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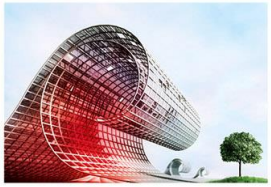

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10 Good Practice Principles for Retirement Phase Modelling in Australia

Jim Hennington and Glenn Langton

Presented to the Actuaries Institute
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Discussion Paper

10 Good Practice Principles for Retirement Phase Modelling in Australia

Jim Hennington and Glenn Langton

Financial Services Forum
16 May 2016

Purpose of Paper:

To propose a set of good practice principles for those organisations that develop projection tools to help with financial planning in the retirement phase.

An objective of the Actuaries Institute is to demonstrate that professional certification of retirement projection models is desirable and that Actuaries are well placed to provide this certification. As part of this process the Superannuation Projections and Disclosure Sub-Committee ("SPD") intends (after receiving feedback on the Principles set out in this Paper) to develop a set of Principles that would be endorsed by the Institute. The Paper has had input from the SPD but represents the views of the authors.

Synopsis

Where a household has very large retirement assets they can have it all. Those with small retirement assets will have to rely on the Age Pension. But those in the middle have to make choices, often involving complex cashflow shapes and significant uncertainty. The role of retirement models is to make sense of the decisions households face and to help people make informed choices. For retirement models to achieve this they need to be relevant, easy enough to digest, and give people maximum confidence that the methodology and assumptions used 'under the bonnet' are accurate, fit-for-purpose and can be trusted.

In this Paper we look at retirement through the eyes of the retiree. What decisions must they make? How do they frame the trade-offs they must make such as risk versus reward, and between those cashflows required shortly after retirement and those required if they live to advanced ages? We consider what a retirement model needs to deal with so that those people using the model can deliver proper strategic advice. We also set out a set of good practice principles along with examples for professionals who build retirement models to refer to.

The Paper also considers how the actuarial control cycle approach can assist a retired household to make the most of their retirement assets in light of their actual expenditure levels, their actual investment experience and their evolving health status. The principles consider both the technical specification of the model and, just as importantly, what concepts need to be presented to retirees given the nature of modern retirement in Australia. The principles address issues such as aligning the complexity of the model with a retiree's key decisions, quantifying uncertainty, allowing for a spouse and non-superannuation assets, allowing for longevity risk, modelling retirement phase cashflows including the Age Pension and other sources of income, dealing with risk preferences and comparing scenarios.

This Paper draws on the work of the SPD as well as UK research on how to best communicate financial concepts to consumers[1].

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Glenn Langton is a Fellow of the Institute of Actuaries with over 30 years' experience in superannuation consulting, asset consulting and management. Now retired, Glenn has held senior roles within Mercer, Coopers & Lybrand and Buck Consultants. Glenn has been responsible for investment services, asset consultant support and developing investment products for ING Investment Management.

[1] https://www.actuaries.org.uk/sites/default/files/documents/pdf/bajweb-versionupdatedpdf.pdf

THE 10 GOOD PRACTICE PRINCIPLES FOR RETIREMENT PHASE PROJECTIONS

Principle 1: **Models should provide information and outcomes that relate to the household's financial goals: their lifetime consumption needs and wants**

Principle 2: **Models should be able to demonstrate the variability of future outcomes to facilitate informed trade-offs**

Principle 3: **Models should allow for the fact that some expenditure needs are more important than others, and should be able to confirm that a household's essential lifestyle needs are secure for life**

Principle 4: **Models should be able to project all significant assets, liabilities and incomes at the household level (including the Age Pension)**

Principle 5: **Models should ensure that they take into account all issues that will have a material impact on future outcomes so that informed decisions can be made**

Principle 6: **Models should provide year-by-year projections of expenditure and assets and be able to allow for changes in personal circumstances and expenditure levels in any future year to allow for dynamic behaviours**

Principle 7: **Models should use best estimates for all required assumptions. These can be time varying and should take into account current market conditions to the extent possible**

Principle 8: **Models should be able to demonstrate the range of uncertainty for the household's lifespan. Mortality rates should be appropriate for clients of the model and include mortality improvements**

Principle 9: **Models should be able to facilitate annual reviews to take into account the household's actual experience**

Principle 10: **Models should be able to be updated as required to take into account changes to assumptions and legislation**

Contents

1. Introduction

As Australia's baby boomers enter retirement the assets in the retirement phase are increasing substantially. Rice Warner has estimated that these assets will rise to $1.4 trillion over the next 15 years (in 2015 dollars)[2]. The objective of this Paper is to clarify the financial planning needs of households as they enter retirement and to suggest a set of good practice principles for modelling the retirement phase.

Models are needed to help retirees understand the decisions they face and to help them make informed choices. A variety of existing models are available from a number of sources. However, many of these projections focus on the accumulation phase and the lump sum available at retirement. Where this lump sum is converted into an income the conversion tends to be carried out using simple methods. With this in mind, we believe it is important for those organisations providing financial planning advice to develop more sophisticated models for the retirement phase to ensure that retirees optimise their quality of life during this time.

To maintain a lifestyle without working puts a strain on a household's retirement assets that need to be managed with care and vigilance. This requires different techniques from managing the creation of wealth during the accumulation phase. Our defined contribution system and complex Age Pension arrangements puts most of the decision making and risk management responsibility in the hands of individual households.

Households who aspire to a lifestyle in retirement that exceeds the level of the Age Pension face significant uncertainty as they convert capital into retirement cashflows. Spend too much and they risk running out of capital. Spend too little and they won't enjoy the retired lifestyle they saved hard to enjoy.

In today's environment most households can't afford the lifestyle they desire *as well as* pass on all their retirement capital to their children. To optimise their standard of living they need to carefully consume capital over the course of their (unknown) future lifespans[3]. This is no easy task and as all good actuarial students know, a financial entity needs reserves if it is to survive in the face of uncertainty[4].

The objective of this Paper is to propose a set of principles for modelling the retirement phase that tackle this problem in a professional manner. In doing so we refer to some of the techniques and tools that financial institutions employ to model their own risks. We suggest that some of these approaches should apply to household retirement modelling too[5]. We give particular emphasis to the scope of the models including how to communicate results in a way that will aid making informed decisions. The principles have been tailored to the Australian context which, due to the dynamic nature of our means tested Age Pension, is more complex than other countries when modelling total retirement income.

The principles in this Paper focus on the retirement phase, but it is clear many of them should extend to pre-retirement modelling as well. As a minimum, the model used in the accumulation phase should be consistent with the techniques used in the retirement phase.

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[2] http://ricewarner.com/strategies-for-surging-retirement-dollars/

[3] In planning this consumption of capital, they need to mould their cashflows around the Age Pension which can have a highly irregular shape for those affected by means testing. This is discussed later in Section 4.

[4] This highlights a flaw in Australia's culture of 'self insuring' their own retirement risks. If millions of households all hold reserves to protect themselves from the same risks, the total reserves needed will be higher than if they were to pool their risk. However for the purposes of this paper we focus on models that help households who do self insure these risks, as this is common practice in Australia.

[5] As noted in the Bibliography, there has been considerable work going on in this area. The principles herein are a call to consolidate this thinking into a common set of principles for the financial planning industry and Actuaries to refer to.

In Section 4 we show that Australian retirees can be split into segments that have a significantly different focus and hence different modelling needs. Those aspiring to a lifestyle in old age that's in excess of the government Age Pension have particularly complex capital management decisions to make and this is a key part of this Paper.

We note that the aim of this Paper is to suggest a set of high level Principles that will provide the background against which more detailed guidance can be developed by professional bodies. The Principles therefore do not specify how the detail should be implemented. We see the Actuaries Institute providing this detailed guidance where, for example, standards would be set around assumptions used in stochastic projections and longevity calculations.

Who should be interested in these principles?

There is a limit to the lifestyle that can be supported by any given amount of capital. The consequence of ignoring this limit impacts the whole retirement industry as follows.

Retirees	Retirees need to make informed decisions about managing capital in retirement that take into account the Age Pension. These typically involve a trade-off between having a more expensive living standard and running out of capital later in retirement.
Financial planning groups / Compliance departments	Retirees often seek advice on all the issues discussed in this Paper. They need confidence that advisers have appropriate tools to model these trade-offs professionally. The underlying risk management processes used by advisers ought to be on par with the standards used elsewhere in the industry including where financial institutions manage their own risk exposures[6]. Overlooking these issues means compliance departments face a risk time-bomb if advisers permit, or even encourage, retirees to spend their money on unsustainable lifestyles and run out of capital earlier than expected. As seen from events over recent years there are significant reputational risks if financial planners are seen to provide poor or misleading advice.
Risk Actuaries / P.I. Insurers	An adviser workforce who is not vigilant in assessing the living standards that their retired clients can sustain represents a major advice risk. Risk Actuaries should consider what will happen if retirees sue their advisers when they run out of money. The 'risk profiling' tools currently used by advisers don't appear to fully address this risk[7]. Setting prudential standards for advisers to adhere to when working with retired clients requires models that can support the calculations required.

[6] At present there seems a stark mismatch between (a) the techniques financial institutions employ to manage risk and (b) the way the industry expects households to manage those very same risks. The industry should not be complacent about the current situation of assuming households can easily manage and absorb retirement risks. This should be of significant concern to risk Actuaries who will be under the spot light if (and when) a paradigm shift occurs and standards for retirement capital management become more stringent.

[7] A stochastic approach to retirement income planning, John De Ravin, 2014

Superannuation funds	Retirees are increasingly turning to their funds for guidance and advice. Much of this will be scaled advice that is limited in scope. Where more detailed advice is needed, superannuation funds will refer their members to financial planners. It is important that the superannuation trustees are confident this advice is soundly based. Common advice areas will be around 'can I afford to retire?' The answer to this question requires a model that adheres to the principles set out in this Paper. Trustees should consider the reputational risks if members run out of money later in retirement.
Regulators / Treasury / Policy makers	The models used when assessing the situation of groups of retirees, and when making policy decisions that impact them, should adhere to these principles if they are to provide meaningful insight. It's important for Australian taxpayers that our retirement system allocates capital efficiently to: - Minimise pressure on the Age Pension where retirees could fund their own lifestyles; and - Avoid a situation where retirees, as a group, are over-reserving for risk using tax sheltered structures (especially if many of these reserves ultimately become inheritances rather than be used to provide retirement incomes) Algorithms used in digital financial product advice should reflect these principles whenever retirement cashflows affect the advice or are part of the recommendations made. Another of the major concerns for regulators is to ensure consumers can compare the information provided by various providers. Where this information is based on a projection it is important that all projections are carried out using similar principles.
Product providers	As well as helping to inform product design, any tools provided to advisers / retirees need to be able to identify which products best meet the needs of retirees.

2. What decisions must retirees make, and what do they need from a model?

A good model needs to be very clear about what need it is trying to meet. It requires knowing what the retiree is seeking to understand, the questions that need to be answered and the decisions that need to be made. The model should focus on what has the most significant impact on the results and actual future outcomes.

Retirement models need to provide information that retirees can understand and which gives them insight into what might happen during their retirement under various scenarios. There is little point to modelling detail that doesn't impact the retiree's outcome. However it is vital to model all the drivers that do have a material impact on them.

The ultimate financial outcomes for a retired household are the lifestyle they can afford while they are alive and the value of their estate on their death.

When someone retires (and ceases to earn a wage or salary), they still require a stream of cashflows to maintain their standard of living, often for periods as long as 30 years or more. In some cases social security will cover the household's needs, but many retirees aspire to a higher living standard than welfare provides.

A lifestyle above that supported by the Age Pension will require capital to produce that extra cashflow. This needs careful management as, for many, it requires amortising the household's capital through uncertain future inflation and investment conditions (both of which are outside the control of the retiree). This 'self annuitisation' of retirement assets becomes a very actuarial problem. Retirees must make vigilant decisions to ensure they can meet their lifetime needs with a level of certainty they are comfortable with. The difficulty is, of course, an individual does not know how long that lifetime will be.

A model that uses fixed, deterministic assumptions makes amortising capital looks simple. With fixed returns and timeframes, all the parameters and outcomes are known in advance. But in reality there are eight major drivers of a household's retirement outcome and some of these carry significant uncertainty. These are set out in the table below.

Table 1: Drivers of outcomes in the retirement phase

Within the retiree's control	Retiree has some influence	Outside the retiree's control
Investment mix (including home equity)	**Timing of retirement**	**Market performance**
Spending level and 'shape'	**Undertaking part time work**	**Inflation**
	Lifespan	**Tax & social security rules**

When someone leaves employment, they no longer have the ability to change their situation by saving more or retiring later. The only levers left to improve their financial situation over time are:

- Changing their spending levels
- Carrying out part time work (if possible)
- Making changes to their investment mix (including the use of annuities or other pooled products)
- Accepting a different level of risk

Looking at retirement through the eyes of the retiree, one of their key decisions is how much uncertainty is acceptable. Retirees need tools to help them visualise this and explore what can be done to control it. Just prior to retirement, the main decisions a retiree has to make are:

- When / whether to retire (noting that the decision is not always in their control)
- What lifestyle to aim for
- What level of risk to accept

Retirement models need to focus directly on these levers and decisions. They need to be able to demonstrate the impact of each decision/lever in a way that retirees can understand and use to make informed trade-offs. Where there are material influences that are outside the retiree's control the model needs to demonstrate the full range of possible outcomes. This is to allow retirees to make informed decisions having regard to the trade-offs that take into account uncertainty.

As mentioned above, the ultimate financial outcomes for a household's retirement are:

- The lifestyle they have over the course of retirement; and
- The value of their estate on death

Consumption (lifestyle) over the course of retirement is partly an outcome of what happens in retirement but current consumption is a decision that impacts what future consumption is achievable at subsequent ages. Consumption decisions will be influenced by what assets are available. But likewise future asset levels are impacted by previous consumption. This feedback cycle highlights how a control cycle approach is needed.

In cases where retirement assets are not sufficient to meet all retirement objectives, compromises need to be made. Ideally, these should be considered in advance, rather than be a surprise adjustment later on in retirement.

