



Australian Government
Australian Government Actuary

TOWARDS MORE EFFICIENT RETIREMENT INCOME PRODUCTS

Paper prepared for the Financial System Inquiry

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1 Introduction

- 1.1 The Financial System Inquiry (FSI) has asked Australian Government Actuary (AGA) to prepare a paper that consolidates a number of pieces of work done for the FSI during the year. Those pieces of work have looked at the efficiency of retirement income products that can be purchased by retiring Australians with their accumulated superannuation money.
- 1.2 The Australian superannuation system is and will continue to be dominated by accumulation-style superannuation accounts for superannuation fund members during the pre-retirement phase.
- 1.3 The focus of this paper, however, is the post-retirement phase.
- 1.4 This paper looks at products available to the vast majority of (retiring) Australian superannuation fund members who will retire with an accumulation-style or 'lump sum' superannuation benefit (rather than a defined superannuation pension benefit).
- 1.5 Upon retirement, some or all of a retiring member's accumulated superannuation money can be used to purchase a 'retirement income product'. The income paid to the retiree from the retirement income product is then available to support expenditure needs during retirement.
- 1.6 The dominant retirement income product in Australia is the account-based pension. Account-based pensions involve an inevitable and unavoidable trade-off between living standards during the early retirement years and the risk of running out of money during older age. That is, with an account-based pension, the price to be paid for higher early retirement living standards is an increased risk of outliving savings.
- 1.7 This paper shows that it is possible to design retirement income products that simultaneously:
 - deliver higher income in retirement to retirees than is possible with an account-based pension; and
 - do this without any increase in the risk of outliving their savings.

2 Models and assumptions

- 2.1 This paper models potential retirement income from a range of retirement income products.
- 2.2 In many cases the income generated from a retirement income product will depend on a number of underlying forces including investment returns, inflation rates, mortality, etc. For example, the income generated from an account based pension depends on both investment performance and the rate at which the account is drawn down.

- 2.3 The modelled results presented in this paper were obtained using a stochastic simulation model. Stochastic simulation models can provide insights into both average trends and variability in potential outcomes by allowing for random variation in some of the independent variables, particularly investment returns.
- 2.4 Details of the modelling and key underlying assumptions are set out in the Appendix.
- 2.5 In some places we have shown only the average outcomes from the simulation models while in other places we have also sought to illustrate the variability in the simulated results.

3 Efficiency

- 3.1 Efficiency is not an unambiguous concept and there are a number of ways to think about it. One way of thinking about the efficiency of a retirement income product is to consider the retirement income profile generated by the product. Consideration of the retirement income profile might take into account any or all of the following:
- How much of the purchase price is actually applied to retirement income?
 - Over what time frame does the retirement income flow?
 - How much longevity risk protection is provided?
 - How stable and predictable is the retirement income profile?
 - How well does the shape of the income profile match likely expenditure needs?
 - How much flexibility/control is available to the retiree over their retirement income?
- 3.2 Relevantly, efficiency is likely to be something which is 'in the eye of the beholder'. For example, a retiree and a taxpayer might have very different views about the 'efficiency' of a certain product, particularly if the product was designed or used in a way that resulted in a large age pension entitlement for the retiree which might not otherwise be available. In this case, the retiree might consider the product to be quite efficient while the taxpayer might not.
- 3.3 Age pension and tax effects are not the only reasons why different perspectives might result in different views on 'efficiency'. Even when products are viewed on a stand-alone basis, efficiency is inevitably a function of perspective and not capable of absolute measurement. For example, a retiree in poor health with lower than average life expectancy would be expected to have a different view on the efficiency of a life annuity from a retiree in good health with above average life expectancy. Thus, the healthy retiree would be expected to regard the annuity as more efficient than the unhealthy retiree.

- 3.4 It was noted above that account-based pensions involve an inevitable and unavoidable trade-off between living standards during the early retirement years and the risk of running out of money during older age.
- 3.5 For the purpose of this paper we have assessed efficiency by considering the inevitable trade-offs between the level of retirement income provided by the product and the risk of running out of money during older age. For example, we have assumed that, for a given risk of running out of money, a product which delivers a higher level of retirement income than another can be regarded as more efficient. More or less equivalently, for a given level of retirement income, a product which entails a lower risk of running out of money than another would be regarded as more efficient.
- 3.6 We have also briefly tested candidate retirement income products against a number of other measures. These other measures include:
- the level of retirement income delivered for a given purchase price and risk of running out of money¹; and
 - the degree of certainty around the level of retirement income delivered for a given purchase price and risk of running out of money.
- 3.7 We have only indirectly considered the interaction of retirement income products with the age pension system in this regard. Thus, our analysis has considered retirement income products on a stand-alone basis. This should not be taken to imply that age pension issues can or should be ignored. Indeed, the interaction of retirement income products with the age pension system is an important consideration for policymakers. Nonetheless there is also likely to be benefit for policymakers in analysis which looks at the underlying product features.

