

Post-Retirement Planning: Asset Allocation

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ABSTRACT

The purpose of the study is to investigate optimal asset allocation as a means of minimising the investment risk, drawdown risk and longevity risk associated with an investment linked living annuity. The three risk elements were tested for various categories of retirees investing the full retirement savings amount in a living annuity.

At first the paper examines the South African public's current pre-retirement savings habits, propensity to save and knowledge on the financial industry. The literature concludes that very few people are saving adequately for retirement, thus leaving a gap between required retirement savings capital and accumulated retirement savings capital. As a consequence, retirees have to take on more risk, usually in the form of equity exposure, (only available in an investment linked living annuity) or delaying retirement, to try and breach the gap.

Secondly the paper examines the constructs in developing an optimal asset allocation. An analysis of the constructs includes risk versus return relationships for retirees, various unit trust sectors and portfolios within the South African financial market, the investment horizon also stated as the life expectancy of a retiree and withdrawal strategies applied by investors or retirees.

The practical data and theory from the literature study formed the basis of the empirical study where different retirement savings balances were tested at various drawdown rates and asset allocations in an investment linked living annuity.

The study concluded that retirees have to consider, among other factors, the required standard of living (stated as a net replacement ratio), the need to withdraw one third of the retirement capital and life expectancy before investing in an investment linked living annuity. These factors will have the biggest influence on the risks associated with an investment linked living annuity. Furthermore, the study concluded that an optimal asset allocation would be able to support a retiree during the post-retirement phase. A well diversified portfolio with a minimum of 50% allocation towards equity and property assets seems to be optimal.

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Chapter 1

South African Retirement Environment

1.1 Introduction

If retirement planning (the act of saving in an approved retirement fund for retirement) is crucial to providing an individual a secure future, the same holds true for post retirement planning (invest savings and draw a compulsory income). That is if one does not want to run out of money in the sunset years, even while maintaining a comfortable standard of living while no longer earning and income.

The ultra-high standards of living that people achieve today using credit cards and other types of credit are based on the assumption that there will be an unlimited future during which to pay all the borrowed money back. Unfortunately, people cannot carry this lifestyle into retirement, as retirement savings will not be able to support such extravagance (Purcell and Whiteman, 2005:32).

Post-retirement planning, thus, requires added attention because people usually under-estimate how much capital is required and over-estimate how much is accumulated. For instance, people assume that after settling mortgage bonds and other long term debt, monthly expenses will reduce over time. However, individuals forget that healthcare expenses, for one, are bound to rise with ageing.

There are other complexities too, for example, people today generally live longer and spend more years in retirement (Paulin and Duly, 2002:38). Individuals, therefore, need to save as well as protect the retirement savings, more to cover the risk of living longer than expected. Traditionally, retirees moved most of the accumulated assets into investments that provided a fixed, guaranteed income (Purcal and Piggott, 2008:495). However, many of today's retirees need to invest for growth as well as income, so that the invested assets will continue to support the retiree long into the future.

Moreover, as people are healthier and love pursuing new interests even in golden years, such as vacationing abroad and playing golf, the post-retirement lifestyles are not bound to be less extravagant than pre-retirement (Sun Life Financial, 2008). Therefore, retirees many a times are faced with the issue of looking beyond those financial plans which assume that post-retirement expenses would always be lower.

From the above it can be concluded that pensioners need to know how to plan for post retirement life. Post-retirement financial planning can either be a continuation of retirement planning or an independent financial planning exercise in itself. Irrespective of which, the plan needs to be reviewed regularly.

A post-retirement financial plan should begin with an assessment of the basics. The latter requires determining current net worth, income and expenses. Evaluating these factors will help to determine how long available assets will last in providing retirement income at various rates of investment returns, inflation and spending.

While in the case of retirement planning the focus is mainly on achieving growth, in post-retirement financial planning the focus is on generating income as well as achieving growth. Since the retiree depends on the income from investments, managing cash flows becomes paramount.

Three important criteria to be considered when choosing a post-retirement investment avenue are safety, rate of return and liquidity (Beattie, 2007:1). At retirement most retirees have a fixed corpus of savings. Thus, protecting the corpus of savings from market downturns is very important. The rate of return that an investment offers is also important as retirees depend on these returns for income. Also, most retirees prefer to have easy-to-liquidate investments to meet the regular and unforeseen expenditures.

Post-retirement, a person does not have a monthly pay check and will have to depend on the annuity receivable from investments. Therefore, the pre-retirement savings capital, or corpus, is most critical to financial independence. Financial planning, therefore, has to be done in the earlier stages of life so that the person will have adequate money to maintain a preferred lifestyle. The money saved during pre-

retirement will determine the investment strategy a retiree would need to pursue, post-retirement.

Unfortunately, however, there are very few investment avenues available today which meet the three criteria of safety, rate of return and liquidity. Safe investments are illiquid or offer low returns. Higher returns, on the other hand, come with relatively higher risks. It is important to allocate the corpus intelligently so that near-term needs can be met with low-return yielding liquid investments and part corpus can be invested in lock-in/illiquid or riskier investments.

Considering the above, some practical implications will follow with reference to post-retirement planning within the context of the South African retirement environment. A retiree would need to consider local regulations, available investment vehicles and personal and economic conditions when deciding on the best alternative investment at retirement.

1.2 Legislation governing annuities

The South African retirement environment is governed mainly by two acts: The Pension Fund Act (Act 24 of 1956) and the Second Schedule to the Income Tax Act (Act 58 of 1962).

The Pension Fund Act (Act 24 of 1956) stipulates which institutions may offer retirement products and gives a detail instruction to these institutions regarding the management of a retirement fund. Institutions include insurance companies or financial service providers as registered with the Financial Services Board.

In essence the Pension Fund Act (Act 24 of 1956) regulates the retirement industry and the management of retirement schemes that include pension funds, provident funds and retirement annuity funds.

The second schedule to the Income Tax Act (Act 58 of 1962) regulate pre- and post retirement savings and investment options. The act gives a clear guide to an

individual with reference to tax payable on investments during pre- and post-retirement, and the available investment options at retirement.

During the pre-retirement savings term an individual can make contributions towards a pension, provident or retirement annuity fund. These contributions are tax exempt, or put differently, payment of tax is deferred until retirement. More recently the South African Revenue Services also exempted the growth an individual receive within a fund, the fund income, from being taxed.

The second schedule to the Income Tax Act (Act 58 of 1962) states that on retirement, a member of an approved pension fund or a retirement annuity fund, may commute up to one-third ($1/3$) of the total value of the fund for a single payment in cash (that is to say, a lump sum). There is one exception to this rule, namely where the value of the remaining two-thirds ($2/3$) does not exceed a pre-determined amount of R50 000, in which case the total capital value may be commuted for a lump sum.

The remaining two-thirds ($2/3$) according to law must be utilised to provide a compulsory, non-commutable life-annuity. A life-annuity will provide the retiree with a monthly income from the invested two-thirds until death. The life-annuity can either be paid by the current retirement fund itself or the remaining two-thirds ($2/3$) can be transferred to another registered South African long-term insurer that will pay the life-annuity.

Under the Income Tax act, as stated above, the total accumulated pre-retirement benefits or proceeds of investment will be taxed in the hands of the retiree at the date of retirement.

Taxation of the one-third ($1/3$) lump sum benefit are taxed according to a sliding scale determined by the Act. The income received from the two-thirds ($2/3$) non-commutable life-annuity will be included in the retiree's annual income and taxed according to tax tables issued by the Minister of Finance on a year to year basis.

As mentioned above, the remaining two-thirds ($2/3$) must be utilised to provide a compulsory, non-commutable life-annuity, or for the purposes of this paper, an

“annuity”. An annuity will, in essence, be an investment in a Guaranteed Life Annuity or an Investment Linked Living Annuity, offered by a registered South African long-term insurer. The products will be discussed below.

1.3 Guaranteed Life Annuity

A guaranteed life annuity, also called an immediate life annuity, is most probably the easiest annuity for the retiring individual to understand. A guaranteed life annuity is offered and underwritten by life insurance companies. These companies guarantee regular, level income payments until the death of an annuitant. At the death of an annuitant, the remaining capital amount is forfeited or relinquished to the insurance company.

The life insurance company offering the guaranteed life annuity carries the risk that:

- Investment returns are not sufficient to provide the income for the annuitant's lifetime, also called investment risk; and
- The annuitant lives longer than expected, also called mortality risk. A life insurance company make use of mortality tables to determine the life expectancy of investors. On average insurance company expect male investors to become 81 years old and female investors, 85. Thus, should an individual live longer than expected, the insurance company would be at a loss with each extra income payment that have to be made.

The only risk to the investor is that the level income payment will be eroded by inflation over time. In other words, the retiree's level income will not be able to keep up with the rise in living expenses.

The amount of income available from a guaranteed life annuity depends on the market conditions at retirement. The amount of income, defined as a percentage of the investment at retirement, is directly linked to current and expected interest rates for the duration of the annuitants' life, adjusted for risk and costs incurred by the life insurance company.

Under a guaranteed life annuity, retirees have the following options available to better meet the retirement needs:

1. Bequeath all or part of the investment by adding one of the following options:
 - A guarantee term – the annuity income will be paid for a certain minimum term irrespective of whether the annuitant is alive or not. For example 10, 15 or 20 years. In the event of an annuitant dying before the end of the term, payments will continue to be made to the nominated beneficiaries.
 - A joint-life option can be taken – the annuitant and the annuitant's partner are covered, or insured, by this option. The annuity income will be paid until the death of the last surviving annuitant; and
 - Life cover can be purchased – a lump sum, equal to the original investment amount, is paid at the death of the annuitant. When packaged with the annuity, this cover is generally available without medical underwriting.
2. Ensure that the income increase over time.
 - Typically the annuitant can specify a fixed percentage annual increase (which is guaranteed) or may even be able to increase the income with an official inflation index. In both cases the initial amount of guaranteed income, as stated by a normal guaranteed life annuity, is reduced to fund the cost of the increases.

Therefore, a guaranteed life annuity is the easiest to understand with the fewest risks to the investor. It holds true that this product also offer more income, in present value terms, to the retiree who expects to live longer than the estimated life expectancy, without any chance of depleting retirement savings (Goemans and Ncube, 2008: 49).

1.4 Investment Linked Living Annuity

The Linked Investment Service Providers Association (LISPA) code on linked annuities defines a linked or living annuity as, "a special type of compulsory purchase annuity offered by insurers, which allows the policyholder to select an income level of between 2.5% and 17.5% per annum. While the policy holder has the flexibility to invest the capital in a wide range of investment portfolios offered by the insurer, the

living annuity policy usually offers no underlying investment guarantees and the policyholder therefore carries the investment risk fully, or in some cases partially”.

The living annuity, thus, provides the retiree with a greater degree of freedom than that afforded by the guaranteed life annuity. Each year the retiree is able to select the amount of income, and this is provided via regular withdrawals from the living annuity capital. Under the current South African legislation, this withdrawal rate, as mentioned above, is limited to between 2.5% and 17.5% per year of the start of each year’s capital value. The limits are set to these percentages to try and ensure that annuitants use the product for which it is intended for – to provide a lifelong income after retirement.

With a living annuity the retiree is also able to choose the assets in which the capital is invested. Most modern living annuity products offer a wide variety of investment portfolios, typically unit trust funds from various providers. The asset allocations can vary from money market instruments to equity, but should comply with prudential investment guidelines, where at most 75% is invested in equities.

On the death of the retiree, the remaining capital in the living annuity portfolio is not forfeited, as is the case with a guaranteed annuity. Instead, it transfers to the retiree’s nominated beneficiaries.

As stated above, the living annuity product does offer the retiree more flexibility in terms of drawdown rates and investment choices and even leaves the individual with the motive to bequeath. However, the retiree would need to take note of the following risks:

- Investment risk, as the responsibility for the investments lie with the investor who may make poor investment decisions.
- Drawdown risk, as the investor may erode the value of the capital by drawing down at too high a rate; and

- Mortality risk, as the investor's capital may be insufficient to provide a sustainable income, even at a low drawdown rate, for the rest of his or her life, especially if he or she lives longer than expected.

Despite the risks involved, living annuities has become a popular South African choice during the past decade. The evidence of this can be found in a survey conducted by Alexander Forbes Financial Services¹ who concluded that living annuities comprised 75% of total annuity sales. However, the Deputy Ombudsman for Long-Term Insurance mentions in the Life Offices Association code of conduct² that a living annuity is "appropriate mainly for individuals with a fair degree of financial knowledge who must be relatively wealthy."

1.5 Personal and economic conditions

The most probable explanation for the popularity of living annuities is the fact that, in most cases at retirement, there is a large gap between the expected and actual retirement capital saved (Friedman & Warshawsky, 1990:136). This results in retirees having to take on more risk, usually in the form of equity exposure, (only available in a living annuity) or delaying retirement, to try and breach that gap.

A further explanation to the popularity of living annuities is the fact that annuitants are driven by the motive to bequeath the remaining investment to nominated beneficiaries. In a guaranteed life annuity this is not possible as the full value of the fund is paid out as an income during the remainder of the annuitant's life after which the investment amount is forfeited. A living annuity on the other hand gives the retiree the benefit, at death, to bequeath the remaining fund value to the nominated beneficiaries. (Purcal & Piggott, 2008:494).

¹ Alexander Forbes Financial Services Member Watch Series, Issue 3

² Chapter 21: Code on living annuity policies, 2002

Another reason for the popularity of living annuities, are the disadvantages associated with life annuities. Guaranteed life annuity income is correlated with actual interest rates in South Africa. There is an inverse relationship between the cost of a guaranteed life annuity and the level of interest rates. When interest rates are low, it costs more to buy an annuity of a specified amount, or put differently, if interest rates are low, the investor will receive a lower income from your guaranteed life annuity. The current South African economic conditions are seen as sustainable due to the effective fiscal and monetary policies adopted by the country, which in turn will yield low interest and inflation rates for some time to come.

Thus, instead of adjusting the retirement lifestyle to fit the budget, retirees are prepared to take the risks associated with a living annuity.

The risks, as mentioned above, associated with the product is longevity risk, as the investor's capital may be insufficient to provide a sustainable income for the rest of his or her life, drawdown risk as the investor may erode the value of the capital by drawing down at too high a rate and investment risk as the responsibility of the investment lies with the investor who may make poor investment decisions.

Investment returns, in conjunction with the other risk factors, ultimately determine the growth within the investment, leading to the amount of income available, which in turn determine the retirement lifestyle and sustainable financial independence at old age. The question then is what the most optimal asset allocation would be for various categories of retirees taking into account a defined level of risk, costs and real rate of return.

1.6 Problem statement

The risks associated with a living annuity are known. It is, however very difficult to determine the correct drawdown rate, life expectancy of a retiree or market returns under various economic conditions.

Ultimately a retiree would want to lead the life envisioned. That constitutes a defined amount of income to sustain a defined retirement lifestyle.

The question then is whether an optimal asset allocation will be able to generate a specified income amount and achieve growth, given various categories of retiree's and investment horizons?

Will it be possible to minimise the longevity and drawdown risks with an optimal portfolio which maximises real returns for an estimate investment period?

1.7 Objective

The main objective of the study is to investigate optimal asset allocation as a means of minimising the investment risk, drawdown risk and longevity risk associated with an investment linked living annuity. The study will investigate the latter for individuals categorised according to different Living Standard Measurement, Financial Services Measure and Labour Force surveys.

1.7.1 Sub-objectives

- To research South African demographics according to the Living Standards Measurements (LSM), Financial Services Measure (FSM) and Labour Force Surveys and to divide retiree's into different categories according to pre-retirement income, pension fund, provident fund and retirement annuity contributions, lifestyles and retirement expectations. Conclusions can be drawn, subject to certain assumptions, on the available capital amount at retirement.
- To research Optimal Asset Allocation as a means of diversifying risk and maximising return for various categories of retirees' (LSM classes) in a living annuity.

1.8 Research methodology

The research comprises a literature and empirical study. The literature study will firstly highlight key characteristics of the South African retirement environment. Retirees will further be categorised according to LSM, FSM and Labour Force surveys. Secondly, the literature study will explore optimal asset allocation by

focusing on risk versus return relationships, different investment sectors, life expectancy and asset allocation strategies.

Empirical research will among others consist of statistical analysis of the local economy and the returns of different asset classes. The analysis will be done using statistical methods to calculate returns, standard deviation and coefficients of variation for the asset classes.

1.9 Limitations

The field of retirement planning has been, and most probably will be for years to come, a very grey area in financial planning. There are arrays of variables that can change in an instance and are difficult to predict with accuracy.

Previous research on retirement planning is limited and only covers parts there off. One can however not see retirement planning as individual parts, one need to take a holistic view. This paper would not be able to cover retirement planning as a whole and will only research optimal asset allocations for various income categories of retirees.

1.10 Chapter division

The chapters in this mini-dissertation are presented as follows:

Chapter 1: Introduction and problem statement

Chapter 1 explained the nature and scope of the study. It gave details to the problem statement, the objectives of the study and the research methodology. The chapter also recognised the limitations of the study and described the layout of the study.

