Master thesis: Risk appetite within the default option of superannuation funds in Australia

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Chapter 1: Introduction

The aim of this thesis is to investigate whether the risk appetite of Australian superannuation funds is influenced by the average age of the fund members. Campbell and Viceira (2002) find that younger households should invest more in risky assets, and later on in life should hold a more conservative investment portfolio. We see that superannuation funds do indeed follow this theory by adjusting their default option for the average age of their members. This relationship is also founded in the Netherlands by Bikker, Broeders, Hollanders and Ponds (2011), in Finland by Alestalo and Puttonen (2006) and in Switzerland by Gerber and Weber (2007). To see if this relationship exists there is looked at the asset allocation in the default option of superannuation funds in the year 2011. The default option of superannuation funds is a good representative since in this investment option superannuation funds can determine the asset allocation for the majority of their members. There is found to be a negative relationship between the average age of the members within superannuation funds and the proportion of equity in the default option. This supports the hypothesis that superannuation funds look at the characteristics of their members when determining the asset allocation of the default option. There is found that superannuation funds allocate 1,5% less equity to the default option if the average age of their members increases with one year. There is also found to be a strong relationship between the assets per member within a superannuation fund and the asset allocation. Next to this there is found to be a relationship between the benefit structure of superannuation funds and the asset allocation in the default option.

In chapter 2 the theoretical relationship between superannuation fund characteristics and risk appetite are being examined and the Australian system for retirement saving is described. In chapter 3 there is established a methodological framework on what can be expected from our results. In chapter 4 the dataset used in this thesis is described. In chapter 5 the empirical results are being discussed, together with a robustness check of the model. In the final chapter there can be found a summary and a conclusion.

Chapter 2: Literature

In this chapter there is established a theoretical framework for this thesis. Literature on possible factors of influence on the asset allocation in the default option is being examined. Where both the characteristics of superannuation funds and characteristics of their members are being discussed. Starting with previous research on the risk appetite of pension funds followed by a review of age, fund size, gender, investment options – default strategy and ending with a review of the Australian pension system.

Chapter 2.1: Previous research risk appetite of pension funds.

In previous literature about the relation between characteristics of pension funds and their allocation to equity there is already found evidence that there is a significant relationship. Bikker et al. (2011) examine for Dutch pension funds if the amount of strategic asset allocation with respect to equity significantly rises, when the average age of the participants lowers. Next to age they include a number of control variables to make the test more robust: fund size, funding ratio, benefit structure and fund type. They run a number of tests to make a distinction between active members and pensioners and find that the average age of active members has an influence on the equity allocation. They make this distinction because they argue that pensioners do not hold any human capital any more. When taking the average age of all members, this influence becomes insignificant, unless personal member wealth is added. They find that an increase of the average age of active fund members with one year, decreases the allocation to equity with 0,5%.

Alestalo and Puttonen (2006) investigate the influence of the liability structure on the asset allocation in Finland, they use age as a proxy for the liability structure. The variables they use for their regressions are: fixed income investments, equity investments, average age, the solvency margin and a dummy for the solvency margin. They check if age has an influence on the amount invested in equity and separately check if age has an influence on the amount invested in fixed interest. And find that age significantly influences the asset allocation. For an average age increase of one year, the proportion of

fixed income increases with 2,3% and the proportion of equity decreases with 1,7%. Gerber and Weber (2007) look at the asset allocation and costs of Swiss pension funds. They try to explain which factors influence the asset allocation of pension funds and find evidence that age influences the equity exposure, the amount of real estate and the proportion of bonds as expected according to economic theory. They include the following variables: fund size, the type of fund, the reserves, exit benefits ratio, the disability and survivors ratio. Lucas and Zeldes (2009) look if they can find fund characteristics that will explain the asset allocation of pension funds in the United States. They do not include the average age of the fund members in their research. But they do not find a statistically significant relationship between the proportion of active members and the amount of equity, while this would be expected according to theory, this will be explained in the next section.

Chapter 2.2: Age

The research question of this is thesis is whether the default option of Australian superannuation funds appropriately reflect their members risk appetite as is set by economic theory. More specifically if the risk appetite of superannuation funds is influenced by the average age of the fund members, as founded in the Netherlands by Bikker et al. (2011), in Finland by Alestalo and Puttonen (2006) and in Switzerland by Gerber and Weber (2007). To do this the equity allocation of the default strategy is being examined. Here we can see if the superannuation funds determine their default strategy by looking at their member's characteristics. The influence of age on the optimal risk vs. risk-free portfolio is a phenomenon that is described extensively in economic theory and will be discussed in the next sections.

Chapter 2.2.1: Human Capital

Bodie, Merton and Samuelson (1992) argue that a person can, during their working life, decide on the time spend on labour and leisure. Next to this a person can invest in financial assets, the success of these investment determine the amount that will be spend on labour in the future. Because a

person can alter the quantity of labour, it is possible for that person to invest more risky. The younger a person is, the more possible labour that person has ahead of him, the riskier that person can invest. Ibbotson, Milevsky, Chen, Zhu (2007) argue that the amount of money a person can earn later on in life is for a big part determined during the earliest stage in life. In this stage a person can build on their skills and education. They find evidence that there is a high correlation between the amount of education and the earning power, also called human capital, people possess.

Chapter 2.2.2: Capital Asset Pricing Model

According to Markowitz's (1952) portfolio theory an optimal risky portfolio is a portfolio for which there are not any more efficient mean-variance portfolios. So for a given return, there are not any portfolios with the same return but less risk. The separation theorem by Tobin (1958), says that one can divide the problem of finding an optimal portfolio by choosing a risky portfolio and lend or borrow against the risk-free rate. These two theories were combined by Sharpe (1964) and turned into the Capital Asset Pricing Model, which states that one has an optimal risky market portfolio. This optimal portfolio should be adjusted to risk preferences by adding more or less of the risk-free portfolio to the total portfolio.

Chapter 2.2.3: Equity as risk preference

In this thesis, we can see the risky portolio as the amount of equity superannuation funds invest in. Leibowitz and Kogelman (1991) also use equity as the sole risky asset. The more equity a superannuation funds holds, the more risk it is taking. The problem of this method is, that it is a static method. According to this theory a person with a certain risk aversion should remain the same distribution between the risky and the risk-free portfolio during ones lifetime. This method only looks at the trade-off between risk and return, it does not account for any other risk.

Chapter 2.2.4: The lifecycle model

Campbell and Viceira (2002) argue that investing for the long term is quite different then for a relatively short term, since riskless assets may become risky and risky assets may loose some of their risk. A good example of this is cash, cash is the most riskless asset available, however on the long-term it is subject to inflation risk. But inflation linked bonds can be very valuable on the long term for example. The lifecycle theory says that a person should decrease the amount of equity during ones lifetime. So start of with a high allocation to equity at an earlier stage in life and decrease this amount as you grow older.

Cocco, Gomes and Maenhout (2005) also argue that the amount of equity that is held by a person should decrease when a person grows older. They test this with a method were there is a risky and a risk-free asset available. They find that the amount of equity should indeed decrease while ageing. This because the possible amount of labour a person has also decreases with age. The exact amount of equity a person should hold is difficult to determine according to them. And the established literature is not very precise. A popular and easy rule is the 100-minus-age rule. It says that you should subtract your age from 100, and the number you have left, is the percentage you should invest in equity. This is off course more a guideline than an exact advice, but gives some global idea on the amount of equity that should be held. Hanna and Peng (1997) even find that the amount of equity a person should hold in their portfolio should be 100% when the investment horizon is 20 years or longer. They have based these findings on the equity behaviour between 1926 and 1995.

Leibowitz and Kogelman (1991) also find that when the investment horizon increases the amount of equity should increase as well. Based on research between 1926 and 1987. They find that a person should invest 100% in equity if they have an investment horizon of more then six years. When a person is younger his investment horizon for retirement savings is longer, so that person should allocate according to the two previous mentioned articles invest

100% in equity. At least until 20 years before he is plans to stop working. There is criticism on the data used. In most researches only U.S. data are used.

Jorion and Goetzmann (1999) argue that these figures are subject to survivorship bias. They also find that the average return in the U.S. is much higher than that the average of all other countries. Next to this Campbell (2001) finds evidence that stock returns will be lower in the 21st century then they were in the 20th century.

Takats (2010) finds evidence that asset prices will face headwinds for at least the next 40 years, this because of an aging population in most big economies. Leading to the conclusion that the previous researches might be off with their advice on the amount of equity a person should hold in the future. Bradford DeLong and Magin (2009) argue that using data from the 20th century is the best way to predict future returns. So there are contradictions in the existing literature on average future returns over the long run. It might be wise for households to take a more conservative approach than recommended by Leibowitz and Kogelman (1991), Hanna and Peng (1997) and not invest 100% in equity at the start of ones working life.

Ibbotson et al. (2007) come to the conclusion that when the amount of human capital (previously called labour) a person holds decreases, the amount of equity they hold should decrease as well. They explain this in the following way. A person has two sorts of capital: Human capital and financial capital. A person should, during their life, hold an adequate amount of risk. Usually at the beginning of a person's life, that person has a lot of human capital, but only a little financial capital. As they grow older, the financial capital increases and the human capital decreases. Because human capital is low risk, compared to equity, the risk that comes with the decrease of human capital should be compensated, by holding less equity. This decreases the risk of the financial capital a person holds. Next to this they mention two other types of risk: Mortality risk and longevity risk. Mortality risk is the risk that a person dies. This risk can be countered by purchasing life insurance. Longevity risk is

the risk that a person outlives his wealth. It is impossible to exactly determine on forehand how old you will grow, so it is hard to estimate the amount of capital that is needed to provide yourself with income during retirement until death. This risk can be countered by purchasing annuity products; these annuity products will then provide a yearly income until death.

