The Yin and Yang of retirement income philosophies

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Exploring probability-based and safety-first retirement income philosophies

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Contents

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Pfau was a selectee for the InvestmentNews "Power 20" in 2013 and "40 Under 40" in 2014, the Investment Advisor 35 list for 2015, the IA 25 list for 2014, and Financial Planning magazine's Influencer Awards. He is a two-time winner of the Journal of Financial Planning Montgomery-Warschauer Award, a two-time winner of the Academic Thought Leadership Award from the Retirement Income Industry Association, and a best paper award winner in the retirement category from the Academy of Financial Services.

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1 Introduction

Within the world of retirement income planning, there are two opposing philosophies: probability-based and safety-first. This paper explains the distinctions and thought processes behind them.

The Australian superannuation system has served as a world leader for ensuring that participants are saving for their retirement, though the question remains for Australians about what to do with their pot of assets on reaching retirement. That is the question of retirement income planning. With a declining role for defined-benefit pensions and the growth in superannuation balances, it has only been in recent years that financial advisers have recognised how retirement income planning can dramatically differ from pre-retirement wealth accumulation. A mountain climbing analogy is useful for clarifying this distinction, as the ultimate goal of climbing a mountain is not just to make it to the top. It is also necessary to get back down again, and the skillset required to get down a mountain is not the same as that needed to reach the summit.

Indeed, the Australian superannuation system is looking to respond to the fact that a growing number of its members are now reaching the peak of the mountain and will need a way to get down the other side. Australians have a total of $2.95 trillion (AUD) in superannuation as at December 2019.[1] Of this, around $800 million is already used to provide retirement income to members[2]. Like most countries, Australia has a cohort of 'baby boomers' who are now starting to retire. The accumulated superannuation savings of this cohort are growing dramatically. With a mandated 9% of salary being added to superannuation since 2002 (currently 9.5% and growing to 12%), the accumulated balance at the age of retirement, 66, is now around $250,000 for the typical male retiree. This is providing most retiring Australian households with a significant nest egg from climbing the mountain. What they need is help to get safely down the other side.

Within the world of retirement income planning, there are many different strategies about how to build a retirement plan. The opposing schools can be identified as probability-based and safety-first. Understanding the distinctions and thought processes of both schools is important as advisers and fund trustees struggle to determine their own investment beliefs and, more importantly, what best meets the needs and goals of their clients and members.

As a basic introduction to these schools, a simple litmus test can be applied. Monte Carlo simulations are often used in financial planning contexts to gain a better understanding about the viability of a financial plan in the face of market and longevity risks. Suppose that a Monte Carlo simulation identifies that a retirement plan has a 90% chance of success. Both sides of the debate might accept this as the correct calculation from the software, but they will have dramatically different interpretations about what to do with this number. For probability-based thinkers, 90% success is a more than reasonable starting point, and the client or member can proceed with the plan. It is likely to work. In the event that future updates determine that the plan might be on course toward failure, a few changes, such as a reduction in spending, should be sufficient to get the plan back on track.

Safety-first advocates, however, will not be comfortable with this level of risk, focusing instead on the 10% chance of failure. The safety-first school makes a distinction between essential expenses and discretionary expenses and seeks a solution that practically eliminates the possibility of failure to meet essential expenses. Jeopardising success is only reasonable when it comes to discretionary expenses.

Indeed, advocates of the two schools view retirement income planning very differently. They provide opposite answers to basic questions such as:

- Can people effectively prioritise among different financial goals in their retirement?
- Is there a sustainable spending rate from a portfolio of volatile assets?
- What is the best way to approach investing financial assets for retirement income?
- What role do lifetime annuities play in the retirement income strategy?
- How should an account-based pension be drawn down?

1 APRA December 2019 quarterly superannuation bulletin, issued 25 February 2020.

2 Super is delivering for people about to retire. Challenger Retirement Income Research Paper June 2019.

The objectives of this paper are to increase awareness and understanding about the different approaches for providing retirement income, and then to provide examples of practical implementations ranging across this spectrum. It is important to understand the logic and thought processes behind each approach in order to best serve clients and fund members.

Financial services professionals should understand which school they most identify with, and to what extent their own thinking might incorporate views from each of the schools. As well, regardless of their own views, financial advisers should be able to serve a range of clients effectively by being more comfortable with each school. Advisers able to communicate effectively with both sides will be more likely to deliver successful retirement income outcomes.

The financial services industry more broadly needs to help retirees and pre-retirees determine which approach is most appropriate for their circumstances, and to help make clear what they might feel intuitively, but are unable to articulate.

2 Separating accumulation from drawdown: the difficulties of retirement income planning

As a start to the discussion of retirement income philosophies, it is worthwhile to explore key differences between wealth accumulation and income distribution which trigger some of the disagreements about retirement income. These differences are summarised in Table 1. Australia's superannuation system is only just starting to adapt to the reality that soon-to-be retirees face a host of new problems requiring a new set of solutions. Traditional defined-benefit pensions allowed the pension managers to pool longevity risk and market risk across plan members; but, with a defined-contribution pension, members are left to manage longevity, inflation and market risks on their own. These risks amplify when drawdowns are necessary to meet spending needs. Cooper (2014) explores these issues further.

One important distinction in retirement is that people often experience large reductions in their risk capacity as the value of their human capital declines and leaves them with fewer options for responding to poor portfolio returns[3]. Risk capacity is the ability to endure a decline in portfolio value without experiencing a substantial decline in your standard of living. Prior to retirement, poor market returns might be counteracted with a small increase in the savings rate; possibly by a brief retirement delay or even a slight increase in risk taking. Once retired, however, people can find it hard to return to the labour force and are more likely to live on fixed budgets. It can be difficult to reduce spending in response to a poor market environment. Portfolio losses could have a more significant impact on a person's standard of living after they have retired, necessitating greater care and vigilance in response to portfolio volatility. Even a person with high risk tolerance, which is the ability to stomach market volatility comfortably, will be constrained by their risk capacity.

A second distinction is that the investing problem fundamentally changes in retirement. The traditional goal of wealth accumulation is generally to seek the highest returns possible in order to maximise wealth, subject to the investor's risk tolerance. This can be justified because many people have greater risk capacity prior to retirement, and can focus more on their risk tolerance. Furthermore, the spending needs that will eventually be financed by the portfolio still reside in the distant future. However, after retiring, the fundamental objective for investing is to sustain a living standard while spending down assets over an unknown, but finite, length of time. Investing during retirement is a rather different matter from investing for retirement, as retirees worry less about maximising risk-adjusted returns and worry more about ensuring that their assets can support their spending goals for the remainder of their lives. In this new retirement calculus, views about how to balance the trade-offs between upside potential and downside protection can change. Retirees might find that the risks associated with seeking return premiums on risky assets loom larger than before, and they might be prepared to sacrifice more potential upside in order to protect against the downside risks of being unable to meet spending objectives.

The requirement to sustain an income from a portfolio is a new constraint on investing which is not considered with basic wealth maximisation approaches such as portfolio diversification and Modern Portfolio Theory (MPT). Cash flows are ignored and the investment horizon is limited to a single, very lengthy, period in MPT. When spending from a portfolio, the concept of sequence of returns risk[4] becomes more relevant, as portfolio losses early in retirement will increase the percentage of remaining assets withdrawn to sustain income. This can dig a hole from which it becomes increasingly difficult to escape, as portfolio returns must exceed the growing withdrawal percentage to prevent further portfolio depletion. Even if markets subsequently recover, the retirement portfolio cannot enjoy a full recovery. The sustainable withdrawal rate from a retirement portfolio can fall well below the average return earned by the portfolio over the retirement period.

Sequence of returns risk is amplified by greater portfolio volatility, but at the same time many retirees cannot afford to play it too safe. Short-term fixed income securities might struggle to provide returns that exceed

3 For more about risk tolerance, see Tomlinson (2013).

4 Challenger Retirement Income Research (2012).

inflation, which can cause these assets to be quite risky in a different sense: in terms of being able to support a retiree's long-term spending goals. Though MPT treats short-term fixed income securities as the 'risk-free' asset, they are not a risk-free asset when the objective is to sustain spending over multiple horizons. Over long periods, even low levels of inflation can create dramatic impacts on purchasing power. For example, if inflation averages 3%, then it takes 24 years for the purchasing power of wealth to fall by half. Retirees must keep an eye on the long-term cumulative impacts of even low inflation.

Retirees also desire flexibility and liquidity for unplanned expenses, as reality will surely intrude on the assumptions required in developing an expense budget over a 20 or 30-year time horizon. A conservative retiree does not necessarily want all of their assets locked into traditional lifetime annuities or a retirement income bond ladder[5] that leaves no flexibility to change the spending profile. Lastly, while liquidity and flexibility are important, retirees should also prepare for the reality that cognitive decline will hamper the portfolio management skills of many as they age, increasing the desirability of having an advanced plan locked into place.

Table 1: Retirement income planning – new challenge

- Reduced flexibility to earn income increases the vulnerability of a retiree's standard of living to poor market returns.
- Retirees seek to fund a sustainable level of income from their investments, an important portfolio constraint that is less visible during wealth accumulation.
- Retirees experience heightened vulnerability to sequence of returns risk: poor returns in early retirement mean that the sustainable withdrawal rate from a portfolio may fall well below what is implied by average portfolio returns over the whole retirement period.
- The length of a person's retirement is unknown, and it could be much shorter or much longer than their life expectancy.
- Even low inflation can compound over a long retirement, leaving retirees vulnerable if their portfolio returns do not at least keep pace with inflation.
- Retirees must preserve flexibility and liquidity to manage risks related to unplanned expenses.
- Despite liquidity needs, retirees must also expect to experience cognitive decline at higher ages, which could hamper portfolio management skills and other financial decision-making.

