The Risk-adjusted Performance of KiwiSaver Funds

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Abstract

The New Zealand government introduced a national superannuation scheme named KiwiSaver to its citizens on 1 July 2007. However, until now, KiwiSaver funds' performance is still an under-researched topic.

This study investigates the risk-adjusted performance of KiwiSaver growth and balance funds, where 3 models (Capital Asset Pricing Model, Fama and French 3-factor model, and Carhart 4-factor model) are applied to the KiwiSaver growth funds and 1 model (Balance fund 4-factor model) is applied to the KiwiSaver balance funds. I observe significant evidence of outperformance for some KiwiSaver growth funds and balance funds. Further, most growth funds are relatively more exposed to large companies and growth stocks. However, once I control for the momentum strategy much of the outperformance disappears, suggesting a lot of fund managers are employing a momentum strategy. I also observe 2 superior KiwiSaver funds based on its outperformance with all methods, and they are Aon KiwiSaver Milford and Milford Active Growth KiwiSaver fund.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signature: 熊雪杉

30/11/2016

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Chapter 1: Introduction

The New Zealand government introduced a national superannuation scheme named KiwiSaver to its citizens on 1 July 2007. KiwiSaver is predominantly a work-based, voluntary superannuation system designed to help New Zealanders' save for their retirement. Frijns and Tourani-Rad (2015) suggest that investors have realized the importance of investing in KiwiSaver gradually since its inception in 2007. However, as Frijns and Tourani-Rad (2015) note, KiwiSaver has become important to many different groups within New Zealand, such as private investors, finance professionals and policy makers. KiwiSaver funds have also become more significant in the financial landscape of New Zealand in recent years, increasing by 31 March 2015 to almost 2.5 million members out of the New Zealand population of 4.5 million citizens[1], and assets under management of NZ$ 28.5 billion (Financial Markets Authority (FMA) of New Zealand, 2015). Table 1 proofs that KiwiSaver members is indeed experiencing a consistent growth in recent years. However, with the growing numbers of KiwiSaver members, the persistence in performance of KiwiSaver funds become more and more significant for KiwiSaver investors. There are generally five basic risk profiles for KiwiSaver funds: cash funds (low risk), conservative funds (low to medium) risk, balanced funds (medium risk), growth funds (medium to high risk), and aggressive fund (high risk) (KiwiSaver, n.d.).

Table 1. Number of active/provisional KiwiSaver members

Year	Jun-2008	Jun-2009	Jun-2010	Jun-2011
Total number	716,637	1,100,540	1,459,942	1,755,932
Year	Jun-2012	Jun-2013	Jun-2014	Jun-2015
Total number	1,966,444	2,146,843	2,350,565	2,530,919

Note: This table shows the total number of KiwiSaver members from June 2008 to June 2015.The data is retrieved from the official website of KiwiSaver. [2]

With the development and growth of KiwiSaver funds, it is necessary to do more research on KiwiSaver. A key aspect in determining the adequacy of retirement income is the issue of fund performance. Better risk-adjusted performance allows an investor to build a greater retirement nest egg. However, KiwiSaver funds' performance is an under-

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[1] However, only citizens and permanent residents are permitted to join.
[2] See details in website http://www.kiwisaver.govt.nz/statistics/annual/

researched topic, so I want to examine the risk-adjusted performance of KiwiSaver funds and provide more data for KiwiSaver studies.

My paper investigates the performance of monthly returns for Balance and Growth KiwiSaver funds between January 2008 and December 2015. My research will focus on KiwiSaver funds' risk-adjusted performance. My main contribution is to update the KiwiSaver growth funds and balance funds' performance with new data from 2008 to 2015 in order to help investors determine whether they can actively select a superior KiwiSaver funds with outperformance. Compared to Frijns and Tourani-Rad (2015), who examine the performance of KiwiSaver growth funds during the period of 2007 to 2013, my research uses more funds (36 funds vs 19 funds), including balanced funds, and examines a longer sample period. This adds to the prior research, especially by considering a longer period following the global financial crisis which may have had a significant impact on Frijns and Tourani-Rad (2015)'s findings. Additionally, I also employ the Carhart four factor asset pricing model which controls for the momentum trading strategy. Frijns and Tourani-Rad do not include this asset pricing model, relying instead on the CAPM and Three-Factor models. Including the Carhart should provide further insights into the outperformance of NZ funds.

The next chapter of my dissertation discusses the prevailing literature including discussions on fund performance, measurement of fund performance, and previous New Zealand mutual funds and KiwiSaver funds studies. In chapter 3, I discuss the methodology which introduces the 4 methods that will be used in this paper. I then discuss the data used in the paper and discuss the summary statistics of the KiwiSaver funds in chapter 4. Chapter 5 provides the summary statistics of benchmark data. After that is the chapter of empirical findings, showing the regression results of Growth and Balanced KiwiSaver funds. The final chapter is the conclusions.

Chapter 2: Literature Review

There are several factors that determine the performance of superannuation funds. Among others, are factors such as returns (the most important factor) and investment management and administrative costs (Hinz, Rudolph, Antolin, & Yermo, 2010). According to Zalgiryte and Guzavicius (2012), most of the mutual funds' performance studies could be divided into three groups: tests of fund manager's stock selection and market-timing abilities (such as Chen, Ferson, & Peters, 2010; Flecher, 1995; Glassman & Riddick, 2006; Henriksson & Merton, 1981; Jiang, Yao, & Yu, 2007; Merton, 1981); analysis of fund characteristics, such as past performance, fund performance, fund family, and fees (Elton, Gruber, & Green, 2007; Indro, Jiang, Hu, & Lee, 1999; Massa, 2003; Pollet &Wilson, 2008; Prather, Bertin, & Henker, 2004); and the persistence of fund performance (Brown & Goetzmann, 1995; Carhart, 1997; Chevalier & Ellison, 1999; Davis, 2001; Huij & Verbeek, 2007; Hendricks, Patel & Zeckhauser, 1993).

Techniques to evaluate the risk adjusted performance of mutual funds were pioneered by Treynor (1965), Sharpe (1966) and Jensen (1968), with these three measures becoming the most commonly used mutual fund portfolio performance measures in financial industry (Vysniauskas & Rutkauskas, 2014). The Treynor (1965) and Sharpe (1966) measures evaluate the fund performance by adjusting the mean excess return for the degree of systematic and total market risk respectively, deriving a number that can be compared with a suitable benchmark to determine under- or over-performance. The measure devised by Jensen (1968) used the deviation of portfolio returns from market returns (Alpha) to evaluate performance, a measure that could be evaluated statistically and which didn't need to be compared with a benchmark to interpret. Modigliani and Modigliani (1997) later proposed a risk-adjusted performance method, the M Squared, which adjusts the returns of a mutual fund to the level of risk in an unmanaged stock market index and then measure the returns on the risk-matched fund. Edwards and Samant (2003) argued that the M^2 measure has two distinct strengths over the earlier methods: first, investors can easily understand the results because it reports the risk-adjusted performance of a mutual fund as a percentage; second, investors are permitted to calculate the degree of leverage which is needed to achieve the highest possible return for a given level of risk by using this measure. However, the M^2 measure results in the same rankings as the Sharpe ratio (Arugaslan, Edwards, & Samant, 2008).

The capital asset pricing model (CAPM) was derived by Sharpe (1964), Lintner (1965) and Mossin (1966) has become a powerful technique to measure the risk-adjusted performance of mutual funds (assess whether they have outperformed the market or not) (Knudsen, 2009). However, CAPM employs a single factor beta to determine the cost of equity capital, and research has shown some persistent anomalies remain after employing the CAPM, suggesting other factors need to be accounted for when evaluating performance. Fama and French (1992) and (1996) identify that size and the book-to-market ratio also have an influence on the expected returns. Chan, Hamao and Lakonishok (1991) show rudimentary evidence that some firm characteristics, such as size, book-to-market ratio, past sales growth ratios, earnings multiples and cash flow, explain the average returns more precisely than CAPM. Fama and French (1992) observed that size (small minus big, or SMB) and book-to-market ratio (the high book-to-market value minus the low book-to-market value, or HML) factors affect the average returns by examining those firm characteristics variables, and Fama and French (1996) introduced the multifactor asset pricing model to capture these value factors which are not explained by the single factor model (CAPM). Thus, we have an expansion of CAPM and one more choice for evaluating the alpha of a fund, the Fama and French 3-factor model. Fama and French 3-factor model has been applied in the research of Australia stock market (Drew & Veeraraghavan, 2002) and KiwiSaver funds (Frijns & Tourani-Rad, 2015). Although this model improves on the CAPM, Carhart (1997) add a fourth factor to account for momentum (winners minus losers, or MOM). According to Jegadeesh and Titman (1993), in the US stock market, previous winners perform better than previous losers by as much as 1.49% monthly. The Sharpe ratio of momentum strategy exceeds the Sharpe ratios of the market, size and value factors (Barroso & Santa-Clara, 2015). Generally, the Carhart 4-factor model performs better than the previously-accredited CAPM, and it has become the standard empirical asset pricing model in the recent decade (Garyn-Tal & Lauterbach, 2015). While the Carhart 4-factor model has been used widely in most developed and emerging markets, the model has not been applied to New Zealand KiwiSaver funds. Therefore it would be contributable for the study of KiwiSaver funds when expand the Fama and French 3-factor model to Carhart 4-factor model, since Fama and French 3-factor model does not capture the momentum factor.

There is not much research on New Zealand mutual funds and especially on KiwiSaver funds. Bauer, Otten and Tourani-Rad (2006) studied 143 New Zealand mutual funds using

CAPM, market timing and multifactor performance models over the period 1990-2003. They found no evidence that New Zealand mutual funds had out-performed, and in fact balanced funds show significant evidence of underperformance. However, as their sample period ended before the introduction of KiwiSaver, their sample did not include any KiwiSaver funds.

There is just one study on the risk-adjusted performance of KiwiSaver funds. Frijns and Tourani-Rad (2015) studied 19 growth or equity KiwiSaver funds for the period September 2007 to April 2013 using both the domestic and global CAPM and Fama and French 3-factor models. In their research, no fund in the sample showed evidence of outperformance, and there are eight funds that significantly underperform the market when using global Fama and French 3-factor model. Thus, none of their chosen funds is able to achieve risk-adjusted outperformance based on the CAPM and Fama and French 3-factor models. However, there are some limitations in their study. Only 19 growth KiwiSaver funds are included, which is a small subset of the total number of KiwiSaver funds. Additionally, their sample funds only contain growth funds but no balance funds. Balanced and moderate funds are also an essential part of the KiwiSaver funds' available to the public.

While not considering the risk adjusted performance of KiwiSaver, Warren (2014) compares and contrasts Australia's MySuper default superannuation funds with New Zealand's range of KiwiSaver funds in some key elements; specifically, the providers and products landscape, fees and asset allocation. For example, KiwiSaver fund providers are for-profit organizations who might offer multiple products, while the majority of MySuper providers are not-for-profit and are permitted to offer only one MySuper product (Warren, 2014). Frijns and Tourani-Rad (2014) states that there has been a captive market for KiwiSaver fund providers in New Zealand, because the government restricts New Zealand employees in their KiwiSaver investment choice and there is no international competition.

Chapter 3: Methodology

There are several risk adjusted performance measures I will use in this paper.

The first measure I will employ is the Sharpe Ratio, which measures the excess return (return on the portfolio minus the risk-free rate of return) divided by standard deviation of the risky portfolio, as a measure of risk (Sharpe, 1966).

$$S_i = \frac{\overline{R}_i - R_f}{\sigma_i} \qquad (1)$$

Where $\overline{R}_i$ is the mean return on fund i; R_f is the mean risk-free rate of return; σ_i is the standard deviation of returns for fund i.

Mean returns are calculated by averaging the monthly total returns over the sample period, from which I subtract the risk-free rate of return. The risk-free rate of return I employ is the New Zealand 90-day bank bill rate. Total risk is measured by the standard deviation of returns, which is expressed as follow:

$$\sigma_i^2 = \frac{\sum_{i=1}^{n}(R_i - \overline{R}_i)}{N-1} \text{ and } \sigma_i = \sqrt{\sigma_i^2} \qquad (2)$$

In this research, the Sharpe Ratio method will be applied for all types of funds, including cash funds, balance funds and growth funds. According to Coates (2009), the Sharpe Ratio plays an essential role in the influential Efficient Market Hypothesis and the Modern Portfolio Theory. Unlike the Sharpe Ratio, the Treynor Ratio employs systematic risk (beta) instead of a standard deviation of the total risk, so it shares beta's limitation. Since Beta is the measurement factor of systematic risk, it is not appropriate for testing low risk funds such as cash funds and conservative funds. Jensen's alpha is the difference between real return and the theoretical expected return of securities, and the theoretical return is most commonly predicted by the Capital Asset Pricing Model (CAPM) which is applied to funds who focus on equity investing. The beta in Jensen's alpha measures the return of an individual stock and a broad market index, which again is not useful for low risk funds. Therefore, only the Sharpe Ratio is suitable for testing all types of funds.

The second technique I employ is the CAPM (Capital Asset Pricing Model), as follows:

$$R_{it} = \alpha_i + \beta_i (R_m - R_f)_t + \varepsilon_{it}$$

Fund managers utilize CAPM as a tool to predict return of an asset or portfolio for a given level of risk and market return, and they can also use CAPM to assess whether they have outperformed the market or not (Knudsen, 2009).

In my research, the KiwiSaver funds will be grouped in Growth funds if their equity investment allocations are more than 60% of their total investments and evaluated by CAPM. Usually those funds are equity, growth and aggressive funds, however, there are a few balanced funds also meet this constraint. Berkman, Clement, and Zhang (2016) find that several KiwiSaver funds might be misclassified, for instance, some Moderate-Balanced and Balanced funds show volatility similar or even greater than the average volatility of growth funds. I also find the same phenomenon in my research, so there will be a few balanced funds that are grouped in Growth funds. The alpha (αi) in the formula measures a funds out or under performance against the market.

First, I compare fund returns against a domestic market index to compare the performance of KiwiSaver funds relative to the New Zealand stock market. The domestic regression is performed as:

$$R_{it} = \alpha_i^L + \beta_i^L (RMRF^L - R_f)_t + \varepsilon_{it} \tag{3}$$

Where R_{it} is the return in NZ dollars of fund, i for month and t in excess of the 90-days bank bill in month t; $RMRF^L$ - R_f is the return on the New Zealand market index in excess of the risk free rate of return. α_i^L captures the risk adjusted out- or underperformance relative to the local market index, while the coefficient β_i^L captures the exposure of the fund to the domestic market index, and therefore provides a measure of the domestic market risk of a fund.

In order to diversify a portfolio, a lot of funds contain not only local financial products but also global financial products. Measuring the fund performance in both domestic and global contexts can provide a better idea of whether the fund has been performing well. Since the New Zealand market is not fully isolated and it is integrated into global equity markets, it is better to test both domestic and global CAPM. O'Brien and Dolde (2000) argue the currency global Capital Asset Pricing Model could be a useful tool for evaluating assets where the markets are integrated globally. I will compare the fund

performance with both a domestic and global index. I then examine the fund performance in a global context by comparing each fund to a global equity portfolio, such that:

$$R_{it} = \alpha_i^W + \beta_i^W (RMRF^W - R_f)_t + \varepsilon_{it} \qquad (4)$$

Where $RMRF^W - R_f$ is the return in NZ dollars on the global market index in excess of the risk free rate of return. As with the domestic CAPM, α_i^W captures the risk adjusted out- or underperformance relative to the index, β_i^W captures the exposure of the fund relative to the global market index

However, CAPM assumes that only market risk is priced. An extension of the CAPM proposed by Fama and French (1992) recommend a three-factor model that includes size and book-to-market factors to the CAPM model. While Carhart (1997) proposes a fourth factor that captures the Jegadeesh and Titman (1993) momentum anomaly, which represents the premium of investing in a portfolio of past winners minus a portfolio of past losers. The Fama and French (1993) three-factor model regression is expressed as

$$R_{it} = \alpha_i + \beta_i (RMRF - R_f)_t + \gamma_{1i}SMB_t + \gamma_{2i}HML_t + \varepsilon_{it}$$

The four-factor model regression is given by:

$$R_{it} = \alpha_i + \beta_i (RMRF - R_f)_t + \gamma_{1i}SMB_t + \gamma_{2i}HML_t + \gamma_{3i}MOM_t + \varepsilon_{it}$$

Therefore, I also calculate alpha using the Fama and French 3 factor, and the Carhart 4-factor models to ensure any outperformance is not the result of funds exposure to known risk factors. As with the analysis for CAPM, I only examine growth funds with equity allocations in excess of 60% of their total investment.