Chapter 2.2.5: Review of The lifecycle model

In this chapter the lifecycle model is reviewed. In literature there can be found a lot of reviews that plead for bigger allocations towards equity during later stages in life, opposite to what the lifecycle model proposes. They argue that returns will be bigger when adding more equity to the overall portfolio. This is countered with the argument that the possible losses do not way up to this possible upside in terms of final utility.

Vora and McGinnis (2000) examine the amount of consumption under different portfolios. They find that consumption would be higher for an investor who has allocated a higher proportion of his wealth to stocks, instead of moving away from stocks as one ages. Shiller (2005) questions the lifecycle model by examining the results of lifecycle models. Shiller finds that lifecycle models loose money in 32% of the cases and even 71% of the cases if they are adjusted for more realistic returns. Schleef and Eisinger (2007) simulate a person's possible financial situation using a Monte Carlo simulation, to see with the use of which method the chances are biggest that a person would actually reach his financial target for retirement. They find that the chances of reaching this target is a lot bigger with fixed asset allocations, where the amount of equity stays high even when coming closer to retirement. Basu and Drew (2009) also find that there should be a higher allocation to equity near retirement. The fact that the size of the overall portfolio is significantly more near retirement than at the beginning of ones working life is of big importance.

Teuling and de Vries (2006) plead for generational accounts within pension funds. This is somehow comparable to personal savings, since other

generations cannot compensate for your losses or visa versa. They also find that the equity allocation should decrease with age, consistent with the lifecycle theory. Bovenberg, Koijen, Nijman and Teulings (2007) examine the optimal saving and investment decisions over a person's life cycle. They find that it would be optimal for a person to borrow at the beginning of their working life against their human capital to have a big risk exposure. Since this is impossible, an individual should have an equity exposure of 100% at the beginning of his working life. Later on in life this equity exposure should be gradually reduced when coming closer to retirement.

Another view on the amount of equity a person should hold in its portfolio during its life, is that a person should hold a steady amount of equity in its portfolio after retirement, since that person does not have any human capital any more. Benzoni, Collin-Dufresne and Goldstein even find that the amount of equity a person holds in his life, is humped shaped. The amount of equity diminishes after people reach the age of 60. They also state that some people shouldn't have any equity exposure at all, since their jobs already are dependent on the state of the economy (equivalent to returns on equity), which removes the argument for human capital.

Pfau (2010) examines what kind of method seems to be the best model, to optimize people's utility with respect to the accumulation of their retirement provision. He compares the lifecycle model with fixed allocation strategies and comes to the conclusion that the lifecycle model seems to be better suited for most people. Even though fixed allocation strategies might have a higher expected yield. For people with a reasonable amount of risk aversion this does not compensate for the possible downside of having a lot of equity near retirement.

As can be concluded from literature, a higher expected return will be established when having a higher allocation to equity later on in life. Utility does not only depend on higher expected return but also on the amount of certainty. As certainty increases when allocating a higher fraction of wealth to bonds, fixed interest, etc. I assume that the lifecycle model is a better model

for investment decisions than fixed allocations throughout a person's life, since the final utility of people seems to be higher when using this model.

Chapter 2.3: Fund size

In literature there is found evidence that fund size matters with respect to risk taking (e.g. Indro, Jiang, Hu, Lee (1999)). A bigger fund can for example invest more in information acquiring and talented fund managers than smaller funds, because they can spread the costs over more members/ assets. Leading to the fact that larger funds can invest in riskier assets than smaller funds. I will only look how investments will differ between different fund sizes; the cost side will not be highlighted in this thesis. This has the following reason, the risk appetite of the superannuation funds is being examined, so not the performance of the funds per se. The fund performance can go up and down by lowering costs do to economies of scale. This does not say anything about the riskiness of the investment; equity vs. bonds. The growth of a fund can lead to a bigger equity exposure since the fund has now more bargaining power, economies of scale with regard to information gathering, etc. with respect to equity investments.

De Dreu and Bikker (2009) find evidence that the equity exposure within Dutch pension funds gets bigger as the fund size increases. They have divided the pension funds in three different size classes: small, medium and large funds based on total investments, with respectively between 0 – €100 Million, €100 Million – €1000 Million and above €1000 Million of total investments. They find that the equity exposure of small funds is 28%, medium funds 35% and large funds 39%. The investments in bonds are respectively 63%, 58% and 47%. The remaining percentages are invested in alternative investments. Given these significant differences in investment in equity instead of bonds, the factor fund size is included in the regression. The size of the total assets under management is taken as a representative of fund size. The amount of assets under management is taken instead of the number of members, since the amount of assets under management gives a

better representative, in my opinion, of how well the costs of better risk management can be divided under the members. Bikker et al. (2011) also consider the number of assets as a size measure and decide not to use this based on a research by Bikker, Broeders and De Dreu (2010). In this research Bikker, Broeders and De Dreu find that pension funds do not rebalance their portfolios on a continuous basis. So a pension fund with a big equity allocation would with high returns on equity, get bigger and also the equity exposure would enlarge. However when they use the number of assets as a size measure for a robustness check, the coefficient does not differ very much and stays significant. The log of the fund size is taken to account for heteroscedasticity.

Chapter 2.4: Gender

One of the factors accounted for in this thesis is gender. According to theory men and women have different preferences when it comes to investing, women are less interested in managing their assets and in making financial decisions as found by Martenson (2008). Women in Australia tend to have a low level on knowledge when it comes to the superannuation system as founded by Worthington (2008) Next to this women have more longevity risk than men, because they grow older. To see if gender has any influence on the amount invested in equity, there is accounted for the percentage of men of a particular superannuation fund in the regression.

Jianakoplos and Bernasek (1998) examine if women are more risk averse when it comes to financial decisions than men. They find that in questionnaires women state to be more risk averse than men, and check if this is reflected by their financial decisions. To do this, they look if the percentage of wealth invested in the risky asset equity increases if wealth increases. When looking at a portfolio of two possible assets; equity as a risky asset and bonds as the risk-free asset, it is found that women hold approximately as much stocks as they hold bonds. While men have approximately twice as much stocks in their portfolio as bonds. They give this

dissimilarity in the risk aversion between men and women as a possible reason why men on average are wealthier than women.

In an article by Jefferson and Preston (2005) they find that women have much more difficulty with accumulating an adequate old-age pension than man in Australia. This has a number of different reasons. Women on average spend about 35% less time in paid employment than men and next to this women have, on average, lower paid jobs than man. Resulting in less accumulation of pension, which results in difficulty in accumulating an adequate old-age provision. For a part of the women this is however not a problem, since they are married and their husband provides for a part of the income, both during the working and after the working years. With an increase in divorces, this adds another risk factor for women to the equation. This is also found for the UK by Ginn (2003), who concludes that it is much more difficult for women to acquire a sufficient old-age pension. This is more evident since there are more divorces, while the pension system is designed on families.

Bajtelsmit, Bernasek and Jianakoplos (1999) test if women are more risk averse when it comes to the allocation of wealth to defined contribution pension funds in the United States than men. To do this they look at the distribution of wealth to the pension funds of men and women of a particular age. They find that women are more risk averse with respect to the allocation of wealth to defined contribution funds than men. Meaning that women will invest a smaller part of their contributions into their pension plan. This research is conducted in the United States, where contributions to ones old age provisions are voluntary. This is a big difference with Australia, where every employer is obligated to make contributions to the employee's old age provision. This article does show that women are more risk averse with regard to pension plans than men.

Croson and Gneezy (2009) find that women are more risk averse than men when it comes to investment decisions. One of the reasons behind this is that women have a stronger feeling with emotions than men; this means that women experience taking risks more strongly. Women are less confident

than men regarding their own investment decisions, resulting in taking less risky decisions. Also women tend to see risks more as threats while men see risks more as challenges, again resulting in less risky investment decisions.

Women are more risk averse than men regarding investment decisions, since the superannuation funds should reflect the risk preferences of their members the amount invested in equity should get bigger, if the percentage of men in the sample increase. This effect should be strengthened because women on average earn less than men, and the less wealthy a person is the more risk averse that person is, as found by Guiso and Paiella (2008). Expectations are that the amount of equity in the default option of a superannuation fund will increase as the percentage of men in that superannuation funds increases.