5 In simple terms, a bond ladder is a series of bond investments with maturities to match cash flow needs over a period of time. This allows all of the bonds to be held to maturity. By the end of the period, all capital is consumed, much like a nil-residual term annuity.

3 Understanding the two schools of thought

After describing the origins for each school, this section describes their philosophy and approach by answering four basic questions: How are goals prioritised? What is the safe withdrawal rate from a diversified portfolio of volatile assets? What is the investment approach? What is the role of lifetime annuities? Table 2 summarises the arguments provided in this section.

Table 2: Retirement income philosophies

	Probability-based	Safety-first
Intellectual foundations	Safe Withdrawal Rates (1990s–present)	Lifecycle Finance Theory (1920s–present)
How are goals prioritised?	Retirees have a particular lifestyle goal in mind and not meeting that overall goal indicates failure. Lifestyle goals are not prioritised between essentials and discretionary.	Goals are prioritised. For instance, Modern Retirement Theory's[6] funding hierarchy is: (1) basic needs, (2) contingency fund, (3) discretionary expenses, (4) legacy goals.
What is the safe withdrawal rate from a diversified portfolio of volatile assets?	The US historical record suggests that we can reasonably expect that 4% or 4.5% is about as bad as it gets, though results vary by country.[7]	Unknown and unknowable. Risky assets are inherently risky; just because something would have worked in our limited historical record does not make it safe.
What is the investment approach?	Usually a total returns perspective framed in the same terms as pre-retirement accumulation using tools of Modern Portfolio Theory (i.e. portfolio diversification). The focus is wealth management for the financial portfolio.	Asset-liability matching. Assets are matched to goals so that risk levels are comparable. Assets used for matching include human and social capital, not just financial assets. Lifetime spending potential over an uncertain horizon is the focus, not maximising wealth. Product allocation indicates a wider role for hedging interest rate risk and seeking longevity insurance.
What is the role of traditional lifetime annuities?	Could have limited uses, but generally returns too low for any marginal increase in safety over a 'safe' withdrawal rate. Annuitising basic needs could lower the chances of being able to fully achieve lifestyle spending goals.	Along with bond ladders, annuities provide one of the fundamental tools for building an income floor to ensure that basic needs are met.
What is the role of an account-based pension?	The account-based pension is all that is needed to deliver a solution that will probably work. They are flexible enough to make whatever adjustments are required.	The account-based pension can be utilised after the safety requirements have been met to deliver aspirational/discretionary spending.

6 See Branning and Grubbs (2010).

7 For instance, see Pfau (2010) or Drew and Walk (2014).

4 The probability-based school of thought

The probability-based school of thought is probably most familiar to the public and to financial professionals. This school's roots are in research from the 1990s by California-based financial planner William Bengen, published in the 'Journal of Financial Planning' [Bengen (1994)], which sought to determine the 'safe withdrawal rate' from a financial portfolio over a long retirement. Though the term 'safe withdrawal rate' uses the word safe, this is not the safety-first approach, as the probability-based school is comfortable using 'safe' in a backward-looking, and statistically likely, context. The probability-based approach is more closely associated with the traditional concepts of wealth accumulation.

In the early 1990s, William Bengen was reading misguided claims in the popular press that average portfolio returns could guide the calculation of sustainable retirement withdrawal rates. If stocks average 7% after inflation, then plugging a 7% return into a spreadsheet suggests that retirees could withdraw 7% each year without ever dipping into their principal. Bengen recognised the naivety of this calculation because it ignores the real-world volatility experienced around that 7% return, and he sought to determine what would have worked historically for hypothetical retirees at different points in time. He used Ibbotson Associates data extending back to 1926 for US financial markets. His research introduced the concept of sequence of returns risk.

The problem he set up is simple: a new retiree makes plans for withdrawing some inflation-adjusted amount from their savings at the end of each year for a 30-year retirement period. For a 65-year-old, this leads to a maximum planning age of 95, which Bengen felt was reasonably conservative. What is the highest withdrawal amount as a percentage of retirement date assets that, with inflation adjustments, will be sustainable for the full 30 years? He looked at rolling 30-year periods from history, such as 1926 through to 1955, 1927 through to 1956, and so on. He found that with a 50/50 asset allocation to stocks and bonds (the S&P 500 and intermediate term government bonds), the worst-case scenario experienced in US history was for a hypothetical 1966 retiree who could have withdrawn 4.15% at most. And thus we have what is known as the '4% rule' in the United States.

Bengen's work provided a useful contribution that sequence of returns risk will reduce safe sustainable withdrawal rates below what is implied by the average portfolio return. Its popularity has coalesced into a general viewpoint about retirement income planning that we refer to as the 'probability-based' approach. We next shift toward describing how the probability-based approach deals with several basic questions about retirement income plans.

a. How are goals prioritised?

Regarding the prioritisation among a retiree's spending goals, the idea of using a 'safe withdrawal rate' as implied by the 4% rule is that a person does not retire until they have accumulated a sufficient level of assets such that their entire lifestyle goal can be met by spending from their portfolio at the determined safe withdrawal rate. For instance, if someone seeks to spend $40,000 per year from their portfolio and is comfortable with spending at an initial 4% rate from assets, then the wealth accumulation target to allow retirement to commence is:

$$\text{Wealth} = \text{Spending/Withdrawal Rate}$$
$$= 40{,}000/0.04 = \$1{,}000{,}000$$

According to probability-based advocates, people are thought to identify lifestyle spending needs that must be met to fulfill the standard of living they have in mind for their retirement. If they are unable to meet these lifestyle spending goals, they will view their retirement as a failure. Thus, the emphasis is on minimising the probability of failure (or, conversely, maximising the probability of success) for the overall lifestyle goal without concern for the potential magnitude of those failures when they happen. For instance, in the influential book, 'The New Wealth Management', Harold Evensky and co-authors argue that clients are generally more sensitive to the probability of meeting their goals than to the magnitude of their shortfall. In the bad luck cases, it hardly matters, so the argument goes, if a retiree can spend only ¼ or ½ less than their goal, because their lifestyle is severely diminished either way.

As suggested by the naming of the probability-based school, the objective is to develop a plan that will maximise the probability of success for meeting the overall lifestyle goal. Some financial planners such as Michael Kitces and Jonathan Guyton argue that it is difficult for people to differentiate between essential needs and discretionary expenses, and that real people are not as blasé about meeting their 'wants' (as opposed to needs) as safety-first advocates assume.

b. What is the safe withdrawal rate from a diversified portfolio of volatile assets?

Though acknowledgment is made that a new worst-case scenario is possible in the future and mid-course corrections might be needed, users of safe withdrawal rates generally treat 4% as a reasonably safe worst-case sustainable withdrawal rate for a 30-year retirement period. Bengen now speaks regularly about 4.5% as the safe withdrawal rate, a result derived from also including small-capitalisation stocks into the portfolio mix. He is confident that US history provides a good guide about worst-case scenarios, since it includes the Great Depression, a world war, and the stagnation of the 1970s, but this approach overlooks the fact that the median real return on non-US equities markets over the period 1921–1996 was only 0.8% per annum: Jorion and Goetzmann (1999).

If a person is able to meet their lifestyle goal using a safe withdrawal rate determined from history, they can be reasonably confident about their retirement. As well, in all but this worst-case scenario, so the argument goes, retirees will enjoy further upside as the portfolio grows when using a conservative withdrawal rate.

Regarding upside, Kitces (2012) and Bengen have both described, as a statement of confidence in safe withdrawal rates, that in 96% of the US historical simulations, the value of assets remaining after 30 years will be higher than the retirement date amount (although this is not adjusted for inflation, which limits the usefulness of these findings). Ultimately, the idea is to not retire until you can meet your spending goals using what you are comfortable in identifying as a safe withdrawal rate for your portfolio.

c. What is the investment approach?

The probability-based approach is based closely on the concepts of maximising risk-adjusted returns from the perspective of the total portfolio. Asset allocation is generally defined in the same way as during the accumulation phase, using MPT to identify a portfolio on the efficient frontier in terms of single period trade-offs between risk and return. Different volatile assets classes that are not perfectly correlated are combined to create portfolios with lower volatility, and the efficient frontier identifies the asset allocation combinations that provide the highest probability-weighted arithmetic average return (often called the 'expected return' in finance literature) for an acceptable level of year-by-year volatility (often called risk). This is an assets-only analysis, and the investor's spending needs are not part of the decision calculus for determining asset allocation. As well, inputs for the efficient frontier are generally estimated from historical data. With MPT, investors aim to maximise wealth by seeking the highest possible returns, given their capacity and tolerance for risk over a specific time horizon.

For retirement planning, spending and asset allocation recommendations are based on historical or Monte Carlo simulations of failure rates to mitigate the risk of wealth depletion that is inherent in drawing down a portfolio of volatile assets (i.e. due to sequence of returns and market risk). The failure rate is the probability that wealth is depleted before death, or before the end of the fixed time horizon which stands in for a maximum feasible lifespan. Asset allocation decisions are generally guided by what is able to minimise the failure rate in retirement. This has led advocates of the probability-based approach to use more aggressive asset allocations than seen elsewhere, with rules of thumb such as bond allocation being equal to a person's age. Advice from Bengen and subsequent studies is to have a stock allocation between 50 and 75%, but as close as possible to 75%. Probability-based advocates are generally more optimistic about the long-run potential of stocks to outperform bonds and to provide positive real returns, and so people are generally advised to take on as much risk as they can tolerate in order to minimise the probability of failure. Historical evidence across various markets highlights that this has not always been the case[8]. Beyond developing a general guideline about the overall stock allocation to minimise the probability of failure, probability-based advocates will generally use portfolio diversification and MPT to determine a specific asset allocation.