This leads to our first principle which is consistent with research from the Institute of Actuaries in the UK[8]:

Principle 1:	**Models should provide information and outcomes that relate to the household's financial goals: their lifetime consumption needs and wants**

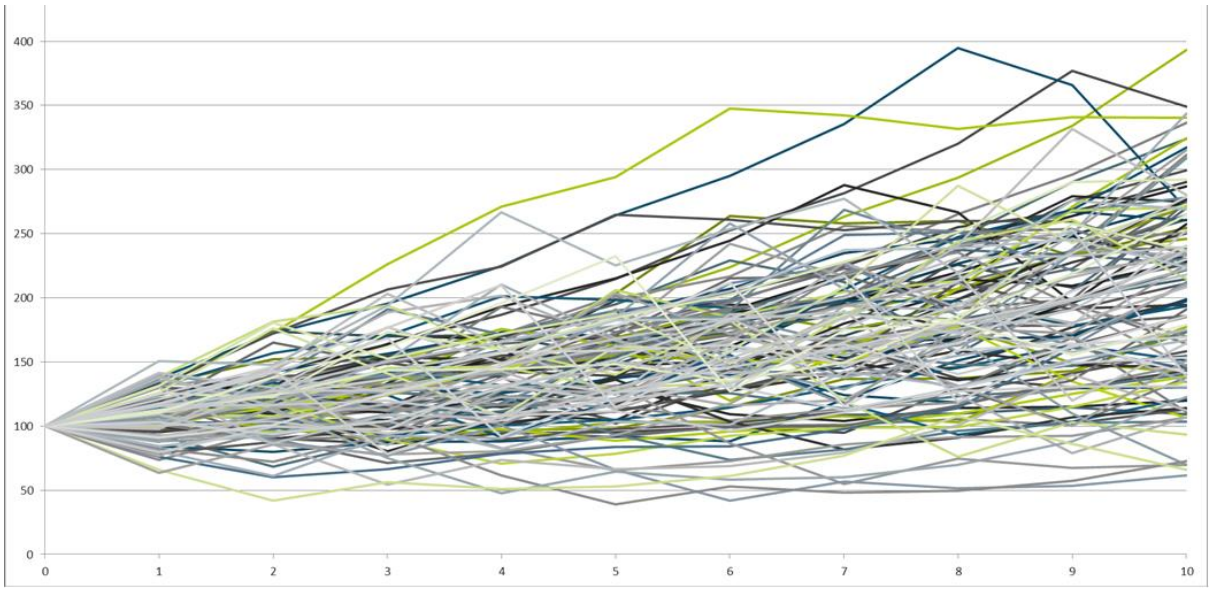
Surveys show that the top concerns of people in retirement relate to the fear of outliving their retirement savings. Things like poor market performance, high inflation or simply living too long are often quoted concerns.

Advisers and online tool providers need models that can give retirees an understanding of the range of possible outcomes they face from any given set of decisions. There are a number of techniques for fitting a distribution to long term outcomes from a household's retirement assets over time and Actuaries are well placed to assist in this regard.

The importance of considering uncertainty, even over long timeframes, is demonstrated in the chart below. This chart shows Australian equity returns (net of inflation) over every 10-year time period since 1883.

[8] https://www.actuaries.org.uk/sites/default/files/documents/pdf/wpconsumerinformationfinalnovember11update.pdf

Chart 1: Real returns on Australian equities over 10-year periods 1883-2015[9]



You can see that even for time periods as long as 10 years different retirees would have experienced very different outcomes depending on what exact year they retired in. Relying on an average returns and assuming all retirees achieve this year on year is unrealistic. Instead, retirement phase models should analyse these distributions and illustrate to retirees a realistic range of what their retirement could look like. This should include a demonstration of how their situation would look if they retired in one of the 'unlucky' years, and show the severity of impact on their personal situation.

Looking forward, there are a number of possible ways for models to do this. If we leverage the work of Quantitative Analysts it's possible to build (or purchase) an Economic Scenario Generator that can generate collections of simulated economic scenarios like this for the future. These models take into account assumed correlation between all the asset classes and inflation and the collection of simulations therefore represents a full distribution of possible economic futures. Tools like this can be used to stress test a household's retirement through the full range of scenarios and identify a distribution of long term results for their retirement.

Another option for demonstrating the range of possible results and calculating the probability of particular outcomes is the use of closed form statistical formulas that can fulfil a similar purpose.

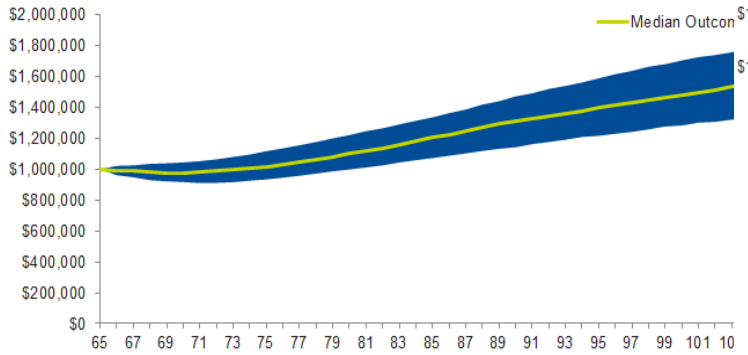
When demonstrating the range of possible outcomes, obviously consumption (withdrawal) decisions will have a material impact. The example charts below use an Economic Scenario Generator[10] to demonstrate the range of possible future outcomes for two different investment mixes, with and without withdrawals being made. The blue shaded area shows the boundary within which there is an 80% chance the portfolio's value will lie at each age. We first show this for a cash portfolio with and without drawdowns each year and then again for a balanced portfolio. For more information about how these charts are produced, see Appendix 1. Figures are in today's purchasing power.

[9] Source: Accurium analysis of ASX all ordinaries total return index

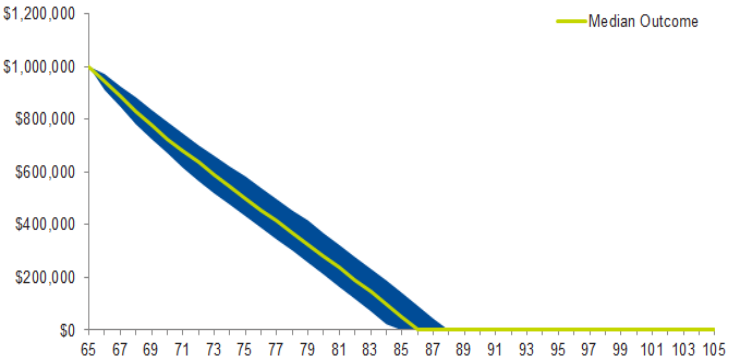
[10] Refer to Appendix 1 for an explanation of how an Economic Scenario Generator produces simulations for future market conditions (including the various asset classes and inflation)

Chart 2: The impact of drawdowns on the performance of a portfolio

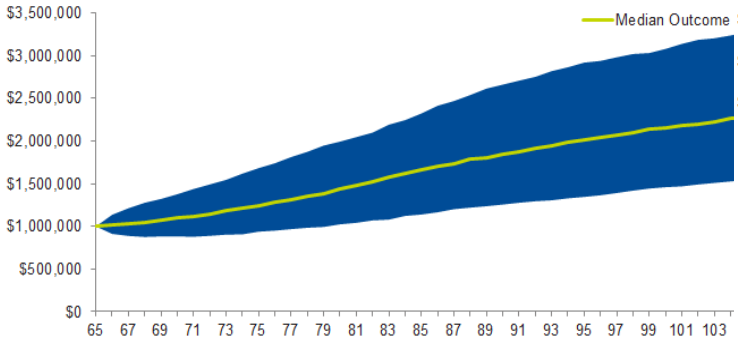
Defensive mix, no drawdown



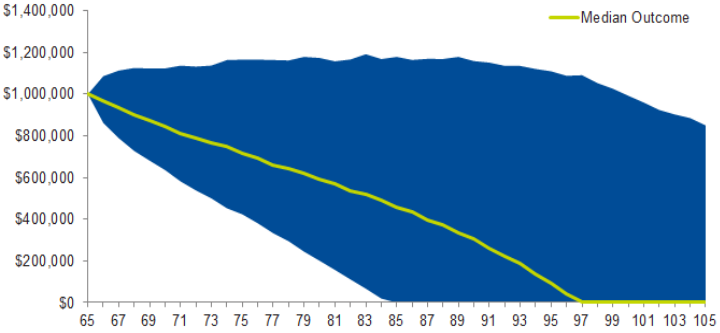
Defensive mix, $50k p.a. drawdown (indexed)



Balanced mix, no drawdown



Balanced mix, $50k p.a. drawdown (indexed)



We note that these charts do not allow for the impact of the Age Pension. To see the impact of the Age Pension refer to chart 6.

Comparing the charts with and without withdrawals, it's clear that drawing cashflows from volatile assets accentuates the relative range of possible outcomes. It invalidates the idea that over a long time period retirees can rely on earning 'average' returns. The simple way to explain this effect is that it's the opposite of dollar-cost averaging. It highlights the amount of uncertainty retirees are left with if models use fixed deterministic assumptions. If stochastic projections are not used, sophisticated scenario testing is required to capture the full amount of uncertainty that retirees face.

This leads to the second Principle.

Principle 2: Models should be able to demonstrate the variability of future outcomes to facilitate informed trade-offs

3. Consumption priorities

When considering variability of outcomes, it's important to acknowledge that some aspects of a person's lifestyle are more important to them than others. Retirees won't want to risk being able to afford things like food and shelter. But items such as luxury holidays and new cars might be acceptable to forfeit in the event of poor market performance.

One approach is based on simple concepts that people can relate to. Some financial advisers ask their client to split their lifestyle expenses into 'essential' and 'discretionary' in order to identify the lifestyle items they cannot do without and those that could be forfeited if things don't go to plan [11].

Different retirees can categorise the various aspects of their lifestyle based on what is most important to them. Some retirees might count things like gardening or visits to grandchildren as things they cannot do without. Others may consider it essential to have the air-conditioning on all day. Every household will have their own form of 'essential' lifestyle they cannot do without and these trade-off decisions can also be influenced by what the retiree can indeed afford.

The essential versus discretionary layering approach provides a simple framework to deal with priorities. When demonstrating the range of outcomes a retiree faces the model should help to ensure their essential spending needs can be met.

Each retiree needs to be able to understand and manage the risk that the consumption they desire won't or can't be achieved. Once their essential needs are secure, retirees can then explore their ability to afford discretionary items as well. In Section 7 we discuss how to manage these decisions in tandem using an actuarial control cycle approach.

An alternative approach to handling this type of dynamic is through utility theory. The idea is to design a utility function that assigns a level of utility to different income levels which reflects the fact that additional income when you're comfortable has less relative value than additional income if you were struggling to meet day to day needs. The problem with this approach is that the utility functions are difficult to calibrate and also difficult for retirees to understand.

The concept that that some expenditure is more important than other expenditure leads to the third Principle.

Principle 3: Models should allow for the fact that some expenditure needs are more important than others, and should be able to confirm that a household's essential lifestyle needs are secure for life

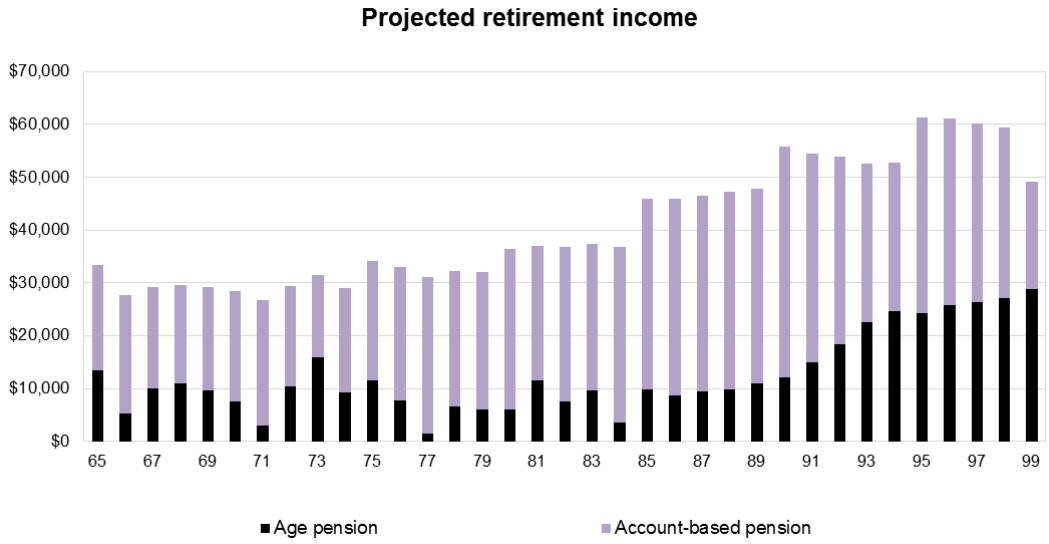
Note that where a household's essential spending needs are lower than the level of Age Pension then for practical purposes they can consider that spending as secure. This allows them to focus on optimising their enjoyment of their capital toward discretionary spending. Where a household's essential spending needs are higher than what's provided by the Age Pension they will need very careful management of their retirement capital to ensure it doesn't run out. We discuss this further below.

[11] Applying the 4-Box Strategy to Generating a Lifetime of Income, Farrell Dolan, LIMRA's MarketFacts Quarterly / Fall 2009

4. Peculiarities for Australian retirees

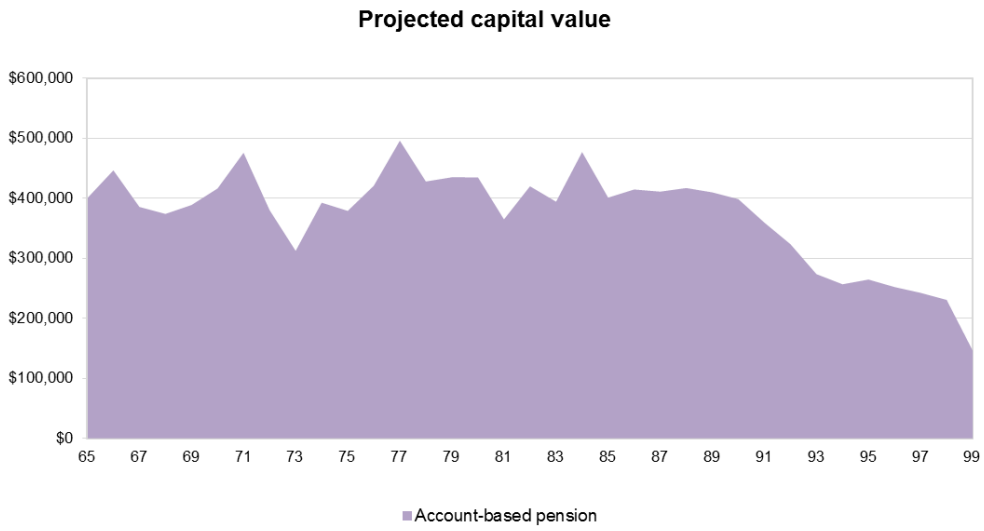
Australia's means tested Age Pension makes a household's combined income in retirement complex to model. For those affected by means testing, the Age Pension provides an irregular series of cashflows that often start out low, or nil, and then vary over time as capital is consumed. The reduction in Age Pension caused by the income test and assets test will change each year as retirement assets are affected by drawdowns and market performance. Any sequence of investment returns will have a corresponding sequence of Age Pension cashflows depending on the pattern of wealth levels each year.