Chapter 2.5: Investment options – default strategy

Superannuation funds can offer a number of different investment options to their members. Here a member can give their risk preferences with respect to their retirement savings. So does a person want an aggressive investment strategy or a more conservative one? Next to having investment options, there is also a default investment option. If a person does not choose a specific investment strategy that person will automatically enrol in the default strategy. The default option can also be chosen as investment strategy. According to Gallery, Gallery and Brown (2004) approximately 80% of all the superannuation funds registered by the APRA, offers their members some sort of choice regarding their investment strategy, but the majority of the fund members have their savings in the default option. They say that these choices are being given based on the economic theory that rational agents can by choosing their own investment strategy maximize utility for themselves, although it is questionable if people really optimize their own utility. In their research they focus on what choosing the default option has for implications. There is a big difference between the performances of the default options of the different superannuation funds. This indicates that the default options of different funds also have totally different asset allocations. Choi, laibson,

Madrian and Metrick (2002) and Mitchell and Utkus (2003) research the choices and consequences of 401(K) plan members and find that the majority of the people are in the default option of their pension plan. They argue that this is because of 'passive decision making', which means that people generally do not change anything or even make a choice if there is a default option available. For 401(K) members they saw the participation rate rise significantly when automatic enrolment was added. Next to this the number of person's in the default option rose significantly, with respect to the number of people in the 'default option' before, this is attributed to the fact that first people had to choose this option, since there was not an automatic option available. Since most of the members are in the default option, the default option offered by a pension plan is of big importance. Madrian and Shea (2001) also research the behaviour of 401(K) members with respect to their behaviour towards the default investment option. They think there are two possible explanations of why most of the people are in the default option; the first is again passive decision making. So people let others make decisions for them. Their second explanation, 'the power of suggestion' as they call it, is that most employees perceive the default option as an investment advice of the pension fund and therefore think this is the best choice they can make.

Since most of superannuation fund members are in the default choice of their fund, Gallery, Gallery and McDougal (2010) research some of the characteristics of these options between different superannuation funds. They look if the name that the default option is given still means something, find that this is not per se the case and that there is need for more regulation regarding default options. The asset allocation of the default option is examined as well. The options are categorized on name and they make three different categories: Balanced, growth and others. For the year 2007 the average allocation to equity in these three categories lies between the 55,3% for balanced default options and 60,6% for growth default options, with the average allocation of equity of the default options with another name in between. For a more complete overview see Appendix A.

Chapter 2.6: The Australian Pension System

Australia's pension system is one of the biggest in the world, at the end of the fiscal year of 2011 the total assets added up to A$1.3 Trillion, as reported in table 1. The Australian pension system is, as in most developed countries, based on a three-pillar system. The three pillars in Australia are: the old age pension, compulsory savings through the superannuation guarantee (SG) and voluntary savings. The old-age pension is a pension provided by the government, when meeting a certain number of requirements. A person has to have reached a certain age, lived in Australia for a number of years and also there are income requirements if and how much old-age pension a person receives. The second pillar consists of compulsory savings by the employer into a superannuation fund. The third pillar consists of voluntary savings by the employee into a superannuation fund.

In Australia superannuation is used when there is referred to savings for old age. The superannuation system as it is known today in Australia originated in 1992. From 1992 employers are obligated to make a contribution to the employers superannuation, nowadays this contribution is (at least) 9% of the employees salary (Cooper, 2010). The employer is required to make these contributions if employees are between the ages of 18 – 69 and earn more than A$450 a week, before taxes[1].

Within the second pillar there are two main types of regulated superannuation funds: Superannuation funds regulated by the Australian Prudential Regulation Authority (APRA) and Self Managed Super Funds (SMSF's) regulated by the Australian Taxation Office (ATO). The funds managed by the APRA consist of five different types of funds: Corporate, Industry, Public Sector, Retail and Small funds. Small APRA funds are defined as pension funds that have less than five members. SMSF's are also funds that have less than five members. The main difference between Small APRA funds and SMSF's is that Small APRA funds have an external trustee while with SMSF's

[1] http://www.ato.gov.au/content/00249857.htm

all the members are trustees and visa versa, next to this SMSF's and Small APRA funds have different regulators (Wilson, 2007).

The majority of the superannuation funds use an accumulation structure to determine the pay out for retirement, this is comparable to a defined contribution scheme, where on forehand you only determine your contribution and your pay out depends on the return you make investing this contributions. When we look at the number of funds using defined benefit or hybrid structures this seems to be only 0,03% of the funds (table 1: 1 – (446370/446524) = 0,03). However this number is somewhat misleading since all small funds automatically are accumulation funds. Of the 'large' superannuation funds, funds with more than 4 members, we again see that superannuation funds only with members with a defined benefit structure are a small part of the market.

Some general statistics about Superannuation funds in Australia at the end of the fiscal year 2010-2011:

Table 1

Distribution of entities - June 2011				
	Number of entities	Number of member accounts ('000)	Assets ($ billion)	Average account balance ('$000)
by fund type				
Corporate	143	593	58,4	98,5
Industry	61	11.449	250,7	21,9
Public sector	39	3.373	210,6	62,5
Retail	143	15.063	369,7	24,5
Small	446.138	846	409,6	484,2
Pooled superannuation trusts	77		86,8	
Balance of life office statutory funds			36,1	
Total [a]	**446.601**	**31.324**	**1.335,2**	
by regulatory classification				
APRA regulated				
Public offer super funds	183	21.784	619,2	28,4
Non public offer super funds	164	2.960	183,9	62,1
Approved deposit funds	95	7	0,2	20,8
Eligible rollover funds	16	4.750	5,3	1,1
Pooled superannuation trusts	77		86,8	
Small APRA funds	3.519	5	2,0	435,8
Total	4.054	29.506	810,6	
ATO regulated				
Self-managed super funds	442.528	841	407,6	484,5
Other				
Exempt schemes [b]	19	977	80,9	82,8
Balance of life office statutory fund			36,1	
Total [a]	**446.601**	**31.324**	**1.335,2**	
by benefit structure				
Accumulation [c]	446.370	16.458	745,6	45,3
Defined benefit	30	627	60,9	97,1
Hybrid	124	14.239	492,6	34,6
Total [d]	**446.524**	**31.324**	**1.299,1**	

Source: APRA, Statistics, Annual Superannuation Bulletin, June 2011 (issued 29 February 2010)

Chapter 3: Methodology

In this chapter the methodological framework used to analyse the risk appetite within the default option of superannuation funds is discussed. All possible factors of influence that were found in literature are being discussed with respect to the expectations for this thesis.

Chapter 3.1 Introduction

To limit the scope of this thesis, the main question will be:

- Does the average age of their members influence the asset allocation of the default option of superannuation funds?

To answer the main question of this thesis, we will look at a number of factors that might influence the asset allocation of the default option of superannuation funds. As in most superannuation funds members only save for themselves, there are a number of factors used in previous literature, which we do not have to include in this thesis. Gerber and Weber (2007) look at the reserves and disability and survivor's ratios, this does not apply to the Australian retirement system. This would also imply that the size of the fund would not matter, however it could be that a larger pension fund has more investment knowhow, and thus can invest in riskier assets. So this characteristic is included in the dataset. Also included are a number of characteristics, which have shown to be of influence in previous literature, mentioned in the literature review. Another characteristic added is gender. Since women live longer, they have a bigger longevity risk by Bajtelsmit (1999) and there is found evidence that women are more risk averse by Jianakoplos (1998).

The number of pension funds in Australia declined from 1245 in 2004 to 289 in 2011[2]. For a more detailed graph see Appendix B. This can be largely

[2] Source: APRA, statistics Superannuation Fund-level profiles and Financial Performance, June 2011 (issued 29 February 2012)

attributed to mergers between different funds to establish cost savings and economies of scale. Because of this high number of mergers it is very hard to see a pattern over time. The statistics of the different funds can change significantly by mergers; therefore it is not possible to establish a proper longitudinal study. Therefore a cross-sectional study is done for the year 2011.

In the following paragraphs all the variables used in the regression will be discussed.

Chapter 3.2: Age

The first variable that will be discussed is also the main focus of this thesis; age. In the previous chapter previous found results on the influence of age on risk preferences of pension funds have been discussed. In this thesis the average age of Australian superannuation funds will be used to see if there is a relation between age and the equity allocation of the default option of superannuation funds. The average age of all members of the superannuation funds is used. In previous literature there was sometimes made a distinction between the age of active members and inactive members. This is in the data made available by the APRA not possible in a statistical appropriate manner. Therefore the average age of all members is used. As can be seen in results found in previous research (e.g. Alestalo and Puttonen, Gerber and Weber, Bikker et al.) age has a negative influence on the proportion invested in equity. Therefore expectations are that age will also have a negative influence on the proportion invested in equity in the default option of Australian superannuation funds.

Chapter 3.3: Fund size

Fund size is supposed to be of influence when considering the amount of risk a fund is willing to take. A possible explanation here fore is that bigger funds can hire more talented managers than smaller funds, for a relatively cheaper price. Also bigger funds might benefit from economies of scale. De Dreu and Bikker (2009) examine this and find that smaller funds indeed have less exposure to risk, equity in this case, than bigger funds. Bikker et al. (2011)

also check if fund size has a significant effect on the equity allocation. They find a positive and significant effect. They argue that next to the reasons mentioned above, moral hazard might also be a cause for bigger funds to invest more risky. If pension funds get too big to fail, they might invest more risky, because the government will have to interact if they fail. Since the size of the fund may have an influence on the amount that is invested in equity, fund size is included in the equation. To account for fund size, the total net assets per fund at the end of the fiscal year 2011 are taken. Fund size is taken in assets and not in the number of members, since the assets determine the deviation of costs for hiring more capable investment managers for example. The log is taken to account for heteroskedasticity. Since in the paper by De Dreu and Bikker the size of the fund had a positive influence of the amount invested in equity, expectations are that fund size will have a positive influence on the amount of equity invested by Australian superannuation funds.