Firstly, the domestic Fama and French 3-factor model and Carhart 4-factor model is given by:

$$R_{it} = \alpha_i^L + \beta_i^L (RMRF^L - R_f)_t + \gamma_{1i}^L SMB_t + \gamma_{2i}^L HML_t + \varepsilon_{it} \qquad (5)$$

$$R_{it} = \alpha_i^L + \beta_i^L (RMRF^L - R_f)_t + \gamma_{1i}^L SMB_t + \gamma_{2i}^L HML_t + \gamma_{3i}^L MOM_t \varepsilon_{it} \qquad (6)$$

Where SMB_t (small minus big) is the local size factor, which is the difference in return in NZ dollars between a domestic small capitalization portfolio and a domestic large capitalization portfolio in month t; HML_t (high minus low) is the local book-to-market

factor, which is the difference in return in NZ dollars between a domestic portfolio with high book-to-market stocks and the domestic portfolio a low book to-market stocks in month t. MOM_t (momentum), in the four factor model, is the local momentum factor, which is the difference in return in NZ dollars between a domestic portfolio with the past 12-month winners and a domestic portfolio with the past 12-month losers in month t. α_i^L provides a measure for risk-adjusted out- or underperformance of the fund after controlling for domestic market risk, and the domestic size and book-to-market effects. The coefficient γ_{1i}^L measures the exposure of the fund to the local size factor, where a positive coefficient implies that the fund invests in small capitalization stocks. The coefficient γ_{2i}^L measures the exposure to the local book-to-market factor, where a positive coefficient suggests that the fund has a greater exposure towards high book-to-market portfolio (Value stocks). The coefficient γ_{3i}^L measures the exposure to the domestic momentum factor, where a positive coefficient suggests that the fund has a greater exposure towards the past 12-month winners.

Furthermore, a global Fama and French 3-factor model and Carhart 4-factor model are tested by adding the global size, book-to-market and momentum factors to the global CAPM formula. The global factors data are obtained from Kenneth French's website[3] which contains the excess return on global market portfolio (RMRF), the global SMB and HML factors.

$$R_{it} = \alpha_i^W + \beta_i^W (RMRF^W - R_f)_t + \gamma_{1i}^W SMB_t + \gamma_{2i}^W HML_t + \varepsilon_{it} \qquad (7)$$

$$\alpha_i^W + \beta_i^W (RMRF^W - R_f)_t + \gamma_{1i}^W SMB_t + \gamma_{2i}^W HML_t + \gamma_{3i}^W MOM_t \varepsilon_{it} + \varepsilon_{it} \qquad (8)$$

To examine those funds that do not have at least 60% exposure to equity and are well diversified into 4 classes (domestic equity and bonds, and global equity and bonds), I group them (excluding cash funds) into the balanced category. I employ a four factor model that contains both bond and equity indices to benchmark the performance of the Balance funds. This method is used in balance funds but not growth funds, because growth funds mainly invest in equity that represent the largest category of mutual funds, while balance funds invest and allocate investments across different asset categories,

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generally between equity and bonds, which are usually required to maintain with specified ratio of debt and equity and with investments varying flexibility degrees.

$$R_{it} = \alpha_i + \beta_{0i}(Rm_{NZequity} - R_f)_t + \beta_{1i}(Rm_{NZbond} - R_f)_t + \beta_{2i}(Rm_{WorldEquity} - R_f)_t$$

$$+ \beta_{3i}(Rm_{WorldBond} - R_f)_t + \varepsilon_{it} \qquad (9)$$

Where, $(Rm_{NZequity} - R_f)_t$ is the excess return in NZ dollars on New Zealand equity market index in month t, $(Rm_{NZbond} - R_f)_t$ is the excess return in NZ dollars on New Zealand Government bond index in month t, $(Rm_{WorldEquity} - R_f)_t$ is the excess return in NZ dollars of the Dow Jones world equity market index in month t, and $(Rm_{WorldBond} - R_f)_t$ is the excess return in NZ dollars on Bank of America Merrill Lynch world government bond index in month t. All the equity market index and government bond index are retrieved from the Datastream database from January 2008 to December 2015.

Chapter 4: Data

The data of 120 KiwiSaver funds can be found in Morningstar and I obtained all of them. My sample period is January 2008 to December 2015 (totally 8 years). Although KiwiSaver was implemented in July 2007, I want to examine the data from the beginning of a calendar year. Monthly total returns (net of fees) on the sample funds are used to compute the risk-adjusted performance measures. I have grouped the 120 KiwiSaver funds into four groups; cash funds, balance funds, growth fund and other funds. Cash funds include those funds that mostly invest in cash, of which there are 11 cash funds in this study. Balanced funds contain the balanced, moderate and conservative funds. These funds invest predominantly into cash and bonds with some exposure to stocks. There are 47 funds that can be grouped into the balanced funds. Growth funds conclude those funds that have more than 60% equity in their total asset allocation, of which there are 36 funds. The rest of the 120 funds (mostly invest heavily in other asset except cash, bond and equity) will be grouped in the other funds, and they will not be investigated in this study. Therefore, total 94 KiwiSaver funds will be examine in this paper.

In Table 2, the summary statistics of the growth funds are presented including the inception date, annualized average return along with the funds' performance ranking, annualized average standard deviation with its ranking, asset allocation and the average 1-year rolling Sharpe Ratio and the ranking of the Sharpe Ratio. We can observe from Table 2 that there are significant differences in the annualized average returns of each fund over the sample periods. The highest average return 15.46% was achieved by Westpac KiwiSaver-Capital Protect Plan 5, followed by Aon KiwiSaver Milford (14.78%) and Westpac KiwiSaver-Capital Protect Plan 4 (14.22%). The lowest average return was 2.63% by Mercer KiwiSaver Shares.

The table also demonstrates that the Grosvenor KiwiSaver Trans-Tasman Share had the highest standard deviation of returns (13.61%), followed by OneAnswer KiwiSaver-International Share (13.11%) and OneAnswer KiwiSaver-Sustainable International Share (11.89%). These three funds all invest largely in equity: the allocation of equity exceeds 94% for all three funds. The fund with the lowest standard deviation (0.57%) was ANZ Default KiwiSaver Scheme-Balanced Growth Fund, followed by BNZ KiwiSaver Moderate Fund (4.03%). The comparatively low standard deviation results from the smaller percentage in equity than other growth funds. As well as the highest annual return,

Westpac KiwiSaver-Capital Protect Plan 5 also owns the highest average Sharpe Ratio (0.9848), followed by Aon KiwiSaver Milford (0.7596) which also have high average annual returns. Both of these funds also had relatively low standard deviations, making them attractive investment options.

Table 2. Descriptive Statistics on Growth KiwiSaver Funds

Fund Name	Inception Date	Return (% p.a.)	Rank	St.Dev. (% p.a.)	Rank	Asset Allocation				Sharpe Ratio	SR Rank
						Cash	Stock	Bond	Other		
AMP KiwiSaver LS Aggressive Fund	Oct-07	3.73%	35	11.56%	4	9.83%	85.64%	1.04%	3.50%	0.2126	30
AMP KiwiSaver LS Growth Fund	Oct-07	3.97%	33	9.73%	9	12.61%	76.21%	6.06%	5.12%	0.2185	29
ANZ Default KiwiSaver Scheme-Balanced Gr	Oct-07	3.78%	34	0.57%	36	16.26%	60.23%	20.03%	3.47%	0.3742	14
ANZ Default KiwiSaver Scheme-Growth	Oct-07	6.41%	25	8.78%	13	12.38%	74.30%	6.71%	6.62%	0.3563	19
ANZ KiwiSaver-Balanced Growth	Oct-07	6.90%	23	5.73%	29	15.10%	60.24%	20.95%	3.71%	0.3951	7
ANZ KiwiSaver-Growth	Oct-07	7.47%	18	9.41%	10	11.19%	75.06%	6.86%	6.89%	0.3595	18
Aon KiwiSaver ANZ Balanced	Oct-07	7.73%	15	7.14%	22	15.08%	64.47%	16.51%	3.93%	0.3929	8
Aon KiwiSaver Milford	May-09	14.78%	2	5.17%	33	26.27%	64.70%	4.79%	4.24%	0.7596	2
BNZ KiwiSaver Balanced Fund	Mar-12	7.72%	16	5.08%	34	15.32%	61.41%	22.17%	1.11%	0.3639	16
BNZ KiwiSaver Growth Fund	Mar-12	9.24%	10	6.51%	25	15.43%	61.41%	22.17%	1.00%	0.3841	11
BNZ KiwiSaver Moderate Fund	Mar-12	6.36%	26	4.03%	35	15.31%	61.41%	22.17%	1.12%	0.3177	24
Fisher Funds Growth KiwiSaver Fund	Oct-07	7.83%	13	11.09%	6	3.94%	69.27%	16.38%	10.41%	0.3481	20
Forsyth Barr KiwiSaver Balanced Port	Jul-08	4.83%	30	5.86%	28	11.87%	60.30%	22.12%	5.71%	0.1546	33
Forsyth Barr KiwiSaver Growth Portfolio	Jul-08	4.65%	32	8.04%	14	6.63%	80.48%	6.07%	6.82%	0.1417	34
Generate KiwiSaver Focused Growth Fund	May-13	11.27%	7	7.07%	23	6.70%	70.21%	6.00%	23.03%	0.3097	25
Generate KiwiSaver Growth Fund	May-13	10.26%	9	5.48%	30	15.38%	60.29%	9.83%	14.51%	0.1406	35
Grosvenor KiwiSaver Balanced Growth	Jun-10	7.23%	20	5.33%	31	7.03%	69.79%	22.89%	0.28%	0.3732	15
Grosvenor KiwiSaver Geared Growth Fund	Aug-09	7.93%	12	8.04%	15	1.36%	92.66%	0.00%	5.99%	0.3216	23
Grosvenor KiwiSaver Socially Rsp Inv Gr	Jun-10	7.96%	11	7.37%	19	5.17%	79.74%	5.33%	9.76%	0.2797	27
Grosvenor KiwiSaver Trans-Tasman Share	May-10	4.78%	31	13.61%	1	1.63%	98.02%	0.00%	0.35%	0.3408	21
Kiwi Wealth KiwiSaver Growth	Oct-07	6.21%	29	10.00%	8	9.31%	81.97%	0.29%	8.43%	0.2191	28
Mercer KiwiSaver Shares	Mar-15	2.63%	36	11.06%	7	2.36%	75.81%	0.00%	21.83%	0.0435	36

Milford Active Growth KiwiSaver	Apr-10	14.15%	4	5.28%	32	26.27%	64.70%	4.79%	4.24%	0.6159	3
OneAnswer KiwiSaver-Australasian Share	Oct-07	7.78%	14	11.53%	5	32.00%	99.54%	0.01%	0.12%	0.2837	26
OneAnswer KiwiSaver-Balanced Growth	Oct-07	7.37%	19	7.57%	17	15.10%	60.24%	20.95%	3.71%	0.3791	13
OneAnswer KiwiSaver-Growth Fund	Oct-07	7.61%	17	9.40%	11	11.19%	75.06%	6.86%	6.89%	0.3618	17
OneAnswer KiwiSaver-Intl Share	Oct-07	6.91%	22	13.11%	2	-0.86%	97.75%	0.69%	2.42%	0.2105	31
OneAnswer KiwiSaver-Sustainable Int Shr	Aug-08	6.22%	28	11.89%	3	5.44%	94.08%	0.03%	0.45%	0.1585	32
Staples Rodway KiwiSaver Balanced	Nov-07	7.14%	21	7.45%	18	6.90%	61.84%	26.38%	4.88%	0.3367	22
Westpac KiwiSaver-Balanced Fund	Oct-07	6.25%	27	5.94%	27	11.06%	62.12%	16.96%	9.87%	0.3850	9
Westpac KiwiSaver-Capital Protect Plan 1	Jan-09	11.49%	6	9.32%	12	4.87%	91.76%	-0.05%	3.42%	0.3820	12
Westpac KiwiSaver-Capital Protect Plan 2	Dec-09	11.00%	8	7.94%	16	4.87%	91.76%	-0.05%	3.42%	0.4212	6
Westpac KiwiSaver-Capital Protect Plan 3	Nov-10	11.73%	5	7.37%	20	4.87%	91.76%	-0.05%	3.42%	0.5335	5
Westpac KiwiSaver-Capital Protect Plan 4	Nov-11	14.22%	3	6.62%	24	4.87%	91.76%	-0.05%	3.42%	0.5583	4
Westpac KiwiSaver-Capital Protect Plan 5	Nov-12	15.46%	1	6.46%	26	4.87%	91.76%	-0.05%	3.42%	0.9848	1
Westpac KiwiSaver-Growth Fund	Oct-07	6.65%	24	7.23%	21	8.95%	71.45%	8.16%	11.44%	0.3843	10

Note: This table reports the inception data, annualized average return and standard deviation with its rank, asset allocation and average one-year rolling Sharpe Ratio with its rank for growth funds. Return *(% p.a.)* and St.Dev. *(% p.a.)* represent the annualized average return and standard deviation, respectively. Sharpe Ratio represents the average one-year rolling Sharpe Ratio.

Table 3 shows the same descriptive data for the balanced funds. Milford KiwiSaver Conservative Fund had the greatest average return, 11.77%, followed by the Milford KiwiSaver Balanced Fund with an average return of 11.49%. Mercer KiwiSaver Growth and Mercer KiwiSaver Moderate Funds had the poorest returns, 2.17% and 2.62%, respectively. Milford KiwiSaver funds, which started in 2010, was not affected by the GFC and the subsequent market price crash.

The highest standard deviation for the balanced fund is 13.54%, Aon KiwiSaver Russell Lifepoints 2045, followed by 11.96%, Aon KiwiSaver Russell Lifepoints Growth. Both of them are comparatively heavily exposed to equity, over 40%, which makes them riskier. Westpac KiwiSaver Defensive (Default) Fund and the Fisher Funds Conservative KiwiSaver Fund have the lowest standard deviation with 1.99% and 2.10% respectively. As with the average returns, both Milford KiwiSaver Conservative Fund and Milford KiwiSaver Balanced Fund have the highest average Sharpe Ratio, specifically 0.6566 and 0.3958. There are two negative Sharpe Ratio from Mercer KiwiSaver Growth (-0.1388) and Mercer KiwiSaver Moderate Funds (-0.1191%) due to their lowest average return, suggesting they earn less than the risk-free rate.

