

# SOME PERSPECTIVES ON PLANNING FOR RETIREMENT

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*SOME PERSPECTIVES ON PLANNING FOR RETIREMENT*

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## ABOUT THE AUTHOR

Prof Krige obtained an MComm degree at Stellenbosch University in 1973 and was admitted as a Fellow to the Institute of Actuaries in London in 1977. He was appointed Managing Director of Momentum Life in 1988 and Deputy Chairman in 1995.

Prof Krige was appointed as Associate Professor at Stellenbosch University in 2003 and as Professor in 2011. He and his colleagues established the Postgraduate Diploma in Financial Planning in 2005. More than 300 students have since successfully completed their diplomas and more than 100 students have enrolled in 2013.

The National Research Foundation awarded a C3 rating to Prof Krige in 2011. He is the co-author of 16 articles that have been published in accredited academic journals.

Prof Krige is a non-executive board member of MMI Holdings, MMI Investments and the Du Toit Group. He is chairman of the board of trustees of the Denel Retirement Fund and is a member of the International Advisory Board of the Brandes Institute in San Diego, USA.



## ABSTRACT

This paper explores two themes related to the financial aspects of retirement – real-age adjusted life expectancy and the financial survival probability of living annuitants.

The first theme focuses on the development of a model to determine an individual's adjusted life expectancy based on his or her real age as opposed to his or her calendar age. The model incorporates aspects such as gender, residing province, income, HIV status, ethnic background, weight, exercise, family illness history, stress, substance abuse and diet. The finding was that the real-age adjusted life expectancy of individuals retiring at age 65 may be as much as twice the life expectancy based on the latest South African actuarial mortality tables. This has significant implications for retirement planning.

The second theme focuses on the financial survival probability of pensioners who have selected living annuities as their preferred retirement investment option. It addresses the question of how long a given amount of capital will be able to fund a living annuitant if the following parameters are known: expected retirement duration (i.e. years between retirement date and expected date of death), investment returns, inflation, annual withdrawal amount and initial capital amount. A model was developed that shows how retirement duration and different withdrawal rates change the probability of having sufficient capital in retirement for different investment scenarios.



# SOME PERSPECTIVES ON PLANNING FOR RETIREMENT

## I. INTRODUCTION

All of us have to plan for retirement in one form or another – both from a financial and an emotional perspective. This discussion focuses on two themes related to the financial aspects of retirement – real-age adjusted life expectancy and the financial survival probability of living annuitants.

The first theme focuses on the development of a model to determine an individual's adjusted life expectancy based on his or her real age, as opposed to his or her actual calendar age. The model incorporates aspects such as gender, residing province, income, HIV status, ethnic background, weight, exercise, family illness history, stress, substance abuse and diet. Predicting life expectancy is very important in retirement planning for two reasons: 1) Given the diverse nature of South Africa, the national average life expectancy cannot be applied to everyone and 2) retirement duration forms a vital part in the retirement planning process. Retirees can make more informed financial investment decisions based on their real age, thus increasing the probability of having sufficient funds during retirement.

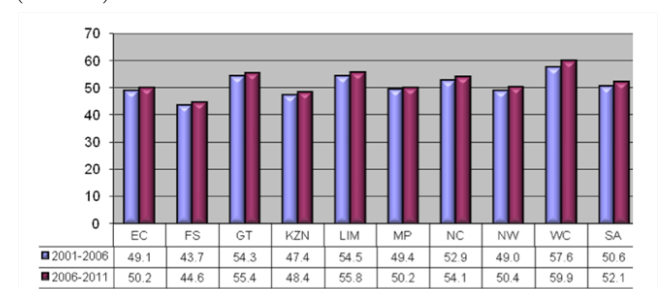
The second theme focuses on the financial survival probability of pensioners who have selected living annuities as their preferred retirement investment option. Living annuities have become the most popular option at retirement for most South Africans earning high incomes. In essence, a living annuity is an investment in a balanced investment portfolio, producing an annual income that is limited to a withdrawal percentage between 2.5% and 17.5% of the funds invested. Significant investment flexibility is offered, which is one of the reasons why living annuities have become so popular. However, the amount of the annuity is not guaranteed by the investment house or life insurer responsible for the administration. Thus this theme addresses the question of how long a given amount of capital will be able to fund a living annuitant if the following five parameters are known: expected retirement duration (i.e. years between date of retirement and expected date of death), investment returns, inflation, annual withdrawal amount and initial capital amount available. The Pension Model was developed,