Chapter 2: Literature review on post-retirement pension provision investments

Chapter 2 will investigate the South African retirement environment with specific reference to the population's ability to save for retirement, knowledge and

perceptions of financial markets and the required living standards. The focus will then shift to the characteristics of obtaining an optimal asset allocation.

Chapter 3: Empirical study on post-retirement asset allocation

This chapter will discuss the overall results of the empirical study. The discussion will entail the assumptions and methodology used as well as the analysis of the data. The findings of the empirical research will be presented and discussed.

Chapter 4: Conclusions and Recommendations.

The final chapter will include the conclusions drawn from the data analysis, practical recommendations and a critical evaluation of the achievement of the study objectives. Finally, suggestions for further research will be made.

Chapter 2

Post-retirement pension provision investments: A Literature review

2.1 The South African Retirement Environment

The purpose of this chapter is to present factual information, whether in theory or as empirical evidence, on the subject of this report. The chapter will aim to firstly categorise the South African population according to the people's ability to save for retirement, and understand the retirement environment. Secondly, the chapter will emphasise key aspects a retiree would need to consider in order to achieve an optimal asset allocation within the context of a living annuity.

The concept of post-retirement planning, unfortunately, cannot be seen as an event on its own, but rather as a continuation of pre-retirement planning. Pre-retirement planning, leading to retirement, constitutes that an individual regularly contribute towards an approved retirement savings scheme. At retirement, the accumulated retirement savings amount will be invested to support a retiree, via regular income withdrawals from the investment, until death. A retiree who contributed more regularly and at a higher rate will have a higher retirement fund value compared to a retiree who did not contribute that often or contributed at a lower rate. Naturally, a retiree with a high retirement savings amount, compared to a retiree with a low savings amount, will be able to withdraw a higher income amount which will lead to a higher standard of living.

However, considering the above, research conducted among American workers concluded that half of all individuals' ages 25 – 71 years will not have sufficient retirement savings to support themselves in retirement (Warshawsky and Ameriks, 2000:37). In other words, half of all American workers will not have saved enough money during the pre-retirement phase to support themselves through the post-retirement phase. The South African retirement statistics support the study of Warshawsky and Ameriks (2000:37) in that only 6% to 10% of all South Africans will be able to retire comfortably (Money Talk, 2004).

Hershey and Jacobs-Lawson (2005:332) describe the problem as one where individuals fail to plan to save. It is mentioned that much of the previous literature on retirement saving focuses on the influence of demographic factors such as age, income, educational level, marital status and gender, but neglects the psychological influences on planning and saving.

In the study three psychological variables were tested which are: future time perspective (measure the extent to which individuals focus on the future, rather than the past or present), knowledge of retirement planning and saving (the lack of knowledge to make informed decisions about retirement planning or retirement itself), and financial risk tolerance (which is a significant predictor of retirement investment and saving strategies). The study concluded that all the mentioned variables are predicative of saving practices. It was found, from an applied perspective, that counselling and intervention efforts aimed at promoting retirement saving should target individuals on the basis of these three psychological dimensions.

Purcell and Whiteman (2005:1) also draw attention to the problem of insufficient retirement savings. Part of the problem, according to the study, is the transition from belonging to a Defined Benefit Plan (where the employer carries all the risk) to participating in a Defined Contribution Plan (the employee bear the risk). As a result of the shift from a Defined Benefit plan to a Defined Contribution plan, workers bear more responsibility for preparing for financial security in retirement. Every decision workers make, or fail to make, impacts on retirement wealth and future retirement income.

The studies above highlight a global retirement savings problem, that is, people are not saving enough money for retirement. The South African retirement environment is following a similar path to that of developed countries. The South African population has the same demographic factors influencing savings behaviour, and similarly, follow the trend away from Defined Benefit plans into Defined Contribution plans since early 1990 (Van den Heever, 2007:2).

In an effort to overcome the problem of a nation not saving sufficiently for retirement, some developed countries, for example the United States of America, are administering a social security structure. The social security structure forces an individual to save through compulsory salary deductions (taxes) which are saved on behalf of the individual. This structure, on average, substitute 41% of an individual's pre-retirement income post-retirement (Purcell and Whitman, 2005:21).

The fact that the South African retirement environment lacks a structure similar to that of America is another driving force in the local pre-retirement savings problem leading to below average living standards post-retirement. The South African government has recognised the shortage and has started with a retirement reform back in 2004.

The reform, which will be very similar to developed countries social and security structures, will aim to assist and alleviate important problems within the South African retirement environment. These issues include the alleviation of poverty, providing temporary income support and a basic level of income protection in the event of retirement. The reform will further aim to include as many levels of society as possible (National Treasury, 2004:4).

Statistics South Africa (2008:6) and various other research foundations within South Africa are drawing a clearer picture on the various categories of people in South Africa. It highlights the clear differences, as stated by Hershey and Jacobs-Lawson (2005:332), in age, income, educational level, marital status and gender, future time perspective, knowledge of financial planning for retirement and risk tolerance. Some of these studies include.

2.2 Labour Force Survey

The Labour Force Survey is a household-based sample survey conducted by Statistics South Africa. It collects data on the labour market activities of individuals aged 15 years and above who live in South Africa. The report only covers the labour market activities of persons aged between 15 and 64 years.

Elias Masilela and Sheshi Kaniki (2009:5) have done research, based on the labour force survey of September 2007 (published by Stats SA, 2009), which reveals that since 2005, the number of South African workers aged 16 and above who have made no arrangement to save for a pension has increased steadily.

According to the report, in September 2005, 56.15 percent of the labour force of nine million contributed to a pension scheme. By September 2007, this proportion had dropped to 55.46 percent of the 9.9 million.

The data available from the report find that there is a strong positive correlation between income and pensions – a higher percentage of people contributing towards an approved retirement scheme are found among those earning higher incomes. However, pension coverage among higher income groups is not as high as one might have expected. In 2006 close to 16% of those earning between R16,000 and R30,000 did not contribute towards a pension. From 2006 to 2007 those earning above R30,001 that did not contribute to a pension, increased from approximately 11.5% to about 13.5%. This increase can possibly be explained by more people being self employed or working on a contract basis.

As just mentioned, the strong positive correlation between income and pensions must not be misunderstood as people in the lower income bands do save for retirement. The number of those saving is significantly lower than those in the higher income bands, but still 43.27% of those earning between R1 501 – R2 500 saved for retirement in 2007.

Mashile and Kaniki (2009:5) also highlights that retirement provision is affected by economic cycles. This can be observed by an increase in the amount of people not contributing towards a pension rising from 3.8 million in 2005 to over 4.5 million in an economically unstable quarter 2 of 2008.

What the report does not tell us, is how much of people's income goes into retirement savings. Neither does the report specify the savings vehicle for retirement.

Another report, complementary to that of Mashile and Kaniki, issued by Sanlam (Sanlam Benchmark survey, 2009:12) confirms the dismal retirement saving habits of South Africans. The report shows that the average employer and employee contribution rate towards retirement savings, as a percentage of annual salary, has risen slightly to 9.9% and 5.9% respectively. The problem though, is that the net allocation towards retirement, after costs, has come down from 12.4% in 2002 to 11.3% in 2009. One can clearly see the diminishing effect that costs, including death and disability insurance cover (3.2% of contribution) and management fees (1.3% of contribution) demanded by the management company, have on the total contribution rate of individuals.

Considering the fact that the net contribution rates has come down, one would be compelled to ask whether or not the current South African contribution rate would be sufficient to support an individual's required living standard in retirement.

The industry accepted rule regarding sufficient income after retirement is approximately 75% of pre-retirement income (Antler & Kahane, 1984:284). In other words, a retired individual would need 75% of annual pre-retirement income to sustain the same living standards (Aon Consulting, 2008:1). A practical example would be a person earning R10,000 per month pre-retirement, would need R7,500 per month post-retirement, to sustain the same standard of living. This ratio of pre-retirement versus post-retirement income is called the net replacement-, or the earnings replacement- or the retirement replacement ratio.

Currently the South African net replacement ratio, according to the contribution rates mentioned above, is 28% (Alexander Forbes, 2009:6). Thus, a retiree will only have saved enough money to sustain a 28% net replacement ratio until death. This is far lower than the generally accepted norm of 75% and also less than the 59% average from compulsory savings products and 68% from voluntary savings products in the member states of the Organisation for Economic Co-Operation and Development (Van Zyl, 2009).

An American study by Purcell & Whiteman, (2005:21) modelled various contribution rates, investment periods and marital status for different investment growth situations. The aim of the study was to determine the net replacement ratios over the investment saving periods at the time an individual retired. The study concluded that the net replacement ratio for personal retirement savings plans for American workers are most sensitive to contribution rates and investment savings terms. The higher the contribution rates and the longer the savings terms, the more retirement savings will be accumulated. As mentioned previously, developed countries, for example America, use a social security structure to help individuals save for retirement. The grants received from the social security structure add another 41% on average to a retiree's net income after retirement. In total an American retiree will have a net replacement ratio of approximately 75%.

The studies above put the South African retirement environment into perspective with regards to the amount of capital available to an individual at retirement. The South African government has started with a pension fund reform process in 2004. This reform will aim to "force" the South African population to save for retirement. The reform will also look to alleviate the savings problem and add to the net replacement ratio of a retiree. Furthermore, the reform will aim to include as many levels of society as possible. These levels can be better explained by the Living Standard Measurement (LSM) classes.

2.3 Living Standard Measurement (LSM)

The Living Standard Measure (LSM) is a system of categorisation utilised in South Africa to provide differentiated socio-economic groupings. The South African Advertising Research Foundation first started to develop the system in 1989 and has been improving the system year on year.

The LSM divides the population into 10 LSM groups, 10 (highest) to 1 (lowest). It cuts across race and other outmoded techniques of categorising people, and instead groups people according to living standards using criteria such as degree of

urbanisation and ownership of cars and major appliances. It is not based on, but highly correlated to income.

An article by FinMark Trust, (Saving against the storm, 2009:2) confirmed that sixty-nine percent of people in South Africa believe that if one saves and invests regularly; eventually the small amounts will add up. Twenty-nine percent of people have a good idea of what the interest or returns are on investments, indicating that those people either understand or take an interest in retirement savings and keep up to date with interest rates that affect investments. According to the study the pro-savings sentiments are more prevalent among whites, Indians/Asians and people in the higher LSM's (7-10).

FinMark Trust (2009:2) recognises the fact that there is not a marked increase in people's provision towards saving for retirement. According to the study only 28% of South Africans had some sort of savings or retirement product in 2008.

Another study done by FinMark Trust (2008:3), in conjunction with the South African Savings Institute, researched the means and ways South Africans employ to provide for old age. The research focused more profoundly on the lower income bands consisting of LSM 1-5. The key findings from the study revealed that:

- Low-income South Africans save very little for retirement. Only one-third of the working age members of LSM 1-5 save at all and only 5 percent of those saving are actually saving for retirement. According to FinMark Trust (2008:2), this proportion of the group is likely saving because employers are forcing all employees to do so. Very few people then save voluntarily for retirement.
- The State Old Age Grant (SOAG) represents by far the most important source of income to South Africa's elderly poor. A FinScope SA (2006:4) reports show that some 89 percent of older (age sixty or more) members of the LSM 1-5 group receive income from the grant while the remaining 11 percent say that income is provided through family and friends, or simply no income is earned or received.

- Significantly fewer South Africans will reach retirement age. The statistical life expectancy of twenty-year olds has fallen dramatically. While at the time of the democratic transition in 1994, twenty-year old women could expect to live, on average, to 71 and men to 63, in 2007, the life expectancy for twenty-year old women is well below 60, and for men below 55. The reduction in the life expectancies of individuals can be assigned to the HIV/Aids pandemic in the developing African countries (Smith, 1998:7). Working age South African's pessimistic attitude towards retirement savings can be reflected by the possibility of not reaching retirement; and
- Low levels of employment results in, an income for working people, that is significantly lower than the income of retired people. Average personal income in every category from LSM 1 to LSM 5 is lower for people of working age than it is for retirees receiving R1010 per month from the State Old Age Pension. While this speaks volumes for the potential for the SOAG to meet the future needs of younger generations, it accentuates the low potential for working age members of the LSM 1-5 group to save. If the SOAG is considered an adequate income for retirees, by definition the incomes of those still working in LSM 1-5 must be considered inadequate even for basic needs and therefore a fragile basis for long term savings activity.

The latest LSM income bands available, from FinScope South Africa (2008:14) report, show that income varies from R723 per month for the LSM 1 group to R1168 per month for the LSM 5 group. The last point of the key findings by FinMark Trust (2008:2) can be confirmed when comparing the income bands to the State Old Age Grant of R1010 per month.

From the article, as stated by the researchers, one can conclude that only part of the South African population see retirement savings as a priority. The South African population can not necessarily afford to forgo current consumption for long term savings, and are discouraged to save by the means test under the State Old Age Grant.

Furthermore to the Livings Standards Measurement survey, the Financial Service Measure differentiates the South African population according to the psychological and physical aspects of financial industry.

2.4 Financial Service Measure (FSM)

FinMark Trust and TNS Research Surveys (Pty) Ltd (2008:14) conducts yearly research on consumer perceptions and behaviours by exploring either individuals' or small business owners' interactions with the financial sector as a whole.

The measure is designed to segment the market not only on what people have or earn, but on key psychological elements. This is to provide an overall and holistic understanding of people's engagement in the financial services arena.

The FSM classifies people into eight tiers based on a variety of measures (Annexure A). The model includes the combination of five broad components namely: Financial penetration, physical access to banks, financial discipline, financial knowledge and control, and connectedness and optimism.

The FinScope South Africa (2008:14) survey divided the South African population into the eight tiers with the following characteristics:

FSM 1 – 3 comprise of 45 percent of the population and corresponds with the LSM 1 – 4 groups. The majority of people have an income of up to R1000 per month with the FSM 3 tier earning up to R2000 per month. Most have never used or previously used banking facilities and have a need for education on basic savings and financial matters. This group mainly make use of burial societies or Mzansi (a low cost banking product focused on the uneducated population. The product is offered by the five main banking groups in South Africa).

FSM 4 – 6 comprise of 44 percent of the population and corresponds with the LSM 5 – 8 groups. The majority of people feel that life is ideal in many ways. The income band for FSM 4 is up to R4000 and FSM 5 and 6 up to R8000 per month. Almost all of the people in these bands are currently making use of a banking facility. This

group are open to insurance and investment products and may be looking to creating a personal investment portfolio.

FSM 7 – 8 comprise of 11 percent of the population and coincide with the LSM 7 – 10 groups. These individuals earn more than R8000 per month and all are making use of a banking facility. The group are financially well educated and make use of the full spectrum of financial products.

The FinScope South Africa (2008:18) research showed a remarkable increase in the amount of people now making use of banking facilities. However, the study highlights the need for financial education amongst the lower FSM groups. Educating the population on financial products for example investments and savings, short term and long term insurance and technology are still a big priority in South Africa.

In summary to the three surveys conducted in South Africa, it is evident that about half of all South African adults are contributing towards some form of retirement savings. The people who are saving are spread across all the income groups, but are stronger correlated to the higher income groups (LSM 7 -10).

The LSM 7 – 10 group coincide with the FSM 7 and 8 groups, who have the relevant knowledge on financial instruments and products, are more prevalent to save for retirement. These individuals would therefore be more likely to have a greater corpus of savings, a better ability to manage retirement savings and superior knowledge to make use of a linked investment living annuity.

Considering the above, it is not to say that the population falling outside these parameters will not have the necessary savings or knowledge on financial instruments to make use of a living annuity. A financial advisor will need to assist a retiree, to educate a retiree from this group and to manage such an investment actively to avoid disappointment.

2.5 Post-retirement planning: Asset Allocation

The literature above emphasises the universal problem of individuals not saving enough money for retirement. The literature points to various reasons why people are not saving enough money and also highlights the diminishing effect it has on an individual's accumulated retirement savings amount.

At retirement though, irrespective of the amount, an individual has a fixed corpus of life savings to invest. The corpus of savings will have to provide an income to sustain an afforded standard of living. In order to draw the highest possible income amount a retiree would need to invest the corpus intelligently in order to maximise the possible returns and minimise the possible risks. In other words, a retiree has to invest the corpus of life savings in an optimal portfolio of assets.

An optimal portfolio can be defined as a portfolio that provides the greatest expected return for a given level of risk, or equivalently, the lowest risk of a given expected return (Santos and Haimes, 2004:697). As stated by the problem statement, an individual investing in an investment linked living annuity would need to take care in managing the risks involved with the product. The risks, as mentioned previously, are investment risk, longevity risk and drawdown risk. A retiree can try to mitigate the investment risk by managing the risk versus return relationship of various asset classes available in a living annuity, the longevity risk making a more accurate assessment of life expectancy, and drawdown risk by choosing an appropriate investment strategy. The different constructs will be discussed below.

