

Performance of member investment choices in their superannuation accounts and implications for fund trustees and regulators

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Abstract

Three crucial ingredients influence how much individuals will have to fund retirement income needs: how much they contribute to savings, how long they save for, and the performance of these savings. This paper focuses on the issue of performance, and how individuals perform when they are given the choice of making their own investment strategy for their retirement savings contributions. An empirical examination using a large sample gathered from four Australian superannuation funds is utilised and finds that on average members underperform their own fund's default option both in raw returns and on a risk-adjusted basis. For trustees and regulators charged with the responsibility of looking after the interests of members an important result identifies significant differences in performance based on how members are allowed to construct their investment strategy.

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Introduction

Australia, like many countries over the past two decades, has implemented a range of policies to address an ageing population and the expected fiscal challenge this demographic change presents for future governments. One such challenge is the government's ability to provide an age pension as currently entitled, or, at current entitlement levels. A major policy component of successive Australian governments, reflected in many developed countries, has been to shift the expectation of responsibility for income provision in retirement from the government to the individual.

Central to the retirement incomes policy in Australia was the introduction in 1992 of the Superannuation Guarantee Act, which requires employers to make contributions on behalf of their employees to a complying superannuation fund.¹ The contribution rate was set initially at three percent of earnings but since 2002 has been nine percent. Paralleling this trend over the past 15 years, which can be characterised as the modern era of Australian superannuation, has been the movement from defined benefit (DB) to defined contribution (DC) funds and products. Contributions are increasingly directed to defined contribution (DC) funds where the majority of members have a choice in the investment strategy for those contributions. The average number of options available for these investment strategies across all fund types¹ is 38 (Australian Prudential Regulation Authority, 2008). However, most individuals choose not to exercise this choice with 51 percent of assets remaining in the default investment strategy (Australian Prudential Regulation Authority, 2008, Table 15).² In addition to this investment choice, since July 2005, a majority of Australian employees have also

¹ A superannuation "fund" can be considered equivalent to a U.S. 401(K) "plan".

² This is not a perfect measure. It is based on the total assets in what is labelled a default strategy by a fund. However because a default is not mandatory, where a default is not labelled APRA (2008) takes the strategy with the most assets as the default.

had a legislated entitlement to choose to which superannuation fund their contributions are directed to through the Superannuation Legislation Amendment (Choice of Superannuation Funds) Act 2004, commonly referred to as choice of fund. However, once again, few have exercised this choice with only four percent of employees changing their superannuation funds, in the first six months since being given the opportunity, primarily due to change of employment (Clare, 2006). This default behaviour is not peculiar to Australia nor is it peculiar to retirement savings decisions. In the U.S., for example, Madrian and Shea (2001) and more recently Mitchell, Mottola, Utkus and Yamaguchi (2006) identify that most U.S. DC participants do not trade (change their investment strategy) at all and remain in the plan default.

Within a DC product member choices directly impact on their accumulated retirement savings, hence, for those who do make investment strategy changes, an important question is how well do their choices perform. This is the empirical question investigated in this paper utilising a large sample of member investment choices to examine what sort of choices members make and how well these investment decisions perform in raw returns, relative to a selection of benchmarks, and adjusted for risk.

The appropriateness of a particular investment choice is ultimately determined by considering member circumstances including, but not restricted to, the amount of assets outside superannuation, the level of debt, number of dependants, and risk tolerance. This information is not readily available and hence investigation of the appropriateness of particular choices is beyond the scope of the paper.

The examination of individual performance is not just of interest to individuals. Fund trustees and government must consider the consequences of member performance in terms of their fiduciary duty and potential fiscal obligations respectively. Fund trustees are required to formulate an investment strategy by the Superannuation Industry (Supervision) Act 1993 with the Australian Prudential Regulation Authority (APRA) responsible for more detailed guidelines for trustees. APRA's guidelines reflect high expectations of trustees with regard to members exercising investment strategy choice. They provide warnings to trustees about allowing members "narrow or risky" choices without regard to what is in the best interests of members (APRA, 2006, p.12). Donald (2006) reviews the nature of the trust structure used by superannuation funds in an environment of member choice and suggests "trustees of many superannuation funds find themselves in a vacuum when it comes to deciding how to offer choice when to do so might represent an abdication of a fundamental fiduciary responsibility" (Donald, 2006, p.12). The question of whether a particular choice is in the best interests of a member can be considered both ex-ante and ex-post. This paper contributes to the latter by providing empirical evidence on the performance of member investment choice using a sample of four large Australian superannuation funds.

The paper proceeds as follows. The next section provides a review of the literature on making investment strategy changes and subsequent performance within the retirement savings context and the broader household savings context. The third section describes the sample data and the fourth section examines the methodology employed in measuring performance and estimated performance relationship. The

fifth section presents results and the final section concludes with a discussion of results and identifies areas of future research.

Why Should Investment Choice be Exercised? Theory and Evidence

Mitchell, et al. (2006) identify that using the traditional finance theoretical framework would suggest fund members choices and changes reflect underlying risk preferences having identified efficient portfolios. Changes would follow given changes to these so long as the expected benefits exceed the costs of trading, in keeping with Grossman and Stiglitz (1980) (Mitchell, et al., 2006, p.3). Investment finance theory suggests that if markets are efficient, these changes will not earn fund members abnormal returns, consistently (Fama 1970, 1991). However a less restrictive definition of efficiency suggests those who do trade based on costly information may earn higher returns to compensate for the higher trading costs (Grossman and Stiglitz, 1980).

The reality is however that few members choose to move out of the default investment option in DC plans. Bowman (2003) suggests that only ten percent of Australian superannuation fund members with investment choice actually exercise it. This is in line with the sample in this paper where between ten and fifteen percent of members exercise investment choice. U.S. results are similar. Agnew, Balduzzi and Sunden (2003) find that only seven percent of members of a 401(k) plan have more than one investment change with an average of approximately one change every four years and overall 87% of members have no investment changes. This evidence is echoed by Ameriks and Zeldes (2004) who find approximately 75 percent of TIAA-CREF members make no investment changes over a decade. Mitchell, et al. (2006)

characterise the trading pattern of 1.2 million participants in approximately 1500 funds as “profound inertia” (Mitchell, et al., 2006, p.12).

Similar low levels of choice have been evident in Australia following legislation, effective in 2006, allowing members to choose the superannuation fund (as distinct from changing the investment strategy within their existing fund) to receive their mandatory employer contributions. Fry, Heaney and McKeown (2007) posit Prospect theory as a means of explaining member behaviour given choice of fund. Given loss aversion they suggest the expected change benefit/cost ratio needs to be substantial to encourage change. Fry, Heaney and McKeown (2007) also suggest the bias to inertia is magnified as “superannuation profits cannot be realised until retirement”.

This suggests that expected fund performance is a key motivator of member choice. While member expectations are not generally observed, it has been demonstrated that historical returns are related to aggregate fund flows in retirement funds (Cronqvist and Thaler, 2004). At an individual choice level Clark-Murphy, Gerrans and Speelman, (2007) have identified apparent returns chasing behaviour in member investment choices. Survey work on what might prompt a member to change funds (Clare, 2006) also highlights the role of past returns.

In the U.S. failure to participate in a 401(k) plan, or equivalent, has been argued as “the most obvious error an individual can make and is well researched in the literature” (Agnew, 2006, p.27). In Australia given mandatory participation, member contribution levels, fund fees and investment strategy choice are fundamental influences on accumulated savings. While participation may be well researched, the

performance of member's chosen investment strategy performance is not. A recent U.S. exception is Yamaguchi, Mitchell, Mottola and Utkus (2006) who use alpha-based performance measures derived from the CAPM and factor-based models to assess the investment performance of more than 1.5 million participants of 1500 U.S. plans. These can be referred to as standard performance metrics of the investment management industry and literature. Their paper examines investment decisions over existing balances, not future contributions which are the focus of this paper, and make four comparisons. The first is those who trade in their 401(k) plan (traders) to those who don't. The second is those who when they trade return their balance allocation to the first observed (target) allocation made by the member. The third group are those plan members who effectively delegate the portfolio rebalancing to a portfolio manager through a choice of balanced or lifecycle funds as against the active rebalancers who make this decision themselves. The fourth compares those who traded and have the highest turnover rate. This final group allows testing whether overconfidence leads to poorer performance as suggested by previous research on individual traders (Odean, 1999; Barber and Odean, 2001 in the US and Guiso and Jappelli, 2006 for Italian investors).

Outside retirement savings investment strategy, a range of studies have examined the performance of individuals' or households' asset allocation decisions. Guiso and Jappelli (2006) use a sample of customers of a major Italian bank to investigate performance and the role of information acquisition. They find a negative correlation between trading activity, lack of diversification, lack of delegation to a financial advisor, information measured as the reported time customers spent collecting information in a typical week, and the Sharpe Ratio of their portfolio performance.

They contend their results do not support a rational investor choice model instead supporting a model where investors are overconfident. Calvet, Campbell and Sodini (2006) use a database of Swedish households to assess the performance and social welfare impacts of under diversification and non-participation in risky asset markets. They find Swedish households to be well diversified with only modest losses due to under-diversification. However, they also identify that 38 percent of Swedish households do not have risky assets in their financial portfolio, with a resulting financial loss, and for five percent of the population the financial loss due to under-diversification is five percent of financial wealth.

In Australia, with participation and minimum contributions mandated³ the focus of research has primarily been the adequacy of the mandatory minimum contributions levels, types of investment strategy or asset allocation decisions, and the impact of fees on accumulated savings. While the performance of superannuation funds has attracted research interest (Drew and Stanford, 2001 and 2003; Frino, Heaney and Service, 2005) as has the impact of fees on accumulated savings (Bateman and Mitchell, 2003), individual member choice performance has not. Drew (2006) employed a normalised rank return measure (NRRM), developed by Bauer and Dahlquist (2001), as a means of highlighting the difficulties for superannuation fund members in successfully timing the market. The NRRM ranks switching strategies between available investment options given a switching frequency. Drew (2006) simulated results on the basis of monthly switching between a range of paired asset classes between 1985 and 2002. The study did not, however, assess actual member choices, instead focussing on what would be needed for a member to outperform

³ The provisions of the 2006 Pension Protection Act in the US have removed the obstacles for employers to offer automatic plan enrolment and default contributions (DiCenzo, J. 2007, p.4) but there remains no legislated obligation for contributions of any sort by employers for employees.

given the limited set of choices and trading allowed. Gallery, Gallery and Brown (2006) review the raw return performance of a sample of Australian fund default options noting that the wide variation in returns implies differing risk characteristics for similarly labelled options. Using member choices from a large sample of investment strategy choices from four Australian funds covering a range of employment industries, the current paper provides an overdue empirical assessment of actual individual choice in Australian superannuation funds.

Data and Methodology

Sample Demographics and Choice Options

Four Australian superannuation funds have provided the investment strategy choice history, for future contributions, of their members. Each of the funds is a not-for-profit fund, three of which are classified as “Industry funds” and one a public-sector fund. Industry fund members are drawn from a number of employers within a single industry, whereas public-sector funds have members from a government agency or a government owned business (Australian Prudential Regulation Authority, 2005, p.3). Collectively the four funds have \$44 billion in assets and 1.6 million members.

The top panel of Table 1 summarises member demographics and investment characteristics from the sample. The sample gender split varies significantly across funds with Fund One having 24 percent males and Fund Two 78 percent, reflecting industry differences each fund’s population. The average contributions were highest for Fund Four members, more than twice that of Fund One members. Average age is comparable between the funds with a three year spread between the youngest (Fund Two) and oldest (Fund Three). Fund Three members have the longest average

investment period of 33 months and Fund One the shortest at 22 months. Members make few choices during the whole sample period with the overall average of 1.15 choices. Fund One and Two offer the greatest range of investment options and the average number of options used by their members reflects this.⁴ Fund Three members had been members longest (69 months) before they made a choice which is in part because Fund Three was the last of the funds to offer choice to members. There is therefore considerable variation in member and investment characteristics across the sample.

<Insert Table 1>

Each fund offers a different number and type of investment choice to members. Fund One, Two and Three offer both readymade options, where the asset allocation is nominated by the fund, and a do-it-yourself (DIY) option where the member can choose their own mixture of readymade options and individual asset classes. Fund Three members can construct a DIY option using only asset classes, not readymade options, whereas Fund One and Fund Two members can construct a DIY option using both asset classes and readymade options. Fund Four members could only choose one readymade option with no mixing across options allowed.⁵

Fees have been levied by the funds on investment changes at various times through the sample period. Fund One members were allowed to make one free change per annum when choice was introduced in 1995 until June 1998 but were charged a \$20 fee when monthly changes were permitted in July 1998. This fee was dropped in 2002. Fund Two members initially could make quarterly changes in July 1997 with the first change free and subsequent changes attracting a \$10 fee. Monthly changes

⁴ Fund Four members were restricted to one option per selection over the sample period.

⁵ Fund Four has since introduced the ability for members to mix readymade options, but outside the data sample period of this paper.

were permitted in January 2001 and the fee was dropped in July 2003. Fund Three members have been permitted to make monthly changes since inception in April 2001 at no charge. Fund Four members receive one free investment change per year with further changes attracting a \$25 fee. For members who joined each fund between October 2002 until June 2004 the average number of choices does not appear to indicate an impact of fees on choice. The average number of changes for Fund Four members, who were charged a fee beyond the first investment switch, is 1.12 against 1.10 for Fund Three and 1.07 for Fund One members who paid no fee for any switch.

Performance Measurement

Returns data for each option offered by the four participating superannuation funds has been obtained since the inception of each offering. Fund One and Fund Two credited member accounts annually between 1998 and 2001, and 1997 and 1998, respectively before adopting monthly crediting. Fund Three has employed monthly crediting since it first offered choice in April 2001. Fund Four credits member accounts quarterly. For Fund Four these quarterly returns between July 1998 and June 2002 have been combined with monthly returns data supplied since July 2002. Hence cumulative raw and excess returns can be calculated for each member choice since inception but risk adjusted measures are problematic due to insufficient returns observations for some choices.