which graphically depicts the relationship between these parameters. This model facilitates retirement planning by showing how retirement duration and withdrawal rates change the financial 'survival probability' (SP), which is the probability of having enough capital to maintain a desired withdrawal rate for the expected retirement duration. The underlying model is based on long-term historical investment returns of equities, bonds and cash in South Africa using a Monte Carlo simulation.

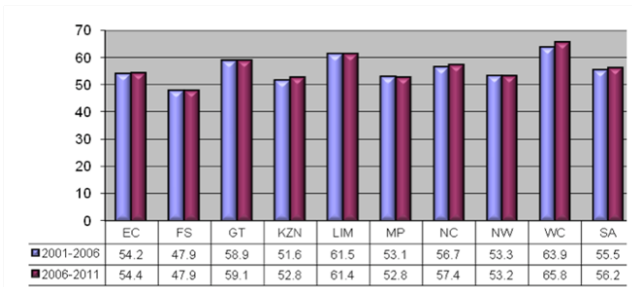
## 2. REAL-AGE ADJUSTED LIFE EXPECTANCY

A model was developed for South Africa to determine a person's real-age adjusted life expectancy. Life expectancy is always changing, but for simplicity the model is static and based on 2011 figures. It must be emphasised that the output of the model is an adjusted life expectancy that is independent of the existing calendar age of the participant. It therefore does not take into account the fact that a person's life expectancy increases with an increase in age.

The base of the model is life expectancy according to province and gender, representing the first two inputs. Years are then added or subtracted according to the other inputs. Life expectancy varies significantly between provinces in South Africa, as is evident from FIGURE 1 (men) and FIGURE 2 (women).



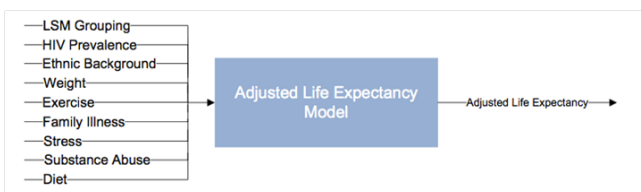
**FIGURE 1: Life expectancy per province (men)**  
**Source: Statistics South Africa (2011)**



**FIGURE 2: Life expectancy per province (women)**  
**Source: Statistics South Africa (2011)**

For example, a man living in the Western Cape has a life expectancy of 59.9 years, whereas a man living in the Free State has a life expectancy of 44.6 years.

The other factors that have been taken into account in developing the model are presented in the flow chart in FIGURE 3.



**FIGURE 3: Flow chart showing the model inputs and outputs**

## 2.1 INPUT: LIVING STANDARDS MEASURE GROUPING

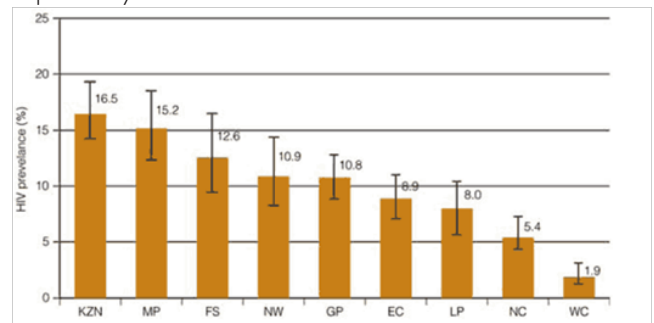
Given the high South African Gini coefficient, an international measure of income inequality, there are individuals in South Africa who will live to the life expectancy of developed countries, in this case up to 30 years longer than the national average. If a person is planning to retire at age 60 and statistically he or she is likely to live to age 90, the chance of money death becomes significant. The term 'money death' refers to the risk that a pensioner may run out of money during retirement.

