The Role of Asset Allocation in Navigating the Retirement Risk Zone
Finsia’s research series about retirement adequacy addresses the challenges facing Australia’s superannuation system to improve the sustainability of retirement savings for all Australians.

How superannuants fare in retirement, and issues raised by increasing population longevity, have taken centre stage, particularly through the recommendations of the Financial System Inquiry and the Intergenerational Report. It is clear that policy initiatives must place a greater focus on the sustainability of retirement income through the many stages of retirement.

The first report in the Finsia series — Sequencing Risk: A Key Challenge to Creating Sustainable Retirement income — examined the effect of the ordering or sequencing of investment returns on the sustainability of retirement income.

The findings by Professor Michael Drew SF Fin, Dr Anup Basu F Fin and Brett Doran were based on simulations from a century of historical investment returns and challenged the belief that average return of investment determines the quality of retirement outcomes.

Through this research the authors identified the ‘Retirement Risk Zone’ — the period encompassing the final 20 years of the retirement saving journey and the initial 15 years of retirement. In this period, retirement savings are at their peak, and most exposed to risk. Importantly, it is in this period that superannuants shift from accumulating to decumulating their retirement savings.

The second report in the research series by Professor Michael Drew SF Fin and Dr Adam Walk SF Fin — How Safe Are Safe Withdrawal Rates in Retirement? An Australian Perspective — challenged the orthodoxy that withdrawing retirement savings at the rate of 4 per cent per annum (‘the 4% Rule’) is safe. They did so by analysing the annualised performance of different investments in a number of countries over a period of 112 years.

Even with the exceptional performance of the Australian stock market over the past century, a 4 per cent withdrawal rate over 30 years on a 50:50 growth/defensive asset allocation was found to come with 20 per cent chance of financial ruin. This finding raises the question of how investors and the industry can respond to ensure that superannuation savings form the basis of sustainable income for retirement.

In this third stage, the series authors, aided by Jason West, have developed an innovative and practical asset allocation strategy in order to maximise retirement outcomes. They advocate a dynamic layered asset allocation as one approach to maximise retirement income.

Significantly, the authors preferred strategy breaks the asset allocation of an investment portfolio across five stages recognising the changing needs of investors across the lifecycle. Recognising and accounting for these changing needs is critical to ensuring adequate standards of living in retirement.

Russell Thomas F Fin  
CEO and Managing Director  
Finsia
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1. INTRODUCTION

1.1 To and through the retirement risk zone

“I am more concerned about the return of my money, than the return on my money.”

Mark Twain

It is common for many approaching retirement, and for the recently retired, to experience high levels of anxiety. One recent (informal) survey suggested that respondents’ reactions to word ‘retirement’ were fairly evenly split between positive and negative sentiments (Carole, 2014). Negative sentiments included words such as: scared, nervous, anxious, worried, and sad. One particular factor that contributes to these negative sentiments is concern over financial security in retirement. Sleepless nights, hasty investment decision making, erratic spending patterns in response to market volatility, and nervousness about outliving financial wealth are some of the symptoms. The anxiety exists for good reason. The problem of ensuring a sustainable retirement income is a difficult and complex one for many folks, filled with uncertainties. The retiree has to balance regular spending needs against a range of ‘known unknowns’: investment returns, potentially significant medical and aged care costs, and the retiree’s planning horizon.

FIGURE 1: Word cloud analysis of financial advice and retirement websites and client comments in Australia, 2012-14

We know that the anxiety may actually start earlier, in the so-called ‘transition (or conversion) phase’ to retirement. In addition to concerns about financial security, individuals also may face uncertainty about such things as involuntary or unexpected job loss and potential deterioration in mental or physical health. A number of scholars have studied the anxiety levels of people transitioning to retirement (Mein et. al. 2003; Gill et al. 2006; Villamil, 2006; Olesen, 2012). The majority of these studies have shown that anxiety levels are highest for those facing the greatest exposure to financial insecurity. But high anxiety can also extend to those who believe they have insufficient funds to sustain retirement, regardless of whether this belief is reasonable. Such beliefs are particularly dangerous when they go on to adversely affect the individual’s investment decisions.
Instinctively, many folks are aware of the financial realities they face during the transition to retirement (e.g. the loss of regular non-investment income, heightened spending patterns in early retirement, and the legacy of existing debts). Above all, perhaps the greatest risk to their financial security is the potential for cumulative losses in their retirement portfolio during the so-called ‘Retirement Risk Zone’ — i.e. in the years immediately before and after their retirement date. A sequence of poor returns in a highly exposed retirement portfolio can deplete wealth to such a degree that postponing retirement for another 5 to 7 years may still be insufficient to allow a full recovery. The impact of these losses — known as ‘sequencing risk’ — was the focus of the first instalment in Finsia’s research program on the Retirement Risk Zone (Basu, Doran and Drew, 2012).

Investors concerned about the potential for large losses during this critical life stage may understandably be tempted to adopt a conservative investment approach. Eliminating as much risk as possible through the allocation of portfolio wealth to low risk assets might appear to be the appropriate response for many people entering the twilight of working life. According to this narrative, the preservation of capital is the overriding objective.

But this approach assumes that investors are best served by short-term protection over longer-term growth. The second report in Finsia’s Retirement Risk Zone research program estimated safe withdrawal rates for a number of investment strategies in a number of countries using historical simulation (Drew and Walk, 2014). It found that adopting an overly conservative investment strategy resulted in low safe withdrawal rates, and that risky assets have their place in retirement portfolios.

Someone entering the retirement risk zone (at, say, age 55) will, on average, continue to live, love, travel, eat and drink (!) for another 30 years. This investment horizon represents around two-thirds of the working life of most full-time employees and almost one-third of one’s entire life (based on current life expectancy). Regardless of context, 30 years represents a long investment horizon. Advising this person to invest their current retirement portfolio conservatively means that their current wealth, plus any future conservatively-invested contributions, is arguably as much as they will ever have to finance their retirement income needs. For most, adopting this approach will yield a lump sum at retirement that is completely inadequate. Such an outcome can motivate individuals to exhaust their portfolio on retiring their mortgage, spending on home renovations and holidays, and gifting wealth to their children while looking to the age pension to at least partially supplement their spending needs.

This third instalment in Finsia’s Retirement Risk Zone series builds on the previous two studies in the series:

> **Sequencing Risk: A Key Challenge to Sustainable Retirement Incomes** highlighted the role of path dependency in retirement outcomes (Basu, Doran and Drew, 2012)
> **How Safe are Safe Withdrawal Rates in Retirement? An Australian Perspective** explored the limitations of the ‘golden’ or four per cent rule as a retirement income strategy in account based pensions (Drew and Walk, 2014).

The first report on sequencing risk was largely concerned with a timeframe ‘to-retirement’; with the second report on withdrawal rates concerned with ‘post-retirement’ (or through-retirement). Unlike these studies, this analysis looks at the journey both to and through the retirement date, starting with early working life (25 years of age) through to late retirement (90 years of age) — a span of some 65 years.

At its heart, the report views the sustainability (or otherwise) of retirement income as primarily a function of asset allocation.

It is timely at this juncture to be clear on what this study is and what it is not. At its heart, the report views the sustainability (or otherwise) of retirement income as primarily a function of asset allocation. Therefore, we are concerned with testing various approaches to asset allocation through the life course (early accumulation; late accumulation; pre-retirement transition; post-retirement transition; stable retirement; and life expectancy). Given the enormity of the asset allocation task, we leave other key issues in the retirement income debate (defined ambition funds; guaranteed minimum withdrawal benefit (GMWB) (and variants) annuity contracts; immediate and deferred annuities; longevity insurance; pooling; phased retirement) to others. As we have learnt from scholars such as Brinson, Hood and Beebower (1986) almost 30 years ago, asset allocation is a primary driver of retirement outcomes. This report seeks to provide positive insights into the debate regarding competing asset allocation approaches over the life course, where retirement income is used as the objective function.

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1 This report is one of a series about the Retirement Risk Zone. Please refer to Finsia’s website for further information: www.finsia.com/retirementriskzone.
2 We acknowledge that these competing approaches to the challenge of creating sustainable retirement incomes for investors are important to the debate. The approach developed in this report is sufficiently flexible that adding these design features can be entertained at a later time.
In the next section we consider the rise of different approaches to the difficult problem of asset allocation (or portfolio selection) through various life stages. It has been said that “what’s safe and what’s risky changes over your life” (Drew and Walk, 2014). In essence, this report considers the role of asset allocation in navigating both to, and through, the Retirement Risk Zone.

1.2 The evolution of investing across the life course
What is the best way to undertake asset allocation decisions over a lifetime? This question has been considered by leading economists, practitioners and mum-and-dad investors alike.

Uncertainty in retirement planning is the result of unknown future labour income and the variable return on the assets in which retirement savings are invested. We need to systematically form a view about both the trade-off between consumption in different states in the same time period and the trade-off between consumption and consumption variability in different time periods over a largely unknown planning horizon. Attitudes and expectations related to these trade-offs will influence the optimal funding and investment strategies for a given individual’s pension plan. In short, what is the best asset allocation approach to ensure the sustainability of retirement income (and minimisation of portfolio ruin)?

To protect wealth from volatile asset returns during the Retirement Risk Zone period many investors use ‘off-the-shelf’ solutions, such as target date funds (TDFs, also known as lifecycle funds). These funds initially have high allocations to stocks and then shift allocations towards less volatile assets like bonds and cash as the target retirement date approaches. Empirical research has generally found that switching to low-risk assets prior to retirement can reduce the risk of confronting the most extreme negative outcomes. It is further claimed that such lifecycle investment strategies reduce the volatility of wealth outcomes making them desirable to investors who seek a reliable estimate of their final pension in the years prior to retirement (Blake et al., 2001).