Table 3. Descriptive Statistics on Balance KiwiSaver Funds

Fund Name	Inception Date	Return (% p.a.)	Rank	St.Dev. (% p.a.)	Rank	Asset Allocation				Sharpe Ratio	SR Rank
						Cash	Stock	Bond	Other		
AMP KiwiSaver ANZ Balanced Plus	Oct-07	7.37%	6	7.87%	10	14.50%	58.23%	22.29%	4.98%	0.1043	23
AMP KiwiSaver Default (Default)	Oct-07	4.62%	44	2.43%	43	44.23%	23.77%	22.70%	9.29%	0.0706	31
AMP KiwiSaver LS Balanced Fund	Oct-07	4.67%	43	7.00%	15	15.91%	58.29%	17.04%	8.77%	0.0037	45
AMP KiwiSaver LS Conservative Fund	Oct-07	5.29%	37	2.63%	38	28.60%	26.25%	31.62%	13.52%	0.1239	20
AMP KiwiSaver LS Moderate Balanced	Oct-07	4.53%	45	5.93%	18	19.43%	49.39%	21.13%	10.05%	0.0051	44
AMP KiwiSaver LS Moderate Fund	Oct-07	4.77%	42	4.22%	27	22.86%	39.82%	25.70%	11.62%	0.0312	42
ANZ Default KiwiSaver Scheme-Cnsrv Bal	Oct-07	6.10%	24	2.47%	39	24.85%	32.11%	37.32%	5.71%	0.2586	4
ANZ Default KiwiSaver Scheme Cnsrv	Oct-07	6.28%	22	5.41%	22	25.90%	6.99%	50.45%	16.66%	0.0989	26
ANZ Default KiwiSaver Scheme-Balanced	Oct-07	6.35%	21	7.07%	14	20.69%	45.85%	28.85%	4.61%	0.0690	32
ANZ Default KiwiSaver Scheme-Cash	Oct-07	6.41%	19	8.78%	8	88.44%	0.00%	10.85%	71.00%	0.0503	37
ANZ KiwiSaver-Balanced	Oct-07	6.90%	13	5.73%	20	19.36%	46.20%	29.61%	4.84%	0.1195	21
ANZ KiwiSaver-Conservative	Oct-07	6.00%	27	2.44%	41	26.66%	17.88%	48.33%	7.13%	0.2408	7
ANZ KiwiSaver-Conservative Balanced	Oct-07	6.51%	17	4.01%	29	25.60%	31.16%	37.37%	5.87%	0.1617	15
Aon KiwiSaver Russell Lifepoints 2015	Oct-07	6.92%	11	6.32%	16	8.32%	22.09%	64.17%	5.41%	0.1264	19
Aon KiwiSaver Russell Lifepoints 2025	Oct-07	6.67%	14	8.97%	6	20.11%	33.70%	39.71%	6.48%	0.0745	29
Aon KiwiSaver Russell Lifepoints 2035	Oct-07	6.64%	15	11.24%	3	33.84%	31.75%	31.60%	2.82%	0.0508	35
Aon KiwiSaver Russell Lifepoints 2045	Oct-07	6.44%	18	13.54%	1	27.61%	44.04%	25.88%	2.47%	0.0360	40
Aon KiwiSaver Russell Lifepoints Bal	Oct-07	6.98%	10	10.02%	4	34.23%	30.96%	32.04%	2.78%	0.0646	33
Aon KiwiSaver Russell Lifepoints Cnsrv	Oct-07	7.40%	5	4.78%	25	8.86%	17.98%	67.62%	5.54%	0.1956	12
Aon KiwiSaver Russell Lifepoints Growth	Oct-07	6.91%	12	11.96%	2	28.21%	43.08%	26.18%	2.53%	0.0508	36
Aon KiwiSaver Russell Lifepoints Mod	Oct-07	7.25%	7	7.19%	13	22.72%	33.47%	36.64%	7.18%	0.1152	22
ASB KiwiSaver Scheme's Balanced	Oct-07	5.89%	28	7.36%	11	7.29%	42.45%	31.01%	19.25%	0.0472	38
ASB KiwiSaver Scheme's Cnsr (Default)	Oct-07	5.44%	36	2.46%	40	20.73%	14.12%	52.53%	12.62%	0.1714	13

Fund	Inception	Return	Rank	St.Dev.	Rank					Sharpe Ratio	Rank
ASB KiwiSaver Scheme's Growth	Oct-07	5.85%	29	9.72%	5	4.25%	56.91%	15.03%	23.81%	0.0258	43
ASB KiwiSaver Scheme's Moderate	Oct-07	5.77%	32	5.00%	24	12.94%	30.35%	43.88%	12.83%	0.0821	28
BNZ KiwiSaver Conservative (Default)	Mar-12	5.11%	39	2.68%	37	23.16%	53.50%	22.31%	1.03%	0.1035	24
Fisher Funds Conservative KiwiSaver Fund	Jul-09	5.48%	35	2.10%	46	12.58%	17.32%	65.00%	5.09%	0.2214	11
Generate KiwiSaver Conservative Fund	May-13	6.25%	23	2.75%	35	45.13%	26.10%	27.87%	0.90%	0.2217	10
Grosvenor KiwiSaver Balanced Fund	Oct-07	5.06%	40	6.02%	17	9.65%	49.65%	31.27%	9.43%	0.0404	39
Grosvenor KiwiSaver Conservative Fund	Oct-07	5.22%	38	3.96%	31	15.83%	22.70%	53.68%	7.79%	0.1031	25
Grosvenor KiwiSaver Socially Rsp Inv Bl	Jul-14	10.39%	3	5.31%	23	10.80%	53.67%	35.49%	0.05%	0.2405	8
Kiwi Wealth KiwiSaver Balanced	Oct-07	6.36%	20	5.91%	19	14.65%	50.62%	30.70%	4.03%	0.0894	27
Kiwi Wealth KiwiSaver Conservative	Oct-07	5.79%	30	2.16%	45	19.78%	16.83%	60.44%	2.95%	0.2477	6
Kiwi Wealth KiwiSaver Scheme Default Fd	Sep-14	4.92%	41	2.17%	44	49.78%	17.18%	27.31%	5.74%	0.0710	30
Mercer KiwiSaver Balanced	Oct-07	5.48%	34	7.95%	9	16.18%	34.34%	18.09%	31.39%	0.0359	41
Mercer KiwiSaver Conservative (Default)	Oct-07	5.78%	31	3.98%	30	34.86%	14.24%	27.99%	22.91%	0.1294	17
Mercer KiwiSaver Growth	Mar-15	2.17%	47	7.29%	12	9.90%	47.88%	10.00%	32.23%	-0.1388	47
Mercer KiwiSaver Moderate	Mar-15	2.62%	46	3.27%	32	28.59%	21.49%	23.84%	26.08%	-0.1191	46
Milford KiwiSaver Balanced	May-10	11.49%	2	4.52%	26	13.50%	55.89%	25.79%	4.83%	0.3958	2
Milford KiwiSaver Conservative Fund	Nov-12	11.77%	1	3.15%	33	25.35%	12.95%	59.03%	2.67%	0.6566	1
OneAnswer KiwiSaver-Balanced	Oct-07	7.04%	9	5.72%	21	19.36%	46.20%	29.61%	4.84%	0.1277	18
OneAnswer KiwiSaver-Conservative	Oct-07	6.09%	25	2.44%	42	26.66%	17.88%	48.33%	7.13%	0.2553	5
OneAnswer KiwiSaver-Conservative Bal	Oct-07	6.61%	16	4.04%	28	25.60%	31.16%	37.37%	5.87%	0.1696	14
Staples Rodway KiwiSaver Growth	Nov-07	8.84%	4	8.96%	7	14.31%	54.35%	21.19%	10.16%	0.0600	34
Westpac KiwiSaver - Moderate	Jul-14	7.13%	8	3.00%	34	16.59%	49.06%	25.23%	9.11%	0.2243	9
Westpac KiwiSaver Defensive (Default)	Jul-14	6.06%	26	1.99%	47	28.86%	39.18%	26.96%	5.00%	0.2768	3
Westpac KiwiSaver-Conservative Fund	Oct-07	5.51%	33	2.69%	36	23.01%	40.76%	28.86%	7.37%	0.1514	16

Note: This table reports the inception data, annualized average return and risk with its rank, asset allocation and average one-year rolling Sharpe Ratio with its rank. Return (% p.a.) and St.Dev. (% p.a.) represent the annualized average return and standard deviation, respectively. Sharpe Ratio represents the average one-year rolling Sharpe Ratio.

Predictably, cash funds have much lower average return and standard deviation. From Table 4, the highest average return for cash funds is 4.01%, Aon KiwiSaver Nikko AM Cash, and the lowest average return is 3.04%, BNZ NZ KiwiSaver Cash Fund. The largest standard deviation is 1.21% by Mercer KiwiSaver Cash and the lowest standard deviation is 0.13% from Kiwi Wealth KiwiSaver Scheme Cash Fund. Cash funds do not have large differences between each other in relation to their returns and risks (standard deviation), since all of them invest heavily in cash which is the safest asset class.

I find that the worst Cash fund outperforms the worst Balanced fund and worst growth fund. One of the reason could be that the worst growth fund and balanced fund all start in March 2015, and they both have much shorter period than the other funds.

Table 4. Descriptive Statistics on Cash KiwiSaver Funds

Fund Name	Inception Date	Return (% p.a.)	Rank	St.Dev. (% p.a.)	Rank	Asset Allocation				Sharpe Ratio	SR Rank
						Cash	Stock	Bond	Other		
AMP KiwiSaver Cash Fund	Oct-07	3.74%	3	0.52%	7	89.43%	1.79%	5.95%	2.83%	0.0013	3
ANZ KiwiSaver-Cash	Aug-08	3.19%	10	0.32%	9	88.44%	0.00%	10.85%	0.71%	-0.5461	10
Aon KiwiSaver ANZ Cash	Oct-07	3.49%	8	0.56%	5	86.05%	0.00%	10.02%	3.93%	-0.0796	6
Aon KiwiSaver Nikko AM Cash	Dec-07	4.01%	1	0.56%	3	78.84%	1.00%	20.61%	0.54%	0.1035	1
ASB KiwiSaver Scheme's NZ Cash	Oct-07	3.59%	6	0.54%	6	100.00%	0.00%	0.00%	0.00%	-0.0387	5
BNZ KiwiSaver Cash Fund	Mar-12	3.04%	11	0.15%	10	100.00%	0.00%	0.00%	0.00%	-1.4845	11
Kiwi Wealth KiwiSaver Scheme Cash Fund	Oct-12	3.65%	5	0.13%	11	99.53%	0.00%	0.47%	0.00%	-0.3861	9
Kiwi Wealth KiwiSaver Scheme CashPlus	Jul-12	3.77%	2	0.56%	4	69.91%	0.00%	25.22%	4.88%	0.0219	2
Mercer KiwiSaver Cash	Oct-07	3.69%	4	1.21%	1	86.56%	0.00%	6.31%	7.13%	-0.0014	4
OneAnswer KiwiSaver-Cash Fund	Oct-07	3.49%	7	0.57%	2	88.44%	0.00%	10.85%	0.71%	-0.0835	7
Westpac KiwiSaver-Cash Fund	Nov-07	3.40%	9	0.42%	8	75.03%	0.00%	15.24%	9.74%	-0.2456	8

Note: This table reports the inception data, annualized average return and standard deviation with its rank, asset allocation and average one-year rolling Sharpe Ratio with its rank for cash funds. Return (% p.a.) and St.Dev. (% p.a.) represent the annualized average return and standard deviation, respectively. Sharpe Ratio represents the average one-year rolling Sharpe Ratio.

Chapter 5: Benchmark Data

I construct the local factor portfolios to use in the three and four factors asset pricing models as per Bauer, Otten and Tourani-Rad (2006) in their research about New Zealand mutual funds. To calculate the local excess market return I obtained all stocks on the NZX from DataStream that have a market capitalization of at least $NZ 5 million, and then subtract the New Zealand 90-day bank bill rate (risk-free rate). For the domestic size factor (SMB), I rank stocks based on their market capitalization at the end of each calendar year, and assign the bottom 20% of total market capitalization to the small portfolio, while the remaining 80% of the market capitalization form into the large portfolio. The size factor small minus big is the difference in return between the small cap and large cap portfolio. The domestic book-to-market factor (HML) is constructed in a similar way to the size factor. I rank the stocks by book-to-market value obtained from Datastream. The top 30% of market capitalization goes into the high book-to-value portfolio and the bottom 30% goes into the low book-to market portfolio. 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% is the momentum factor. The returns of the factor portfolios are calculated using value-weighting. The global factor portfolios returns are obtained from Kenneth French's website.

Table 5 shows the domestic and global benchmark portfolios during the sample period. Panel A reports the summary statistics for the domestic benchmark portfolio, the RMRF column shows the excess return of the New Zealand market over the New Zealand risk-free rate. Since the average result is negative, an investment in a risk-free security would achieve a higher return than the domestic market. The market index has a standard deviation of 0.0351 and negative skewness. The New Zealand SMB factor is also negative, therefore, during 2008-2015, domestic large cap companies outperform relative to domestic small cap companies. The New Zealand HML factor is -0.0361, showing an outperformance of domestic growth stock over domestic value stock. Finally, we have a positive average factor for the New Zealand MOM, which suggests that domestic past winner stock have earned higher returns than domestic past loser stock. Panel B provides the global benchmark portfolio. Unlike the excess return of the domestic market portfolio, the excess return of the global market portfolio is positive, and with a higher standard deviation of 0.0485. The average global SMB factor is positive too, suggesting global

small caps firms outperform global large caps firms. The average global HML factor is -0.0001, hence, there is a slight outperformance of global growth stock over global value stock. The average global MOM factor is -0.0004, showing a slight outperformance of global past loser stock over past winner stock.

Table 5. Summary Statistics on Benchmark Portfolio (2008-2015)

Panel A: Domestic risk factors				
	RMRF	SMB	HML	MOM
Mean	-0.0019	-0.0084	-0.0361	0.0437
St.dev.	0.0351	0.0516	0.0985	0.0143
Max	0.0659	0.1929	0.2193	0.1101
Min	-0.1237	-0.1041	-0.4644	0.0182
Skewness	-1.2113	0.6599	-1.3640	1.2622
Kurtosis	2.1796	1.5071	5.8400	3.9317
Panel B: Global risk factors				
	RMRF	SMB	HML	MOM
Mean	0.0065	0.0018	-0.0001	-0.0004
St.dev.	0.0485	0.0243	0.0367	0.0543
Max	0.1134	0.1064	0.1972	0.1245
Min	-0.1715	-0.0427	-0.0875	-0.3458
Skewness	-0.6676	0.7322	1.5729	-2.8126
Kurtosis	1.1679	2.4604	8.2802	16.6956

Note: This table reports summary statistics for the various benchmark portfolios during 2008-2015. Panel A reports the results for the domestic risk factors, where RMRF is the excess return for the New Zealand market; SMB is the New Zealand size factor, HML is the New Zealand book-to market factor, and MOM is the New Zealand momentum factor. Panel B reports the results for the global risk factors, where RMRF is the excess return for the global market; SMB is the global size factor, HML is the global book-to market factor, and MOM is the global momentum factor.

Chapter 6: Empirical Findings

In this section, I will assess the risk-adjusted performance of KiwiSaver growth and balanced funds by using the asset pricing model as mentioned above, i.e. CAPM, FF3, C4, and the balanced four factor model.

I will examine the performance of growth funds first. 36 KiwiSaver growth funds are included in the regression results.

Table 6. Average Alpha, Beta, SMB, HML, MOM and Adjusted R^2 of all Growth Funds

			α (%p.a.)	β	SMB	HML	MOM	R^2_{adj}
Domestic CAPM	Average		0.0269	0.5239				46.68%
	No. of Sig	+	15	36				
		-	1	0				
Global CAPM	Average		-0.0025	0.3856				50.28%
	No. of Sig	+	2	36				
		-	2	0				
Domestic FF3	Average		0.0206	0.5274	-0.0644	-0.0002		48.27%
	No. of Sig	+	14	36	0	0		
		-	1	0	18	0		
Global FF3	Average		-0.0074	0.4082	-0.0657	-0.0696		52.21%
	No. of Sig	+	2	36	0	0		
		-	4	0	9	10		
Domestic C4	Average		-0.0456	0.4987	-0.0598	-0.0052	0.1231	49.13%
	No. of Sig	+	2	36	0	0	6	
		-	4	0	17	0	0	
Global C4	Average		-0.0074	0.4085	-0.0708	-0.1129	-0.0358	52.14%
	No. of Sig	+	2	36	0	0	0	
		-	4	0	8	12	0	

Note: This table reports average alpha, beta, SMB, HML, MOM and adjusted R^2 of all 36 growth fund from regression results for Equation (3)--(8). No. of sig is the number of significance of all the funds results. "+" represents positive significance while "-" represents negative significance.

Table 6 illustrates a brief summary of my results: the average alpha, beta, SMB, HML, MOM, and adjusted R^2 for all the 36 sample growth KiwiSaver funds during the sample period by using CAPM, Fama and French 3-factor model and Carhart 4-factor model both domestically and globally. The average alphas are positive when using domestic CAPM and Fama and French 3-factor model, while they are negative when using global CAPM and Fama and French 3-factor model, as well as both domestic and global Carhart 4-factor model. However, there are more significant evidence of alpha when applying the domestic CAPM and Fama and French 3-factor model. The average betas of all models are relatively small for growth funds. All the average SMB factors are negative, so the majority of the growth KiwiSaver funds focus their investing in larger companies rather than small companies. All the average HML factors are negative as well, but there is no significant evidence when applying domestic methodologies. Thus, KiwiSaver funds have a higher exposure to growth stocks globally. The average MOM factor is positive, and 6 growth funds are significantly momentum driven when using domestic Carhart 4-factor model. However, the average MOM factor is negative when using global Carhart 4-factor model and none of them is significant.

Specifically, I begin by examining the CAPM results. Table 7 to Table 9 present the alpha, beta and adjusted R^2 results for the CAPM method.