2.6 Risk versus Return Relationship

According to general accepted financial theory, investors expect a trade-off between risk and return. The higher the risk (variability) of an investment's returns, the higher the expected return to compensate for the extra risk taken, and vice versa. It may, therefore be argued that return should not be regarded in isolation, but rather relative to the degree of risk incurred by the investor to achieve the return. It is important to realise that risk and return relationships alter over time, and investors should therefore continually re-evaluate this relationship.

Risk, however, is a very loosely defined concept. Olsen and Khaki (1998:59) argue that investors should not only look at the conventional mathematical measures of risk, but also view risk in terms of loss opportunities and the possibility of realizing returns below target levels. Swisher and Kasten (2005:76) also indicate that investors see risk mainly in three ways:

- The risk of loss (that is, returns below zero).
- The risk of underperformance (returns below a benchmark, such as a neighbour's portfolio or the S&P 500); and
- The risk of failing to meet one's retirement goal.

Risk versus return therefore is the potential for a bad outcome versus the potential of a good outcome. One must see risk, in part, as the fear an investor has for bad outcomes. Human behaviour cannot be measured accurately, but can be explained to some degree with reference to mean-variance analysis (Swisher and Kasten, 2005:76)

The standard practice amongst investment managers, individual investors and the like is to calculate risk according to an analytical tool called mean-variance analysis. This analysis involves using the expected returns, standard deviations and coefficient variation's of individual investment opportunities to analyze the risk-return tradeoffs' of combinations, or portfolios, of investments. Mean-variance analysis can be better explained by a more detail breakdown of each of the constructs namely return, standard deviation and coefficient of variation.

2.6.1 Measuring returns of a portfolio

A portfolio is a family of n investments, each contributing to the aggregate profitability of the portfolio. The decision variable P_i in a portfolio selection problem is the proportion of the total portfolio value to allocate to each investment i . Thus, it follows that the sum of all the P_i 's is always 1. Since P_i is the weight of investment i in the portfolio, then the expected portfolio return is defined as the weighted sum of the returns of each investment. Denoting the return of investment i by P_i ($i = 1, 2, \dots, n$),

the formula for calculating the expected portfolio return \hat{r} is given in the equation below.

$$\text{Expected rate of return} = \hat{r} = P_1 r_1 + P_2 r_2 + \dots + P_n r_n = \hat{r} = \sum_{i=1}^{n=1} P_i r_i$$

where:

r_i = is the i th possible outcome

P_i = probability of the i th outcome

It is a maximisation type of objective, since investors naturally want to have as high an expected return as possible from the portfolios. However, increasing the expected return exposes a portfolio to risk.

2.6.2 Measuring Portfolio Risk

A common measure of the risk of an investment is the standard deviation of its returns. The standard deviation, σ_i of a specific investment i is calculated based on how its returns ($r_i(t)$) for periods of interest ($t = 1, 2, \dots, T$) deviate from the expected returns (\hat{r}). The term volatility in financial literature is used to describe how the value of an investment can fluctuate over time and can be denoted as follows.

$$\text{Standard deviation} = \sigma = \sqrt{\sum_{i=1}^n (r_i - \hat{r})^2 P_i}$$

where:

r_i = is the i th possible outcome

\hat{r} = expected rate of return

P_i = probability of the i th outcome

2.6.3 Measuring Portfolio performance on a risk adjusted basis

The coefficient of variation shows the risk per unit of return, and it provides a more meaningful basis for comparison when the expected returns on two alternatives are not the same. This measure can be better explained by.

$$\text{Coefficient of variation} = CV = \frac{\sigma}{\hat{r}}$$

where:

σ = standard deviation

\hat{r} = expected return

Considering the above, it is important to note that mean-variance analysis is based on the following assumptions:

- All investors are risk-averse.
- Expected returns, variances and covariance's of assets can be calculated; and
- Optimal portfolios can be created only with the use of data on expected returns, variances and covariance's.

A portfolio's risk, as mentioned above, can be defined by the variability, or volatility of its returns. The volatility is measured by calculating a portfolio's variance and standard deviation, both of which quantify how much a portfolio's returns deviate from its average return over a specific period. The variance or standard deviation is also compared to the variance or standard deviation of a relative measuring base, or benchmark, for example the Johannesburg Stock Exchange, to better understand the portfolio risk associated.

Other measures include covariance and the correlation coefficient. Covariance measures the variance (volatility) of a security within a portfolio relative to other securities within the same portfolio. Should the returns of these securities move in unison, it is said to have a large covariance and vice versa. Correlation coefficient is

a standardizing measure for covariance, by valuing data on a similar scale. These two measures will rarely be used by investors, as these calculations are done by fund managers compiling the portfolio.

(Swisher and Kasten, 2005:76), (Fabozzi et al., 2008:20), (Fraser-Sampson, 2007:82) all argue that variance and standard deviation are not the most accurate method of measuring risk.

Swisher and Kasten (2005:76) propose a more recent measure, called below-target variance. Below-target variance measures volatility below an established target that is considered a “bad” risk, whereas return above the target is deemed a “good” risk. The counterpart to standard deviation in this context is downside deviation. Both below-target variance and downside deviation consider only the volatility of the downside. The reasoning behind the findings is that 1) financial assets do not follow a normal distribution around a person’s minimum acceptable return (personal goal growth) and 2) that standard deviation fails to describe human risk. The study describe below-target variance as an ideal measure of risk, as a retiree will not mind above average returns, but will be concerned with below target returns.

The risk measures mentioned was derived from a model called Modern Portfolio Theory, developed by Dr. Harry Markowitz in 1959. The model proposed that investors expect to be compensated for taking additional risk, and that an infinite number of “efficient” portfolios exist along a curve defined by three variables: standard deviation, correlation coefficient and return. The efficient-frontier curve consists of portfolios with the maximum return for a given level of risk or the minimum risk for a given level of return. The algorithm used to generate the curve is known as mean variance optimization, since what is being optimized is return versus standard deviation, or variance from the mean return.

According to the Modern Portfolio Theory, the best way to minimise risk and maximise return is to diversify a portfolio. A diversified portfolio ideally contains uncorrelated investments that behave differently, so that as one decreases in value, another increases in value. Because the movements of the investments counteract

each other, the net effect will be more stability in the portfolio's value over time. The theory contends that investment risk in a well-diversified portfolio is entirely systematic and cannot be further diversified away. In theory, the portfolio becomes the market, which is very rare.

Further research, based on the work by Markowitz, has been done by William Sharpe. Sharpe developed a model measuring the risk of an individual stock within a portfolio. Called the Capital Asset Pricing Model (CAPM), the model's primary conclusion is that: the relevant risk of an individual stock is its contribution to the risk of a well-diversified portfolio. In essence, an individual stock's risk, if held in a portfolio, can be eliminated by diversification making its relevant risk smaller than its stand-alone risk.

Risk according to the literature, are still a well debated topic with no clear conclusion on the best possible measuring analysis. A retiring individual would need to consider at least some of the risk measures in constructing an optimal portfolio.

2.7 Optimal Asset Allocation

As explained in chapter 1, the code on linked annuities defines a linked or living annuity as, "a special type of compulsory purchase annuity offered by insurers, which allows the policyholder to select an income level of between 2.5% and 17.5% per annum from the invested capital amount. While the policy holder has the flexibility to invest the capital in a wide range of investment portfolios offered by the insurer, the living annuity policy usually offers no underlying investment guarantees and the policyholder therefore carries the investment risk fully, or in some cases partially" (LOA Code of Conduct, 2002:21.3).

Within this definition lies the important aspect of asset allocation. A retiree has the freedom or flexibility to invest the capital in a wide range of investment portfolios. Such an investment portfolio consists of unit trust funds, or collective investment schemes, from various providers regulated by the Collective Investment Schemes Control Act (Act 45 of 2002).

Under the Collective Investment Schemes Control Act (Act 45 of 2002) a unit trust fund can be defined as a collective investment scheme that pools the money of a number of investors through a managing company. The pool of money is then divided into identical units. The unit holders are the owners of the units in the fund and are therefore entitled to the fund's net income (in the form of dividend and interest disbursements) as distributed on payment dates.

Unit trust funds are grouped into sectors to enable investors to compare the performance of funds with similar objectives and similar benchmarks. An investor would need to consider, among other factors, the underlying philosophy, volatility, risk, growth potential and income of each fund. With this knowledge, the retired investor can match the retirement needs with the investment objectives of the fund.

Table 2.1 below categorise the different unit trust funds according to: geographic focus, asset allocation and sub-categories of asset allocations. At the first level of the illustration, funds are classified according to the geographic focus of the underlying investments – whether the assets are invested in South Africa, offshore, or in a combination of local and offshore assets. The domestic funds are funds that have at least 80% of the assets invested in South African markets at all times. Worldwide funds are funds which invest in both South African and foreign markets. These funds can have 100% of the assets offshore or 100% in South Africa, or any mix in between, depending on the view of local and overseas markets, exchange rates and other factors. Foreign funds are funds that invest at least 80% of the assets outside South Africa at all times. These funds still have to comply with exchange control regulations still in place in South Africa.

At the second level, funds are divided into four main groupings: equity funds, asset allocation funds, fixed interest funds and real estate. Equity funds are funds that are obliged to invest a minimum of 75% of the assets in equities at all times. The remaining 25% can be invested, subject to the mandate of the fund, at the discretion of the fund manager. Asset allocation funds invest in a spread of investments in the equity, capital, money and property equity markets. These funds seek to maximise total returns (that is, both capital appreciation and income growth) over the long term.

Fixed interest funds, on the other hand, invest in the bond and money markets and will mainly earn an income in the form of interest payments. Real estate funds invest predominantly in listed property shares.

Table 2.1: Unit Trust fund classification

Fund Classification				
	Domestic	Worldwide		Foreign
1st Tier (Domicile of Assets)	Invest at least 80% of the assets in South African investments	Invest in South African and/or foreign markets (complete flexibility, up to 100% either way)		Invest at least 80% of the assets in offshore markets
2nd Tier (Asset Allocation)	Equity Listed shares on various stock exchanges, depending on 1 st tier classification	Asset Allocation Invests in combination of equity and fixed interest	Fixed Interest Bonds, money market investments and other interest-bearing securities.	Real Estate Listed property shares on local and overseas stock exchanges.
3rd Tier (Focus)	Funds <ul style="list-style-type: none"> • Financial • General • Growth • Value • Large Cap • Smaller Companies • Varied Specialist • Resources and basic industries • Industrial Sector 	Funds <ul style="list-style-type: none"> • Prudential low equity • Prudential medium equity • Prudential high equity • Prudential variable equity • Flexible • Targeted absolute and real return 	Funds <ul style="list-style-type: none"> • Income • Bond • Money market • Varied specialist 	Funds <ul style="list-style-type: none"> • General

Source: www.fundsdata.co.za

It is important to note that each of the second-tier categories can be associated with each of the first-tier categories. In other words, one can have domestic equity funds, worldwide equity funds and foreign equity funds.

The third level is a more detail differentiation of the various asset allocations in the second level (that is to say, a further distinction in asset classification). The third level can be summarized as follows:

The **equity funds category** comprises of various different specialist subcategories as per table 2.1, the third tier. These funds have in general a medium to high risk versus return relationship and are more suitable over a long term investment period (Profile's Unit Trusts, 2009:111). The subcategories are discussed below:

Financial funds – these funds invest in financial services companies, including banks, insurance companies, brokerage firms and other companies whose principal business operations involve the provision of various financial services.

General funds – these funds invest in selected shares across all industry sectors of the Johannesburg Stock Exchange (JSE) as well as across the range of large, mid and smaller cap shares.

Growth funds – these funds seek maximum capital appreciation. The primary objective for these funds is achieved through investing in growth companies. Growth companies can be defined as those whose earnings are on or are anticipated to enter a strong and sustainable upward trend and typically trade on high price to earnings ratios (PE ratios).

Value funds – these funds seek medium to long-term capital appreciation as the primary investment objective. The funds seek out “value” situations by typically investing in shares with low relative PE ratios as well as shares that are trading at a discount to the net asset value. These funds frequently offer a higher than average level of income.

Large cap funds – funds in this category seek long-term growth as primary objective through investment in large market capitalisation shares. These companies fall within the top 40 JSE listed shares by market capitalisation.

Smaller companies funds – these funds seek maximum capital appreciation as primary investment objective. New investment by the funds is restricted to small and mid cap shares. At least 75% of the fund will be invested in these shares, which fall outside the top 40 JSE listed shares by market capitalisation, at all times.

Financial & industrial sector funds – these funds seek capital appreciation by investing in selected shares in the financial and industrial sectors.

Varied specialist funds – equity sub-category, varied specialist funds, refers to funds with specialist themes or focuses outside of the other recognised categories. Due to the varying nature and focus, these funds cannot be compared. Once there are five or more funds with the similar focus, a new category will be created to accommodate the sector.

The **asset allocation funds** may spread investments over different asset classes (that is, cash, equity, bonds and property). These funds, in general, have a medium risk versus return relationship and are suitable over a medium to long term investment period (Profile's Unit Trust, 2009:114). These funds include three specialist categories as discussed below.

Prudential funds – these funds comply with Regulation 28 of the Pension Fund Act, which states that retirement funds may not hold more than 75% of the asset value in the equity market. These funds are accordingly categorised by the amount of equity exposure held. The prudential low equity funds comprises of equity exposure of up to 40%. The prudential medium equity funds hold equity exposure of between 40% and 65% and the prudential high equity funds have equity exposure of between 65% and 75%. The prudential variable equity funds conform to Regulation 28 but may vary the equity holding in a broad range between 0% and 75%.

Flexible funds – invest in a flexible combination of the assets mentioned under prudential funds, to maximise returns in accordance with changing market and economic conditions (that is, these funds are aggressively managed).

Targeted Absolute and Real Return funds – to achieve an explicit benchmark (for example, CPI plus 2%) these funds may add derivatives to the traditional asset mix (property, equity, cash and bonds). These funds tend to display below average short term volatility. Moreover, these funds may not conform to Regulation 28 of the Pension Funds Act governing retirement funds.

The **fixed interest funds** cover four categories and will mainly earn an income in the form of interest payments. These funds have in general a low risk versus return relationship and are suitable over a medium to short term investment period (Profile's Unit Trust, 2009:116). The funds include.

Bond funds – invest in a combination of bonds, fixed deposits and other interest bearing securities with the aim to realise a capital growth with regular and high levels of income payments. The maturity of the investments exceeds two years.

Income funds – invest in a combination of the assets mentioned under bond funds, but with a maturity that is below two years to ensure capital stability and high income.

Money market funds – invest in money market instruments with an average maturity that does not exceed 90 days. These funds maximise interest income, preserve the fund's capital and provide immediate liquidity. Money market funds also have a fixed price of R1.00 per unit, and can be compared with a savings account at a bank, albeit with a higher return. The investments in these funds are, however, more diversified, and the money market fund should thus have a lower risk than a savings account at a bank. This is one of the few exceptions where higher returns (above deposit rates) are associated with lower risk taking.

Fixed interest – varied specialist – these funds invests in bonds, fixed deposits, structured money market instruments, listed debentures and other high yielding securities. Varied specialist funds seek to maximise income with either preservation

or stability of capital, or an offer of potential growth of capital. The underlying risk and return objectives of individual funds may vary as dictated by each fund's mandate and stated investment objective and strategy. However, in terms of the different investment mandates, these funds fall outside the existing sub-categories of the fixed interest sector. Should it be considered appropriate, where five or more funds have a similar focus, a new category will be created and the funds transferred.

The last category, Real Estate, has come into being as a result of the new millennium property boom. At this stage the sector has only one General sub-sector. These general funds invest at least 50% in listed securities. The objective of these funds is to provide high levels of income and long term capital appreciation.

Considering the vast range of investment options from above, a retired investor would need to take care in the decision on which of the asset allocations to include in the investment. As previously mentioned, an investor would need to consider, among other factors, the underlying philosophy, volatility, risk, growth potential and income of each fund or fund sector.

Optimal asset allocation refers to the strategy followed by retired investors, of dividing the corpus of life savings among the various asset classes in the second level. The retiree would have to further diversify the corpus of savings amongst the funds categories in the third level. The correct allocation of assets amongst various asset classes will strive to minimise investment risk and to maximise the growth potential and income from the fund, or put differently, match the retirement needs with the investment objectives of the fund.

To minimise risk and maximise return, one would need to understand the risk-return characteristics, as discussed previously, of the various asset classes. Figure 2.1 compares the risk and potential return of some of the popular asset classes.