Comparable to Yamaguchi, Mitchell, Mottola and Utkus (2006) we estimate the monthly raw returns for a member based on their asset allocation(s). We also calculate two relative measures. The excess of a member's return relative, firstly to the default option of the fund and secondly relative to each previous choice of the member is calculated. This second measure is similar in spirit to the "own relative benchmark" of

Yamaguchi, et al. (2006). The difference is we calculate the monthly difference using a current allocation which is fixed whereas the “current allocation” weightings for Yamaguchi, et al. (2006) drift with monthly performance of the underlying asset classes reflecting their focus on balances rather than contributions as in this paper.

A return series is generated for each member calculated as $r_{it} = \sum_{n=1}^N w_{n,t} r_{n,t}$, where r_{it} is the return for member i in period t , n represents each of the investment options in the member’s investment strategy from the N readymade or asset class options available and $w_{n,t}$ is the weighting assigned to option n in period t . Using this series of raw returns a member’s performance can be measured from the time they made their first investment strategy change until the end of each fund’s data sample. As noted, the observation of r_{it} varies from annual to monthly. Therefore while a raw or excess return is able to be calculated from the beginning of each member’s choice, only those choices made during the period since monthly returns were published allow risk-adjusted measures due to number of observations available.

Performance is measured using raw returns, excess returns, and an information ratio. The raw return (r_{it}) is as previously described. The excess is defined as $(r_{it} - r_{bt})$ where r_{bt} is the return on benchmark b in period t . Two benchmarks are used: the default option (r_{dt}) for the member’s fund and the member’s previous investment choice r_{pt} . The two excess return measures therefore determine the return of the member’s choice relative to remaining in, or changing back, to their fund’s default option, or remaining in their previous investment strategy. The raw return and excess return measure are annualised as specified in equation 1.

$$\text{Annualised Return} = \left(\prod_{t=1}^T \left(1 + \sum_n^N w_{n,t} r_{n,t} \right) \right)^{(12/T)} - 1 \quad \text{equation 1}$$

where, additionally, T is the investment period in months for the member.

Where monthly returns data is available a risk-adjusted measure, the information ratio, is estimated using equation 2. A range of risk adjusted measures are available and therefore the choice is contestable. The choice here reflects the ultimate purpose of the research which is to help inform members of the consequences of their investment strategy choices and provide trustees with information on how their members perform given the range of investment strategy choices the trustees make available. When measuring investment management performance most studies employ some variation of Jensen's alpha based on single or multi-factor models. Implicit in the use of a multi-factor alpha is the rationale that returns need adjustment for the returns that could be generated from available investable portfolios which capture style, size or other factors known to explain returns. Members of the four funds do not have access to these factor portfolios and therefore judging their performance relative to this is of questionable value. An alternative is the Sharpe Ratio which adjusts performance for risk by assuming access to a risk-free asset and calculating the average excess return divided by the standard deviation of these excess returns. Member access to a risk-free asset is also not available, notwithstanding access to a variety of "Cash" options. A variation is the information ratio, or more precisely here the "differential return information ratio" (Sharpe, 1994), which calculates the excess return using a nominated benchmark, rather than the risk-free asset.

$$\text{Information Ratio} = \frac{\frac{\sum_{t=1}^T r_{e,t}}{T}}{\frac{\sum_{t=1}^T (r_{e,t} - \overline{r_{e,t}})^2}{T-1}}, \quad \text{equation 2}$$

where $r_{e,t}$ is the member's excess return in month t , defined as the member's actual return in month t ($r_{i,t}$) less the benchmark option return in month t ($r_{b,t}$), being either the default option ($r_{d,t}$) or previous investment strategy choice ($r_{p,t}$). As previously noted, fund crediting rates in some cases were originally annual (Fund One and Fund Two) or quarterly (Fund Four). Information ratios are only calculated when monthly crediting commenced. However, information ratios have been calculated for Fund Four by converting the quarterly crediting rate to a monthly rate to supplement the monthly return series available since 2002. In this instance the impact on the information ratio is to dampen the volatility of excess returns and inflate the IR from what it otherwise would be with monthly data.

Performance Assessment

Member performance is assessed both in terms of overall average member performance and across each fund. For purposes of analysis choices have been included where the member's performance period, defined as the time elapsed since first choice was made, is at least six-months. In summarising performance data bivariate analysis considers differences by fund, the year a decision was made and gender. For Funds One, Two and Three who allow members to construct investment choices with asset classes and/or readymades, we assess what types of choices are made by members as well as the performance of each choice type.

Multivariate analysis is also employed to further investigate what factors together may help explain variation in member performance. Equation three is estimated to explore the role of member and investment characteristics.

$$P_i = a + \mathbf{x}'_m \mathbf{b} + \mathbf{y}'_c \boldsymbol{\gamma} + e_i \quad \text{equation 3}$$

where P_i is the performance of member i over all choices the member has made; \mathbf{x}_m is a vector of member characteristics; \mathbf{y}_c is a vector of investment choice characteristics; and e_i an error term. Member raw returns differ systematically across the funds given the differing strategic asset allocation of each fund's options and secondly the year a member's choice history began. Given the possible clustering of performance linked to both fund membership and the year the first member choice was made, a robust covariance matrix was estimated based on "fundyear" clusters. Each fund has a series of years where a first decision could be made. For example Fund Three has four clusters: 2001, 2002, 2003, 2004. In total there are 21 fundyears (Fund One four, Fund Two seven, Fund Three four, Fund Four six). The robust estimator employed is Rogers' (1993) application of Huber (1967).⁶

Member Characteristics

A range of member characteristics were included to explore their relationship with member investment choice performance. Gender is included as it has been demonstrated to have a relationship with investment decisions in terms of the type of decision and performance, though the results are not unequivocal.⁷ Membership length at the time the member made their first decision is included to investigate whether familiarity or exposure to the investment options available from the fund can

⁶ The requirement that each cluster account for five percent or less of the sample is violated with seven of the 21 clusters larger than five percent. Rogers' (1993) adjustment employed in STATA using `hreg2.ado` has therefore been employed.

⁷ See for example Barber and Odean (2001) for investment generally and Gerrans and Clark-Murphy (2004) for gender differences in an Australian retirement savings context.

explain performance variation. Members with longer membership would have a greater chance of exposure to fund publications providing information on the range of choice options available to them and investments more generally. Guiso and Japelli (2006) have demonstrated that information can be expected to have both a positive and negative relationship with performance, depending upon whether a rational or behavioural decision making model is assumed, respectively.

Income has been shown to be related to equity allocation (Agnew, Balduzzi and Sunden, 2003) and is thus expected to be related to investment performance. Income was not observable for members but contributions were available as a proxy. Consistent with the finding that equity exposure increases with income, it is hypothesised contributions will have a positive relationship with performance. Member age is also included as a member characteristic. To the extent that age is positively related with investment experience, age may be expected to have a positive effect on performance. Confounding this is the potential for cognitive decline with ageing to negatively impact on investment skill. Korniotis and Kumar (2007) provide evidence in support of both effects using stock holdings though finding the negative effect having a larger impact. Agarwal, Driscoll, Gabaix and Laibson (2007) provide evidence of a humped age and financial sophistication profile using interest costs and fees paid, with a peak at about age 53. Also confounding possible experience benefits of ageing is the extent to which there may be age effects in asset allocation, where members may reduce equity exposure with age, which may impact raw returns but not risk-adjusted returns. Fund membership is controlled for by the inclusion of fund dummies given the noted variation in investment options offered by fund.

Investment Characteristics

Several characteristics are included which relate to the member's investment choice itself. The number of choices a member has made is included as Odean (1999) and Barber and Odean (2000) demonstrate that trading decreases individual performance consistent with models of overconfidence using a sample of discount brokerage firm clients. Guiso and Japelli (2006) compare rational and behavioural models of information gathering, overconfidence and resultant trading and also find a negative trading relationship using a sample of Italian investors. They conclude that their results do not support a rational decision making model. Yamaguchi et al. (2006) estimate the relationship of trading frequency on performance in a retirement savings context using a sample of 401(k) participants. They find a positive relationship with trading and raw returns but a negative relationship with risk-adjusted returns.

The year a member made their first investment choice is included as a control as over the sample period investment option returns varied markedly. For example equity markets and international equity in particular experienced poor returns through 2001 and 2002. The timing of the offering or expansion of choice by a fund at a particular time or the date a member joins a fund and makes a decision will impact directly on their performance. The length of the investment period is included to control for the fact that the dependent variable, whilst annualised, is not estimated over a comparable period for all members. In the regression analysis a member was only included if they had a returns history of six months or more. A member record is treated equally therefore if it has a six months or six year history.

The first regression utilises the full choice sample from all four funds and each of the member and investment characteristics discussed. A second regression is also estimated to explore the relationship between additional investment characteristics and performance. The first additional variable is the average number of options chosen in a member's investment choices. It is not clear whether using more or less options in a choice is necessarily good or bad. However the number of options made available is increasing for most members. The second additional variable, choice type, describes how the member constructed their choices. Depending on their fund, members could choose pre-mixed readymade options, combine asset classes themselves, or have a mixture of readymades and/or asset classes. Fund Four members were however restricted to single readymade choices. Fund Three members could select a single readymade but not multiples, single asset classes or multiple asset classes. Fund One and Fund Two members choices expanded from single or multiple readymades, when choice was first offered to their members, to a full range of choices. In all, seven investment construction types can be identified. In the first two, all choices are either A) one readymade option, or B) one asset class. In the next two all member choices involve C) multiple readymades or D) multiple asset classes. The remaining are mixtures. In E) all member choices involve multiple mixtures of asset classes or readymades but not mixtures of both. In F) at least one but not all choice involves mixtures of readymades and asset classes in a single choice. Finally in G) all choices are combinations of asset classes and readymades. The second regression focuses only on Fund One and Fund Two members.

Results

Choice and Overall Performance

Gallery, Gallery and Brown (2004) found such significant variation in performance of a sample of the default options for industry, corporate and government funds that they suggested “many Australians’ retirement wealth (or otherwise) will be determined by the ‘accident’ of working for a particular employer or in a particular industry” (Gallery, Gallery and Brown, 2004, p.60). The results in the current study for all investment options available to members of the four funds suggest the variation goes beyond those who remain in their fund’s default option.

In terms of how members performed when they could choose from the options available to them the most striking result from an examination of the performance data, summarised in the last column of Table 2, is that members who exercise choice underperform, both in terms of raw returns and risk adjusted returns, relative to their fund’s default option or their own previous investment choice. The overall mean raw return is a strong 8.95% per annum. However, average excess returns and information ratios are all significantly less than zero, both relative to the default option of the member’s fund or the member’s previous choice. There is however much additional information behind these overall averages.

<Insert Table 2>

Firstly, within each fund, gender differences are evident in performance. This is more evident for the risk-adjusted measure where males perform better than females. With the exception of Fund Three excess returns are significantly better for males, however Fund Three is the only fund where males have significantly higher raw returns. When data is aggregated however, raw returns, excess returns and the information ratio

based on the default option are each significantly higher for females than males. This apparent contradiction can be explained by the gender splits in each fund. Fund One has the largest number and proportion of female membership and though their performance is lower than Fund One males it is better than each other fund's members. Hence when results are aggregated across funds overall female performance becomes better.

Secondly, the year the member makes their first investment decision, summarised in Table 3, is an important determinant of member performance by end of the data collection period. Those members who made their first choice in 2000 and 2001, who in turn had higher equity allocations on average (in 2001 and in international equity in particular), have the worst performance in terms of raw returns. Fund Three members were first offered choice in 2001 and the lower average returns of their members, discussed below, reflect this timing. Excess returns and information ratios are lowest for 2000 and 2003.

<Insert Table 3>

Table 4 summarises choice type for Fund One, Two and Three members over the period where the largest range of options was made available to their members during the sample period. Readymade options were the most common choice type used by members of all funds. For Fund One and Two members, who had a comparable range of choice types, more Fund Two members (34 percent) made all choices involving single readymades than Fund One members (23 percent) and comparable proportions (31 and 36 percent respectively) made all choices using combinations of readymades. While Fund Three members had a more limited range of options a much larger proportion of members relied on a single readymade (79 percent) for all choices.

Twice the proportion (26 percent) of Fund One members than Fund Two members used combinations of asset classes in all choices, whereas approximately double the proportion of Fund Two members (13 percent) used single asset class choices than Fund One members (seven percent). Fund Three members were much less likely to make single asset class choices (three percent). An examination of gender suggests that for Fund Two and Fund Three members, females were more likely to use readymade options whereas males were likely to use multiple asset class mixes (Fund Three) or single asset class choices (Fund Two). Little choice type difference is evident by gender for Fund One. The determinants of choice type will be examined in future work.

<Insert Table 4>

Table 5 presents performance estimates for each choice type by fund and Table 6 ranks the performance of each choice for each performance measure. For Fund One and Fund Two members results are presented for the full data period and the period where full choice was available. From the results, choice type matters for a member's performance. Very few choice types performed better on average for members than remaining with their fund's default option or their own previous choice. For the discussion that follows it is important to emphasise that "better" means a member underperformed less as on average members would have done better to remain in their fund's default option or their previous investment choice.