Table 7 shows the annualized alpha after running the regressions of equation (2) (domestic CAPM) and equation (3) (global CAPM) for each growth fund over the sample period. Alpha captures the risk adjusted out- or under-performance relative to the market index. Table 5 demonstrates that there are more positive alphas (32 out of 36) when using the domestic CAPM, whereas there are more negative alphas (26 out of 36) when using the global CAPM. When using the domestic CAPM, 15 out of the 34 growth funds have significantly positive alphas, and 1 growth fund has significantly negative alpha. Therefore, the 15 growth funds outperform relative to the New Zealand market index and the 1 growth funds show significant evidence for underperformance relative to the local market index. However, when I employ the global CAPM, the results show that only 2 out of 34 growth funds have significantly positive alphas, and 2 growth funds have significantly negative alphas. This suggests only 2 KiwiSaver growth funds show significant evidence for outperformance relative to the global market index, and 2 funds show significant evidence for underperformance relative to the global market index. The best performer based on CAPM is Aon KiwiSaver Milford which is ranked first based on

its annualized alpha in both the domestic and global CAPMs, (0.076 and 0.071 respectively), and both alphas are significantly different from zero. It is followed by OneAnswer KiwiSaver-Australasian Share, Westpac KiwiSaver-Capital Protect Plan 5 and Milford Active Growth KiwiSaver. The worst performer is Mercer KiwiSaver Shares which ranks last in domestic alpha (-0.036) and ranks 33rd in global alpha (-0.042), and both of its alphas are significantly negative. Except Aon KiwiSaver Milford and Milford Active Growth KiwiSaver, there is no significant evidence for outperformance relative to the world market index. Therefore, only Aon KiwiSaver Milford and Milford Active Growth KiwiSaver outperform the market both locally and globally. They are good choice for investors based on its risk-adjusted performance by CAPM.

Knudsen (2009) found that local and global CAPM valuation models differ considerably depending on the country and industry. In my research, the domestic CAPM shows better results than global CAPM (higher growth funds' alphas and more significant evidence). From the asset allocation collected from Morningstar, most KiwiSaver growth funds invest predominantly in domestic stocks, and compared to other developed market such as U.S., Australia and Europe, New Zealand equity market is comparably isolated, so using domestic CAPM seems more appropriate. However, on the other hand, according to Graham and Harvey (2001), there is a potential case to use a global CAPM rather than a domestic CAPM, if the market has become fully integrated, especially when addressing the developed global markets. Although New Zealand capital market is relatively isolated, it is still integrated with the global capital markets, so using global CAPM might be also appropriate. I use both domestic and global CAPM, because I think they are both reasonable to be used in my KiwiSaver studies.

A previous study of the risk-adjusted performance of KiwiSaver growth funds (Frijns and Tourani-Rad, 2015) investigated 19 growth funds during the period September 2007 to April 2013 by using both domestic CAPM and FF3 model, and global CAPM and FF3 model. They have a shorter regression period and less funds compared to my study. In their CAPM results, there are more negative domestic alphas than positive domestic alphas, which contrasts with my findings as I observe more positive domestic alphas than negative domestic alphas. One of the reasons could be that I have a longer sample period after the global financial crisis. The global financial crisis is striking the global financial market through 2008 to 2009, which might lead to worse performance of KiwiSaver fund. Except 1 significantly negative global alpha, they do not observe any significant alpha,

therefore there is no significant evidence for outperformance of their 19 KiwiSaver growth funds relative to the market index in their sample period. But I observe several significant evidence in my study for outperformance. We have 9 funds in common, but ASB Growth fund and Staples Rodway Growth fund belong to my balanced fund for the reason that their equity is less than 60% of total asset allocation. So the equity of the 2 funds' asset allocation has been decreasing. Among the 7 same growth funds, there are 3 funds (ANZ KiwiSaver-Growth Fund, Fisher Funds Growth KiwiSaver Fund and Westpac KiwiSaver-Growth Fund) that show significance for outperformance.

Table 7. Alpha results -- CAPM

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.012	26	-0.044*	36
AMP KiwiSaver LS Growth Fund	0.013	25	-0.034	34
ANZ Default KiwiSaver Scheme-Balanced Gr	0.033**	19	-0.007	20
ANZ Default KiwiSaver Scheme-Growth	0.038**	12	-0.011	26
ANZ KiwiSaver-Balanced Growth	0.035***	17	0.003	9
ANZ KiwiSaver-Growth	0.045**	8	-0.008	23
Aon KiwiSaver ANZ Balanced	0.045**	7	0.008	6
Aon KiwiSaver Milford	0.076***	1	0.071***	1
BNZ KiwiSaver Balanced Fund	0.009	28	-0.007	21
BNZ KiwiSaver Growth Fund	0.010	27	-0.014	30
BNZ KiwiSaver Moderate Fund	0.006	30	-0.004	17
Fisher Funds Growth KiwiSaver Fund	0.051*	5	-0.003	16
Forsyth Barr KiwiSaver Balanced Port	0.006	29	-0.009	24
Forsyth Barr KiwiSaver Growth Portfolio	-0.002	32	-0.025	32
Generate KiwiSaver Focused Growth Fund	-0.003	33	-0.012	27
Generate KiwiSaver Growth Fund	-0.007	35	-0.013	29
Grosvenor KiwiSaver Balanced Growth	0.004	31	-0.008	22
Grosvenor KiwiSaver Geared Growth Fund	0.018	23	-0.015	31
Grosvenor KiwiSaver Socially Rsp Inv Gr	0.016	24	-0.002	13
Grosvenor KiwiSaver Trans-Tasman Share	-0.005	34	-0.006	33
Kiwi Wealth KiwiSaver Growth	0.033	20	-0.006	19
Mercer KiwiSaver Shares	-0.036***	36	-0.042***	35
Milford Active Growth KiwiSaver	0.052***	4	0.034*	3
OneAnswer KiwiSaver-Australasian Share	0.058***	2	-0.003	14
OneAnswer KiwiSaver-Balanced Growth	0.043***	9	0.000	10
OneAnswer KiwiSaver-Growth Fund	0.048**	6	-0.005	18
OneAnswer KiwiSaver-Intl Share	0.037	13	-0.012	28
OneAnswer KiwiSaver-Sustainable Int Shr	0.022	22	-0.010	25
Staples Rodway KiwiSaver Balanced	0.039**	11	-0.001	11
Westpac KiwiSaver-Balanced Fund	0.031***	21	-0.001	12
Westpac KiwiSaver-Capital Protect Plan 1	0.035	18	0.005	8
Westpac KiwiSaver-Capital Protect Plan 2	0.035	16	0.007	7
Westpac KiwiSaver-Capital Protect Plan 3	0.036	15	0.015	5
Westpac KiwiSaver-Capital Protect Plan 4	0.041	10	0.033	4
Westpac KiwiSaver-Capital Protect Plan 5	0.056*	3	0.040	2
Westpac KiwiSaver-Growth Fund	0.037***	14	-0.003	15

Note: This table reports annualized alphas of each fund from regression results for Equation (3) (4). The domestic alpha is the regression results for Equation (3) and the global alpha is the regression results for Equation (4). Rank column is the ranking of annualized alpha in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 8 presents the betas for the funds, which signifies the degree of market risk each fund is exposed to, after running the regressions of equation (2) (3) for each growth fund during the sample periods. From Table 7, the betas obtained from KiwiSaver growth funds by using CAPM are comparably small. We can observe from Table 6, no beta is higher than 1 and the highest beta is 0.917 for OneAnswer KiwiSaver-Australasian Share. Betas are higher when testing by domestic CAPM than global CAPM. The highest beta using global CAPM is 0.563 for AMP KiwiSaver LS Aggressive Fund. Although all the betas are significant, they are really small betas for growth funds. This suggests that fund managers of those growth funds follow comparably conservative strategies rather than aggressive strategies. The best performer Aon KiwiSaver Milford based on alpha, has a beta of just 0.521 for the domestic CAPM and 0.226 for the global CAPM. The worst performer, Mercer KiwiSaver Shares, has betas which are less than 0.1 for both domestic and global CAPM.

In the study by Frijns and Tourani-Rad (2015) there was only 1 beta that exceed 1 when using domestic CAPM and no beta exceed 1 when using global CAPM. Their betas from domestic CAPM are higher than that from global CAPM, which is similar to my results. Thus, growth KiwiSaver funds have small betas both in previous study and my study.

I find different beta results from equity mutual funds studies in different countries and markets. In Detzel and Detzel (2016)'s study, the U.S. equity mutual funds' average beta are between 0.9 to 1.05 within different equity classes from January 1991 to December 2011. Australia equity funds show beta within the range of 0.8 to 1.0 for the period June 1992 to December 2013 (Haque & Ahmed, 2015). Hence, compared to U.S. equity fund and Australia equity fund, the beta of New Zealand growth fund is relatively small. On the other hand, the beta of emerging market is comparably small based on the literature I have found. Rao, Iqbal, and Tauni (2016) found an average beta of 0.7408 by CAPM and 0.7614 by Carhart 4-factor model when investigating the performance and persistence of 520 equity funds in China for the period January 2004 to December 2014. Vysniauskas and Rutkauskas (2014) found only 1 out of 10 equity funds has the beta exceed 1 when they examine 10 mutual funds registered in Lithuania for the period from January 2012 to October 2013, and the betas of rest 9 funds are from 0.3162 to 0.8732. Nainggolan, How, and Verhoeven (2016) also found betas that are smaller than 1 for their majority global sample of Islamic equity funds from 1984 to 2010. Panda, Mahapatra, and Moharana (2015) found a beta range from 0.4 to 0.6 based on the majority equity funds

from 5 Indian asset management companies for the period from January 2008 to December 2013. Therefore, the beta of New Zealand growth KiwiSaver fund is closer to the betas in emerging capital markets than developed capital market.

Table 9 shows the result of the adjusted R^2, representing the goodness of fit of CAPM models. R^2 reflects the percentage of a fund's movement which are explained by movements in its benchmark index (Morningstar, n.d.). From Table 7, adjusted R^2 is higher when using the domestic CAPM than the global CAPM. There is wild variation in the fit of both domestic CAPM and global CAPM models, where the domestic adjusted R^2 ranges from 7.94% (Grosvenor KiwiSaver Trans-Tasman Share) to 89.56% (OneAnswer KiwiSaver-Australasian Share) while the global adjusted R^2 range from 5.87% (Generate KiwiSaver Growth Fund) to 77.67% (BNZ KiwiSaver Growth Fund). A high R^2 adds more credibility to the accuracy of the funds's alpha and beta. Thus, OneAnswer KiwiSaver-Australasian Share with a domestic beta of 0.917, and adjusted R^2 of 89.56% indicates that its performance is close to that of the domestic market.

Table 8. Beta result -- CAPM

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.671***	5	0.563***	1
AMP KiwiSaver LS Growth Fund	0.568***	14	0.469***	10
ANZ Default KiwiSaver Scheme-Balanced Gr	0.513***	20	0.364***	20
ANZ Default KiwiSaver Scheme-Growth	0.628***	8	0.451***	14
ANZ KiwiSaver-Balanced Growth	0.405***	26	0.300***	25
ANZ KiwiSaver-Growth	0.657***	6	0.497***	4
Aon KiwiSaver ANZ Balanced	0.454***	22	0.352***	22
Aon KiwiSaver Milford	0.521***	19	0.226***	31
BNZ KiwiSaver Balanced Fund	0.433***	24	0.386***	18
BNZ KiwiSaver Growth Fund	0.554***	15	0.535***	2
BNZ KiwiSaver Moderate Fund	0.330***	30	0.278***	28
Fisher Funds Growth KiwiSaver Fund	0.685***	4	0.498***	3
Forsyth Barr KiwiSaver Balanced Port	0.394***	28	0.237***	30
Forsyth Barr KiwiSaver Growth Portfolio	0.569***	13	0.351***	23
Generate KiwiSaver Focused Growth Fund	0.110**	34	0.074*	34
Generate KiwiSaver Growth Fund	0.100***	35	0.055*	36
Grosvenor KiwiSaver Balanced Growth	0.403***	27	0.284***	27
Grosvenor KiwiSaver Geared Growth Fund	0.521***	18	0.422***	15
Grosvenor KiwiSaver Socially Rsp Inv Gr	0.241***	33	0.161***	32
Grosvenor KiwiSaver Trans-Tasman Share	0.276**	31	0.256***	29
Kiwi Wealth KiwiSaver Growth	0.454***	23	0.371***	19
Mercer KiwiSaver Shares	0.088***	36	0.060*	35
Milford Active Growth KiwiSaver	0.247***	32	0.139***	33
OneAnswer KiwiSaver-Australasian Share	0.917***	1	0.467***	12
OneAnswer KiwiSaver-Balanced Growth	0.531***	16	0.399***	16
OneAnswer KiwiSaver-Growth Fund	0.653***	7	0.493***	5
OneAnswer KiwiSaver-Intl Share	0.607***	11	0.454***	13
OneAnswer KiwiSaver-Sustainable Int Shr	0.363***	29	0.320***	24
Staples Rodway KiwiSaver Balanced	0.500***	21	0.390***	17
Westpac KiwiSaver-Balanced Fund	0.430***	25	0.285***	26
Westpac KiwiSaver-Capital Protect Plan 1	0.766***	2	0.469***	9
Westpac KiwiSaver-Capital Protect Plan 2	0.689***	3	0.488***	6
Westpac KiwiSaver-Capital Protect Plan 3	0.627***	9	0.480***	7
Westpac KiwiSaver-Capital Protect Plan 4	0.612***	10	0.467***	11
Westpac KiwiSaver-Capital Protect Plan 5	0.584***	12	0.476***	8
Westpac KiwiSaver-Growth Fund	0.526***	17	0.353***	21

Note: This table reports betas of each fund from regression results for Equation (3) (4). The domestic beta is the regression results for Equation (3) and the global beta is the regression results for Equation (4). Rank column is the ranking of beta in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 9. Adjusted R^2 -- CAPM

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	46.36%	22	63.52%	13
AMP KiwiSaver LS Growth Fund	47.20%	20	62.65%	14
ANZ Default KiwiSaver Scheme-Balanced Gr	72.16%	4	70.36%	8
ANZ Default KiwiSaver Scheme-Growth	72.22%	3	71.91%	6
ANZ KiwiSaver-Balanced Growth	66.93%	9	71.00%	7
ANZ KiwiSaver-Growth	67.92%	6	75.20%	2
Aon KiwiSaver ANZ Balanced	55.53%	13	64.68%	11
Aon KiwiSaver Milford	66.37%	10	31.76%	29
BNZ KiwiSaver Balanced Fund	46.42%	21	69.56%	9
BNZ KiwiSaver Growth Fund	43.80%	24	77.67%	1
BNZ KiwiSaver Moderate Fund	44.72%	23	59.79%	17
Fisher Funds Growth KiwiSaver Fund	53.37%	15	54.53%	20
Forsyth Barr KiwiSaver Balanced Port	49.50%	18	43.67%	26
Forsyth Barr KiwiSaver Growth Portfolio	53.92%	14	50.44%	22
Generate KiwiSaver Focused Growth Fund	8.13%	35	6.93%	35
Generate KiwiSaver Growth Fund	10.74%	33	5.87%	36
Grosvenor KiwiSaver Balanced Growth	30.55%	26	43.73%	25
Grosvenor KiwiSaver Geared Growth Fund	27.31%	30	49.82%	23
Grosvenor KiwiSaver Socially Rsp Inv Gr	20.08%	31	17.29%	31
Grosvenor KiwiSaver Trans-Tasman Share	7.94%	36	13.80%	33
Kiwi Wealth KiwiSaver Growth	29.27%	28	38.06%	27
Mercer KiwiSaver Shares	8.20%	34	7.28%	34
Milford Active Growth KiwiSaver	28.24%	29	16.73%	32
OneAnswer KiwiSaver-Australasian Share	89.56%	1	44.32%	24
OneAnswer KiwiSaver-Balanced Growth	67.83%	7	74.02%	4
OneAnswer KiwiSaver-Growth Fund	67.82%	8	74.59%	3
OneAnswer KiwiSaver-Intl Share	30.38%	27	32.86%	28
OneAnswer KiwiSaver-Sustainable Int Shr	13.93%	32	21.43%	30
Staples Rodway KiwiSaver Balanced	62.04%	11	73.35%	5
Westpac KiwiSaver-Balanced Fund	71.73%	5	60.99%	16
Westpac KiwiSaver-Capital Protect Plan 1	56.78%	12	56.20%	19
Westpac KiwiSaver-Capital Protect Plan 2	49.57%	17	68.01%	10
Westpac KiwiSaver-Capital Protect Plan 3	41.81%	25	62.00%	15
Westpac KiwiSaver-Capital Protect Plan 4	51.39%	16	54.31%	21
Westpac KiwiSaver-Capital Protect Plan 5	47.64%	19	58.15%	18
Westpac KiwiSaver-Growth Fund	73.13%	2	63.54%	12

Note: This table reports adjusted R^2 of each fund from regression results for Equation (3) (4). The domestic adjusted R^2 is the regression results for Equation (3) and the global adjusted R^2 is the regression results for Equation (4). Rank column is the ranking of adjusted R^2 in descending order.