The Living Standards Measure (LSM) is the most widely used segmentation tool in South Africa, which cuts across race, gender and age. It groups people into 10 categories according to their living standards. The LSM grouping is thus added as the third input to the model. LSM information and detailed age statistics are compiled in the South African Audience Research Foundation's All Media and Products Survey (AMPS®) database (Tracey, 2012). Life expectancy for each LSM was determined based on

this information, with the exclusion of LSM 1 because of low data integrity, as cautioned in the AMPS® database. The difference in life expectancy between the high and low LSM groups is 30 years, which forms the basis of the LSM input.

## 2.2 INPUT: HIV PREVALENCE

HIV/Aids is epidemic in South Africa and it is unlikely that it will be eradicated in the near future. It is thus an important input in the model, because according to the National Health Service in the United Kingdom (UK), a person could still live up to the age of 66 years if treated correctly (National Health Service, 2011). The National Health Service study states that this age is 20 years shorter than the normal life expectancy in the UK; therefore, if a person has Aids, his or her life expectancy will decrease by approximately 25%. In this study, HIV prevalence is based per province (see FIGURE 4), assuming the HIV status is not known. If a person is known to be HIV positive, it is assumed that this person's life expectancy decreases by 25%, similar to the UK experience referred to above. If it is not known, there is still a risk of having HIV, as so few people are tested. In this case, the decrease in life expectancy is calculated by taking the provincial prevalence (as years, not percentages) multiplied by 25%. If tested with no positive results, there is no impact on life expectancy.



**FIGURE 4: HIV prevalence per province**  
**Source: Human Sciences Research Council (2005)**

## 2.3 INPUT: ETHNIC BACKGROUND

Racial profiling, though banned for political purposes, still has an important role to play in determining life expectancy in South Africa. Although income and education levels are much more significant determinants of life expectancy, a study conducted by Cutler, Fryer and Glaeser in 2005 showed that life expectancy among black people was six years less than among white people.

The assumption in the model is that the life expectancy



of white people will increase by three years. No adjustment is made for coloured and Indian people, whereas the life expectancy of black people is decreased by three years.

## **2.4 INPUT:WEIGHT**

The World Health Organization (2011) states that obesity is the fifth biggest cause of death worldwide. It is also one of the first questions asked in any real-age survey. Obesity is becoming a problem in South Africa despite it still being a developing country, as 59% of women and 29% of men are considered to be obese (Van der Merwe and Pepper, 2005). A US-based cohort population study found that the life expectancy of 40-year-old non-smoking men who were 20 kilograms overweight was reduced by eight years compared to their counterparts with optimal body mass (Peeters, Barendregt, Willekens, Mackenbach, Al Mamun and Bonneux, 2003). Theoretically, the body mass index should be calculated for each person, but for simplicity, kilograms overweight was used. Based on the Peeters et al. (2003) study, the relationship between kilograms to years' decrease in life expectancy is assumed to be 0.4. Therefore, if a person is 10 kilograms overweight, he or she can expect to live for four years less.

## **2.5 INPUT: EXERCISE**

A recent study by Wen, Wai, Tsai, Yang, Cheng, Lee, Chan, Tsao, Tsai and Wu (2011) concluded that exercising 30 minutes per day increases life expectancy by three to four years. This is, however, not indefinitely continuous – exercising for 10 hours a day will obviously not increase life expectancy by 60 to 80 years. Thus, a cap is set on five years in the model if a person exercises for 90 minutes or more per day.

## **2.6 INPUT: FAMILY HISTORY OF ILLNESS**

There are many hereditary diseases, such as Huntington's disease, Marfan syndrome and cancer, and a person is at higher risk if the gene is in the family. It is near impossible to determine the relevance for each person, thus a notional value is applied in the model. According to the Bankrate Life Expectancy Calculator (2012), life expectancy decreases by three years if both parents die of illnesses before the age of 60. This is the extreme case, so for the purpose of this study, family history is broken down into three categories: high prevalence, prevalent and not prevalent. In each case, three years, one and a half years and nil years are subtracted from life expectancy, respectively.