<Insert Table 5>

<Insert Table 6>

For Fund Two and Fund Three the members who performed best, both in raw returns and risk adjusted returns, had choices that used combinations of asset classes only. For Fund Two the average member raw return for this choice type was almost double

the worst performing choice type; which was selecting a single readymade. For Fund Three members the disparity between best and worst performing choice type, asset class combinations versus single asset classes respectively, was 28 percent. Notably those Fund Two and Fund Three members who only made choices using multiple asset classes, were the only choice type group who had average non-negative information ratios. All other choice types, which account for the majority of choices, underperformed relative to the fund default option or the member's previous choice. Fund One members who similarly only used combinations of asset classes, however, performed relatively poorly. The best performing Fund One members, in terms of raw returns, were those who always combined readymades and asset classes in all their choices whereas in risk-adjusted terms those who only combined readymades performed the best. Members who relied on one readymade in all their choices performed relatively well for Fund One and Fund Three but poorly for Fund Two. Staying with single readymade options for all choices was the worst performing choice, in terms of raw returns, for Fund Two members, third worst for Fund One but second best for Fund Three. Relying on selecting single asset classes was the worst option for Fund Three members, second worst for Fund One members but third best for Fund Two members.

In summary, member choices do not perform as well as the default. A general, though not uniform, conclusion is that members who did make changes underperformed least when they mixed asset classes or readymade options. It must be emphasised that performance has been assessed over short periods relative to the likely average investment horizon. Given the average age of members in the sample is 38 years, an investment horizon of beyond 25 years needs to be considered which the

data does not permit. The results therefore do not comment on what may ultimately prove the better performing choice over a member's eventual total investment period.

Performance Variation

The previous discussion has focussed on average performance with some limited analysis of gender, decision year and investment choice type. This section examines what characteristics may help explain variation in member performance in a multivariate setting. The available data allows a number of member demographics and fund/investment characteristics to be empirically investigated for a relationship with performance.

The investment choice options available to members varied over the data period. Fund One and Fund Two options increased over the data period whereas Fund Three members had the same range of choices and Fund Four members could only select single readymades. As a consequence two estimates of equation 3 are provided with different regressors and sample periods. Both regressions are estimated using raw returns and the information ratio based on the default as the benchmark. The first regression includes all members with at least a six-month performance history, but uses a more limited set of variables reflecting that some investment characteristics variables are fixed by which fund a member belongs to and the year the decision was made.

Results of the first regression are presented in Table 7. Of member characteristics the length of membership before the member made their first choice is significantly negatively related to performance. If membership length can be interpreted as being related to information, or at least the opportunity to gather information or exposure to

information, this result is consistent with the findings of Guiso and Jappelli (2006). They suggest such a negative relationship between information and performance is consistent with a model of overconfidence. The proxy for information used here is indirect as it is assumed information gathering increases with membership length. This is quite different to Guiso and Jappelli (2006) who have direct measures of how much time investors devoted to gathering information regarding their investments.

<Insert Table 7>

Males perform significantly better in the choices they make. Lower raw returns for females may be a reflection of choosing more risk averse options, though lower information ratios cannot be similarly explained. This is somewhat at odds with previous findings on gender and investment performance (Barber and Odean, 1999) particularly given the suggested role of overconfidence in their paper and previously in other investment contexts (Guiso and Jappelli, 2006; Barber and Odean, 1999) and reported gender differences in feelings of competence in financial matters (Prince, 1993).

Member contributions levels were also positively related to performance, consistent with Barber and Odean (1999) to the extent that contributions are a proxy for income. In terms of the investment choice characteristics, the number of choices made and the length of the investment period were both significant having controlled for fund membership and decision-type, which were also generally significant. The negative relationship between number of choices and performance is consistent with the literature (Guiso and Jappelli, 2006, Barber and Odean, 1999) though Yamaguchi et al. (2006) find a positive trading relationship with trading and raw returns but a negative relationship with risk-adjusted returns. The negative sign for investment

period suggests the longer the member has their investment the lower their performance.

In the second regression, summarised in Table 8, two additional variables are included using a shorter sample period and only Fund One and Fund Two members who had the most complete range of choice types available. The sign of each of the previous member and investment characteristics are replicated with the additional variables and smaller sample. The dummy variables included for how a member constructed their investment strategy indicate that choice type is significant. This is an interesting finding in view of APRA's warnings to trustees about allowing "narrow or risky" choices by members. Compared with single readymade choices, single asset class choices were negatively related to performance but only significantly for risk adjusted performance. Only choices which involved multiple readymades were significantly better than selections which used only a single readymade option of the fund. The average number of options a member used in his or her choices was negatively related to performance but only significantly for risk adjusted performance. That is, the fewer options a member included in their choices the better their performance.

<Insert Table 8>

Discussion and Further Work

Investment choices, like all choices, have consequences. For workers, given the choice how to invest their compulsory superannuation contributions, the very real consequence of poor choices is less accumulated savings when they retire. This sample of investment choices from four large not-for-profit funds suggests on average member accumulations would be lower than had they stayed with their fund's default option or their previous choice. A major qualification to this finding is that the

performance period has been arbitrarily defined by the data sample period. Individual's choices may eventually outperform the fund's default over a longer timeframe. A longer time period will allow reflection on this issue.

For fund trustees who have been warned by APRA about allowing "narrow or risky" allocations by their members the results for the two funds with the least restrictive array of choice options provides some basis for this concern. Choice type does matter within a fund but results are not uniform across the funds in this sample. Members whose choices could be regarded as the narrowest, as they rely on single asset class options performed significantly worse than the readymade options available from their funds. However it needs to be made clear how such choices are to be judged as raw returns or information ratios provide differing assessments. Finally, the more choices members made and the more options they included the worse their performance. Choice may be good but too much or too narrow may have detrimental effects.

Table 1 Sample Characteristics

This table summarises the sample data with a breakdown for the full sample and the smaller sample utilised in the regression analysis.

		Age (years)	Gender (Male percent)	Employer Contributions (\$ 2004)	Membership Length at First Choice (months)	Investment Period (months)	Total Number Choices	Average Options
Full Sample								
Fund One	n	37181	37176	32061	37182	43792	43792	43792
	Mean	37.36	24	2720.26	19.62	22.43	1.09	2.49
	SD	11.74		4390.32	39.16	17.80	0.43	1.65
Fund Two	n	23021	23018	15891	22436	23030	23030	23030
	Mean	36.90	78	4616.08	24.71	29.80	1.17	1.87
	SD	11.89		6166.05	44.35	19.99	0.57	1.18
Fund Three	n	17448	17448	12574	17448	17608	17608	17608
	Mean	40.21	41	4291.54	69.30	33.25	1.11	1.45
	SD	10.14		4225.91	43.79	10.45	0.56	1.12
Fund Four	n	35705	35705	24446	35705	35705	35705	35705
	Mean	40.12	48	6840.01	33.93	27.47	1.22	1
	SD	11.07		8399.73	50.44	20.74	0.58	0
TOTAL	n	113355	113347	84067	112771	120135	120135	120135
	Mean	38.57	45	4405.95	32.85	26.93	1.15	1.77
	SD	11.43		6229.05	47.71	18.73	0.53	1.35
Regression Sample								
Fund One	n	27134	27134	27134	27134	27134	27134	27134
	Mean	36.37	23	2395.05	10.41	19.32	1.07	2.66
	SD	11.82		4020.96	29.03	8.69	0.36	1.68
Fund Two	n	13915	13915	13915	13915	13915	13915	13915
	Mean	36.67	79	4154.23	25.80	29.69	1.20	1.96
	SD	11.77		6120.71	44.91	18.52	0.58	1.22
Fund Three	n	12071	12701	12071	12071	12071	12071	12071
	Mean	39.84	39	4358.60	66.68	33.77	1.12	1.47
	SD	10.09		4245.48	43.43	9.42	0.58	1.15
Fund Four	n	20559	20559	20559	20559	20559	20559	20559
	Mean	39.92	50	7872.84	39.63	31.85	1.28	1
	SD	10.91		9971.84	51.63	21.70	0.65	0
TOTAL	n	73679	73679	73679	73679	73679	73679	73679
	Mean	37.98	44	4577.48	30.69	27.14	1.16	1.88
	SD	11.42		6967.95	46.20	16.60	0.54	1.42

Table 2 Performance by Fund and Gender

This table presents mean performance for each fund with a gender breakdown. A significant difference in gender means at a 95 percent confidence level is indicated by bold. Performance is measured from end of the first month decision is made to the last record date for choice data from each fund. Only records with at least six months return history included.

		Fund One			Fund Two			Fund Three			Fund Four			Total		
		Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	
Raw Return	n	27214	8700	38303	4679	15189	19878	9969	6872	17000	15803	14852	30655	57665	45613	105836
	mean	11.66	11.75	11.79	9.27	9.22	9.24	4.77	5.05	4.88	7.42	7.51	7.46	9.11	8.52	8.95
	SD	5.5	5.87	5.67	5.25	5.35	5.33	3.83	4.32	4.04	5.1	5.38	5.24	5.77	5.72	5.81
Excess (Def)	n	27214	8700	38303	4679	15189	19878	9969	6872	17000	15803	14851	30654	57665	45612	105835
	mean	-1.23	-0.99	-1.17	-2.29	-2.07	-2.13	-0.81	-0.81	-0.81	-1.59	-1.29	-1.45	-1.34	-1.42	-1.37
	SD	3.72	3.92	3.86	3.68	3.53	3.56	1.81	2.09	1.93	3.26	3.11	3.19	3.35	3.34	3.39
Excess (Prev)	n	27214	8700	38303	4679	15189	19878	9969	6872	17000	15803	14852	30655	57665	45613	105836
	mean	-1.17	-0.90	-1.1	-2.08	-1.82	-1.89	-0.82	-0.83	-0.82	-1.36	-1.02	-1.2	-1.24	-1.24	-1.23
	SD	3.73	3.9	3.87	3.71	3.59	3.62	1.83	2.13	1.96	3.37	3.24	3.32	3.39	3.39	3.44
IR (Def)	n	23580	7538	33506	4568	14839	19415	9969	6872	17000	15803	14851	30654	53920	44100	100575
	mean	-0.12	-0.08	-0.11	-0.27	-0.25	-0.26	-0.09	-0.07	-0.08	-0.11	-0.07	-0.09	-0.12	-0.14	-0.13
	SD	0.53	0.52	0.54	0.4	0.38	0.39	0.19	0.21	0.2	0.45	0.42	0.44	0.45	0.41	0.44
IR (Prev)	n	23580	7538	33506	4568	14839	19415	9969	6872	17000	15803	14852	30655	53920	44101	100576
	mean	-0.12	-0.07	-0.11	-0.25	-0.23	-0.24	-0.08	-0.07	-0.08	-0.08	-0.04	-0.06	-0.11	-0.12	-0.11
	SD	0.52	0.52	0.54	0.4	0.39	0.39	0.19	0.21	0.2	0.44	0.42	0.43	0.45	0.41	0.44

Table 3 Performance by Decision Year

Table present mean performance data broken down by decision year, which is the year the member first made an investment change. Performance is measured from end of the first month decision is made to the last record date for choice data from each fund. Only records with at least six months return history included.

		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004*	Overall
Raw Return	n	42	129	927	2110	8203	7082	20463	23479	33133	10268	105836
	mean	9.60	9.46	7.52	6.66	5.29	4.25	3.93	7.60	13.00	15.71	8.95
	SD	0.91	0.55	1.04	1.14	0.96	1.66	2.27	3.72	5.11	6.20	5.81
Excess (Def)	n	42	129	927	2110	8203	7082	20463	23478	33133	10268	105835
	mean	0.29	0.22	-0.34	-0.68	-1.03	-1.61	-1.19	-1.30	-1.83	-0.79	-1.37
	SD	0.84	0.51	0.66	0.77	0.70	1.48	1.72	2.49	4.53	5.36	3.39
Excess (Prev)	n	42	129	927	2110	8203	7082	20463	23479	33133	10268	105836
	mean	0.35	0.25	-0.25	-0.54	-0.95	-1.49	-1.17	-1.09	-1.62	-0.74	-1.23
	SD	0.86	0.51	0.69	0.90	0.96	1.59	1.78	2.64	4.54	5.38	3.44
IR (Def)	n				1321	7601	4977	19797	23478	33133	10268	100575
	mean				-0.09	-0.12	-0.17	-0.13	-0.12	-0.15	-0.08	-0.13
	SD				0.10	0.08	0.12	0.13	0.23	0.60	0.74	0.44
IR (Prev)	n				1321	7601	4977	19797	23479	33133	10268	100575
	mean				-0.05	-0.09	-0.15	-0.13	-0.10	-0.13	-0.07	-0.11
	SD				0.08	0.08	0.13	0.13	0.24	0.60	0.74	0.44

* part year observations for all funds

Table 4 Choice Type Breakdown

This table presents a breakdown of choice type during the sample period where each fund offered their full range of choices: Fund One July 2001-September 2004, Fund Two January 2002-June 2004, Fund Three April 2001- December 2004.