The second model I employ is the Fama and French 3-Factor Model (FF3). Table 10 presents the alpha after running the regressions of equation (5) and (7) for each growth fund over the sample period. Just like the alpha result from CAPM, there are more positive alphas when using the domestic FF3 model compared with the global FF3. When I employ the domestic FF3, 14 out of the 36 growth funds show significantly positive alphas, indicating that these 14 growth funds outperform relative to the domestic market index, while 1 growth funds show significant evidence for underperformance relative to the domestic market index. When using the global FF3, the results show that only 2 out of 36 growth funds have significantly positive alphas, while 4 growth funds have significantly negative alphas. This suggests that only 2 KiwiSaver growth funds show significant evidence for outperformance relative to the global market index, and 4 KiwiSaver growth funds show significant evidence for underperformance relative to the global market index. Therefore, almost half of KiwiSaver growth funds provide better performance compared to New Zealand market index. The alpha results from the FF3 are similar to the results from the CAPM, Aon KiwiSaver Milford is still the best performer with domestic alpha of 0.075 and global alpha of 0.066, followed by the Milford Active Growth KiwiSaver. The worst performer is still Mercer KiwiSaver Shares, with significantly negative alphas for the domestic FF3, alpha of -0.037 and ranked last, and global FF3, alpha of -0.044 and ranked 33rd. In my study, there are 14 funds that show significant evidence of outperformance relative to the New Zealand market index. Only 2 funds (Aon KiwiSaver Milford and Milford Active Growth KiwiSaver) show significant evidence of outperformance relative to global market index. So, Aon KiwiSaver Milford and Milford Active Growth KiwiSaver both have better performance than New Zealand market index and the global market index. I still have more positive alphas and significant evidence than Frijns and Tourani-Rad's study (2015) when they use the FF3.

Table 10. Alpha result -- FF3

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.020	20	-0.047**	36
AMP KiwiSaver LS Growth Fund	0.019	21	-0.036*	34
ANZ Default KiwiSaver Scheme-Balanced Gr	0.027*	16	-0.008	18
ANZ Default KiwiSaver Scheme-Growth	0.032*	11	-0.012	23
ANZ KiwiSaver-Balanced Growth	0.030**	13	0.002	8
ANZ KiwiSaver-Growth	0.037*	9	-0.009	17
Aon KiwiSaver ANZ Balanced	0.046**	5	0.007	5
Aon KiwiSaver Milford	0.075***	1	0.066***	1
BNZ KiwiSaver Balanced Fund	-0.001	30	-0.023	29
BNZ KiwiSaver Growth Fund	0.000	29	-0.032*	33
BNZ KiwiSaver Moderate Fund	-0.003	31	-0.018	28
Fisher Funds Growth KiwiSaver Fund	0.042	6	-0.002	13
Forsyth Barr KiwiSaver Balanced Port	0.001	27	-0.010	21
Forsyth Barr KiwiSaver Growth Portfolio	-0.007	33	-0.026	31
Generate KiwiSaver Focused Growth Fund	-0.004	32	-0.015	25
Generate KiwiSaver Growth Fund	-0.007	34	-0.016	26
Grosvenor KiwiSaver Balanced Growth	-0.013	35	-0.018	27
Grosvenor KiwiSaver Geared Growth Fund	0.003	26	-0.024	30
Grosvenor KiwiSaver Socially Rsp Inv Gr	0.018	22	-0.005	16
Grosvenor KiwiSaver Trans-Tasman Share	0.004	25	-0.032	32
Kiwi Wealth KiwiSaver Growth	0.014	23	-0.011	22
Mercer KiwiSaver Shares	-0.037***	36	-0.044***	35
Milford Active Growth KiwiSaver	0.053***	3	0.032*	2
OneAnswer KiwiSaver-Australasian Share	0.057***	2	-0.003	14
OneAnswer KiwiSaver-Balanced Growth	0.036**	10	-0.001	10
OneAnswer KiwiSaver-Growth Fund	0.040*	7	-0.006	17
OneAnswer KiwiSaver-Intl Share	0.000	28	-0.014	24
OneAnswer KiwiSaver-Sustainable Int Shr	0.007	24	-0.009	20
Staples Rodway KiwiSaver Balanced	0.031*	12	-0.002	12
Westpac KiwiSaver-Balanced Fund	0.023**	19	-0.001	11
Westpac KiwiSaver-Capital Protect Plan 1	0.023	18	0.007	6
Westpac KiwiSaver-Capital Protect Plan 2	0.025	17	0.000	9
Westpac KiwiSaver-Capital Protect Plan 3	0.030	14	0.004	7
Westpac KiwiSaver-Capital Protect Plan 4	0.039	8	0.020	4
Westpac KiwiSaver-Capital Protect Plan 5	0.053*	4	0.025	3
Westpac KiwiSaver-Growth Fund	0.028**	15	-0.004	15

Note: This table reports annualized alphas of each fund from regression results for Equation (5) (7). The domestic alpha is the regression results for Equation (5) and the global alpha is the regression results for Equation (7). Rank column is the ranking of annualized alpha in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 11 presents the market factor results from equation (5) (7) for each growth fund. The highest beta using the domestic FF3 is 0.918 (OneAnswer KiwiSaver-Australasian Share) while the lowest beta is 0.089 (Mercer KiwiSaver Shares). The highest beta using the global FF3 is 0.635 (AMP KiwiSaver LS Aggressive Fund) and the lowest beta using global FF3 is 0.084 (Mercer KiwiSaver Shares). Just like the result from the CAPM model, it suggests that KiwiSaver managers are following comparably safer strategies for KiwiSaver growth funds.

Table 12 presents the SMB coefficients. The majority of the SMB factors are negative both for the domestic and the global FF3, suggesting that the majority of the KiwiSaver funds focus their investing in larger companies rather than small companies, which might be one reason for the low beta results. 18 out of 36 funds have significantly negative SMB coefficients when using domestic FF3, while 9 out of 36 funds show significance with negative SMB based on global FF3. Frijns and Tourani-Rad (2015) observe insignificant exposures to the SMB factor for the domestic FF3 and significantly negative exposures for 13 funds when using global FF3. Therefore, both studies suggest funds invest more heavily in larger companies rather than smaller funds, albeit I find evidence in both the domestic and global FF3 as opposed to just the global FF3 as in Frijns and Tourani-Rad (2015).

Table 13 presents the HML coefficient after running the regressions of equation (5) (7) for each growth fund during the sample periods. There are more negative HML coefficients when using both the domestic FF3 and global FF3. However, there is no significant evidence for domestic HML, and 9 out of 34 funds show significantly negative HML for the global model. Therefore, globally, some KiwiSaver funds have a higher exposure to growth stocks (low book-to-market values) than to value stocks (high book-to-market values).

Table 14 shows the result of adjusted R^2 after running the regressions of equation (5) (7) for each growth fund during the sample periods. The adjusted R^2 results still have a wild range when using both domestic FF3 (6.66% of Mercer KiwiSaver Shares to 89.36% of OneAnswer KiwiSaver-Australasian Share) global FF3 (9.53% of Mercer KiwiSaver Shares to 84.11% of BNZ KiwiSaver Growth Fund). Hence, Mercer KiwiSaver Shares provides the worst fit.

Table 11. RMRF results -- FF3

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.669***	5	0.635***	1
AMP KiwiSaver LS Growth Fund	0.566***	14	0.530***	5
ANZ Default KiwiSaver Scheme-Balanced Gr	0.516***	20	0.392***	20
ANZ Default KiwiSaver Scheme-Growth	0.632***	9	0.483***	11
ANZ KiwiSaver-Balanced Growth	0.408***	27	0.312***	25
ANZ KiwiSaver-Growth	0.661***	6	0.513***	6
Aon KiwiSaver ANZ Balanced	0.454***	23	0.374***	22
Aon KiwiSaver Milford	0.521***	19	0.259***	31
BNZ KiwiSaver Balanced Fund	0.436***	24	0.414***	17
BNZ KiwiSaver Growth Fund	0.556***	15	0.564***	2
BNZ KiwiSaver Moderate Fund	0.332***	30	0.303***	26
Fisher Funds Growth KiwiSaver Fund	0.690***	4	0.459***	13
Forsyth Barr KiwiSaver Balanced Port	0.399***	28	0.263***	30
Forsyth Barr KiwiSaver Growth Portfolio	0.574***	13	0.381***	21
Generate KiwiSaver Focused Growth Fund	0.111**	34	0.124***	34
Generate KiwiSaver Growth Fund	0.101**	35	0.096***	35
Grosvenor KiwiSaver Balanced Growth	0.420***	26	0.324***	24
Grosvenor KiwiSaver Geared Growth Fund	0.535***	16	0.476***	12
Grosvenor KiwiSaver Socially Rsp Inv Gr	0.242***	33	0.217***	32
Grosvenor KiwiSaver Trans-Tasman Share	0.276**	31	0.290***	29
Kiwi Wealth KiwiSaver Growth	0.464***	22	0.416***	16
Mercer KiwiSaver Shares	0.089**	36	0.084**	36
Milford Active Growth KiwiSaver	0.247***	32	0.187***	33
OneAnswer KiwiSaver-Australasian Share	0.918***	1	0.498***	10
OneAnswer KiwiSaver-Balanced Growth	0.535***	17	0.412***	18
OneAnswer KiwiSaver-Growth Fund	0.658***	7	0.508***	7
OneAnswer KiwiSaver-Intl Share	0.623***	10	0.455***	14
OneAnswer KiwiSaver-Sustainable Int Shr	0.372***	29	0.295***	27
Staples Rodway KiwiSaver Balanced	0.503***	21	0.411***	19
Westpac KiwiSaver-Balanced Fund	0.433***	25	0.294***	28
Westpac KiwiSaver-Capital Protect Plan 1	0.778***	2	0.448***	15
Westpac KiwiSaver-Capital Protect Plan 2	0.691***	3	0.532***	4
Westpac KiwiSaver-Capital Protect Plan 3	0.633***	8	0.532***	3
Westpac KiwiSaver-Capital Protect Plan 4	0.614***	11	0.507***	8
Westpac KiwiSaver-Capital Protect Plan 5	0.584***	12	0.505***	9
Westpac KiwiSaver-Growth Fund	0.530***	18	0.368***	23

Note: This table reports betas of each fund from regression results for Equation (5) (7). The domestic beta is the regression results for Equation (5) and the global beta is the regression results for Equation (7). Rank column is the ranking of beta in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 12. SMB results -- FF3

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.002	3	-0.184**	36
AMP KiwiSaver LS Growth Fund	-0.004	4	-0.170**	33
ANZ Default KiwiSaver Scheme-Balanced Gr	-0.061***	18	-0.065	16
ANZ Default KiwiSaver Scheme-Growth	-0.075***	25	-0.087	22
ANZ KiwiSaver-Balanced Growth	-0.047**	16	-0.018	7
ANZ KiwiSaver-Growth	-0.078**	27	-0.021	8
Aon KiwiSaver ANZ Balanced	-0.016	9	-0.085	21
Aon KiwiSaver Milford	0.020	1	-0.115	25
BNZ KiwiSaver Balanced Fund	-0.039	13	-0.141**	30
BNZ KiwiSaver Growth Fund	-0.045	15	-0.149**	31
BNZ KiwiSaver Moderate Fund	-0.035	12	-0.127**	27
Fisher Funds Growth KiwiSaver Fund	-0.073*	24	0.127	1
Forsyth Barr KiwiSaver Balanced Port	-0.041	14	-0.080	19
Forsyth Barr KiwiSaver Growth Portfolio	-0.050	17	-0.073	18
Generate KiwiSaver Focused Growth Fund	-0.026	11	-0.070	17
Generate KiwiSaver Growth Fund	-0.023	10	-0.058	15
Grosvenor KiwiSaver Balanced Growth	-0.114***	32	-0.108	24
Grosvenor KiwiSaver Geared Growth Fund	-0.155***	33	-0.182**	35
Grosvenor KiwiSaver Socially Rsp Inv Gr	-0.068**	22	-0.084	20
Grosvenor KiwiSaver Trans-Tasman Share	-0.084	29	-0.032	12
Kiwi Wealth KiwiSaver Growth	-0.208***	35	0.060	5
Mercer KiwiSaver Shares	-0.012	6	-0.024	10
Milford Active Growth KiwiSaver	0.014	2	-0.101	23
OneAnswer KiwiSaver-Australasian Share	-0.009	5	-0.122	26
OneAnswer KiwiSaver-Balanced Growth	-0.062**	19	-0.018	6
OneAnswer KiwiSaver-Growth Fund	-0.078**	26	-0.033	13
OneAnswer KiwiSaver-Intl Share	-0.242***	36	0.119	2
OneAnswer KiwiSaver-Sustainable Int Shr	-0.195***	34	0.080	3
Staples Rodway KiwiSaver Balanced	-0.065**	21	-0.043	14
Westpac KiwiSaver-Balanced Fund	-0.064***	20	-0.023	9
Westpac KiwiSaver-Capital Protect Plan 1	-0.113***	31	0.073	4
Westpac KiwiSaver-Capital Protect Plan 2	-0.091**	30	-0.131*	29
Westpac KiwiSaver-Capital Protect Plan 3	-0.081	28	-0.149*	32
Westpac KiwiSaver-Capital Protect Plan 4	-0.014	7	-0.173*	34
Westpac KiwiSaver-Capital Protect Plan 5	-0.015	8	-0.128	28
Westpac KiwiSaver-Growth Fund	-0.070***	23	-0.029	11

Note: This table reports SMB factors of each fund from regression results for Equation (5) (7). The domestic SMB is the regression results for Equation (5) and the global SMB is the regression results for Equation (7). Rank column is the ranking of SMB in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 13. HML results -- FF3

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.018	3	-0.097	26
AMP KiwiSaver LS Growth Fund	0.013	4	-0.073	19
ANZ Default KiwiSaver Scheme-Balanced Gr	0.001	12	-0.041	16
ANZ Default KiwiSaver Scheme-Growth	0.003	11	-0.040	15
ANZ KiwiSaver-Balanced Growth	-0.002	21	-0.023	7
ANZ KiwiSaver-Growth	0.000	13	-0.033	13
Aon KiwiSaver ANZ Balanced	0.007	7	-0.012	4
Aon KiwiSaver Milford	-0.006	30	-0.043	17
BNZ KiwiSaver Balanced Fund	-0.022	34	-0.164***	33
BNZ KiwiSaver Growth Fund	-0.019	33	-0.196***	35
BNZ KiwiSaver Moderate Fund	-0.025	35	-0.135***	31
Fisher Funds Growth KiwiSaver Fund	-0.002	23	0.036	1
Forsyth Barr KiwiSaver Balanced Port	-0.005	29	-0.025	8
Forsyth Barr KiwiSaver Growth Portfolio	-0.001	16	-0.040	14
Generate KiwiSaver Focused Growth Fund	0.004	9	-0.106***	27
Generate KiwiSaver Growth Fund	0.006	8	-0.084***	23
Grosvenor KiwiSaver Balanced Growth	-0.007	32	-0.111	30
Grosvenor KiwiSaver Geared Growth Fund	-0.004	28	-0.089	24
Grosvenor KiwiSaver Socially Rsp Inv Gr	0.021	2	-0.094*	25
Grosvenor KiwiSaver Trans-Tasman Share	0.042	1	-0.082	22
Kiwi Wealth KiwiSaver Growth	0.007	6	-0.172**	34
Mercer KiwiSaver Shares	-0.001	20	-0.057*	18
Milford Active Growth KiwiSaver	-0.002	22	-0.081*	21
OneAnswer KiwiSaver-Australasian Share	-0.001	17	-0.016	6
OneAnswer KiwiSaver-Balanced Growth	0.000	14	-0.027	11
OneAnswer KiwiSaver-Growth Fund	0.000	15	-0.026	9
OneAnswer KiwiSaver-Intl Share	-0.027	36	-0.079	20
OneAnswer KiwiSaver-Sustainable Int Shr	0.012	5	0.025	2
Staples Rodway KiwiSaver Balanced	-0.003	24	-0.033	12
Westpac KiwiSaver-Balanced Fund	-0.004	27	-0.012	5
Westpac KiwiSaver-Capital Protect Plan 1	-0.003	25	0.012	3
Westpac KiwiSaver-Capital Protect Plan 2	-0.001	19	-0.107	28
Westpac KiwiSaver-Capital Protect Plan 3	0.003	10	-0.110	29
Westpac KiwiSaver-Capital Protect Plan 4	-0.001	18	-0.136	32
Westpac KiwiSaver-Capital Protect Plan 5	-0.006	31	-0.208**	36
Westpac KiwiSaver-Growth Fund	-0.003	26	-0.027	10