Chart 3: Example of irregular cashflows from the Age Pension (in real terms) if historic returns and inflation since 1975 were repeated. Single female with $500,000 in a balanced superannuation fund



In the above chart, the income from the Account Based pension is the age based the minimum pension standards.

Chart 4: Corresponding real asset values for Chart 3

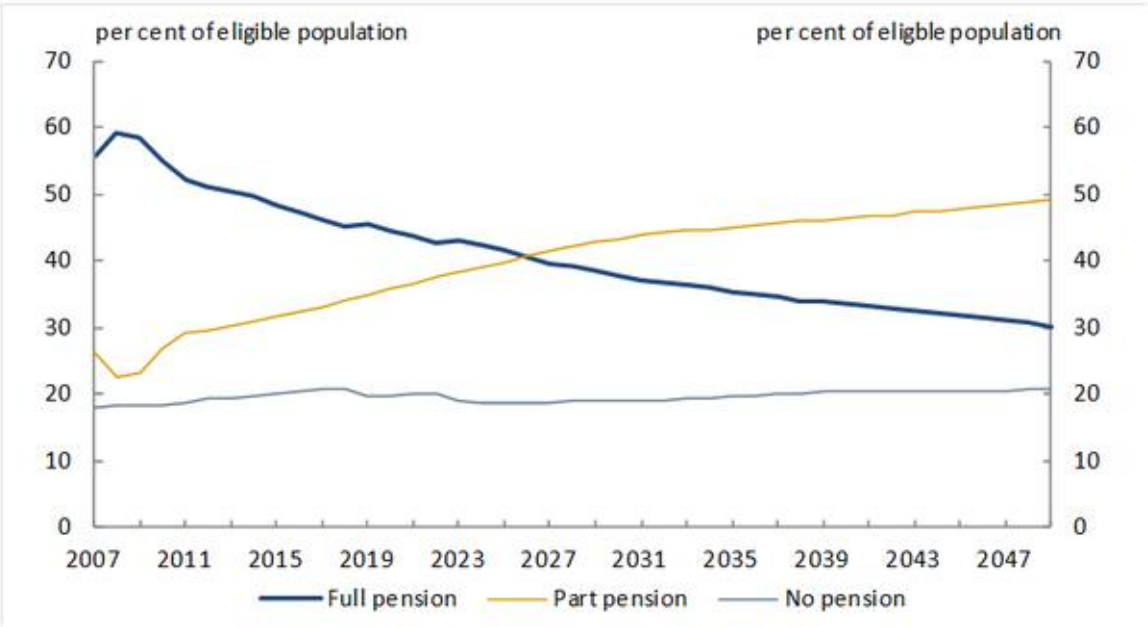


This is further complicated as the Age Pension is indexed to wages while retirees might maintain their essential and discretionary spending in dollar terms or in line with the rate of price inflation.

Chart 5 below shows estimates from a 2014 report by the National Commission of Audit around how many Australian retirees will receive an Age Pension. Under the rules at that time (prior to the change in asset test rules from 1 January 2017) 80% of retired Australians were expected to receive either a full or part pension until 2050 and beyond. Of this 80%, the number of retirees receiving a means tested pension (a 'part pension') was projected to increase to almost 50% of Australian retirees.

Whilst the exact figures will now be different from 1 January 2017, this nonetheless shows that retirement models need to include the Age Pension on a year by year basis.

Chart 5: Projected proportion of eligible persons receiving an Age Pension (National Commission of Audit study)



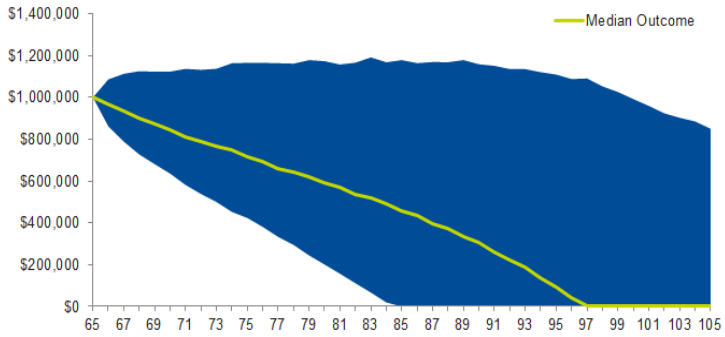
Source: Rothman, 2012.

For retired households with consumption needs that are level over the course of retirement, any income received from the Age Pension will offset the amount they need to draw from their own capital. This will therefore create irregular series of cashflows coming from the retiree's own capital. For those on a part pension, the contribution toward consumption that comes from the Age Pension gets higher as the retiree's own assets are depleted. In effect the Age Pension acts as cushion which helps absorb downside risk.

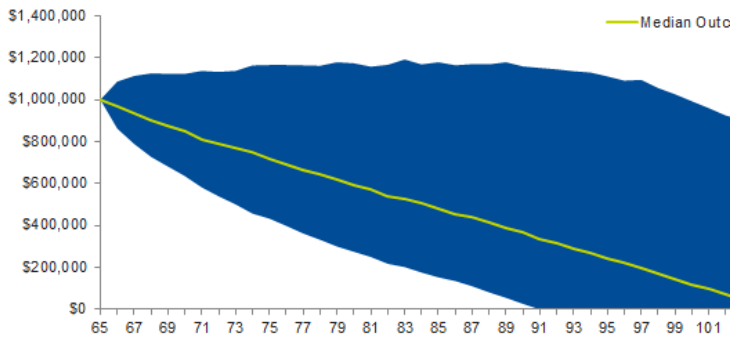
This effect can be seen in the charts below. The chart on the left is the same chart from Section 2 above showing the range of possible outcomes from a balanced portfolio drawing out $50,000 (indexed) per year. On the right we show the impact if some of this $50,000 instead comes from the Age Pension. You can see that the 'worst case' scenarios (the bottom of the blue shaded area) have improved.

Chart 6: The impact of the Age Pension on the range of outcomes in retirement

Balanced mix, $50k p.a. drawdown (indexed)



Balanced mix, $50k p.a. drawdowns reduced by Age Pension Received



When considering the Age Pension for couples, it's important to model them together rather than model each individual spouse separately. The reasons for this are:

- The Age Pension is assessed at household level and the means testing rules take all assets and incomes of both spouses into account
- The means test thresholds for a single are more than half those for a couple
- The Age Pension payment rate for a single person is more than half the Age Pension for a couple
- The expenditure required to support two people living together is usually lower than two people living apart
- On death the assets of one spouse typically pass to the other

Retirement models in Australia must therefore model all the assets and incomes of both spouses together (potentially including future inheritances in cases where these are sufficiently predictable).

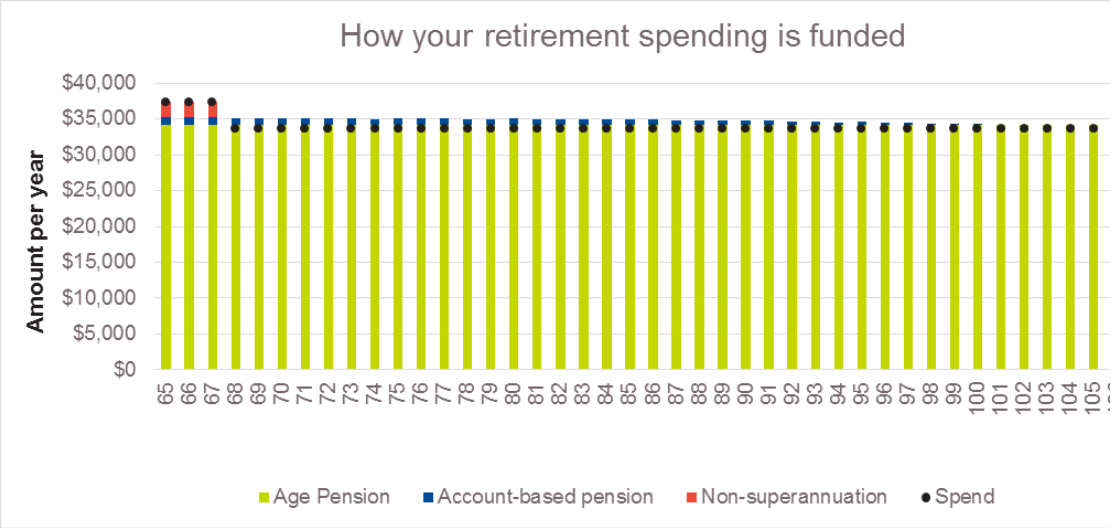
The Age Pension rules create several distinct segments of retiree based on where they sit relative to the means testing rules and if their lifestyle objectives are more than the level of income provided by the Age Pension.

It is vital not to assume retirees all view retirement decisions in the same way. People building retirement models need to understand that the key drivers for each segment can be totally different. The most important decisions and trade-offs that one group focus on can be very different to the focus for other groups.

The main segments of retiree in Australia are as follows[12].

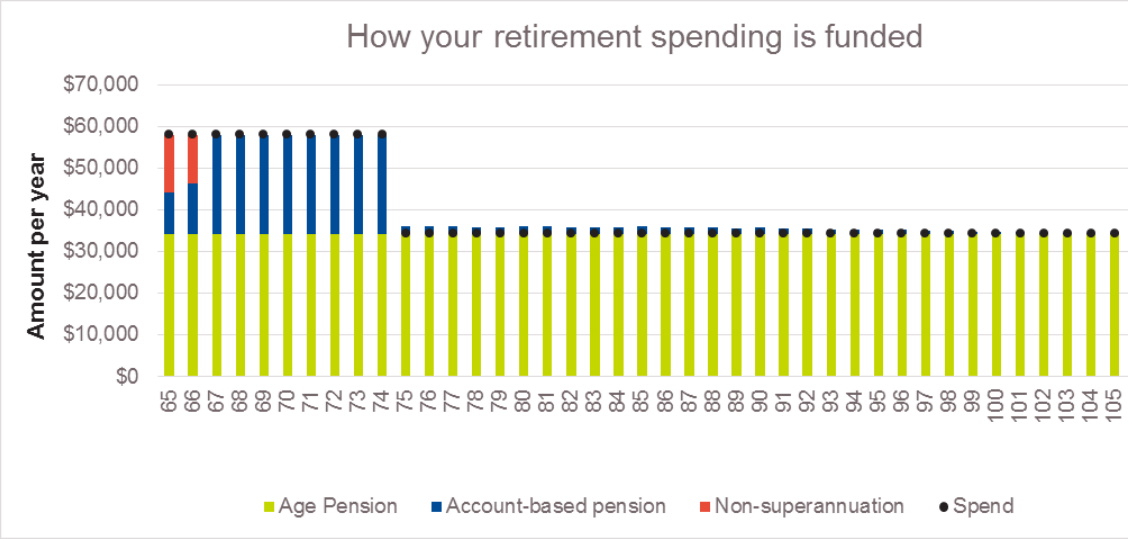
1. **Households with low levels of assets at retirement**. These households will be fully dependant on the full Age Pension. They will typically have very low superannuation balances and may already be dependent on welfare. Any assets they have are unlikely to support a higher living standard for long and are instead likely to be used as a capital buffer for lumpy expenditures. They do not have many decisions to make in retirement other than ensuring they live within their means.

[12] The charts show example case studies that might reflect each segment. The charts assume that if the household's living costs exceed their total income from the Age Pension plus minimum Account Based Pension then they consume non-superannuation retirement assets first to meet that shortfall (the rationale is that non-superannuation assets are likely to be less tax sheltered than superannuation). Consumption of non-superannuation assets is shown in red on the charts.



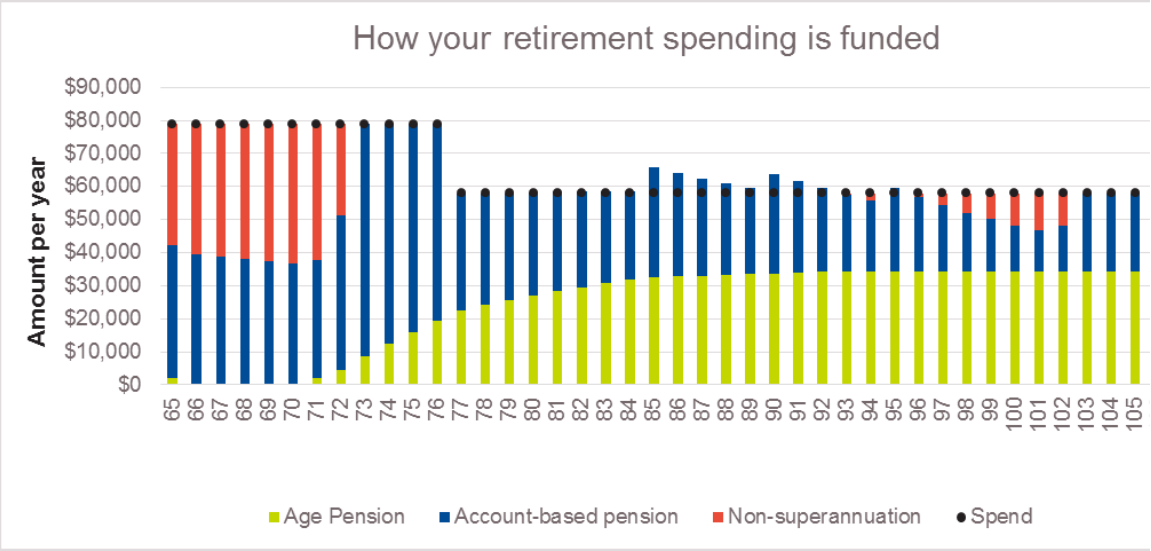
2. **Households with modest levels of assets at retirement.** These households may aspire to higher living standards than the Age Pension provides, especially in the earlier years of retirement when they are active and healthy. After this the Age Pension broadly covers their 'essential' living costs and so the main decisions they need to focus on are about optimising their enjoyment of assets before they fall back on the Age Pension.