However other scholars show that these benefits come at a substantial cost to the investor. This cost is the sacrifice of significant upside potential wealth accumulation offered by more aggressive strategies (Booth and Yakoubov, 2004; Byrne et al., 2007; Basu and Drew, 2009). Bodie and Treussard (2007) argue that deterministic target date funds are optimal for some investors, but not for others, with suitability depending on the investor’s risk aversion and human capital risk.

A variety of studies attempt to optimise retirement portfolios through the use of the following methods:
> a declining equity glide path (e.g. where equity exposure is lowered as people get older)
> a static fixed allocation (Bengen, 1996; Blanchett, 2007)
> a rising equity glide path (e.g. the portfolio is initially conservative and becomes more aggressive through the retirement period (see the work of Pfau and Kitces, 2014 based on the based on the portfolio size effect work of Basu and Drew, 2009) to minimise the probability of ruin during retirement).

Each approach claims to reduce the probability of ruin, and bring about improvements in the risk characteristics of portfolios. These claims depend heavily on the portfolio return experienced by investors as well as the timing of such returns. As shown in Byrne, et al. (2011), a poor sequence of returns may be detrimental to a cohort approaching retirement while it may have little effect on other cohorts of investors, such as those deep into the retirement phase. In most analyses of this phenomenon, and in how investment managers like to frame the response, a heavy dependency is placed on the impact to the investor’s ‘glide path’.

TDFs gradually reduce their exposure to stocks as investors approach the target date of retirement. Notwithstanding this design feature, pre-programmed lifecycle strategies remain potentially vulnerable to sequencing risk. This can translate into an investment profile that accumulates too little wealth during the initial years of the strategy and fails to justify switching to more conservative assets in the later stages of the investor’s planned retirement (Basu, et al., 2011).

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3 Although not a cheery concept, portfolio ruin in this context is the risk of retirement capital being exhausted. Typically, this risk is considered in terms of the probability of the event (ruin) occurring.
Recent research has suggested that the optimal allocation to risky assets resembles a ‘V’ (or in some cases a displaced V — Kingston and Fisher, 2013). The share of growth assets declines in the order of 20 to 50 percentage points over an individual’s working life up to the day of retirement and then rises again during the drawdown phase, again by the order of 20 to 50 percentage points. The V (or displaced V in cases where a discrete shift away from growth assets occurs) is dynamically derived (rather than pre-determined) in order to respond to the goal-oriented outcomes desired by investors. For example, Pfau and Kitces (2014) find that for investors who wish to protect against the most adverse outcomes, owning a more conservative portfolio at the start of retirement and allowing equities to drift higher in retirement is an effective strategy for maximising wealth when they die. Rising equity glide paths therefore show a modest but persistent benefit by aiding the portfolio’s sustainability in the worst sequences.

Basu et al. (2011) demonstrate that deterministic switching rules may produce inferior wealth outcomes for investors compared to dynamic strategies that alter the allocation between growth and conservative assets based on cumulative portfolio performance relative to a set target. Dynamic allocation strategies exhibit almost stochastic dominance (ASD) over strategies that deterministically switch the asset allocation without regard for underlying portfolio performance (see Basu et al., 2011 for further discussion).

The findings of this research motivate the examination of whether dynamism of asset allocation (informed by a pre-determined outcome or goal) is an investment philosophy that results in superior retirement outcomes. Dynamism is a key factor underlying the recent notion of ‘goal-oriented investing’; that is, in order to achieve retirement goals it is necessary to actively adjust portfolio settings in the face of volatile financial markets.

Prescriptive glide paths offer little flexibility to adjust asset allocations if market conditions change. For instance, the automatic scaling back of allocations to growth assets in the transition-to-retirement phase — to protect against sequencing risk — may mean that investors forego significant wealth generation potential if stock prices are already depressed by historical standards, and the market stands on the cusp of a boom. Similarly, if stocks are overvalued relative to history, then automatically switching to stocks through the retirement phase may result in sub-optimal outcomes. Thus, merely taking a long-term view on growth assets may not be sufficient to enable portfolio recovery given the short time horizon faced by many retirees.

Mean reversion in asset returns is a contentious issue which leads to heated debates about market timing and active management. The extent of the debate is summarised in Campbell and Shiller (2001) and Benson, Bortner and Kong (2011). However a simple relative value measure, especially for stocks, can potentially be used to derive a medium-term forecast of asset class returns (Campbell and Shiller, 1988). This forecast can then be used as the basis for a dynamic portfolio strategy aimed at managing sequencing risk and improving dollar-weighted returns. Therefore, in light of the work by Campbell and Shiller (1998) and others, it is also timely to examine whether there is a repeatable and effective way to adjust the investment portfolios based on valuations that yields better retirement outcomes.

In this analysis, we consider various extant designs that are used in the market today (such as the prescriptive glide paths used by off-the-shelf TDF providers) through to current innovations in the lifetime asset allocation debate, including:

- ‘V’ shaped glide paths
- dynamic lifecycle funds
- a new layered approach (target tracking, transition, market valuation, and mean reversion).

The layered approach to asset allocation tested in this report is based on the idea that investors should account for retirement income targets, their horizon relative to the retirement date (the transition-to-retirement phase), and sequencing risk through a valuation-sensitive investment approach.4 Unlike the previous reports in this series, we are concerned in this study with providing insights into the challenge of asset allocation over the very long run (around 65 years). In the next section we consider issues from the institutional setting that inform our research agenda.

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4 Sequencing risk is the degree of vulnerability to a negative sequence of returns when the portfolio’s size is at its peak. Sequencing risk acknowledges that a given percentage change has an outsized impact on absolute wealth when the size of the portfolio is greatest.
2. INSTITUTIONAL SETTING

This section of the report may be read as a primer on some of the issues facing superannuants in Australia (and their fiduciaries). The motivation here is to consider the interplay between:

- the nature of defined contribution plans
- longevity
- asset allocation
- markets and mean reversion.

The interplay between these concepts is critical in understanding the competing approaches to asset allocation over the very, very long run and retirement outcomes considered in the analysis.

2.1 The nature of defined contribution plans

Defined contribution (DC) plans allow workers to accumulate wealth based on contributions made to the portfolio and the investment performance on the portfolio’s assets over the working life of the member. Much like a savings account, an individual’s DC account balance is equivalent to the market value of assets accumulated in the account. In Australia, employees have substantial control over how the contributions to their superannuation plan are invested and can therefore choose from a number of asset classes (stocks, fixed income assets, real estate, etc.) and asset allocations.

While DC plans are typically portable between employers throughout an individual’s career, they are subject to a range of risks borne by the plan member. These risks include:

- the risk of inadequate contributions (depending on contribution rate, periods of unemployment, etc.)
- investment risk, including sequencing risk (Basu et al. 2012)
- unsustainable withdrawal rates during retirement or longevity risk (i.e. outliving portfolio wealth) (Drew and Walk, 2014).

Retirees who purchase annuities to manage longevity risk may also face (Poterba, 2006):

- interest-rate risk (e.g. retiring when interest rates are low may mean the annuity yields an income that is permanently low)
- inflation risk (particularly if a level annuity is purchased)
- income risk (particularly if an investment-linked annuity is purchased)
- credit risk (for instance, the risk associated with the annuity-provider’s creditworthiness).

Also, DC plan members bear the risk of changes in the regulatory system (taxes, asset class investment restrictions), and as mentioned earlier, the risk unplanned expenses (e.g. health and aged care costs). Recent regulatory changes such as MySuper and competitive pressures (e.g. fund mergers) have seen superannuation funds innovate to attempt to manage some or all of these risks on behalf of plan members.

Notwithstanding the efforts of superannuation fund trustees, the long-term shift from traditional defined benefit pensions to DC investing places significant responsibility and challenges on retirees to successfully generate lifetime retirement income. Some of the key challenges include:

- Life expectancy — Dramatic improvements in life expectancy mean that the funds saved for retirement may need to last a long time (i.e. 20 to 30 years or more after retirement). Given the uncertainty around how long an individual retiree may actually live, many retirees are not prepared to manage this critical task on their own (see next section for further data).
- Market events — Investment risk complicates the challenge of managing a retirement portfolio during both the accumulation phase and the drawdown phase (Drew and Walk, 2014). For instance, since the 1980s there have been four significant market events that have, in some way, affected the capacity of retirees to manage their affairs. Since today’s retirees are likely to live for at least 20 to 30 years beyond their retirement date, retirees must expect and plan to survive more financial volatility in the future.
- Financial literacy — Most of us simply don’t know how to calculate the amount of retirement savings we will need to generate a desired retirement income in a way that sees us through our lives. Research has shown that many people struggle with portfolio selection decisions (Benartzi and Thaler, 1999, 2001). This can result in workers retiring too early, with too little saved, and without any buffer for contingencies during retirement (such as age-related health care or aged-care costs). Social security may provide a form of safety net but whether the age pension is adequate for most retirees to live on is debatable.

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5 This is in contrast to defined benefit (DB) plan members whose pension benefits are instead based on formula which combines years of service and the worker’s pre-retirement earnings profile.
Inadequate planning and management — A great deal of evidence suggests that retirees do a poor job of managing retirement risks. For instance, many retirees lack a formal plan to generate income from their savings, and many spend down their assets at an unsustainable rate. Other retirees greatly under-spend during their retirement for fear of running out of money, sometimes leaving significant wealth to their heirs. Both extremes represent an inefficient approach to managing retirement (Drew and Walk, 2014).

Financial advice is one way to address both the lack of financial literacy and inadequate planning but the use of financial advice by superannuation investors is not as widespread as one might hope given the complexity of the retirement planning problem. Given the challenges of increasing the take up of holistic financial advice, some market participants are developing or have developed new technologies (known as ‘robo-advisors’) that are specifically designed to assist with key parts of the financial planning process.

2.2 Longevity

It is important to quantify the metrics of longevity for existing and future retirees. Life expectancy is usually calculated from life tables using current age-specific death rates. The ‘current’ life table method is computed using the current rate of deaths per population between each exact age and each age plus one year.