Fund	Choice Type	Gender			Total
		Female	Male	Missing	
Fund One	All Single Readymade	5550	1766	1615	8931
		22.7%	22.6%	24.4%	23.0%
	All Single Asset Class	1593	551	593	2737
		6.5%	7.0%	9.0%	7.0%
	All Readymade Mixes	9130	2754	2123	14007
		37.4%	35.2%	32.1%	36.1%
	All Asset Class Mixes	6586	2196	1398	10180
		27.0%	28.1%	21.1%	26.2%
	At Least One Multiple Readymades or Multiple Asset Classes - No Mix	262	135	9	406
		1.1%	1.7%	0.1%	1.0%
At Least One Mix Readymades and Asset Classes	126	77	8	211	
	0.5%	1.0%	0.1%	0.5%	
All Readymades and Asset Class Mixes	1160	344	869	2373	
	4.8%	4.4%	13.1%	6.1%	
Total	24407	7823	6615	38845	
		100%	100%	100%	100%
Fund Two	All Single Readymade	1385	4046	3	5434
		37.9%	32.4%	50.0%	33.7%
	All Single Asset Class	224	1924	1	2149
		6.1%	15.4%	16.7%	13.3%
	All Readymade Mixes	1277	3709	1	4987
		34.9%	29.7%	16.7%	30.9%
	All Asset Class Mixes	410	1533	1	1944
		11.2%	12.3%	16.7%	12.0%
	At Least One Multiple Readymades or Multiple Asset Classes - No Mix	30	145	0	175
		0.8%	1.2%	0.0%	1.1%
At Least One Mix Readymades and Asset Classes	57	168	0	225	
	1.6%	1.3%	0.0%	1.4%	
All Readymades and Asset Class Mixes	276	954	0	1230	
	7.5%	7.6%	0.0%	7.6%	
Total	3659	12479	6	16144	
		100.0%	100.0%	100.0%	100.0%
Fund Three	All Single Readymade	8520	5242	118	13880
		82.5%	73.6%	73.8%	78.8%
	All Single Asset Class	241	257	8	506
		2.3%	3.6%	5.0%	2.9%
	At Least One Multiple Asset Class Mix	1371	1447	29	2847
		13.3%	20.3%	18.1%	16.2%
All Asset Class Mixes	190	180	5	375	
	1.8%	2.5%	3.1%	2.1%	
Total	10322	7126	160	17608	
		100.0%	100.0%	100.0%	100.0%

Table 5 Performance by Choice Type and Fund (all records, six months history)

Table presents performance summary for choice types being: A) all choices one readymade, B) all choices one asset class, C) all choices consist of readymades at least one multiple D) all choices consist of asset classes at least some more than one, E) at least one choice has multiple readymades and/or multiple asset classes but not mixtures, F) at least one mixture of asset classes and readymades in a single choice, G) all choices mixtures of asset classes and readymades. Performance is from end of the first month decision is made to the last record date for choice data from each fund. Only records with at least six months return history included.

			A	B	C	D	E	F	G	Total
Fund One overall	Raw Return	n	10503	2331	13902	9203	655	251	1458	38303
		mean	11.11	8.80	12.79	11.74	7.80	10.06	14.43	11.79
		SD	6.83	6.77	5.01	4.18	4.73	5.66	5.22	5.66
	Excess (Def)	n	10503	2331	13902	9203	655	251	1458	38303
		mean	-0.82	-4.80	-0.13	-2.12	-2.70	-1.85	-0.94	-1.17
		SD	4.61	5.93	2.35	3.32	2.74	3.13	4.08	3.86
	Excess	n	10503	2331	13902	9203	655	251	1458	38303
		mean	-0.78	-4.68	-0.11	-2.06	-1.69	-1.28	-0.92	-1.10
		SD	4.62	6.03	2.34	3.32	3.19	2.99	4.08	3.87
	IR (Def)	n	7600	2283	12384	9203	392	186	1458	33506
		mean	-0.07	-0.41	0.02	-0.23	-0.26	-0.18	-0.18	-0.11
		SD	0.56	0.58	0.50	0.46	0.33	0.46	0.72	0.54
	IR (Prev)	n	7600	2283	12384	9203	392	186	1458	33506
		mean	-0.07	-0.40	0.02	-0.22	-0.13	-0.10	-0.18	-0.11
		SD	0.56	0.59	0.50	0.46	0.33	0.45	0.72	0.54
Fund One 7/01-12/04	Raw Return	n	7518	2282	12322	9203	387	186	1458	33356
		mean	13.06	8.88	13.70	11.74	9.87	11.88	14.43	12.66
		SD	7.01	6.81	4.54	4.18	4.74	5.30	5.22	5.49
	Excess (Def)	n	7518	2282	12322	9203	387	186	1458	33356
		mean	-0.60	-4.85	0.06	-2.12	-2.76	-1.63	-0.94	-1.11
		SD	5.26	5.97	2.38	3.32	3.07	3.38	4.08	4.07
	Excess	n	7518	2282	12322	9203	387	186	1458	33356
		mean	-0.58	-4.74	0.06	-2.06	-1.42	-0.93	-0.92	-1.06
		SD	5.28	6.06	2.38	3.32	3.67	3.15	4.08	4.07
	IR (Def)	n	7518	2282	12322	9203	387	186	1458	33356
		mean	-0.07	-0.41	0.02	-0.23	-0.26	-0.18	-0.18	-0.11
		SD	0.56	0.58	0.50	0.46	0.33	0.46	0.72	0.54
	IR (Prev)	n	7518	2282	12322	9203	387	186	1458	33356
		mean	-0.07	-0.40	0.02	-0.22	-0.12	-0.10	-0.18	-0.11
		SD	0.56	0.59	0.50	0.46	0.33	0.45	0.72	0.54
Fund Two	Raw Return	n	7831	742	7963	1651	297	369	1025	19878
		mean	7.55	13.41	8.70	15.07	8.54	9.17	14.12	9.24
		SD	4.68	9.55	3.94	5.27	4.36	4.71	4.84	5.33
	Excess (Def)	n	7831	742	7963	1651	297	369	1025	19878
		mean	-3.30	-1.16	-1.64	-0.07	-2.19	-1.67	-1.11	-2.12
		SD	3.83	7.89	1.83	3.91	2.49	2.55	3.70	3.56
	Excess	n	7831	742	7963	1651	297	369	1025	19878
		mean	-2.98	-0.78	-1.51	-0.01	-0.69	-0.52	-1.07	-1.88
		SD	3.99	7.99	1.81	3.89	3.10	2.63	3.68	3.62
	IR (Def)	n	7577	731	7798	1651	281	352	1025	19415
		mean	-0.28	-0.09	-0.34	0.00	-0.21	-0.18	-0.12	-0.26
		SD	0.34	0.62	0.34	0.40	0.23	0.30	0.52	0.38
	IR (Prev)	n	7577	731	7798	1651	281	352	1025	19415
		mean	-0.25	-0.06	-0.32	0.01	-0.07	-0.05	-0.11	-0.24
		SD	0.35	0.63	0.35	0.40	0.25	0.27	0.52	0.39
Fund Two 01/02-12/04	Raw Return	n	5445	692	5354	1651	180	227	1025	5445
		mean	8.71	13.99	10.23	15.07	10.92	11.59	14.12	8.71
		SD	5.15	9.62	3.94	5.27	3.93	4.43	4.84	5.15
	Excess (Def)	n	5445	692	5354	1651	180	227	1025	5445
		mean	-4.04	-1.17	-1.94	-0.07	-2.51	-1.88	-1.11	-4.04
		SD	4.36	8.16	2.11	3.91	2.98	3.11	3.70	4.36
	Excess	n	5445	692	5354	1651	180	227	1025	5445
		mean	-3.62	-0.80	-1.81	-0.01	-0.30	-0.32	-1.07	-3.62
		SD	4.60	8.25	2.09	3.89	3.69	3.15	3.68	4.60
	IR (Def)	n	5445	692	5354	1651	180	227	1025	5445
		mean	-0.32	-0.09	-0.40	0.00	-0.23	-0.20	-0.12	-0.32
		SD	0.39	0.64	0.39	0.40	0.26	0.37	0.52	0.39
	IR (Prev)	n	5445	692	5354	1651	180	227	1025	5445
		mean	-0.27	-0.06	-0.38	0.01	-0.02	-0.03	-0.11	-0.27
		SD	0.40	0.65	0.40	0.40	0.28	0.32	0.52	0.40

Fund Three 4/01-9/04	Raw Return	n	13392	490	2748	370	17000
		mean	4.69	4.22	6.02	4.26	4.88
		SD	3.27	9.01	5.52	3.89	4.04
	Excess (Def)	n	13392	490	2748	370	17000
		mean	-0.86	-2.16	-0.26	-1.31	-0.81
		SD	1.11	6.22	2.96	2.46	1.93
	Excess	n	13392	490	2748	370	17000
		mean	-0.85	-2.25	-0.36	-1.52	-0.82
		SD	1.14	6.17	2.97	2.96	1.96
	IR (Def)	n	13392	490	2748	370	17000
		mean	-0.10	-0.06	0.04	-0.11	-0.08
		SD	0.16	0.29	0.27	0.20	0.20
	IR (Prev)	n	13392	490	2748	370	17000
		mean	-0.10	-0.07	0.03	-0.11	-0.08
		SD	0.16	0.28	0.27	0.20	0.20
Fund Four 7/98-6/04	Raw Return	n	30655				30655
		mean	7.46				7.46
		SD	5.24				5.24
	Excess (Def)	n	30654				30654
		mean	-1.45				-1.45
		SD	3.19				3.19
	Excess	n	30655				30655
		mean	-1.20				-1.20
		SD	3.32				3.32
	IR (Def)	n	30654				30654
		mean	-0.09				-0.09
		SD	0.44				0.44
	IR (Prev)	n	30655				30655
		mean	-0.06				-0.06
		SD	0.43				0.43

Table 6 Performance by Choice Type (all records, minimum 6 month returns)

Table presents performance rank from best (1) to worst (7) for choice types being: A) all choices one readymade, B) all choices one asset class, C) all choices consist of readymades at least one multiple D) all choices consist of asset classes at least some more than one, E) at least one choice has multiple readymades and/or multiple asset classes but not mixtures, F) at least one mixture of asset classes and readymades in a single choice, G) all choices mixtures of asset classes and readymades. Performance is from end of the first month decision is made to the last record date for choice data from each fund. Only records with at least six months return history included. Fund Four is not included as during the period of analysis members were only able to select single readymade options. Minimum six 6 month performance history.

		Choice Type						
		A	B	C	D	E	F	G
Fund One	Raw Return	4	6	2	3	7	5	1
Overall	Excess (Def)	2	7	1	5	6	4	3
	Excess (Prev)	2	7	1	6	5	4	3
	IR (Def)	2	7	1	5	6	3	4
	IR (Prev)	2	7	1	6	4	3	5
	Raw Return	3	7	2	5	6	4	1
Fund One 7/01-12/04	Excess (Def)	2	7	1	5	6	4	3
	Excess (Prev)	2	7	1	6	5	4	3
	IR (Def)	2	7	1	5	6	4	3
	IR (Prev)	2	7	1	5	6	4	3
	Raw Return	7	3	5	1	6	4	2
Fund Two Overall	Excess (Def)	7	3	4	1	6	5	2
	Excess (Prev)	7	4	6	1	3	2	5
	IR (Def)	6	2	7	1	5	4	3
	IR (Prev)	6	3	7	1	4	2	5
	Raw Return	7	3	6	1	5	4	2
Fund Two 01/02-12/04	Excess (Def)	7	3	6	1	5	4	2
	Excess (Prev)	7	4	6	1	2	3	5
	IR (Def)	6	2	7	1	5	4	3
	IR (Prev)	6	4	7	1	2	3	5
	Raw Return	2	4		1	3		
Fund Three Overall	Excess (Def)	2	4		1	3		
	Excess (Prev)	2	4		1	3		
	IR (Def)	3	2		1	4		
	IR (Prev)	3	2		1	4		

Table 7 Performance Regressions – Full Sample

This table presents the regression results for all member records for all funds with a minimum six month performance history.

	Performance Measure		Information	
	Raw Returns	Std Error	Ratio	Std Error
Member characteristics				
Membership	-0.0036**	0.0014	-0.0006***	0.0002
Age	-0.0139	0.0095	-0.0012	0.0010
Gender	0.2592*	0.1321	0.0346**	0.0158
Contributions (Ln)	0.1590**	0.0713	0.0232***	0.0073
Fund (base Fund Four)				
Fund One	2.2019***	0.2858	0.0319*	0.0167
Fund Two	1.0489**	0.4390	-0.1213***	0.0297
Fund Three	0.0817	0.4394	0.1246**	0.0458
Investment Characteristics				
Investment length (months)	-0.1082***	0.0109	-0.0134***	0.0050
Total Choices	-0.1734**	0.0841	-0.0307***	0.0129
Decision year (base 2004)				
1998	-1.2506*	0.7307	0.8302***	0.3095
1999	-3.4174***	0.6420	0.6646***	0.2599
2000	-6.3305***	0.5806	0.4977**	0.2097
2001	-7.3245***	0.4838	0.2717*	0.1489
2002	-4.6282***	0.3045	0.1891*	0.0934
2003	-1.3310***	0.2207	0.0269	0.0576
Intercept	14.4839***	0.3432	-0.0455	0.0629
n	77776		73679	
Adjusted R ²	0.5537		0.0405	

***99% **95% *90% significance levels

Table 8 Performance Regressions – Restricted Sample

This table presents the regression results for all members of Fund One and Fund Two only with a minimum six month performance history.

	Raw	Performance Measure		
	Returns	Std Error	Information Ratio	Std Error
Member characteristics				
Membership	-0.0069**	0.0028	-0.0005*	0.0003
Age	-0.0039	0.0128	0.0000	0.0012
Gender	0.3127**	0.1322	0.0349**	0.0143
Contributions (Ln)	0.1822***	0.0573	0.0292***	0.0076
Fund One (base Fund Two)	1.4905***	0.2709	0.2203***	0.0245
Investment Characteristics				
Investment length (months)	-0.2707**	0.1090	-0.0121***	0.0031
Total Choices	-0.0270	0.0804	-0.0216**	0.0101
Average Number Options	-0.0915	0.0840	-0.0357***	0.0109
Choice type (All readymade base)				
Single asset class	-2.5118	1.6309	-0.1974*	0.1120
Multiple readymades	1.5813***	0.3941	0.1239***	0.0349
Multiple asset classes	0.0772	1.3126	0.0233	0.0942
Separate readymades/asset class mix	-0.4686	0.9410	-0.0184	0.0663
Mix of readymades & asset classes	0.8945	1.1440	0.0977	0.0819
All mix readymades & asset classes	0.9866	1.1021	0.0967	0.0998
Decision year (base 2004)				
2001	-2.0215	3.3430	0.2124**	0.0866
2002	-1.2816	2.2284	0.1765***	0.0560
2003	-0.1238	0.8543	-0.0106	0.0392
Intercept	15.7078***	1.0247	-0.2794***	0.0494
n	36661		36661	
Adjusted R ²	0.2980		0.0600	

***99% **95% *90% significance levels

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Performance of member investment choices in their superannuation accounts and implications for fund trustees and regulators

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Abstract

Three crucial ingredients influence how much individuals will have to fund retirement income needs: how much they contribute to savings, how long they save for, and the performance of these savings. This paper focuses on the issue of performance, and how individuals perform when they are given the choice of making their own investment strategy for their retirement savings contributions. An empirical examination using a large sample gathered from four Australian superannuation funds is utilised and finds that on average members underperform their own fund's default option both in raw returns and on a risk-adjusted basis. For trustees and regulators charged with the responsibility of looking after the interests of members an important result identifies significant differences in performance based on how members are allowed to construct their investment strategy.