## **2.7 INPUT: STRESS**

Life has definitely become more stressful, higher-paced and less forgiving than it was 50 years ago. Stress can have negative effects on one's health and potentially leads to depression and obesity/anorexia, thus diminishing life expectancy. Foster, Chua and Ungar (2012) indicated in their life expectancy calculator that a single stress factor, such as divorce or financial trouble, decreases life expectancy by up to one year. It is possible to have multiple stress factors at one time, so two years is the maximum possible decrease in life expectancy built into the model.

## **2.8 INPUT: SUBSTANCE ABUSE**

Smoking, drugs and (prescription) substance usage without moderation cause long-term damage. Smoking was shown to decrease life expectancy by two to four years (Ferrucci, Izmirlian, Leveille, Phillips, Corti, Brock and Guralink, 1999). The model reduces life expectancy by four years for smokers and by two years for people who smoked at any time during their lives. Drugs and substance abuse are far more serious than smoking. This will, however, be hard for the financial planner to determine because this information is not readily discussed. It is therefore not taken into account in this study.

## **2.9 INPUT: DIET**

The final input into the simulator is diet. This input also relies on an honest answer: Are healthy foods being eaten and is a balanced diet being followed? Fast foods and high-starch meals do not fall into a healthy diet category. A balanced meal consists of meat (in moderation), salads or vegetables and at least three meals per day must be consumed. Foster et al. (2012) determined that two years could be gained in life expectancy if a diverse, healthy diet is maintained. For the purpose of this input, two years will be added for healthy eating, no change for an average diet and finally, two years subtracted for an unhealthy diet.

## **2.10 INTERDEPENDENCE BETWEEN FACTORS**

The inputs described above were determined assuming no interdependence between them. For example, stress and exercise each affected the life expectancy separately. However, in reality they are linked, as most people who exercise are in better control of their stress, for example, therefore some of these inputs cannot

be considered discrete inputs. The following factors are assumed to be discrete:

- LSM grouping
- HIV status
- Ethnic background
- Family history of illness

The remaining factors, namely weight, diet, substance abuse, stress and exercise, are assumed to have some form of correlation. It is not possible to determine the relationship between all the factors together, hence they were analysed in pairs. The correlation between substance abuse (specifically smoking) and obesity was determined in a study by Peeters et al. (2003). Obese male and female smokers reduced their life expectancy by 13.7 and 13.3 years respectively. Their model predicted that a smoker who is 20 kilograms overweight will have a decreased life expectancy of 12 years, and made no distinction between men and women. Their study revealed that the life expectancy decrease was compounded when factors were interdependent. The adjustment factor in this model includes a term where an obese female smoker's life expectancy is decreased a further 11% and that of an obese male smoker 12.4%.

Hughes, Casal and Leon (1986) conducted a study on a trial group of men to establish whether solitary exercise determined psychological improvement. The study revealed that exercise did not improve tension, anger, depression or a host of other conditions. Improvement was thus attributed to other aspects related to exercise, such as the social aspect or the training effect. A more recent study by DiLorenzo, Bargman, Stucky-Ropp, Brassington, Frensch and LaFontaine (1999) concluded that there were significant gains to be had in terms of stress relief and emotional wellbeing resulting from regular exercise. The study did not specify whether the exercise was done alone or socially. Given the complicating nature of these results, it was assumed for this model that exercise is done socially and that there are benefits. The result indicates that if a person is stressed, the benefits of exercise are not fully obtainable. The difference between the two factors was used as the interdependence adjustment factor. The outcome of this is that if a person is stressed, the impact of exercise is lessened. The adjustment is a decrease in life expectancy of a maximum of two years.

Diet is the most challenging factor to integrate into the model because it has a wide impact, affecting weight, exercise results and, potentially, emotional wellbeing. The interdependence of diet and weight was thus assumed to halve the impact of a healthy diet; this is because the benefits of healthy eating have already been factored in. Exercise and diet should also be related. If one is exercising and not eating correctly, one's life expectancy is expected to decrease. Effects of an unhealthy diet on

life expectancy will thus be halved for the individual who is exercising regularly.

