Down the retirement risk zone with gun and camera

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Abstract

The retirement risk zone represents a fragile period in the financial life cycle of people in defined-contributions superannuation. It primarily affects people of middle means. Sequencing risk has been described as an independent risk but it has largely been a consequence of the dominant asset allocation strategy, described here as aggressive constant-mix. Lifetime glide paths should instead resemble a displaced V: the share of growth assets should fall by something like 20 to 50 percentage points over working life, then another 5 or 10 percentage points on the day of retirement, but should subsequently rise through retirement, by something like 20 to 30 percentage points.

Keywords: constant-mix strategy, defined contributions superannuation, glide paths, retirement risk zone, sequencing risk.

1 Introduction and Summary

The retirement risk zone represents a fragile period in the financial life cycle of people in defined-contribution superannuation plans. It has been described as running 5 to 10 years either side of the retirement year. It primarily affects people of middle means because a lifelong high weight to growth assets is less of an issue for people at the extremes of the wealth distribution. Models based on probability and statistics generally paddle around the edges of constructive suggestions for negotiating the risk zone.[1] Fortunately, economic logic comes to the rescue.

Early retirement is particularly risky. Ongoing drawdowns for living expenses deplete lump sums, making it hard to recoup even if investment returns improve later on. We all know self-funded retirees who still have to count the pennies in the wake of the sharemarket crash of 2008. A study by HSBC finds that Australians entering retirement were the most severely affected among the 15 countries surveyed.[2] These people have generally been remarkably stoical, although class actions against financial planners are underway.

Sensitivity of living standards to the timing of poor investment returns is called sequencing risk. The literature on the retirement risk zone deals with this notion. We argue that sequencing risk has largely been a consequence of the dominant strategy for allocating assets in superannuation accounts. That strategy is *aggressive constant-mix*: allocate a high and stable share of the portfolio to growth assets.

In Australia this share tends to be fixed at somewhere between 70 per cent and 90 per cent of a superannuation portfolio, depending on how you define 'income' assets. (Beware—these might include highly-geared listed property trusts). Australian discussions tend to treat aggressive constant-mix and sequencing risk as two different things. Take this statement from Basu *et al*. (2012): "In a DC-oriented system like Australia, it seems that sequencing risk adds to the range of other important risks (such as inflation, market, liquidity and longevity) faced by plan members".

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[1] An exception to this generalisation is Pfau and Kitces (2013), which offers advice on asset allocation for retirees similar to that given here, namely, a rising equity glide path. These authors focus on a linear rising glide path whereas we argue for a retirement glide path that is not only rising but increasingly so towards the end of life.

[2] See Collett (2013).

Accordingly, unsatisfactory performance of a hypothetical portfolio analysed by Basu *et al.* is attributed to sequencing risk. On closer inspection, however, aggressive constant mix turns out to be the culprit.

Basu *et al.* assume a world in which future superannuation contributions are known with certainty. Sequencing risk is easily eliminated in this world, at least during its accumulation phase. First, recognise that a household's remaining contributions stream is effectively a long position in a security resembling a safe term annuity. Its present value starts high, and falls over time. Second, invest a constant share of growth assets in the household's economic retirement portfolio, i.e., its headline portfolio plus the present value of its remaining superannuation contributions. As the present value of remaining contributions falls with advancing age, the share of growth assets in the headline portfolio falls too. Adverse market returns at the end of working life no longer do more damage than those at the outset. Voila, no sequencing risk.

Basu *et al.* do belatedly acknowledge that you could "adjust asset allocation over the working life to achieve higher portfolio exposure to growth assets in the early years". But this is canvassed in just one paragraph. Moreover, the 38-page paper in question is silent on alternatives to aggressive constant-mix during the drawdown phase. Sequencing risk has actually proved to be more of a problem during that phase, as most people enjoy some flexibility in retirement timing. (Exceptions include airline pilots and teachers in government high schools, whose jobs tend to become too arduous after age 60). *A retiree's spending plan should drive asset allocation, not the other way round*. This approach requires homely economic notions: the distinction between discretionary and non-discretionary spending, along with consideration of the timing of outlays.