Keywords: Retirement savings, Superannuation, Asset allocation, Investment Performance.
JEL Codes: D91, G11, D14

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Introduction

Australia, like many countries over the past two decades, has implemented a range of policies to address an ageing population and the expected fiscal challenge this demographic change presents for future governments. One such challenge is the government's ability to provide an age pension as currently entitled, or, at current entitlement levels. A major policy component of successive Australian governments, reflected in many developed countries, has been to shift the expectation of responsibility for income provision in retirement from the government to the individual.

Central to the retirement incomes policy in Australia was the introduction in 1992 of the Superannuation Guarantee Act, which requires employers to make contributions on behalf of their employees to a complying superannuation fund.¹ The contribution rate was set initially at three percent of earnings but since 2002 has been nine percent. Paralleling this trend over the past 15 years, which can be characterised as the modern era of Australian superannuation, has been the movement from defined benefit (DB) to defined contribution (DC) funds and products. Contributions are increasingly directed to defined contribution (DC) funds where the majority of members have a choice in the investment strategy for those contributions. The average number of options available for these investment strategies across all fund types¹ is 38 (Australian Prudential Regulation Authority, 2008). However, most individuals choose not to exercise this choice with 51 percent of assets remaining in the default investment strategy (Australian Prudential Regulation Authority, 2008, Table 15).² In addition to this investment choice, since July 2005, a majority of Australian employees have also

¹ A superannuation "fund" can be considered equivalent to a U.S. 401(K) "plan".

² This is not a perfect measure. It is based on the total assets in what is labelled a default strategy by a fund. However because a default is not mandatory, where a default is not labelled APRA (2008) takes the strategy with the most assets as the default.

had a legislated entitlement to choose to which superannuation fund their contributions are directed to through the Superannuation Legislation Amendment (Choice of Superannuation Funds) Act 2004, commonly referred to as choice of fund. However, once again, few have exercised this choice with only four percent of employees changing their superannuation funds, in the first six months since being given the opportunity, primarily due to change of employment (Clare, 2006). This default behaviour is not peculiar to Australia nor is it peculiar to retirement savings decisions. In the U.S., for example, Madrian and Shea (2001) and more recently Mitchell, Mottola, Utkus and Yamaguchi (2006) identify that most U.S. DC participants do not trade (change their investment strategy) at all and remain in the plan default.

Within a DC product member choices directly impact on their accumulated retirement savings, hence, for those who do make investment strategy changes, an important question is how well do their choices perform. This is the empirical question investigated in this paper utilising a large sample of member investment choices to examine what sort of choices members make and how well these investment decisions perform in raw returns, relative to a selection of benchmarks, and adjusted for risk.

The appropriateness of a particular investment choice is ultimately determined by considering member circumstances including, but not restricted to, the amount of assets outside superannuation, the level of debt, number of dependants, and risk tolerance. This information is not readily available and hence investigation of the appropriateness of particular choices is beyond the scope of the paper.

The examination of individual performance is not just of interest to individuals. Fund trustees and government must consider the consequences of member performance in terms of their fiduciary duty and potential fiscal obligations respectively. Fund trustees are required to formulate an investment strategy by the Superannuation Industry (Supervision) Act 1993 with the Australian Prudential Regulation Authority (APRA) responsible for more detailed guidelines for trustees. APRA's guidelines reflect high expectations of trustees with regard to members exercising investment strategy choice. They provide warnings to trustees about allowing members "narrow or risky" choices without regard to what is in the best interests of members (APRA, 2006, p.12). Donald (2006) reviews the nature of the trust structure used by superannuation funds in an environment of member choice and suggests "trustees of many superannuation funds find themselves in a vacuum when it comes to deciding how to offer choice when to do so might represent an abdication of a fundamental fiduciary responsibility" (Donald, 2006, p.12). The question of whether a particular choice is in the best interests of a member can be considered both ex-ante and ex-post. This paper contributes to the latter by providing empirical evidence on the performance of member investment choice using a sample of four large Australian superannuation funds.

The paper proceeds as follows. The next section provides a review of the literature on making investment strategy changes and subsequent performance within the retirement savings context and the broader household savings context. The third section describes the sample data and the fourth section examines the methodology employed in measuring performance and estimated performance relationship. The

fifth section presents results and the final section concludes with a discussion of results and identifies areas of future research.

Why Should Investment Choice be Exercised? Theory and Evidence

Mitchell, et al. (2006) identify that using the traditional finance theoretical framework would suggest fund members choices and changes reflect underlying risk preferences having identified efficient portfolios. Changes would follow given changes to these so long as the expected benefits exceed the costs of trading, in keeping with Grossman and Stiglitz (1980) (Mitchell, et al., 2006, p.3). Investment finance theory suggests that if markets are efficient, these changes will not earn fund members abnormal returns, consistently (Fama 1970, 1991). However a less restrictive definition of efficiency suggests those who do trade based on costly information may earn higher returns to compensate for the higher trading costs (Grossman and Stiglitz, 1980).

The reality is however that few members choose to move out of the default investment option in DC plans. Bowman (2003) suggests that only ten percent of Australian superannuation fund members with investment choice actually exercise it. This is in line with the sample in this paper where between ten and fifteen percent of members exercise investment choice. U.S. results are similar. Agnew, Balduzzi and Sunden (2003) find that only seven percent of members of a 401(k) plan have more than one investment change with an average of approximately one change every four years and overall 87% of members have no investment changes. This evidence is echoed by Ameriks and Zeldes (2004) who find approximately 75 percent of TIAA-CREF members make no investment changes over a decade. Mitchell, et al. (2006)

characterise the trading pattern of 1.2 million participants in approximately 1500 funds as “profound inertia” (Mitchell, et al., 2006, p.12).

Similar low levels of choice have been evident in Australia following legislation, effective in 2006, allowing members to choose the superannuation fund (as distinct from changing the investment strategy within their existing fund) to receive their mandatory employer contributions. Fry, Heaney and McKeown (2007) posit Prospect theory as a means of explaining member behaviour given choice of fund. Given loss aversion they suggest the expected change benefit/cost ratio needs to be substantial to encourage change. Fry, Heaney and McKeown (2007) also suggest the bias to inertia is magnified as “superannuation profits cannot be realised until retirement”.

This suggests that expected fund performance is a key motivator of member choice. While member expectations are not generally observed, it has been demonstrated that historical returns are related to aggregate fund flows in retirement funds (Cronqvist and Thaler, 2004). At an individual choice level Clark-Murphy, Gerrans and Speelman, (2007) have identified apparent returns chasing behaviour in member investment choices. Survey work on what might prompt a member to change funds (Clare, 2006) also highlights the role of past returns.

In the U.S. failure to participate in a 401(k) plan, or equivalent, has been argued as “the most obvious error an individual can make and is well researched in the literature” (Agnew, 2006, p.27). In Australia given mandatory participation, member contribution levels, fund fees and investment strategy choice are fundamental influences on accumulated savings. While participation may be well researched, the

performance of member's chosen investment strategy performance is not. A recent U.S. exception is Yamaguchi, Mitchell, Mottola and Utkus (2006) who use alpha-based performance measures derived from the CAPM and factor-based models to assess the investment performance of more than 1.5 million participants of 1500 U.S. plans. These can be referred to as standard performance metrics of the investment management industry and literature. Their paper examines investment decisions over existing balances, not future contributions which are the focus of this paper, and make four comparisons. The first is those who trade in their 401(k) plan (traders) to those who don't. The second is those who when they trade return their balance allocation to the first observed (target) allocation made by the member. The third group are those plan members who effectively delegate the portfolio rebalancing to a portfolio manager through a choice of balanced or lifecycle funds as against the active rebalancers who make this decision themselves. The fourth compares those who traded and have the highest turnover rate. This final group allows testing whether overconfidence leads to poorer performance as suggested by previous research on individual traders (Odean, 1999; Barber and Odean, 2001 in the US and Guiso and Jappelli, 2006 for Italian investors).

Outside retirement savings investment strategy, a range of studies have examined the performance of individuals' or households' asset allocation decisions. Guiso and Jappelli (2006) use a sample of customers of a major Italian bank to investigate performance and the role of information acquisition. They find a negative correlation between trading activity, lack of diversification, lack of delegation to a financial advisor, information measured as the reported time customers spent collecting information in a typical week, and the Sharpe Ratio of their portfolio performance.

They contend their results do not support a rational investor choice model instead supporting a model where investors are overconfident. Calvet, Campbell and Sodini (2006) use a database of Swedish households to assess the performance and social welfare impacts of under diversification and non-participation in risky asset markets. They find Swedish households to be well diversified with only modest losses due to under-diversification. However, they also identify that 38 percent of Swedish households do not have risky assets in their financial portfolio, with a resulting financial loss, and for five percent of the population the financial loss due to under-diversification is five percent of financial wealth.

In Australia, with participation and minimum contributions mandated³ the focus of research has primarily been the adequacy of the mandatory minimum contributions levels, types of investment strategy or asset allocation decisions, and the impact of fees on accumulated savings. While the performance of superannuation funds has attracted research interest (Drew and Stanford, 2001 and 2003; Frino, Heaney and Service, 2005) as has the impact of fees on accumulated savings (Bateman and Mitchell, 2003), individual member choice performance has not. Drew (2006) employed a normalised rank return measure (NRRM), developed by Bauer and Dahlquist (2001), as a means of highlighting the difficulties for superannuation fund members in successfully timing the market. The NRRM ranks switching strategies between available investment options given a switching frequency. Drew (2006) simulated results on the basis of monthly switching between a range of paired asset classes between 1985 and 2002. The study did not, however, assess actual member choices, instead focussing on what would be needed for a member to outperform

³ The provisions of the 2006 Pension Protection Act in the US have removed the obstacles for employers to offer automatic plan enrolment and default contributions (DiCenzo, J. 2007, p.4) but there remains no legislated obligation for contributions of any sort by employers for employees.

given the limited set of choices and trading allowed. Gallery, Gallery and Brown (2006) review the raw return performance of a sample of Australian fund default options noting that the wide variation in returns implies differing risk characteristics for similarly labelled options. Using member choices from a large sample of investment strategy choices from four Australian funds covering a range of employment industries, the current paper provides an overdue empirical assessment of actual individual choice in Australian superannuation funds.

Data and Methodology

Sample Demographics and Choice Options

Four Australian superannuation funds have provided the investment strategy choice history, for future contributions, of their members. Each of the funds is a not-for-profit fund, three of which are classified as “Industry funds” and one a public-sector fund. Industry fund members are drawn from a number of employers within a single industry, whereas public-sector funds have members from a government agency or a government owned business (Australian Prudential Regulation Authority, 2005, p.3). Collectively the four funds have \$44 billion in assets and 1.6 million members.

The top panel of Table 1 summarises member demographics and investment characteristics from the sample. The sample gender split varies significantly across funds with Fund One having 24 percent males and Fund Two 78 percent, reflecting industry differences each fund’s population. The average contributions were highest for Fund Four members, more than twice that of Fund One members. Average age is comparable between the funds with a three year spread between the youngest (Fund Two) and oldest (Fund Three). Fund Three members have the longest average

investment period of 33 months and Fund One the shortest at 22 months. Members make few choices during the whole sample period with the overall average of 1.15 choices. Fund One and Two offer the greatest range of investment options and the average number of options used by their members reflects this.⁴ Fund Three members had been members longest (69 months) before they made a choice which is in part because Fund Three was the last of the funds to offer choice to members. There is therefore considerable variation in member and investment characteristics across the sample.

<Insert Table 1>

Each fund offers a different number and type of investment choice to members. Fund One, Two and Three offer both readymade options, where the asset allocation is nominated by the fund, and a do-it-yourself (DIY) option where the member can choose their own mixture of readymade options and individual asset classes. Fund Three members can construct a DIY option using only asset classes, not readymade options, whereas Fund One and Fund Two members can construct a DIY option using both asset classes and readymade options. Fund Four members could only choose one readymade option with no mixing across options allowed.⁵

Fees have been levied by the funds on investment changes at various times through the sample period. Fund One members were allowed to make one free change per annum when choice was introduced in 1995 until June 1998 but were charged a \$20 fee when monthly changes were permitted in July 1998. This fee was dropped in 2002. Fund Two members initially could make quarterly changes in July 1997 with the first change free and subsequent changes attracting a \$10 fee. Monthly changes

⁴ Fund Four members were restricted to one option per selection over the sample period.

⁵ Fund Four has since introduced the ability for members to mix readymade options, but outside the data sample period of this paper.

were permitted in January 2001 and the fee was dropped in July 2003. Fund Three members have been permitted to make monthly changes since inception in April 2001 at no charge. Fund Four members receive one free investment change per year with further changes attracting a \$25 fee. For members who joined each fund between October 2002 until June 2004 the average number of choices does not appear to indicate an impact of fees on choice. The average number of changes for Fund Four members, who were charged a fee beyond the first investment switch, is 1.12 against 1.10 for Fund Three and 1.07 for Fund One members who paid no fee for any switch.

Performance Measurement

Returns data for each option offered by the four participating superannuation funds has been obtained since the inception of each offering. Fund One and Fund Two credited member accounts annually between 1998 and 2001, and 1997 and 1998, respectively before adopting monthly crediting. Fund Three has employed monthly crediting since it first offered choice in April 2001. Fund Four credits member accounts quarterly. For Fund Four these quarterly returns between July 1998 and June 2002 have been combined with monthly returns data supplied since July 2002. Hence cumulative raw and excess returns can be calculated for each member choice since inception but risk adjusted measures are problematic due to insufficient returns observations for some choices.