Figure 2.1: Risk versus Return relationships for various asset allocations



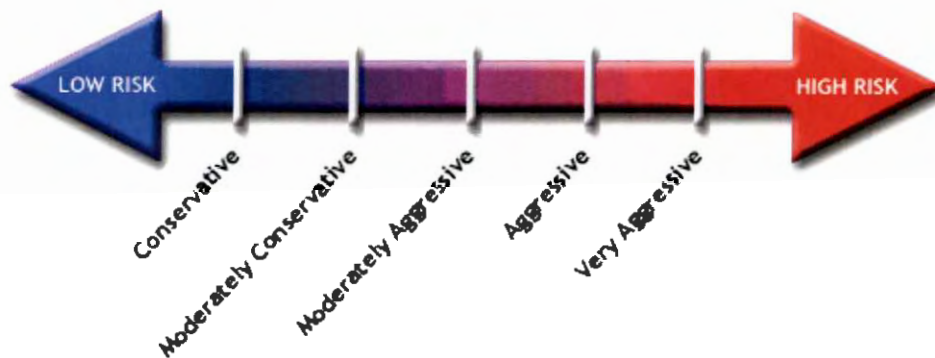
Source: Own

Figure 2.1 displays the historical risk (as measured by the funds standard deviation) versus return (growth or income received) relationships for different asset allocations on the horizontal and vertical axis respectively. The figure illustrates that money market funds and government bonds have the lowest level of risk, but also the lowest level of returns. The small cap equity sector display a high level of risk (high volatility) versus return relationship. This can be explained by the fact that investors want to be compensated for extra risk taken.

From the above, it is evident that each asset class has varying levels of return for a certain risk. The retirees risk tolerance, investment objectives, time horizon and available capital will provide the basis for the asset composition in a portfolio. Asset allocation can help retirees to diversify investments in such a way to reduce the investment risk associated with different asset classes. This can be accomplished by allocating the corpus of life savings in a portfolio portraying a low standard deviation, correlation coefficient and covariance, or in other words, an investing in an optimal portfolio.

Insurers or investment companies created a series of model portfolios (unit trust funds), each comprising different proportions of asset classes such as equities, bonds, money markets and property. These portfolios of different proportions satisfy a particular level of investor risk tolerance and required return. Portfolios can vary from conservative (low risk) to very aggressive (high risk) and will comprise of the following characteristics:

Figure 2.2: Risk classification model



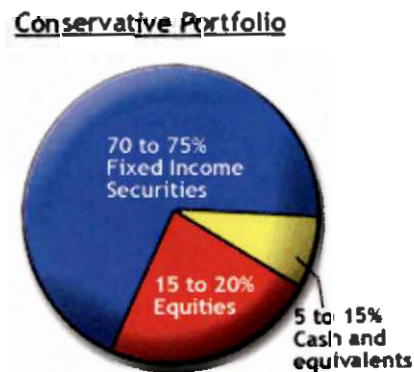
Source: Own

Figure 2.2 shows, the variations in risk as measured by a portfolio's standard deviation on a sliding scale from 1 (low risk) to 10 (high risk). Considering the asset allocations as depicted in figure 2.1 above, one would be able to class a portfolio consisting only of money market instruments as a 1 (low risk or low volatility) on the sliding scale shown in figure 2.2. In contrast, a portfolio only consisting of small cap equities will be classed a 10 (high risk) portraying a high level of volatility. From the above two figures, one can determine the relative risk versus return relationship for various model portfolios.

Conservative model portfolios - generally allocate a large percentage of the total portfolio to lower-risk securities such as fixed-income and money market securities. These securities, fixed-income and money market, portray low volatility and can therefore be classed as a 1 or 2 on the sliding scale in figure 2.2. The main goal with a conservative portfolio is to protect the principal value of the investment (that is to say, the original invested amount). A retiree investing in a conservative portfolio will

need to guard against the risk of inflation, or put differently, guard against the risk of living expenses rising faster than the growth received in the investment. These portfolios are often referred to as capital preservation portfolios.

Figure 2.3: Example Conservative portfolio

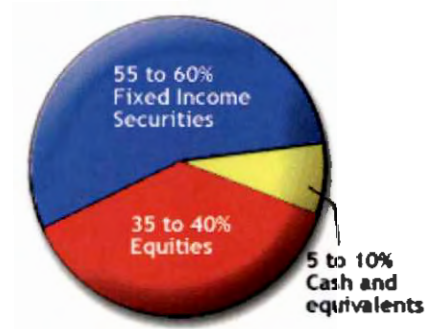


Source: Own

A moderately conservative model portfolio – is ideal for those who wish to preserve a large portion of the investment's total value, but are willing to take on a higher amount of risk to get some inflation protection. This can be better explained by comparing figure 2.3 and figure 2.4. From the comparison one can clearly see that the proportion allocated towards fixed income securities (low risk) in figure 2.3 are being replaced by more equities (high risk) in figure 2.4. Therefore, an investor would still be able to preserve a large portion (55% - 60%) of the investments value, but are guarding against inflation risk by adding more equities portraying a higher risk versus return relationship. A retiree can choose securities that pay a high level of dividends or coupon payments to enhance current income.

Figure 2.4: Example Moderately Conservative portfolio

Moderately Conservative Portfolio

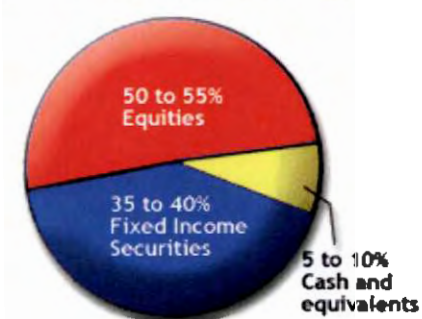


Source: Own

Moderately aggressive model portfolios – are often referred to as “balanced portfolios” since the asset composition is divided almost equally between fixed-income securities and equities in order to provide a balance of growth and income. A moderately aggressive portfolio has a higher level of risk than conservative portfolios and should be selected in accord with a longer time horizon (generally more than five years).

Figure 2.5: Example Moderately Aggressive portfolio

Moderately Aggressive Portfolio

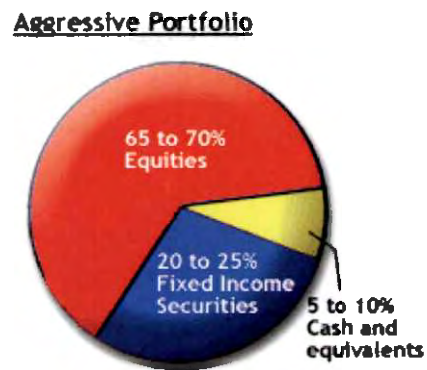


Source: Own

Aggressive model portfolios – mainly consist of equities. The main goal for an aggressive portfolio is capital growth over a long-term. Volatility in the unit price and market returns contributes to the high risk classification. Again, considering the risk

versus return relationship, an investor can expect to earn a greater return than that offered by a conservative portfolio.

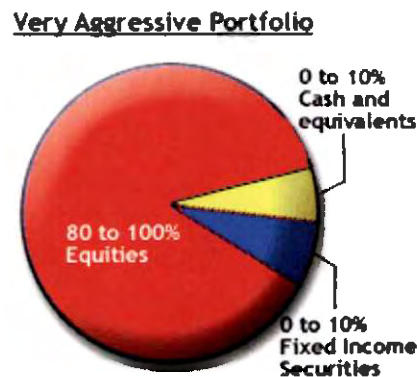
Figure 2.6: Example Aggressive portfolio



Source: Own

Very aggressive model portfolios consist almost entirely of equities. The main goal of such a portfolio would be capital growth over a long time horizon. The portfolio carry a considerable amount of risk, and the value of the investment will vary widely over the short term.

Figure 2.7: Example Very Aggressive portfolio



Source: Own

The asset composition of a retiree's investment will depend on the personal circumstances of that individual. A retiree, along with the financial advisor, will need to consider life expectancy/time horizon, risk tolerance, investment objective and

available capital prior to, or at retirement. Constructing a portfolio according to the definition of an optimal portfolio might assist a retiree in mitigating the investment risk associated with a linked investment living annuity. However, a retiree is also confronted with managing the longevity of the investment. This, to a certain extent, can be explained by a more accurate assessment of the retiree's life expectancy.

2.8 Life expectancy

Life expectancy is defined as the age to which a person is expected to live. It can also be described as the remaining number of years a person is expected to live based on life expectancy tables used by insurance companies. It is important to note that life expectancy changes over time. As a person continues to age past mid-life, that person outlives an increasing number of people who are younger, so one's life expectancy actually increases. In other words, the older one gets – past a certain age – the older one is likely to get.

The application of life expectancy is a very important factor to consider when choosing the most appropriate post retirement investment vehicle. As mentioned previously, a retiree's life expectancy, along with current and future interest rates, will determine the income an annuitant will receive from a guaranteed life annuity. A guaranteed life annuity implicitly assumes the capital is fully depleted over the retiree's expected lifetime as calculated by the insurance company. Yaari (1965:137) used the results from a Modigliani life-cycle model on savings and consumption, to demonstrate that in a life cycle with no bequest motives, all consumers will hold life annuities as opposed to liquid assets or marketable wealth. The implication is that individuals, who expect to live longer than anticipated by the insurance company, will receive a prolonged income stream from the guaranteed life annuity surpassing the original capital amount invested.

From the above it is clear that a guaranteed life annuity has two distinct advantages in managing the longevity of an investment. The first is that the longevity risk is transferred to the insurance company, and the second is the fact that the original capital amount invested is assumed to be depleted at the estimated time of death.

Contrary to a guaranteed life annuity, in an investment linked living annuity the longevity risk has to be managed by the retiree. Also, the original capital amount invested can never be depleted as the maximum drawdown rate is fixed at 17.5% of the beginning of each year's fund value.

This implies that a retiree investing in an investment linked living annuity has to determine the estimated time of death in order to maximise the amount of income that can be withdrawn, keeping to the maximum 17.5% drawdown rule, over the specified period. Insurance companies, as mentioned above, uses standard mortality tables applicable to guaranteed life annuities to calculate life expectancies. On average an insurance company expects a male investor to reach an age of 81 years and a female investor 85 years. A retiree, however, would need to consider other factors in estimating life expectancy. The factors can include gender (females live longer than males), personal medical conditions and family history. Assessing these factors will give the retiree a better understanding of the investment horizon from the date of retirement until death.

2.9 Investment Horizon / Time

Life expectancy can also be translated into an investment horizon for the purposes of a retiree choosing a living annuity. Life expectancy constitutes the investment horizon from retirement until the event of bequeathing. When considering the various asset classes ranging from cash and bonds to property and equity, time would be a key considerate in choosing amongst the various asset classes. In general one can expect cash and bonds to show a low level of volatility, yielding relatively low returns. In contrast to cash and bonds, one can expect property and equity to show a high level of volatility, yielding relatively high returns. An important factor then to consider is that cash and bonds will yield a low risk versus return relationship irrespective of the investment horizon, short term or long term. Property and equity, however, will show a high level of risk versus return relationship over the short term, but viewed over the long term, this will change to a low level of risk with a high level of return.

Time and the effect of inflation is an important principle in examining asset classes. Although in the short term cash and bonds are somewhat safer, in the longer term it provides less protection against inflation. This means that for long term investment these are actually riskier in terms of maintaining real buying power, while property and equities, on an absolute return basis, are safer (Profile's Unit Trust, 2009:88).

Erasmus, et al., (2005:29) convey another point of reasoning when inflation is considered. The study analyzed the South African asset classes under various condition of inflation for the period 1980 – 2002. The findings divided the period into high inflation, disinflation and stationary inflation scenarios and found that on a risk adjusted basis, cash and long bonds outperformed the remaining asset classes in a disinflation scenario. In a high inflation and stationary inflation scenario cash again were ranked number one followed by unlisted property. On an absolute return basis, equities was ranked number one during the high and stationary inflation scenarios with unlisted property producing the second highest returns.

Investment term/horizon can also be correlated with the risk tolerance of individuals. Boscaljon (2004:168), based on previous research done by Bodie et al., (1992:427), illustrated how time impacts portfolio and consumption choices over an individual's life cycle. According to the theory, an individual's wealth is comprised of human capital and financial wealth. At the start of an individual's life cycle, wealth comprise mainly of human capital, which can be defined as the amount of working hours available. As an individual age, total remaining human capital decrease and financial wealth increases. Human capital, seen as a riskless asset, is decreased to a point where it is equal to financial wealth, seen as a risky asset. It is from this point onward in the life cycle that individual's start to reduce the amount of risky assets to keep the portfolio of human capital, financial wealth to a certain degree of risk tolerance.

Malkiel (1996:25) suggests that a persons' risk attitude is subjective, but risk capacity can be measured by position in the life cycle. This implies that people saving for retirement will become more risk averse closer to retirement or bequeathing. Hence, conventional financial planning models support the notion of time diversification and individual investors are encouraged to reduce the amount held in equities as the end

of pre- or post retirement is approached (Samuelson, 1989:4). The rate at which equity exposure are reduced, are often subjective and financial planners suggest a starting term as long as 15 years before retirement.

Vora and McGinnis (2000:47) found that the notion to reduce equity exposure during the retirement saving term might be questionable when considering the shortfall risk associated with a bond-heavy portfolio during pre-retirement planning. One would also need to consider whether pre-retirement and post-retirement planning can be seen as two separate events in relation to investment horizon, or should it rather be seen as one ongoing process with regards to asset allocation.

2.10 Asset allocation strategies

Retirement planning, as already mentioned, comprises of many unpredictable variables of which economic conditions and investment returns are just to name a few.

Retirees need to consider personal circumstances, life expectancies/investment horizons and risk tolerance when making decisions on how to best invest retirement savings. The ultimate goal for an annuitant, investing in a living annuity, is to preserve the capital for the purposes of bequeathing along with drawing a sustainable, growing income to combat the effects of inflation. With retirement planning the main focus was on achieving growth, while in post-retirement planning the focus will be on generating an income as well as achieving growth.

To achieve the focus points of post-retirement planning, a retiree would need to invest retirement savings intelligently according to an asset allocation strategy. Such a strategy will enable a retiree to control, to a certain extent, unpredictable variables like economic conditions and investment returns.

Investment strategies are well researched within the context of pre-retirement planning (Kim and Wong, 1997:37; Battocchio, Menoncin, Scaillet, 2007:141) and focus on investment horizons and variations of asset allocation. Post-retirement strategies, on the other hand, are not well documented. Asset allocation strategies

vary in depth and relevancy to the South African retirement environment and thus are not giving a clear indication to the best post-retirement investment strategy available to a retiring individual.

Many pre-retirement planning asset allocation strategies focus on a life cycle approach where the amount of equity exposure decreases as the investor near retirement. Life cycle studies consider investment horizon as a very important factor (Kim and Wong, 1997:36). It is suggested that, an investor with a long time horizon should invest the majority of a portfolio in equities. The exposure to equities should reduce systematically over time and be replaced with less volatile bonds and money market instruments. The reasoning behind the approach is that investors with a long investment horizon will have sufficient time to recover from a market slump leading to retirement. The closer the investor gets to retirement, the shorter the recovery time. In other words, a life cycle approach states that an individual, for example an individual aged 25, will hold a portfolio only consisting of equities because of the long investment horizon still left until retirement. Contrary to a 25 year old individual, a 60 year old person will hold a portfolio consisting mainly of risk-less assets such as bonds or money market instruments. The reason for the varying asset allocations can be explained by the 60 year old individual not having enough time left to recover capital losses after a sudden market downturn, whereas the 25 year old will have sufficient time to recover from such a market downturn.

It is also argued that, during pre-retirement, investors are in an accumulating phase where risk factors, measured by standard deviation, are minimised and returns maximised through averaging. The volatility over a long time horizon gives the investor the benefit of "dollar cost averaging". Dollar cost averaging implies that an investor will invest savings at different asset prices which will give an average investment cost over the time horizon and subsequently enhance returns over the same period of time (Dubil, 2004:267).

Post-retirement planning differs from pre-retirement in the sense that investors move from an accumulation phase to a de-accumulation phase. This is where investors utilise life savings to generate an income from. Dollar cost averaging, although

successful in the accumulation phase due to the neutralizing effect it has on standard deviation, are not applicable in the de-accumulation phase. Risky assets coincide with high volatility, thus, should a severe market downturn concurs with spending down retirement savings a retiree might not have sufficient time to recoup investment losses.

Ellement and Lucas (2007:35) have extended the life cycle philosophy to stretch beyond the investor's retirement age. The study argues that a retiree, according to life expectancy tables, still have a long investment horizon. It is concluded that a conservative asset allocation, during the post-retirement life cycle of a retiree, will have the highest probability of depleting assets where a moderate life cycle portfolio (that is well diversified amongst various asset classes) and the aggressive life cycle portfolio will have the smallest probability of depleting assets. Depleted assets according to the study constitute a zero savings balance. In an investment linked living annuity, however, the fund value cannot be zero due to the restrictions on the withdrawal rate (maximum 17.5 percent of the beginning of each year's fund value).

The study by Ellement and Lucas (2007:35) are supported by Schleef and Eisinger (2007:241). Schleef and Eisinger (2007:241) also agree that investors should choose a more aggressive life cycle approach as appose to a defensive one. Schleef and Eisinger (2007:241) argued that the risks involved with pre-retirement planning can rather be described as 1) not reaching retirement goals, 2) achieving the goal by having to invest extraordinary sums annually, or 3) coming close to reaching one's retirement goal, only to have a sudden market downturn near retirement result in significant loss of capital just as one approaches retirement age. These finding support the fact that some retirees need to invest more heavily in equities due to a possible gap between retirement savings and required capital at retirement.