Note: This table reports HML factors of each fund from regression results for Equation (5) (7). The domestic HML is the regression results for Equation (5) and the global HML is the regression results for Equation (7). Rank column is the ranking of HML in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 14. Adjusted R^2 -- FF3

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	45.54%	20	65.55%	12
AMP KiwiSaver LS Growth Fund	46.33%	19	64.80%	14
ANZ Default KiwiSaver Scheme-Balanced Gr	73.86%	5	70.83%	8
ANZ Default KiwiSaver Scheme-Growth	73.98%	4	72.33%	7
ANZ KiwiSaver-Balanced Growth	68.24%	9	70.70%	9
ANZ KiwiSaver-Growth	69.37%	6	74.90%	3
Aon KiwiSaver ANZ Balanced	54.88%	13	64.87%	13
Aon KiwiSaver Milford	66.07%	10	32.70%	28
BNZ KiwiSaver Balanced Fund	44.76%	22	78.15%	2
BNZ KiwiSaver Growth Fund	41.44%	26	84.11%	1
BNZ KiwiSaver Moderate Fund	43.91%	23	70.16%	10
Fisher Funds Growth KiwiSaver Fund	53.75%	15	54.62%	21
Forsyth Barr KiwiSaver Balanced Port	49.94%	17	43.97%	25
Forsyth Barr KiwiSaver Growth Portfolio	54.06%	14	50.26%	23
Generate KiwiSaver Focused Growth Fund	7.51%	35	15.62%	33
Generate KiwiSaver Growth Fund	10.68%	33	14.31%	34
Grosvenor KiwiSaver Balanced Growth	37.24%	28	45.28%	24
Grosvenor KiwiSaver Geared Growth Fund	34.96%	29	51.84%	22
Grosvenor KiwiSaver Socially Rsp Inv Gr	23.63%	31	20.20%	32
Grosvenor KiwiSaver Trans-Tasman Share	9.70%	34	12.85%	35
Kiwi Wealth KiwiSaver Growth	41.91%	25	40.60%	27
Mercer KiwiSaver Shares	6.66%	36	9.53%	36
Milford Active Growth KiwiSaver	26.99%	30	20.71%	30
OneAnswer KiwiSaver-Australasian Share	89.36%	1	43.91%	26
OneAnswer KiwiSaver-Balanced Growth	69.23%	8	73.71%	5
OneAnswer KiwiSaver-Growth Fund	69.28%	7	74.27%	4
OneAnswer KiwiSaver-Intl Share	40.08%	27	32.27%	29
OneAnswer KiwiSaver-Sustainable Int Shr	21.87%	32	20.22%	31
Staples Rodway KiwiSaver Balanced	63.59%	11	73.32%	6
Westpac KiwiSaver-Balanced Fund	74.68%	3	60.35%	18
Westpac KiwiSaver-Capital Protect Plan 1	60.45%	12	55.56%	20
Westpac KiwiSaver-Capital Protect Plan 2	51.17%	16	69.35%	11
Westpac KiwiSaver-Capital Protect Plan 3	42.66%	24	63.55%	15
Westpac KiwiSaver-Capital Protect Plan 4	49.46%	18	57.54%	19
Westpac KiwiSaver-Capital Protect Plan 5	44.88%	21	63.49%	16
Westpac KiwiSaver-Growth Fund	75.46%	2	63.11%	17

Note: This table reports adjusted R^2 of each fund from regression results for Equation (5) (7). The domestic adjusted R^2 is the regression results for Equation (5) and the global adjusted R^2 is the regression results for Equation (7). Rank column is the ranking of adjusted R^2 in descending order.

Finally, I apply the Carhart 4-Factor Model (C4) to the growth sample. Table 15 shows the alpha after running equations (6) and (8) which include the momentum factor, MOM. We can observe from Table 13 that, after adding the MOM factor to the regression, there are more negative alphas compared the alpha results in Tables 6 and 9. When I employ the domestic and global C4, 2 out of the 36 growth funds show significantly positive alphas, while 4 growth funds show significant evidence for underperformance relative to the domestic market index. The results are broadly consistent with the global CAPM and FF3 alphas, however they are markedly different from the domestic CAPM and FF3 alphas. When using domestic CAPM and FF3, 15 and 14 funds have significantly positive alphas respectively, while only 2 funds have positive alphas when testing by domestic C4. This results suggest that much of the observed outperformance in the domestic CAPM and FF3 regressions came from pursuing a momentum strategy. The best performers from employing the C4 are still Aon KiwiSaver Milford (0.081 locally and 0.065 globally) and Milford Active Growth KiwiSaver (0.103 locally and 0.032 globally). The worst domestic performer is BNZ KiwiSaver Growth Fund with a significantly negative -0.208 alpha, while the worst performer is AMP KiwiSaver LS Aggressive Fund (-0.048).

Aon KiwiSaver Milford and Milford Active Growth KiwiSaver have significant outperformance.

Table 15. Alpha results – C4

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	-0.053	19	-0.048**	36
AMP KiwiSaver LS Growth Fund	-0.038	16	-0.036*	34
ANZ Default KiwiSaver Scheme-Balanced Gr	0.001	10	-0.009	18
ANZ Default KiwiSaver Scheme-Growth	-0.013	15	-0.012	23
ANZ KiwiSaver-Balanced Growth	0.020	7	0.002	8
ANZ KiwiSaver-Growth	-0.011	14	-0.010	20
Aon KiwiSaver ANZ Balanced	0.033	5	0.007	5
Aon KiwiSaver Milford	0.081*	2	0.065***	1
BNZ KiwiSaver Balanced Fund	-0.144*	34	-0.021	29
BNZ KiwiSaver Growth Fund	-0.208**	36	-0.030*	32
BNZ KiwiSaver Moderate Fund	-0.099	27	-0.017	27
Fisher Funds Growth KiwiSaver Fund	-0.088	25	-0.004	14
Forsyth Barr KiwiSaver Balanced Port	-0.064	22	-0.011	21
Forsyth Barr KiwiSaver Growth Portfolio	-0.095	26	-0.027	31
Generate KiwiSaver Focused Growth Fund	-0.131***	33	-0.015	25
Generate KiwiSaver Growth Fund	-0.105***	30	-0.016	26
Grosvenor KiwiSaver Balanced Growth	-0.071	23	-0.019	28
Grosvenor KiwiSaver Geared Growth Fund	-0.115	31	-0.024	30
Grosvenor KiwiSaver Socially Rsp Inv Gr	-0.001	11	-0.005	16
Grosvenor KiwiSaver Trans-Tasman Share	0.037	4	-0.032	33
Kiwi Wealth KiwiSaver Growth	-0.072	24	-0.012	22
Mercer KiwiSaver Shares	-0.046	17	-0.044***	35
Milford Active Growth KiwiSaver	0.103*	1	0.032*	2
OneAnswer KiwiSaver-Australasian Share	0.045	3	-0.003	13
OneAnswer KiwiSaver-Balanced Growth	0.005	9	-0.001	10
OneAnswer KiwiSaver-Growth Fund	-0.008	13	-0.006	17
OneAnswer KiwiSaver-Intl Share	-0.148	35	-0.015	24
OneAnswer KiwiSaver-Sustainable Int Shr	-0.123	32	-0.010	19
Staples Rodway KiwiSaver Balanced	-0.001	12	-0.002	12
Westpac KiwiSaver-Balanced Fund	0.025	6	-0.002	11
Westpac KiwiSaver-Capital Protect Plan 1	-0.048	18	0.006	6
Westpac KiwiSaver-Capital Protect Plan 2	-0.059	20	0.000	9
Westpac KiwiSaver-Capital Protect Plan 3	-0.061	21	0.003	7
Westpac KiwiSaver-Capital Protect Plan 4	-0.104	29	0.023	4
Westpac KiwiSaver-Capital Protect Plan 5	-0.101	28	0.029	3
Westpac KiwiSaver-Growth Fund	0.017	7	-0.004	15

Note: This table reports annualized alphas of each fund from regression results for Equation (6) (8). The domestic alpha is the regression results for Equation (6) and the global alpha is the regression results for Equation (8). Rank column is the ranking of annualized alpha in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 16 shows the market factor results for the growth funds. The relatively small beta problem still exists in the C4 regressions. Table 14 shows no beta exceeds 1. The beta result from the C4 method are similar to the beta results from the CAPM and FF3. The highest beta from domestic C4 is 0.918 (OneAnswer KiwiSaver-Australasian Share) while the lowest beta from domestic FF3 is 0.089 (Mercer KiwiSaver Shares). The highest beta using global FF3 is 0.637 (AMP KiwiSaver LS Aggressive Fund) while the lowest beta using global FF3 is 0.086 (Mercer KiwiSaver Shares).

Table 17 also shows similar findings to the FF3 results for SMB in Table 11, with little evidence of investments in small companies, and some evidence of significant exposure to large cap firms. Table 18, which presents the HML coefficients, shows no significant exposure to value companies, and 11 funds which are significantly exposed to growth companies (negative and significant coefficient) in the global C4 model, but not in the domestic C4 results. Table 19 presents the MOM coefficients. 6 growth funds are significantly momentum driven when using domestic C4, but there is no significance evidence for MOM when using global C4. The highest significant domestic MOM is 0.362 from BNZ KiwiSaver Growth Fund.

Table 20 shows the result of adjusted R^2 with a wide range in domestic C4 of 5.75% Mercer KiwiSaver Shares to 89.26% OneAnswer KiwiSaver-Australasian Share and in global C4 of 10.82% of Mercer KiwiSaver Shares to 84.12% of BNZ KiwiSaver Growth Fund.

The best domestic fit is for OneAnswer KiwiSaver-Australasian Share when testing in domestic method (CAPM, FF3 and C4) while the best global fit is for BNZ KiwiSaver Growth Fund when testing in global method (CAPM, FF3 and C4).

Table 16. RMRF results – C4

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.669***	5	0.637***	1
AMP KiwiSaver LS Growth Fund	0.567***	15	0.532***	4
ANZ Default KiwiSaver Scheme-Balanced Gr	0.516***	20	0.393***	20
ANZ Default KiwiSaver Scheme-Growth	0.632***	10	0.485***	11
ANZ KiwiSaver-Balanced Growth	0.408***	27	0.312***	25
ANZ KiwiSaver-Growth	0.662***	6	0.514***	6
Aon KiwiSaver ANZ Balanced	0.454***	24	0.375***	22
Aon KiwiSaver Milford	0.520***	19	0.259***	31
BNZ KiwiSaver Balanced Fund	0.461***	23	0.409***	19
BNZ KiwiSaver Growth Fund	0.593***	13	0.556***	2
BNZ KiwiSaver Moderate Fund	0.349***	30	0.300***	26
Fisher Funds Growth KiwiSaver Fund	0.690***	4	0.467***	13
Forsyth Barr KiwiSaver Balanced Port	0.399***	28	0.266***	30
Forsyth Barr KiwiSaver Growth Portfolio	0.575***	14	0.387***	21
Generate KiwiSaver Focused Growth Fund	0.111**	34	0.126***	34
Generate KiwiSaver Growth Fund	0.101***	35	0.097***	35
Grosvenor KiwiSaver Balanced Growth	0.427***	26	0.325***	24
Grosvenor KiwiSaver Geared Growth Fund	0.544***	16	0.476***	12
Grosvenor KiwiSaver Socially Rsp Inv Gr	0.242***	33	0.211***	32
Grosvenor KiwiSaver Trans-Tasman Share	0.276**	31	0.290***	29
Kiwi Wealth KiwiSaver Growth	0.464***	22	0.419***	16
Mercer KiwiSaver Shares	0.089**	36	0.086***	36
Milford Active Growth KiwiSaver	0.247***	32	0.185***	33
OneAnswer KiwiSaver-Australasian Share	0.918***	1	0.499***	9
OneAnswer KiwiSaver-Balanced Growth	0.535***	17	0.413***	17
OneAnswer KiwiSaver-Growth Fund	0.658***	7	0.509***	7
OneAnswer KiwiSaver-Intl Share	0.624***	11	0.457***	14
OneAnswer KiwiSaver-Sustainable Int Shr	0.373***	29	0.296***	27
Staples Rodway KiwiSaver Balanced	0.503***	21	0.411***	18
Westpac KiwiSaver-Balanced Fund	0.433***	25	0.296***	28
Westpac KiwiSaver-Capital Protect Plan 1	0.781***	2	0.454***	15
Westpac KiwiSaver-Capital Protect Plan 2	0.699***	3	0.532***	5
Westpac KiwiSaver-Capital Protect Plan 3	0.644***	9	0.533***	3
Westpac KiwiSaver-Capital Protect Plan 4	0.644***	8	0.500***	8
Westpac KiwiSaver-Capital Protect Plan 5	0.615***	12	0.495***	10
Westpac KiwiSaver-Growth Fund	0.530***	18	0.370***	23

Note: This table reports betas of each fund from regression results for Equation (6) (8). The domestic beta is the regression results for Equation (6) and the global beta is the regression results for Equation (8). Rank column is the ranking of beta in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 17. SMB results – C4

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.004	5	-0.195**	36
AMP KiwiSaver LS Growth Fund	-0.003	6	-0.180**	34
ANZ Default KiwiSaver Scheme-Balanced Gr	-0.060***	18	-0.071	16
ANZ Default KiwiSaver Scheme-Growth	-0.074***	26	-0.094	23
ANZ KiwiSaver-Balanced Growth	-0.047**	16	-0.021	6
ANZ KiwiSaver-Growth	-0.077**	27	-0.026	8
Aon KiwiSaver ANZ Balanced	-0.016	9	-0.091	21
Aon KiwiSaver Milford	0.020	1	-0.116	25
BNZ KiwiSaver Balanced Fund	-0.021	11	-0.141	30
BNZ KiwiSaver Growth Fund	-0.018	10	-0.148**	31
BNZ KiwiSaver Moderate Fund	-0.024	14	-0.126**	26
Fisher Funds Growth KiwiSaver Fund	-0.070	25	0.091	2
Forsyth Barr KiwiSaver Balanced Port	-0.039	15	-0.089	20
Forsyth Barr KiwiSaver Growth Portfolio	-0.047	17	-0.087	19
Generate KiwiSaver Focused Growth Fund	-0.023	13	-0.078	17
Generate KiwiSaver Growth Fund	-0.021	12	-0.063	15
Grosvenor KiwiSaver Balanced Growth	-0.107***	31	-0.109	24
Grosvenor KiwiSaver Geared Growth Fund	-0.145***	33	-0.182**	35
Grosvenor KiwiSaver Socially Rsp Inv Gr	-0.067**	22	-0.084	18
Grosvenor KiwiSaver Trans-Tasman Share	-0.085	30	-0.031	10
Kiwi Wealth KiwiSaver Growth	-0.206***	35	0.048	5
Mercer KiwiSaver Shares	-0.011	8	-0.031	11
Milford Active Growth KiwiSaver	0.013	2	-0.093	22
OneAnswer KiwiSaver-Australasian Share	-0.008	7	-0.128	28
OneAnswer KiwiSaver-Balanced Growth	-0.062**	19	-0.022	7
OneAnswer KiwiSaver-Growth Fund	-0.077**	28	-0.037	13
OneAnswer KiwiSaver-Intl Share	-0.239***	36	0.110	1
OneAnswer KiwiSaver-Sustainable Int Shr	-0.193***	34	0.076	3
Staples Rodway KiwiSaver Balanced	-0.065**	21	-0.044	14
Westpac KiwiSaver-Balanced Fund	-0.064***	20	-0.030	9
Westpac KiwiSaver-Capital Protect Plan 1	-0.111***	32	0.064	4
Westpac KiwiSaver-Capital Protect Plan 2	-0.082*	29	-0.132*	29
Westpac KiwiSaver-Capital Protect Plan 3	-0.069	23	-0.149*	32
Westpac KiwiSaver-Capital Protect Plan 4	0.006	4	-0.176*	33
Westpac KiwiSaver-Capital Protect Plan 5	0.007	3	-0.127	27
Westpac KiwiSaver-Growth Fund	-0.070***	24	-0.037	11