Chapter 3.4: Gender

Women are more risk averse than men regarding investment decisions and allocating wealth to pension plans as found by Croson and Gneezy (2009), Bajtelsmit, Bernasek and Jianakoplos (1999), Jianakoplos and Bernasek (1998) and Martenson (2008). To account for gender in this thesis the percentage of the fund that is male is added to the equation. Since superannuation funds should reflect the risk preferences of their members the amount invested in equity is expected to get bigger, if the percentage of males in a superannuation fund increases.

Chapter 3.5: Fund type

The data as provided by the APRA make a distinction between five different superannuation fund types: Corporate, industry, public sector, retail and retail

ERF. The APRA handles the following definitions with regard to the fund types[3]:

- Corporate funds: are superannuation funds that are sponsored by a single sponsoring company or multiple related companies. In the past these funds offered defined benefit funds, the last years there has been a shift to an accumulation structure. Most of the corporate funds used to be non-public funds; the last years there has been a shift to public funds.
- Industry funds: are superannuation funds that have members from a specific or from multiple) job categories, for example construction or medical care, etc. Just like corporate funds, industry funds used to be non-public but recently there has been a shift to public funds.
- Public sector funds: Are superannuation funds that have government or government owned agencies as their sponsoring company. The majority of these superannuation funds used to have a defined benefit structure, again there has been a recent shift to accumulation. The public sector funds are typically non-public.
- Retail funds: are superannuation funds that are open to everyone, for a commercial fee. ERF's are seen as part of the retail funds.
- Retail ERF's (Eligible roll-over funds): are superannuation funds to which other superannuation funds can transfer their 'lost' members or members who may no longer be part of that superannuation fund. ERF's in general accept small accounts that are not active any more. The mission statement of ERF's is to protect the gathered retirement savings.

There is found by Bikker et al. (2011) that the type of pension fund can have a significant influence on the equity allocation. The different fund type is a nominal variable; since regression analysis is only possible when having numerical variables there are created dummy variables. There are created four dummy variables. One dummy variable for every sector except for the Retail ERF's, so we can see the influence of all other fund types with respect

[3] Source: APRA, Statistics, Classification of superannuation entities, issued 4 May 2005

to the Retail ERF's. The reason why the Retail ERF's are chosen as the variable to which we compare all the other variables is because ERF's are accepting the accounts of inactive and 'lost' members of other superannuation funds. Because the requirements of ERF's are to protect the retirement savings of lost and inactive members, they will probably invest less risky than the other types of funds, the expectation is that the other variables will have a positive influence on the equity exposure compared to the ERF's.

Chapter 3.6: Benefit structure

There are a number of different schemes to accumulate savings for retirement. Defined benefit schemes are schemes were the benefits are set in advance. Defined contribution schemes are schemes were the benefits are depended on the amount a person puts into his retirement savings account and on the rate of return that is received on the assets, from here on defined contribution schemes will be called accumulation schemes.

Worldwide there can be seen that in the last decades there has been a shift from defined benefit schemes to defined contribution schemes. This is the same in Australia where only 5% of the schemes offers a defined benefit structure[4]. The advantage of a defined benefit structure is that the investment risk can be shared over multiple generations. According to Gollier (2007) pension funds with a defined benefit structure can, by efficiently manage the reserves, smooth equity fluctuations in time and by doing so can take more risk. Next to this within the defined benefit funds the risk can be shared over a large pool of members, making again that they can take more risk than an individual.

Therefore expectations are that superannuation funds only existing of accumulation members will invest more conservatively. Thus the

[4] Source: APRA, statistics Superannuation Fund-level profiles and Financial Performance, June 2011 (issued 29 February 2012)

accumulation dummy is expected to have a negative influence on the proportion of equity in the overall portfolio.

Chapter 3.7: Assets per member

The amount of assets per member is added as a variable to account for the fact that wealthier people have less risk aversion, than less wealthy people. If a person's wealth increases, as found by Guiso and Paiella (2008), that person will be less risk averse.

The amount of assets per members in A$, is not per se a direct measure of wealth, since people might have divided their money over multiple superannuation funds or not use superannuation funds as their main savings for retirement. However on average it is probably a good indication of the average wealth level of people. Since people who are wealthier are less risk averse and possibly have more knowledge on investing, what again translates in more wealth, it can be expected that the amount of assets per member has a positive influence on the proportion of equity in the default option of a superannuation fund. This should in theory be the case as superannuation funds should reflect their members risk preferences. Expectations are that as the average amount of assets per member within a superannuation fund gets higher, the proportion invested in equity in the default option by that superannuation fund will go up as well.

Chapter 3.8: Investment options – default strategy

Gallery, Gallery and Brown (2004) find that more than 80% of the superannuation funds had multiple investment options. For the year 2011 almost 90% of the superannuation funds offer multiple investment options[5]. As can be found in literature the majority of the people have the default investment option with their superannuation funds. Choi, laibson, Madrian and

[5] Source: APRA, Statistics Superannuation Fund-level profiles and Financial Performance, June 2011 (issued 29 February 2012)

Metrick (2002), Mitchell and Utkus (2003) and Madrian and Shea (2001) find that most of the people are in the default option for two reasons. They do not want to make a decision themselves and they think that the superannuation funds will make the default option the best investment option. In the dataset provided by the APRA on average 53,13% of the assets is in the default option in the year 2011[6]. Gallery, Gallery and McDougal (2010) find that for the year 2007 the average allocation to equity in default options lies between the 55,3% and 60,6%. While the average allocation to equity in 2007 for superannuation funds in the default option is lower than this with 50,7%, according to the data provided by the APRA[7]. A similar phenomenon is found by Byrne, Blake, Cairns and Dowd (2007), who examine the default investment options for UK pension funds. They find that the default option is typically more risky than an average one. A possible explanation why the proportion of equity is on average higher in the default option of superannuation funds than the total average might be that superannuation funds are judged on their performance. With a better performance they will have more clientele. Taking more risk leads to a higher expected return, so a better performance. In the section where the robustness of the model is checked, there is tested if excluding superannuation funds with a low proportion of the assets in the default strategy will generate different results, this is not the case.

Chapter 3.9: Fixed income

Alestalo and Puttonen (2006) also research if age has an influence on the proportion invested in fixed income, such as bonds. They find that the proportion invested in fixed income is negatively correlated with age. This is because fixed income can be seen as a quite riskless asset. According to the lifecycle theory the proportion of fixed income should, as founded by Alestalo and Puttonen, get higher as age increases. Bikker et al. (2011) use the

[6] Source: APRA, Statistics Superannuation Fund-level profiles and Financial Performance, June 2011 (issued 29 February 2012)
[7] Source: APRA, Statistics Superannuation Fund-level profiles and Financial Performance, June 2011 (issued 29 February 2012)

amount invested in fixed income as a robustness check and find similar results. It is to be expected that this also is applicable for Australian superannuation funds. My expectations are that age will have a positive influence on the amount of fixed income in default option of superannuation funds. With regard to the other independent variables there can be expected that they will have the opposite sign as proposed in the previous sections, since fixed income can be seen as an opposite asset of equity.

Chapter 3.10: Formula

To measure the risk appetite of the superannuation funds the proportion of the assets that is invested in equity is used, as used before by Bikker et al. (2011), Campbell (2002) and Alestalo and Putonen (2006). To test if there is a relation between different characteristics of superannuation funds and the risk appetite of the default option of these funds, the following characteristics are taken into account: A constant, Average age, Superannuation fund size where a log is taken for fund size to account for hederoscedasticity (assets under management), gender, fund type with dummy variables for: Retail, public, industry and public sector, Benefit structure with a dummy variable for Accumulation, assets per member.
The formula looks as follows:

Equity allocation = α + β Average age + χ Log fund size + δ Gender + φ Industry dummy + φ Retail dummy + φ Public Sector dummy + φ Corporate dummy + γ Accumulation dummy + η Log assets per member + ε

The following hypotheses are stated to answer the main questions of this thesis:
$H0^A$: There is no relation between the average age of members of superannuation fund members and the amount invested in equity in the default option.

$H1^{A}$: There is a negative relation between the average of superannuation fund members and the amount invested in equity in the default option.

Chapter 4: Dataset

Chapter 4.1: The Australian Prudential Regulation Authority

As mentioned before the APRA is the regulator in Australia for superannuation funds. The APRA requires superannuation funds to deliver statistics on a number of subjects, on a monthly, quarterly and annual basis. The information that has to be delivered to the APRA consists of information on asset allocation and a number of factors on the whole fund level. The information that has to be delivered to the APRA has not been changed since 2004[8]. In the Discussion paper reporting standards for superannuation they propose a number of changes with respect to the reporting of superannuation funds to make the information even more transparent. The APRA makes the information provided by the superannuation funds public, unless superannuation funds object against this than the APRA will keep a part of the information non-public.