Outlays on legacies tend to be substantial, discretionary and at the end of life. Revisions to your estate plan can play the role of buffering market shocks. Indeed, there is strong evidence that bequests are used as shock absorbers. This calls for an upward-sloping glide path, i.e., a rising percentage allocation to growth assets during retirement.

Non-discretionary spending tends to be less bunched. A leading example is energy, which accounts for 5 per cent of the budget needed for what ASFA describes as a 'comfortable' retirement for a home-owning couple. Provision for essentials needs to be secure and up-front − another reason to underweight shares in early retirement.

Putting the pieces together, and introducing some rough numbers, your lifetime glide path should generally look like a *displaced V*: the share of growth assets should fall by the order of 20 to 50 percentage points over working life, then another 5 or 10 percentage points on the day of retirement, but should rise during the drawdown phase, by the order of 20 to 30 percentage points. Figure 1 refers.

[Figure 1]

Almost all Australian providers have stubbornly adhered to aggressive constant-mix, despite the lingering fallout from 2008. That aggressive constant-mix is the industry standard is no coincidence. Superannuation balances typically peak in the neighbourhood of retirement, and the fees charged by fund managers are usually higher for growth assets than interest-bearing ones.[3] So providers profit from aggressive constant-mix. Strong vertical integration of the Australian personal finance industry implies that financial planners typically benefit as well. And trustees enjoy a quiet life when people of different ages in the same workplace see the same superannuation returns when they compare annual statements.

Trends in 401(k) plans in the United States suggest that we are falling behind best practice. Paths that drop 20 percentage points or more over the course of working life are becoming common.[4] Plans offering upward-sloping glide paths to retirees are available too.

It is time that Australian practice shifted away from mindless constant-mix. Responsibility rests with the industry, ASIC, APRA and individual households.

[3] See Kingston (2009).
[4] See Mitchell and Utkus (2012).

2. Literature

Pioneering investigations of the retirement risk zone are due to William Bengen, Ken Henry, Moshe Milevsky and co-authors, and Michael Drew and co-authors. This section summarises and appraises their views.

2.1 Bengen

William Bengen is the doyen of American financial planners. He pioneered the use of overlapping time series of historical returns to inform recommendations for drawing down lump sums and allocating assets. He generally assumes constant-mix allocations. His research (see e.g. Bengen 2001) typically involves four steps. First, divide 20th-century data, on investment returns to broad asset classes, into numerous overlapping 30-year spans. Second, estimate how long a given real spending rate, expressed as a percentage of a retiree's initial lump sum, would have lasted over each historical span. Third, come up with summary statistics representing estimates of the probability that a given spending rate can be sustained for 30 years. Finally, use these estimates to recommend spending rates and asset allocations that represent a reasonable compromise between running out of money before 30 years have elapsed, on the one hand, and leaving an overly generous legacy, on the other.

Bengen's recommended spending rate turns out to be about 4 per cent of initial retirement capital. This estimate continues to dominate North American discussions. His recommended allocation to growth assets is between 50 per cent and 75 per cent of retirement capital. Finally, he infers from his returns histories that bear markets in early retirement are particularly damaging. The reason is that drawdowns for living expenses further deplete lump sums, making it hard to recoup even if investment returns improve later on. In this way, Bengen pioneered the notion of sequencing risk.

Influential as it has been, Bengen's methodology raises questions. One debatable feature is its assumption of rigid withdrawal rates. These are assumed fixed in real terms at 4, 5 or 6 per cent of the retiree's initial portfolio. Economic theory, common sense and observed reality in the wake of the global crisis all point towards a more adaptive approach. For example, a retiree should spend more in bull markets and less in bear markets. The behaviour of self-funded retirees in the wake of the global financial crisis has shown that actual spending patterns are far from rigid. Australian self-funded retirees successfully lobbied the authorities to halve the minimum annual withdrawal from accounts-based pensions.