8 See for example, Pfau (2010); Drew and Walk (2014) and Jorion and Goetzmann (1999).

d. What is the role of lifetime annuities?

Probability-based advocates generally do not see much value in using lifetime annuities. Lifetime annuities have no upside potential, and advocates view this as a cost that is too high relative to the safety that the lifetime annuity provides. Especially with the low interest rates of today, building a lifetime floor can be seen through this prism as expensive (although this could be a criticism of all bond-like investments). Lifetime annuities might protect a person from destitution, but probability-based advocates argue that annuities could also lock out any ability to enjoy the higher quality of life that people desire for their retirement.

Most retirees will not have saved enough to safely immunise their entire lifestyle spending goals using only bond ladders and lifetime annuities, and still have sufficient remaining wealth available to create a liquid contingency fund to deal with unexpected expenses. If a retiree's desired withdrawal rate is above what can be generated with the yield curve, a bond portfolio will not be able to meet all of their spending goals. Bonds would actually serve as a drag on the portfolio because there will be no chance to get the types of returns needed to fund their desired lifestyle. It is the same if the spending goal exceeds what can be obtained with a lifetime annuity. Equity exposure moves retirees away from the guarantee that their plan will work, but it might provide the only opportunity for them to meet all of their aspirations. This aspect of probability maximisation through a diversified portfolio is why we refer to this school of thought as probability-based.

e. What is the role of account-based pensions?

The flexibility of the account-based pension makes it the ideal vehicle to implement a probability-based approach for retirement income. Investment choice and flexibility within the account-based pension enables the retiree to optimise their asset allocation and maximise their probability of hitting a target. Minimum drawdowns also adjust as the capital falls, so that a failing account-based pension can be extended for longer by reducing pension payments.

5 The safety-first school of thought

The safety-first school of thought was originally derived from academic models about how people allocate their resources over their lifetime to maximise their lifetime satisfaction. Frank Ramsey and Irving Fisher were both active in the 1920s in the early research on lifecycle finance guiding this approach. Academics studying these models since the 1920s were trying to think about how rational people make optimal decisions to maximise utility. In the retirement context: how to get the most lifetime satisfaction from their limited financial resources. It is the basic fundamental question of economics, of how you optimise in the face of scarcity. In more recent history, Nobel Prize winners such as Paul Samuelson, Robert Merton, Franco Modigliani and William Sharpe are familiar names in the research annals exploring these models.

As this school has a more academic basis, it has often been described with mathematical equations in academic journals. It has been slow to enter the public consciousness. In popular culture, the safety-first approach is probably best associated with Professor Zvi Bodie from Boston University, whose popular books such as the 2003 'Worry Free Investing' and 'Risk Less and Prosper' have brought these ideas alive to the public. Michael Zwecher's 'Retirement Portfolios' (2010) is also an excellent resource written for financial professionals about this school of thought.

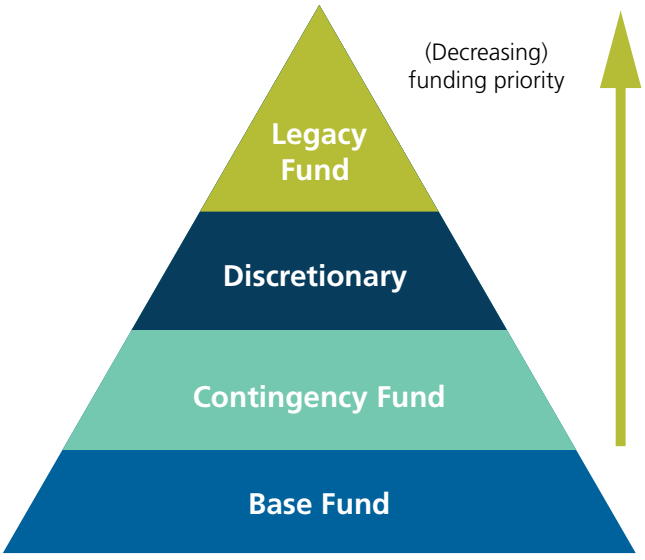
a. How are goals prioritised?

Advocates of the safety-first approach view prioritising among retirement goals as an essential component of developing a good retirement income strategy. Prioritisation will be very important, as discussed further below, because the investment strategy is to match the risk characteristics of assets and goals.

This prioritisation of goals has its academic origins in the idea of utility maximisation. As people spend more, they experience diminishing marginal value from the spending increases. The spending required to satisfy basic needs provides much more value and satisfaction to someone than the additional spending on luxury goods after basic needs are met. Retirees should plan to smooth spending over time so as to not overspend on luxuries in one year at the cost of not being able to afford essentials in a later year.

In developing Modern Retirement Theory, financial planner Jason Branning and academic M. Ray Grubbs create a funding priority for retiree liabilities.[9] Essential needs are the top priority, and then a contingency fund, funds for discretionary expenses, and a legacy fund. They illustrate these funding priorities with the pyramid, and building a retirement strategy requires working up the pyramid to make sure each goal is properly funded before continuing to the next higher level. This is recreated in Figure 1. There is no consideration of discretionary expenses or providing a legacy until a secure funding source for essential needs and contingencies is in place. In another example, planner Erin Botsford wrote 'The Big Retirement Risk'[10] for consumers, and she describes this goal prioritisation as a 'house of security'. The priority of spending goals is to meet needs (food, shelter, clothing and insurance), wants (travel, hobbies and entertainment), likes (vacation home, boat, recreational activities) and wishes (charitable giving, and gifts to heirs).

Figure 1: Modern Retirement Theory hierarchical pyramid



Source: Branning and Grubbs www.modernretirementtheory.com

9 Branning and Grubbs (2010).

10 Botsford (2012).

b. What is the safe withdrawal rate from a diversified portfolio of volatile assets?

The general view of safety-first advocates is that there is no such thing as a safe withdrawal rate from a volatile portfolio. It is unknown and unknowable. Retirees only receive one shot to obtain sustainable cash flows from their savings (one 'whack at the cat', as Michael Zwecher has memorably described it) and must develop a strategy that will at least meet basic needs no matter the length of life or the sequence of post-retirement market returns and inflation. Retirees have little leeway for error, as returning to the labour force might not be a realistic option. Volatile assets like stocks are not appropriate when seeking to meet basic retirement living expenses. Just because a strategy did not fail over a historical period does not ensure that it will always succeed in the future.

c. What is the investment approach?

Traditionally, investing in the accumulation phase has built on the tools of MPT and portfolio diversification to find a suitable balance between expected investment returns and the volatility of those returns. Investors seek strategies that will support the highest expected wealth, subject to the investor's tolerance and capacity to endure downward fluctuations in the portfolio value. However, this was never the complete story. In 1991, Nobel laureate and MPT founder Harry Markowitz wrote about how MPT was never meant to apply to the investment problems of a household. Rather, it was for large institutions with indefinite lifespans and no specific spending objectives for the portfolio. This should have been a Eureka moment for the retirement income industry.

People have finite lifespans, and the reason for saving and investing is to fund spending during their retirement. This is a more complicated problem which is not addressed by MPT. The alternative is asset-liability matching, which focuses more holistically at the household level and also emphasises hedging and insurance. In simple terms, hedging means holding individual bonds to maturity and insurance means using lifetime annuities as a solution for longevity and market risk.

With asset-liability matching, investors are not trying to maximise their year-to-year returns on a risk-adjusted basis, nor are they trying to beat an investing benchmark. The goal is to have cash flows available to meet spending needs as required, and investments are chosen in such a way that meets those needs. Assets are matched to goals so that the risk and cash flow characteristics are comparable. For essential spending, Modern Retirement Theory argues that funding must be with assets meeting the criteria of being 'secure, stable, and sustainable'. This can include defined-benefit pensions, bond ladders and fixed rate annuities. In this regard, another important aspect of the investment approach for the safety-first school is that investing decisions are made in the context of the entire household balance sheet. This moves beyond looking only at the financial portfolio to consider also the role of human and social capital. Examples of human and social capital include the ability to work part-time, pensions, the social safety net, and so on.

An important point is that volatile assets are seen as inappropriate for basic needs and the contingency fund. Stated again, the objective of investing in retirement is not to maximise risk-adjusted returns, but to first ensure that basics will be covered in any market environment and to then invest for additional upside. Volatile (and hopefully, but not necessarily, higher returning) assets are suitable for discretionary expenses and legacy, in which there is some flexibility about whether the spending can be achieved.

Asset allocation, therefore, is an output of the analysis, as the entire household balance sheet is used and assets are allocated to match appropriately with the household's liabilities. Asset-liability matching removes the probability-based concept of safe withdrawal rates from the analysis, since it rejects relying on a diversified portfolio for the entire lifestyle goal.

d. What is the role of lifetime annuities?

The objective for retirement is first to build a safe and secure income floor for your entire retirement planning horizon, and only after that can you begin to include more volatile assets that provide greater upside potential and accompanying risk. In terms of this floor for essentials and contingencies, pensions, bond ladders and lifetime annuities should take the lead. Failure should not be an option when meeting basic needs. Thus, lifetime annuities serve as a fundamental building block for retirement income.