Spitzer and Singh (2008:151) differ from the previous research mentioned. The study compared three life cycle funds (gentle decent, steep decent and a portfolio consisting of 25 percent equity and 75 percent bonds) against six, fixed percentages of equity and bond, portfolios. The conclusion to the study was that life cycle funds have a high probability of shortfall (longevity) risk and do not provide larger estates.

The study found that portfolios containing between 50 and 70 percent equity are most optimal and outperform all the life cycle funds over a 30 year period.

A South African study by Goemans and Ncube (2008:37) modelled asset allocation strategies for retirees investing in a living annuity. The aim was to establish whether a specific asset allocation would be able to support different income percentages drawn from the investment. The study compared the results to the available income amounts from a guaranteed life annuity and with-profits annuity. The findings were based on three different withdrawal strategies and found that the most optimal asset allocation strategy would be one consisting of 25 percent equities and 75 percent bonds. This portfolio, according to the study, also has the least chance of financial ruin (earning below minimum level). Goemans and Ncube concluded that an annuitant should not withdraw an income of more than 7.5 percent of the capital amount.

Beinash (2007:23) also conducted a study on living annuities with reference to asset allocation. The model derived tested eight different portfolios with asset allocations varying between equities, long term index linked bonds, one-year index linked bonds, long term conventional bonds and short term conventional bonds. It was concluded that for withdrawal rates smaller than 5 percent, an all bond portfolio would be most optimal and produce the lowest probability of ruin. It is also noted that the higher the drawdown rate, the more exposure to equity a retiree would need to consider. It is evident from the study that with an increase in equity, the probability of ruin also increases significantly.

It has to be said that adequate retirement savings are the key to financial independence. A retiree with a gap between required retirement capital and actual retirement savings does not have a choice, but to embrace equity exposure during the post retirement period. The risks involved can be measured and a decision would need to be taken with regards to probability of ruin. Unfortunately, a retiree would need to understand that human capital is depleted at retirement, and should financial ruin become evident, no alternative would be left but to cut to back on the current life style.

Chapter 3

Post-Retirement Asset Allocation empirically investigated

3.1 Introduction

Retirement is a lifelong dream becoming a reality. This reality for most South African retirees will be in stark contrast to the dream about retirement. Statistics show that very few individuals will be able to afford the same standard of living after retirement (Warshawsky and Ameriks, 2000:37). This is mainly because people under-estimate how much capital is needed for retirement and over-estimate how much capital is accumulated at retirement.

Saving for retirement ultimately is the only way one can guarantee a financially independent retirement. An individual would need to actively manage the retirement savings process to assure that the target retirement capital amount is reached. Individuals would need to consider key aspects for example contribution rates, as a percentage of salary, towards an approved retirement scheme, the required rate of return on investments and the contribution or investment term. Managing these critical success factors will enhance the probability of reaching the required 75% income replacement ratio.

At retirement though, an individual's human capital is depleted and retirement savings stops to accumulate. In other words, at retirement a retiree does not have any working days left, and therefore no way of accumulating more retirement savings. A retiree would need to use the fixed corpus of life savings to buy an income for life. From the literature review it is evident that as many as 75% of individuals choose to invest the corpus of life savings in a living annuity. A living annuity offers the retiree more flexibility in terms of drawdown rates and investment choices and even leaves the retiree with the motive to bequeath.

This chapter will endeavour to highlight key considerations of the pre-retirement savings process and the post-retirement investment phase within the context of a living annuity.

The chapter is divided into two sections covering the full retirement cycle from pre-retirement savings to post retirement income withdrawals from a living annuity. The first section of the chapter will look at the pre-retirement savings habits of investors in order to determine the available capital amount at retirement for different categories of retirees. The second section will focus on the post-retirement phase where the retirement savings is invested in a living annuity. Different asset allocations will be tested in order to determine which assets will yield the highest returns taking into account longevity risk, drawdown risk and investment risk.

3.2 Research Methodology

3.2.1 General Modelling Procedures and Assumptions

Software used: Modelling was done using Microsoft Excel and XLSTAT version 2009.04.07.

XLSTAT was used to do the forecasting of unit prices in the post-retirement phase. This forecasting model is based on the program's Auto-Regressive Integrated Moving Average (ARIMA) function. The ARIMA function uses time series data to project future returns.

Retirement date: For the purposes of this study the retirement date was set at the 20th of July 2004.

Categories of retirees: All calculations done will refer to individuals from different Living Standards Measurement (LSM) categories ranging from LSM one to ten. The LSM categories, as defined by the literature review, are divided according to different income bands. For the purposes of this study three (3) broad LSM groups were selected. LSM one to five constitute the first group, LSM six and seven the second, and LSM eight to ten the third group. The respective income bands per group will be R1500.00 per month for the first group, R3500.00 per month for the second and R11000.00 per month for the third group. The categories of retirees were further divided into individuals retiring at different ages. It was decided to model individuals retiring at ages 55, 60, 65 and 70.

3.2.2 Modelling Procedures and Assumptions: Pre-Retirement savings phase

This section of the chapter will look at the pre-retirement savings habits of investors in order to determine the available capital amount at retirement for different categories of retirees. As this part of the computations is not dealt with in the literature review specifically, it was decided to use a simplistic, yet thorough, approach using the following assumptions and methodology.

Categories of retirees: Various categories of retirees were modelled with reference to the different LSM groups and retirement ages. It was assumed that all categories of retirees started to save for retirement at the age of 25.

Final earnings will refer to the income bands associated with the three LSM groups. For the first group (LSM 1 – 5), final earnings of R1500.00 per month were modelled, for the second group (LSM 6 and 7) R3500.00 per month and for the last group (LSM 8 – 10) final earnings were assumed to be R11000.00 per month.

Contribution rates: From the final earnings assumptions various contribution rates were modelled. The literature review refers to the average contribution rate currently applicable in the South African retirement environment. The 2009 contribution rate stands at 11.3% of an individual's annual salary. In the pre-retirement calculations this rate was taken as the mean. A best case scenario is also tested at a contribution rate of 13.3% and a worst case scenario of 9.3% contribution. These rates were used to calculate a monthly contribution towards an approved retirement savings scheme.

Investment growth rates: The monthly contributions made towards an approved retirement savings scheme is modelled to earn investment growth at a compounding growth rate. The growth rates were modelled at a worst case scenario of 8%, a mean of 10% and a best case scenario of 12% investment growth.

The salary increase rate: The final earnings income amounts for the different LSM groups were discounted back annually at the historical inflation rate (applicable to the year of income) to the age of 25. In other words an inverse calculation was done for an income growing at the current inflation rate from age 25 until retirement.

Required standard of living: As stated by the literature review, the required standard of living can be defined by the net replacement ratio, the earnings replacement ratio or the retirement replacement ratio. Three scenarios were tested assuming a net replacement ratio of 75%, 50% and the current South African retirement environment norm of 28%. The net replacement ratio was expressed as a percentage of the accumulated retirement fund value. This ratio was taken as the percentage income to be withdrawn from the living annuity. The net replacement ratio can be explained by the following example.

The assumptions applicable to the pre-retirement phase enable one to calculate an estimated retirement value. For example, assuming an individual retiring at age 60 with a final earnings of R11,000.00 per month, contributing 11.3% of monthly income towards an approved retirement savings scheme and earning 10% compounded investment growth can expect to have an estimated R775 508 in retirement capital. A net replacement ratio of 75% constitute a monthly income post-retirement of R8250.00 ($R11,000 \times 75\%$). Thus, a retiree would draw a total of R99,000 ($R8250 \times 12$) during any given year. The R99,000 yearly income expressed as a percentage of the total fund value ($R99,000/R775,508$) is 12.77%. In other words, the retiree needs to withdraw 12.77% of the fund value in order to sustain a 75% net replacement.

3.2.3 Modelling Procedures and Assumptions: Post-Retirement phase

This section of the chapter will look at the post-retirement phase where a retiring individual invests the corpus of life savings in a living annuity. The post-retirement phase is characterized by the monthly income being withdrawn from the life savings invested in a living annuity. The living annuity product offers the retiree flexibility in terms of drawdown rates and investment choices.

The pre-retirement savings, as determined in the pre-retirement phase, will be used to model various categories of retirees investing in a living annuity. This section will test the sustainability of income withdrawals at various withdrawal rates from investments in a range of asset allocations made up of unit trust funds from different

investment sectors. In order to analyse the different variables, the following assumptions and methodology were used:

Category of retirees: The pre-retirement phase calculations highlighted a range of individuals retiring with different retirement fund values. These will be tested against various withdrawal rates and asset allocations.

Life expectancy or investment term: For each of the individuals retiring at ages 55, 60, 65 and 70 life expectancies were calculated. The calculation of life expectancy was done using a risk model, rather than an annuity model, to simulate the investment term. The risk model used considered the following factors: smoking status, monthly income and the level of education per individual. It was considered important to use a risk model to further diversify the categories of retirees. (Annexure B)

Data: Selected financial and stock market data were obtained from Profile's Unit Trusts and Collective Investments internet web site (www.fundsdata.co.za). Data were drawn according to table 2.1. For each of the 3rd Tier fund sectors, nine unit trust funds were selected. The data obtained included daily unit prices and dividends declared from the 21st of July 2004 until the 20th of July 2009. The data was projected forward for a period of 35 years, or until July 2044. The forecast was done using the ARIMA model as discussed under the general assumptions.

Investment costs and taxes: Investment costs included fund manager fees, administration fees and ongoing commission charges. The costs were calculated as a Total Expense Ratio (TER). The TER was derived using the average cost to invest among three insurance companies. A TER of 2.09% per year was used for all calculations. The effects of income and retirement taxes were excluded from all calculations.

The post-retirement phase, as mentioned previously, is characterized by the monthly income being withdrawn from the life savings amount invested in a living annuity. The post-retirement phase will test the sustainability of income withdrawals at various

withdrawal rates from a range of asset allocations making use of different categories of retirees highlighted by the pre-retirement phase.

For each of the 3rd Tier fund sectors, the annual returns, risk as defined by the sectors standard deviation and coefficient of variation was calculated from July 2004 (retirement date) until July 2009. The same methods were repeated for the projected figures to estimate the time of ruin (monthly income falling below the original income amount considering the maximum withdrawal rate of 17.5%) for the various fund sectors at a range of withdrawal rates.

3.3 Results and discussion

3.3.1 Pre-Retirement Phase

The pre-retirement phase provided insights into the amounts available for retirement. A simplistic model was developed to calculate the retirement amounts available making use of contribution rates, investment growth and the investment term as variables.

Retirement savings balances for individuals with final earnings of R1500.00 per month, retiring at ages 55, 60, 65 and 70 were simulated at varying contribution rates and investment growth assumptions. The details thereof are shown in Table 3.1 below. The retirement savings balances for individuals earning R3500.00 per month and R11,000.00 per month is included in Appendix C.

A study by Purcell and Whiteman (2005:32) confirmed that the investment term, contribution rate and investment growth has the biggest influence on an individual's retirement savings balance. This can be confirmed by the accumulated amounts as depicted in Table 3.1.

Table 3.1: Retirement savings balances

		Contribution					
		Retirement age 55			Retirement age 70		
		13.3%	11.3%	9.3%	13.3%	11.3%	9.3%
Growth	12.00%	R 146 470	R 124 444	R 102 419	R 288 285	R 244 934	R 201 583
	10.00%	R 105 963	R 90 029	R 74 095	R 171 274	R 145 518	R 119 763
	8.00%	R 78 737	R 66 897	R 55 056	R 108 988	R 92 599	R 76 209

		Contribution					
		Retirement age 60			Retirement age 65		
		13.3%	11.3%	9.3%	13.3%	11.3%	9.3%
Growth	12.00%	R 182 465	R 155 027	R 127 588	R 230 833	R 196 121	R 161 410
	10.00%	R 124 468	R 105 751	R 87 034	R 146 998	R 124 893	R 102 788
	8.00%	R 88 247	R 74 977	R 61 707	R 98 737	R 83 889	R 69 041

Source: Own

Stating the obvious, the longer one save the more savings will be accumulated. What is not explicitly visible is the effect of compounded growth. An individual retiring at age 70, earning 12% compounded growth annually and contributing 13.3%, only contributed R2394.00 during the last year before retirement. The savings balance though grew by 13.68% from R253 592 to R288 285. The effect of compounded interest is perhaps even clearer when comparing the same individual's savings balance at a rate of 8% compounded interest. It is also evident from the calculation that the higher the contribution rate, the higher the savings balance would be.

For an individual earning R1500.00 a month, retiring at age 65, contributing 11.3% and earning 10% growth, having R124 893 in accumulated savings might seem like enough money to retire with. One, however, would have to convert this amount of accumulated savings into a net replacement ratio. The net replacement ratio has to be stated as a percentage of income that needs to be withdrawn from the life

savings. Assuming the same 65 year old retiree require a 75% net replacement ratio, thus R1125 income per month, would need to draw 10.8% from the life savings yearly, paid on a monthly basis. The table below detail the required drawdown rates at various net replacement ratios.

Table 3.2: Net Replacement ratio converted to drawdown rates

Individual retiring at age 55										
Net Replacement Ratio	13.3% Contribution			11.3% Contribution			9.3% Contribution			
	75%	50%	28%	75%	50%	28%	75%	50%	28%	
Growth rate	12	9.22%	6.14%	3.44%	10.85%	7.23%	4.05%	13.18%	8.79%	4.92%
	10	12.74%	8.49%	4.76%	15.00%	10.00%	5.60%	18.22%	12.15%	6.80%
	8	17.15%	11.43%	6.40%	20.18%	13.45%	7.53%	24.52%	16.35%	9.15%

Individual retiring at age 60										
Net Replacement Ratio	13.3% Contribution			11.3% Contribution			9.3% Contribution			
	75%	50%	28%	75%	50%	28%	75%	50%	28%	
Growth rate	12	7.40%	4.93%	2.76%	8.71%	5.81%	3.25%	10.58%	7.05%	3.95%
	10	10.85%	7.23%	4.05%	12.77%	8.51%	4.77%	15.51%	10.34%	5.79%
	8	15.30%	10.20%	5.71%	18.01%	12.00%	6.72%	21.88%	14.59%	8.17%

Individual retiring at age 65										
Net Replacement Ratio	13.3% Contribution			11.3% Contribution			9.3% Contribution			
	75%	50%	28%	75%	50%	28%	75%	50%	28%	
Growth rate	12	5.85%	3.90%	2.18%	6.88%	4.59%	2.57%	8.36%	5.58%	3.12%
	10	9.18%	6.12%	3.43%	10.81%	7.21%	4.04%	13.13%	8.76%	4.90%
	8	13.67%	9.12%	5.10%	16.09%	10.73%	6.01%	19.55%	13.04%	7.30%

Individual retiring at age 70										
Net Replacement Ratio	13.3% Contribution			11.3% Contribution			9.3% Contribution			
	75%	50%	28%	75%	50%	28%	75%	50%	28%	
Growth rate	12	4.68%	3.12%	1.75%	5.51%	3.67%	2.06%	6.70%	4.46%	2.50%
	10	7.88%	5.25%	2.94%	9.28%	6.18%	3.46%	11.27%	7.51%	4.21%
	8	12.39%	8.26%	4.62%	14.58%	9.72%	5.44%	17.71%	11.81%	6.61%

Source: Own

From the table above, it is evident that the more one saves during the pre-retirement phase, the less strain (that is, the smaller the required drawdown rate) one will put on the life savings post-retirement. An individual, retiring at age 70, contributing 13.3% and only earning 8% growth, would have to withdraw 12.39% from the life savings in order to sustain a 75% net replacement ratio. The literature review highlighted that very few people will be able to support themselves during the post-retirement phase. This is supported by the high percentages retirees with low growth and contribution rates have to withdraw, even to replace 28% of the final earnings. Comparing these ratios to the maximum allowable drawdown rate of 17.5%, one can clearly see why the South African retirement environment only has a 28% net replacement ratio. The study shows that final earnings have no effect on the drawdown percentages. In other words, whether the final earnings is R1500.00 per month or R11000.00 per month does not have any influence on the percentage that needs to be withdrawn to sustain for example a 75% replacement ratio. The factors influencing the drawdown percentages are confined to the contribution rates, investment growth rates and the investment or contribution term (retiring at different ages).