### 3. RESULTS: REAL-AGE ADJUSTED LIFE EXPECTANCY

Two fictitious representative individuals' results were simulated in the real-age adjusted life expectancy model as a test. The individuals are described below with their resulting life expectancy given. In each case, a graphical interface of the real-age adjusted life expectancy model is presented.

#### 3.1 PERSON\_X

The first individual, named Person\_X, is a white man living in the Western Cape. Degree-educated, this person is in the LSM 10 group, and has private medical aid and a large portion of disposable income. No Aids test has been taken. Person\_X is health-conscious, exercises regularly, eats healthily and does not carry any extra weight. There is a small history of illness in the family, namely prostate cancer and minor heart disease. He does not work in the corporate world, therefore stress is kept to a minimum, and he does not smoke. FIGURE 5 displays the model simulation for Person\_X.

- The real-age adjusted life expectancy for Person\_X is 87 years.

	Male	Female		Real Age						
Gender	1	0		-						
In which province do you live	EC	FS	GT	KZN	LIM	MP	NC	NW	WC	59.9
Which LSM are you in?	LSM 0-3	LSM 4-5	LSM 6-7	LSM 8-10						20
HIV status or prevalence	If tested and Negative choose 0, else 1									-0.475
Race	White	Coloured	Indian	Black						3
Weight (kg away from ideal)	kg									0
Daily Exercise	Minutes									4
Family history of illness	High	Medium	Low							-1.5
High Blood pressure / stress	If High choose 1, else 0									0
Smoker / substance abuse	Never	Ex-smoker	Smoker	Drug addict						0
Diet	Healthy	Unhealthy								2
Interdependence factor										0.0
										89.9

FIGURE 5: Graphical interface showing simulation of Person\_X

#### 3.2 PERSON\_Y

Person\_Y is a black woman living in Limpopo. Also degree-educated and a working professional, she provides the sole income to the house. Given her lower disposable income, she is in the LSM 7 group. She has been HIV tested (result: negative) and is in good physical shape due to 30 minutes' exercise per day and a healthy diet. Similar to Person\_X, she does not smoke or have

a highly stressful job. There is no trace of family illness. FIGURE 6 displays the model simulation for Person\_Y.

- The real-age adjusted life expectancy for Person\_Y is 72 years.

Gender	Male	Female								Real Age	
	0	1								-	
In which province do you live	EC	FS	GT	KZN	LIM	MP	NC	NW	WC	61.4	
	0	0	0	0	1	0	0	0	0		
Which LSM are you in?	LSM 0-3	LSM 4-5	LSM 6-7	LSM 8-10						10	
	0	0	1	0							
HIV status or prevalence	If tested and Negative choose 0, else 1									0	
	0										
Race	White	Coloured	Indian	Black						-3	
	0	0	0	1							
Weight (kg away from ideal)	kg									0	
	0										
Daily Exercise	Minutes									2	
	30										
Family history of illness	High	Medium	Low							0	
	0	0	1								
High Blood pressure / stress	If high choose 1, else 0									0	
	0										
Smoker / substance abuse	Never	Ex-smoker	Smoker	Drug addict						0	
	1	0	0	0							
Diet	Healthy	Unhealthy								2	
	1	0									
Interdependence factor										0.0	
										72.4	

**FIGURE 6: Graphical interface showing simulation of Person\_Y**

It is evident that real-age adjusted life expectancy has significant financial implications for retirement planning. For example, based on the latest South African actuarial mortality tables, the life expectancy of a man retiring at age 65 is 78 years. However, Person\_X in the example above has a real-age adjusted life expectancy of almost 87 years. It is very likely that this person based his retirement planning on an expected retirement duration of 13 years. However, he should have provided for an expected retirement duration of 22 years based on his real-age adjusted life expectancy.

Conversely, should a person's real-age adjusted life expectancy be significantly shorter than the life expectancy based on normal mortality tables, it would be unwise to base retirement planning on the shorter expected retirement duration. It is suggested that one should err on the side of conservatism in planning for retirement.

#### 4. THE FINANCIAL SURVIVAL PROBABILITY OF LIVING ANNUITANTS

The second theme addresses the question of how long a given amount of capital will be able to fund a living annuitant if the following five parameters are known: expected retirement duration (i.e. years between date of retirement and expected death), investment returns, inflation, annual withdrawal amount and initial capital amount available.