Lifetime annuities are especially valuable because of their ability to provide longevity protection through the provision of 'mortality credits'. People do not know in advance their age of death. They can learn about their remaining life expectancy, but that is just a projection of the average outcome and there is a surprisingly large distribution of actual lifespans around the mean. Individual retirees cannot self-insure to protect from this longevity risk, and without annuitisation they are obliged to plan for a long lifespan.

The annuity provider, however, can pool longevity risk across a large group of retirees, and those who die earlier than average subsidise payments to those who live to around, or longer than, average. These are mortality credits. Because the annuity provider can pool the longevity risk, they are able to make payments at a rate much closer to what would be possible when planning for remaining life expectancy.

A retiree seeking to 'self-annuitise' must assume a time horizon extending well beyond life expectancy (such as 30 years with the 4% rule), in order to better hedge against the consequences of living beyond their planning age. A retiree must spend less when on the 'self-annuitisation' path.

Annuities provide a risk management tool that helps to protect clients from sequence-of-returns, longevity, market and potentially inflation risk. They are an essential tool to be considered for any retirement income plan.

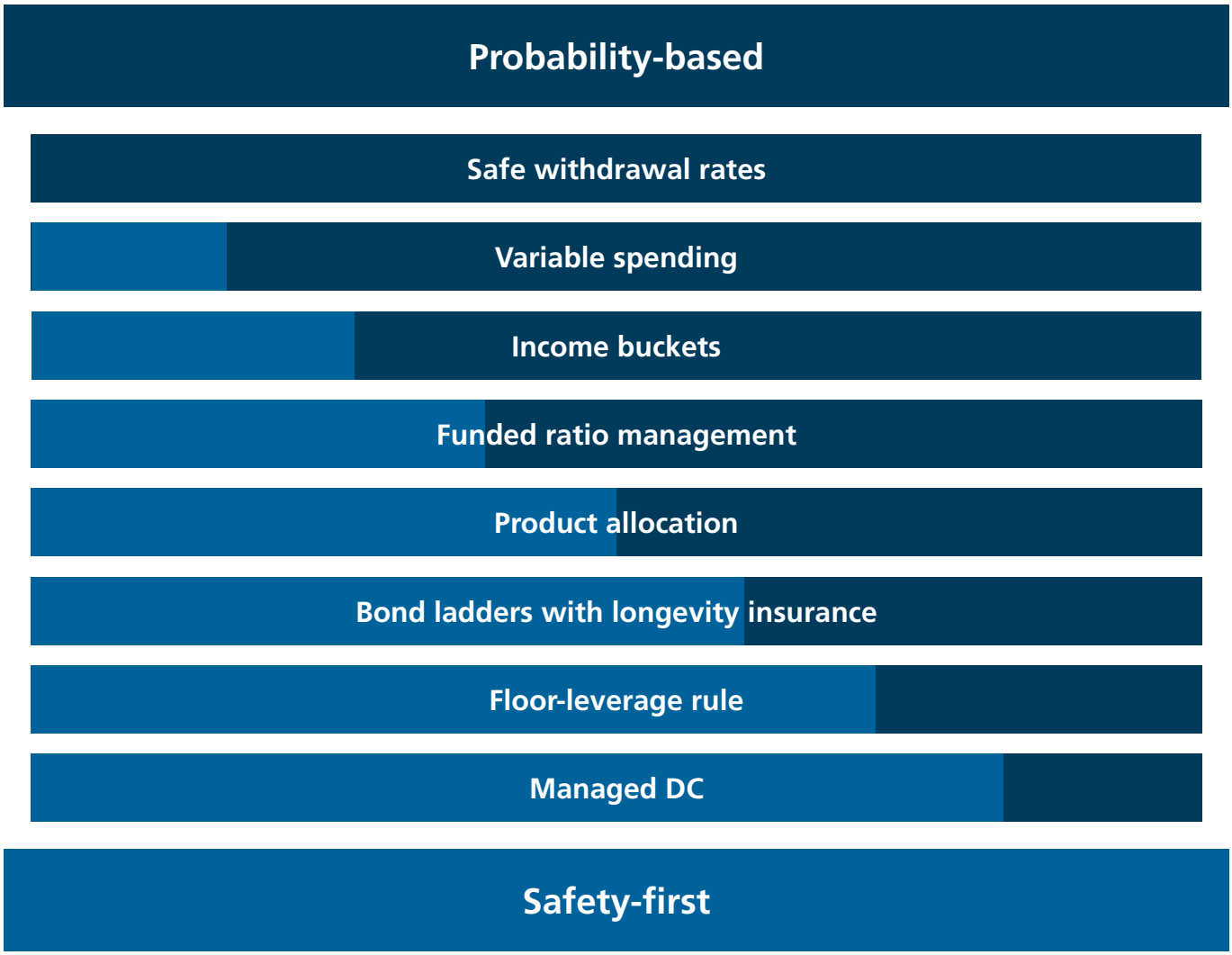
e. What is the role of account-based pensions?

The account-based pension does not provide any safety features. Some safety-minded strategies, such as income buckets, can be constructed within an account-based pension, but these require additional management to monitor and maintain the investment approach. The account-based pension is what comes second. Safety is first, but once the basic needs are covered, the account-based pension is ideal for the remaining retirement savings. The flexibility of the structure and the ability to vary income payments in line with market performance is a good fit for meeting the spending needs for a retiree's additional wants.

6 The spectrum from probability-based to safety-first: practical implementations

Next, we describe various practical approaches in greater detail. Figure 2 shows the order in which we will describe eight practical implementations and where they sit on a spectrum ranging from probability-based to safety-first.

Figure 2: Spectrum of retirement income strategies



7 Safe withdrawal rates

a. The United States experience

A practical starting point for discussing retirement income strategies is William Bengen's research on the subject of 'safe' withdrawal rates, which led to the 4% rule of thumb for retirement income planning. As discussed, his research serves as the foundation for the probability-based approach. Bengen used the term SAFEMAX to identify the historical worst-case scenario sustainable withdrawal rate. The worst-case scenario Bengen identified was 4.15% for a 1966 retiree. The SAFEMAX will vary based on data source, assumed asset classes and asset allocation, and length of retirement. Bengen recommended a stock allocation for retirees of 50–75%, but as close to 75% as possible. Historically, these aggressive retiree asset allocations have provided greater upside potential, while not having a noticeable negative impact on the SAFEMAX.

Though his work is based only on US data since 1926 (a relatively short, and rather exceptional, period in world history), Bengen provides a comprehensive analysis of systematic withdrawals to smooth consumption from a portfolio of volatile assets invested with a total returns perspective. Retirees seek constant inflation-adjusted spending over their retirement, and feasible spending rates are defined as a percentage of the retirement date portfolio. In subsequent years, since spending grows with inflation and the portfolio grows or shrinks according to what is withdrawn and the realised portfolio returns, the withdrawal rate, as a percentage of remaining assets, can fluctuate dramatically and is not specifically tracked.

Bengen's initial research morphed into the retirement income strategy of safe withdrawal rates. Table 3 highlights some key aspects of the 4% rule as a retirement income strategy.

Table 3: Underlying philosophy of the 4% rule (a purely probability-based approach)

- Focus is on the overall lifestyle spending goal.
- Failure is defined as not meeting the full spending goal over 30 years.
- Retirees want to smooth spending, but they have an appetite for market risk.
- Investment focus is on total portfolio returns.
- Investment risk management: A diversified portfolio with 50–75% stocks minimises failure.
- Longevity risk management: 30 years is sufficiently beyond life expectancy.
- Users have confidence in the historical record as providing sufficient precedent for the future.

Table 4 continues with a description of potential problems stemming from the use of the 4% rule in practice. Some of these issues relate to oversimplified assumptions behind the rule (such as the assumptions of a 30-year retirement, a constant inflation-adjusted spending need, the lack of fees and the assumption that investors can precisely earn the underlying index return), while others are more serious critiques offered by safety-first advocates. The basic question is how much retirees should be able to withdraw each year without running out of financial assets. There is no attempt to guarantee an income floor, and research in this area generally tends not to consider other sources of retirement income or annuities, as the basic thrust is how to draw down wealth from a volatile portfolio in a sustainable manner.

Table 4: Problems with the 4% rule

- New worst-case scenarios are possible, especially as the 4% rule is based only on US historical data.
- With improved longevity, 30 years is no longer a conservative assumption for retirement length. According to the Australian Government Actuary, one in ten 65-year-old females is likely to live beyond 100 (Department of the Treasury (Australia), 2014).
- It does not account for the magnitude of spending shortfalls in failure cases.
- It assumes a constant (inflation-adjusted) spending need. Higgins and Roberts (2011) demonstrate a real decline in spending in Australia. Blanchett (2014) does the same for US retirees.
- The strategy is inefficient in the sense that spending should adjust based on portfolio performance and time horizon. Flexibility is important.
- There is the incongruity of funding a smooth spending stream from a volatile portfolio – this is a unique cause of sequence of returns risk.
- The implied 'self-annuitisation' with the 4% rule misses value from mortality credits.
- It requires asset and distribution management into advanced age (i.e. it ignores cognitive decline).
- Extreme aversion to longevity risk (the risk of outliving assets) is required to not plan for higher spending in early retirement and lower spending in later retirement when the probability for survival is less.
- It assumes that the investor always rebalances on schedule and is able to earn underlying index returns without any fee drag.