Chapter 4.2: The average age per superannuation fund

The average age of the members of the superannuation fund members is critical to this thesis, however these data on are not to be found pre specified. In the data from the APRA only the number of pension members in certain age cohorts are available. The age cohorts provided by the APRA per superannuation fund are: <35, 35-49, 50-59, 60-65, 66+. Per superannuation fund the number of members within a certain age cohort is displayed, for males and for females. To approach the average age per fund as precisely as possible, the average age of the entire Australian population per cohort is calculated, while making a distinction between male and female, with the

[8] Source: APRA, Discussion Paper, Reporting standards for superannuation, 19 September 2012

assumption that these funds are on average a good representative of the entire population per age cohort. This is because the population distribution even within certain cohorts might not be linear, see Appendix C. For the first age cohort (<35), the average age when people start accumulating superannuation is taken. People that are working will by law start accumulating superannuation from the age of 18. Bearing in mind that not everyone starts working at the age of 18, because they are going to college for example, the average age that people start accumulating superannuation is estimated at 20. The average of 20 and 34 is 27, while the weighted average of the entire population has an average of 26,89 years for males and 26,96 for females. The weighted average age of the male population of the cohort 35-49 is 41,97 years and for females 41,98 years. The average of 35 and 49 not adjusting for population size is 42. For the cohort of 50-59, the weighted average of the entire population is 54,36 years for both males and females. The average of 50 and 59 is 54,5. As can be seen the differences between the weighted average of the entire population and the linear average of the fund cohorts is negligible.

The next cohorts did not exactly match however, the cohort of the entire population is 60-64 and the cohort of the superannuation funds is 60-65. However as we have seen in the previous cohorts, the weighted and regular average are quite similar. Here the weighted average would be 62 years and the fund average is 62,5 years.

The last cohort: 66+. The average life expectancy for males in Australia is 79 years and the life expectancy for females is 84 years[9]. Creating fund averages of 72,5 years for males and 75 years for females. The weighted age averages from the entire population are respectively 73,97 years for males and 75,36 years for females. With the average age of males and females over 85 estimated at 86 and 87. Changing this number does not create a significant difference. So down below a short overview of the differences:

[9] World Population Prospects, The 2006 Revision, United Nations, Economic and Social Affairs

Age cohort	<35 (years)	35-49 (years)	50-59 (years)	60-65 (years)	66+ (years)
Fund average male (unweighted)	27	42	54,5	62,5	72,5**
Fund average female (unweighted)	27	42	54,5	62,5	75**
Population weighted average male	26,89	41,97	54,36	62*	73,97
Population weighted average female	26,96	41,98	54,36	62*	75,36
					* Age cohort of 60-64
					** Adjusted for difference in life expectancy

For a more detailed calculation see Appendix D. As can be seen the averages have a high correlation. This also gives the suggestion that the APRA might have chosen the age cohorts in such a way that this would be the case.
To calculate the average age per superannuation fund as precise as possible the weighted averages of the entire population are takes as an average for each coherent age cohort and weighted by the number of members in that cohort. Except for the cohort 60-65, where the average of 62,5 is taken instead of the weighted average of 62, this because of the cohort mismatch. This is done for each superannuation fund while making a distinction between males and females. After this the total weighted average of males and females is taken per superannuation fund. The average age of all superannuation fund members combined is 43,59 years. An overview of the average age of all superannuation funds can be found in Appendix E.

Chapter 4.3: The Australian fiscal year

In Australia the fiscal year goes from the first of July till the 30th of June. As this is the case, the fund year ends at the 30th of June as well. The data examined are for the year 2011, meaning from 1st of July 2010 – 30th of June 2011.

Chapter 4.4: Data sample

In the year 2011 there were 289 superannuation funds in Australia. Of these 289 funds, 138 funds have no publicly available data. Leaving 151 superannuation funds as a dataset. Of these 151 funds, 1 fund has a fund year-end before the 30th of June and for this reason is also excluded from the

dataset. There are 150 funds available for testing the hypothesis. So the dataset consists of more than 50% of the entire 'population' of superannuation funds, which indicates that we have a representative sample. The composition of the sample is somewhat different from the entire population with regard to fund type. As can be seen below, the percentage of corporate pension funds in our sample is quite small in comparison to the entire population. Making the other fund types a little bit overrepresented in our sample. The conclusions should still be valid, since the sample is quite big in comparison to the population.

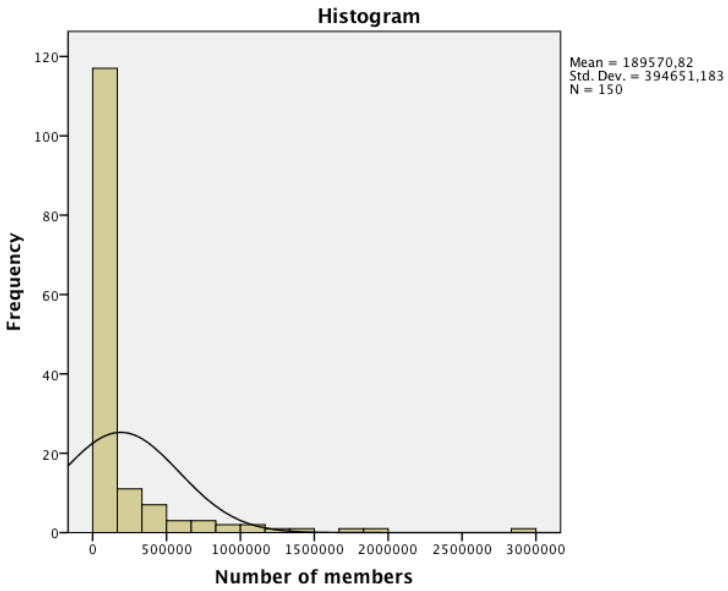
Fund type sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Corporate	19	12,7	12,7	12,7
	Industry	46	30,7	30,7	43,3
	Public Sector	17	11,3	11,3	54,7
	Retail	56	37,3	37,3	92,0
	Retail - ERF	12	8,0	8,0	100,0
	Total	150	100,0	100,0	

Fund type total population

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Corporate	94	32,5	32,5	32,5
	Industry	56	19,4	19,4	51,9
	Public Sector	20	6,9	6,9	58,8
	Retail	103	35,6	35,6	94,5
	Retail - ERF	16	5,5	5,5	100,0
	Total	289	100,0	100,0	

When looking at the dataset there can be seen a huge variation between the different funds. When looking at fund size with regard to the number of members, we see that the majority of the superannuation funds are relatively small; less than 200.000 members. But there are also much bigger funds with more than one million members.



Some general statistics about the dataset can be found in table 2.

Table 2	Min	Max	Average	Stdev
Number of members	1866	2858220	189570	394651
Percentage of male members	17%	95%	57%	15%
Average age all male members	29,8	67,9	43,8	7,1
Average age all female members	30,4	68,9	43,2	7,1
Average age all members	30,1	67,4	43,6	7,1
Total investment in equity	0%	100%	45%	22%

Source: Statistics Superannuation Fund-level Profiles and Financial Performance, June 2011 (Issued 29 February 2012)

There can be made no differentiation between second and third pillar because the same funds are used for this purpose. Meaning that there is not made a differentiation between the money saved by the employer and the employee. Since both are being saved for retirement purposes, there is assumed that this does not make any difference for our analysis and conclusions. We can say however that on average the contributions by the employer were more than triple the voluntary contributions in the year 2010 – 2011. Employers contributed around A$50 Billion to the superannuation funds, while voluntary contributions almost added up to A$15 Billion[10].

[10] Source: APRA, Statistics, Superannuation Fund-level Profiles and Financial Performance, June 2011, issued 29 February 2012

Chapter 5: Empirical research

Chapter 5.1: Introduction

In this chapter I will try to examine how the different above-mentioned variables influence the proportion of equity in superannuation funds. With the main focus to see if the variable age is a determinant for the amount of equity superannuation funds have in their default option. Next to this there will be a number of tests to see if the model is robust.
As explained earlier, a linear regression is used for cross sectional data. The outcomes of the model will be discussed below. First starting off with the model including all variables that are expected to have a significant influence according to theory and prior research. As mentioned before in the methodology chapter the equation used to examine the relationship between the different variables is:

Equity allocation = α + β Average age + χ Log fund size + δ Gender + φ Industry dummy + φ Retail dummy + φ Public Sector dummy + φ Corporate dummy + γ Accumulation dummy + η Log assets per member + ε

Chapter 5.2: Results basic model

The first linear multivariate regression analysis that is discussed is the main model mentioned previously above. Where all factors as found in literature are included. Below the results from the regression can be found in table 3. Lets first start with some remarks about the entire model, when looking at the ANOVA table; we can say that the model in general is significant at a 1% level. From the adjusted R^2 there can be said that the model explains 28,8% of the variance of the dependent variable.

The average age has a negative influence on the amount of equity set in the default option within Australian superannuation funds, this is as expected according to the lifecycle theory. The coefficient for age is -1,467, which

means that for every year that the average age of a superannuation funds gets higher, they will on average invest 1,47 % less in equity, for members within the default strategy.

The (logarithm of) fund size has a positive impact on the equity allocation in the default option as could be expected, but this positive coefficient is insignificant so fund size seems to have an insignificant influence on the proportion of equity within Australian superannuation funds, unlike earlier findings in other countries. Gender is insignificant as well, what surprising here to see is that the sign of gender is negative. So the amount of equity gets smaller as the proportion of men increases, this while women are more risk averse than men. A possible explanation for this could be that women suffer more from longevity risk and on average have lower retirement savings, so they might need to take more risk to provide a sufficient old age provision.