Note: This table reports SMB factors of each fund from regression results for Equation (6) (8). The domestic SMB is the regression results for Equation (6) and the global SMB is the regression results for Equation (8). Rank column is the ranking of SMB in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 18. HML results – C4

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.014	3	-0.189*	31
AMP KiwiSaver LS Growth Fund	0.010	4	-0.148*	26
ANZ Default KiwiSaver Scheme-Balanced Gr	0.000	10	-0.088	18
ANZ Default KiwiSaver Scheme-Growth	0.000	9	-0.091	20
ANZ KiwiSaver-Balanced Growth	-0.002	15	-0.045	5
ANZ KiwiSaver-Growth	-0.002	16	-0.070	12
Aon KiwiSaver ANZ Balanced	0.006	5	-0.060	8
Aon KiwiSaver Milford	-0.005	23	-0.029	3
BNZ KiwiSaver Balanced Fund	-0.041	35	-0.204**	32
BNZ KiwiSaver Growth Fund	-0.048	36	-0.258***	34
BNZ KiwiSaver Moderate Fund	-0.037	34	-0.160**	28
Fisher Funds Growth KiwiSaver Fund	-0.010	29	-0.251**	33
Forsyth Barr KiwiSaver Balanced Port	-0.008	28	-0.087	16
Forsyth Barr KiwiSaver Growth Portfolio	-0.006	24	-0.140	25
Generate KiwiSaver Focused Growth Fund	-0.004	21	-0.162***	29
Generate KiwiSaver Growth Fund	-0.001	11	-0.129**	24
Grosvenor KiwiSaver Balanced Growth	-0.011	30	-0.077	14
Grosvenor KiwiSaver Geared Growth Fund	-0.012	31	-0.083	15
Grosvenor KiwiSaver Socially Rsp Inv Gr	0.019	2	-0.091	19
Grosvenor KiwiSaver Trans-Tasman Share	0.044	1	-0.075	13
Kiwi Wealth KiwiSaver Growth	0.002	7	-0.265**	35
Mercer KiwiSaver Shares	-0.002	13	-0.118**	23
Milford Active Growth KiwiSaver	0.001	8	-0.021	2
OneAnswer KiwiSaver-Australasian Share	-0.001	12	-0.067	11
OneAnswer KiwiSaver-Balanced Growth	-0.002	14	-0.060	9
OneAnswer KiwiSaver-Growth Fund	-0.003	17	-0.055	6
OneAnswer KiwiSaver-Intl Share	-0.036	33	-0.148	27
OneAnswer KiwiSaver-Sustainable Int Shr	0.003	6	-0.008	1
Staples Rodway KiwiSaver Balanced	-0.005	22	-0.037	4
Westpac KiwiSaver-Balanced Fund	-0.003	19	-0.061	10
Westpac KiwiSaver-Capital Protect Plan 1	-0.008	26	-0.058	7
Westpac KiwiSaver-Capital Protect Plan 2	-0.007	25	-0.101	22
Westpac KiwiSaver-Capital Protect Plan 3	-0.003	18	-0.098	21
Westpac KiwiSaver-Capital Protect Plan 4	-0.008	27	-0.170	30
Westpac KiwiSaver-Capital Protect Plan 5	-0.017	32	-0.275**	36
Westpac KiwiSaver-Growth Fund	-0.004	20	-0.087	17

Note: This table reports HML factors of each fund from regression results for Equation (6) (8). The domestic HML is the regression results for Equation (6) and the global HML is the regression results for Equation (8). Rank column is the ranking of HML in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 19. MOM results – C4

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	0.136	16	-0.076	33
AMP KiwiSaver LS Growth Fund	0.105	20	-0.062	31
ANZ Default KiwiSaver Scheme-Balanced Gr	0.048	27	-0.038	18
ANZ Default KiwiSaver Scheme-Growth	0.081	23	-0.042	22
ANZ KiwiSaver-Balanced Growth	0.018	31	-0.018	10
ANZ KiwiSaver-Growth	0.088	21	-0.030	15
Aon KiwiSaver ANZ Balanced	0.025	28	-0.039	20
Aon KiwiSaver Milford	-0.011	34	0.015	3
BNZ KiwiSaver Balanced Fund	0.241*	8	-0.039	19
BNZ KiwiSaver Growth Fund	0.362**	1	-0.059	30
BNZ KiwiSaver Moderate Fund	0.158	15	-0.024	11
Fisher Funds Growth KiwiSaver Fund	0.247	6	-0.235	36
Forsyth Barr KiwiSaver Balanced Port	0.123	18	-0.051	27
Forsyth Barr KiwiSaver Growth Portfolio	0.172	11	-0.081	35
Generate KiwiSaver Focused Growth Fund	0.250***	5	-0.046	24
Generate KiwiSaver Growth Fund	0.192***	10	-0.037	17
Grosvenor KiwiSaver Balanced Growth	0.112	19	0.038	2
Grosvenor KiwiSaver Geared Growth Fund	0.234	9	0.006	6
Grosvenor KiwiSaver Socially Rsp Inv Gr	0.061	24	0.002	8
Grosvenor KiwiSaver Trans-Tasman Share	-0.059	35	0.005	7
Kiwi Wealth KiwiSaver Growth	0.164	13	-0.076	34
Mercer KiwiSaver Shares	0.017	32	-0.050	26
Milford Active Growth KiwiSaver	-0.087	36	0.049	1
OneAnswer KiwiSaver-Australasian Share	0.021	29	-0.043	23
OneAnswer KiwiSaver-Balanced Growth	0.056	26	-0.027	14
OneAnswer KiwiSaver-Growth Fund	0.086	22	-0.024	12
OneAnswer KiwiSaver-Intl Share	0.295	2	-0.056	29
OneAnswer KiwiSaver-Sustainable Int Shr	0.253	4	-0.027	13
Staples Rodway KiwiSaver Balanced	0.060	25	-0.003	9
Westpac KiwiSaver-Balanced Fund	-0.004	33	-0.040	21
Westpac KiwiSaver-Capital Protect Plan 1	0.133	17	-0.053	28
Westpac KiwiSaver-Capital Protect Plan 2	0.161	14	0.007	5
Westpac KiwiSaver-Capital Protect Plan 3	0.169	12	0.013	4
Westpac KiwiSaver-Capital Protect Plan 4	0.247*	7	-0.032	16
Westpac KiwiSaver-Capital Protect Plan 5	0.257*	3	-0.066	32
Westpac KiwiSaver-Growth Fund	0.020	30	-0.050	25

Note: This table reports MOM factors of each fund from regression results for Equation (6) (8). The domestic MOM is the regression results for Equation (6) and the global MOM is the regression results for Equation (8). Rank column is the ranking of MOM in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 20. Adjusted R^2 – C4

Funds	Domestic	Rank	Global	Rank
AMP KiwiSaver LS Aggressive Fund	45.28%	24	65.64%	12
AMP KiwiSaver LS Growth Fund	46.03%	23	64.86%	13
ANZ Default KiwiSaver Scheme-Balanced Gr	73.69%	5	70.84%	8
ANZ Default KiwiSaver Scheme-Growth	73.90%	4	72.29%	7
ANZ KiwiSaver-Balanced Growth	67.93%	9	70.49%	9
ANZ KiwiSaver-Growth	69.25%	6	74.75%	3
Aon KiwiSaver ANZ Balanced	54.44%	14	64.82%	14
Aon KiwiSaver Milford	65.63%	10	31.87%	28
BNZ KiwiSaver Balanced Fund	49.29%	19	77.83%	2
BNZ KiwiSaver Growth Fund	47.79%	21	84.12%	1
BNZ KiwiSaver Moderate Fund	46.61%	22	69.43%	10
Fisher Funds Growth KiwiSaver Fund	54.40%	15	58.95%	19
Forsyth Barr KiwiSaver Balanced Port	50.45%	18	44.17%	25
Forsyth Barr KiwiSaver Growth Portfolio	54.63%	13	50.81%	23
Generate KiwiSaver Focused Growth Fund	14.14%	34	15.94%	33
Generate KiwiSaver Growth Fund	16.64%	33	14.60%	34
Grosvenor KiwiSaver Balanced Growth	37.48%	28	44.75%	24
Grosvenor KiwiSaver Geared Growth Fund	36.41%	29	51.20%	22
Grosvenor KiwiSaver Socially Rsp Inv Gr	23.05%	31	19.37%	32
Grosvenor KiwiSaver Trans-Tasman Share	8.83%	35	11.95%	35
Kiwi Wealth KiwiSaver Growth	41.94%	26	40.62%	27
Mercer KiwiSaver Shares	5.75%	36	10.82%	36
Milford Active Growth KiwiSaver	26.80%	30	20.74%	30
OneAnswer KiwiSaver-Australasian Share	89.26%	1	43.47%	26
OneAnswer KiwiSaver-Balanced Growth	69.03%	8	73.57%	5
OneAnswer KiwiSaver-Growth Fund	69.16%	7	74.07%	4
OneAnswer KiwiSaver-Intl Share	40.64%	27	31.77%	29
OneAnswer KiwiSaver-Sustainable Int Shr	22.21%	32	19.45%	31
Staples Rodway KiwiSaver Balanced	63.35%	11	73.04%	6
Westpac KiwiSaver-Balanced Fund	74.42%	3	60.42%	18
Westpac KiwiSaver-Capital Protect Plan 1	60.49%	12	55.38%	21
Westpac KiwiSaver-Capital Protect Plan 2	51.62%	17	68.92%	11
Westpac KiwiSaver-Capital Protect Plan 3	43.24%	25	62.95%	17
Westpac KiwiSaver-Capital Protect Plan 4	51.89%	16	56.78%	20
Westpac KiwiSaver-Capital Protect Plan 5	47.89%	20	63.02%	16
Westpac KiwiSaver-Growth Fund	75.22%	2	63.22%	15

Note: This table reports adjusted R2 of each fund from regression results for Equation (6) (8). The domestic adjusted R2 is the regression results for Equation (6) and the global adjusted R2 is the regression results for Equation (8). Rank column is the ranking of adjusted R2 in descending order.

Finally, I consider the outperformance of the KiwiSaver balanced funds by computing alphas based on the Balance fund 4-factor model (B4). The four factors are the NZ equity returns minus the risk-free rate (NZ e-Rf), the NZ bond yield minus the risk-free rate (NZ b-Rf), the world equity return minus the risk-free rate (World e-Rf), and the world bond yield minus risk-free rate (World b-Rf). There are 35 balance funds included in the regression. Those 35 balance funds all have the monthly data from 2008 to 2015 (sample periods). Table 20 and Table 21 demonstrates the annualized alpha, adjusted R^2, NZ equity-Rf, NZ bond-Rf, World equity-Rf and World bond-Rf results.

Table 21 shows the annualized alpha and adjusted R^2 from the regression results of B4 method. The results show strong evidence of significant outperformance for just over half the balanced funds, 18 out of 35. The best performer is ANZ Default KiwiSaver Scheme-Cnsrv (0.034), followed by OneAnswer KiwiSaver-Balanced (0.031) and Kiwi Wealth KiwiSaver Balanced (0.030).

Adjusted R^2 varies from the worst fit Staples Rodway KiwiSaver Growth (47.30%) to the best fit ANZ Default KiwiSaver Scheme- Cnsrv Bal (92.63%). The range of Adjusted R^2 between balanced funds is narrower than that growth funds.

Table 22 demonstrates the regression results of the 4 factors for testing balance funds: New Zealand equity, New Zealand bond, international equity and international bond. We can observe that these tested KiwiSaver balance funds show significantly positive exposure to New Zealand equity and bond indices, as well as the world equity index. However, except Kiwi Wealth KiwiSaver Conservative fund, the regression results are all significantly negative related to the international bond factor.

Table 21. Alpha & Adjusted R^2 – B4

Funds	Alpha	Rank	R2	Rank
AMP KiwiSaver ANZ Balanced Plus	0.022	16	74.92%	20
AMP KiwiSaver Default (Default)	0.006	31	76.19%	15
AMP KiwiSaver LS Balanced Fund	0.001	34	75.49%	17
AMP KiwiSaver LS Conservative Fund	0.007	30	63.59%	31
AMP KiwiSaver LS Moderate Balanced Fund	0.000	35	74.95%	19
AMP KiwiSaver LS Moderate Fund	0.004	33	72.80%	26
ANZ Default KiwiSaver Scheme Cnsrv(DFLT)	0.016***	23	73.89%	24
ANZ Default KiwiSaver Scheme-Balanced	0.025***	11	89.40%	6
ANZ Default KiwiSaver Scheme- Cnsrv Bal	0.034***	2	92.63%	1
ANZ KiwiSaver-Balanced	0.029***	5	90.51%	3
ANZ KiwiSaver-Conservative	0.015***	26	75.89%	16
ANZ KiwiSaver-Conservative Balanced	0.023***	14	86.55%	10
Aon KiwiSaver Russell Lifepoints 2015	0.022	18	68.13%	29
Aon KiwiSaver Russell Lifepoints 2025	0.022	19	72.59%	27
Aon KiwiSaver Russell Lifepoints 2035	0.023	13	73.77%	25
Aon KiwiSaver Russell Lifepoints 2045	0.023	15	73.90%	23
Aon KiwiSaver Russell Lifepoints Bal	0.026	10	74.06%	22
Aon KiwiSaver Russell Lifepoints Cnsrv	0.026**	9	61.18%	34
Aon KiwiSaver Russell Lifepoints Growth	0.027	8	74.34%	21
Aon KiwiSaver Russell Lifepoints Mod	0.027*	7	71.68%	28
ASB KiwiSaver Scheme's Balanced	0.022**	17	89.76%	5
ASB KiwiSaver Scheme's Cnsr (Default)	0.011***	29	82.11%	13
ASB KiwiSaver Scheme's Growth	0.028**	6	91.93%	2
ASB KiwiSaver Scheme's Moderate	0.015**	25	85.01%	12
Grosvenor KiwiSaver Balanced Fund	0.011	28	87.87%	8
Grosvenor KiwiSaver Conservative Fund	0.004	32	81.86%	14
Kiwi Wealth KiwiSaver Balanced	0.030**	4	62.17%	33
Kiwi Wealth KiwiSaver Conservative	0.018***	20	66.42%	30
Mercer KiwiSaver Balanced	0.017	21	85.84%	11
Mercer KiwiSaver Conservative (Default)	0.016	24	62.21%	32
OneAnswer KiwiSaver-Balanced	0.031***	3	90.37%	4
OneAnswer KiwiSaver-Conservative	0.016***	22	75.36%	18
OneAnswer KiwiSaver-Conservative Bal	0.024***	12	86.63%	9
Staples Rodway KiwiSaver Growth	0.038	1	47.30%	35
Westpac KiwiSaver-Conservative Fund	0.014***	27	88.09%	7

Note: This table reports annualized alphas and adjusted R^2 of each fund from regression results for Equation (9) during sample period. Rank column is the ranking of annualized alpha and adjusted R^2 in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Table 22. NZ E-Rf, NZ B-Rf, World E-Rf & World B-Rf – B4