Most of the work on safe withdrawal rates has been generated using US financial market data. How would Bengen's research have applied for the case of Australian financial market data? We can answer this using the Dimson, Marsh, and Staunton Global Returns Dataset from Morningstar. It provides annual returns for Australian stocks, bonds and bills since 1900.[11] At this point, Australians need to pause and reflect on what the stock market must have looked like in 1900. Federation had not yet occurred, Melbourne was the seat of financial and political power, and information asymmetries beyond our comprehension must have been rife on those early stock exchanges. The equity risk premium in those early days would need to have been very high to justify the risks involved.

In 1998, a study known commonly as the Trinity study was published by three professors from Trinity University in Texas, Cooley et al (1998). It extended Bengen's work to identify historical portfolio success rates for different withdrawal rates, asset allocations, and retirement durations. Table 5 replicates the approach of the Trinity study for Australian financial market data. The table shows the historical success rates over rolling periods since 1900 for hypothetical Australian retirees attempting to sustain inflation-adjusted spending based on different initial withdrawal rates. Asset allocations in the table range from 100% stocks to 0% stocks.

b. The Australian experience on withdrawal rates

Bengen noted that in the United States, a 4% withdrawal rate would have always worked with a 50–75% stock allocation over a 30-year retirement. This would not have been the case in Australia. For 50% stocks, the success rate in Australia is 81% (i.e. a 19% failure rate), although it was 95% with 75% stocks. The full results can be seen in Table 5, which shows historically high allocations to Australian equities provided higher success rates. The same was not true for the US or many other countries. See Pfau (2012) for details on the range of results in other countries.

11 Similar results have been found by Drew and Walk (2014).

Table 5: Portfolio success rates in Australia (inflation-adjusted withdrawals for various withdrawal rates, asset allocations, and retirement durations using Dimson, Marsh and Staunton Global Returns Dataset (1900-2013))

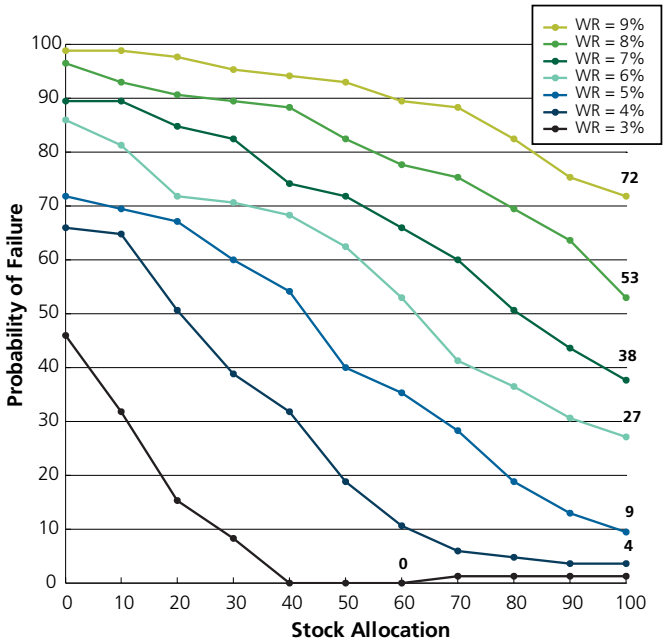
	3%	4%	5%	6%	7%	8%	9%	10%
100% Stocks, 0% Bonds, 0% Bills								
20 Years	100	98	96	92	77	65	52	34
25 Years	99	97	91	82	69	56	34	24
30 Years	99	96	91	73	62	47	28	15
35 Years	99	95	85	68	58	39	26	11
40 Years	97	93	79	61	49	32	21	11
75% Stocks, 20% Bonds, 5% Bills								
20 Years	100	98	94	85	66	54	42	23
25 Years	100	98	90	68	56	40	23	13
30 Years	99	95	78	62	44	28	16	8
35 Years	99	91	66	54	35	23	10	6
40 Years	97	87	60	49	27	17	8	4
50% Stocks, 40% Bonds, 10% Bills								
20 Years	100	98	88	67	55	41	28	16
25 Years	100	93	69	51	38	29	18	6
30 Years	100	81	60	38	28	18	7	5
35 Years	96	68	53	33	20	9	4	1
40 Years	93	59	41	25	16	5	4	1
25% Stocks, 60% Bonds, 15% Bills								
20 Years	100	92	68	53	37	28	26	15
25 Years	100	71	48	34	28	22	11	2
30 Years	88	59	33	29	16	11	4	1
35 Years	74	43	29	19	6	4	1	0
40 Years	68	33	23	9	4	1	1	0
0% Stocks, 80% Bonds, 20% Bills								
20 Years	95	71	47	36	29	27	22	6
25 Years	77	42	34	27	23	16	2	1
30 Years	54	34	28	14	11	4	1	0
35 Years	41	28	13	6	3	1	0	0
40 Years	32	20	7	3	1	0	0	0

Figure 3 exemplifies the situation in Australia by showing the probability of failure for different withdrawal rates and asset allocations over a 30-year horizon. Fixed income allocations are divided 80% into bonds and 20% into bills. Targeting a 4% withdrawal rate in Australia using this analysis would have led to a recommendation of holding at least 70% stocks in order to get the historical failure rate below 10%. This is a common approach in Australia with many funds investing account-based pensions in a diversified growth portfolio.

Despite the name, it is not safe. There are periods in history, such as the 1970s, where this approach would have failed to last the distance.

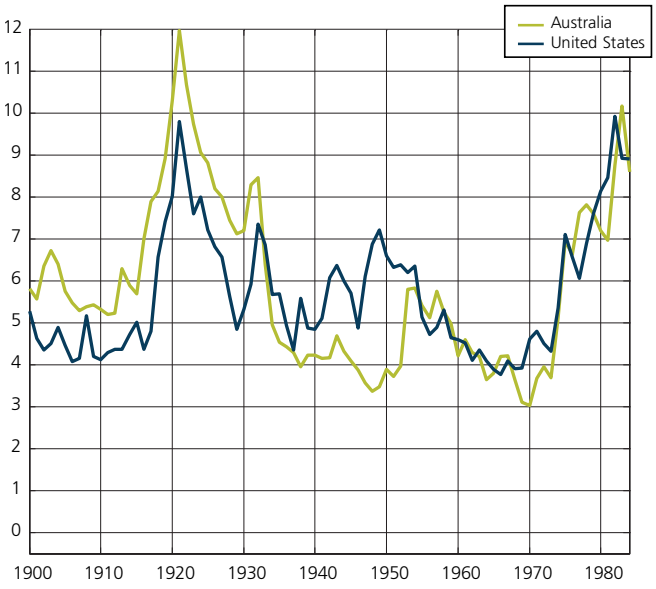
With Australian data (to the extent that the historical data can be relied upon), the general probability-based message of using an aggressive asset allocation becomes even stronger, though Australian historical data also does reveal greater vulnerability for the 4% rule than is demonstrated by analyses of only the United States.[12]

Figure 3: Historical failure probabilities for inflation-adjusted withdrawal strategies in Australia over a 30-year retirement horizon



Next, Figure 4 compares the historical trends for sustainable withdrawal rates over 30-year periods and for a 50/50 portfolio for the United States and Australia. For Australia, in 19% of the historical cases, the sustainable withdrawal rate was less than 4%. It came quite close to 3% for a new retiree in 1970. The figure really highlights that, had Bengen done his initial study with Australian data, instead of US data, the 4% rule would in all likelihood be known instead as the 3% rule, unless retirees were willing to hold the vast majority of their financial assets in equities. This is now reinforced by Drew and Walk (2014).

Figure 4: Maximum sustainable withdrawal rates by year of retirement for a 50/40/10 stocks/bonds/bills asset allocation and 30-year retirement horizon



The safe withdrawal rate sets a level of income maintained in real terms that is likely to last for the lifetime of a retiree based on historical events. Market risk is taken and there is a small probability that the plan will fail.

12 Each data source does result in slightly different outcomes for sustainable withdrawal rate estimates. As a point of comparison, with this dataset the 4% rule in the United States enjoys a 96% success rate over 30 years with 75% stocks and a 95% success rate over 30 years with 50% stocks.

8 Variable spending strategies

The constant-spending assumption of the 4% rule could be considered a simplification to aid in obtaining a general guideline about feasible retirement spending. For real retirees, spending will vary over time. They will not play the implied game of chicken of keeping spending constant as their portfolios plummet toward zero. As well, constant spending from a volatile portfolio is a unique source of sequence of returns risk, which can be partially alleviated by reducing spending when the portfolio drops.

But, how exactly should retirees adjust their spending patterns in response to changes in the value of their retirement portfolios? Of countless variable spending approaches, we will consider two of the most prominent. Real spending can increase or decrease along with the fortunes of the market. This can ensure that wealth will not run out, though it provides no protection against painfully low levels of spending. These variable spending strategies, though they reduce sequencing risk, are probability-based approaches. The loss of capital in a volatile portfolio could push spending to uncomfortably low levels and bond ladders or lifetime annuities are not given consideration to lock in any minimum level of spending.

Portfolio volatility can also wreak havoc on attempts to plan a stable budget. The two practical variable strategies we describe attempt to smooth spending relative to two even more basic strategies. The basic strategies are to spend a constant percentage of the remaining portfolio balance in each year of retirement (note that spending 4% of what remains from a portfolio each year is very different from the minimum drawdown rules which apply in Australia).[13] Minimum drawdowns are based on the current account balance and the age of the pension account-holder. If the balance falls, then so does the amount required to be drawn down. Even when the percentage requirement increases, market movements can reduce income payments. The purpose of the rule is to push money out of the tax-advantaged account-based pension where it is either spent or subject to normal taxation.