An alternative to this method is the cohort life table method where the death rate experience of birth cohorts is used (Armitage and Berry, 1994). Life expectancy at a particular age is represented as the probable mean length of additional life beyond that age of all people alive at that age if they are truly representative of the overall population. Life tables are produced based on a hypothetical starting population of 100,000 persons at exact age zero and ceasing at 99 years of age. Since males and females experience different death rates, life tables are produced separately by gender. Deaths in each year reduce the population at the next age, and if plotted, produce a curve of ‘survival’. Life tables are useful for comparing different populations as they standardise for different age structures.

For a 65-year-old Australian male alive today, there is around a 50 per cent chance he will live to the age of 85, a 30 per cent chance he will live to the age of 90 and a 12 per cent chance he will live to the age of 95. Similarly, for a 65-year-old Australian female there is a 50 per cent chance she will live to the age of 87, a 41 per cent chance she will live to the age of 90 and a 21 per cent chance she will live to the age 95. Most striking is that for a male and female couple, both aged 65, there is a 50 per cent chance that at least one will live until the age of 91 and a 31 per cent chance that at least one will live to the age of 95 (Knox, 2007; Association of Superannuation Funds of Australia, 2013; Australian Government Actuary, 2014). Almost one out of three retired couples will need income to sustain at least one of their household until the age of 95. Figure 2 illustrates these survival curves. Longevity risk, while well understood by many retirees, still presents a major concern for informing asset allocation strategies.

**FIGURE 2: Survival curves for Australian men, women and couples**

![Survival curves for Australian men, women and couples](source: Australian Bureau of Statistics (2013) and Australian Government Actuary (2014))

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6 For Australian tables.
In considering these survival curves it is worth noting that they do not take account of future longevity gains. If future longevity gains are similar to those observed for the past century or so, planning based on these survival curves could significantly underestimate longevity risk.

### 2.3 Asset allocation

Observed investor behaviour reveals that most investors do not change the asset allocation of their retirement portfolio as their working life evolves, and many make no change even as new information on asset performance becomes available (Benartzi and Thaler, 1999). In the field of economics, scholars traditionally have framed decision making by rational agents using some form of utility function. According to this framework, investors seek a level of retirement wealth that maximises their utility (see Samuleson, 1969).

Conventional approaches to the problem of asset allocation ultimately seek to maximise portfolio wealth on the date of retirement for a given level of risk aversion. Retirees with high levels of risk aversion are advised to invest conservatively and purchase annuities or deferred annuities to offset longevity risk. Retirees with low risk aversion levels are generally advised to allocate a higher proportion of their portfolio to growth assets (stocks, real estate, exchange traded funds (ETFs), etc.) and the remainder to defensive assets (bonds and cash). Retirees with medium risk aversion levels are often advised to adopt a variant of the two. The aim in each case is to preserve wealth through retirement from which income is drawn, with the constraint that wealth shall not be depleted before death. Under this formulation, it is rare that the retirement goals and cash flow needs of retirees are considered and indeed, retirement income itself is seldom viewed as the key variable to optimise (Bianchi, Drew and Walk, 2013).

As mentioned earlier, research on the theory of asset allocation shows that both fixed and pre-determined glide path asset allocation strategies are optimal under certain conditions. In Samuelson (1969) and Merton (1969, 1990), the optimal investment strategy is independent of wealth and constant over time if:

- asset return distributions are independently and identically distributed (iid)
- the utility function of the investor adheres to constant relative risk aversion (CRRA)
- only investment income is considered (ignoring access to state pensions, home equity, etc.)
- there are no transaction costs (rebalancing assets and asset class liquidity are ignored).

Dynamic strategies may be optimal if any of the above conditions are violated. In general, and in most practical cases, the optimal investment strategy is necessarily dynamic to reflect the real-life behaviour of investors. Optimising wealth at retirement (or even, as some scholars insist, at death) is not a sufficient objective function. While maximising wealth at retirement is important, it is only necessary insofar as it simultaneously meets retiree cash flow needs through retirement, takes as much risk as is warranted, and protects against the probability of ruin.

When retirees become more concerned about outliving their retirement portfolio than leaving an inheritance to their children, the optimal asset allocation strategy during retirement often shifts from a focus on wealth maximisation and a bias towards equities (as much as is tolerable to generate a greater average return), to strategies that look to preserve wealth under adverse economic scenarios. This shift obviously comes at the expense of upside returns when times are good.

There are a wide range of retirement asset allocation and product strategies focused on minimising spending risks, instead of wealth maximisation. These include the use of annuities with various guarantees, bucket strategies with cash reserves, and the ‘rising equity glide path’ strategy (Kitces and Pfau, 2014) that allocates portfolio wealth to conservative assets early in retirement and then becomes progressively more exposed to risky assets (i.e. equities) over time. The conservative assets (bonds and cash) finance spending during the early years of retirement. These sorts of approaches go part way towards addressing the possibility of long-term depressed markets as well as sequencing risk, but do so deterministically. The absence of a feedback mechanism in a strategy that only considers wealth subordinates both short- and long-term cash flow needs to some higher order risk measure.

Concerns over sequencing risk tend to drive behaviour towards risk minimisation strategies. However for some retirees, such strategies may be unnecessary because sequencing risk and its impact on retirement portfolios at a critical time never materialises. Investors therefore need to better understand whether they are exposed to the potential for a five or 10-year period of low or negative returns to predict when it becomes necessary to focus on risk minimisation strategies. The corollary to this is that it also allows investors to better understand when wealth maximisation strategies will generate the optimal retirement outcome.
The Role of Asset Allocation in Navigating the Retirement Risk Zone

Figure 3 highlights the relative importance of time-weighted portfolio returns, dollar-weighted portfolio returns, sequencing risk, and unanticipated liabilities during retirement (such as age-related health care and aged care costs) through the accumulation and retirement phases of an individual’s life. During the early part of our working life time-weighted returns dominate all other concerns. Dollar-weighted returns and the threat of sequencing risk grow in importance as we near the Retirement Risk Zone. At the retirement date, dollar-weighted returns as well as capital preservation become important. As the individual enjoys their retirement, the threat of unexpected expenditures emerges so dollar-weighted returns dominate other concerns. As longevity risk emerges late in retirement, time-weighted returns may come to dominate other concerns, except perhaps for the continued threat of unexpected expenditures. Bequests also become an important consideration during the late retirement phase. The complex interplay of these risks through the stages of an individual’s working life and retirement suggests that a simple glide path strategy is insufficient for dealing with the investment problem.

**FIGURE 3: The relative importance of factors that contribute to retirement outcomes**

The maximisation of wealth on the date of retirement as the objective function ignores the 20 to 40 year investment horizon most retirees face. Such an approach also ignores the relative value of defensive and growth assets over such a long horizon.

Consider the following example. Say you retired exactly 20 years ago in 1995. Over this period your retirement portfolio would have endured the tail end of a long recession, a substantial liquidity crisis courtesy of LTCM, the Asian Financial Crisis, the dot-com boom and bust, the mining boom, the global credit crisis, the European debt crisis and the recent slowing of economic growth in Australia. If your portfolio was valued at $400,000 on your retirement date, and you withdrew a relatively frugal $3,000 per month (indexed to inflation), your portfolio would be represented in Figure 4, for a range of asset allocation strategies. If you switched to a conservative portfolio on the date of retirement you would have around half of your portfolio remaining today. If you invested the entire portfolio in stocks, you would have more money today than when you started. If you invested half in stocks and half in bonds, you would have around the same amount today as when you started. These strategies remain ignorant of market behaviour and relative asset values, and simply assume you will withdraw the same income of $3,000 (in real terms) month after month.

But what if you used a relative market valuation metric as a guide for whether to invest in growth or defensive assets? There have been several attempts to implement ‘market-aware’ metrics to guide strategic asset allocation. These include the use of

- wealth ratios (Lettau and Ludvigson, 2001)
- adaptive macro indexes (Bai, 2010)
- the sum of macro variables (Ferreira and Santa-Clara, 2011)
- implied cost of capital (Li, Ng and Swaminathan, 2013)
- factors relating to the price of oil (Kilian and Park, 2007)
- the current PE ratio relative to the historical average (Shiller, 2000).
The metric that has been shown to be robust and remains credible under almost all conditions is Shiller’s historical price-to-earnings (PE) ratio. This simple ratio is represented as current price divided by the average of ten years of earnings adjusted for inflation. This is a ‘market aware’ valuation strategy that explicitly takes account of when the stock market is over-valued or under-valued relative to the historical average. By using an upper market PE threshold of 24 and a lower market PE threshold of 14 as a decision tool that dictates whether we switch our entire portfolio out of, or into, stocks respectively, we find that the portfolio earns substantially more than the alternative naïve strategies. The upper line profile in Figure 4 illustrates its performance relative to the baseline strategies. But this is only half the story.

FIGURE 4: Portfolio value of alternative investment strategies for a retiree commencing in 1995 with $400,000 in savings and a monthly withdrawal of $3,000 indexed to inflation

More importantly, the volatility of the portfolio is lower than all of the baseline (naïve) strategies. Figure 5 illustrates that the normalised portfolio standard deviation (using a moving window of 24 months) exhibits lower variability than the 100 per cent stocks (as perhaps expected) and 100 per cent bonds options (as perhaps not expected). In fact, the volatility is lower than all naïve combinations of stocks and bonds over this period. The variability in Figure 5 is normalised by portfolio value to give a better indication of movements relative to actual portfolio value.