Funds	NZ equity-Rf	Rank	NZ bond-Rf	Rank	World equity-Rf	Rank	World bond-Rf	Rank
AMP KiwiSaver ANZ Balanced Plus	0.149**	15	0.729***	1	0.335***	10	-0.348***	30
AMP KiwiSaver Default (Default)	0.054***	33	0.217***	33	0.099***	29	-0.112***	11
AMP KiwiSaver LS Balanced Fund	0.132**	20	0.557***	8	0.284***	14	-0.329***	28
AMP KiwiSaver LS Conservative Fund	0.064**	31	0.364***	18	0.098***	31	-0.073***	8
AMP KiwiSaver LS Moderate Balanced Fund	0.107*	25	0.485***	12	0.246***	18	-0.278***	26
AMP KiwiSaver LS Moderate Fund	0.089**	27	0.398***	15	0.175***	24	-0.179***	19
ANZ Default KiwiSaver Scheme Cnsrv(DFLT)	0.102***	26	0.342***	24	0.077***	35	-0.044***	3
ANZ Default KiwiSaver Scheme-Balanced	0.203***	5	0.304***	29	0.233***	20	-0.141***	16
ANZ Default KiwiSaver Scheme- Cnsrv Bal	0.299***	1	0.226***	32	0.400***	6	-0.237***	22
ANZ KiwiSaver-Balanced	0.171***	11	0.350***	22	0.280***	15	-0.177***	18
ANZ KiwiSaver-Conservative	0.087***	29	0.341***	25	0.091***	33	-0.054***	7
ANZ KiwiSaver-Conservative Balanced	0.128***	22	0.351***	21	0.186***	23	-0.119***	12
Aon KiwiSaver Russell Lifepoints 2015	0.142**	18	0.540***	9	0.225***	21	-0.275***	25
Aon KiwiSaver Russell Lifepoints 2025	0.169*	12	0.576***	7	0.342***	9	-0.418***	31
Aon KiwiSaver Russell Lifepoints 2035	0.188*	7	0.603***	4	0.441***	4	-0.533***	33
Aon KiwiSaver Russell Lifepoints 2045	0.207	4	0.639***	3	0.534***	2	-0.649***	35
Aon KiwiSaver Russell Lifepoints Bal	0.179*	9	0.579***	6	0.392***	8	-0.470***	32
Aon KiwiSaver Russell Lifepoints Cnsrv	0.120**	24	0.482***	13	0.155***	26	-0.184***	20
Aon KiwiSaver Russell Lifepoints Growth	0.193	6	0.597***	5	0.475***	3	-0.568***	34
Aon KiwiSaver Russell Lifepoints Mod	0.152**	14	0.525***	11	0.269***	17	-0.323***	27
ASB KiwiSaver Scheme's Balanced	0.182***	8	0.358***	19	0.399***	7	-0.197***	21
ASB KiwiSaver Scheme's Cnsr (Default)	0.088***	28	0.316***	28	0.105	28	-0.044***	4
ASB KiwiSaver Scheme's Growth	0.220***	2	0.292***	30	0.544	1	-0.262***	24
ASB KiwiSaver Scheme's Moderate	0.145***	17	0.404***	14	0.245	19	-0.131***	14
Grosvenor KiwiSaver Balanced Fund	0.166***	13	0.381***	16	0.327	13	-0.094***	10

Fund	NZ equity-Rf	Rank	NZ bond-Rf	Rank	World equity-Rf	Rank	World bond-Rf	Rank
Grosvenor KiwiSaver Conservative Fund	0.135***	19	0.528***	10	0.167***	25	-0.040**	2
Kiwi Wealth KiwiSaver Balanced	0.047	34	0.124	35	0.335***	11	-0.093**	9
Kiwi Wealth KiwiSaver Conservative	0.043*	35	0.173***	34	0.108***	27	0.000	1
Mercer KiwiSaver Balanced	0.213***	3	0.381***	17	0.328***	12	-0.330***	29
Mercer KiwiSaver Conservative (Default)	0.146***	16	0.317***	27	0.098***	30	-0.131***	15
OneAnswer KiwiSaver-Balanced	0.172***	10	0.349***	23	0.278***	16	-0.175***	17
OneAnswer KiwiSaver-Conservative	0.087***	30	0.338***	26	0.091***	34	-0.052***	5
OneAnswer KiwiSaver-Conservative Bal	0.128***	23	0.356***	20	0.188***	22	-0.119***	13
Staples Rodway KiwiSaver Growth	0.055	32	0.664***	2	0.412***	5	-0.258***	23
Westpac KiwiSaver-Conservative Fund	0.131***	21	0.277***	31	0.094***	32	-0.053***	6

Note: This table reports NZ equity-Rf, NZ bond –Rf, World equity-Rf, and World bond-Rf of each fund from regression results for Equation (9) during sample period. Rank column is the ranking of these four factors in descending order. * Indicates significance at 10% level. ** Indicates significance at 5%. *** Indicate significance at 1%.

Chapter 7: Conclusions

This study investigates the performance of KiwiSaver growth and balanced funds. There are several important findings for the KiwiSaver growth funds. First, around 40 percent growth funds show significant evidence for outperformance relative to the domestic market index when using the domestic CAPM and FF3 model. However, this significant outperformance disappears when using the domestic C4 model, i.e. adding MOM factor to the model, suggesting that much of the observed outperformance came from pursuing a momentum strategy, and when I benchmark against a global index. Second, Aon KiwiSaver Milford and Milford Active Growth KiwiSaver are the 2 best performers irrespective of the model used. Third, KiwiSaver growth funds have comparably low betas compared to other developed capital market. Finally, KiwiSaver growth funds are relatively more exposed to large companies and growth stocks. Furthermore, half the KiwiSaver balance funds in my sample outperform the local market index based on domestic balance fund 4-factor model, but none of them show significant evidence for outperformance when benchmarked against global factors.

My findings also have important implications for KiwiSaver investors. First, there are some growth funds and balance funds that outperform the local market index, which suggests that some KiwiSaver funds are starting to perform better than previous years. Investors should however be careful with their KiwiSaver investments, because much of the literature says that firms cannot consistently outperform. They also need to be prudent about those fund managers who claim themselves as "predictors" for future fund performance, since the majority outperformance of KiwiSaver came from the momentum strategy. Second, Aon KiwiSaver Milford and Milford Active Growth KiwiSaver are 2 superior funds for investors based on my research.

A limitation for my study is that the sample period is still not long enough to decide whether KiwiSaver performance can be profitable persistently in the long run. Further studies about the performance and persistence of KiwiSaver are recommended in the future and further study into the KiwiSaver growth funds' relatively low betas is recommended as well.

References

Avramov, D., & Russ, W. (2006). Investing in mutual funds when returns are predictable. *Journal of Financial Economics, 81,* 339-377.

Bauer, R., Otten R., & Tourani-Rad, A. (2006). New Zealand mutual funds: Measuring performance and persistence in performance. *Accounting and Finance, 46,* 347-363.

Barras, L., Scaillet, O., & Wermers, R. (2010). False discoveries in mutual fund performance: Measuring luck in estimated alphas. *Journal of Finance, 65*, 179–216.

Barroso, P., & Santa-Clara, P. (2015). Momentum has its moments. *Journal of Financial Economics, 116,* 111-120.

Berkman, H., Clement, R., & Zhang, A. (2016). KiwiSaver risk indicators. *New Zealand Economic Papers, 50,* 71-87. doi: 10.1080/00779954.2015.1035670

Blake, D., Cairns, A. J. G., & Dowd, K. (2001). Pensionmetrics: stochastic pension plan design and value-at-risk during the accumulation phase. *Insurance: Mathematics and Economics, 29*, 187-215. doi:10.1016/S0167-6687(01)00082-8

Bollen, N., & Busse, J. (2005). Short-term persistence in mutual fund performance. *Review of Financial Studies, 18,* 569-597.

Brown, S. J., & Goetzmann, W. N. (1995). Performance persistence. *The Journal of Finance, 50*, 679-698.

Busse, J., Goyal, A., & Wahal, S. (2010). Performance and persistence in institutional investment management. *Journal of Finance, 65*, 765–790.

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of Finance, 52,* 57-82.

Chan, L. K. C., Hamao, Y., & Lakonishok, J. (1991). Fundamental and stock returns in Japan. *Journal of Finance*, *46*, 1739-1789.

Chen, Y., Ferson, W., & Peters H. (2010). Measuring the timing ability and performance of bond mutual funds. *Journal of Financial Economics, 98*, 72-89.

Chevalier, J., & Ellison, G. (1999). Are some mutual fund managers better than others? Cross-sectional patterns in behavior and performance. *The Journal of Finance, 54*, 875-899.

Coates, J.M. (2009). A Note on trader sharpe ratios. *PLoS ONE, 4,* 11.

Davis, J. L. (2001). Mutual fund performance and manager style. *Financial Analysts Journal, 57*, 19-27.

Detzel, A., & Detzel L. (2016). Differences in short-term performance persistence by mutual fund equity class. *Banking & Finance Review, 8,* 39-67.

Edwards, E., & Samant, A. (2003). Investing with a conscience: An evaluation of the risk-adjusted performance of socially presonsible mutual funds. *American Journal of Business, 18,* 51-60.

Elton, E. J., Gruber, M. J., & Green, T. C., (2007). The impact of mutual fund family membership on investor risk. *Journal of Financial and Quantitative Analysis*, *42*, 257-277.

Fama, E., & French, K. (1996). Multifactor Explanation of Asset Pricing. *Journal of Finance*, *51*, 55-84.

Fama, E., & French, K. (1992). The Cross-Section of Stock Returns. *Journal of Finance*, *47*, 427-465.

Fama, E., & French, K. (2010). Luck versus skill in the cross section of mutual fund returns. *Journal of Finance, 65,* 1915–1947.

Financial Markets Authority of New Zealand. (2015). *KiwiSaver Annual Report 1 July 2014 – 30 June 2015.* Retrieved from https://assets.documentcloud.org/documents/2448156/151005-fma-kiwisaver-report-2015.pdf

Fletcher, J. (1995). An examination of the selectivity and market timing performance of UK unit trusts. *Journal of Business & Accounting*, *22,* 143-156.

Frijns, B., & Tourani-Rad, A. (2015). On the performance of KiwiSaver funds. *Pacific Accounting Review, 27,* 266-281.

Frijns, B., & Tourani-Rad, A. (2014). Kiwisaver, who is really reaping the benefits? . *Applied Finance Letters, 3*, 12-15.

Garyn-Tal, S. & Lauterbach, B. (2015). The formulation of the four factor model when a considerable proportion of firms is dual-listed. *Emerging Markets Review, 24,* 1-12.

Glassman, D. A., & Riddick, L. A. (2006). Market timing by global fund managers. *Journal of International Money and Finance*, *25*, 1029-1050.

Graham, J., & Harvey, C. (2001). The theory and practice of corporate finance: Evidence from the field. *Journal of Financial Economics, 60*, 187-243.

Grinblatt, M., & Titman, S. (1992). Persistence in mutual fund performance. *Journal of Finance, 47,* 1977–1984.

Grinblatt, M., Titman, S. & Wermers, R. (1995). Momentum investment strategies, portfolio performance and herding: a study of mutual fund behaviour. *The American Economic Review, 85,* 1088-1105.

Haque, T., & Ahmed, A. D. (2015). The relationship between Australian mutual fund fees and risk-adjusted performance in differing economic conditions. *Australian Economic Papers, 54*, 1-21. doi: 10.1111/1467-8454.12036

Hendricks, D., Patel, J., & Zeckhauser, R. (1993). Hot hands in mutual funds: Short-run persistence of relative performance, 1974-1988. *The Journal of Finance*, *48*,93-130.

Henriksson, R. D., & Merton, R. C. (1981). On market timing and investment performance. II. Statistical procedures for evaluation forecasting skills. *The Journal of Business*, *54*, 513-533.

Hinz, R. P., Rudolph, H. P., Antolin, P., & Yermo, J. (2010). *Evaluating the financial performance of pension funds*. Washington, DC: World Bank Publications.

Huji, J., & Verbeek, M. (2007). Cross-sectional learning and short-run persistence in mutual fund performance. *Journal of Banking & Finance*, *31*, 973-997.

Indro, D. C., Jiang, C. X., Hu, M. Y., & Lee, W. Y. (1999). Mutual fund performance: Does fund size matter? *Financial Analysts Joural*, *55*, 74-87.

Inland Revenue. (2013). *Annual report 2013*. Retrieved from http://www.ird.govt.nz/resources/6/4/643702804171ef74bb01fb6fe0111a70/annual-report-2013.pdf

Javier, V. (2013). The persistence of European mutual fund performance. *Research in International Business and Finance, 28,* 45-67. doi: 10.1016/j.ribaf.2012.09.004

Javier, V., Marta, V., Sabri, B., & Gazi Salah, U. (2016). The short-term persistence of international mutual fund performance. *Economic Modelling, 52,* 926-938. doi: 10.1016/j.econmod.2015.10.031

Jegadeesh, N., & Titman, S. (1993). Returens to buying winners and selling losers: Implications for stock market efficiency. *The Journal of Finance, 48,* 65-91. doi: 10.1111/j.1540-6261.1993.tb04702.x

Jensen, M.C. (1968). The performance of mutual funds in the period 1945-1964. *Journalof Finance, 23,* 389-416.

Jiang, G. J., Yao, T., & Yu, T. (2007). Do mutual funds time the market? Evidence from portfolio holdings. *Journal of Financial Economics*, *86*, 724-758.

KiwiSaver (n.d.). *What types of investment funds are available?* Retrieved October 30, 2016, from http://www.kiwisaver.govt.nz/providers/about/funds/

Knudsen, J. (2009). *Testing the developed world: Global CAPM vs. Local CAPM.* Retrieved from https://brage.bibsys.no/xmlui//bitstream/handle/11250/168827/1/Knudsen%202009.pdf

Kosowski, R., Timmermann, A., Wermers, R., & White, H. (2006). Can mutual fund stars really pick stocks? New evidence from a bootstrap analysis. *Journal of Finance, 61*, 2551–2595.

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stocks portfolios and capital budgets. *Review of Economics and Statistics, 47,* 13-37.

MacDonald, K. L., Bianchi, R. J., & Drew, M. E. (2012). KiwiSaver and retirement adequacy. *Australasian Accounting Business and Finance Journal, 6*, 61-78.

Massa, M. (2003). How do family strategies affect fund performance? When performance-maximization is not the only game in town. *Journal of Financial Economics*, *67,* 249-304.

Merton, R. C. (1981). On market timing ad investment performance. I. An equilibrium theory of value for market forecasts. *The Journal of Business*, *54,* 363-406.

Modigliani, N. L. F., & Modigliani, L. (1997). Risk-adjusted performance. *Journal of Portfolio Management, 23,* 45-54.

Morningstar. (2015). *KiwiSaver Survey September Quarter 2015.* Retrieved from http://www.morningstar.com.au/s/documents/kiwisaver_survey_2015Q3_v1.pdf

Mossin, J. (1966). Equilibrium in a Capital Asset Market. *Econometrica*, *34,* 768-783.

Nainggolan, Y., How, J., & Verhoeven, P. (2016). Ethical screening and financial performance: The case of Islamic equity funds. *Journal of Business Ethics, 137,* 83-99. doi: 10.1007/s10551-014-2529-5

Panda, B., Mahapatra, R. P., & Moharana, S. (2015). Myth of Equity Mutual Fund Performance. *Vision (09722629), 19,* 200-209. doi: 10.1177/0972262915593658

Pollet, J. M., & Wilson, M. (2008). How does size affect mutual fund behavior? *The Journal of Finance, 63,* 2941-2969.

Prather, L., Bertin, W. J., & Henker, T. (2004). Mutual fund characteristics, managerial attributes, and fund performance. *Review of Financial Economics*, *13,* 305-326.

Rao, Z., Iqbal, A., & Tauni, M. Z. (2016). Performance persistence in institurional investment management: The case of Chinese equity funds. *Borsa Istanbul Review, 16,* 146-156. doi: 10.1016/j.bir.2016.05.002.

Sharpe, W. F. (1966). Mutual fund performance. *Journal of Business, 39,*119-138.

Sharpe, W. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance, 19,* 425-442.

St John, S., & Littlewood, M. (2006). *Does KiwiSaver improve the unique New Zealand mix of retirement policies?* Retrieved from http://docs.business.auckland.ac.nz/Doc/Paper-Does-KiwiSaver-improve-the-unique-New-Zealand-mix-of-retirement-policies.pdf

Tonks, I. (2005). Performance persistence of pension-fund managers. *Journal of Business, 78,* 1917-1942.

Treynor, J. L. (1965). How to rate management of investment funds. *Harvard Business Review, 43,* 63-75.

Vysniauskas, P., & Rutkauskas, A. V. (2014). Performance evaluation of investment (mutual) funds. *Business: Theory & Practice*, *15*, 398-407. doi: 10.3846/btp.2014.40

Warren, G. J. (2014). MySuper vs. KiwiSaver: Retirement saving for the less engaged. *Applied Finance Letters, 3*, 2-11.

Zalgiryte, L., & Guzavicius, A. (2012). Analysis of different type USA mutual funds performance evaluation in the period of 2000-2010. *Economics and Management*, *17,* 1300-1307.