Countless proposals have been made for dynamic withdrawal rates to provide a compromise between the desire to plan ahead and the need to make spending adjustments to reduce the odds of asset value depletion. A practical variable spending strategy used by US advisers is the 'decision rule' approach developed by Jonathan Guyton (2004) and with William Klinger (2006) in 'Journal of Financial Planning' articles. Using Guyton's approach, clients begin retirement with a higher withdrawal rate, but future spending won't always increase with inflation and it might need to be cut in certain circumstances.

In practice, the variety of options in altering the spending profile results in a series of rules that can be complex. Typically, one or more of four decision rules are applied to a retiree's portfolios. The four Guyton and Klinger decision rules that advisers can apply to client portfolios include:

- the portfolio management rule (which focuses on attempting to make withdrawals from asset classes which have experienced the most growth);
- the withdrawal rule (which avoids adjusting withdrawals for inflation in down market years);
- the capital preservation rule (which cuts spending when portfolio withdrawal rates exceed 20% of their initial level – because the portfolio is shrinking); and
- the prosperity rule (which increases spending when portfolio withdrawal rates fall by more than 20% of their initial level – because the portfolio is growing).

Less well known to financial professionals is an approach that is closely tied to how actuaries view the retirement-spending problem. It is a cousin of the minimum withdrawal tax rules. The age-based, three-dimensional distribution model was developed by Larry Frank, John Mitchell and David Blanchett in a series of articles (2011, 2012a, 2012b).[14] They viewed retirement spending as a dynamic process and believed that the sustainability of a given plan should be revisited frequently. Since retirement is an ongoing process, their focus was always on the current withdrawal rate, rather than the initial safe withdrawal rate.

13 Australian SIS Regulations 1994 require minimum annual account-based pension payments typically as follows: age 65–74 at 5%; age 75–79 at 6%; age 80–84 at 7%; age 85–89 at 9%; age 90–94 at 11% and 95+ at 14%. For the 2019-20 and 2020-21 financial years, these minimums will be halved.

14 Further consideration can be found in Blanchett, Kowara and Chen (2012) and Blanchett (2013).

While Guyton's decision rules focused on a fixed planning horizon, Frank, Mitchell and Blanchett suggested using a dynamic measure of remaining life expectancy, noting that withdrawal rates can increase as the remaining time horizon shortens.

Frank, Mitchell and Blanchett developed a three-dimensional model for factors that determine the forward-looking sustainable withdrawal rate from a given point in time: age, market returns and asset allocation. Spending adjustments are made with regard to the probability of failure.

They concluded that the most important factor is age, which affects the length of the remaining distribution period and the longevity risk. Bengen's original safe withdrawal rate research based retirement planning on a fixed horizon of 30 years. But, mortality and survivorship data can be used dynamically to measure the remaining life expectancy. Withdrawals can be based on remaining life expectancy, rather than an arbitrarily longer planning horizon.

Next in importance is the sequence of market returns. As this approach considers that spending should fluctuate in response to market returns, they argued that sequence of returns risk is always present in a retiree's portfolio and is not just a symptom of the early years of retirement. To maintain the same probability of failure, the withdrawal rate will need to adjust over time. Since the remaining time horizon shortens as years pass, the withdrawal rate that corresponds to a given probability of failure will increase.

The third factor, which has the smallest effect on the sustainable withdrawal rate, is the asset-allocation choice.

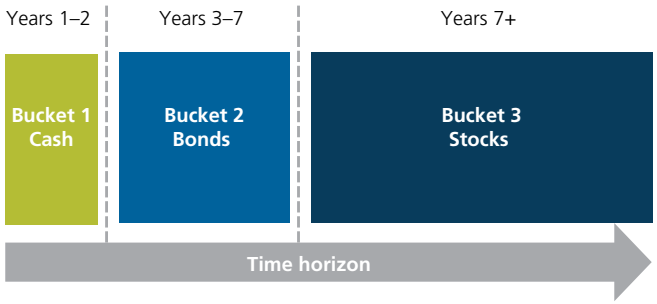
Variable spending strategies start with a higher spending rate, but they allow income (and spending) to fall when market returns don't meet expectations. Plan failure results in the money available for spending being inadequate.

9 Income bucketing (or time segmentation)

With traditional asset allocation and total returns investing, different asset classes are mixed into a single portfolio, and people can have a difficult time relating to the purpose of the different parts of their portfolio. Bonds are used to dampen volatility, which leaves them looking like they are just sluggish stocks. Leaving behind the purely total returns perspective, another important avenue for retirement income building is to hold fixed income assets to maturity in order to guarantee upcoming retiree expenses over the short and/or medium term. More volatile assets, with higher expected returns, are then deployed to cover expenses for more distant time periods. This is time segmentation.

Time segmentation moves away from a total returns analysis to provide a mental accounting framework that distinguishes different accounts (or income buckets) of the portfolio to be used for different purposes (income at different points of time). Rather than worrying about short-term volatility and then allocating between stocks and bonds to find the happy mix, time segmentation uses fixed income assets specifically to lock-in future spending amounts over the subsequent horizon of perhaps three to 10 years. Stocks are left alone to grow without worrying that they will have to be sold after a downturn. The bond allocation is determined by how much of the portfolio is required to build the front-end fixed income ladder locked-in for upcoming spending needs, and the stock allocation is whatever is left after creating a bond ladder. Asset classes are deployed for what they do best: bonds provide income and stocks provide growth.

Figure 5: Example of income buckets



Lifetime annuities are generally not used in time segmentation, as bonds will meet upcoming expenses, providing a longer period for volatile assets to recover from market declines before they must be sold.

This viewpoint relies on the potentially erroneous belief[15] that time diversification makes stocks less risky when held over longer periods. While time might reduce the average annual volatility of equity returns, it clearly increases the risk of larger deviations from expected terminal portfolio values. Though income bucketing is a hybrid approach, incorporating aspects from both the probability-based and safety-first frameworks, it is this confidence in the long-term growth of stocks which leads us to identify time segmentation as closer in nature to a probability-based approach.

The primary advantage of time segmentation is that it provides a behavioural foundation for retirees to maintain their asset allocation and avoid panicking during market downturns, although this might not always be achieved in practice. Income bucketing can be more intuitive than the blended approach of the total returns portfolio, because it is easier for people to understand that certain assets are to be used for the short-term horizon, certain assets for the medium-term horizon and others for long-term spending needs.

Nonetheless, it must be emphasised that on a theoretical level, income bucketing cannot be a superior investing approach relative to total returns investing. In practice, whether targeting total returns or income bucketing ends up providing better performance when viewed after the fact cannot be predicted in advance and will be determined by the actual sequence of market returns experienced. The benefits of income bucketing relate more to helping people to understand their retirement income plan and keep their resolve to stay the course and avoid panicking during market downturns. Retirees might be less likely to sell stock holdings if they know there is time to wait for a market recovery before needing to spend those assets. Practical implementations of time segmentation include the Asset Dedication approach by Stephen Huxley and J. Brent Burns (2005), and Somnath Basu's (2005) Age Banding work.

Income bucketing secures spending levels for the early years, but is still reliant on good market returns in order to maintain desired spending levels over time.

15 See for example Bodie (1995).

10 Funded ratio management

On the spectrum, we place 'funded ratio management' as one of the midpoints between probability-based and safety-first approaches. This approach is best associated with Russell Investments. It is described more completely in the book, 'Someday Rich: Planning for Sustainable Tomorrows Today', by Timothy Noonan and Matt Smith (2012).

The main idea of funded ratio management is to treat personal retirement planning in the same manner as a corporate pension fund and to focus on a person's funded status. Funded status of 100% means that a person has just enough assets to meet the present discounted value of their future liabilities, while overfunded and underfunded people have more or less than this, respectively.

Assets are the resources people have available to fund their financial goals and liabilities are these financial goals. More specifically, assets include both the current value of a retiree's financial assets, and for pre-retirees, the present discounted value of their human capital.

This model can be used during both the pre-retirement and post-retirement periods to find out if a person is on track for a sustainable retirement. Being on track means that people's available assets are at least as large as the spending implied by their financial goals.

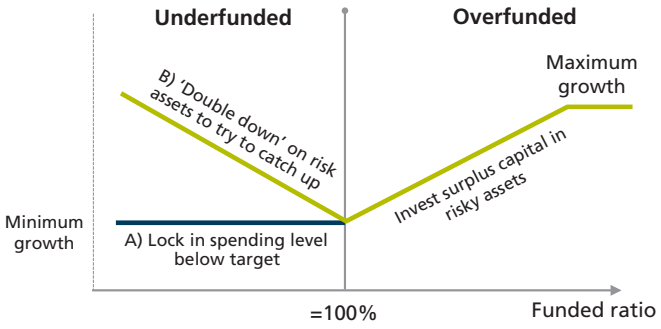
If a retiree is underfunded for retirement, potential solutions include working longer, saving more, or planning to spend less in retirement. Another option is to take more investment risk and increase the expected return (or discount rate of the future liabilities), but that could backfire if the portfolio drops further.

When those other options are no longer available and retirement is already underway, then a drop toward underfunded status means that a retiree should seriously consider annuitising in order to lock-in a floor of sustainable income. This eliminates the possibility of any further upside, but at least it prevents further tragedy if their investment portfolio continues to drop.

Being funded does require monitoring carefully about the evolving costs of annuitisation and the value of assets and liabilities. But, careful investment planning does help to smooth some of the volatility. For instance, if interest rates increase, then the present values of assets and liabilities will decrease, and the cost of annuitisation will decrease. Things move in tandem. The co-movements can be quite precise when duration matching for assets and liabilities is used.