The Pension Model was developed, which graphically depicts the relationship between the parameters listed above. This allows for retirement planning by showing how retirement duration and withdrawal rates change the financial 'survival probability' (SP), which is the probability of having enough capital to maintain a desired withdrawal

rate for the expected retirement duration. Retirement duration is based on the real-age adjusted life expectancy. The living annuitants can then decide whether they are comfortable with the financial SP of their chosen withdrawal rate, or whether their withdrawal rate should be reduced in order to increase the financial SP.

#### 4.1 INVESTMENT RETURNS

The Pension Model was based on a Monte Carlo simulation in order to calculate the returns for various portfolios. In essence, a Monte Carlo simulation provides information about the range of possible investment results from a given asset allocation over the course of the investor's time horizon, as well as the likelihood that each result will occur. Portfolios are classified as high-, medium- and low-risk. Ten thousand simulations were run for each scenario. Only the expected returns, volatilities and pairwise correlations of equities, bonds and cash were considered in the model, with the expected numbers being based on historical information over the past 85 years for each of these three asset classes.

Portfolio risk profiles were determined by the equity exposure of each portfolio, as stipulated below.

- High-risk: 75% in equities
- Medium-risk: 50% in equities
- Low-risk: 25% in equities

The cash component in the portfolio varies and was assumed to be equal to the annual withdrawal rate (typically 2.5% to 12.5%). It was assumed that the balance of the non-equity component was invested in bonds.

#### 4.2 INFLATION

It was assumed that inflation was 6% per year throughout.

#### 4.3 WITHDRAWAL RATES

A fixed withdrawal plan, which is a function of the annual fund value, was used for the model, albeit only one of a number of plans available to retirees. The simulations were run with 2.5%, 5%, 7.5%, 10% and 12.5% initial withdrawal rates. These rates were chosen on the basis that in practice, withdrawal is typically 2.5% to 12.5% of the fund value. The withdrawal rate is used to determine the initial benefit received based on the pension fund value on the day of retirement.

#### 4.4 INITIAL CAPITAL AMOUNT

It was assumed that a notional initial capital amount of R1 million was available. It was also assumed that

retirees purchased a living annuity at age 65 and that the living annuity was the only source of income during retirement.

#### 4.5 THE PENSION MODEL

In order to calculate what the financial SP was for a given age in retirement, the actual yearly benefit as a percentage of the funds available was compared to the desired benefit as specified by the living annuitant for each possible return scenario. Initial benefits were determined as a fixed percentage of the capital amount available, with the withdrawal increasing in line with inflation at 6% per annum. The financial SP is thus the number of iterations where the actual benefit received was at least equal to the desired benefit, divided by the total number of iterations (i.e. 10 000).

### 5. RESULTS: FINANCIAL SURVIVAL PROBABILITY

The results are presented in graphical format for each of the three risk profiles such that the financial SP could be read from it. FIGURE 7 to FIGURE 9 show the financial SPs for a given age in retirement and initial withdrawal rate for low-, medium- and high-risk profiles, respectively. The lines in the figures represent financial SPs expressed as a percentage.

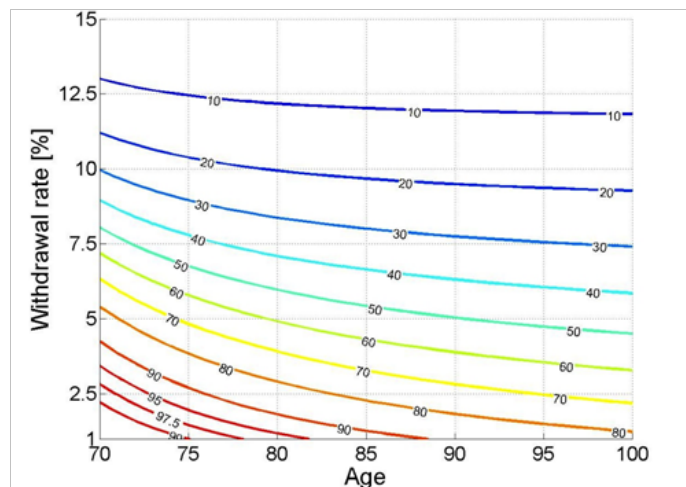
Bearing in mind that a retirement age of 65 is assumed, a 5% initial withdrawal rate in the case of the low-risk portfolio (FIGURE 7) results in a financial SP of 80% at age 72, 70% at age 74, 60% at age 79, 50% at age 90 and well more than 40% at age 100.