All the fund type dummy variables are insignificant. All four dummy variables have quite a big coefficient, ranging from 7,158 for the corporate dummy to 12,846 for the industry dummy, indicating that Retail ERF's indeed have a way more conservative investment strategy compared to all the other types of funds. This was to be expected since the requirements of an ERF are to conserve member benefits. However since all the coefficients are insignificant, we cannot say that there are fundamentally differences in equity allocation between the before mentioned fund types and ERF's.

The accumulation dummy accounts for superannuation funds that only have members with an accumulation structure. The coefficient is significant at a 5% level. The sign is positive as was to be expected since in accumulation structures, there is no risk sharing. The difference between the proportion of equity between superannuation funds that only have an accumulation structure and funds that do not is 8,6%. From this can be concluded that risk sharing gives a substantial opportunity for more risky investments.

The (logarithm of) amount of assets per member (A$), has a significant influence on the proportion invested in equity at a 5% level. Meaning that if

people are wealthier in terms of pension benefits, they are willing to take more risk. This is according to literature that states that when people get wealthier they will be less risk averse, as founded by Guiso and Paiella (2008).

To see if our regression suffers from multicollinearity the collinearity statistics are added to the regression. There is some disagreement in literature on where the threshold lies, when there is the possibility of multicollinearity. When looking at the VIF values, some think that the threshold to have multicollinearity lies at 10, but there is also a school arguing that between three and vife the chances that a regression suffers from multicollinearity is significant. When looking at the statistics all VIF-values are way below the threshold of 10. But there is a number of factors that is above the threshold of three. The dummy variables that are created to account for the fund type and the dummy variable that accounts for (logarithm of) assets per member that have VIF-values between 3,646 and 6,818. This might indicate that there is a high correlation between the assets per member and the fund type. If this is the case, the results might be biased.

To check if the possible multicollinearity of the fund type dummy variables has an influence on the other variables, they were excluded from the regression. After removing the fund type dummy variables, basically nothing changed. All signs stayed the same and also of the same magnitude, also all the coefficients kept the same significance. Indicating that there is a correlation between the fund type and the assets per member. And that fund type is an indicator for the assets per member. For the results see Appendix F. When running a separate linear regression to see how much of the variance of the assets per member is explained by the fund type dummy variables, the result is that 49,6% (adjusted R^2) of the variance is explained, for the results see Appendix G. Because of the fact that fund type is a categorical variable and assets per member is a categorical variable it is hard to create a correlation matrix. However we can see from the variance explained that they are highly correlated. From here on the fund type dummy variables will be excluded from the model.

Table 3

Descriptive Statistics

	Mean	Std. Deviation	N
Equity allocation %	45,112	22,3112	150
Average age	43,591	7,0691	150
Log Fund Size $	21,0333	1,88603	150
Gender	57,226	15,1632	150
Industry dummy	,3067	,46265	150
Retail dummy	,3733	,48531	150
Corporate dummy	,1267	,33371	150
Public Sector dummy	,1133	,31806	150
Accumulation dummy	,6467	,47961	150
Log Assets per Member	10,2737	1,53389	150

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24560,381	9	2728,931	7,701	,000[b]
	Residual	49610,417	140	354,360		
	Total	74170,798	149			

a. Dependent Variable: Equity allocation %

b. Predictors: (Constant), Log Assets per Member, Gender, Industry dummy, Public Sector dummy, Corporate dummy, Log Fund Size $, Accumulation dummy, Average age, Retail dummy

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,575[a]	,331	,288	18,8245

a. Predictors: (Constant), Log Assets per Member, Gender, Industry dummy, Public Sector dummy, Corporate dummy, Log Fund Size $, Accumulation dummy, Average age, Retail dummy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	61,525	24,568		2,504	,013	12,953	110,096		
	Average age	-1,467	,303	-,465	-4,837	,000	-2,067	-,867	,517	1,934
	Log Fund Size $	,370	1,078	,031	,343	,732	-1,762	2,502	,575	1,739
	Gender	-,118	,104	-,081	-1,144	,254	-,323	,086	,965	1,036
	Industry dummy	12,846	8,049	,266	1,596	,113	-3,067	28,759	,172	5,831
	Retail dummy	8,911	8,298	,194	1,074	,285	-7,494	25,316	,147	6,818
	Corporate dummy	7,158	10,008	,107	,715	,476	-12,628	26,944	,213	4,690
	Public Sector dummy	7,966	9,705	,114	,821	,413	-11,221	27,154	,250	4,007
	Accumulation dummy	-8,601	4,337	-,185	-1,983	,049	-17,175	-,026	,550	1,819
	Log Assets per Member	4,188	1,920	,288	2,181	,031	,392	7,983	,274	3,646

a. Dependent Variable: Equity allocation %

Chapter 5.4: Robustness check

To check for the robustness of the model, a number of variables are changed to see how sensitive the model is. There is examined if age has a positive relation with fixed interest and we see if fund size with the number of members as a proxy for size is used, similar results are generated. There is also checked if the outcomes will change if superannuation funds with a low proportion of assets in the default option are excluded. This is to account for the possibility that the characteristics of the entire superannuation fund do not properly reflect the members that are in the default option. There is not tested if there is a hump-shaped relationship between equity and age by adding age-squared. This is because the correlation between age and age squared is 99,5%, for results see Appendix H. When the equity allocation is plotted there seems to be no hump-shaped relationship between age and equity. The plot looks like the lifecycle model predicted. At it's highest when the average age is youngest and at its lowest when the average age is highest. For plot see appendix I.

Chapter 5.4.1: Fixed income

At first there is tested if the model will produce reversed results if we replace equity by cash. In table 4 below the correlations between fixed income, equity, fixed income + cash and age can be found. Previous literature gave a clear and significant positive correlation between the average age and fixed income. As can be seen in the matrix below, there is an insignificant correlation between age and fixed income. This is not as was expected and also not as found in previous literature (e.g. Alestalo and Puttonen). This might be explained by the fact that because of the recent crisis, fixed income is not regarded as riskless as it was before. To check if there is still a relationship between age and the riskless asset, cash is added to fixed income to see what the influence is of age on the riskless asset. As can be seen there is a significant positive relation between age and the amount of fixed interest + cash. Giving an indication that the model is still robust, if we account for the fact that bonds are not seen as riskless as they were before.

Table 4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,569[a]	,324	,300	24,67998

a. Predictors: (Constant), Log Assets per Member, Gender, Accumulation dummy, Log Fund Size Member, Average age

Correlations

		Average age	Equity allocation %	Fixed Interest + Cash Allocation	Fixed Interest allocation %
Average age	Pearson Correlation	1	-,336**	,340**	,108
	Sig. (2-tailed)		,000	,000	,190
	N	150	150	150	150
Equity allocation %	Pearson Correlation	-,336**	1	-,890**	-,195*
	Sig. (2-tailed)	,000		,000	,017
	N	150	150	150	150
Fixed Interest + Cash Allocation	Pearson Correlation	,340**	-,890**	1	,304**
	Sig. (2-tailed)	,000	,000		,000
	N	150	150	150	150
Fixed Interest allocation %	Pearson Correlation	,108	-,195*	,304**	1
	Sig. (2-tailed)	,190	,017	,000	
	N	150	150	150	150

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	44,493	29,226		1,522	,130	-13,275	102,260		
	Average age	2,085	,356	,500	5,853	,000	1,381	2,789	,645	1,551
	Log Fund Size Member	-2,346	1,294	-,139	-1,813	,072	-4,904	,212	,800	1,250
	Gender	,171	,135	,088	1,271	,206	-,095	,438	,976	1,025
	Accumulation dummy	7,534	4,749	,122	1,586	,115	-1,853	16,921	,788	1,269
	Log Assets per Member	-8,455	1,739	-,440	-4,862	,000	-11,892	-5,018	,575	1,741

a. Dependent Variable: Fixed Interest + Cash Allocation

Chapter 5.4.2: Test for a change of the size factor

Previously fund size was measured by the amount of assets per member (A$). Next there will be checked if the coefficients change if we change this to the number of members. Bikker et al. (2011) use fund size in number of members as a proxy for size and test if this is a robust variable by changing this variable for fund size into assets under management. They find that this produces similar results. Implying that both variables would be a good proxy for fund size. To see if fund size is a robust variable, the fund size is also taken in number of members. Again we take the log for the fund size to account for heteroscedasticity. We find that all coefficients stay the same in size and significance, pointing to the fact that fund size is a robust variable. For the results see Appendix J.

Chapter 5.4.3: Test for default option characteristics

To see if the outcomes change if only superannuation funds with a high percentage of assets in the default option are included, superannuation funds with a percentage of assets in the default strategy below certain thresholds are excluded. The thresholds are 10%, 50% and 80%. The results of the regression analysis do not change when these superannuation funds are excluded. The coefficients keep the same sign, magnitude and significance; the results from these analyses can be found in Appendix K.

Chapter 6: Conclusion

The model seems to be robust so the results can be interpreted. First there is a significant negative relationship between age and the equity allocation, this is as expected. So the theory of the lifecycle model seems to hold within Australian superannuation funds. Superannuation funds look at the average age of their members when determining the asset allocation of the default investment option. The older people get the less there is invested in the risky portfolio consisting of stocks and the more is invested in the riskless assets cash and bonds. Where we have to take notice that bonds alone do not have the same relationship with equity as found in previous literature. This can be attributed to the recent financial crisis, where bonds turned out to be not as riskless as they seemed before.