FIGURE 5: Portfolio standard deviation (24-month window) normalised by value of alternative investment strategies for a retiree commencing in 1995 with $400,000 in savings and a monthly withdrawal of $3,000 indexed to inflation

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7 Yale University professor Robert Shiller presented an argument demonstrating how stock markets can be assessed as either overvalued or undervalued in his book *Irrational Exuberance* first published in 2000. The stock market collapse of 2000 happened the exact month of the book’s publication. The second edition published in 2005 was updated to cover the housing bubble.
This simple, very stylised, illustration of the role of market-awareness in asset allocation decisions provides the rationale for its inclusion in this report. As with all these types of analyses, it is important to stress that the 20-year window used in this example represents only one possible retirement portfolio path. This result alone cannot be used to justify the wholesale use of market-aware asset allocation decisions for all circumstances. However it does serve as a prompt for us to investigate the possibility of using relative asset valuations as a basis for intelligent investment decision-making, particularly during the critical Retirement Risk Zone where portfolio wealth is at its zenith.

2.4 Markets and mean reversion

Many traditional economic models for evaluating future equity market returns are based on arguable assumptions.8 Basing predictions on the earnings growth of companies, which in turn are derived from the economic metrics of its host nation, and then extending this to estimate equity returns using relative market valuation techniques, can be perhaps be described as heroic. At best, a rough forecast can be made for economic fundamentals (GDP growth, inflation) which can be translated into a narrow forecast of corporate expectations. The earnings profile of multinational companies, which tend to dominate equity index composition, are increasingly decoupled from national or regional economic trends, and earnings growth is correlated weakly with the equity market development in the medium term (Carrieri, Errunza and Sarkissian, 2012).

While many of these issues remain contested, investors have explored whether market valuation measures can offer guidance to inform the asset allocation glide path both to and through retirement (e.g. Okunev, 2014; Estrada, 2014). While acknowledging that most, if not all, such approaches are open to critique, we are motivated in this report to consider the merits (or otherwise) of a dynamic approach to asset allocation decisions as they relate to retirement investing. In this analysis, we introduce a dynamic approach as an alternative to deterministic (or static) asset allocation frameworks. Specifically we consider whether it is beneficial to adjust equity exposure dynamically based on market valuations from year to year throughout both the accumulation and retirement phases. That is, we consider the merits of competing asset allocation approaches to retirement outcomes over the very, very long run (some 65 years).

As part of the broader research question, there is evidence to suggest that sequences can at least be partially predicted by long-term valuation measures. One well-known measure which was mentioned earlier is the cyclically adjusted price-to-earnings ratio, commonly known as the Shiller CAPE9 or the P/E 10 ratio. This measure is defined as the current price for a stock divided by the inflation-adjusted average of ten years of earnings (Campbell and Shiller, 1988). The metric has been used to form a view about equity returns over the coming 10 to 20-year period: higher than average CAPE values imply lower than average long-term annual average returns (Shiller, 2000) and vice versa. It is not a reliable leading indicator of impending market crashes, although high CAPE values have been associated with such events. While the measure is a poor predictor of short-term performance and will not aid with market timing, it may help predict long-term performance when used prudently as an asset allocation tool. If the Shiller CAPE measure can help predict the danger of an extended sequence of bad market returns, it could also be employed to help define the asset allocation glide path over the retirement transition period.

Figure 6 illustrates the 10-year annualised future returns against the Shiller CAPE ratio for Australia, 1890–2004, segmented into epochs. Apart from the 1920–1940 period, a general inverse relationship between Shiller’s CAPE and subsequent stock returns generally holds in the Australian context. Figure 7 illustrates the Australian stock value index relative to periods when the CAPE suggests stocks are overvalued (shaded periods). Plateaus in stock values (represented by horizontal black lines) emerge during and immediately after each period that experiences high CAPE values.

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8 For instance, assumptions regarding the timeframe over which valuations return to normal are hotly contested. Is this period five years? Seven years? Or is the period a non-constant number of months or years? We know these issues are very difficult to resolve on an ex-ante basis.

9 The measure is named after the same Robert Shiller mentioned earlier, who popularised the 10-year version of Graham and Dodd’s five-year P/E (Graham and Dodd, 1951).
FIGURE 6: 10-year annualised future returns against the Shiller CAPE ratio for Australia, 1890–2004

FIGURE 7: Time series of CAPE (Australia) and inflation-adjusted S&P/ASX 200 Accumulation Index (in AUD) over the period 1881–2013

NB: The blue columns indicate overvaluation phases where CAPE > 18. Horizontal black lines show the plateau in stock values that emerges during and/or immediately after each period of high CAPE values.

The Shiller CAPE measure has its share of critics who argue that the earnings component of CAPE is far too low. For instance, Jeremy Siegel has argued new accounting standards place a downward bias on earnings (Siegel, 2013). He further claims that the CAPE ratio generates overly pessimistic predictions which are based on biased earnings data because changes in the accounting standards have forced companies to impair assets that have fallen in value but are not permitted to revalue assets upwards when their values rise. These assets therefore do not contribute to earnings unless they are sold.
It is important to examine the mechanics of the underlying measure in order to judge its applicability for predicting equity market reversions to the mean. The Shiller CAPE approach uses GAAP earnings per share (EPS) for the entire time series. Others have suggested augmenting GAAP EPS early in the time series with operating EPS or pro-forma EPS metrics (Ro, 2014). The advent of goodwill and asset impairments has naturally caused GAAP EPS to understate the ‘fair’ EPS. In addition, there is also concern over the use of inflation-adjusted historical EPS. Adjusting for inflation only, while necessary, may underscore the impact of changes in the dividend payout ratio observed in the market. This adjustment would be difficult to achieve in practice owing to the tax incentives surrounding the choice between dividends and stock buybacks, particularly in Australia. Nevertheless, some version of the Shiller CAPE metric can be applied for the Australian equity market to judge the sensitivity of a heavy allocation towards equities, especially during the Retirement Risk Zone.

Having now provided some necessary background on the interplay between key issues that motivate the analysis, we now turn to the report’s methodological approach.

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10 Generally Accepted Accounting Principles (GAAP) refers to the standard framework of guidelines for financial accounting.
11 This outcome is largely due to the elimination of pooling accounting for mergers and the regular impairment test of acquired goodwill.
3. INVESTMENT ELEMENTS AND METHODOLOGY

What is the best way for investors to construct a portfolio that combines both growth and defensive assets, and then change the composition as investors move through their life cycle, in order to finance their retirement? We consider various extant designs that are used in the market today (such as TDFs) through to current innovations in the lifetime asset allocation debate, including: V shaped glide paths; dynamic lifecycle funds; and a new layered approach (target tracking, transition, and market valuation).12

Research has consistently shown that asset allocation is the primary decision variable for investors (Brinson, et. al. 1986). Given that equities dominate the risk budget of most portfolios, this fact can be reduced further:

How much of my retirement portfolio should I allocate to equities in the following phases?
> early accumulation
> late accumulation
> Retirement Risk Zone
> early retirement
> late retirement.

The relative importance of time-weighted returns, dollar-weighted returns, sequencing risk, longevity and unanticipated liabilities will drive this decision (refer to Figure 3 in the previous section). As well as testing various extant designs (such as TDFs), we also consider the merits (or otherwise) of a systematic layered approach to the asset allocation decision, based on all of the key inputs that affect this decision. These inputs include:
> salary (and salary growth)
> expected retirement income
> investment horizon (including retirement date)
> life expectancy (which many retirees already have an intuitive idea of).

We test various asset allocation approaches through all phases of our hypothetical investor’s working life and retirement. After all, workers see their life as a continuous stream of income (through the realisation of human capital), investment wealth (in the form of returns on savings) and the associated liabilities, rather than a discrete set of investment phases.

To model investment behaviour through both the accumulation phase and the retirement phase, and to derive both the optimal asset allocation strategy and the optimal retirement income, some form of dynamic programming is necessary. For serially independent asset returns, general utility, and no transaction costs, a stochastic dynamic programming recursion is effective and efficient. This approach can provide some insight into the capacity for dynamic strategies to minimise sequencing and longevity risk. However the results will only be approximate and the sensitivity of outcomes will be largely contingent on the volatility of the underlying assets. For general serially dependent asset returns and the consideration of transaction costs, as is observed in the market, a multi-stage stochastic programming approach is needed.

Here we examine four strategies, each of which attempts to represent an approach to allocating assets that has been employed in the DC systems around the world. The first strategy is a simple target date fund (TDF1) strategy. The TDF1 strategy invests heavily in growth assets for up to 30 years following the commencement of superannuation contributions. The strategy then linearly switches from growth to defensive assets over the remaining years to retirement such that at the point of retirement the majority of wealth is invested in defensive assets. The allocation remains defensive in nature through retirement. This type of allocation is typical of lifecycle or target date strategies used in practice.

The second strategy (TDF2) is similar to the TDF1 strategy in that it also adopts an increasingly defensive asset allocation as the retirement date approaches. The key difference is that it incorporates the findings of Kitces and Pfau (2014) by linearly switching out of defensive assets into growth assets through retirement. TDF2 is therefore an example of a V-shaped glide path.

The third and fourth strategies adopt variants of the dynamic lifecycle (DLC) approach of Drew et al. (2014b). Because each dynamic asset allocation strategy requires context they are discussed below in further detail with reference to the layers of the investment plan.

12 Using market data, we investigate four strategies. We are specifically interested in whether a simple, replicable dynamic asset allocation strategy yields superior outcomes not only in terms of absolute wealth, but also in improving the sustainability of income in retirement. Using a layered approach, individualised investment strategies can be designed based on retirement objectives. At a more detailed level, these strategies are a function of the relationship between required and target wealth levels, the investment horizon of the investor, and relative market valuation.
3.1 The first layer — target tracking

Target tracking strategies are defined as those that are conditional on the attainment of a plan member’s wealth accumulation objective. They are loosely classified as dynamic lifecycle strategies and have been shown to be highly effective relative to static strategies for reaching retirement wealth objectives (Basu, Byrne and Drew, 2011).