Comparable to Yamaguchi, Mitchell, Mottola and Utkus (2006) we estimate the monthly raw returns for a member based on their asset allocation(s). We also calculate two relative measures. The excess of a member's return relative, firstly to the default option of the fund and secondly relative to each previous choice of the member is calculated. This second measure is similar in spirit to the "own relative benchmark" of

Yamaguchi, et al. (2006). The difference is we calculate the monthly difference using a current allocation which is fixed whereas the “current allocation” weightings for Yamaguchi, et al. (2006) drift with monthly performance of the underlying asset classes reflecting their focus on balances rather than contributions as in this paper.

A return series is generated for each member calculated as $r_{it} = \sum_{n=1}^N w_{n,t} r_{n,t}$, where r_{it} is the return for member i in period t , n represents each of the investment options in the member’s investment strategy from the N readymade or asset class options available and $w_{n,t}$ is the weighting assigned to option n in period t . Using this series of raw returns a member’s performance can be measured from the time they made their first investment strategy change until the end of each fund’s data sample. As noted, the observation of r_{it} varies from annual to monthly. Therefore while a raw or excess return is able to be calculated from the beginning of each member’s choice, only those choices made during the period since monthly returns were published allow risk-adjusted measures due to number of observations available.

Performance is measured using raw returns, excess returns, and an information ratio. The raw return (r_{it}) is as previously described. The excess is defined as $(r_{it} - r_{bt})$ where r_{bt} is the return on benchmark b in period t . Two benchmarks are used: the default option (r_{dt}) for the member’s fund and the member’s previous investment choice r_{pt} . The two excess return measures therefore determine the return of the member’s choice relative to remaining in, or changing back, to their fund’s default option, or remaining in their previous investment strategy. The raw return and excess return measure are annualised as specified in equation 1.

$$\text{Annualised Return} = \left(\prod_{t=1}^T \left(1 + \sum_n^N w_{n,t} r_{n,t} \right) \right)^{(12/T)} - 1 \quad \text{equation 1}$$

where, additionally, T is the investment period in months for the member.

Where monthly returns data is available a risk-adjusted measure, the information ratio, is estimated using equation 2. A range of risk adjusted measures are available and therefore the choice is contestable. The choice here reflects the ultimate purpose of the research which is to help inform members of the consequences of their investment strategy choices and provide trustees with information on how their members perform given the range of investment strategy choices the trustees make available. When measuring investment management performance most studies employ some variation of Jensen's alpha based on single or multi-factor models. Implicit in the use of a multi-factor alpha is the rationale that returns need adjustment for the returns that could be generated from available investable portfolios which capture style, size or other factors known to explain returns. Members of the four funds do not have access to these factor portfolios and therefore judging their performance relative to this is of questionable value. An alternative is the Sharpe Ratio which adjusts performance for risk by assuming access to a risk-free asset and calculating the average excess return divided by the standard deviation of these excess returns. Member access to a risk-free asset is also not available, notwithstanding access to a variety of "Cash" options. A variation is the information ratio, or more precisely here the "differential return information ratio" (Sharpe, 1994), which calculates the excess return using a nominated benchmark, rather than the risk-free asset.

$$\text{Information Ratio} = \frac{\frac{\sum_{t=1}^T r_{e,t}}{T}}{\frac{\sum_{t=1}^T (r_{e,t} - \overline{r_{e,t}})^2}{T-1}}, \quad \text{equation 2}$$

where $r_{e,t}$ is the member's excess return in month t , defined as the member's actual return in month t ($r_{i,t}$) less the benchmark option return in month t ($r_{b,t}$), being either the default option ($r_{d,t}$) or previous investment strategy choice ($r_{p,t}$). As previously noted, fund crediting rates in some cases were originally annual (Fund One and Fund Two) or quarterly (Fund Four). Information ratios are only calculated when monthly crediting commenced. However, information ratios have been calculated for Fund Four by converting the quarterly crediting rate to a monthly rate to supplement the monthly return series available since 2002. In this instance the impact on the information ratio is to dampen the volatility of excess returns and inflate the IR from what it otherwise would be with monthly data.

Performance Assessment

Member performance is assessed both in terms of overall average member performance and across each fund. For purposes of analysis choices have been included where the member's performance period, defined as the time elapsed since first choice was made, is at least six-months. In summarising performance data bivariate analysis considers differences by fund, the year a decision was made and gender. For Funds One, Two and Three who allow members to construct investment choices with asset classes and/or readymades, we assess what types of choices are made by members as well as the performance of each choice type.

Multivariate analysis is also employed to further investigate what factors together may help explain variation in member performance. Equation three is estimated to explore the role of member and investment characteristics.

$$P_i = a + \mathbf{x}'_m \mathbf{b} + \mathbf{y}'_c \boldsymbol{\gamma} + e_i \quad \text{equation 3}$$

where P_i is the performance of member i over all choices the member has made; \mathbf{x}_m is a vector of member characteristics; \mathbf{y}_c is a vector of investment choice characteristics; and e_i an error term. Member raw returns differ systematically across the funds given the differing strategic asset allocation of each fund's options and secondly the year a member's choice history began. Given the possible clustering of performance linked to both fund membership and the year the first member choice was made, a robust covariance matrix was estimated based on "fundyear" clusters. Each fund has a series of years where a first decision could be made. For example Fund Three has four clusters: 2001, 2002, 2003, 2004. In total there are 21 fundyears (Fund One four, Fund Two seven, Fund Three four, Fund Four six). The robust estimator employed is Rogers' (1993) application of Huber (1967).⁶

Member Characteristics

A range of member characteristics were included to explore their relationship with member investment choice performance. Gender is included as it has been demonstrated to have a relationship with investment decisions in terms of the type of decision and performance, though the results are not unequivocal.⁷ Membership length at the time the member made their first decision is included to investigate whether familiarity or exposure to the investment options available from the fund can

⁶ The requirement that each cluster account for five percent or less of the sample is violated with seven of the 21 clusters larger than five percent. Rogers' (1993) adjustment employed in STATA using `hreg2.ado` has therefore been employed.

⁷ See for example Barber and Odean (2001) for investment generally and Gerrans and Clark-Murphy (2004) for gender differences in an Australian retirement savings context.

explain performance variation. Members with longer membership would have a greater chance of exposure to fund publications providing information on the range of choice options available to them and investments more generally. Guiso and Japelli (2006) have demonstrated that information can be expected to have both a positive and negative relationship with performance, depending upon whether a rational or behavioural decision making model is assumed, respectively.

Income has been shown to be related to equity allocation (Agnew, Balduzzi and Sunden, 2003) and is thus expected to be related to investment performance. Income was not observable for members but contributions were available as a proxy. Consistent with the finding that equity exposure increases with income, it is hypothesised contributions will have a positive relationship with performance. Member age is also included as a member characteristic. To the extent that age is positively related with investment experience, age may be expected to have a positive effect on performance. Confounding this is the potential for cognitive decline with ageing to negatively impact on investment skill. Korniotis and Kumar (2007) provide evidence in support of both effects using stock holdings though finding the negative effect having a larger impact. Agarwal, Driscoll, Gabaix and Laibson (2007) provide evidence of a humped age and financial sophistication profile using interest costs and fees paid, with a peak at about age 53. Also confounding possible experience benefits of ageing is the extent to which there may be age effects in asset allocation, where members may reduce equity exposure with age, which may impact raw returns but not risk-adjusted returns. Fund membership is controlled for by the inclusion of fund dummies given the noted variation in investment options offered by fund.

Investment Characteristics

Several characteristics are included which relate to the member's investment choice itself. The number of choices a member has made is included as Odean (1999) and Barber and Odean (2000) demonstrate that trading decreases individual performance consistent with models of overconfidence using a sample of discount brokerage firm clients. Guiso and Japelli (2006) compare rational and behavioural models of information gathering, overconfidence and resultant trading and also find a negative trading relationship using a sample of Italian investors. They conclude that their results do not support a rational decision making model. Yamaguchi et al. (2006) estimate the relationship of trading frequency on performance in a retirement savings context using a sample of 401(k) participants. They find a positive relationship with trading and raw returns but a negative relationship with risk-adjusted returns.

The year a member made their first investment choice is included as a control as over the sample period investment option returns varied markedly. For example equity markets and international equity in particular experienced poor returns through 2001 and 2002. The timing of the offering or expansion of choice by a fund at a particular time or the date a member joins a fund and makes a decision will impact directly on their performance. The length of the investment period is included to control for the fact that the dependent variable, whilst annualised, is not estimated over a comparable period for all members. In the regression analysis a member was only included if they had a returns history of six months or more. A member record is treated equally therefore if it has a six months or six year history.

The first regression utilises the full choice sample from all four funds and each of the member and investment characteristics discussed. A second regression is also estimated to explore the relationship between additional investment characteristics and performance. The first additional variable is the average number of options chosen in a member's investment choices. It is not clear whether using more or less options in a choice is necessarily good or bad. However the number of options made available is increasing for most members. The second additional variable, choice type, describes how the member constructed their choices. Depending on their fund, members could choose pre-mixed readymade options, combine asset classes themselves, or have a mixture of readymades and/or asset classes. Fund Four members were however restricted to single readymade choices. Fund Three members could select a single readymade but not multiples, single asset classes or multiple asset classes. Fund One and Fund Two members choices expanded from single or multiple readymades, when choice was first offered to their members, to a full range of choices. In all, seven investment construction types can be identified. In the first two, all choices are either A) one readymade option, or B) one asset class. In the next two all member choices involve C) multiple readymades or D) multiple asset classes. The remaining are mixtures. In E) all member choices involve multiple mixtures of asset classes or readymades but not mixtures of both. In F) at least one but not all choice involves mixtures of readymades and asset classes in a single choice. Finally in G) all choices are combinations of asset classes and readymades. The second regression focuses only on Fund One and Fund Two members.

Results

Choice and Overall Performance

Gallery, Gallery and Brown (2004) found such significant variation in performance of a sample of the default options for industry, corporate and government funds that they suggested “many Australians’ retirement wealth (or otherwise) will be determined by the ‘accident’ of working for a particular employer or in a particular industry” (Gallery, Gallery and Brown, 2004, p.60). The results in the current study for all investment options available to members of the four funds suggest the variation goes beyond those who remain in their fund’s default option.

In terms of how members performed when they could choose from the options available to them the most striking result from an examination of the performance data, summarised in the last column of Table 2, is that members who exercise choice underperform, both in terms of raw returns and risk adjusted returns, relative to their fund’s default option or their own previous investment choice. The overall mean raw return is a strong 8.95% per annum. However, average excess returns and information ratios are all significantly less than zero, both relative to the default option of the member’s fund or the member’s previous choice. There is however much additional information behind these overall averages.

<Insert Table 2>

Firstly, within each fund, gender differences are evident in performance. This is more evident for the risk-adjusted measure where males perform better than females. With the exception of Fund Three excess returns are significantly better for males, however Fund Three is the only fund where males have significantly higher raw returns. When data is aggregated however, raw returns, excess returns and the information ratio

based on the default option are each significantly higher for females than males. This apparent contradiction can be explained by the gender splits in each fund. Fund One has the largest number and proportion of female membership and though their performance is lower than Fund One males it is better than each other fund's members. Hence when results are aggregated across funds overall female performance becomes better.

Secondly, the year the member makes their first investment decision, summarised in Table 3, is an important determinant of member performance by end of the data collection period. Those members who made their first choice in 2000 and 2001, who in turn had higher equity allocations on average (in 2001 and in international equity in particular), have the worst performance in terms of raw returns. Fund Three members were first offered choice in 2001 and the lower average returns of their members, discussed below, reflect this timing. Excess returns and information ratios are lowest for 2000 and 2003.

<Insert Table 3>

Table 4 summarises choice type for Fund One, Two and Three members over the period where the largest range of options was made available to their members during the sample period. Readymade options were the most common choice type used by members of all funds. For Fund One and Two members, who had a comparable range of choice types, more Fund Two members (34 percent) made all choices involving single readymades than Fund One members (23 percent) and comparable proportions (31 and 36 percent respectively) made all choices using combinations of readymades. While Fund Three members had a more limited range of options a much larger proportion of members relied on a single readymade (79 percent) for all choices.

Twice the proportion (26 percent) of Fund One members than Fund Two members used combinations of asset classes in all choices, whereas approximately double the proportion of Fund Two members (13 percent) used single asset class choices than Fund One members (seven percent). Fund Three members were much less likely to make single asset class choices (three percent). An examination of gender suggests that for Fund Two and Fund Three members, females were more likely to use readymade options whereas males were likely to use multiple asset class mixes (Fund Three) or single asset class choices (Fund Two). Little choice type difference is evident by gender for Fund One. The determinants of choice type will be examined in future work.

<Insert Table 4>

Table 5 presents performance estimates for each choice type by fund and Table 6 ranks the performance of each choice for each performance measure. For Fund One and Fund Two members results are presented for the full data period and the period where full choice was available. From the results, choice type matters for a member's performance. Very few choice types performed better on average for members than remaining with their fund's default option or their own previous choice. For the discussion that follows it is important to emphasise that "better" means a member underperformed less as on average members would have done better to remain in their fund's default option or their previous investment choice.