   This group are less likely to have a significant bequest motive but may wish to look at releasing equity in their homes at some stage to help sustain their lifestyles.



3. **Households with comfortable levels of assets at retirement.** This group are likely to have similar objectives to the Modest group but are more likely to have essential spending needs that exceed the Age Pension. They are likely to see their Age Pension impacted by means testing rules in the early years of retirement when their wealth is greatest. The main trade-offs and decisions they need to focus on are how to optimise their enjoyment of discretionary items without risking the security of their essential lifestyle later in life.

   This group faces an especially complex trade-off between (i) making discretionary spending decisions early in retirement and (ii) the remaining capital they will have for essential spending later in life with sufficient certainty. [13]

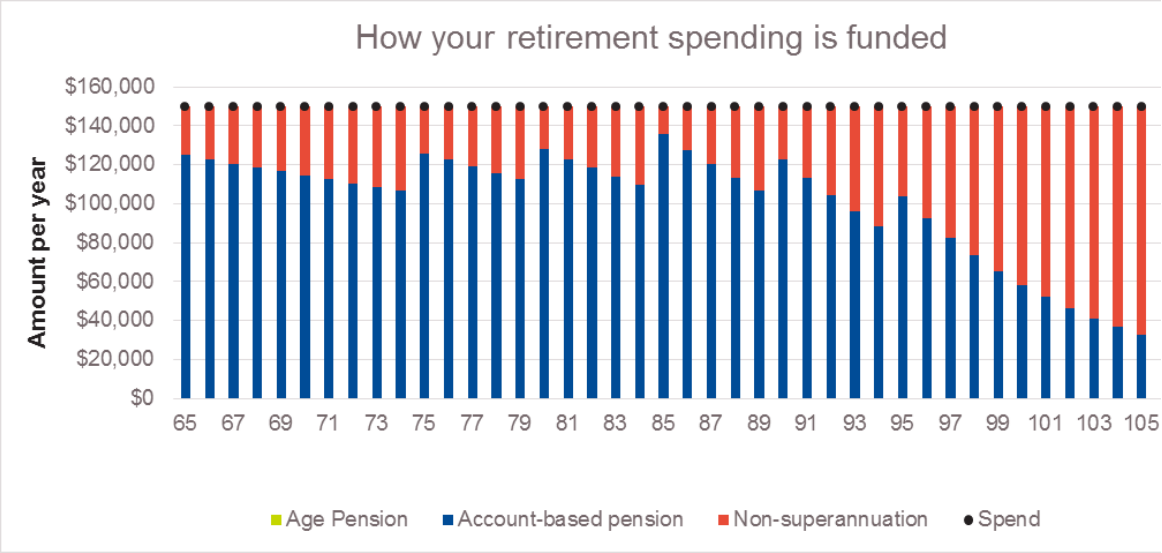


4. **Households with high levels of assets at retirement.** Even very wealthy households face a trade-off between their expensive lifestyles and their ability to sustain these over very long timeframes. High net worth households are more likely to focus on leaving an inheritance and the impact that different lifestyle choices will have on their ability to do so.

   If the ratio of their capital to their lifestyle is very high (e.g. at least 30 times their annual spending), then sustainability of their assets may be less of a concern and they can concentrate on generating high returns. However if they have a high bequest motive, or the ratio of their capital to their lifestyle is lower (e.g. less than 25 times their annual spending) then they face similar trade-offs and decisions to Segment 3 in terms of how to optimise their enjoyment of discretionary items without risking the security of their essential lifestyle later in life.

   This segment is also likely to have more complex financial arrangements which only the more sophisticated models will be able to cater for.

[13] The shape of this chart reflects the fact that at age 85 the Age Pension plus minimum account based pension income exceeds this household's living costs. The excess is assumed to be saved outside of superannuation and is used to support spending at later ages.



The way each segment generates cashflow to secure lifestyle needs is clearly different and the risks and trade-offs they are most interested in are therefore different. Further the asset structures of each group will vary significantly. Retirement models should have the ability to model a wide range of asset structures and let each type of retiree focus on the decisions that are relevant to him/her.

The table below summarises these segments and suggests what decisions each group is likely to focus on. Note that Australian retirees also have a high proportion of wealth held in their homes. This is likely to form an increasing part of the retirement decision making process for Segments 2 and 3.

Table 2: Segments of Australian retiree and the range of decisions they focus on

Segment	Description	Most important decision
1. Low assets at retirement	Those with low levels of assets who are totally dependent on the Age Pension	Maintaining some capital for lumpy expenditures and use in emergencies
2. Modest assets at retirement	Those whose essential spending needs are covered by the Age Pension but have assets they can use to optimise their discretionary spending	How to optimise their enjoyment of their assets before falling back on the Age Pension. When to release equity from the home and what this can achieve.
3. Comfortable assets at retirement	Those who want to secure lifestyles that cost more than the Age Pension. Some of that expenditure will be considered essential and some discretionary.	How to balance their discretionary spending against the risk of outliving their assets and not being able to sustain their essential lifestyle needs at older ages. When to release equity from the home and what this can achieve.
4. High assets at retirement	Fully self funded retirees who can comfortably afford expensive lifestyles as well as leave a bequest. Note this is likely to require $3m+ in assets (over and above the home) to sustain an inflation linked lifestyle over $100,000 per year.	Generating high returns and balancing their expensive lifestyles with the amount of bequest they leave their children

The importance of household income and assets and the impact of the Age Pension lead to Principle 4.

Principle 4:	**Models should be able to project all significant assets, liabilities and incomes at the household level (including the Age Pension)**

5. Principles for communication and framing retirement decisions

The principles in this Paper reflect a strong belief in the role of models to help retirees make the best choices. Retirees need to receive engaging information they can easily digest and understand. Often there is no 'right' answer and each retiree must make trade-offs around spending decisions today versus uncertainty about his/her financial situation in the longer term.

For models to be engaging they need to have the retiree's objectives at heart. They need to focus on the decisions that retirees need to make and to demonstrate what their retirement could look like under different sets of decisions.

Just like other industries (for example automotive, airline, computer hardware), the client does not want exposure to the internal workings and complexities behind the scenes. They want to see enough detail to make the decisions they have to, but beyond that leave the detail to experts. If you are reading this on a computer then you probably aren't interested in all the electrical engineering going on behind the screen. When you take a flight you trust that trained and supervised professionals have taken all the mechanical complexities into account properly and have made appropriate decisions and assumptions to safely deliver that service. All you need to worry about is whether the flight is likely to land on time for you to make your meeting.

Summarising the above sections, it's important for the model to:

- Focus on the retiree's objectives, especially having cashflow to support their essential lifestyle (however this is determined)
- Deal with all the major drivers of the retiree's outcomes. Where these are subject to risks outside the retirees control the model should demonstrate the variability of outcomes faced
- Provide an indication of the likelihood of being able to achieve particular objectives (such as essential and discretionary expenditure)
- Allow the retiree to assess the impact of different decisions on their range of outcomes. Note that the most important decisions are different for different segments of retiree.

There needs to be a line between (a) what the retiree needs control and visibility over, (b) what the retiree needs visibility of but can just trust meets professional standards and (c) detail that retirees may not need to see at all but just assume meets professional standards.

Table 3: How much visibility and control retirees need over key model items

Retirees need to see, and be able to change	Retirees need to see, but just trust	Retirees need to trust, but only see if interested
• Their retirement age • Their consumption goals throughout retirement (profiles of spending) • Their assumed investment mix	• The range of outcomes they could experience • The likelihood of achieving certain outcomes	• Fee assumptions • Tax & legislative rules modelled • Asset model assumptions

Where the retiree is being advised by a financial adviser, the adviser needs to be able to:

- Carry out due diligence into the assumptions and methodologies used within the model
- Adjust key assumptions where required
- Look at and compare the results of a range of scenarios in order to determine the best advice to give their client

Ideally inputs and results should be presented in plain English. Models need to be well designed and laid out and avoid use of jargon. For those who want more detail, this should be available and easy to digest but should not clutter up the main user-interface.

This leads to Principle 5.

Principle 5: Models should ensure that they take into account all issues that will have a material impact on future outcomes so that informed decisions can be made

6. Calculation Principles

Retirement models need to provide information that retirees can use to understand what may happen during their retirement and the possible scenarios they face. It is vital to model the drivers that materially impact future outcomes and could therefore impact the retiree's decisions. But there is little point to modelling detail that doesn't impact the retiree's outcome.

Frequency of calculations

As spending patterns are likely to change over the course of retirement, including one-off expenditures, models should allow for a shape of expenditure over time. As set out in Section 4 above modelling the Age Pension means testing rules can be difficult because any sequence of investment returns will produce a corresponding sequence of Age Pension cashflows. The Age Pension acts like a negatively correlated asset because if the value of retirement assets fall then the cashflow received from a means tested Age Pension may rise.

As the charts in Section 2 above demonstrated, a retirees' asset mix also has a major impact on the range of outcomes they face in retirement. Retirees are naturally going to want to explore the impact of changing their asset mix to understand the impact this would have on their outcomes.

As retirees need to understand the potential impact of the various drivers on future cashflows and asset values each year after they retire, projections must provide retirees with yearly statements of these cashflows and asset values. This leads to Principle 6.

Principle 6:	**Models should provide year-by-year projections of expenditure and assets and be able to allow for changes in personal circumstances and expenditure levels in any future year to allow for dynamic behaviours**

Setting assumptions

As stated in Section 5 above, there are elements of a model that retirees need to know they can trust but, assuming they can, won't necessarily need a lot of visibility of in order to make decisions. To maintain maximum integrity, modellers should use best estimates for all of these assumptions based on sound analysis of those items. Examples of this are:

- The various assumptions for future market conditions:
  - Average returns and other statistical properties of each asset class[14]
  - Inflation and its statistical properties
- Fees and costs: including investment management fees, percentage based admin fees and fixed fees
- Assumed changes to legislated bands, thresholds and payment rates for the Age Pension

For more information about how an asset model or economic scenario generator builds up the assumptions to create simulated market scenarios, see Appendix 1.

This leads to Principle 7.

Principle 7:	**Models should use best estimates for all required assumptions. These can be time varying and should take into account current market conditions to the extent possible**

Planning horizon

As discussed earlier, for Segment 3 to sustain a long term lifestyle that costs more than the Age Pension requires capital to produce that extra cashflow. In effect this cashflow requires 'self annuitisation'. As well as market risk, the difficulty is that an individual doesn't know how long their lifetime will be. For couples it becomes a joint life question given that some cashflow is needed for as long as either one of them are alive.

[14] Other statistical properties may include: standard deviation, skewness, cross-correlations, auto-correlation etc

It is inappropriate to use average life expectancy for this purpose. One in every two households will outlive their median life expectancy. To use averages for individual retirement planning leaves each household with a 50/50 chance of the model results being wrong compared to their actual 'specific' outcome. Instead retirees need to allow for the range of possible outcomes they face. Each household needs to plan using a timeframe that includes a safety buffer, to reduce the chance their actual lifespan outlasts their assets. This can give them a confidence level they are more comfortable with, rather than 50/50.

Models should help retirees understand the range of their possible lifespan. This range should include mortality improvement and ideally allow also for systematic mortality risks (the chance that actual mortality improvements are different to expectations). Models should, to the extent possible, take into account each spouse's health status.

The table below shows the ages to which different proportions of retirees are likely live to from age 65, allowing for life expectancy improvements[15]. For example one in four 65 year old couples will see one of them live to age 96. Percentiles like these are helpful for making decisions that take into account the range of outcomes a retiree could experience.

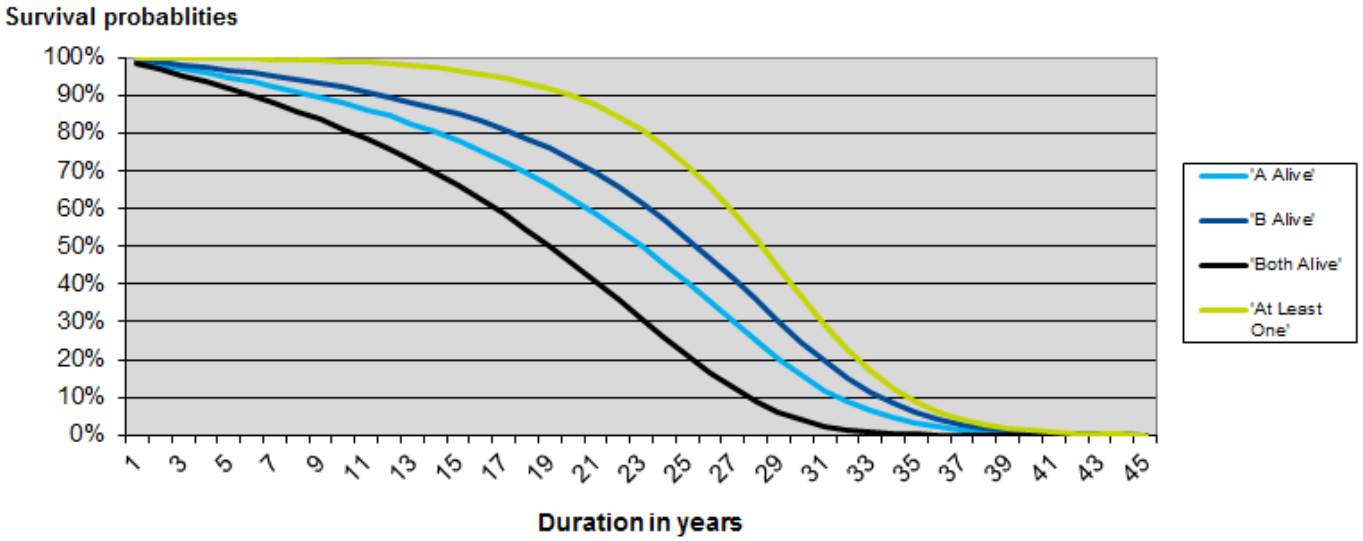
Table 4: Age to which different proportions of retirees are likely to live from age 65

Likelihood of survival	Males	Females	Couples (at least one alive)
90%	73	76	85
75%	81	84	89
50%	88	90	93
25%	93	95	96
10%	96	98	99

For each row in the table that number of retirees *will* experience that outcome. The fact that 'on average' males are expected to live to 88 and females to age 90 is irrelevant.