Dynamic lifecycle strategies, identified here as target tracking, are responsive to past performance of the portfolio relative to an investor’s target return in determining the mix of assets in future periods. Switching to conservative assets takes place only if the investor has accumulated wealth in excess of a target accumulation at the point of switch. After switching to conservative assets, if accumulated wealth falls below the target in any period, the direction of the switch is reversed by moving away from bonds and cash towards stocks. The use of a wealth accretive target during an investor’s accumulation phase helps define the need to switch between conservative and risky assets to reach a wealth objective (e.g., 9 per cent per annum compounded return for 30 years).

In this analysis, we employ two dynamic lifecycle strategies for an investor over both the accumulation and retirement phases. During the accumulation phase the dynamic strategies have the same asset allocation as the TDF strategies until 20 years prior to the investor’s predicted retirement date. Each year after this point, the strategy reviews how the portfolio has performed relative to the investor’s accumulation objective. If the value of the portfolio at any point is found to equal or exceed the investor’s target, the portfolio partially switches to conservative assets. Otherwise, it remains invested 100 per cent in stocks. If the switch to conservative assets has begun and the cumulative performance drops below target, the fund is switched back into growth assets. The dynamic lifecycle strategy uses performance feedback to determine the asset allocation at any point in time while typical static or lifecycle strategies do not.

Specifications regarding the targets used in this study are provided in Section 3.4. Moreover, all strategies are outlined in detail in Section 3.5.

3.2 The second layer — retirement risk zone

For the purposes of this report, the retirement risk zone is defined as the final five years of working life (the ‘accumulation’ phase) and the first five years of retirement (the ‘decumulation’ phase). Importantly, it is this 10-year period when the greatest amount of retirement wealth is in play and, therefore, risk is at an all-time high (Figure 8). Workers near or at retirement are at risk from two related phenomena: the portfolio size effect (wealth is at its zenith), and sequencing risk. Basu and Drew (2009a) find that, due to the positive compounding effect of salary growth, contributions and returns, portfolio size grows rapidly in the latter half of a worker’s accumulation phase. When the portfolio size effect is combined with an unfavourable sequence of returns (Macqueen and Milevsky, 2009) the impacts can be both extreme and irreversible.

**FIGURE 8: Retirement Risk Zone relative to portfolio value**
In the first of Finsia’s papers about the Retirement Risk Zone, Doran et. al. (2012) find that the sequence of returns materially impacts the terminal wealth of superannuants, and heightens the probability of portfolio ruin. In fact, sequencing risk can deplete terminal wealth by almost a quarter while simultaneously increasing the probability of portfolio ruin at age 85 from one-in-three to one-in-two.

As a response, in this study, when the investor enters the Retirement Risk Zone the portfolio is automatically shifted towards more defensive assets, unless the investor is both below the target accumulation level and the market valuation metric for stocks is favourable.

3.3 The third layer — market valuation and mean reversion

The third layer influences asset allocation by reference to whole-of-market valuation techniques. In this analysis we use the Shiller CAPE (discussed earlier) to evaluate market value conditions which in turn feed into the asset allocation decision. [Recall, Figures 6 and 7 illustrate the quantitative evidence pointing to long-term trends in market values.]

To appropriately categorise market return expectations, we divide the market value predictor into three groups: (1) overvalued markets, defined as years in which the Shiller CAPE is equal to or greater than 1.25 times the historical average; (2) undervalued markets, defined as years in which the Shiller CAPE is equal to or below 0.75 times the historical average; and, (3) neutral markets, defined years in which the Shiller CAPE is between the 0.75 and 1.25 times historical average thresholds.13 This corresponds to a Shiller CAPE between 11 and 21. Figure 9 illustrates the current Shiller CAPE and ten-year real stock market returns for Australia.

FIGURE 9: Shiller CAPE and ten-year real stock market returns for Australia, 1965–2004

3.4 Setting the accumulation target

We can set the retirement accumulation target in one of two ways. First, a simple target value based on history and future expectations can be set. Dimson, Marsh, and Staunton (2002), for example, have compiled returns for US stocks, bonds, and bills from 1900. We take an updated version of their dataset and find the geometric mean return offered by US stocks between 1900 and 2004 is 9.69 per cent (Dimson, Marsh and Staunton, 2008). We might assume that the individual sets a target of achieving a return on the retirement plan investments close to this rate, say 10 per cent. In other words, the retirement portfolio under the dynamic strategy aims to closely match the compounded accumulation of a fund where contributions are annually reinvested at a 10 per cent nominal rate of return.

The second approach is more complex and involves reverse-engineering a portfolio value at retirement based on an assumed dataset, a required annual income drawn from the portfolio, and an assumption on individual mortality. We simulate a number of possible paths forward from the date of retirement, accounting for withdrawals and portfolio returns, and iteratively solve for the optimal income withdrawal at a given confidence level. This method is described in more detail below.14

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13 These thresholds are based on the Graham and Dodd (1951) investing rules. This methodology predates the Shiller CAPE and represents rules of thumb used in the application of the relative market valuation approach to asset allocation.

14 Readers who are comfortable with simply assuming an arbitrary accumulation target as defined above can safely move to the next section without fear of understanding the more complex approach to accumulation targets.
This model assumes that the retiree begins retirement with an initial withdrawal from their retirement portfolio and the post-withdrawal portfolio is invested in stocks, bonds and cash. The portfolio earns an inflation-adjusted rate of return, earned initially from a constant asset allocation, until the next annual withdrawal. A discrete time representation of the portfolio rate of return is:

\[ r_t^i = \sum_{j=1}^{n} w_{t,j} r_{t,j}^i, \]

where \( r_t^i \) is the weighted average portfolio return for simulation \( i \) at time \( t \), \( w_{t,j} \) is the portfolio proportion assigned to asset class \( j \) at time \( t \) and \( r_{t,j}^i \) is the annual inflation-adjusted return for asset \( j \) at time \( t \) for simulation \( i \). Ongoing withdrawals remain the same inflation-adjusted amount from the portfolio (in inflation-adjusted dollars), and the value of the portfolio is derived as:

\[ V_t^i = [V_{t-1}^i - MV_t](1 + r_t^i), \]

where \( V \) represents the value of the portfolio and \( M \) is the constant withdrawal fraction amount.

We use stochastic optimisation in the model to identify the optimal withdrawal rate for a set of asset allocations and a known investment horizon that minimises the probability of portfolio ruin. We use the stochastic optimisation process to derive optimal withdrawal rates for the retirement phase. Prior to retirement we incorporate annual cash flows into the accumulation account up to the nominated date of retirement as well as initial portfolio conditions. The portfolio value \( V_{\tau, t} \) at time \( t \) is defined as:

\[ V_{\tau, t} = (V_{t-1} + CF_{t-1})(1 + X_t) - LS_t + 1_g(SSP_{t>\tau}), \quad \tau < T, \]

where \( CF_t \) is the after-tax cash inflow (positive) or outflow (negative), \( X_t \) is the weighted average portfolio return \( w^0_{t,n} \) at time \( t \), \( LS_t \) is any lump sum payment withdrawn at retirement date \( \tau \) and \( 1_g(SSP_{t>\tau}) \) is an indicator function where \( 1_g \) is equal to one if the investor qualifies for social security payments (SSP) during retirement \( \tau > t \) and zero if the investor does not qualify for such payments. Both the retirement date \( \tau \) and the withdrawal dates \( t \) are assumed to be less than the terminal date \( T \) for all payments as selected by the investor. The value \( V_t \) of the portfolio at \( t=0 \) is set to the initial portfolio value of the investor.

In contrast with deterministic approaches to retirement planning, where both the investment horizon and the investment return are assumed to be known with certainty, in this analysis we represent the variables as stochastic. We derive the stochastic present value at either the date of retirement (which assumes a deterministic terminal portfolio value) or at any point before retirement as:

\[ PV = \sum_{\tau=1}^{T} \prod_{j=1}^{n} (1 + r_j)^{-1}. \]

where \( T \) is the random time of death (in years) and \( r_j \) is the random investment return in year \( j \). As \( T \to \infty \) the stochastic PV simply reduces to the infinitely-lived endowment (Milevsky, 2006). The frequency of the above measure can be reduced to quarters or months as required without loss of generality.

The simulation process in this model assumes \( T \) is fixed and is estimated by the investor (90 years of age in our case, but any mortality assumption is valid). This greatly simplifies the simulation and optimisation process. The asset values and projections are simulated 10,000 times and the key percentiles at each time \( t \) are estimated from the simulation. A range of percentiles are extracted from the simulated terminal values (at time \( T \)) for the investor’s portfolio and then used as the future value to iterate backwards to retirement date \( \tau \). To conduct the search we use a simple generalised reduced gradient search algorithm (Lasdon et al. 1978) to solve for the annual withdrawal over the withdrawal period \( (\tau \to T) \), which is also simulated 10,000 times to achieve convergence. This method is sufficiently robust to find at least a local optimum where the function is continuously differentiable. This approach is also known to be robust relative to other nonlinear optimisation methods.

The algorithm needs input function values as well as the Jacobian, which we do not assume to be constant for our nonlinear model. We approximate the Jacobian using finite differences re-evaluated at the commencement of each major iteration (i.e. the major percentile terminal values).

Fundamentally, the simulation estimates the range of outcomes for an investor through both the accumulation and retirement phases. The stochastic optimisation process aims to select a constant withdrawal rate through the retirement phase that yields an expected terminal wealth of zero at a 10 per cent confidence level coinciding with the investor’s ‘expiry’ date (death or other nominated future date). The Box Method (Box, 1965) iteratively searches possible input values for withdrawal amounts to equate the simulated probability of ruin at a 10 per cent confidence level, to find a global minimum solution (if one exists).
The objective function is thus:

\[ \max (CF_t) \text{ subject to } Pr[V_T > x] = 0.10 : \forall t, \]  

where \( x \) is set to zero for each and every period \( t \in [0,T] \).