Investment planning still plays a role, and Russell describes an adaptive asset allocation approach that relates both to the funded status and to a retiree's comfort with volatile investment strategies. It is a form of portfolio insurance under which investment risk is allowed to increase as the funded status increases. This approach generally assumes that annuitisation involves all assets and is only undertaken as a last resort. There is no move to lock in some income through an annuity, while maintaining some market exposure and liquidity with the other accumulated savings. Exposure to the market can move up and down, depending on the funding ratio. Figure 6 indicates how the growth asset exposure is at a minimum with a 100% funded ratio, increasing to either invest the surplus, or to try to catch up (probability-based approach). The option for underfunded older retirees moves from catching up through higher equities to locking in spending plans by not letting them get any worse (safety-first approach).

Figure 6: Growth exposure with adaptive asset allocation



Source: Adapted from Pittman and Greenshields (2012)

The strategy considers only a traditional lifetime annuity that locks the capital up at purchase. Modern annuities, such as currently available in Australia, offer a liquidity window of up to 15 years. The purchase of this annuity can be unwound, reducing the cost of prematurely locking in an income level.

Managing to a funded ratio can be used to lock in the desired spending level if capital is sufficient. It is a relatively complex strategy and still relies on good market outcomes when capital is not sufficient.

11 Product allocation (or goal segmentation)

The classic evaluation tool for traditional safe withdrawal rate studies is the failure rate or success rate. These rates have several deficiencies though: they are not useful for strategies that partially allocate to guaranteed income sources or that use flexible withdrawals in part to avoid wealth depletion, and they do not measure the magnitude of failure when it happens.

Associate Professor Moshe Milevsky of York University in Canada describes 'product allocation' as how to allocate retirement wealth optimally among stocks, bonds, lifetime annuities, and variable annuities with guarantee riders. Product allocation moves toward safety-first principles by considering retirement income strategies more holistically through the retirement income efficient frontier. Though the efficient frontier presents probability-based outcomes, it does so in a manner that allows the entire household balance sheet to be incorporated into the analysis. This allows lifetime annuities an opportunity to receive fair consideration, and allocations including guaranteed income sources in retirement generally outperform strategies without any guaranteed income.

Unlike the safe withdrawal rate framework, the retirement efficient frontier does not focus solely on avoiding financial wealth depletion. Instead, there is a trade-off between two objectives: supporting minimum spending needs and lifestyle spending goals, and maintaining a buffer of financial assets. This buffer could be for a legacy or to use as a reserve in the case of expensive health shocks, divorce, severe economic downturns or other emergency needs. Individuals must determine how much they value each objective and choose the appropriate balance between them in a manner similar to the risk/return trade-offs in MPT's efficient frontier.

The resulting efficient frontier shows the allocations that support the largest buffer of remaining financial assets at death, while still providing a given percentage of spending needs (or, alternatively, the highest percentage of spending needs that can be satisfied for a given reserve of financial assets). Any of the product allocations on the efficient frontier represent a potentially optimal point. Whoever is taking responsibility for the allocation of the end beneficiary, be it direct client or fund member, must decide what is optimal.

This efficient frontier approach provides a very robust and scalable framework for evaluating retirement income strategies. The inputs can be modified to fit the circumstances for a retiree. Age, gender, marital status, asset classes and allocations, performance expectations, current pricing, available household assets and spending needs and goals can all be adjusted to product an efficient frontier. This frontier graphically illustrates the trade-offs between downside spending protection and the potential to grow wealth. Retirees or their advisers/fiduciaries can then make decisions about how to optimise the available choices.

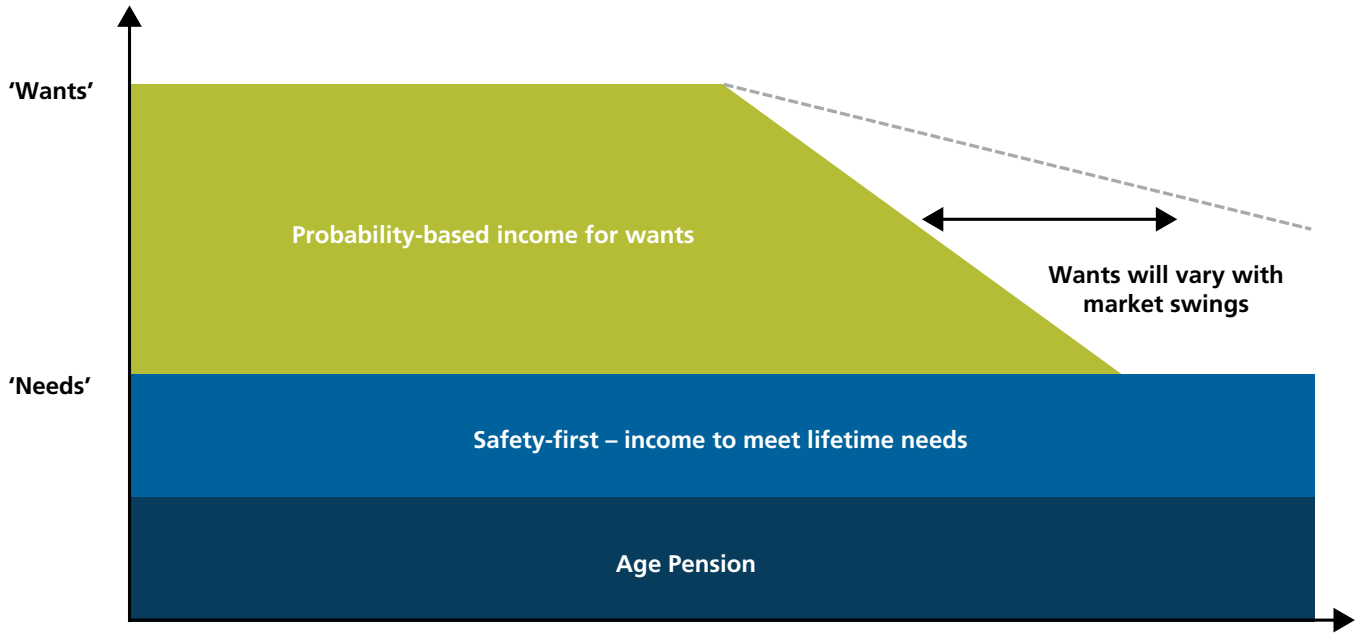
a. Income layering

A clear example of the goal segmentation approach is also provided in what is known as an income layering approach. The idea is to set clear needs and wants and prioritise how each of those goals will be achieved. Income that is required to meet 'needs' is locked in for life. Consideration should first be given to access to social security such as the Age Pension, but then the remaining income for 'needs' is generated from a guaranteed product. For retirees with the option of a defined benefit pension, that is suitable, but for others, a lifetime annuity provides the simplest way to match this lifetime income need.

Most retirees will have a significant proportion of their wealth available to meet the various 'wants' that they have through retirement. Often, these wants are higher in the earlier stage of retirement when the retiree is in full health and has an active lifestyle. As the needs are safely covered, the retiree can pursue the probability-based approach through an account-based pension to generate income to meet their wants. This split is demonstrated in Figure 7.

Goal segmentation reflects the Yin and Yang in the title of this paper. Safety-first is paramount to meeting needs. Once these needs have been locked in, the retiree can seek to maximise their other outcomes through a probability-based approach.

Figure 7: Income layering example of goal segmentation



12 Bond ladders and longevity insurance

If pressed to identify a safe withdrawal rate, safety-first advocates sometimes point to the payout rate on an inflation-adjusted lifetime annuity as the most reasonable estimate. They think of it as the retirement income discount rate. Retirees, however, seem disinclined to give up all the liquidity and access to assets implied by complete annuitisation, although modern Australian annuities have addressed this by providing liquidity for an initial period. This has led researchers to look for alternatives. One such approach developed by Professor S. Gowri Shankar (2009) was to combine a 20-year ladder of inflation-protected government bonds (called TIPS in the US) with a deferred lifetime annuity (DLA) which begins payments 20 years after the retirement date. Stephen C. Sexauer, Michael W. Peskin and Daniel Cassidy (2012) reconfirmed this idea in a 'Financial Analysts Journal' article and also extended the argument that this should be used as the benchmark for calculating feasible retirement income.

For both single-premium immediate annuities (SPIAs) and DLAs, a lump-sum premium is paid today (or perhaps by smaller premiums over time) in return for a guaranteed income for life. The difference is that for the DLA, the guaranteed income does not begin until a later date. Another way to look at this is that a SPIA is a DLA with no deferral period. The basic idea of 'longevity insurance' is that a 65-year-old might buy a DLA for which income begins 15 or 20 years later. Because the income is deferred, total lifetime payouts will be less and the cost of the annuity lower. This provides longevity protection at a lower cost. The idea of this strategy is that it might be more palatable than only buying an inflation-adjusted SPIA, since it does not require sacrificing liquidity for assets, and the remaining unused bond ladder would be available to a surviving spouse or an estate in the event of an early death. This strategy provides a good example of a safety-first approach, with protection being sought for the entire lifestyle spending goal for life.

A bond ladder can provide a stream of income for a set period with a deferred lifetime annuity to cover spending needs afterwards. Market exposure to bonds still remains, but the income is locked in.

13 Floor-leverage rule

Jason Scott and John Watson are both important developers of research at Bill Sharpe's Financial Engines[16] which explains why the 4% rule is an inefficient retirement income strategy. Their floor-leverage rule provides an effort to develop a retirement income strategy which can better meet the competing retiree preferences that have turned the 4% rule into the default strategy for retirement.