3.3.2 Post-Retirement Phase

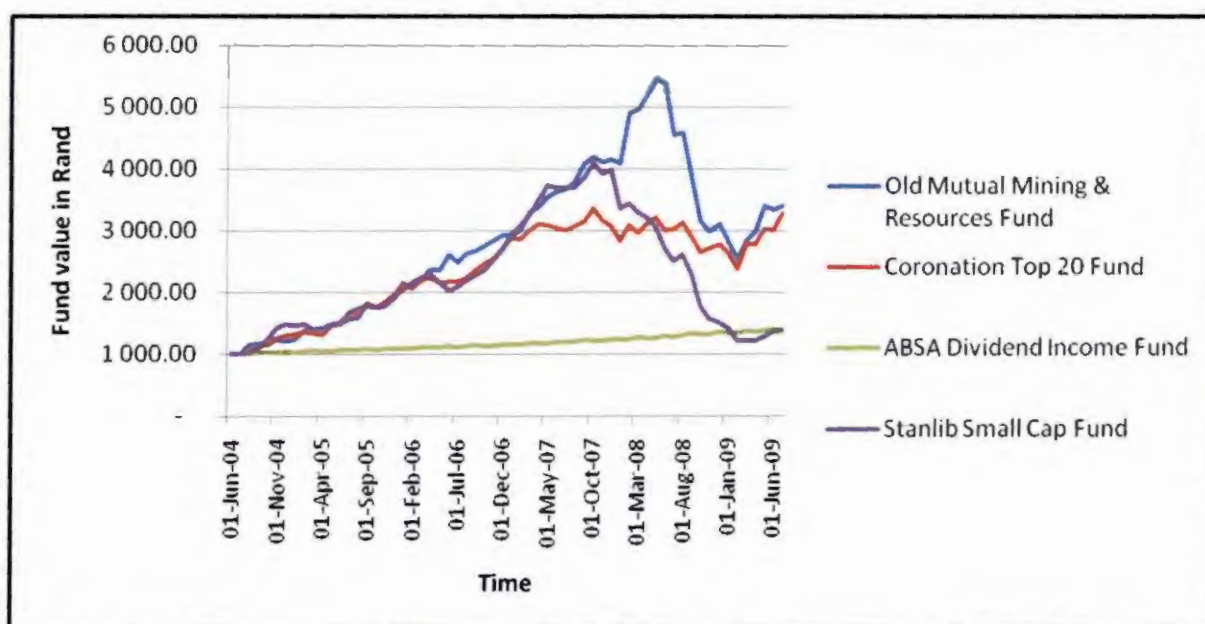
The pre-retirement phase provided insights into the amounts available for retirement calculated according to contribution rates, investment growth rates and the

contribution terms. The available retirement amounts were used to calculate withdrawal rates at various net replacement ratios.

The post-retirement phase will test the sustainability of these drawdown rates against the life expectancy of various retiring individuals. The available retirement savings balances will be invested in a living annuity (keeping to product rules) utilizing various categories of unit trust funds from different investment sectors as per table 2.1. In total 191 unit trust funds from different investment sectors, as per Tier 3, have been analysed on the actual returns from July 2004 (retirement date) until July 2009.

The data from the unit trust funds showed that the Old Mutual Mining and Resources Fund, Class R, returned the highest growth rate, with the Coronation Top 20 fund the second highest growth rate. The ABSA Dividend Income fund, Class A, and the Stanlib Small Cap fund, Class A, were the two worst performing funds during the last 5 years. Graph 3.1 below shows the growth of an R1000.00 lump sum amount invested in each fund over the past 5 years.

Chart 3.1: Investment growth for 4 individual unit trust funds



Source: Own

The graph clearly shows the investment growth during the 5 year term. The Old Mutual Mining & Resources fund showed a 27.8% annual growth with a standard deviation of 25.13%. In comparison to the Old Mutual Mining & Resources fund, the Stanlib Small Cap fund illustrated a 9.67% annual growth rate with a standard deviation of 24.46%. The standard deviation (deviation from the mean) measuring the risk component of a fund confirms that high risk, as in the case with the Stanlib Small Cap fund, is not always correlated to high returns. The ABSA Dividend Income fund has very little deviation from the mean (4.72%), but very little growth was achieved (6.42%) over the past 5 years.

The components that constitute the growth in the 4 funds are not as clearly visible as the actual growth of the funds. A unit trust fund has two parts that can contribute towards the overall growth. The first component is the unit price and the second the dividend and interest declarations paid annually, semi annually or quarterly. The Old Mutual Mining & Resources fund's unit price has risen from R17.10 per unit in 2004 to R52.27 in July 2009. The rise in the unit price gave the investor a capital growth of 25.04% annually. The remainder of the growth came from the dividend and interest declarations made throughout any given year. On the other hand, the ABSA Dividend Income fund's unit price has only risen from R1.0074 per unit to R1.0216 per unit, thus, a capital growth of 0.28% annually. Dividend and interest declarations made up the remainder of the 6.42% growth annually. It has to be noted that the four funds illustrated, are from different investment sectors, all with varying investment mandates and required risk versus return relationships. These funds can thus not be compared to each other on a pure return basis.

A more appropriate evaluation of the individual unit trust funds would be by comparing the returns, adjusted by the risk factor. The coefficient of variation (CV) has been calculated for each of the unit trust funds illustrating the risk per unit of return. The Coronation Top 20 fund achieved the second highest absolute return during the past 5 years with a coefficient of variation of 0.704. On a risk adjusted basis then, the Coronation Top 20 fund is less risky than the ABSA Dividend Income

fund with a CV of 0.736, the Old Mutual Mining & Resources fund (0.903) and the Stanlib Small Cap fund (2.544).

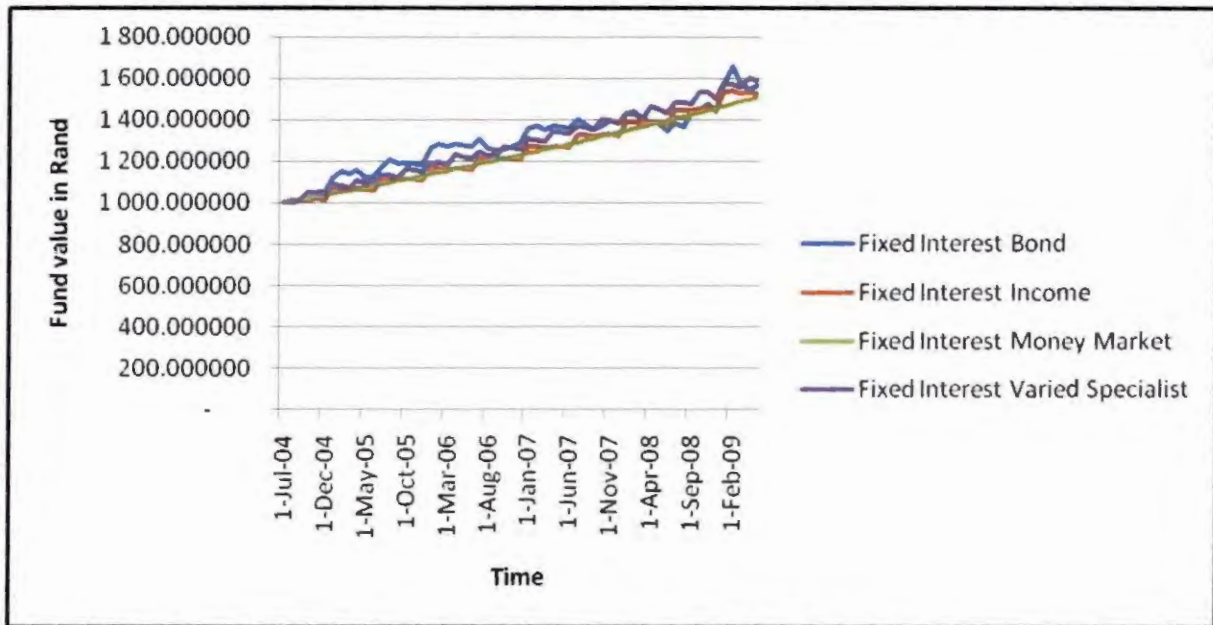
The sectors within which these funds fall, as defined by the literature review, all focus on a specific part of the financial market. The equity - financial sector, for example, invests in financial institutions including banks, insurance companies and brokerage firms and the fixed interest – income sector invests in fixed deposits and gilts. The risk versus return relationship will vary depending on the focus area. Illustrating the performances of the various sectors has been done using the average unit price returns and dividend and interest declarations for the individual funds linked to that sector. Each of the average sector funds has been priced at R1.00 per unit on the 20th of July 2004. The growth per average sector fund, given a R1000.00 lump sum investment, as classed under the different asset allocations, is shown in the charts below.

Chart 3.2: Equity Asset Allocation – historical growth



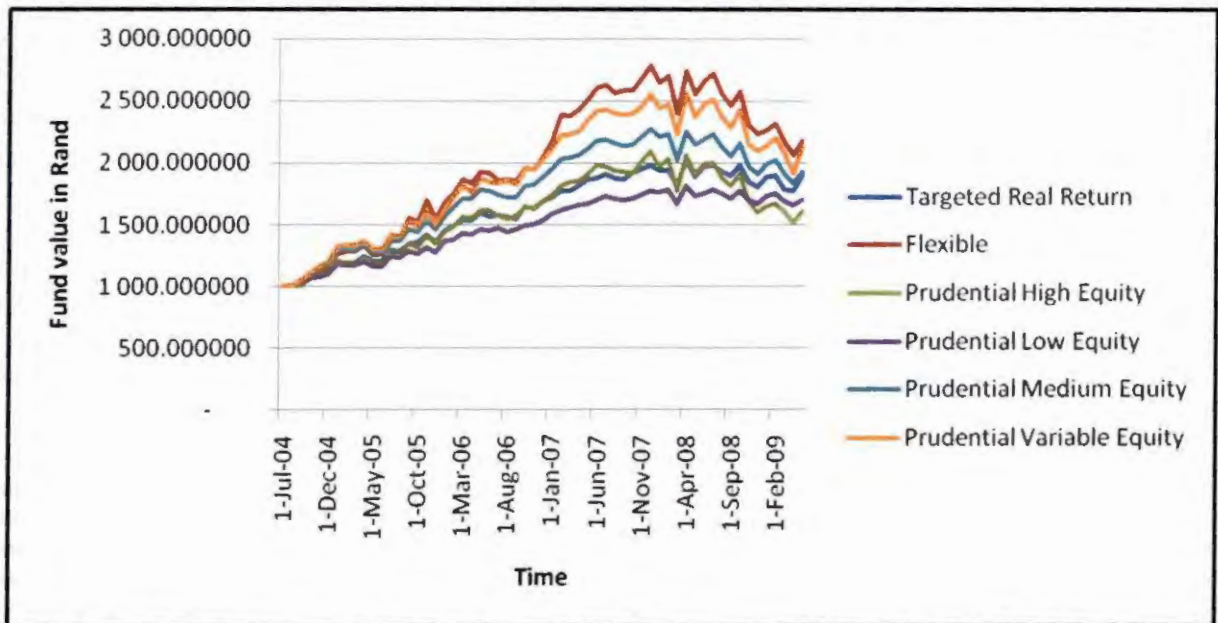
Source: Own

Chart 3.3: Fixed Interest Asset Allocation – historical growth



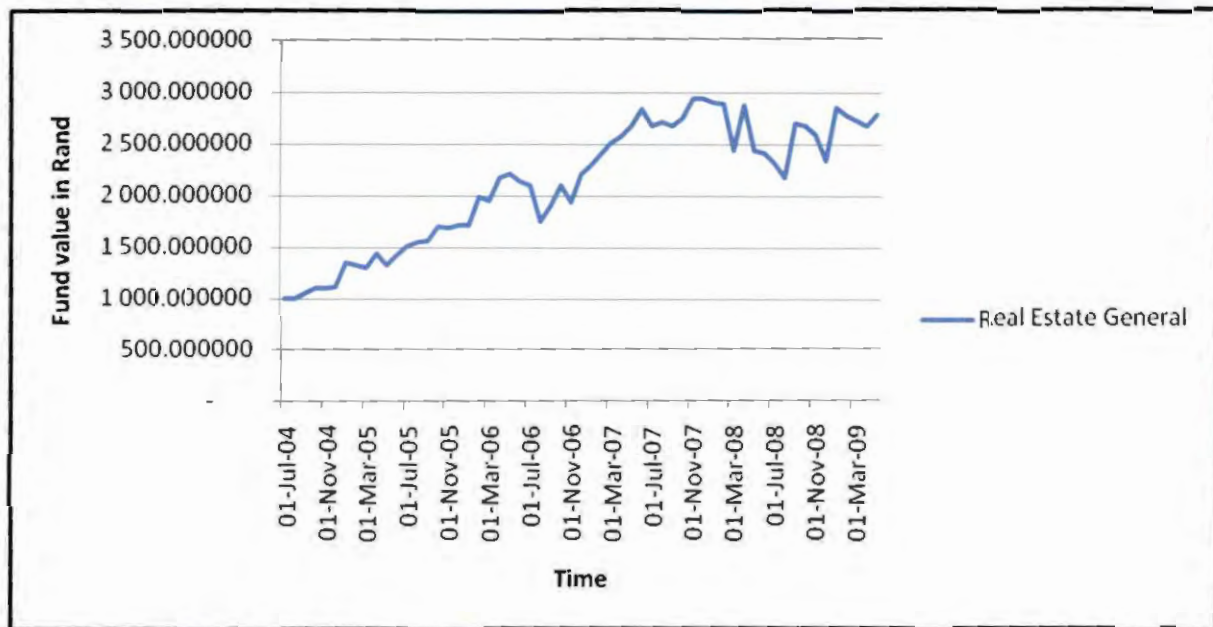
Source: Own

Chart 3.4: Asset Allocation – historical growth



Source: Own

Chart 3.5: General Property Asset Allocation – historical growth



Source: Own

The charts above show the growth rates of various sector funds, grouped under the respective asset allocation classes. The equity asset allocation class displays a high percentage of volatility and also higher growth rates compared to that of the fixed interest asset allocation and the general asset allocation class. The equity asset allocation, on average, gained 16.06% in capital growth compared to the 10.54% of the general asset allocation, the fixed interest (0.96%) and general property (14.42) asset allocation. The growth rates again have to be compared on a risk adjusted basis. The tables below highlight the individual characteristics per sector class.

Table 3.3: Equity Asset Allocation – individual sectors

Sector Fund	Equity Financial	Equity General	Equity Growth	Equity Industrial	Equity Large Cap	Equity Resource ; industries	Equity Small Cap	Equity Value	Equity Varied Specialist
Average Return	17.87%	17.72%	18.57%	20.70%	18.93%	23.85%	18.24%	19.69%	18.39%
Standard Deviation	27.44%	20.68%	27.92%	22.65%	24.90%	35.52%	28.59%	15.52%	22.81%
Coefficient of Variation	1.5361	1.1672	1.5032	1.0938	1.3152	1.4897	1.5675	0.7885	1.2403

Source: Own

Table 3.4: Fixed Interest and General Property Asset Allocation – individual sectors

Sector Fund	Fixed Interest Bond	Fixed Interest Income	Fixed Interest Money Market	Fixed Interest Varied Specialist	Real Estate General
Average Return	9.41%	8.79%	8.48%	9.46%	24.75%
Standard Deviation	9.31%	6.85%	0.00%	7.17%	28.73%
Coefficient of Variation	0.9900	0.7792	0.0000	0.7575	1.1610

Source: Own

Table 3.5: General Asset Allocation – individual sectors

Sector Fund	Targeted Real Return	Flexible	Prudential High Equity	Prudential Low Equity	Prudential Medium Equity	Prudential Variable Equity
Average Return	12.84%	17.28%	10.93%	10.83%	14.21%	16.24%
Standard Deviation	13.30%	18.51%	17.14%	10.57%	14.51%	18.11%
Coefficient of Variation	1.0357	1.0714	1.5672	0.9756	1.0215	1.1151

Source: Own

The tables above highlight the average returns, standard deviations and risk adjusted returns for the various asset allocation classes. The real estate - general sector had the highest return (24.75%) followed by the equity - resources and basic Industries sector (23.85%). The coefficient of variation for the equity class (average 1.3) is much higher than that of the general asset allocation (average 1.13) or the fixed interest (0.84) asset allocation class. The equity class's higher returns are associated with much more risk compared to the other asset classes. It is important to note that these returns are highly correlated to the current, or in this case historical, economic environment. The South African economy had a long bull market (high financial market returns) in which equity yielded very high returns. Certain sectors, for example the resources and basic industries sector and the general property sector yielded above average returns because of the favourable market conditions.

It was therefore decided, in testing the different drawdown strategies, to only use the average returns from the equity sector funds, asset allocation sector funds, fixed interest and real estate sector funds as per Tier 2 and 3 of table 2.1. The unit price for each of the individual asset classes were again set at R1.00 per unit on the 20th of July 2004. The available data from July 2004 to July 2009 were used to forecast the monthly unit prices until July 2044. Dividend and interest declarations were simulated

by using the average six monthly declarations for the equity, general asset allocation and real estate classes. For the fixed interest class an average declaration every three months were simulated. Employing these calculations, the portfolios (combinations of asset allocations) below were constructed. Each of the portfolios was tested to determine the time until financial ruin considering various categories of retirees as depicted in the pre-retirement phase. The portfolios were rebalanced at the end of every investment year to keep to the set asset allocation.