Intuitively, this approach allows the investor to focus on a level of income at a given confidence level. This avoids the perhaps more hopeful approach of setting the objective function to maximise wealth at the date of retirement and then draw down income and assume that the portfolio value is sufficient for the investor to not outlast their portfolio. Indeed, the intention of goals-based investing is to match the time-weighted value of assets and liabilities that cater for cash flows through an investor’s working life as well as through retirement.

3.5 Simulation methodology

Simulations are useful in situations where there is a belief that something sensible can be stated about the factors that affect a problem, but when these factors are grouped together, the exact outcome is unknown. The range of factors that affect retirement outcomes including asset allocation, financial market performance, retirement date, salary growth rates, inflation, longevity, housing equity, pension withdrawals and unexpected costs during retirement, as well as many other factors, dictate that no single mathematical representation can adequately capture the overall result. It is important not to take shortcuts however, and to use as much empirical data as possible to adequately represent actual market behaviour (while remembering that, no matter how much data is thrown at the problem, the future remains uncertain). In this analysis, we employ actual asset returns, observed salary growth rates, observed and forecast inflation rates and observed pension withdrawal rates to lend the highest degree of reality to the simulation outcomes.

The block bootstrap is the most efficient approach when model residuals are correlated. Simple bootstraps or other forms of residual resampling will fail because they are unable to replicate the correlation in the data. The block bootstrap replicates the correlation by resampling blocks of data. We follow the block bootstrap process articulated in Ruiz and Pascual (2002) and Künsch (1989). Based on experience in using the block bootstrap approach outlined in Drew and Walk (2014b) we employ a block length of 36 months for the simulation. We simulate the data at a monthly frequency.

We simulate across our four investment strategies. The four strategies are as follows:

- **TDF1**
  Asset allocation remains at the initial level until 10 years prior to retirement date.
  - at retirement date minus 10 years the plan switches to 60 per cent stocks and 40 per cent bonds
  - at retirement date minus five years the plan switches to 30 per cent stocks and 70 per cent bonds
  - at retirement date and beyond the plan switches to 30 per cent stocks 60 per cent bonds and 10 per cent cash and remains at this allocation through retirement.

TDF1 is a reasonable approximation of the sorts of glide path strategies available in DC plans throughout the world.
TDF2
Asset allocation is the same as for TDF1 except that five years after the retirement date it reverts to 40 per cent stocks and 60 per cent bonds. At retirement date plus 10 years the strategy switches to 50 per cent stocks and 50 per cent bonds and increases the allocation to stocks by 5 per cent every five years thereafter.

TDF2 is a type of V-shaped glide path.

DLC1
Asset allocation follows the same glide path as for TDF2 except an allowance is made for the use of dynamism to ensure that an accumulation target is met.

The DLC1 strategy invests in a 100 per cent stocks portfolio for 20 years and assumes that the individual sets a target of 10 per cent (compounded) annual rate of return on investment for this initial 20-year period. At the end of 20 years, if the actual accumulation in the retirement account exceeds the accumulation target, the assets are switched to a more conservative growth portfolio comprising of 80 per cent stocks and 20 per cent fixed income (equally split between bonds and cash). However, if the actual accumulation in the account is found to fall below the target, the portfolio remains invested in 100 per cent stocks.

Performance of the portfolio is reviewed annually for the next 10 years and the asset allocation is adjusted depending on whether the holding period return is greater or less than the target, which remains set at a 10 per cent annualised return on a cumulative basis. In the final 10 years of the accumulation phase the same allocation principle is applied with one difference. If the value of the portfolio in any year during this period matches or exceeds the investor’s target accumulation (i.e. 10 per cent annualised cumulative return), 60 per cent of assets are invested in equities and 40 per cent in fixed income (equally split between bonds and cash). Failing to achieve the target return for the holding period, results in all assets being invested in the 100 per cent stocks portfolio. The above-target asset allocations in the retirement phase match those for TDF2.

DLC1 allows us to understand the benefits (or not) of being dynamic in pursuit of a target based purely on a pre-set decision rule.

DLC2
The strategy is essentially the same as DLC1 in that a dynamic asset allocation approach is employed to ensure that an accumulation target is met. The further addition to this strategy is the relative market valuation factor measured using the CAPE methodology only is applied during the Retirement Risk Zone period.

If the CAPE is equal to or above 21, we assume the market is relatively overvalued and reduce the allocation to growth assets to 30 per cent during the Retirement Risk Zone. If the CAPE is equal to or below 11, we assume the market is relatively undervalued and increase the allocation to stocks to 60 per cent during the Retirement Risk Zone. If the CAPE is between 11 and 21 the allocation to stocks remains fixed at 40 per cent.

Note that these upper and lower limits are arbitrary and can be altered to reflect the relative valuation view of the portfolio manager or investor.

DLC2 allows us to investigate the potential benefits of being dynamic in achieving a target based on both a pre-set decision rule and current market valuations.
FIGURE 10: Sample strategy profiles for TDF1, TDF2, DLC1 and DLC2 strategies

NB: The DLC1 strategy maintains flexible allocation during accumulation up to the point of retirement while the DLC2 strategy maintains a flexible allocation during both accumulation and the retirement risk zone.
Sample strategies are illustrated in Figure 11. Note that the DLC2 strategy is a more flexible version of the DLC1 strategy, allowing the asset manager to switch in/out of growth assets if the market values of growth assets are greatly under- or over-valued respectively, relative to historical CAPE measures.

**FIGURE 11: Sample glide paths of TDF1, TDF2, DLC1 and DLC2 strategies**

NB: The DLC1 strategy maintains flexible allocation during accumulation and while the DLC2 strategy maintains a flexible allocation during both accumulation and the retirement risk zone.

Because, by definition, the DLC strategies are dynamic, the glide paths shown are sample glide paths based on a given set of returns. If we were to repeat this analysis, the allocations for the DLC1 and DLC2 strategies would be different because both would be dynamically responding to a different set of simulations.
4. DATA AND CALIBRATION

To overcome concerns relating to insufficient data we adopt a block bootstrap resampling simulation approach. The empirical monthly return vectors for the three asset classes in the dataset are randomly resampled in 36-month blocks with replacement to generate asset class return vectors for each month of the accumulation and withdrawal investment horizon confronting a retirement plan investor. Since we randomly draw blocks of rows (representing 36 months) from the matrix of asset class returns we retain both the cross-correlation between the asset class returns and serial correlation within asset classes observed in the historical data. As the resampling is done with replacement, a particular data point from the original data set can appear multiple times in a given bootstrap sample. This is particularly important when trying to anticipate the probability distribution of future outcomes.

Asset class return data for the block bootstrap was obtained from Global Financial Data (GFD). The S&P/ASX 200 Accumulation Index (in AUD) return series is used to represent Australian stocks while the S&P 500 Total Return Index w/GFD extension (in AUD) return series was used to represent foreign stocks. The 10-year Government Bond Return Index (in AUD) returns series was used to represent Australian bond data and the Total Returns Bills Index (in AUD) is used to represent Australian cash returns. We collated and synchronised the data to derive a series of monthly returns from October 1882 to December 2013. The summary statistics for the monthly data is provided in Table 1.

TABLE 1: Summary statistics (nominal) for monthly return series of Australian stocks, foreign stocks, Australian bonds and Australian bills, October 1882–December 2013

<table>
<thead>
<tr>
<th></th>
<th>Australian equities</th>
<th>Overseas equities</th>
<th>Australian bonds</th>
<th>Australian cash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1.01%</td>
<td>0.90%</td>
<td>0.49%</td>
<td>0.35%</td>
</tr>
<tr>
<td>Stand Dev</td>
<td>3.76%</td>
<td>5.10%</td>
<td>2.27%</td>
<td>0.29%</td>
</tr>
<tr>
<td>Skew</td>
<td>-0.84</td>
<td>1.01</td>
<td>0.60</td>
<td>1.78</td>
</tr>
<tr>
<td>Kurt</td>
<td>13.94</td>
<td>11.60</td>
<td>13.65</td>
<td>3.19</td>
</tr>
<tr>
<td>JB-Stat</td>
<td>12,935</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>P-value</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>n</td>
<td>1.575</td>
<td>1.575</td>
<td>1.575</td>
<td>1.575</td>
</tr>
<tr>
<td>Max</td>
<td>23%</td>
<td>49%</td>
<td>21%</td>
<td>2%</td>
</tr>
<tr>
<td>Min</td>
<td>-42%</td>
<td>-24%</td>
<td>-13%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Long-term stock returns (arguably) exhibit mean reversion, there is a positive long-run equity risk premium, most assets exhibit leptokurtosis and the contemporaneous correlation between financial asset returns and real earnings growth is not strong.15 We also find evidence that the real yield on T-bills exhibits strong persistence over time. The historical returns presented in Table 1 seem optimistic, but the future is unknown.

We define a hypothetical individual as follows: a 25-year old worker with a commencing salary of $40,000 and $0 in retirement savings, experiencing salary increases of 2 per cent per annum, contributing 9.5 per cent per annum of their salary to a retirement portfolio on a continual basis through each working year up to a retirement age of 65 years.

All analysis undertaken in this study is considered in real (inflation-adjusted) terms. On the matter of asset returns, we account for historical inflation in the block bootstrap (that is, the simulation approach generates many, many real return paths). By considering real returns, we can evaluate inflation-adjusted retirement income levels for retirees and the associated probability of ruin to age 90 (by asset allocation strategy).

A selection of the simulations (every 200th simulation from each round of 10,000) are presented in panels (a) to (d) of Figure 12 for each of the four strategies.