Retiree preferences that increase the seeming attractiveness of using the 4% rule include:

- A desire for sustainable and non-decreasing spending over retirement.
- An appetite for taking equity risk in the hope of supporting a higher sustainable spending stream.
- A strategy that will be relatively simple to implement and understand.

The fundamental problem is the trade-off between wanting downside protection to ensure a sustainable spending stream and also wanting portfolio growth and greater upside. Scott Watson (2013) argue that their floor-leverage rule provides a more effective way to satisfy these preferences than using a traditional diversified volatile portfolio.

The floor-leverage rule is a barbell strategy mixing very secure and very volatile assets. With traditional rebalancing, you buy stocks after they lose value which can lead to portfolio depletion in worst-case scenarios. With the floor-leverage rule, you do not buy stocks after they fall in value, but rather only sell stocks after they gain in value. This is accomplished by building a safe and secure spending floor (using the safety-first meaning for these words) with 85% of the assets in the financial portfolio. This provides a lifetime floor which spending can never fall below. Next, they put the remaining 15% of financial assets in a highly-volatile 3x-leveraged equity portfolio. Lastly, they conduct annual portfolio reviews. If the equity portion of the portfolio exceeds 15% of the portfolio asset allocation, they sell enough equities to return to the 15% allocation and use the proceeds to ratchet up the spending level supported by the secure spending portfolio. Otherwise, they do nothing.

With this approach, spending can increase, but it can never decrease. It is possible for the leveraged equity allocation to be wiped out, but the initial secure spending floor is still in place and the retiree is exposed to, at most, a 15% drop in their financial assets.

Regarding the spending floor created by the 85% allocation, spending can be supported in constant or in inflation-adjusted terms, or some combination of the two. The level of spending depends on the longevity risk aversion of the retiree. The more fearful they are of outliving their assets, the longer their bond ladder would need to be. This will mean less spending. With greater longevity risk aversion, including a lifetime annuity will support greater spending since the mortality-risk pooling offered by the insurer allows payouts to be based on terms closer to life expectancy. The use of longevity insurance (i.e. a DLA) also provides a way to increase sustainable spending by allowing for a shorter planning horizon with the bond ladder, with the longevity tail covered by the DLA.

> The floor-leverage rule seeks to lock in a high level of total desired income and then leverage up remaining exposure to market risks in an attempt to improve the available income to spend.

16 http://corp.financialengines.com/

14 Managed DC

The most extreme form of safety-first is an approach sometimes referred to as Managed DC. The DC refers to defined contribution as the alternative pension structure to a traditional defined benefit pension. The concept, is applied in some pension schemes globally such as NEST in the UK.[17] It has also been articulated by Nobel laureate Robert Merton and is reflected in Dimensional's Target Date Retirement Income Fund. The Managed DC approach seeks to create participant outcomes similar to traditional defined-benefit pensions.

Each plan participant is guided toward accumulating enough wealth to afford an inflation-adjusted immediate lifetime annuity at retirement that can provide their desired amount of spending for life. The income that can be guaranteed depends on current wealth and projected future savings, and on the prices of hypothetical inflation-adjusted deferred annuities.

Merton's approach is to optimise the asset allocation to maximise the probability of achieving the specified target income level. The first slice of the portfolio goes to meeting a retiree's minimal spending goal, with at least 96% confidence. The rest of the portfolio maximises the probability of meeting an overall desired income goal. This allocation takes into account factors such as the time to retirement and the nature of income growth and volatility in the participant's employment sector.

The NEST approach is to match the liabilities of the annuity available at retirement, but the final income level will be what can be purchased so that a potential surplus can lead to higher retirement income. By not completely de-risking, there is a chance that the surplus from early strong performance can be unwound by subsequent poor performance.

Projections for annuity prices depend on interest rates, the inflation outlook and mortality statistics. Prices can be quite volatile with a large exposure to interest rates, and nothing is actually guaranteed with respect to what will actually be on the market when the desired retirement date arrives. Fixed-income holdings in the individual's plan are adjusted so that the duration of the assets matches the duration of the potential annuity's liability payments. Assets and liabilities move in lock-step as interest rates change, minimising the fluctuations in the projected guaranteed lifetime income stream.

When plans bring the retiree near the desired spending goal, volatility ratchets down to lock-in the goal by moving to a duration-matched combination of bond funds. Without adjustment, all further upside is given up to lock in the desired spending level. Safety is not only first, it becomes paramount. Of course, participants could modify their outcomes by deciding to save more, retire later, or revise spending goals downward. Indeed, asset allocation decisions are first guided by the participant's input, including his or her intended retirement date, the projected amount of new contributions to be made each year, a minimal acceptable income floor during retirement, and a reasonable desired spending level that serves as the primary goal. Built-in feedback, in the form of an estimated probability that the pension will reach its desired spending goal, is meant to guide the planning process toward a set of consistent, realistic decisions about saving and spending.

Though young participants might not be able to duration-match their long-term liabilities, their plans can be refined as retirement approaches. Projecting retirement income to meet specific goals gives a wide variety of participants at least the potential to understand their projected retirement income and the assumptions that underlie it, as well as the implications of altering those assumptions. Participants should update plans from time to time, but otherwise the approach prepares default outcomes for disinterested participants.

Is it wise at the societal level to shift pensions from defined benefit to defined contribution, when it is clear that many people lack the interest or ability to master the basics of investing? Perhaps not, though life-cycle proponents are seeking ways to bring the benefits of defined-benefit pensions into a defined-contribution world, without unduly burdening employers. Managed DC approaches exemplify this trend. Participants will learn that building a guaranteed retirement income floor is expensive, particularly in a low interest rate environment, but showing the link between a person's current situation and his or her projected guaranteed lifetime income will prove valuable in motivating more focus on retirement. The reality is, of course, that it is retirement that is expensive.

A Managed DC approach will lock in a target level of spending when it is available by trading off the potential to increase spending above that level.

17 (Copy the below web address into your internet browser's address field)
nestpensions.org.uk/schemeweb/NestWeb/includes/public/docs/Merton-Applying-life-cycle-economics,PDF.pdf

15 The retirement income challenge

Though disagreements exist about the best approach, a cutting-edge retirement income framework must be able to translate client goals, needs, and desires into an appropriate product and asset allocation strategy. The process must delve into: how much retirement income is feasible; how to best spread spending power over the course of retirement; how to allocate among various products differing in the amount of control and guarantees provided; and how to choose an asset allocation for the portion of wealth to be used with systematic portfolio withdrawals.

Figure 8 summarises the retirement income challenge. Retirees and their advisers consider how to best combine a variety of income tools to meet a broad set of goals and to manage the risks which jeopardise those goals.

Figure 8: The retirement income challenge

The essential difference between the schools of thought relates to the degree of comfort you have that stocks will always perform well enough for a broadly diversified portfolio to meet a retiree's basics without relying on more secure assets. With essentials-versus-discretionary, lifetime flooring protection is created for essential needs. This is really 'goal segmentation'. Time segmentation focuses only on funding short and medium-horizon spending goals with dedicated assets, with faith that volatile assets will perform adequately when left to grow for long enough. Systematic withdrawals generally leave the entire lifestyle spending goal at risk, since spending needs must be supported from a portfolio of volatile assets.

Table 6 provides a list of questions to help people gauge which school they more closely identify with. Someone inclined to feel more comfortable with the safety-first approach might provide answers such as: (1) a lot, (2) yes, (3) yes, (4) overfunded retirees could lock in their lifestyle and reduce worry, (5) no, the downside risk would be more devastating and not worth the risk, and (6) meeting spending goals is more important than the bequest motive. Naturally, opposite answers would suggest a person is more comfortable with probability-based approaches.

Table 6: Determining comfort with probability-based or safety-first

1. How does stock market volatility affect your sleeping patterns?
2. Are you particularly fearful about outliving your assets or having to reduce spending dramatically at higher ages?
3. Is your standard of living (as distinct from annual spending amounts) vulnerable to a large market decline? In other words, do you have limited flexibility to reduce spending and still remain comfortable?
4. How funded is the retirement plan? Could you meet your goals without market risk, or is seeking upside integral to the success of the plan?
5. Is it worth seeking greater upside potential when it exposes you to downside losses? How would you feel if your assets doubled in value? What if they lost half their value?
6. How do bequest motives compare to spending goals?

Retirees face a complex optimisation problem to find the proper balance between many goals over an uncertain lifespan. To meet essential and discretionary spending goals, underfunded and constrained retirees will seek to spend as much as possible while keeping close watch over the chances of having to make unacceptable cuts to their retirement budget. While traditional lifetime annuities, with their pooling of mortality risk, provide a solution to maximise spending potential in the face of uncertain lifespans, some retirees are loath to sacrifice control over all their hard-earned savings. Product providers can and do innovate to provide some control, such as increased liquidity, but for some to benefit from mortality pooling, someone else has missed out (on a bequest in this example). Optimising among all these complex and uncertain trade-offs is challenging to say the least. Meanwhile, retirees must also deal with an assortment of behavioural quirks that impede good decision-making.

16 Concluding remarks

Super funds and financial advisers alike can help retirees overcome the complexities of generating retirement income by first understanding their own philosophical approach to retirement income. While neither a probability-based nor a safety-first approach is definitively right or wrong, different people will align more easily with one or the other. It will be important to be able to articulate which one most accurately reflects a fund's or adviser's philosophy or whether a blend is advocated. That way, funds and advisers can be clearer about explaining what they are offering and measuring the success or otherwise of the outcomes.

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