Table 3.6: Different Portfolios tested

Portfolio	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Equity	100 %				50 %		50 %		50 %		25 %	40 %	30 %	20 %	10 %
Real Estate		100 %			50 %			50 %		50 %	25 %	30 %	20 %	10 %	40 %
Asset Allocation			100 %			50 %		50 %	50 %		25 %	20 %	10 %	40 %	30 %
Fixed Interest				100 %		50 %	50 %			50 %	25 %	10 %	40 %	30 %	20 %

Source: Own

The portfolios above all have different risk and return characteristics as explained by the literature review. The portfolios vary from very aggressive (portfolio 1) to very conservative (portfolio 4) depending on the exposure to highly volatile equities or very stable fixed interest instruments. The risk to a retiree investing in a highly volatile portfolio would be that if in the short term returns are poor, the portfolio may not be able to recover even when returns improve again. The volatility in a very aggressive portfolio however, might enable an investor to receive returns that is above average and the investor would therefore be able to grow the overall fund value, even when withdrawing an income. The risk associated by a very conservative portfolio would be the low potential growth receivable. This would impact the fund value negatively, as the investor might be drawing a higher percentage income than the growth received on the funds. The table below highlight the respective returns,

standard deviations and coefficient of variations for the different portfolios over a 5 and 40 year term.

Table 3.7: Portfolio returns, standard deviations and coefficient of variations

		Standard Deviation		Returns		Coefficient of variation	
Column number		1	2	3	4	5	6
Investment years		5	40	5	40	5	40
Averages		20.14%	10.50%	17.91%	7.34%	1.09	1.48
Portfolio	1	29.91%	14.91%	22.40%	5.74%	1.34	2.60
	2	29.39%	14.62%	24.33%	9.52%	1.21	1.54
	3	16.79%	8.59%	14.83%	5.16%	1.13	1.67
	4	4.49%	3.87%	10.06%	8.95%	0.45	0.43
	5	29.65%	14.77%	23.37%	7.63%	1.27	1.94
	6	10.64%	6.23%	12.46%	7.05%	0.85	0.88
	7	17.20%	9.39%	16.23%	7.34%	1.06	1.28
	8	23.09%	11.61%	19.58%	7.34%	1.18	1.58
	9	23.35%	11.75%	18.61%	5.45%	1.25	2.16
	10	16.94%	9.25%	17.19%	9.24%	0.99	1.00
	11	20.14%	10.50%	17.90%	7.34%	1.13	1.43
	12	24.59%	12.46%	20.23%	7.08%	1.22	1.76
	13	18.32%	9.80%	17.09%	7.72%	1.07	1.27
	14	16.98%	9.04%	15.86%	6.85%	1.07	1.32
	15	20.68%	10.69%	18.43%	7.72%	1.12	1.38

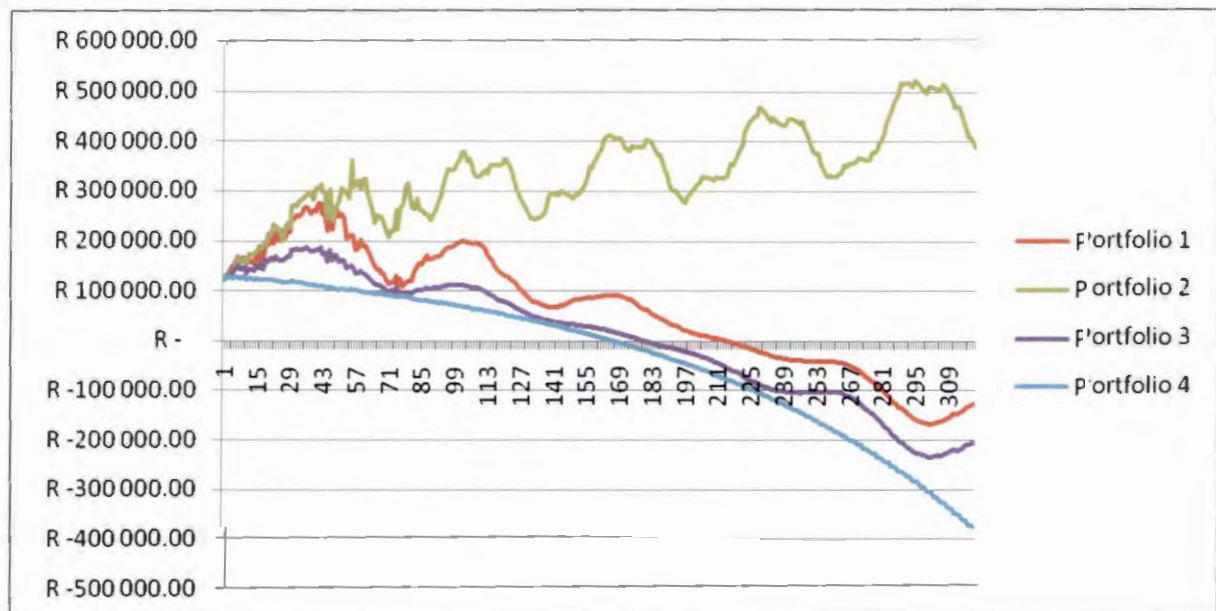
Source: Own

The table above highlight the fact that the more exposure a retiree has to equity the higher the risk per unit of return one can expect (portfolio 1, column 6). The data show that over the past 5 years, an investor investing in portfolio 1 would have received a growth rate of 22.40% (column 3) and in portfolio 2, comprising of real estate only, a growth rate of 24.33% (column 3). Portfolio 4, comprising of 100% fixed interest securities, yielded above average returns (column 4) over the projected

40 year term with a very low percentage standard deviation (column 2). It also seems that, as in the case with portfolio 13, the higher the fixed interest portion in a portfolio, the less risk per unit of return is associated with the portfolio (column 6). Portfolio 11, which is equally weighted amongst all the asset allocations, has achieved returns equal to the averages over all the different portfolios. This portfolio would be able to test the potential benefits of diversification.

Given the data above, one would have to question whether or not portfolio 4, which is a 100% fixed interest portfolio, would be able to support a retiree until the end of the life expectancy term, given a fixed net replacement ratio throughout the post-retirement phase. One would also have to ask whether portfolio 1 or 2 (having the highest returns) would be an appropriate asset allocation when withdrawing a regular income, because of the high volatility associated with these investments. The graph below depicts the movement in fund value for portfolio 1 to 4. An individual retiring at age 65, who had a contribution rate of 11.3% and earned 10% investment growth with final earnings of R1500.00 per month were tested. Assuming this individual require a net replacement ratio of 75% is simulated.

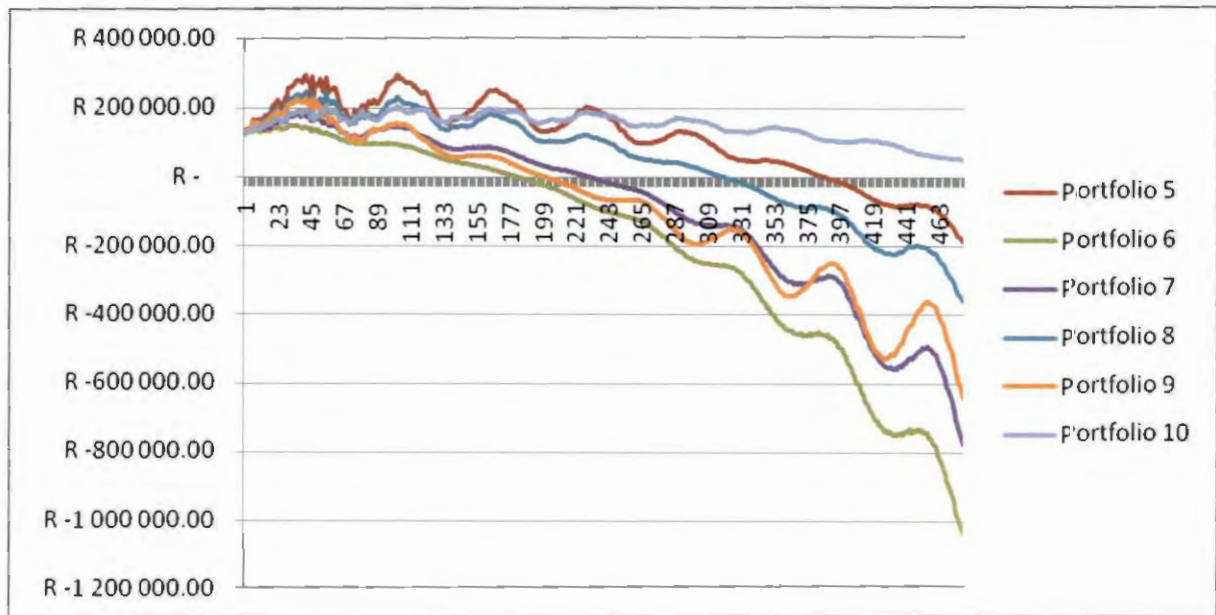
Chart 3.6: Fund value over time



Source: Own

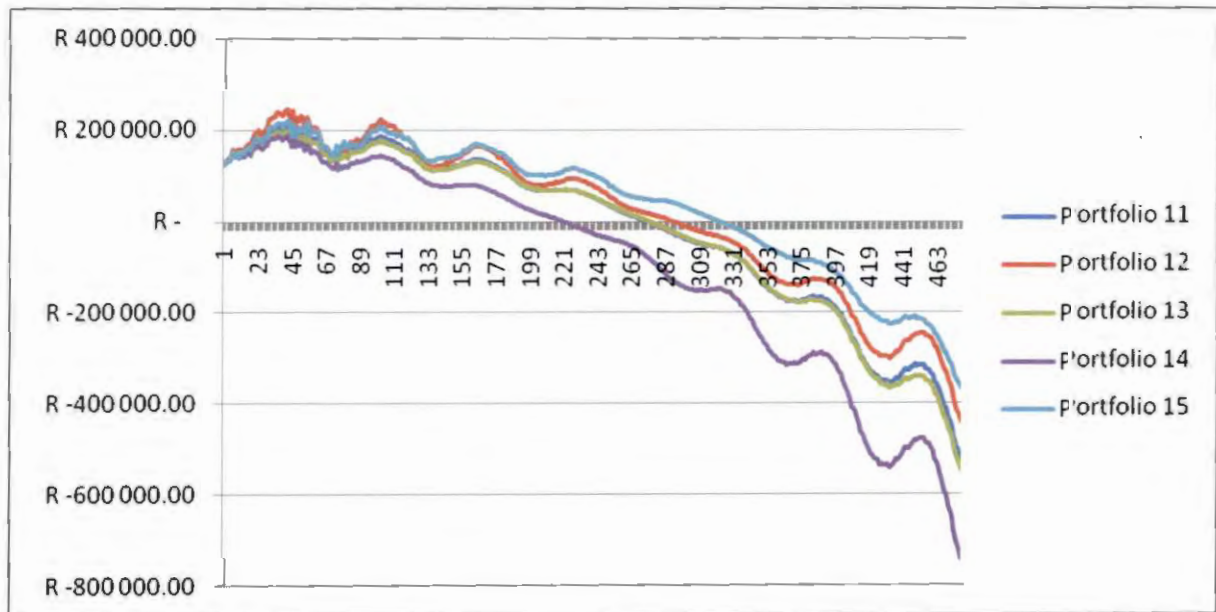
From the graph above it is evident that portfolio 4, comprising 100% of fixed interest instruments, performed the worst of the 100% portfolios despite the fact that it had an 8.95% growth rate over the projected 40 years. This would be due to the fact that a portfolio consisting only of fixed interest instruments, have no potential to gain any capital growth. The 100% property asset allocation, portfolio 2, performed the best of all the portfolios with no indication of financial ruin. However, one would need to question the performance in light of the relevant data used to predict the future returns. The property market, as mentioned previously, portrayed a high growth period from 2004 until 2009, thus making the future projection not as reliable as the rest of data. The 100% equity asset allocation, portfolio 1, did perform better than the general asset allocation portfolio and the fixed interest portfolio, but still showed a sharp decline over time. An investor drawing down an income during a period of poor returns will have very little chance of regaining the extra units that had to be sold during such a time. The equity portfolio's fund value reaches zero at 214 months, or 17.83 years. The literature review though, highlight the fact that it is not possible for an investor's fund value to reach zero, because of the 17.5% maximum withdrawal rate applicable to a living annuity. The investor will experience a decline in the net replacement ratio when the maximum drawdown rate is reached, leading to a decline in living standards long before the fund value reaches zero. This decline in the standard of living, according to the literature review, is also referred to as financial ruin as the retiree's income drops below the initial, or required income amount. The retiree will reach the maximum 17.5% drawdown rate in 174 months, or in 14.5 years, after which a decline in living standards will be inevitable. Comparing the time until financial ruin to the life expectancy of 18.6 years for a 65 year old male, who is a non-smoker and has a 3 year qualification, one can clearly see the predicament a retiree will endure during the last years of retirement. The picture is even bleaker for a female investor, retiring at age 65, who is a non-smoker and has a 3 year qualification, in that her life expectancy is 21.5 years leaving her with a 7 year term of declining living standards. The charts below highlight the fund values for the combination portfolios as well as the diversified portfolios.

Chart 3.7: Combination portfolios – 50% allocation towards an asset class



Source: Own

Chart 3.8: Diversified portfolios



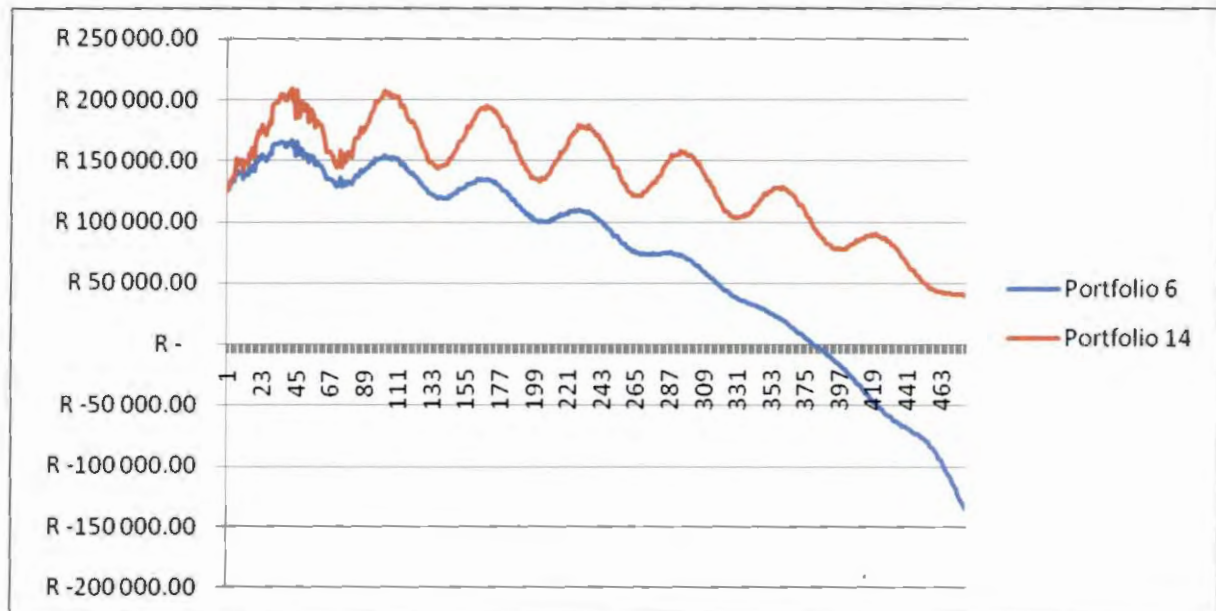
Source: Own

The graphs show that the diversified portfolios produced higher long term returns than the portfolios utilizing only two asset classes (50%; 50% allocation towards

different asset classes). A diversified portfolio with more equity and real estate exposure give the retiree the highest probability of sustaining the net replacement ratio. Portfolio 6 (comprising 50% general asset allocation and 50% fixed interest), from the combination allocations, showed the weakest returns over the long term with financial ruin occurring at 117 months, or 9.75 years since retirement. Portfolio 14 (comprising 20% equities, 10% property, 40% general asset allocation and 30% fixed interest), from the diversified allocation group, also has a very slim chance of supporting an individual during the post-retirement phase. A retiree will start to experience financial ruin at 167 months, or 13.91 years since retirement.

A retiree with too little retirement savings at the date of retirement unfortunately would have no alternative but to cut back on the standard of living. The consequences of not doing so is dire in that financial independence would turn to financial dependence. The same 65 year old retiree, who contributed 11.3% and received a 10% investment growth with final earnings of R1500.00, would be able to sustain a 50% net replacement ratio for the duration of the life expectancy. Such an individual would even be able to fulfil the motive to bequeath. The graph below illustrates the effect of a 50% net replacement ratio, even when investing in the 2 worst performing portfolios, portfolio 6 and 14.

Chart 3.9: Fund values for a 65 year old retiree investing in Portfolio 6 and 14 with a 50% replacement ratio.