Scope for adapting consumption during retirement, to news about wealth and longevity prospects, is in general telescoped forward into the optimal initial level of retirement consumption. The relevant theory was pioneered by Merton (1969, 1971). Papers in the Merton tradition derive formulas saying that spending during any year of retirement should be an age-dependent fraction of the retiree's financial wealth in that particular year, not earlier ones. 'Bygones are bygones'; wealth at the outset of retirement should not affect current spending.

In a Merton-type setting the age-dependent fraction in question depends on a long list of factors: remaining lifespan, time preference (impatience), risk aversion, expected returns to the retirement portfolio, the volatility of expected returns, the extent to which funds must be committed to ultra-necessities (e.g. energy), and the extent to which spending is intended for luxuries and is therefore particularly adjustable (e.g. bequests). In the case of people still working, wages and the scope for working longer also need to be added to the list.[5] Section 3 returns to Merton's model of spending and asset allocation.

2.2 Henry

Ken Henry is the doyen of Australian public-sector economists. His 2012 speech examines the optimal allocation to 'fixed interest' through the lens of sequencing risk.[6] He is more concerned with average allocations to fixed interest over the life cycle than with dynamic asset allocation, i.e. how the share of risky assets changes with the age of the investor. He does not consider credit risk.

Henry makes some good points:

[5] See e.g. Merton (1969, 1971). Farhi and Panageas (2007) extend the Merton portfolio model to the case of endogenous retirement.
[6] 'Safe interest-bearing securities' might be a more apposite term. Fixed interest consists of interest-bearing securities that mature in at least 12 months. Such securities are not necessarily free of investment or credit risk.

> Australian superannuation funds allocate not much more than one tenth of their assets to fixed income, against an OECD average of about one-half …Let's remind ourselves that the equity premium is not a gift to investors (p2).

Moreover:

> As life expectancy increases, people should either increase their rate of saving or work longer or both. The idea that they should move ever further along the risk-return frontier in the north-easterly direction strikes me as dangerously misguided (p5).[7]

Henry says that the "publicly provided age pension system provides a safety net" (p5). However, the term 'safety net' is a misnomer. Some 7 out of 10 retired households rely primarily on the pension for an income in retirement, and 9 out of 10 retired households draw some pension during retirement. At the time of writing, a home-owning couple could have up to $1,110,500 in assessable assets and still qualify for a part pension. Moreover, the fact that the pension is effectively a negative-beta asset goes a considerable way towards explaining the high weight to growth assets in Australian superannuation portfolios.[8]

Henry compares a portfolio consisting of a safe interest-bearing security and a portfolio consisting of a risky security with a higher expected return.[9] He assumes a fixed span of working life, contrary to the fact that most jobs offer some scope for choosing your retirement date. Like Bengen, he observes that a bad return is more damaging when your accumulation is large than when it is small. Henry builds on Bengen by observing that accumulations are large in late working life as well as in early retirement. Your exposure to sequencing risk is therefore not limited to early retirement, at least to the extent you lack retirement flexibility.

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[7] That template industry advice conformed to Henry's critical summary is confirmed by e.g. Kingston (2009).

[8] That means testing of the pension entails a negative-beta property for it, considered as an asset class, is an observation due to Hardy et al. (2013).

[9] The properties of Henry's hypothetical risky security are peculiar: "it is known with absolute certainty that a share portfolio yields a 10 per cent rate of return in 19 years out of 20 and a negative rate of return of 50 per cent in the other year, but nobody knows in which of the 20 years the negative rate of return (the stock market crash) will occur" (p3).

Henry shows that, taking into account the possibility of large losses in late working life, you will not necessarily prefer a risky asset to a safe asset, even if the risky asset has a higher expected return. This is true but trite. By comparing portfolios that are either 100 per cent risky or 100 per cent safe, Henry is implicitly confining attention to constant-mix strategies. The right question is how to construct a portfolio that *combines* risky and safe assets, and *changes* in composition as you move through the life cycle.