[15] *Australian Life Tables 2010-12*,

Chart 7: Probability that a Male (A) and Female (B) who are both age 65 will still be alive at future ages (including allowance for mortality improvements)



The above tables include an assumption for future mortality improvements as life expectancies improve over time. However the actual rate of these improvements also carries a degree of uncertainty. This 'systematic' mortality risk for the overall Australian population further increases the range of possible lifespans that a particular retiree faces.

The importance of a retiree understanding the impact of mortality on their retirement needs leads to Principle 8.

Principle 8:	**Models should be able to demonstrate the range of uncertainty for the household's lifespan. Mortality rates should be appropriate for clients of the model and include mortality improvements**

7. Applying an Actuarial Control Cycle

By definition retirees are going to achieve returns that are below average about half the time[16]. It's therefore important to consider what they should do when this occurs. As set out in Section 2 above, a retired household's options for improving their financial situation are limited. The strongest 'lever' is likely to be to reduce spending levels. Obviously each retiree's ability to do so will depend on how much of their spending is discretionary versus essential.

An appropriate way to use a financial model in the retirement phase might look something as follows. Note that the emphasis on particular points will change depending on what segment of retiree is being modelled.

[16] Real investment returns tend to demonstrate a positive skew.

First year:

1. Obtain current values of all financial resources
2. Identify the household's essential lifestyle pattern throughout their future retirement
3. Use the model to confirm that there is a very high probability [17] this essential lifestyle can be achieved for life, in light of the full range of possible future outcomes
4. If not, adjust their expectations (which may involve downsizing the home and/or reducing what is categorised as essential)
5. If so, then the next step is to use the model to explore what level of discretionary expenditure the retiree can reasonably aim for in addition:
   i. Start by assessing their total *desired* expenditure patterns throughout retirement
   ii. Adjust this expenditure so that the chosen pattern can be achieved using 'best estimate' assumptions

Future years:

1. Check the actual experience the retiree has seen over the past year, including:
   - Investment returns
   - Inflation
   - Changes to legislative rules (including the Age Pension level and thresholds)
   - Actual asset mix
   - Actual spending levels
   - Changes to family situation
   - Changes in health status
   - Changes in needs including what's considered essential going forward
2. Revisit and update the assumptions including all of the items in (1) above as well as assumed future mortality rates and legislative rules
3. Repeat the above 'first year' process

The need to easily carry out regular reviews of a retiree's situation during retirement leads to Principle 9.

Principle 9: Models should be able to facilitate annual reviews to take into account the household's actual experience

There are a range of rules and assumptions that a model uses which are subject to change over time and need to be maintained. Market conditions and expectations change over time. Mortality tables and improvement factors get revised periodically. Also legislation which impacts the financial situation of retirees is subject to change. Models should be able to be updated as required to take into account all of these changes easily, quickly and cost effectively. This leads to Principle 10.

Principle 10: Models should be able to be updated as required to take into account changes to assumptions and legislation

[17] For 'essential' living costs, the model should carry out stress tests that confirm these living costs are sustainable for life with at least 95%+ confidence. (If less confidence that this is thought necessary then the living standard isn't really essential).

8. Why Actuaries

There are many factors that impact on the future cashflows of a retiree. Many of these factors are subject to significant variability and most involve complex interactions with each other. Retirees and financial planners will rely on the results of the projection of these cashflows and will assume that the projection correctly models all of these factors. Retirees will assume that the results from projections prepared by different financial planners can be compared. It is important that the projection software and the assumptions used in these projections are soundly based and consistent across the industry.

It is our contention that this can only be achieved if the projection software and the assumptions used in the projections are certified by a properly qualified expert in the area.

Assuming that expert certification is required, we believe that Actuaries with appropriate experience are uniquely placed to provide this certification. The characteristics of such Actuaries are:

- **Modelling expertise**
  Retirement projections need expertise in superannuation, investments and their associated returns (and variability), tax, social security, computing and communication. Actuaries have training in each of these areas through actuarial education and practical experience.

- **Ability to explain complex financial matters to consumers**
  Projections are only useful if consumers can understand the outputs from the projections and can therefore make considered choices about the future. Actuaries have a long history of explaining complex financial matters to boards, senior management and superannuation fund trustees as well as communicating these matters to superannuation fund members. This experience is invaluable when developing the outputs from projections.

- **The Actuaries Institute**

  The Actuaries Institute is a professional body which:

  - develops professional standards
  - has a disciplinary process

  The value of expert certification comes through having a process where standards are developed and enforced. The Actuaries Institute has a history in developing standards in a range of areas where expert certification is required. The Institute has a process which ensures that any actuary who does not comply with these standards is identified and either disciplined or banned from carrying out similar certification in the future.

- **Ability to apply a financial control cycle**

  The Actuarial Control Cycle is a set of principles for making robust decisions in light of future financial uncertainty. The control cycle approach ensures that Actuaries evaluate past experience, revisit their assumptions and re-evaluate future cashflow forecasts accordingly. This discipline ensures that financial entities and the tools they use can adapt rapidly to whatever financial conditions they face.

  Many of the factors that affect the cashflows of a retiree are subject to considerable variability. This means the progression of the retired household's capital will not follow what's set out in any one

projection. It is therefore vital that a retiree's situation is monitored on a regular basis and adjustments made to take into account actual experience over time. There are a number of different reasons why the projection of future cashflows should be adjusted. These include past experience being inconsistent with what was assumed, changes in future assumptions to reflect paradigm changes, changes in circumstances and objectives, changes in laws and product rules, or identified shortcomings in the projection methodology.

One of the major thrusts of actuarial training through the Control Cycle is to carry out this process. Therefore Actuaries are well placed to ensure projection software can assist a financial planner and retiree in this process of review.

- **Actuaries' international connections**

  The gradual aging of the population is a feature of many countries and the issue of how to manage assets during retirement is currently being addressed in many other countries too. It is important that the experts who certify projection software are aware of developments in this area around the world.

  Most developed countries have an Actuarial body operating in their country. There are close links between the Actuaries Institute and these other institutions. As a result of these links, Actuaries in Australia ensure that projection software developed in Australia has regard to developments around the world.

9. Conclusions

Retirement models must focus on the entire household. They need to focus on the consumption goals and in doing so include all significant assets, liabilities and sources of income that impact the ability to achieve that consumption.

Models need to demonstrate the range of outcomes in order to help retirees understand the likelihood of achieving their consumption goals and to compare scenarios when making decisions.

We hope that this Paper makes it clear how each of the principles herein are vital to meet the needs of Australians entering retirement. The models required in retirement are indeed complex. Retirees should be shielded from that complexity where possible but, just like other industries that need safety standards, consumers should feel confident there are professional standards in place that protect their interests.

Superannuation Actuaries in particular should be thinking like financial planners once members enter retirement. Retirement decisions need to be made at household level, not through the lens of a particular superannuation fund.

Professional bodies like the Actuaries Institute are ideal to set and define the standards required so that retirees can trust and rely on the service they are getting from the industry. The models are of little value unless retirees can have full faith that they have been built by and audited by appropriately qualified professionals who work to the highest ethical and professional standards.

In many ways the personal financial modelling industry is like a new profession in its infancy. The standards should be set in advance, rather than in retrospect when we see disasters.

We note there are likely to be opportunities for Actuaries to provide advice directly to retirees using these type models.

In Appendices 2 and 3 we set out two practical examples that show how retirees can use models to make decisions as they enter retirement. In the first example we look at how this could work for a 60 year old male using a deterministic model. In the second example we demonstrate the use of a stochastic model to look at how a 60 year old couple can make safe spending decisions in retirement.

Further work

We point out that the principles set out here are high level. In preparing the Paper we feel there are certain areas that need further work to address them in more detail.

These areas include:

- Sophisticated scenario testing techniques for deterministic models to demonstrate uncertainty in an appropriate manner (and demonstrate the range of outcomes under Principle 2).

  The model used for Appendix 3 is an example of how a full monte-carlo model achieves this, but many of the tools currently in the market (that Actuaries may be asked to certify) don't focus on monte-carlo modelling. Further research is needed on techniques that modellers could use to select deterministic scenarios that represent particular percentiles in terms of the range of long term outcomes a retiree faces. Sophisticated techniques are needed to take into account both (a) their asset mix and (b) the impact that cashflows have on the long term uncertainty they face. This is important for Principle 3 – to quantify how confident a household can be that their essential lifestyle needs are secure.

- Health factors: to identify simple questions that can be asked about a retirees health status in order produce a more accurate (personal) mortality curve for each household.

- Most retirees will need to choose between (a) discretionary cashflows in the years shortly after retirement when they are in good health and (b) the level of certainty associated with their essential expenditure at advanced ages. Further research is required to develop easily understood methods and metrics for retirees to nominate how important different future expenditures are to them. This will enable models to support choices more objectively.

Bibliography

Communication and Framing of Retirement Issues:

a. Transforming Consumer Information, Consumer Information Working Party, Institute and Faculty of Actuaries, 2011
b. A Next Generation Retirement Solution, Jan Snippe, presentation at the Pensions, Benefits and social security colloquium 26 September 2011
c. Designing a Monthly Paycheck for Retirement, Managing Retirement Decisions Series, Society of Actuaries, 2012
d. Applying the 4-Box Strategy to Generating a Lifetime of Income, Farrell Dolan, LIMRA's MarketFacts Quarterly / Fall 2009
e. A Holistic Framework for Life Cycle Financial Planning, Joshua Corrigan and Wade Matterson, July 2009
f. Financial System Inquiry Final Report Chapter 2: Superannuation and Retirement Incomes, November 2014
g. Retirees' Needs and Their (In) Tolerance for Risk, National Seniors Australia, March 2013
h. Report 279: Shadow Shopping Study of Retirement Advice, ASIC, March 2012
i. Establishing the risk a customer is willing and able to take and making a suitable investment selection, Financial Services Authority UK, March 2011
j. Yin and Yang of retirement income philosophies, Wade Pfau and Jeremy Cooper
k. Plot your own course – Actuarial Modelling Meets Retirement Planning, Dunn & Hennington, 2014
l. Efficacy of Publically-Available Retirement Planning Tools, Texas Tech University, Utah Valley University and Evensky & Katz Wealth Management, 18 Feb 2016

Retirement Income Modelling Techniques:

m. Good Practice Principles in Modelling Defined Contribution Retirement Plans, Kevin Dowd & David Blake, September 2013
n. Accurium SMSF Retirement Insights – Pension strategies for SMSF retirees, Accurium, February 2016
o. Accurium SMSF Retirement Insights – Bridging the prosperity gap, Accurium, August 2015
p. Beyond the horizon – Delivering better retirement outcomes (a compilation of Towers Watson articles in the broad area of post-retirement), Towers Watson, 29 May 2015
q. Securing Retirement Incomes: Tax, Super and The Age Pension: Assessing the value of total government support, Mercer, February 2012
r. For Richer, For Poorer: Retirement Incomes, Actuaries Institute, 2 September 2015
s. The Perfect Withdrawal Amount: A methodology for Creating Retirement Account Distribution Strategies, Suarez, Suarez and Walz, 3 August 2015
t. A stochastic approach to retirement income planning, John De Ravin, 2014
u. Towards more efficient retirement income products, Australian Government Actuary, December 2014
v. A user-friendly approach to stochastic mortality modelling, Aro and Pennanen, Helsinki University of Technology
w. Essential Features of a Good Economic Scenario Generator White Paper, Conning, April 2014

Other :

x. How Safe are Safe Withdrawal Rates in Retirement? An Australian Perspective, Financial Services Institute of Australia, March 2014
y. Safe Withdrawal Rates for Australian Retirees: Where did the 4% rule come from and what can it tell us today?, Morningstar, 15 January 2016
z. The future of Australia's super: a new framework for a better system, ASFA, November 2014

Appendix 1: Economic Scenario Generators (ESGs)

An Economic Scenario Generator (ESG) is a software tool that generates a collection of simulated economic scenarios that represent a full distribution of possible economic futures. ESGs are commonly used by large financial organisations to support risk management, reserving and pricing activities. The theory and science behind ESGs has evolved considerably as computer power has increased and the field of Quantitative Analysis has developed.

The collection of simulated scenarios from an ESG can be used to 'stress test' a financial entity through a plausible range of future market outcomes. Provided the probability distributions used within the ESG are appropriate, we can use the collection of scenarios to map out the range of outcomes a given financial entity faces based on its own exposures to the various risks. For example to satisfy Europe's Solvency II legislation insurers must demonstrate that they can withstand a '1 in 200 year market event.

Improvements in the methodologies used to model risk make it possible to quantify issues to a deeper level than was common practice even a decade ago. These same stress testing techniques can be applied to household retirement modelling too. This can help retirees align their financial planning decisions (e.g. spending levels) with the level of security that suits their risk preferences. Some retirees might want maximum security and, like Europe, be able to withstand a 1 in 200 year event. This would require large reserves (a high capital to spending ratio) and will result in lifestyle decisions that are very conservative. Whereas other retirees may be willing to accept that if a 1 in 20 year event were to occur then their retirement lifestyle would end. This decision would let them enjoy a much better lifestyle providing they remain in a lucky cohort.

ESG software lets the modeller simulate a full range of factors driving market risk. A good ESG is a coherent, integrated Monte Carlo generator that produces arbitrage-free scenarios. The scenarios include a variety of metrics including interest rates, credit spreads, equities, property and exchange rates, each with a carefully chosen and calibrated probability distribution. The model needs to consider:

- Means for each asset class (often time varying), taking into account starting market conditions
- Standard deviations
- Correlations (including both cross correlation and auto correlation)
- Tail distributions

The ESG is likely to incorporate an analysis of theory, history and current market conditions as well as having an element of subjective judgement when setting expectations for the future. It needs to be able to produce some extreme but plausible results and generate scenarios that embed realistic market dynamics. Often large teams work on maintaining an institutional ESG and will work with an investment committee to review and update approve assumptions as market conditions and expectations evolve.