Source: Own

The graph illustrates the fact that a retiree with an average level of retirement savings would be able to sustain a 50% net replacement ratio, even when investing in the 2 worst performing portfolios. The decision to lower the standard of living from the start of the post-retirement phase would be the hardest to do, but certainly the most important one considering the longevity of one's retirement savings. Table 3.8 displays the time until financial ruin for each portfolio assuming a 75%, 50% and 28% replacement ratio. Individuals retiring at ages 55, 60, 65 and 70 with an average contribution rate of 11.3% and investment growth rate of 10% were tested.

Table 3.8: Time, in months, until financial ruin

Age		55			60			65			70		
Replacement ratio		75%	50%	28%	75%	50%	28%	75%	50%	28%	75%	50%	28%
Portfolio	1	68	184	388	122	198		133	261		190	369	
	2	253											
	3	59	127	327	69	181		120	237		137	301	
	4	24	116		48	197		90			147		
	5	128	383		192			315					
	6	47	129		65	194		116	314		169		
	7	62	191		113	317		173			246		
	8	119	311		177			250			378		
	9	63	174	387	114	194		128	257		184	325	
	10	107			187								
	11	68	253		127	438		194			316		
	12	115	258		169	434		239			319		
	13	67	255		125			194			329		
	14	62	186		113	260		164	449		231		
	15	113	317		170			251			435		

Source: Own

Table 3.8 highlight the time until financial ruin, stated in months, for individuals retiring at different ages. The cells with no data illustrate that the fund value will support the net replacement ratio tested for longer than the 40 year investment period. From the table it is evident that the higher the net replacement ratio, the quicker one will reach financial ruin. A retiree aged 55; for example, who requires a 75% net replacement ratio can expect to encounter financial ruin 24 months after retirement in portfolio 4. Portfolio 4 (consisting only of fixed interest securities) will support a 70 year old retiree for 147 months. One would therefore have to compare the ability of a portfolio to support a specific net replacement ratio before choosing among the various asset classes. For a 70 year old female retiree, non-smoking with a 3 year qualification and final earnings of R1500.00, the life expectancy is 17.7 years or 212.4 months. From this one can conclude that Portfolio 4, for example, will

not be the best alternative investment as it will not be able to support the required net replacement ratio. The retiree mentioned in this example will have to consider more equity exposure in order to minimise the longevity risk associated with a living annuity. Table 3.8 show that the longer the retirement phase, the higher the probability of financial ruin become. For an individual with an average retirement savings balance, the chances of sustaining a 75% replacement ratio are very slim. Further to the example above, it is also evident when considering a 55 year old male or female with an average retirement savings balance. Only portfolio 5 will be able to sustain a 50% net replacement ratio. The chances to sustain a specified replacement ratio naturally increase as the pre-retirement savings period increase and the life expectancy decrease. In other words, an individual would have more capital available for a much shorter time.

The post-retirement phase, unfortunately, is one that no individual can pass over. One would need to consider the consequences of a low retirement savings balance at the start of retirement. As stated by the literature review, at retirement, human capital is depleted and the opportunity to accumulate more retirement savings has gone. A retiree with a low retirement savings balance would not be able to sustain a 75% replacement ratio, irrespective of the asset allocation utilised. A 28% net replacement ratio, which is the South African norm, would be a fair expectation considering the potential asset allocation returns.

Chapter 4

Conclusions and recommendations

4.1 Introduction

This chapter includes conclusions derived from the findings, limitations in the research and recommendations for future research. The conclusions and recommendations are done with consideration of the problem statement, the literature study and the empirical study.

The main purpose of the study was to investigate asset allocation as a means of minimising the investment risk, drawdown risk and longevity risk associated with a living annuity. The three risk elements were tested for various categories of retirees investing the full retirement savings amount in a living annuity.

In order to reach the aim and objectives of the study, a literature overview of the current South African retirement environment was firstly given. This part of the literature review classified the South African public according to savings habits, the propensity to save and knowledge on the financial industry. The second part of the literature review highlighted key considerations with regards to an optimal asset allocation. The key considerations included the risk versus return relationships for retirees, various unit trust sectors and portfolios within the South African financial market, the investment horizon also stated as the life expectancy of a retiree and withdrawal strategies applied by investors or retirees. The study continued with the empirical study modelling the pre- and post-retirement phases respectively.

4.2 Conclusions

The next section draws conclusions based on the literature and the results of the study (chapters 2 and 3). The conclusions are made on the pre-retirement phase and post-retirement phase.

4.2.1 Pre-Retirement Phase

The pre-retirement phase provided insights into the amounts available for retirement. Three factors were used as variables in modelling the pre-retirement phase. These factors included the rate at which contributions were made towards an approved retirement savings scheme, the investment term and the investment growth rate received throughout the savings term. The following conclusions were derived from these sets of factors.

Contribution rate: The contribution rate is stated as a percentage of the monthly earnings. The monthly earnings on which the contribution rates were modelled had no influence on the net replacement ratio, as the percentage of income to be withdrawn stayed the same irrespective of the final earnings. Naturally, the more one contribute towards an approved retirement savings scheme, the higher the value of savings at retirement.

Investment term: The investment term varied according to the age of retirement assuming all the individuals tested started to save at the age of 25. A longer savings term gave the investor an opportunity to better utilise the effects of compounded growth. Again, the longer one save, the more contributions are made and the higher the value of savings at retirement.

Investment growth rates: This factor had the biggest influence on the amount available at retirement. An increase in the investment growth rate resulted in a substantial change, compared to a change in the contribution rate or the investment term, in the final value of savings.

Having a high contribution rate, long investment term and a high investment growth rate will enable a retiree to lessen the strain on the corpus of life savings when withdrawing an income. This can be confirmed by the lower drawdown rates necessary in order to sustain a higher net replacement ratio.

4.2.2 Post-Retirement Phase

The post-retirement phase tested the sustainability of income withdrawals at various withdrawal rates from a range of asset allocations. The aim was to determine whether or not an optimal asset allocation would be able to minimise the drawdown risk, longevity risk and investment risk for a retiree investing in a living annuity. In order to minimise the risks, a retiree investing in a living annuity need to consider the following factors: available retirement capital, life expectancy, drawdown rate as stated by a net replacement ratio, investment capital growth, risk versus return relationship and the allocation of funds towards different asset classes. The following conclusions were derived from these sets of factors:

Available retirement capital: At retirement, a retiree would need to assess the basic requirements for the post-retirement phase. This analysis will determine the current net worth, income requirements and expense obligations. Legislation permits a retiree to withdraw one third of the retirement capital as a lump sum, subject to tax. Most often than not a retiree choose to exercise this option in order to settle an outstanding mortgage or related debt. A retiree, however, would need to consider this lump sum withdrawal very carefully. The empirical study, which utilised the total retirement savings, showed that a retiree with an average contribution and growth rate will not be able to support a 75% net replacement ratio. Thus, by reducing the available retirement savings, with the one third lump sum, will be detrimental to the longevity of the retirement capital and the retiree's net replacement ratio.

Life expectancy: A risk model, instead of an annuity model, was used to calculate life expectancy of various retirees. This was considered important as the life expectancy of an individual who is a smoker versus one that is not, differs by as much as 4 years. The same argument goes for one with a 3 year qualification versus one with a Matric certificate. A retiree with a long life expectancy need to take extra precaution when investing the corpus of life savings as to not deplete it too quickly, leading to a decline in the required net replacement ratio.

Drawdown rate: The risk associated with a high drawdown rate will be the probability of not having a sustainable income for life, or in other words, financial ruin.

The empirical study highlight the latter in stating that none of the combinations of asset allocations (portfolios) would be able to support a 75% net replacement ratio (or the equivalent drawdown rate) for an individual with an average contribution and growth rate retiring at ages 55 and 60. Even sustaining a 50% net replacement ratio would seem like a daunting task. For individuals with a longer pre-retirement savings period, with higher contribution and growth rates, the picture does look a lot more favourable. All the portfolios will be able to support a 75% net replacement ratio for individuals retiring at ages 65 and 70.

Another factor that a retiree would need to consider while drawing down an income is the volatility associated with equities. If a retiree draws down a high income in times when investment returns are poor, the portfolio will not be able to recover even when returns improve again.

Investment capital growth: As stated in the empirical study, capital growth is achieved when the unit price of a unit trust fund increases. Capital growth is more prevalent in the equity and real estate asset classes. The portfolios tested with a higher allocation towards the mentioned asset classes showed a marked increase in the time unit financial ruin. An allocation of 50% towards any of these asset classes is optimum.

Risk versus return relationship: The literature study revealed that every individual has a certain tolerance of risk. This level can vary over time depending on the individual's perception of the financial market and personal circumstances. The empirical study showed that the portfolios with more equity and real estate exposure naturally have more risk associated, but without taking on extra risk, one compromise on the longevity of the retirement capital. The less risky portfolios, as measured by standard deviation, reached the time until financial ruin much quicker than the risky counterparts. An individual should consider the risk versus return relationships for every sector according to table 2.1, Tier 3.

The allocation of funds towards different asset classes: The portfolios tested were constructed by allocating varying percentages towards each asset class. Each of the asset classes displayed a unique risk versus return relationship. From the analysis it is evident that a more diversified portfolio resulted in a lower probability of financial ruin than a portfolio only invested in one or two asset classes. A diversified portfolio that is more heavily invested in the equity and real estate market has the best probability to sustain the required net replacement ratio. This would be due to a combination of capital growth achieved within these asset classes as well as the regular interest declarations made by the fixed interest and asset allocation asset classes. Portfolios 8, 12 and 15 were the portfolios best suited to withdraw an income from. No portfolio though, could make up any possible shortfall in the pre-retirement savings.

4.3 Limitations

The field of retirement planning has been, and most probably for years to come, will be a very grey area in financial planning. There are arrays of variables that can change in an instance and are difficult to predict with accuracy.

Previous research on retirement planning within the context of the South African retirement environment is limited and only covers parts thereof. One can however not only see retirement planning in its parts, but need to see it as a whole.

The assumptions used in the study such as sector growth rates, inflation, saving terms and forecasting models can be considered a limitation. Historical data were used to predict the future and although carefully chosen the future might be totally different. The effect of inflation was ignored for the purposes of the post-retirement phase. An individual would need to take extra care in predicting the future cost of living.

The study, although not perfect, is an important concept for a retiring individual to consider at retirement. The analysis does not attempt to be a clear guide on investment strategies within a living annuity, but merely highlight the characteristics

of different asset allocations. The study revealed that a living annuity, no matter what the asset allocation, will not be able to support a high drawdown rate in order to sustain a required net replacement ratio. The gap between actual retirement savings and required retirement savings cannot be breached by an aggressive asset allocation in a living annuity.

4.4 Recommendations

Retirees are faced with the difficult choice of what to do with retirement savings. Apart from the fact that no single rule applies to all individuals, there is no clear research in South Africa on which annuity strategies are expected to provide the most income over one's future lifetime. Neither, within the context of a living annuity, is there any research giving direction to the best suited asset allocation post-retirement.

This analysis is by no means perfect, and the methodology and assumptions can almost certainly be improved on. The author feels it is worthwhile examining whether the conclusions hold if:

- The individual unit trust funds linked to a market sector are tested instead of an average asset class for example the equity or fixed interest.
- Extending the historical unit trust data range from 5 years to 10 years.
- The income withdrawals grew by an inflation factor.
- Examining a population of retiring individuals and balancing the actual retirement savings against the required net replacement ratio.
- A set level of the retirement fund value must remain to be bequeathed.

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Appendix A:

Living Standard Measurement and Financial Services Measurement tables

2008		LSM			FSM			
Tier	Sample Size	Average Personal Monthly Income	Sample Size	Average Household Monthly Income	Sample Size	Average Personal Monthly Income	Sample Size	Average Household Monthly Income
Total	n=3285	R2 096	n=2677	R5 725	n=3285	R2096	n=2677	R5 725
1	n=20	R723	n=18	R1 506	n=339	R371	n=244	R2 211
2	n=183	R579	n=147	R1 637	n=474	R439	n=351	R2 747
3	n=247	R788	n=203	R1 934	n=475	R928	n=387	R2 935
4	n=454	R848	n=357	R2 616	n=513	R1 361	n=409	R4 123
5	n=563	R1 168	n=481	R3 485	n=592	R2 258	n=496	R6 040
6	n=762	R1 916	n=632	R5 333	n=451	R4 334	n=388	R9 518
7	n=344	R2 791	n=265	R7 620	n=296	R7 134	n=259	R14 391
8	n=263	R4 613	n=204	R12 389	n=145	R11 240	n=143	R23 221
9	n=214	R5 794	n=172	R16 566				
10	n=235	R10 721	n=198	R26 313				

2007		LSM			FSM			
Tier	Sample Size	Average Personal Monthly Income	Sample Size	Average Household Monthly Income	Sample Size	Average Personal Monthly Income	Sample Size	Average Household Monthly Income
Total	n=3284	R1 720	n=2767	R4 794	n=3284	R1 720	n=2767	R4 794
1	n=8	R637	n=8	R742	n=403	R330	n=339	R1 707
2	n=256	R497	n=228	R1 523	n=564	R368	n=455	R2 271
3	n=368	R491	n=328	R1 569	n=411	R776	n=331	R2 990
4	n=480	R714	n=405	R2 264	n=478	R1 073	n=403	R3 780
5	n=577	R1 171	n=495	R3 259	n=568	R2 080	n=469	R5 976
6	n=638	R1 683	n=525	R5 800	n=473	R3 311	n=412	R7 480
7	n=312	R2 628	n=258	R8 643	n=281	R5 407	n=257	R11 308
8	n=276	R4 446	n=225	R11 169	n=106	R15 297	n=101	R22 743
9	n=213	R5 720	n=171	R16 050				
10	n=156	R9 712	n=124	R21 716				

Source: FinScope South Africa 2008

Appendix B:

Life expectancy in years – Risk Model

Males – grouped according to smoking status, education and income

Age	Income	Non-Smoking		Smoking	
		Matric	3 Year Degree	Matric	3 Year Degree
55	2500	21.8	26.8	17.8	22.1
55	12500	27.6	29.4	22.7	24.1
60	2500	18.1	22.5	14.5	18.3
60	12500	23.4	24.9	18.9	20.1
65	2500	14.7	18.6	11.6	14.9
65	12500	19.4	20.7	15.5	16.5
70	2500	11.7	15.0	9.2	11.9
70	12500	15.8	16.8	12.5	13.3

Females – grouped according to smoking status, education and income

Age	Income	Non-Smoking		Smoking	
		Matric	3 Year Degree	Matric	3 Year Degree
55	2500	25.0	30.1	21.8	26.5
55	12500	31.0	32.7	27.3	28.8
60	2500	21.0	25.7	18.1	22.4
60	12500	26.6	28.0	23.1	24.5
65	2500	17.4	21.5	14.9	18.6
65	12500	22.4	23.6	19.3	20.4
70	2500	14.1	17.7	11.9	15.2
70	12500	18.4	19.4	15.9	16.8

Appendix C:

Retirement savings balances – Final earnings R3500.00 per month

		Contribution					
		Retirement age 55			Retirement age 70		
		13.3%	11.3%	9.3%	13.3%	11.3%	9.3%
Growth	12.00%	R 341 762	R 290 369	R 238 977	R 672 664	R 571 512	R 470 359
	10.00%	R 247 248	R 210 068	R 172 888	R 399 639	R 339 543	R 279 447
	8.00%	R 183 719	R 156 092	R 128 465	R 254 305	R 216 063	R 177 822

		Contribution					
		Retirement age 60			Retirement age 65		
		13.3%	11.3%	9.3%	13.3%	11.3%	9.3%
Growth	12.00%	R 425 752	R 361 729	R 297 706	R 538 610	R 457 616	R 376 622
	10.00%	R 290 426	R 246 753	R 203 080	R 342 995	R 291 417	R 239 839
	8.00%	R 205 910	R 174 946	R 143 982	R 230 385	R 195 741	R 161 097

Retirement savings balances – Final earnings R11000.00 per month

		Contribution					
		Retirement age 55			Retirement age 70		
		13.3%	11.3%	9.3%	13.3%	11.3%	9.3%
Growth	12.00%	R 1 074 110	R 912 589	R 751 069	R 2 114 088	R 1 796 180	R 1 478 272
	10.00%	R 777 066	R 660 214	R 543 362	R 1 256 007	R 1 067 134	R 878 261
	8.00%	R 577 402	R 490 575	R 403 748	R 799 244	R 679 057	R 558 870

		Contribution					
		Retirement age 60			Retirement age 65		
		13.3%	11.3%	9.3%	13.3%	11.3%	9.3%
Growth	12.00%	R 1 338 076	R 1 136 862	R 935 647	R 1 692 776	R 1 438 223	R 1 183 670
	10.00%	R 912 767	R 775 509	R 638 251	R 1 077 986	R 915 883	R 753 779
	8.00%	R 647 144	R 549 829	R 452 515	R 724 068	R 615 186	R 506 304