Fund size does not seem to have a significant influence on the amount invested in equity in default options. So in Australia smaller funds might have a similar access to investment managers as bigger funds. Also we might argue that the moral hazard as mentioned by Bikker et al. (2011) is not as big in Australia as in the Netherlands. Gender is not of significant influence on the equity allocation. This could be because superannuation funds do not make a distinction between men and women, because they are treated as equals. There is a strong positive relationship between the assets per member and the equity allocation within a default option. This means that pension funds that have 'wealthier' members assume that these are less risk averse and therefore have a more aggressive default option.

The first suggestion for future research is to conduct a study over multiple years, instead of only one year. This might be possible if the amount of superannuation funds stays more constant the coming years or by focussing on a smaller number of superannuation funds that did not merge in the last years. The second suggestion is to conduct an analysis with a more complete dataset, where all superannuation funds are represented. At this moment, especially a big number of the corporate funds do not allow the APRA to publicly display their investment strategy, which might create biased results.

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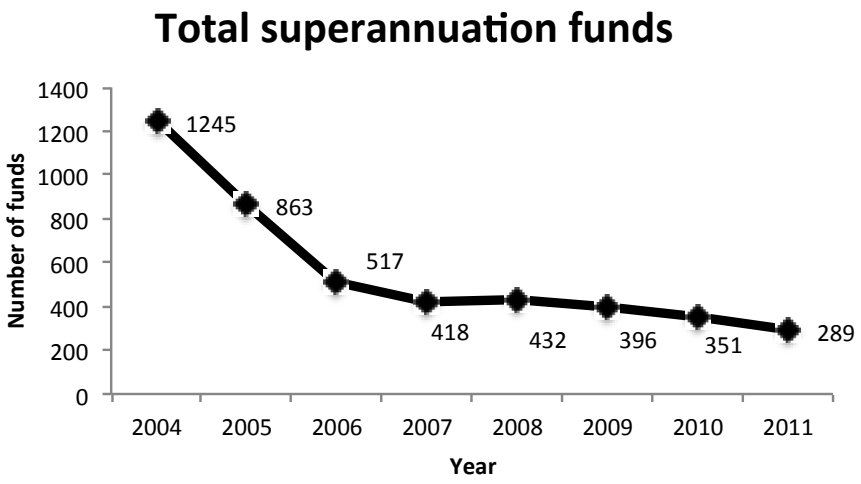
Appendices

Appendix A.

2005	n	%	Australian shares	International shares	total property	total fixed interest	cash	Alternative	SUM stocks
balanced	49	60	0,323	0,2321	0,0949	0,2175	0,054	0,0784	0,5551
growth	20	24	0,3368	0,2606	0,1031	0,162	0,0473	0,0903	0,5974
other	13	16	0,3052	0,225	0,0916	0,1719	0,1079	0,0983	0,5302
total	82								
2006	n	%							
balanced	46	54	0,3165	0,2302	0,0926	0,2161	0,0544	0,0903	0,5467
growth	24	28	0,3284	0,2783	0,0976	0,1586	0,0351	0,1021	0,6067
other	15	18	0,3337	0,2576	0,0963	0,1439	0,0631	0,1056	0,5913
total	85								
2007	n	%							
balanced	51	51	0,3177	0,235	0,1	0,1901	0,0532	0,104	0,5527
growth	31	31	0,3269	0,2792	0,094	0,1676	0,0334	0,0988	0,6061
other	18	18	0,3289	0,2515	0,0982	0,1323	0,0538	0,1353	0,5804
total	100								

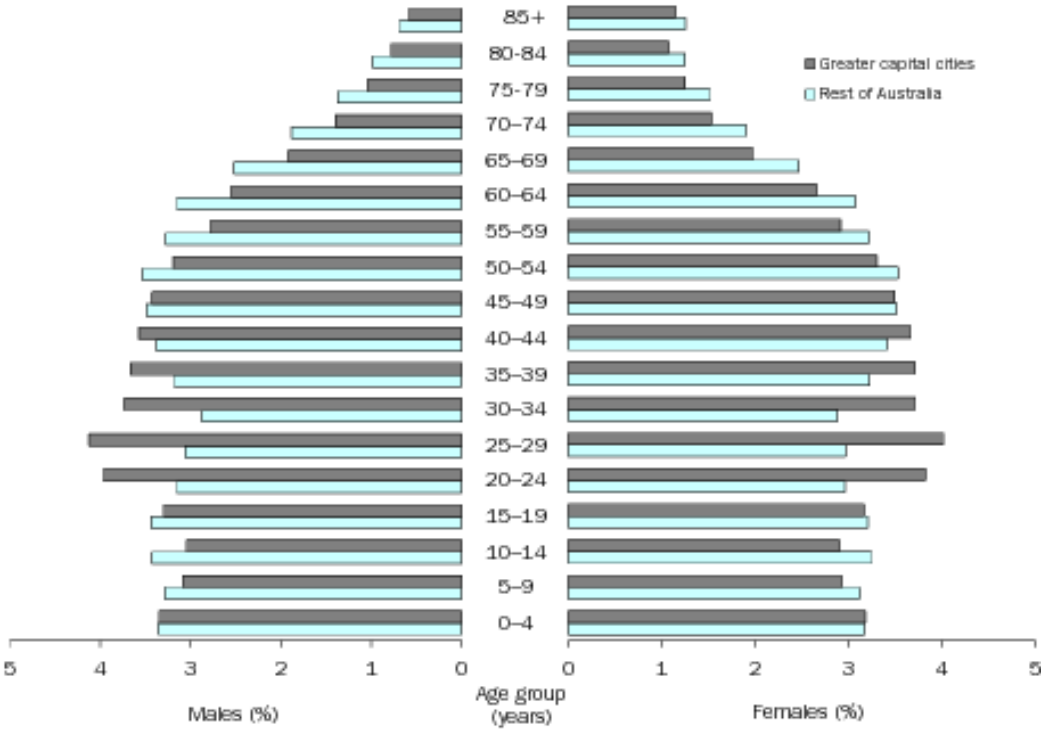
Source: Gallery, G., Gallery, N., McDougall, L., 2010, Don't judge a Superannuation Default Investment Option by Its Name, Australian Accounting Review, 20 (3), 286-295

Appendix B.



Source: APRA, Statistics Superannuation Fund-level profiles and Financial Performance, June 2011 (issued 29 February 2012)
Number of superannuation funds with more than four members registered with the APRA.

Appendix C.



Source: Australian Bureau of Statistics: Population by Age and Sex, Regions of Australia, 2011 (cat. No. 3235.0)

Appendix D.

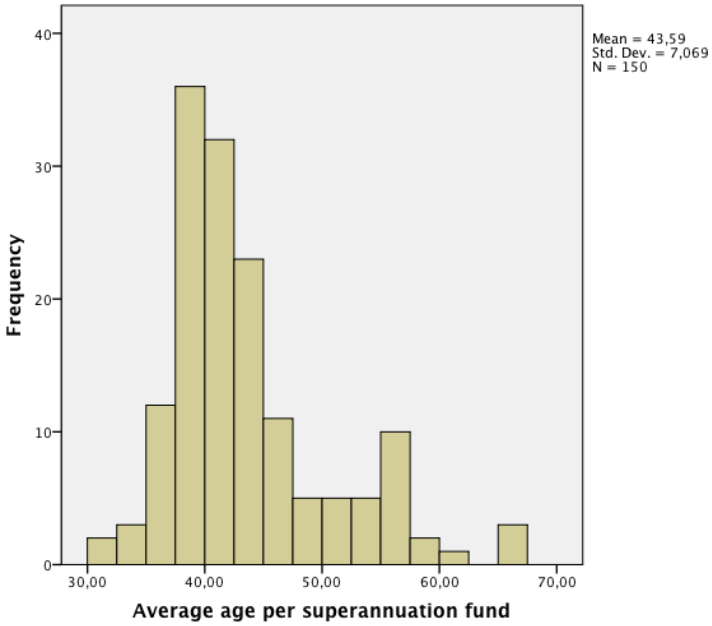
		Age group (Years)																	
ASGC 2011		0-4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85 and over
S/T name	SD code	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.
TOTAL MALES AUSTRALIA		748101	704447	708887	746817	823241	840165	768866	782289	782809	769849	739179	659220	615406	473457	349421	258072	190455	138934
Average age age cohorts						22	27	32	37	42	47	52	57	62	67	72	77	82	86
Total years per age cohort						18111302	22684455	24603712	28944693	32877978	36182903	38437308	37575540	38155172	31721619	25158312	19871544	15617310	11948324
Superannuation Fund age cohorts							<35			35-49		50-59		60-65		66<			
Weighted average age per age cohort population							26,88822			41,97336		54,35705		62		73,96598			

ASGC 2011		0-4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85 and over
S/T name	SD code	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.	no.
TOTAL FEMALES AUSTRALIA		709470	667918	673650	709562	787707	816659	766629	791837	799582	781750	754695	674063	624596	478952	369829	299699	253347	264373
Average age age cohorts						22	27	32	37	42	47	52	57	62	67	72	77	82	87
Total years per age cohort						17329554	22049793	24532128	29297969	33582444	36742250	39244140	38421591	38724952	32089784	26627688	23076823	2E+07	23000451
Fund age cohorts							20-34			35-49		50-59		60-65		66-dood			
Average age per age cohort							26,95555			41,97875		54,35891		62		75,36262			

Source: Australian Bureau of Statistics: Population by Age and Sex, Regions of Australia, 2011 (cat. no. 3235.0)

The average age per age cohort is used after this to calculate the average age per superannuation fund.