<Insert Table 5>

<Insert Table 6>

For Fund Two and Fund Three the members who performed best, both in raw returns and risk adjusted returns, had choices that used combinations of asset classes only. For Fund Two the average member raw return for this choice type was almost double

the worst performing choice type; which was selecting a single readymade. For Fund Three members the disparity between best and worst performing choice type, asset class combinations versus single asset classes respectively, was 28 percent. Notably those Fund Two and Fund Three members who only made choices using multiple asset classes, were the only choice type group who had average non-negative information ratios. All other choice types, which account for the majority of choices, underperformed relative to the fund default option or the member's previous choice. Fund One members who similarly only used combinations of asset classes, however, performed relatively poorly. The best performing Fund One members, in terms of raw returns, were those who always combined readymades and asset classes in all their choices whereas in risk-adjusted terms those who only combined readymades performed the best. Members who relied on one readymade in all their choices performed relatively well for Fund One and Fund Three but poorly for Fund Two. Staying with single readymade options for all choices was the worst performing choice, in terms of raw returns, for Fund Two members, third worst for Fund One but second best for Fund Three. Relying on selecting single asset classes was the worst option for Fund Three members, second worst for Fund One members but third best for Fund Two members.

In summary, member choices do not perform as well as the default. A general, though not uniform, conclusion is that members who did make changes underperformed least when they mixed asset classes or readymade options. It must be emphasised that performance has been assessed over short periods relative to the likely average investment horizon. Given the average age of members in the sample is 38 years, an investment horizon of beyond 25 years needs to be considered which the

data does not permit. The results therefore do not comment on what may ultimately prove the better performing choice over a member's eventual total investment period.

Performance Variation

The previous discussion has focussed on average performance with some limited analysis of gender, decision year and investment choice type. This section examines what characteristics may help explain variation in member performance in a multivariate setting. The available data allows a number of member demographics and fund/investment characteristics to be empirically investigated for a relationship with performance.

The investment choice options available to members varied over the data period. Fund One and Fund Two options increased over the data period whereas Fund Three members had the same range of choices and Fund Four members could only select single readymades. As a consequence two estimates of equation 3 are provided with different regressors and sample periods. Both regressions are estimated using raw returns and the information ratio based on the default as the benchmark. The first regression includes all members with at least a six-month performance history, but uses a more limited set of variables reflecting that some investment characteristics variables are fixed by which fund a member belongs to and the year the decision was made.

Results of the first regression are presented in Table 7. Of member characteristics the length of membership before the member made their first choice is significantly negatively related to performance. If membership length can be interpreted as being related to information, or at least the opportunity to gather information or exposure to

information, this result is consistent with the findings of Guiso and Jappelli (2006). They suggest such a negative relationship between information and performance is consistent with a model of overconfidence. The proxy for information used here is indirect as it is assumed information gathering increases with membership length. This is quite different to Guiso and Jappelli (2006) who have direct measures of how much time investors devoted to gathering information regarding their investments.

<Insert Table 7>

Males perform significantly better in the choices they make. Lower raw returns for females may be a reflection of choosing more risk averse options, though lower information ratios cannot be similarly explained. This is somewhat at odds with previous findings on gender and investment performance (Barber and Odean, 1999) particularly given the suggested role of overconfidence in their paper and previously in other investment contexts (Guiso and Jappelli, 2006; Barber and Odean, 1999) and reported gender differences in feelings of competence in financial matters (Prince, 1993).

Member contributions levels were also positively related to performance, consistent with Barber and Odean (1999) to the extent that contributions are a proxy for income. In terms of the investment choice characteristics, the number of choices made and the length of the investment period were both significant having controlled for fund membership and decision-type, which were also generally significant. The negative relationship between number of choices and performance is consistent with the literature (Guiso and Jappelli, 2006, Barber and Odean, 1999) though Yamaguchi et al. (2006) find a positive trading relationship with trading and raw returns but a negative relationship with risk-adjusted returns. The negative sign for investment

period suggests the longer the member has their investment the lower their performance.

In the second regression, summarised in Table 8, two additional variables are included using a shorter sample period and only Fund One and Fund Two members who had the most complete range of choice types available. The sign of each of the previous member and investment characteristics are replicated with the additional variables and smaller sample. The dummy variables included for how a member constructed their investment strategy indicate that choice type is significant. This is an interesting finding in view of APRA's warnings to trustees about allowing "narrow or risky" choices by members. Compared with single readymade choices, single asset class choices were negatively related to performance but only significantly for risk adjusted performance. Only choices which involved multiple readymades were significantly better than selections which used only a single readymade option of the fund. The average number of options a member used in his or her choices was negatively related to performance but only significantly for risk adjusted performance. That is, the fewer options a member included in their choices the better their performance.

<Insert Table 8>

Discussion and Further Work

Investment choices, like all choices, have consequences. For workers, given the choice how to invest their compulsory superannuation contributions, the very real consequence of poor choices is less accumulated savings when they retire. This sample of investment choices from four large not-for-profit funds suggests on average member accumulations would be lower than had they stayed with their fund's default option or their previous choice. A major qualification to this finding is that the

performance period has been arbitrarily defined by the data sample period. Individual's choices may eventually outperform the fund's default over a longer timeframe. A longer time period will allow reflection on this issue.

For fund trustees who have been warned by APRA about allowing "narrow or risky" allocations by their members the results for the two funds with the least restrictive array of choice options provides some basis for this concern. Choice type does matter within a fund but results are not uniform across the funds in this sample. Members whose choices could be regarded as the narrowest, as they rely on single asset class options performed significantly worse than the readymade options available from their funds. However it needs to be made clear how such choices are to be judged as raw returns or information ratios provide differing assessments. Finally, the more choices members made and the more options they included the worse their performance. Choice may be good but too much or too narrow may have detrimental effects.

Table 1 Sample Characteristics

This table summarises the sample data with a breakdown for the full sample and the smaller sample utilised in the regression analysis.

		Age (years)	Gender (Male percent)	Employer Contributions (\$ 2004)	Membership Length at First Choice (months)	Investment Period (months)	Total Number Choices	Average Options
Full Sample								
Fund One	n	37181	37176	32061	37182	43792	43792	43792
	Mean	37.36	24	2720.26	19.62	22.43	1.09	2.49
	SD	11.74		4390.32	39.16	17.80	0.43	1.65
Fund Two	n	23021	23018	15891	22436	23030	23030	23030
	Mean	36.90	78	4616.08	24.71	29.80	1.17	1.87
	SD	11.89		6166.05	44.35	19.99	0.57	1.18
Fund Three	n	17448	17448	12574	17448	17608	17608	17608
	Mean	40.21	41	4291.54	69.30	33.25	1.11	1.45
	SD	10.14		4225.91	43.79	10.45	0.56	1.12
Fund Four	n	35705	35705	24446	35705	35705	35705	35705
	Mean	40.12	48	6840.01	33.93	27.47	1.22	1
	SD	11.07		8399.73	50.44	20.74	0.58	0
TOTAL	n	113355	113347	84067	112771	120135	120135	120135
	Mean	38.57	45	4405.95	32.85	26.93	1.15	1.77
	SD	11.43		6229.05	47.71	18.73	0.53	1.35
Regression Sample								
Fund One	n	27134	27134	27134	27134	27134	27134	27134
	Mean	36.37	23	2395.05	10.41	19.32	1.07	2.66
	SD	11.82		4020.96	29.03	8.69	0.36	1.68
Fund Two	n	13915	13915	13915	13915	13915	13915	13915
	Mean	36.67	79	4154.23	25.80	29.69	1.20	1.96
	SD	11.77		6120.71	44.91	18.52	0.58	1.22
Fund Three	n	12071	12701	12071	12071	12071	12071	12071
	Mean	39.84	39	4358.60	66.68	33.77	1.12	1.47
	SD	10.09		4245.48	43.43	9.42	0.58	1.15
Fund Four	n	20559	20559	20559	20559	20559	20559	20559
	Mean	39.92	50	7872.84	39.63	31.85	1.28	1
	SD	10.91		9971.84	51.63	21.70	0.65	0
TOTAL	n	73679	73679	73679	73679	73679	73679	73679
	Mean	37.98	44	4577.48	30.69	27.14	1.16	1.88
	SD	11.42		6967.95	46.20	16.60	0.54	1.42

Table 2 Performance by Fund and Gender

This table presents mean performance for each fund with a gender breakdown. A significant difference in gender means at a 95 percent confidence level is indicated by bold. Performance is measured from end of the first month decision is made to the last record date for choice data from each fund. Only records with at least six months return history included.

		Fund One			Fund Two			Fund Three			Fund Four			Total		
		Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	
Raw Return	n	27214	8700	38303	4679	15189	19878	9969	6872	17000	15803	14852	30655	57665	45613	105836
	mean	11.66	11.75	11.79	9.27	9.22	9.24	4.77	5.05	4.88	7.42	7.51	7.46	9.11	8.52	8.95
	SD	5.5	5.87	5.67	5.25	5.35	5.33	3.83	4.32	4.04	5.1	5.38	5.24	5.77	5.72	5.81
Excess (Def)	n	27214	8700	38303	4679	15189	19878	9969	6872	17000	15803	14851	30654	57665	45612	105835
	mean	-1.23	-0.99	-1.17	-2.29	-2.07	-2.13	-0.81	-0.81	-0.81	-1.59	-1.29	-1.45	-1.34	-1.42	-1.37
	SD	3.72	3.92	3.86	3.68	3.53	3.56	1.81	2.09	1.93	3.26	3.11	3.19	3.35	3.34	3.39
Excess (Prev)	n	27214	8700	38303	4679	15189	19878	9969	6872	17000	15803	14852	30655	57665	45613	105836
	mean	-1.17	-0.90	-1.1	-2.08	-1.82	-1.89	-0.82	-0.83	-0.82	-1.36	-1.02	-1.2	-1.24	-1.24	-1.23
	SD	3.73	3.9	3.87	3.71	3.59	3.62	1.83	2.13	1.96	3.37	3.24	3.32	3.39	3.39	3.44
IR (Def)	n	23580	7538	33506	4568	14839	19415	9969	6872	17000	15803	14851	30654	53920	44100	100575
	mean	-0.12	-0.08	-0.11	-0.27	-0.25	-0.26	-0.09	-0.07	-0.08	-0.11	-0.07	-0.09	-0.12	-0.14	-0.13
	SD	0.53	0.52	0.54	0.4	0.38	0.39	0.19	0.21	0.2	0.45	0.42	0.44	0.45	0.41	0.44
IR (Prev)	n	23580	7538	33506	4568	14839	19415	9969	6872	17000	15803	14852	30655	53920	44101	100576
	mean	-0.12	-0.07	-0.11	-0.25	-0.23	-0.24	-0.08	-0.07	-0.08	-0.08	-0.04	-0.06	-0.11	-0.12	-0.11
	SD	0.52	0.52	0.54	0.4	0.39	0.39	0.19	0.21	0.2	0.44	0.42	0.43	0.45	0.41	0.44

Table 3 Performance by Decision Year

Table present mean performance data broken down by decision year, which is the year the member first made an investment change. Performance is measured from end of the first month decision is made to the last record date for choice data from each fund. Only records with at least six months return history included.

		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004*	Overall
Raw Return	n	42	129	927	2110	8203	7082	20463	23479	33133	10268	105836
	mean	9.60	9.46	7.52	6.66	5.29	4.25	3.93	7.60	13.00	15.71	8.95
	SD	0.91	0.55	1.04	1.14	0.96	1.66	2.27	3.72	5.11	6.20	5.81
Excess (Def)	n	42	129	927	2110	8203	7082	20463	23478	33133	10268	105835
	mean	0.29	0.22	-0.34	-0.68	-1.03	-1.61	-1.19	-1.30	-1.83	-0.79	-1.37
	SD	0.84	0.51	0.66	0.77	0.70	1.48	1.72	2.49	4.53	5.36	3.39
Excess (Prev)	n	42	129	927	2110	8203	7082	20463	23479	33133	10268	105836
	mean	0.35	0.25	-0.25	-0.54	-0.95	-1.49	-1.17	-1.09	-1.62	-0.74	-1.23
	SD	0.86	0.51	0.69	0.90	0.96	1.59	1.78	2.64	4.54	5.38	3.44
IR (Def)	n				1321	7601	4977	19797	23478	33133	10268	100575
	mean				-0.09	-0.12	-0.17	-0.13	-0.12	-0.15	-0.08	-0.13
	SD				0.10	0.08	0.12	0.13	0.23	0.60	0.74	0.44
IR (Prev)	n				1321	7601	4977	19797	23479	33133	10268	100575
	mean				-0.05	-0.09	-0.15	-0.13	-0.10	-0.13	-0.07	-0.11
	SD				0.08	0.08	0.13	0.13	0.24	0.60	0.74	0.44

* part year observations for all funds

Table 4 Choice Type Breakdown

This table presents a breakdown of choice type during the sample period where each fund offered their full range of choices: Fund One July 2001-September 2004, Fund Two January 2002-June 2004, Fund Three April 2001- December 2004.

