03	0.90	0.13%	(1.18)	1.00	0.02	0.02	-0.02	0.89	33.3%
Small	0.06%	(0.62)	1.04	0.89	0.04%	(0.37)	1.03	0.00	0.07	0.89	0.04%	(0.43)	1.03	0.00	0.06	-0.01	0.89	33.3%
L-S	-0.10%	(-1.39)	-0.03		-0.08%	(-1.30)	-0.03	0.03	-0.02*		-0.08%	(-1.29)	-0.03	0.03	-0.02*	0.00		
Panel B: Grouped by market cap of local share holdings																		
Large	0.01%	(0.07)	1.02	0.91	0.00%	(-0.01)	1.02	0.027	0.041	0.91	0.01%	(0.06)	1.01	0.03	0.04	-0.02	0.91	33.3%
Medium	0.03%	(0.31)	1.03	0.89	0.01%	(0.11)	1.03	0.000	0.053	0.89	0.02%	(0.17)	1.03	0.00	0.05	-0.01	0.89	33.3%
Small	0.22%*	(1.73)	1.00	0.85	0.19%	(1.62)	1.00	-0.030	0.065**	0.85	0.19%	(1.64)	1.00	-0.03	0.06**	-0.01	0.85	33.3%
L-S	-0.21%*	(-1.71)	0.02		-0.19%*	(-1.68)	0.01	0.06*	-0.02		-0.19%	(-1.65)	0.01	0.06*	-0.03	-0.01		
Panel C: Group by firm type																		
Banks	0.09%	(0.78)	1.02	0.87	0.07%	(0.61)	1.02	-0.016	0.054	0.87	0.08%	(0.69)	1.01	-0.02	0.05	-0.02	0.87	26.9%
Insurance	0.00%	(0.01)	1.03	0.90	-0.02%	(-0.18)	1.03	0.014	0.057	0.90	-0.01%	(-0.12)	1.02	0.01	0.05	-0.01	0.90	10.4%
Investment	0.03%	(0.32)	1.03	0.90	0.04%	(0.37)	1.02	0.035*	0.012	0.90	0.04%	(0.44)	1.02	0.03*	0.01	-0.02	0.90	62.7%
Panel D: Grouped by past returns																		
High	0.03%	(0.35)	1.03	0.91	0.02%	(0.23)	1.02	0.019	0.044	0.91	0.03%	(0.28)	1.02	0.02	0.04	-0.01	0.91	33.3%
Medium	0.09%	(0.75)	0.98	0.87	0.07%	(0.64)	0.98	-0.009	0.039	0.87	0.08%	(0.70)	0.98	-0.01	0.04	-0.01	0.87	33.3%
Low	0.01%	(0.05)	0.97	0.80	0.00%	(0.01)	0.96	0.050	0.056	0.81	0.01%	(0.07)	0.96	0.05	0.05	-0.02	0.81	33.3%
H-L	0.02%	(0.13)	0.06		0.02%	(0.12)	0.06	-0.03	-0.01		0.02%	(0.10)	0.06	-0.03	-0.01	0.01		
Panel E: Grouped by fees																		
High (>1.5%)	-0.01%	(-0.08)	1.04	0.87	-0.03%	(-0.33)	1.04	0.002	0.070	0.87	-0.03%	(-0.29)	1.03	0.00	0.07	-0.01	0.87	11.3%
Medium (1 - 1.5%)	0.04%	(0.44)	1.02	0.91	0.03%	(0.32)	1.02	0.017	0.042	0.91	0.04%	(0.39)	1.01	0.02	0.04	-0.02	0.91	42.1%
Low (<1%)	0.01%	(0.07)	1.02	0.90	-0.01%	(-0.08)	1.02	0.024	0.057	0.90	0.00%	(-0.05)	1.01	0.02	0.06	-0.01	0.90	46.6%
H-L	-0.01%	(-0.23)	0.02		-0.02%	(-0.47)	0.02	-0.022	0.014		-0.02%	(-0.43)	0.02	-0.02	0.01	-0.01		

Table 8. Active Share and Tracking Error

This table reports the fund's Active Share from Equation (6) and Tracking Error from Equation (7). The benchmark is the NZXALL index.

	Active Share	Tracking Error
Aggregate Portfolio	26.4%	2.8%
Grouped by fund size		
Large	25.4%	2.7%
Medium	28.6%	3.0%
Small	30.6%	3.2%
Grouped by market cap of local share holdings		
Large	27.6%	2.8%
Medium	27.1%	3.2%
Small	29.1%	3.7%
Grouped by business type		
Banks	24.3%	3.4%
Insurance	27.1%	3.0%
Investment	30.3%	2.9%
Grouped by past returns		
High	27.8%	2.9%
Medium	26.9%	3.3%
Low	29.8%	4.2%
Grouped by fees		
High	27.0%	3.5%
Medium	28.5%	2.8%
Low	25.4%	3.0%

Table 9. Determinants of portfolio rebalancing

This table reports the results from Equation (8). γ_1, γ_2 and γ_3 are the regression coefficients for the future, current and lagged returns, respectively. γ_4 is the regression coefficient for the number of disclosure. We apply both firm- and time-fixed effects in the panel regression. Figures in parentheses are t-statistics corrected using clustered standard error. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Coefficient	Δ*Weight*	*t-stat*
c	-0.006%**	(-2.05)
γ_1	0.013%	(1.41)
γ_2	0.000%	(0.00)
γ_3	0.042%***	(4.53)
γ_4	0.001%*	(1.74)
R^2(adj)	0.00	