15 Studies have reported evidence of negative serial correlation, or mean reversion, over longer horizons (Fama and French, 1988; Poterba and Summers, 1988; Lo and MacKinlay, 1988). While attempts have been made to explain mean reversion (e.g. Malliaropulos and Priestley, 1999; Poterba and Summers, 1988; DeBondt and Thaler, 1987, 1989), no decisive argument has yet emerged. To complicate matters, a number of scholars find evidence against mean reversion (e.g. Richardson and Stock, 1989; Kim et al., 1991; McQueen, 1992; Miller et al., 1994).
FIGURE 12

FIGURE 12A: Portfolio paths for the TDF 1 strategy (every 200th simulation path)

FIGURE 12B: Portfolio paths for the TDF 2 strategy (every 200th simulation path)

FIGURE 12C: Portfolio paths for the DLC 1 strategy (every 200th simulation path)

FIGURE 12D: Portfolio paths for the DLC 2 strategy (every 200th simulation path)
5. RESULTS

5.1 Wealth and income

We first show the cumulative distribution plots at various stages during the retirement phase for each of the four strategies. The sequence of panels in Figure 13 (panels (a) to (f)) progresses from five years prior to the retirement date to the terminal date of the individual (assuming death occurs at the age of 90 years). The horizontal axis of each panel represents the nominal dollar value of the portfolio while the vertical axis represents the probability of failing to achieve that level of wealth (for simplicity, we assume a $35,000 real income withdrawal level annually to age 90). In general, if the CDF plot for one strategy lies under (or to the right of) other CDF plots, then that strategy represents a superior outcome relative to the other strategies. The slope of each CDF function is an indicator of the variability of that strategy (the flatter the curve, the less variability of outcomes).

FIGURE 13
In each panel it is apparent that apart from a small portion to the left of zero wealth in the late retirement phase, the cumulative distribution plots of the DLC strategies outperform each of the TDF strategies. In particular, the DLC2 strategy, that takes advantage of a market value signal during the Retirement Risk Zone period, outperforms the DLC1 strategy that limits its dynamism to focussing on the target (i.e. it ignores current market valuations). The dynamic lifecycle strategy thus dominates the TDF strategies to the right of zero (i.e. in terms of positive wealth outcomes) but not to the left of zero (i.e. its worst outcomes are slightly worse than the worst TDF outcomes). While this violates the strict stochastic dominance criterion, it is only the very worst outcomes that do so. In such situations, an investor would be unhappy no matter what strategy they were invested in.

The median wealth outcomes and the normalised portfolio volatility for the four strategies during the Retirement Risk Zone are provided in two panels in Figure 14 (again, this assumes a $35,000 per annum real withdrawal rate to age 90). Volatility for the market aware DLC2 strategy increases with the other strategies during the withdrawal phase but at a decreasing rate. This illustrates that using market-aware investment strategies through the Retirement Risk Zone does not necessarily come at the cost of higher portfolio return volatility. In this way, we see tentative evidence that there may be a strategy that allows funds to assist superannuation investors to navigate the retirement risk zone.

Let us now consider the relative performance of our four strategies from the perspective of risk (specifically, where risk is defined as portfolio ruin).
5.2 Median wealth outcomes, VaR and CVaR

The key risk measures (VaR and CVaR), as well as median wealth outcomes, for each of the four strategies are provided in Table 2.\(^\text{16}\)

The results illustrate that the DLC approach tends to outperform (i.e. yields a higher absolute value) than TDF glide path approaches in terms of both risk metrics and median outcomes. Because of its dynamism, the DLC strategy attempts to preserve portfolio value during poor market conditions and takes advantage of better returns during positive economic conditions.

**TABLE 2: Portfolio value five years prior to retirement, on the date of retirement, five years after retirement and 10 years after retirement for TDF1, TDF2, DLC1 and DLC2 strategies**

<table>
<thead>
<tr>
<th></th>
<th>5% VaR</th>
<th>CVaR</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retirement date –5 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDF1</td>
<td>365,968</td>
<td>342,330</td>
<td>656,784</td>
</tr>
<tr>
<td>TDF2</td>
<td>355,646</td>
<td>322,515</td>
<td>611,961</td>
</tr>
<tr>
<td>DLC1</td>
<td>379,415</td>
<td>344,126</td>
<td>688,363</td>
</tr>
<tr>
<td>DLC2</td>
<td>388,581</td>
<td>353,071</td>
<td>743,032</td>
</tr>
<tr>
<td><strong>Retirement date</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDF1</td>
<td>511,783</td>
<td>464,635</td>
<td>890,188</td>
</tr>
<tr>
<td>TDF2</td>
<td>495,297</td>
<td>449,353</td>
<td>846,893</td>
</tr>
<tr>
<td>DLC1</td>
<td>520,544</td>
<td>476,519</td>
<td>942,770</td>
</tr>
<tr>
<td>DLC2</td>
<td>542,867</td>
<td>495,891</td>
<td>1,113,903</td>
</tr>
<tr>
<td><strong>Retirement date +5 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDF1</td>
<td>284,800</td>
<td>227,428</td>
<td>814,440</td>
</tr>
<tr>
<td>TDF2</td>
<td>278,963</td>
<td>205,102</td>
<td>796,086</td>
</tr>
<tr>
<td>DLC1</td>
<td>317,336</td>
<td>230,734</td>
<td>921,129</td>
</tr>
<tr>
<td>DLC2</td>
<td>385,497</td>
<td>267,415</td>
<td>1,287,984</td>
</tr>
<tr>
<td><strong>Retirement date +10 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDF1</td>
<td>16,272</td>
<td>-</td>
<td>710,854</td>
</tr>
<tr>
<td>TDF2</td>
<td>17,745</td>
<td>-</td>
<td>748,138</td>
</tr>
<tr>
<td>DLC1</td>
<td>66,571</td>
<td>45,860</td>
<td>931,343</td>
</tr>
<tr>
<td>DLC2</td>
<td>273,121</td>
<td>149,841</td>
<td>1,551,970</td>
</tr>
</tbody>
</table>

The retirement incomes that correspond to the wealth values shown in Table 2 are provided in Table 3. Both DLC strategies forecast higher annual retirement income for the 25 years of retirement at each confidence level. For the purposes of illustration, we had to select an annual retirement income level, based on the probability of portfolio ruin (as distinct from the arbitrary $35,000 real income withdrawal level per annum in the previous section). This annual income rate is a function of the asset allocation strategy selected. Specifically, the anchor chosen is the confidence level associated with the probability of ruin for each strategy, rather than comparing the same, fixed dollar amount across all strategies (this is due to each asset allocation strategy producing a different terminal wealth outcome). The confidence level is set at the point at which portfolio ruin can occur (a 10 per cent confidence level has been selected in Table 2 to correspond with a 10 per cent probability of portfolio ruin within 25 years assuming real income is maintained at this level throughout retirement). These values were derived using the stochastic optimisation technique discussed in Section 3.4. It is important to note that the confidence levels reported are computed at the retirement date. In reality, investors would be updating their preferences through time (say, annually) and assess their liabilities, retirement income withdrawal needs, market conditions and asset allocation accordingly.

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\(^{16}\) The 5 per cent Value-at-Risk (VaR) is the value at which 95 per cent of all outcomes are superior and, therefore, 5 per cent of all outcomes are worse. One of the drawbacks of VaR as a risk measure is that it doesn’t tell the analyst how bad the 5 per cent worst outcomes can be. Therefore, we supplement VaR with Conditional Value-at-Risk (CVaR), which is the average value of the 5 per cent worst outcomes. As such, CVaR must be less than (i.e. worse than) VaR.
TABLE 3: Sustainable annual retirement income withdrawals for 2, 10, 25 and 50 per cent confidence levels (probability of ruin) assuming constant annual withdrawals, for TDF1, TDF2, DLC1 and DLC2 strategies

<table>
<thead>
<tr>
<th></th>
<th>2% confidence</th>
<th>10% confidence</th>
<th>25% confidence</th>
<th>50% confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDF1</td>
<td>$18,992</td>
<td>$26,128</td>
<td>$53,571</td>
<td>$60,804</td>
</tr>
<tr>
<td>TDF2</td>
<td>$22,364</td>
<td>$26,603</td>
<td>$64,817</td>
<td>$67,000</td>
</tr>
<tr>
<td>DLC1</td>
<td>$25,060</td>
<td>$37,894</td>
<td>$71,060</td>
<td>$90,017</td>
</tr>
<tr>
<td>DLC2</td>
<td>$28,310</td>
<td>$38,772</td>
<td>$98,909</td>
<td>$121,868</td>
</tr>
</tbody>
</table>

FIGURE 15: Sustainable annual retirement income withdrawals for 2, 10, 25 and 50 per cent confidence levels (probability of ruin) assuming constant annual withdrawals, for TDF1, TDF2, DLC1 and DLC2 strategies

Figure 15 provides a pictorial representation of the income levels shown in Table 3. This analysis highlights some of the critical (and, at times, very complex) trade-offs facing retirees. This approach frames the problem of retirement income planning as one of understanding the investor's preferences regarding portfolio ruin. In short, the objective function for the investor is maximising through retirement (in this case, to age 90) income levels, subject to the risk of ruin. This is a very different decision frame to maximising wealth (popularly termed the ‘pot-of-gold’) at retirement. These trade-offs lie at the very heart of decision-making in account-based pensions.

5.3 Goals based investing

Goals-based investing is an investment approach that directly contrasts with conventional investing methodologies. A conventional investing methodology defines financial performance as a return against an investment benchmark or a peer group, with the major drawback being that performance can be considered ‘good’ regardless of whether the portfolio achieved positive or negative absolute returns. A goals-based approach instead focuses on funding personal financial goals rather than simply achieving higher investment returns relative to some arbitrary index or peer benchmark. Further, it proposes an investment approach for a household based on their risk capacity rather than their risk tolerance.17

Goals-based approaches is in essence are similar to asset-liability management (ALM) approaches adopted by insurance companies, and liability driven investment (LDI) approaches adopted by defined benefit pension funds. It is distinguished from these however in that it integrates financial planning (in simplified form) and investment management to ensure that household goals are financed.