Fund	Choice Type	Gender			Total
		Female	Male	Missing	
Fund One	All Single Readymade	5550	1766	1615	8931
		22.7%	22.6%	24.4%	23.0%
	All Single Asset Class	1593	551	593	2737
		6.5%	7.0%	9.0%	7.0%
	All Readymade Mixes	9130	2754	2123	14007
		37.4%	35.2%	32.1%	36.1%
	All Asset Class Mixes	6586	2196	1398	10180
		27.0%	28.1%	21.1%	26.2%
	At Least One Multiple Readymades or Multiple Asset Classes - No Mix	262	135	9	406
		1.1%	1.7%	0.1%	1.0%
At Least One Mix Readymades and Asset Classes	126	77	8	211	
	0.5%	1.0%	0.1%	0.5%	
All Readymades and Asset Class Mixes	1160	344	869	2373	
	4.8%	4.4%	13.1%	6.1%	
Total	24407	7823	6615	38845	
		100%	100%	100%	100%
Fund Two	All Single Readymade	1385	4046	3	5434
		37.9%	32.4%	50.0%	33.7%
	All Single Asset Class	224	1924	1	2149
		6.1%	15.4%	16.7%	13.3%
	All Readymade Mixes	1277	3709	1	4987
		34.9%	29.7%	16.7%	30.9%
	All Asset Class Mixes	410	1533	1	1944
		11.2%	12.3%	16.7%	12.0%
	At Least One Multiple Readymades or Multiple Asset Classes - No Mix	30	145	0	175
		0.8%	1.2%	0.0%	1.1%
At Least One Mix Readymades and Asset Classes	57	168	0	225	
	1.6%	1.3%	0.0%	1.4%	
All Readymades and Asset Class Mixes	276	954	0	1230	
	7.5%	7.6%	0.0%	7.6%	
Total	3659	12479	6	16144	
		100.0%	100.0%	100.0%	100.0%
Fund Three	All Single Readymade	8520	5242	118	13880
		82.5%	73.6%	73.8%	78.8%
	All Single Asset Class	241	257	8	506
		2.3%	3.6%	5.0%	2.9%
	At Least One Multiple Asset Class Mix	1371	1447	29	2847
		13.3%	20.3%	18.1%	16.2%
All Asset Class Mixes	190	180	5	375	
	1.8%	2.5%	3.1%	2.1%	
Total	10322	7126	160	17608	
		100.0%	100.0%	100.0%	100.0%

Table 5 Performance by Choice Type and Fund (all records, six months history)

Table presents performance summary for choice types being: A) all choices one readymade, B) all choices one asset class, C) all choices consist of readymades at least one multiple D) all choices consist of asset classes at least some more than one, E) at least one choice has multiple readymades and/or multiple asset classes but not mixtures, F) at least one mixture of asset classes and readymades in a single choice, G) all choices mixtures of asset classes and readymades. Performance is from end of the first month decision is made to the last record date for choice data from each fund. Only records with at least six months return history included.

			A	B	C	D	E	F	G	Total
Fund One overall	Raw Return	n	10503	2331	13902	9203	655	251	1458	38303
		mean	11.11	8.80	12.79	11.74	7.80	10.06	14.43	11.79
		SD	6.83	6.77	5.01	4.18	4.73	5.66	5.22	5.66
	Excess (Def)	n	10503	2331	13902	9203	655	251	1458	38303
		mean	-0.82	-4.80	-0.13	-2.12	-2.70	-1.85	-0.94	-1.17
		SD	4.61	5.93	2.35	3.32	2.74	3.13	4.08	3.86
	Excess	n	10503	2331	13902	9203	655	251	1458	38303
		mean	-0.78	-4.68	-0.11	-2.06	-1.69	-1.28	-0.92	-1.10
		SD	4.62	6.03	2.34	3.32	3.19	2.99	4.08	3.87
	IR (Def)	n	7600	2283	12384	9203	392	186	1458	33506
		mean	-0.07	-0.41	0.02	-0.23	-0.26	-0.18	-0.18	-0.11
		SD	0.56	0.58	0.50	0.46	0.33	0.46	0.72	0.54
	IR (Prev)	n	7600	2283	12384	9203	392	186	1458	33506
		mean	-0.07	-0.40	0.02	-0.22	-0.13	-0.10	-0.18	-0.11
		SD	0.56	0.59	0.50	0.46	0.33	0.45	0.72	0.54
Fund One 7/01-12/04	Raw Return	n	7518	2282	12322	9203	387	186	1458	33356
		mean	13.06	8.88	13.70	11.74	9.87	11.88	14.43	12.66
		SD	7.01	6.81	4.54	4.18	4.74	5.30	5.22	5.49
	Excess (Def)	n	7518	2282	12322	9203	387	186	1458	33356
		mean	-0.60	-4.85	0.06	-2.12	-2.76	-1.63	-0.94	-1.11
		SD	5.26	5.97	2.38	3.32	3.07	3.38	4.08	4.07
	Excess	n	7518	2282	12322	9203	387	186	1458	33356
		mean	-0.58	-4.74	0.06	-2.06	-1.42	-0.93	-0.92	-1.06
		SD	5.28	6.06	2.38	3.32	3.67	3.15	4.08	4.07
	IR (Def)	n	7518	2282	12322	9203	387	186	1458	33356
		mean	-0.07	-0.41	0.02	-0.23	-0.26	-0.18	-0.18	-0.11
		SD	0.56	0.58	0.50	0.46	0.33	0.46	0.72	0.54
	IR (Prev)	n	7518	2282	12322	9203	387	186	1458	33356
		mean	-0.07	-0.40	0.02	-0.22	-0.12	-0.10	-0.18	-0.11
		SD	0.56	0.59	0.50	0.46	0.33	0.45	0.72	0.54
Fund Two	Raw Return	n	7831	742	7963	1651	297	369	1025	19878
		mean	7.55	13.41	8.70	15.07	8.54	9.17	14.12	9.24
		SD	4.68	9.55	3.94	5.27	4.36	4.71	4.84	5.33
	Excess (Def)	n	7831	742	7963	1651	297	369	1025	19878
		mean	-3.30	-1.16	-1.64	-0.07	-2.19	-1.67	-1.11	-2.12
		SD	3.83	7.89	1.83	3.91	2.49	2.55	3.70	3.56
	Excess	n	7831	742	7963	1651	297	369	1025	19878
		mean	-2.98	-0.78	-1.51	-0.01	-0.69	-0.52	-1.07	-1.88
		SD	3.99	7.99	1.81	3.89	3.10	2.63	3.68	3.62
	IR (Def)	n	7577	731	7798	1651	281	352	1025	19415
		mean	-0.28	-0.09	-0.34	0.00	-0.21	-0.18	-0.12	-0.26
		SD	0.34	0.62	0.34	0.40	0.23	0.30	0.52	0.38
	IR (Prev)	n	7577	731	7798	1651	281	352	1025	19415
		mean	-0.25	-0.06	-0.32	0.01	-0.07	-0.05	-0.11	-0.24
		SD	0.35	0.63	0.35	0.40	0.25	0.27	0.52	0.39
Fund Two 01/02-12/04	Raw Return	n	5445	692	5354	1651	180	227	1025	5445
		mean	8.71	13.99	10.23	15.07	10.92	11.59	14.12	8.71
		SD	5.15	9.62	3.94	5.27	3.93	4.43	4.84	5.15
	Excess (Def)	n	5445	692	5354	1651	180	227	1025	5445
		mean	-4.04	-1.17	-1.94	-0.07	-2.51	-1.88	-1.11	-4.04
		SD	4.36	8.16	2.11	3.91	2.98	3.11	3.70	4.36
	Excess	n	5445	692	5354	1651	180	227	1025	5445
		mean	-3.62	-0.80	-1.81	-0.01	-0.30	-0.32	-1.07	-3.62
		SD	4.60	8.25	2.09	3.89	3.69	3.15	3.68	4.60
	IR (Def)	n	5445	692	5354	1651	180	227	1025	5445
		mean	-0.32	-0.09	-0.40	0.00	-0.23	-0.20	-0.12	-0.32
		SD	0.39	0.64	0.39	0.40	0.26	0.37	0.52	0.39
	IR (Prev)	n	5445	692	5354	1651	180	227	1025	5445
		mean	-0.27	-0.06	-0.38	0.01	-0.02	-0.03	-0.11	-0.27
		SD	0.40	0.65	0.40	0.40	0.28	0.32	0.52	0.40

Fund Three 4/01-9/04	Raw Return	n	13392	490	2748	370	17000
		mean	4.69	4.22	6.02	4.26	4.88
		SD	3.27	9.01	5.52	3.89	4.04
	Excess (Def)	n	13392	490	2748	370	17000
		mean	-0.86	-2.16	-0.26	-1.31	-0.81
		SD	1.11	6.22	2.96	2.46	1.93
	Excess	n	13392	490	2748	370	17000
		mean	-0.85	-2.25	-0.36	-1.52	-0.82
		SD	1.14	6.17	2.97	2.96	1.96
	IR (Def)	n	13392	490	2748	370	17000
		mean	-0.10	-0.06	0.04	-0.11	-0.08
		SD	0.16	0.29	0.27	0.20	0.20
	IR (Prev)	n	13392	490	2748	370	17000
		mean	-0.10	-0.07	0.03	-0.11	-0.08
		SD	0.16	0.28	0.27	0.20	0.20
Fund Four 7/98-6/04	Raw Return	n	30655				30655
		mean	7.46				7.46
		SD	5.24				5.24
	Excess (Def)	n	30654				30654
		mean	-1.45				-1.45
		SD	3.19				3.19
	Excess	n	30655				30655
		mean	-1.20				-1.20
		SD	3.32				3.32
	IR (Def)	n	30654				30654
		mean	-0.09				-0.09
		SD	0.44				0.44
	IR (Prev)	n	30655				30655
		mean	-0.06				-0.06
		SD	0.43				0.43

Table 6 Performance by Choice Type (all records, minimum 6 month returns)

Table presents performance rank from best (1) to worst (7) for choice types being: A) all choices one readymade, B) all choices one asset class, C) all choices consist of readymades at least one multiple D) all choices consist of asset classes at least some more than one, E) at least one choice has multiple readymades and/or multiple asset classes but not mixtures, F) at least one mixture of asset classes and readymades in a single choice, G) all choices mixtures of asset classes and readymades. Performance is from end of the first month decision is made to the last record date for choice data from each fund. Only records with at least six months return history included. Fund Four is not included as during the period of analysis members were only able to select single readymade options. Minimum six 6 month performance history.

		Choice Type						
		A	B	C	D	E	F	G
Fund One	Raw Return	4	6	2	3	7	5	1
Overall	Excess (Def)	2	7	1	5	6	4	3
	Excess (Prev)	2	7	1	6	5	4	3
	IR (Def)	2	7	1	5	6	3	4
	IR (Prev)	2	7	1	6	4	3	5
	Raw Return	3	7	2	5	6	4	1
Fund One 7/01-12/04	Excess (Def)	2	7	1	5	6	4	3
	Excess (Prev)	2	7	1	6	5	4	3
	IR (Def)	2	7	1	5	6	4	3
	IR (Prev)	2	7	1	5	6	4	3
	Raw Return	7	3	5	1	6	4	2
Fund Two Overall	Excess (Def)	7	3	4	1	6	5	2
	Excess (Prev)	7	4	6	1	3	2	5
	IR (Def)	6	2	7	1	5	4	3
	IR (Prev)	6	3	7	1	4	2	5
	Raw Return	7	3	6	1	5	4	2
Fund Two 01/02-12/04	Excess (Def)	7	3	6	1	5	4	2
	Excess (Prev)	7	4	6	1	2	3	5
	IR (Def)	6	2	7	1	5	4	3
	IR (Prev)	6	4	7	1	2	3	5
	Raw Return	2	4		1	3		
Fund Three Overall	Excess (Def)	2	4		1	3		
	Excess (Prev)	2	4		1	3		
	IR (Def)	3	2		1	4		
	IR (Prev)	3	2		1	4		

Table 7 Performance Regressions – Full Sample

This table presents the regression results for all member records for all funds with a minimum six month performance history.

	Performance Measure		Information	
	Raw Returns	Std Error	Ratio	Std Error
Member characteristics				
Membership	-0.0036**	0.0014	-0.0006***	0.0002
Age	-0.0139	0.0095	-0.0012	0.0010
Gender	0.2592*	0.1321	0.0346**	0.0158
Contributions (Ln)	0.1590**	0.0713	0.0232***	0.0073
Fund (base Fund Four)				
Fund One	2.2019***	0.2858	0.0319*	0.0167
Fund Two	1.0489**	0.4390	-0.1213***	0.0297
Fund Three	0.0817	0.4394	0.1246**	0.0458
Investment Characteristics				
Investment length (months)	-0.1082***	0.0109	-0.0134***	0.0050
Total Choices	-0.1734**	0.0841	-0.0307***	0.0129
Decision year (base 2004)				
1998	-1.2506*	0.7307	0.8302***	0.3095
1999	-3.4174***	0.6420	0.6646***	0.2599
2000	-6.3305***	0.5806	0.4977**	0.2097
2001	-7.3245***	0.4838	0.2717*	0.1489
2002	-4.6282***	0.3045	0.1891*	0.0934
2003	-1.3310***	0.2207	0.0269	0.0576
Intercept	14.4839***	0.3432	-0.0455	0.0629
n	77776		73679	
Adjusted R ²	0.5537		0.0405	

***99% **95% *90% significance levels

Table 8 Performance Regressions – Restricted Sample

This table presents the regression results for all members of Fund One and Fund Two only with a minimum six month performance history.

	Raw	Performance Measure		
	Returns	Std Error	Information Ratio	Std Error
Member characteristics				
Membership	-0.0069**	0.0028	-0.0005*	0.0003
Age	-0.0039	0.0128	0.0000	0.0012
Gender	0.3127**	0.1322	0.0349**	0.0143
Contributions (Ln)	0.1822***	0.0573	0.0292***	0.0076
Fund One (base Fund Two)	1.4905***	0.2709	0.2203***	0.0245
Investment Characteristics				
Investment length (months)	-0.2707**	0.1090	-0.0121***	0.0031
Total Choices	-0.0270	0.0804	-0.0216**	0.0101
Average Number Options	-0.0915	0.0840	-0.0357***	0.0109
Choice type (All readymade base)				
Single asset class	-2.5118	1.6309	-0.1974*	0.1120
Multiple readymades	1.5813***	0.3941	0.1239***	0.0349
Multiple asset classes	0.0772	1.3126	0.0233	0.0942
Separate readymades/asset class mix	-0.4686	0.9410	-0.0184	0.0663
Mix of readymades & asset classes	0.8945	1.1440	0.0977	0.0819
All mix readymades & asset classes	0.9866	1.1021	0.0967	0.0998
Decision year (base 2004)				
2001	-2.0215	3.3430	0.2124**	0.0866
2002	-1.2816	2.2284	0.1765***	0.0560
2003	-0.1238	0.8543	-0.0106	0.0392
Intercept	15.7078***	1.0247	-0.2794***	0.0494
n	36661		36661	
Adjusted R ²	0.2980		0.0600	

***99% **95% *90% significance levels

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