As is expected, the higher the initial withdrawal rate and the longer the retirement period, the lower the financial SP – regardless of risk profile. However, it is interesting to note that if a relatively high initial withdrawal rate and a long retirement period are required, the financial SP is higher in the case of a high-risk portfolio compared to a low-risk portfolio. For example, if a 7.5% initial withdrawal rate and a terminal age of 90 are required, the financial SP in the case of a low-risk portfolio is 32%, compared to a financial SP of 49% in the case of a high-risk portfolio.

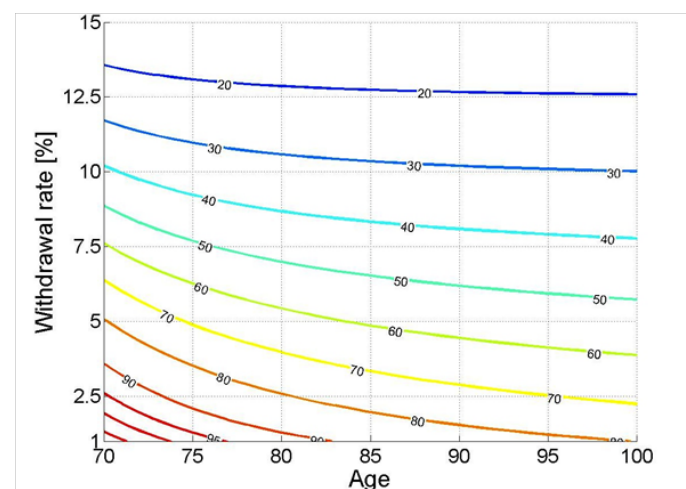
Conversely, if a low initial withdrawal rate and a relatively short retirement period are required, the financial SP is higher in the case of a low-risk portfolio. For example, if a 2.5% initial withdrawal rate and a terminal age of 80 are required, the financial SP in the case of a low-risk portfolio is 83% compared to a financial SP of 77% in the case of a high-risk portfolio.

It is evident that if a high withdrawal rate and a long retirement period are required, the annuitant has to

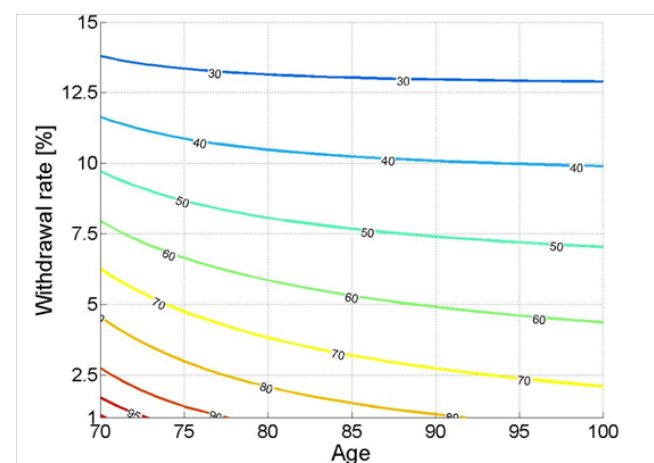
accept higher risks and thus higher volatility in order to achieve higher returns. It is also evident that the financial SPs in the second example above are significantly higher than in the first example, as expected.