2.3 Milevsky and Co-Authors

Contributions by Milevsky and co-authors popularised the notion of sequencing risk. Of these, Milevsky and Salisbury (2006) is perhaps the most substantial. It is the source of the temporal definition of the retirement risk zone stated at the outset. It follows Bengen in assuming rigid spending plans based on some fixed percentage of initial retirement capital. It also follows Bengen − at least implicitly, and before the discussion turns to derivatives – in focusing on constant mix strategies. In Section 2, for example, the reader is invited to compare long-term investments with constant expected returns and volatilities. The authors build on Bengen's ideas by applying ruin theory more systematically, and by exploring possible roles for derivative instruments.

Milevsky and Salisbury anticipate Henry-type points about the sequencing of returns,[10] although they concentrate on retirement. Suppose that you are retired for 3 decades. Suppose further that there are two possible outcomes: your gross decade-average returns follow the sequence

1.07, 1.27, 0.87

or

1.07, 0.87, 1.27.

Average investment returns in retirement are the same. Yet the first sequence will generally be preferred to the second, because the retiree's portfolio will generally be larger during the second decade of retirement than the third. Even better would be a gross return of 1.27 in the first decade rather than the second.

[10] Henry's contribution contains no references to the pre-existing literature.

More realistic numbers, notably those in Exhibit 5.5 of the paper, shed light on "the ideal risk management product":

> It would convert [wealth] paths that lead to early ruin and extend their lifespan by mitigating the negative return in the first five to ten years (p19).

In this way, Milevsky and Salisbury canvass derivative instruments as the most promising solution to the problem of the risk zone. They initially explore collars:

> Combining puts and calls in a *retirement collar*, allows you to sell a call with a high strike price and, in turn, use the proceeds to purchase a put with a higher strike price (p21, emphasis as in the original).

Bateman (1997) casts doubt on collars as suitable derivatives for managing market risk in defined contributions plans. She shows that the equivalent position in underlying assets (i.e. shares and cash) typically turns out to be surprisingly conservative. Her research illustrates why you may well be better off using positions in underlying assets that change through time rather than constant-mix positions overlaid with derivatives. Notably, you tend to get a clearer picture of your effective portfolio. Moreover, Australian structured products have typically been expensive, i.e., the package typically costs much more than the total cost of its individual components.

The main pre-packaged security canvassed by Milevsky and Salisbury is the so-called GMWB:

> the new leading contender for retirement income product allocation is a concept called a guaranteed minimum withdrawal benefit (GMWB) which was introduced in the U.S. market over 5 years ago and has been extremely popular with soon-to-be retired baby boomers. What a GMWB tries to achieve is to create an income stream that is protected from poor market performance early-on in retirement. Boiled down to its essence, a GMWB can be viewed as an umbrella that is placed on top of a portfolio of securities or funds. As long as you stay within the radius of the umbrella and make sure to hold it up at all times, it will protect you from the rain. More technically, the GMWB

> overlay guarantees that you will get at least your money back and perhaps much more, as long as you do not withdraw more than a specified amount from this underlying portfolio in any given year (p23).

GMWBs, then, may provide longevity insurance as well as protection against market risk. This raises an immediate problem for Australian retirees: our market for mortality-contingent securities is very thin.[11] Other potential problems with GMWBs, paralleling those of collars, are transparency and costs. Finally, Australia's pension is not only a negative-beta asset, like the put options canvassed by Milevsky and Salisbury, but provides longevity insurance. Our public-sector substitute for GMWBs limits their potential appeal to Australian retirees, especially less affluent ones.[12] Why pay for insurance against market and longevity risk when the government provides it for free?