Often the models are built up from a primary metric such as global inflation. Inflation in any year is typically assumed to be a function of (a) inflation in the previous year, (b) an assumed long term rate of inflation and (c) a random element consistent with the distribution assumed. Local inflation is likely to have linkages to both global and past local inflation plus a random element.

Bond yields might assume a process with linkages to global inflation and previous years' yields both globally and locally. A yield curve is typically constructed from short and long rates meaning that bonds of different maturities can be modelled concurrently.

Equities might reflect a CAPM structure with distributions that capture an assumed shape for the tails. Assumptions for skewness and kurtosis should be consistent with what is seen in actual equity markets. Exchange rates typically incorporate a Purchasing Power Parity approach and each future year would normally depend on the previous year.

Appendix 2: Example of how a retiree might use a deterministic model

Scenario

Consider a single male who retires aged 60.

He has a home worth $1,000,000 and is debt free.

He also has $500,000 in a pension fund.

Decisions he needs to make

He wants to generate an income to meet what he considers to be his essential needs of $35,000 (indexed to price inflation) at all ages.

However, he is not sure whether he should be concerned about having discretionary income at advanced ages to ensure that he will be able to live comfortably if he lives to an advanced age. Alternatively, should he have discretionary income at younger ages so that he can enjoy himself when he is healthy and fit?

He recognises that, as he has limited assets, he may have to be willing to forgo discretionary expenditure at younger ages or at advanced ages.

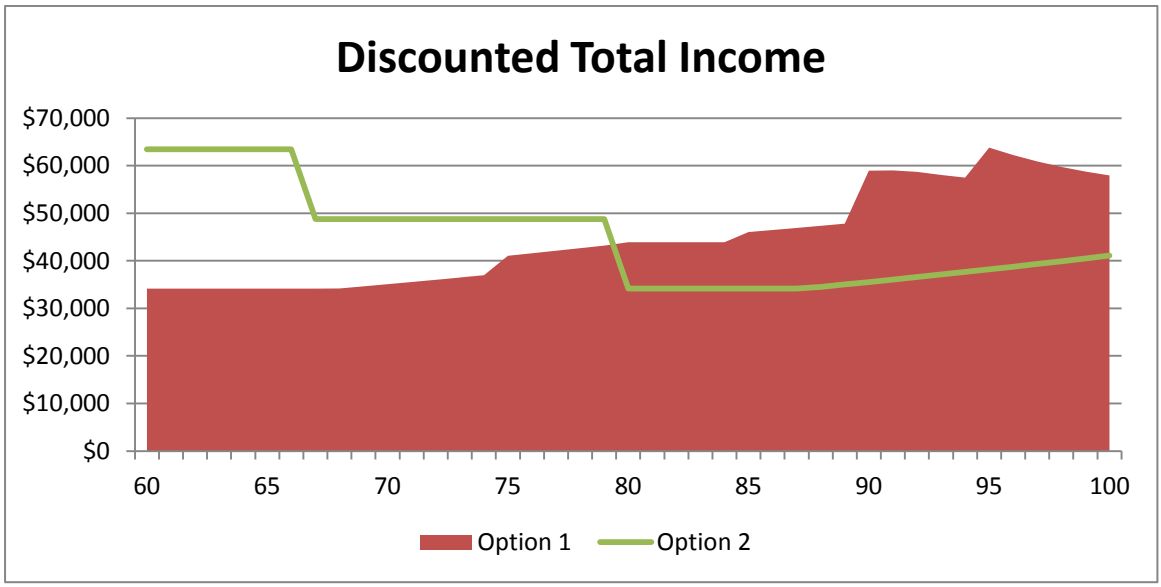
Let us look at the two possible scenarios.

In Option 1, he takes no discretionary income up to age 80, $10,000 (in current dollars) per annum between ages 80 up to age 90 and then $5,000 (in current dollars) per annum thereafter.

In Option 2, he takes $30,000 (in current dollars) per annum of discretionary income up to age 67, $15,000 from 68 to 79 and no discretionary income after age 80.

How he uses a retirement model

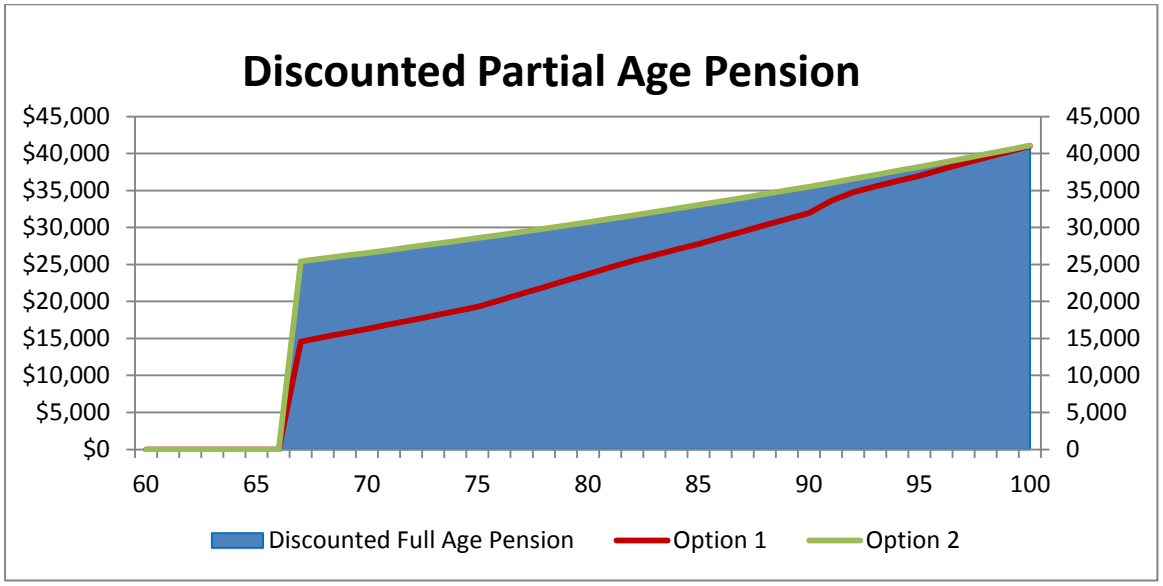
Let's look at the future income under each Option. Note that future income has been discounted at price inflation back to age 60.



Under Option 1 you can see the income grow over time. Note the impact of the minimum drawdown from the pension fund on the income.

Now let's look at the income he will receive under Option 2. As required, he has more discretionary income at early ages but less at advanced ages. Note that his income increases at advanced ages even though he has elected to have no discretionary income at these ages. The reason for this is the impact of the Age Pension at advanced ages.

Let's see what happens to the Age Pension under each Option.



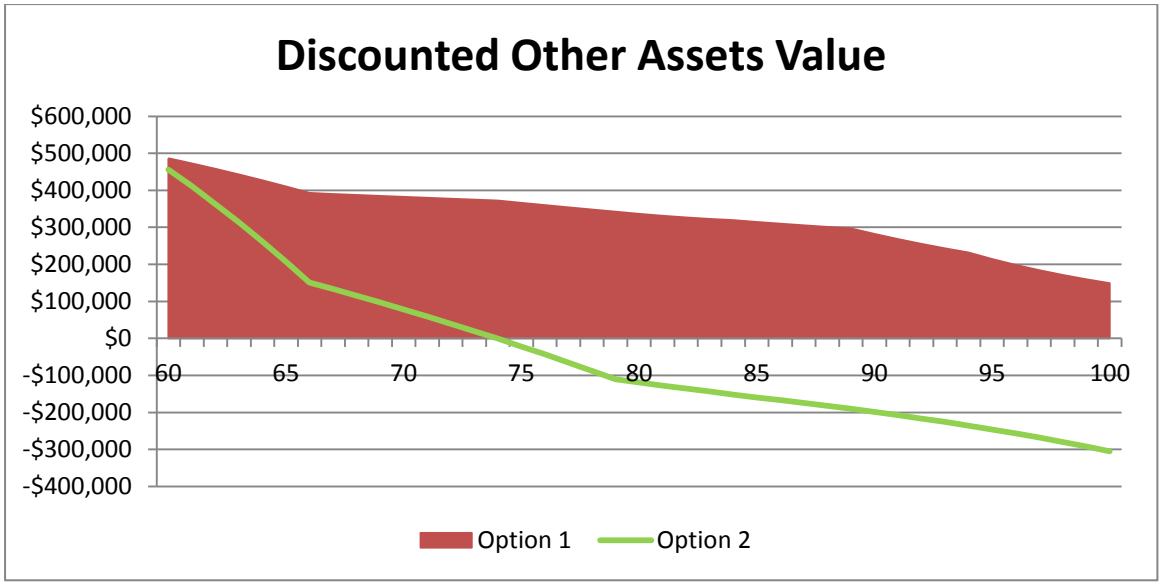
First consider what happens to the full age pension.

Note that the Age Pension increases over time. This is because the Age Pension is indexed to wage inflation whilst we discount back to current dollars at the rate of price inflation (which is lower). This means that the Age Pension will not only keep pace with increases in prices – it will keep pace with general increases in living standards of working Australians.

The actual Age Pension received under Option 1 is significantly less than the full Age Pension. This occurs because he retires at age 60 but doesn't take any discretionary income before age 67. This means that his pension assets are still substantial and will impact of the level of Age Pension he will receive.

Compare this to Option 2. The actual Age Pension received under Option 2 is much higher than under Option 1. This occurs because, under Option 2, he has to draw down more of his pension fund to generate the discretionary income he requires. This means the reduction in Age Pension due to the means tests will be lower. In fact, you can see, that the reduction in pension assets before age 67 under Option 2 is so significant that all of the Age Pension is payable.

We can see what happens if we look at the pension fund asset over time under Option 1.

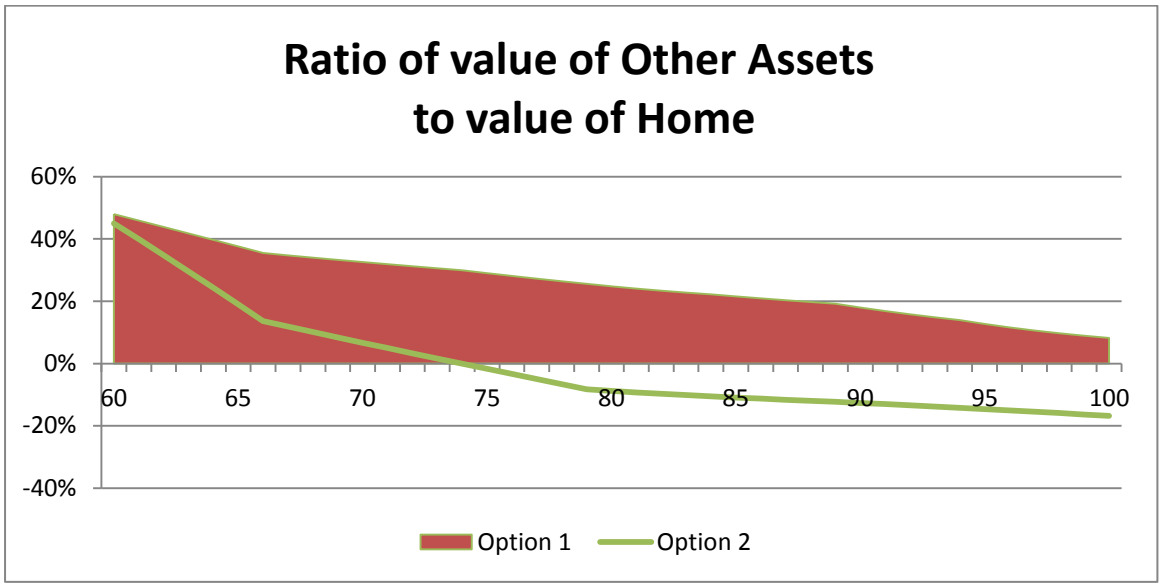


You can see the gradual decline in value (in current dollars) as pension fund assets are required to supplement the Age Pension. Note the increase in the rate of reduction at advanced ages when the level of discretionary income is increased.

However, the picture under Option 2 is significantly different.

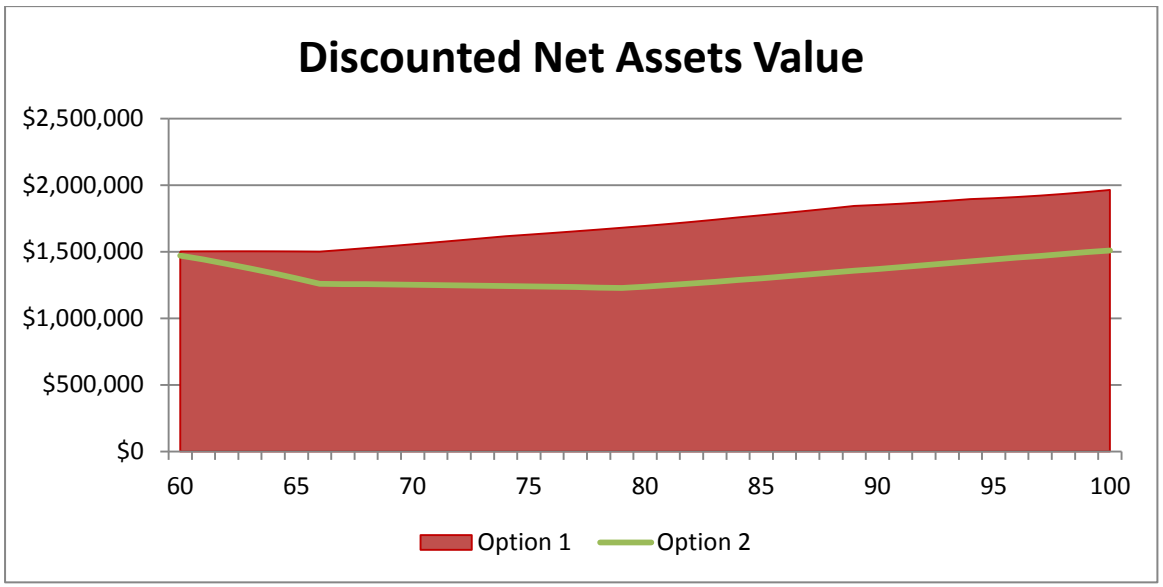
Because the level of discretionary income at younger ages is substantial, the pension fund asset is depleted at age 74. You can see that the value of Other Assets becomes negative after he reaches this age. This means that there is no pension fund asset to supplement the Age Pension after this age. However, as he owns his own home we can use this as an asset to provide income after age 75. We therefore assume that he will take out a reverse mortgage to provide this top up income after age 75.