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17 Risk tolerance is an investor-specific attribute that describes how an investor copes with risk. Risk tolerance often varies with age, income and financial goals. Risk capacity refers to amount of risk an investor needs to take to achieve their financial goals. Many financial products target the investor’s risk tolerance (e.g. a ‘conservative’ investment option) and remain largely ignorant of their financial goals. What we propose here is an approach that takes the amount of risk necessary to achieve the investor’s retirement income goal.
For a goals-based investing approach to be most efficient, all household assets and liabilities across a lifetime need to be considered. Assets represent the full set of resources available to the investor such as financial assets, real estate, employment income and social security. Liabilities represent all financial obligations such as loans and mortgages, in addition to the capitalised value of the household’s financial goals and aspirations. Goals such as educating children, retiring early and achieving a desired income level in retirement need to be articulated from the outset. The ultimate aim of this approach is therefore to prevent poor investment decisions by providing a clear process for identifying goals and choosing investment strategies for those goals. This approach not only adapts investment style to actual investors, it avoids the need to ensure that such investors have a superior understanding of financial markets and investment strategies. In this sense, such an approach is ideal for a product-based offering.

5.4 Incorporating the age pension
Fiscal constraints, and demographic headwinds, mean that states will struggle to fully support an ageing population of retirees for 20 to 40 years’ worth of pension payments. Goals-based investing has emerged to address retirement needs, not only as a form of financial security at the individual level (a ‘micro’ question), but also as a form of prudent social policy (a ‘macro’ or public policy question). If investors are achieving better outcomes on an individual basis due to improved investment strategy it might be possible to relieve the pressure on the social security system. Whatever improvements in investment strategies that might result from this or any other research, we concede that a significant number of individuals will continue to rely on the age pension to supplement their retirement income.

To ensure the model is robust and general, the age pension is implicitly incorporated into the model via the SSP variable in Equation 3, and can be introduced via decision rules related to asset and income means testing. Given the current debate regarding the future of the age pension in Australia, we leave this as an important area for future research.

5.5 Lump sum withdrawals at or after the date of retirement
The model also allows for lump sum withdrawals on the date of retirement which provides greater flexibility for investors to gauge the implications for retirement income of extinguishing mortgages and other loans. The anticipated lump sum is necessary to compute expected retirement income because it will obviously have an effect on portfolio sustainability.

Unplanned lump sum withdrawals are, however, more complex to model, and will have a significant effect on the sustainability of the portfolio, especially when they occur early in retirement. For instance, large unexpected age-related health costs (hearing aids, elective surgery, chronic disease treatments, etc.) and/or aged-care costs may significantly impact the longevity risk of retirees. A successful but costly treatment may have the paradoxical effects of extending life expectancy and reducing portfolio sustainability. There is the danger that improved health can lead to poverty. These possibilities are not included in this model, but have been addressed in other recent research (for instance, see Drew, Walk and West, 2014, working paper).
6. ASSET ALLOCATION THROUGH THE LIFE COURSE: THE NEXT STEPS

This study is concerned with asset allocation decisions over the life course (hopefully, the very long run for all). We considered a timeframe of some 65 years (from 25 through 90 years of age). Imagine all of the changes in the world that a 25 year old in the early 1950s would have witnessed through to being 90 years of age today. Moreover, consider the myriad of economic, financial and geopolitical events that affected markets during this period, not to mention the many personal and household events (family, health, career, etc.) that also would have impacted on asset allocation and financial decision making.

In short, perhaps sadly, all we really do know about asset allocation and navigating both to and through the Retirement Risk Zone is that uncertainties are pervasive and outcomes are not assured.

In a superannuation or DC plan system like Australia, this perhaps leave us with the question of how we can nudge the balance of probabilities in favour of investors, to give them the ‘best’ chance of securing a sustainable retirement income.

We highlight the following areas where investors could do with some help:

Outcome awareness
Outcome- (or goal-) oriented investing takes its cues from liability driven investing (LDI) models. The goal of a LDI investment approach is to design as asset portfolio to meet both current and future liabilities. This requires a laser-like focus on the outcome (say, the investor’s liability of a sustainable retirement income stream). This can be challenging in a superannuation/DC framework where we largely focus success on a pot-of-gold at retirement, not a retirement income stream through retirement. Considering lessons from behavioural finance, how do make retirement outcomes meaningful to people through various life stages?

Prescription versus dynamism
The merits of prescriptive (or off-the-shelf) glide path designs continue to be challenged. Outcome-oriented approaches to investing — such as those explored in this report with retirement income the objective function — require greater flexibility. While the surface level simplicity of simple glide path designs is appealing, we need only look to the recent past (e.g. the performance of the 2010 TDF cohort during the global financial crises in the US) to see the limitations of such an approach.18 If we agree that markets are dynamic, why do our approaches to asset allocation not similarly reflect this dynamism?

Market awareness
This report has used a simple, replicable approach to form a view on relative value (which also implicitly assumes a belief in mean reversion in stock returns). Issues of mean reversion and whether or not information from the past can garner insights about the future is not a trivial debate in both practitioner and academic circles (for instance, see the debates arising between Nobel Prize winners Professors Eugene Fama and Robert Shiller).19 In practice, there is both academic and practitioner research that supports that idea that having a sophisticated dynamic asset allocation (DAA) approach, with a focus on five- to seven-year timeframes, may be able to assist in smoothing volatility. Discipline of process when markets deviate from ‘fair value’, and implementation, are important considerations in the debate. However, as this report (and others) has shown, the potential merits of a market aware approach seem to suggest that it is a path worthy of further consideration by sophisticated investors.20 While the debate regarding the efficient market hypothesis (EMH) is one that, at times, tends to generate far more heat than light, policy issues of mean reversion and its impacts on asset allocation are topics that investment committees must have a clear and defensible position.

20 For an academic perspective, see Shiller (2000); Campbell and Shiller (2001); Kritzman, Page and Turkington (2012); Asness, Clifford, Moskowitz and Pedersen (2013).
Black swans
Perhaps it goes without saying, but in many superannuation (DC) asset allocations, the timing of black swan events is critical. We know that the holding of growth assets (such as equities) in portfolios tend to dominate risk budgets. This is even more acute when the largest amount of retirement savings is at risk (cf. portfolio size effect of Basu and Drew, 2009). This report attempts to provide insights into asset allocation over the life course; however an area for further research is the price of tail hedging and the opportunity cost of such an approach. The question we ask here is that investors seem happy to insure against a myriad of risks across the life course (life, trauma, home and contents and car), why would we not give similar consideration to issues of, say, sequencing risk in DC plans?

Complexity
One of the challenges to more dynamic approaches to the problem of retirement investing is complexity. As we have alluded to on numerous occasions throughout the report the Retirement Risk Zone (by its very nature) is characterised by complexity. There are a myriad of endogenous (human capital, health, household, family) risks and exogenous (labour market, economic and financial shocks, geopolitical events) risks that are borne by individuals in DC systems. We would suggest that there is an important policy discussion to be had that begins by acknowledging just how complex DC plans are and how we can nudge households into better decisions. An interesting study by Milevsky (2008) showed that listed firms that freeze their DB plan enjoy a positive announcement effect of 3.8 per cent. In a retirement system with little pooling, how well have we really prepared households (and their respective balance sheets) in Australia to manage the complexities of superannuation?

‘Both-and’ versus ‘either-or’
We have reiterated many times that this report focuses on asset allocation and its role of navigating people both to and through the Retirement Risk Zone. We need to state categorically that our motivation was to provide positive insights into asset allocation through the life course. With this baseline established, we can now have ‘both-and’ conversations on the role of annuities and deferred annuities, longevity swaps and other important building blocks in the solving the puzzle of retirement income.

We absolutely reject ‘either-or’ framing in this debate. For various reasons (the complexity of the problem, commercial interests, political expediency, professional pride), there has been too much time spent on looking for silver-bullet solutions that simply do not, in our view, exist. How holistic is our approach to retirement income solutions? Is our philosophy truly ‘both-and’ when it comes to the challenges of retirement income planning, or really, in practice, ‘either-or’?

Fees
The decision to take a more dynamic approach is not a cost free decision. Somewhat unfortunately at times, the fee debate in Australia (and globally) seems largely framed around management expense ratios for active managers. Again, we wish to be clear, we believe too many folks seek an additional one per cent return, rather than controlling things like fee levels. However, the fee debate is something more than simply investment manager remuneration. It is our conjecture that we need to frame fees as the cost of pursuing an outcome (in this case, a sustainable retirement income). When framed this way, an outcome-oriented way, we can then think (and act) more holistically regarding fee budgeting.

See, for example, Basu and Drew (2014).
Governance budget

It is our conjecture that the complexity facing investors across the life course is not going away quickly. In fact, the more we save for retirement, the larger the portfolio size effect and the amplification of sequencing risk. As an industry, there seems to be much energy spent on publishing management expense ratios. Why would we not publicly disclose governance budgets?

Governance is not free, and good governance is priceless. The nature of the task is such that funds require best practice fiduciary (trustee) governance, the necessary C-suite leadership and support, and organisations capable of delivering high quality retirement solutions. Perhaps focussing more closely on the key enabling capability of investment governance will encourage funds to continue to invest in raising standards.

A lack of financial security is a key contributor to an anxious retirement. International evidence, particularly from the US, is that many recent, or soon-to-be, retirees have expressed dissatisfaction with the existing approaches to asset allocation over the life course, especially using relatively simple TDF glide paths. This report has shown how approaches that take a more dynamic, market-aware approach to the problem of asset allocation over the life course may improve the balance of probabilities in the favour of the investor. Our findings suggest that there are a range of layers (target tracking, transition, and market valuation) that may be incorporated into the asset allocation decision that can potentially be accretive to retirement outcomes. Our search to find ‘safe passage’ both to and through the retirement risk zone continues.