2.4 Drew and Co-Authors

Contributions by Michael Drew and co-authors to understanding the risk zone include Basu *et al*. (2012). That paper defines sequencing risk as "the worst returns in their worst order", where the term 'worst order' presumably means the time when your superannuation balance peaks. Its model portfolio has a constant-mix allocation of 67 per cent to growth assets. The mean portfolio return over the period 1900 to 2011 is 10 per cent p.a., consistent with the exceptionally high equity premium in Australia during the 20th century.[13] The methodology and the findings are reminiscent of those due to Bengen, and Milevsky and co-authors, although working life is taken into account. Superannuation contributions are assumed deterministic, like the cash flows associated with a safe term annuity. In conjunction with the assumed constant-mix strategy, this means the economic or effective portfolio in early working life is heavily weighted to safe securities. Sequencing risk is a consequence of this imbalance. The authors initially approach sequencing risk in a way that brings to mind the tail that wagged the dog − then pull back:

> First, the contribution rates could be set high initially and gradually brought down as one approaches retirement…The obvious difficulty in implementing such a policy would be the reluctance of investors to put more money into superannuation when they are younger, leaving less income for consumption (p24).

[11] The main reason is that the Australian authorities, in contrast to their counterparts in most comparable countries, have been reluctant to institute the mixture of tax incentives and compulsion needed to underpin a deep market for annuities.
[12] In all countries, rich retirees tend to self-insure against market and longevity risk, via elastic bequests.
[13] Our inflation rate during that century averaged 4 per cent p.a.

We finally arrive at the point that should have been front and centre:

> The alternative to setting unequal contribution rates would be to adjust asset allocation over the working life to achieve higher portfolio exposure to growth assets in the early years than occurs with existing exposure levels (p24).

In contrast to the numeric emphasis of the study as a whole, however, there are no numbers put on how steep the glide path should be. Working-life glide paths with deterministic contributions tend to be implausibly steep. Accordingly, Viceira (2001) extended the Merton model, showing that incorporating contributions requires modelling their distinctive risks − a difficult yet necessary exercise.

Basu *et al.* conclude with the claim that sequencing risk is a primitive one rather than purely derivative of underlying financial risks combined with a constant-mix allocation. Section 1 above disputed this claim.

3. Towards economics-based financial plans

The economics of glide paths builds on the Merton portfolio model. It is not an exact science yet is more credible than unthinking applications of aggressive constant-mix.

3.1 Glide Path during Working Life

Viceira (2001) assumes worker-investors face idiosyncratic risks of losing their jobs. There is also a correlation risk from risky assets, i.e. human capital is a positive-beta asset. Viceira's principal guess of the correlation between returns to growth assets and unexpected growth in real wages is 25 per cent. He abstracts from distinctions between essential and discretionary purchases.

Figure 2 interpolates some of Viceira's Table 1 estimates. In particular, it splits the difference between his estimates for constant relative risk aversion equal to 3 and 5. The drop in the share of growth assets over working life is 42 percentage points. That represents a big departure from constant-mix.

[Figure 2]

More research is needed on the extent to which human capital is a positive-beta asset. One problem is that we are mainly interested in low-frequency correlations, but data on individual wage histories do not span more than a couple of generations. It might be possible to infer the required correlations from long time series of aggregate wages and salaries at the occupational level.

Viceira abstracts from retirement flexibility, which could be expected to lift and flatten the glide path. Farhi and Panageas (2007) is the pioneering study of that case. Like Viceira, these authors assume constant relative risk aversion. In contrast to Viceira's setup, retirement is voluntary. Workers retire if and when their actual financial assets hit reservation retirement assets. The latter depends on the disutility of work, the wage foregone on the occasion of retirement, and other variables. Calibrations for the case of CRRA equal to 4 suggest a drop in the allocation to growth assets at the point of retirement. The magnitude could be around 10 percentage points. As with the analysis of Viceira (2001), however, more research is needed. Notably, allowing for an increasing disutility of work with age could be expected to reduce the size of the discrete drop.

3.2 Spending and Glide Path during Retirement

Ding et al. (forthcoming) investigate consumption and asset allocation for retirees in a Merton setting with particular attention to the shock-absorber role of bequests. As in virtually all Merton models, annual outlays are curtailed if wealth falls or if expected remaining lifespan is revised upwards. Table 1 adapts the analysis of Ding et al. to the concerns of this paper.