**FIGURE 7: Financial survival probability for the low-risk portfolio**



**FIGURE 8: Financial survival probability for the medium-risk portfolio**



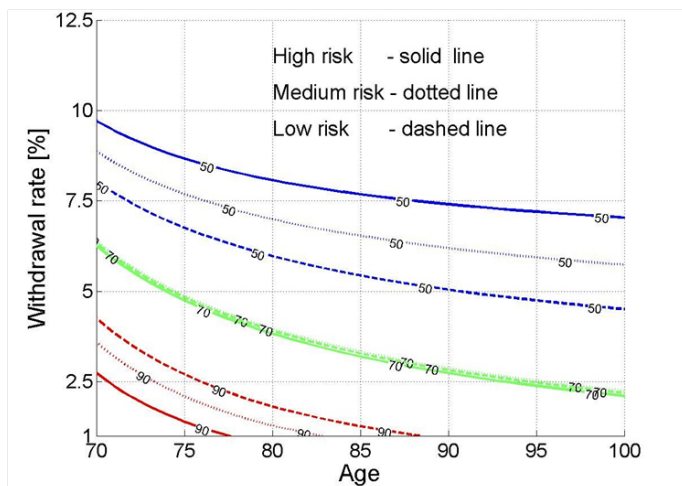
**FIGURE 9: Financial survival probability for the high-risk portfolio**

## 5.1 FINANCIAL SURVIVAL PROBABILITY AS A FUNCTION OF RISK PROFILE

Inspection of FIGURE 7 to FIGURE 9 showed that a common financial SP existed where it was immaterial whether a low-risk portfolio or a high-risk portfolio was selected. To elaborate on this theme, three financial SPs (50%, 70% and 90%) were plotted for the various portfolios on one graph in FIGURE 10. From this it may be seen that a financial SP of 70% produces the same line for each of the three risk profiles. This means that when a retiree chooses a financial SP of 70%, it does not matter in which portfolio he or she invests, irrespective of the terminal age and initial withdrawal rate chosen.

As the financial SP desired drops below 70%, the retiree should invest in a high-risk portfolio, again irrespective of age and withdrawal amount. The converse is true for higher financial SPs. If the financial SP desired is above 70%, then a low risk-portfolio should be chosen. The terminal age and withdrawal amount are thus independent and the portfolio could be chosen based solely on the financial SP.

This unexpectedly simple result is an elegant step for retirement planning in that it should ensure that the individual understands the concept of financial SP and that the decision on an initial withdrawal rate and risk profile is a more informed one.



**FIGURE 10: Survival probabilities as a function of time and withdrawal rate**

## 6. CONCLUSIONS

It is evident that real age rather than calendar age should be taken into account when planning for retirement. In the case of high-income earners with healthy lifestyles resident in the Western Cape, it is possible that the real-age adjusted life expectancy at age 65 is more than double the life expectancy based on normal mortality tables. This fact has significant financial implications and should be

factored into retirement planning at an early age.

Conversely, it is prudent to err on the conservative side if a person's real-age adjusted life expectancy is shorter than the life expectancy based on normal mortality tables.

In the case of the financial survival probability of living annuitants it has to be accepted that a meaningful investment in equities is required to protect retirees against the negative effects of inflation. Although equities have significantly outperformed bonds and cash over longer periods, the volatility of equity returns is also substantially higher. This may result in the retiree having to realise a significant number of equities at a time when equity prices are low, resulting in limiting the upside potential when equity prices recover. This may result in increasing the risk of money death.

The implication is that retirees have to accept that there are very few scenarios where their financial SP is close to 100%. The most important precautionary measure available to living annuitants is to start with the lowest possible withdrawal rate at retirement (2.5% at present). This withdrawal rate could then be increased at a later stage should post-retirement investment performance be above average. Alternatively, retirement should be postponed to an older age. This has the threefold advantage of increasing the funds available for retirement due to investment performance, adding further contributions and shortening the period for which provision has to be made.

A final alternative would be to switch a part of the funds invested in the living annuity to a guaranteed fixed annuity at a later stage when interest rates are higher. Should this alternative be pursued, it must be accepted that a high initial guaranteed annuity will be received at the expense of forfeiting future growth, thus not providing protection against the negative effects of inflation. Although it is possible to opt for a guaranteed annual increase of (say) 5%, the reduction in the initial guaranteed annuity is substantial.

I want to thank Duncan Palmer, one of my MBA students, who made a significant contribution to the development of these perspectives.

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