Appendix E.


Mean = 43,59
Std. Dev. = 7,069
N = 150
Frequency
40
30
20
10
0
30,00
40,00
50,00
60,00
70,00
Average age per superannuation fund

Appendix F.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,561[a]	,314	,290	18,7933

a. Predictors: (Constant), Log Assets per Member, Gender, Accumulation dummy, Log Fund Size $, Average age

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	59,274	22,255		2,663	,009	15,285	103,262		
	Average age	-1,639	,271	-,519	-6,042	,000	-2,175	-1,103	,645	1,551
	Log Fund Size $	,594	,985	,050	,603	,547	-1,353	2,542	,686	1,457
	Gender	-,127	,103	-,086	-1,238	,218	-,330	,076	,976	1,025
	Accumulation dummy	-6,766	3,616	-,145	-1,871	,063	-13,915	,382	,788	1,269
	Log Assets per Member	5,492	1,468	,378	3,742	,000	2,591	8,393	,468	2,138

a. Dependent Variable: Equity allocation %

Appendix G.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,714[a]	,509	,496	1,08900

a. Predictors: (Constant), Public Sector dummy, Corporate dummy, Industry dummy, Retail dummy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	6,790	,314		21,600	,000		
	Industry dummy	3,271	,353	,987	9,266	,000	,298	3,351
	Retail dummy	3,932	,346	1,244	11,351	,000	,282	3,551
	Corporate dummy	4,145	,402	,902	10,323	,000	,443	2,256
	Public Sector dummy	4,299	,411	,891	10,470	,000	,467	2,143

a. Dependent Variable: Log Assets per Member

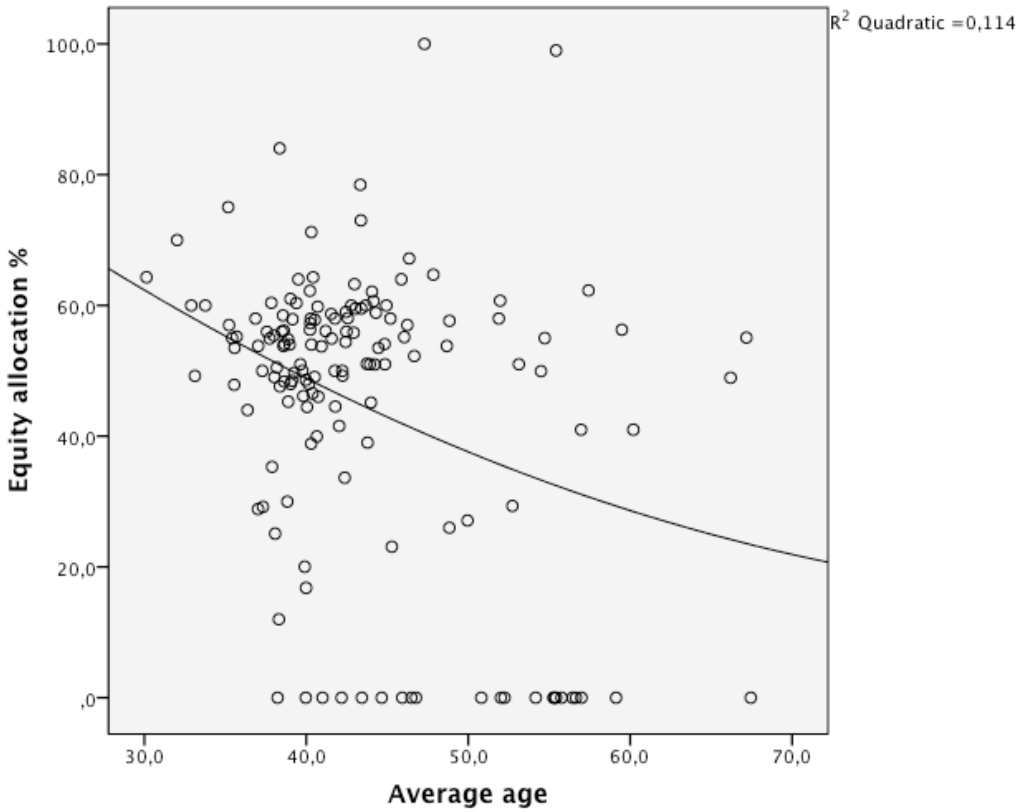
Appendix H.

Correlations

		Average age	Average age squared
Average age	Pearson Correlation	1	,995**
	Sig. (2-tailed)		,000
	N	150	150
Average age squared	Pearson Correlation	,995**	1
	Sig. (2-tailed)	,000	
	N	150	150

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix I.



Appendix J.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,561[a]	,314	,290	18,7933

a. Predictors: (Constant), Log Assets per Member, Gender, Accumulation dummy, Log Fund Size Member, Average age

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	59,274	22,255		2,663	,009	15,285	103,262		
	Average age	-1,639	,271	-,519	-6,042	,000	-2,175	-1,103	,645	1,551
	Log Fund Size Member	,594	,985	,047	,603	,547	-1,353	2,542	,800	1,250
	Gender	-,127	,103	-,086	-1,238	,218	-,330	,076	,976	1,025
	Accumulation dummy	-6,766	3,616	-,145	-1,871	,063	-13,915	,382	,788	1,269
	Log Assets per Member	6,087	1,324	,418	4,596	,000	3,469	8,704	,575	1,741

a. Dependent Variable: Equity allocation %

Appendix K.

Results when superannuation funds that have less than 10% of their assets in the default strategy are excluded.

Descriptive Statistics

	Mean	Std. Deviation	N
Equity allocation %	46,968	21,3106	125
Average age	42,653	6,8467	125
Log Fund Size $	20,9943	1,91024	125
Gender	57,404	16,3442	125
Accumulation dummy	,6400	,48193	125
Log Assets per Member	10,1230	1,60797	125

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,542[a]	,294	,264	18,2783

a. Predictors: (Constant), Log Assets per Member, Gender, Accumulation dummy, Average age, Log Fund Size $

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	43,771	24,170		1,811	,073	-4,089	91,631		
	Average age	-1,504	,287	-,483	-5,250	,000	-2,072	-,937	,700	1,429
	Log Fund Size $	,575	1,087	,052	,529	,598	-1,576	2,727	,625	1,599
	Gender	-,089	,103	-,069	-,868	,387	-,293	,114	,951	1,052
	Accumulation dummy	-2,487	3,875	-,056	-,642	,522	-10,160	5,185	,773	1,294
	Log Assets per Member	6,127	1,511	,462	4,055	,000	3,135	9,118	,456	2,191

a. Dependent Variable: Equity allocation %

Results when superannuation funds that have less than 50% of their assets in the default strategy are excluded.

Descriptive Statistics

	Mean	Std. Deviation	N
Equity allocation %	45,276	20,3218	78
Average age	41,567	7,0744	78
Log Fund Size $	20,6809	1,97828	78
Gender	57,877	18,4774	78
Accumulation dummy	,7051	,45894	78
Log Assets per Member	9,6199	1,74827	78

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,672[a]	,452	,414	15,5593

a. Predictors: (Constant), Log Assets per Member, Gender, Average age, Accumulation dummy, Log Fund Size $

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	52,659	25,341		2,078	,041	2,142	103,175		
	Average age	-1,632	,289	-,568	-5,649	,000	-2,208	-1,056	,753	1,329
	Log Fund Size $	,392	1,216	,038	,322	,748	-2,033	2,816	,543	1,841
	Gender	-,113	,098	-,103	-1,147	,255	-,309	,083	,953	1,050
	Accumulation dummy	-4,365	4,317	-,099	-1,011	,315	-12,971	4,242	,801	1,249
	Log Assets per Member	6,442	1,581	,554	4,076	,000	3,291	9,592	,412	2,429

a. Dependent Variable: Equity allocation %

Results when superannuation funds that have less than 80% of their assets in the default strategy are excluded.

Descriptive Statistics

	Mean	Std. Deviation	N
Equity allocation %	40,001	23,5985	49
Average age	42,070	8,4503	49
Log Fund Size $	20,2202	2,13642	49
Gender	61,422	17,3545	49
Accumulation dummy	,7959	,40721	49
Log Assets per Member	9,1621	1,99281	49

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,680[a]	,462	,400	18,2829

a. Predictors: (Constant), Log Assets per Member, Gender, Accumulation dummy, Average age, Log Fund Size $

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	41,969	34,063		1,232	,225	-26,725	110,663		
	Average age	-1,665	,372	-,596	-4,473	,000	-2,416	-,915	,704	1,421
	Log Fund Size $	1,514	1,711	,137	,885	,381	-1,936	4,964	,521	1,919
	Gender	-,022	,156	-,016	-,142	,888	-,336	,292	,955	1,047
	Accumulation dummy	-12,325	7,096	-,213	-1,737	,090	-26,634	1,985	,834	1,199
	Log Assets per Member	5,310	2,146	,448	2,474	,017	,981	9,639	,381	2,627

a. Dependent Variable: Equity allocation %