That spending and estate plans are assumed adjustable in the face of wealth shocks is one reason why the initial safe spending rate is higher than 4 per cent in Table 1. Wealth taken into retirement is assumed to be $1 million. Allowable retirement-year spending is $48,000, or $8,000 higher than under the 4 per cent rule. The expected rise in the share of growth assets during retirement is 28 percentage points. As with asset allocation during working life, then, the departure from constant-mix is big.

[Table 1]

The upward-sloping glide path of Table 1 can be implemented by financing early retirement mostly by drawing down interest-bearing assets, and financing late retirement mostly by drawing down growth assets. This approach is known in the financial-planning community as a 'bucket strategy', although it is not necessarily recommended for the reasons given in this paper.

The Table 1 plan turns out to imply an expected estate of $285,027. This contingent outlay represents a discretionary item that has alternative uses, notably, as a cushion against the contingencies of spending more than 30 years in retirement, or unexpectedly low returns to growth assets, or uninsurable health setbacks late in life.

As with our candidate glide path for working life, there is ample scope for further research. Thus, even though Table 1's expected return to growth assets is low by the standards of the 20th century, there is a case for further downward revision of expected returns. Likewise, there is a case for assuming that 'ultra-necessities' cost more than $2,900 pa. For example, the retired household might want to ensure its standard of living is bounded below by the Age Pension, to 'keep up with the Joneses'.[14]

4. Concluding Comments

Before the advent of mass defined contributions superannuation, asset allocation over the life cycle typically conformed to the displaced-V glide paths advocated here. A young household would borrow heavily to finance the family home. As the household moved through working life, the debt would get paid down, lowering the volatility of the household's overall portfolio. The occasion of retirement often triggered an employment-separation payment which could be used to pay out any remaining debt. Retirement was financed largely by the Age Pension or a comparable safe lifetime

[14] In that case we would want a number lower than 1.7 for the curvature parameter of the utility function.

income stream from a large employer. As the household moved through retired life, its portfolio would become riskier again, as the remaining present value of its safe income stream progressively fell. The children would inherit the house (the volatility of returns to a single dwelling is similar to that of the returns to a diversified portfolio of stocks.) Since the advent of mass superannuation, however, we seem to have unlearned this particular piece of traditional wisdom, namely, the need for comparatively safe portfolios for people of middle means in the neighbourhood of retirement.

There is a public interest in safer portfolios on the cusp of retirement. “Age Pension applications in December 2008 were around 50 per cent higher than the number recorded in October of the same year” (Harmer 2009). Yet our official family has expressed far more concern about tax expenditures than the direct costs of pension payments occasioned by the effects of the global financial crisis on risky private savings.

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Years into retirement	Spending/wealth ratio	Growth assets/wealth ratio
	Expected, per cent	Expected, per cent
0	4.8	45
5	5.2	47
10	5.8	49
15	6.7	51
20	8.0	55
25	10.5	62
29	14.7	73

Source: spreadsheet created by Jie Ding, for the numerics of Ding et al. (forthcoming).

Notes: In common with Ding *et al.* (forthcoming), the expected real return to growth assets is 5 per cent pa, the volatility of returns to growth assets is 20 per cent pa, the real return to safe assets is 2 per cent pa, the bequest utility parameter is $20,400, and the propensity to bequeath is .92. In contrast to Ding *et al.*, the financial wealth taken into retirement is $1 million; the annual expenditures on essential goods are $2,900, corresponding to what ASFA (2013) says is the annual energy expenditure needed by a home-owning couple for a 'comfortable' retirement; the rate of time preference is 3.7 per cent, that being the rate which levels out the expected retirement consumption path (at about $48,000 pa.); and the utility curvature parameter is 1.7, that being the value which fixes the initial growth assets share at 45 per cent of the financial wealth taken into retirement.