People are concerned by the impact of reverse mortgages on their finances so we need to look at the debt that will accrue on the house when he relies on the reverse mortgage to supplement the Age Pension payable.



As expected under Option 1, the ratio of the value of Other Assets to the value of the home remains positive. However, under Option 2 the reverse mortgage debt is a gradually increasing proportion of the house value. However, even he lives to an advanced age, the reverse mortgage debt is less than 20% of the value of his home.

In looking at his financial position over time it is important to consider how his house impacts on his overall financial position. So let's look at the combined value of the pension fund asset and his house.

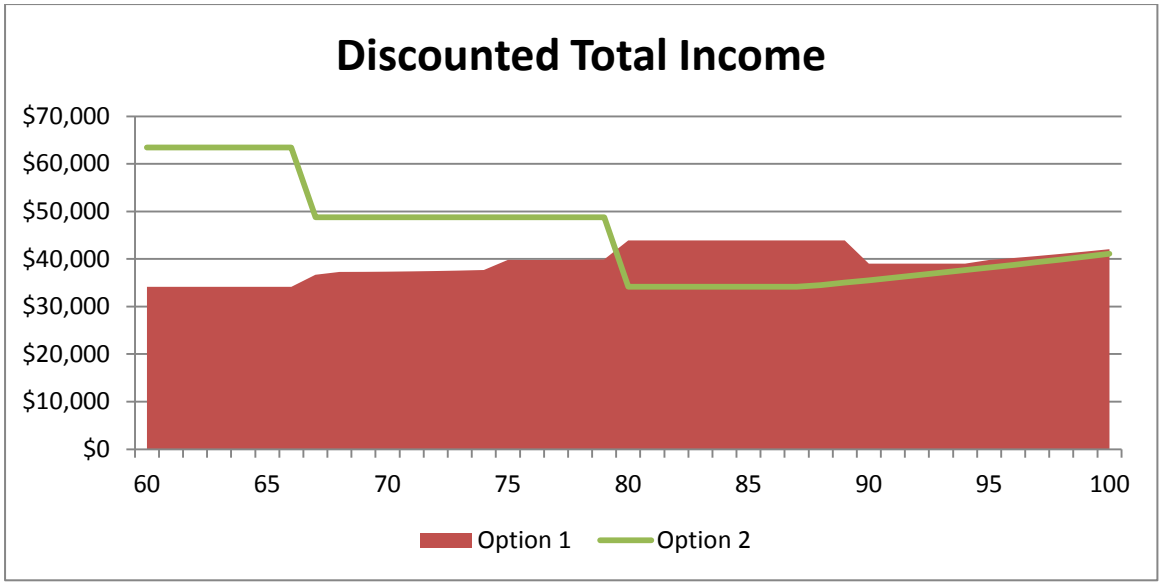


Under Option 1, the value of the combined assets (in current dollars) increases over time, notwithstanding the fact that the value of the pension fund asset is reducing.

Under Option 2, even though there a Reverse Mortgage is taken out at age 75, the value of the house less the value of the outstanding reverse mortgage debt, is still substantial.

Under Option 2, there will be less available on his death than under Option 1. It will, however, still be a significant amount. Importantly, under Option 2 he will have enjoyed a much better standard of living in the years shortly after he retires.

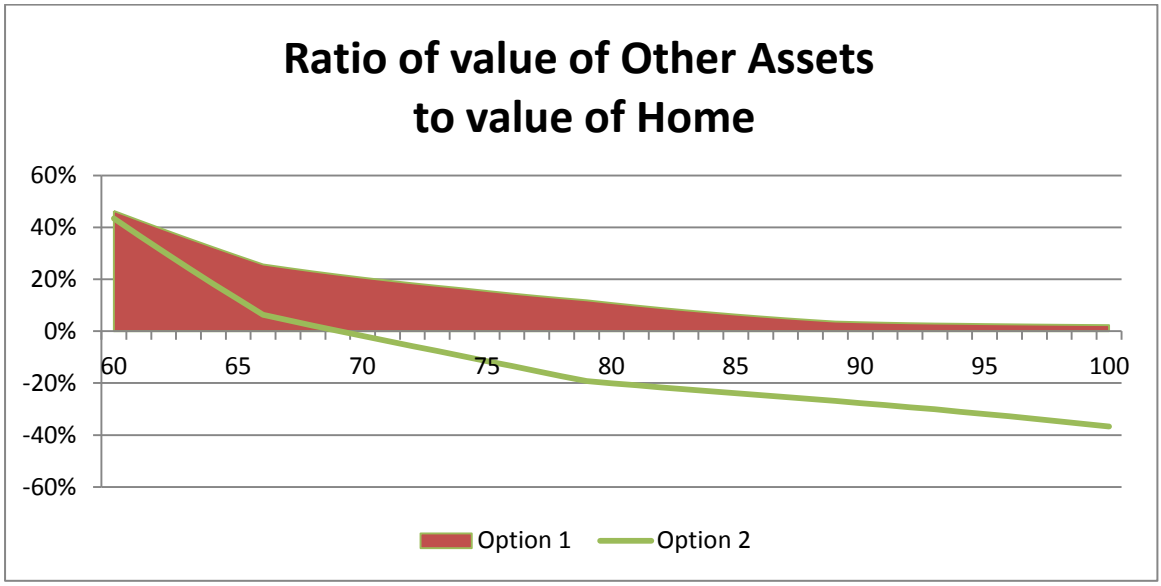
The above analysis assumes that the pension assets earn 7% after fees and taxes. However, an important part of any financial projection is to show the impact of volatility, particularly in investment returns. With deterministic projections the best way to provide this information is through scenario testing. Let us assume that our client has placed a high value on the discretionary expenditure early in retirement and is therefore happy to accept higher risk of lower expenditure later in life. For example, what happens to our projection if we have separately analysed the future potential returns from the pension fund assets and have estimated that there is a 33% chance that the return will be below 3.5%.



Under Option 1 the income generated is lower assuming 3.5% return at older ages as the pension assets are depleted at a faster rate.

Interestingly, under Option 2, the income is the same because we have assumed that a Reverse Mortgage will be taken out to meet his income objectives.

Clearly, this will mean that the Reverse Mortgage debt will be a greater proportion of the value of the home. However, will the level of debt be acceptable?



The results show that if he lives to advanced ages the level of mortgage debt will increase to nearly 40%. This still however means that on the sale of the home on his death the net proceeds would be substantial.

If the level of debt (or the age at which it commences) given this level of risk is unacceptable then we could carry out the projection assuming lower levels of discretionary expenditure at younger ages to determine how much discretionary expenditure would have to be forgone to reduce the potential impact of the reverse mortgage debt to an acceptable level.

In this scenario test, we have only varied one of the assumptions. We can also consider other scenarios where other assumptions were changed. For example, what would happen if we assumed a much higher level of price inflation? Alternatively, the client may wish to see what would happen if the investment returns were in the bottom 10% of the possible outcomes.

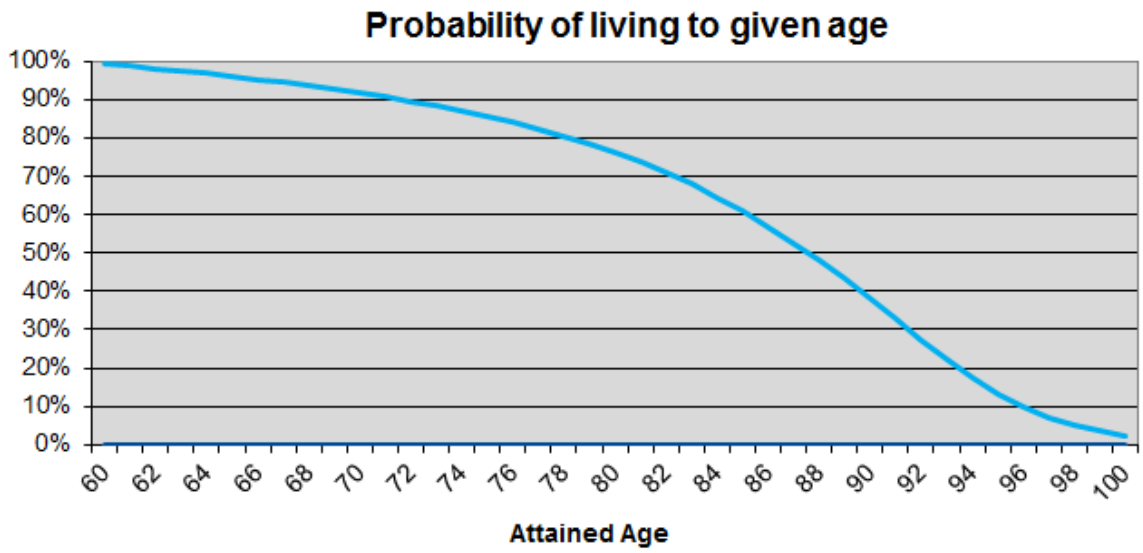
The important point is to ensure that he understands that the results are variable.

It should be noted that one of the weaknesses of the deterministic approach is that the use of a fixed rate of investment earnings in scenario testing does not take into account the effect of the cashflows during the projection period. One way to help overcome this problem would be to compile a data base of past annual returns from investments with the same risk/return profile assumed in the projection. The scenario testing would then populate the annual returns in the projection with data from these returns. Of course, if this approach was taken, then a similar approach would have to be taken for price and wage inflation.

How to show the impact of mortality

One of the Principles is that the model should be able to show the impact of mortality. The typical deterministic model does not embed the impact of mortality in the projection itself. However, it is important to be able to demonstrate the potential impact of mortality during retirement.

An approach that can be used to provide an insight into the impact of mortality is through a graph that shows the likelihood that a person will be alive at various ages after retirement (including mortality improvements). An example of this would be the following.



The important points that can be gained from this graph are:

1. There is a 93% chance that he will live to age 70. Therefore it is highly likely that he will be able to enjoy the first ten years of retirement.
2. There is a 50% chance the retiree will die at or before reaching age 88. Therefore, there is a reasonable chance that he will not live beyond age 88.
3. The probability of living to age 94 reduces to just over 20%.

This information should help him determine his priorities when it comes to when he wants his discretionary expenditure. For example, he might well say that (given his home provides some protection if he lives to an advanced age) he wants most of his discretionary expenditure in the first ten to fifteen years of retirement when he is most likely to be alive to enjoy it.

Appendix 3: Example of how a retiree might use a stochastic model

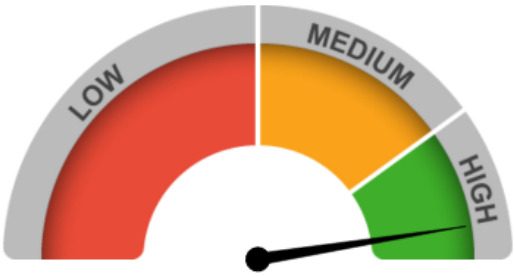
Scenario

- Couple both aged 60
- $600,000 in a 'balanced' superannuation fund
- $1million home, no debt
- Essential lifestyle needs = $45,000 p.a, reducing by 30% on first death.
- No bequest motive over and above the home
- Would like to spend a further $20,000 p.a. but unsure if they have enough money to do this:
  - Early in retirement and/or late in retirement; and
  - Whilst still keep their long term lifestyle secure

Step 1: Confirm that they can afford a lifestyle costing $45,000 per year

- The model[18] tests 2,000 simulations of possible market sequences and lifespans (based on market distributions and Australian Life Tables with improvements). The set of simulations represents a full distribution of possible outcomes
- The model incorporates all financial resources for the couple including the Age Pension and non-superannuation assets
- Assumes spending keeps pace with price inflation
- Result: In 95% of simulated scenarios the couple were able to spend $45,000 p.a. without running out of assets whilst either spouse was alive

Your retirement sustainability result is:



95%

This shows that in **95%** of the 2,000 scenarios tested your spending (adjusted for future inflation) is sustainable for life.

The retirement health**check** makes allowances for the main risks that retirees face - longevity risk, market risk and inflation. It also considers:

- a household's assets within superannuation and non-superannuation
- the Age Pension and means testing rules
- the range of possible lifespans for each spouse,

Outputs

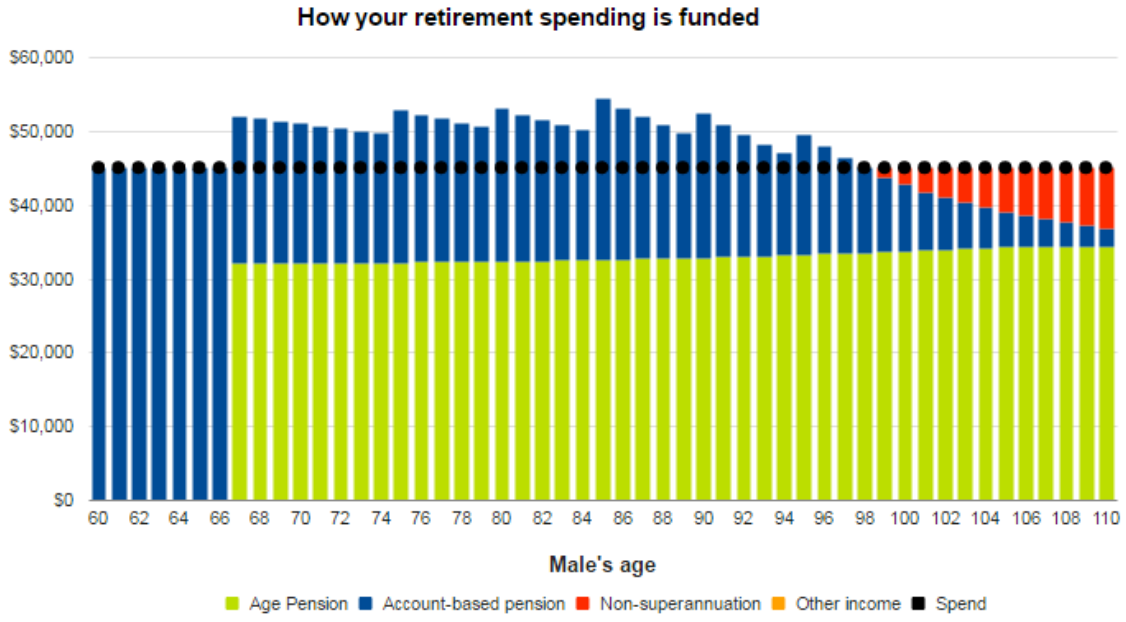
Low	Less than 50%
Medium	Between 50% and 80%
High	Over 80%