Table 1. *An Economics-Based-Plan for a 30-Year Retirement*

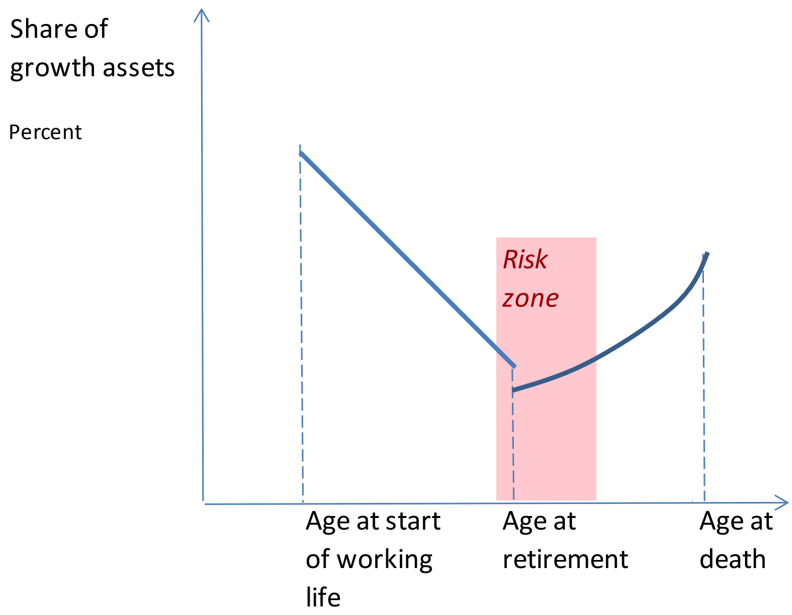
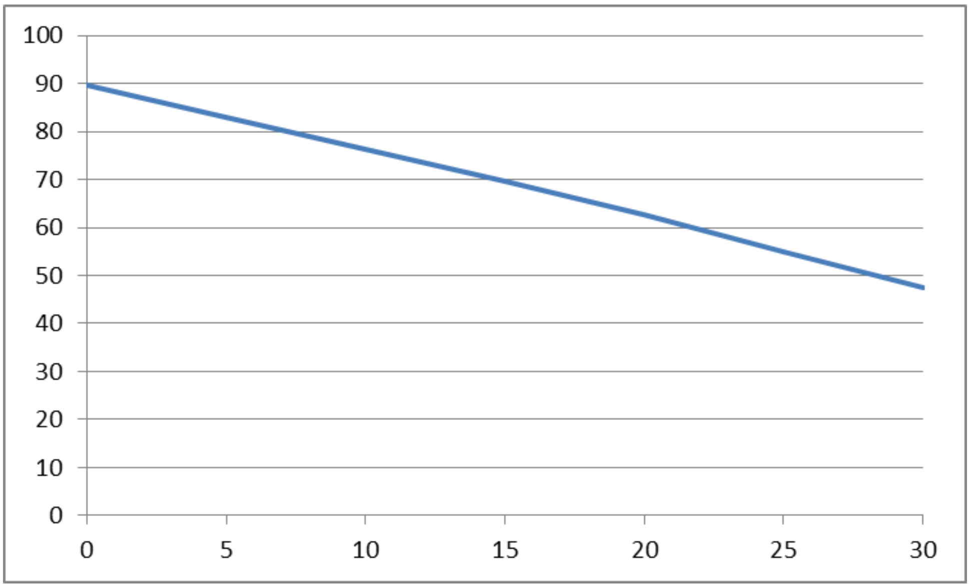


Figure 1. *'Displaced V' Lifetime Glide Path*



Notes: The expected span of working life of the household is 30 years. Following Viceira (2001) the assumed risk premium is 4 percentage points and the assumed volatility of returns to growth assets is 18% pa. The assumed correlation between stock returns and growth in real wages is 25 per cent. The household can neither be forced to retire early nor choose to postpone retirement. Preferences are of the CRRA variety.

Figure 2. *Candidate Glide Path during Working Life*