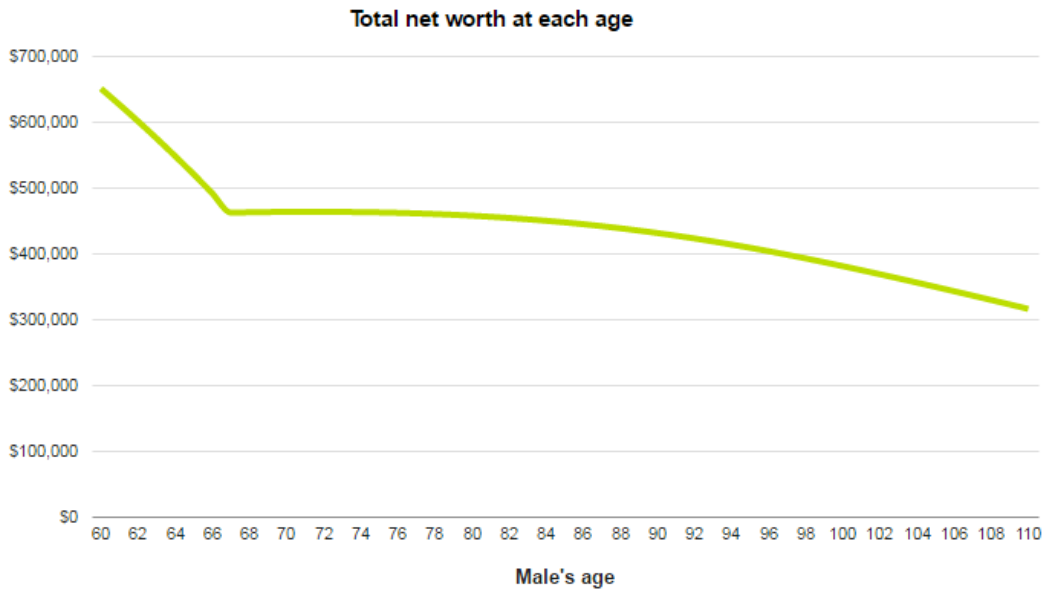
[18] This scenario has been produced using Accurium's Retirement Healthcheck software. For more details of this system see https://www.accurium.com.au/smsf/retirement-healthcheck

Interpretation of Step 1

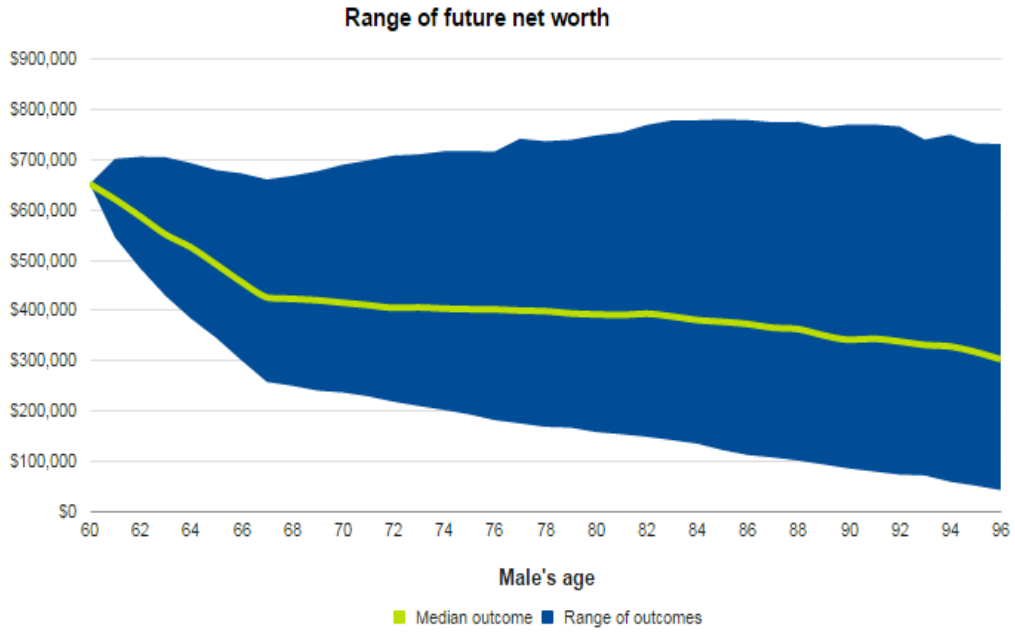
Looking at an 'average' projection we can quickly build insight into the client's overall scenario

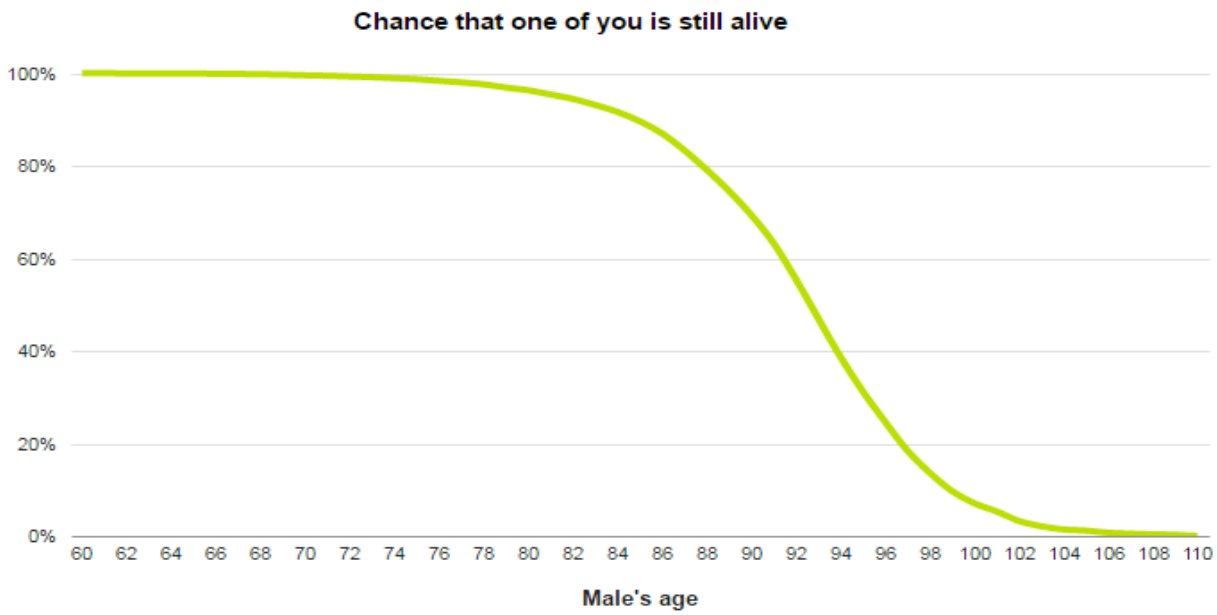
- The charts below show that a lot of capital is consumed before the Age Pension kicks in
- But once the Age Pension commences their capital is protected
- Where the minimum account based pension exceeds their spending, the surplus is assumed to be invested outside of superannuation





- Using stochastic simulation we can explore the range of outcomes around this average
- The blue shading in the chart below indicates where 80% of the 2,000 simulations landed on a year by year basis
- The light green line in the second chart below shows the probability that at least one spouse will still be alive over time

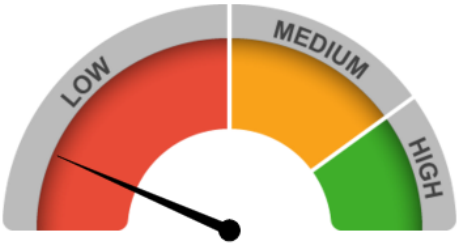




Step 2: Test whether they can afford a lifestyle costing $65,000 per year

- Re-running the 2,000 simulations on this higher level of spending, we can see there is only a 13% chance that they could sustain this lifestyle until death
- The stochastic simulation shows that even in the best 10% of outcomes assets were exhausted before their (joint) life expectancy

Your retirement sustainability result is:



13%

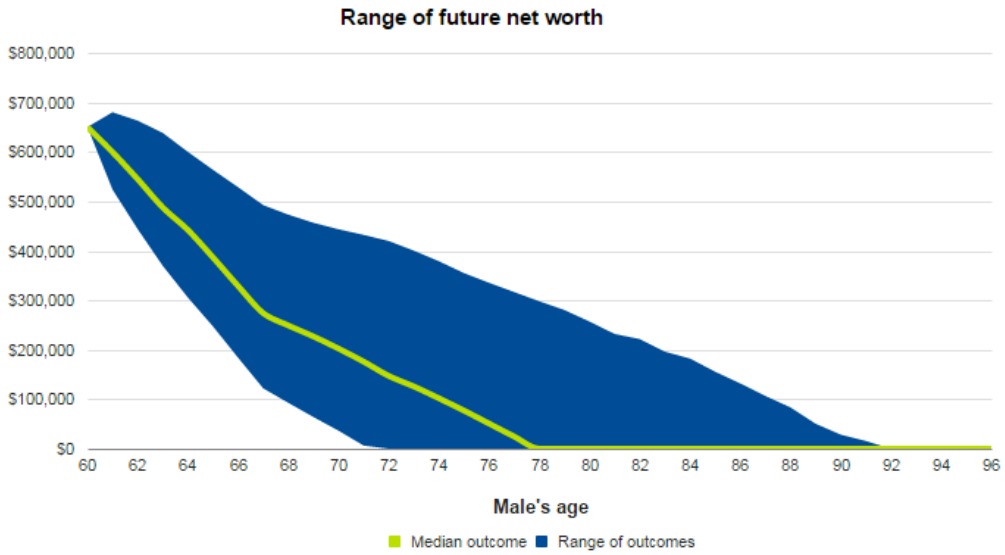
This shows that in **13%** of the 2,000 scenarios tested your spending (adjusted for future inflation) is sustainable for life.

The retirement health**check** makes allowances for the main risks that retirees face - longevity risk, market risk and inflation. It also considers:

- a household's assets within superannuation and non-superannuation
- the Age Pension and means testing rules
- the range of possible lifespans for each spouse,

Outputs

Low	Less than 50%
Medium	Between 50% and 80%
High	Over 80%



Step 3: Decision making

- The couple decide they are willing for their spending to reduce from the desired level of $65,000 p.a. down to their essential spending level of $45,000 p.a. from age 80. They are also prepared to release equity from the home in 12 years time (e.g. through downsizing)
- If both of these were implemented then the probability that this lifestyle is achievable increases to 61%. I.e. there is a good chance they can achieve these goals
- The blue shaded chart below demonstrates the range of outcomes they face in this scenario. There is still a risk of not being able to support this lifestyle if markets perform poorly and therefore they should check, on a year by year basis, that their essential lifestyle is secure before making the extra spending decisions.

Your retirement sustainability result is:

61%

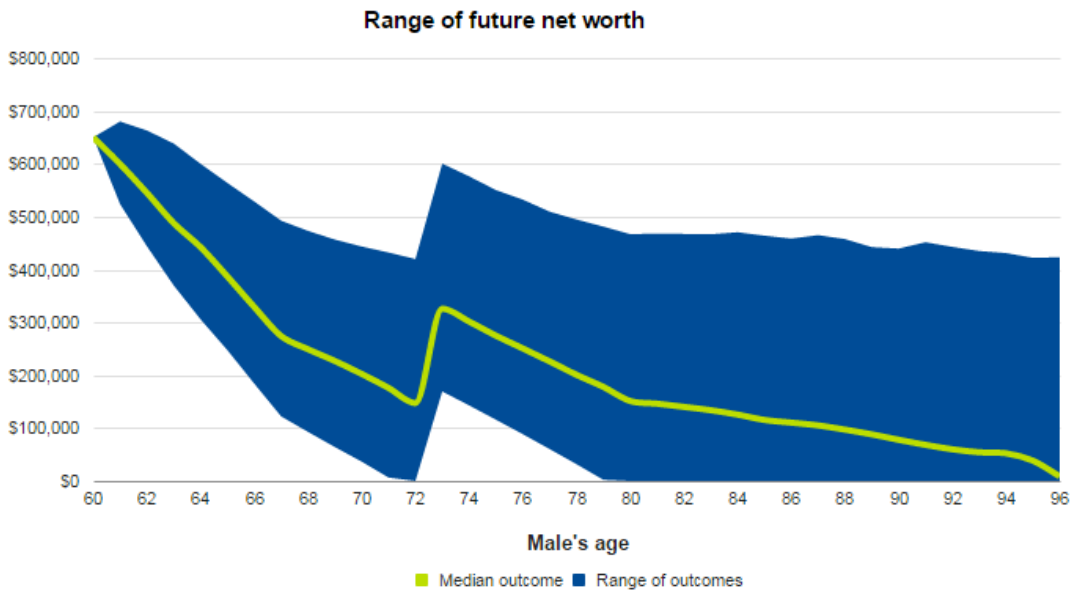
This shows that in **61%** of the 2,000 scenarios tested your spending (adjusted for future inflation) is sustainable for life.

The retirement health**check** makes allowances for the main risks that retirees face - longevity risk, market risk and inflation. It also considers:

- a household's assets within superannuation and non-superannuation
- the Age Pension and means testing rules
- the range of possible lifespans for each spouse,

Outputs

Low	Less than 50%
Medium	Between 50% and 80%
High	Over 80%



Conclusions from using a stochastic model

- There is a 61% chance the couple can have the lifestyle they desire until age 80 if they are willing to downsize in future
- If markets perform poorly then they will have to forego their extra spending sooner than hoped
- But if managed carefully they can still maintain a 95%+ probability their essential lifestyle needs of $45,000 p.a. are secure
- A control cycle approach can help them make spending decisions in light of the experience over time, whilst ensuring they have enough capital to cover their essential lifestyle with maximum certainty
- Please be aware that the above scenario is only one example of using this software. A good model can cater for a full range of ages, asset mixes and spending shapes