4 Account-based pensions

- 4.1 The dominant retirement income product in Australia is the account-based pension.
- 4.2 An account-based pension (ABP) operates like a tax-advantaged at-call investment account. At retirement, the 'superannuation lump sum' is invested and, thereafter:
- investment earnings on the invested funds are tax-exempt;
 - the retiree draws money out of the account from time to time, subject to a requirement to draw at least a minimum amount out each year; and

¹ Refer to the 'income efficiency' concept discussed in the FSI's interim report

- any money left over on death is payable to the retiree's estate (although there is scope for the account-based pension to revert to a surviving spouse).

4.3 An account-based pension is, in effect, an investment account that is drawn down progressively throughout retirement, subject to a minimum amount being drawn down each year. The minimum drawdown amount is the account balance at the start of the financial year multiplied the relevant minimum drawdown factor. A set of age-based minimum drawdown factors is prescribed for this purpose.

Age	Factor
65 - 74	5%
75 - 79	6%
80 - 84	7%
85 - 89	9%
90 - 94	11%
95+	14%

Retirement income generated directly by an account-based pension

4.4 The minimum drawdown factors were set to allow a reasonably level income pattern relative to CPI (that is, in real terms) over a long retirement. In any given year, most account-based pensioners draw their account down at the minimum permissible rate.

4.5 Among other things, this strategy minimises the risk that the account-based pensioner will outlive their retirement savings. It also minimises their living standards during retirement.

4.6 Faster rates of drawdown increase income during early retirement but at the expense of lower income at older ages. This is because the account balance is run down more quickly if it is drawn down at a rate faster than the minimum allowed. Put differently, faster rates of drawdown increase the risk that a retiree will outlive their superannuation savings.

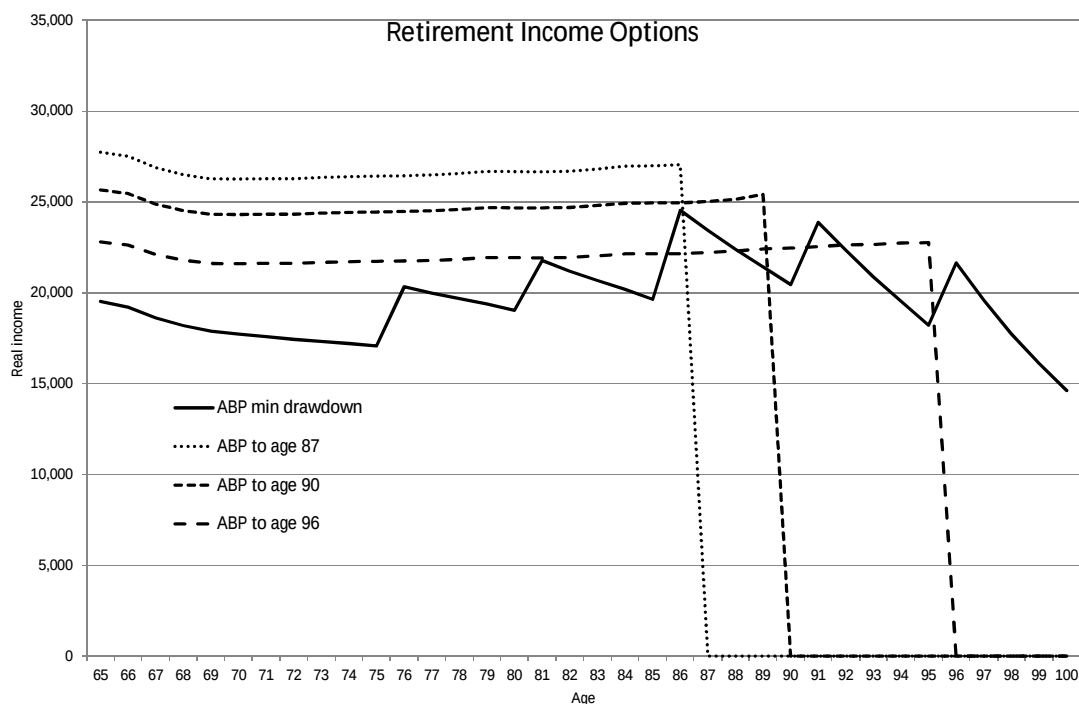
4.7 There is a statistical expectation that some money will be left over in the account on death. This is reasonably intuitive when an account-based pension is drawn down at the minimum rate but it is also true (though not as intuitive) when an account-based pension is drawn down at a rate faster than the minimum rate. If an account-based pension is drawn down at faster than the minimum rate there are three consequences:

- first, the retiree gets more retirement income (until the point that the balance is exhausted); but
- second, there is an increased risk of running out of money (that is, dying without any money left in the account); and
- third, although the expected amount of money left in the account on death is reduced, it is not reduced to zero.

4.8 The chart and discussion below illustrate the retirement income (in real terms) generated directly by an account-based pension for a range of different drawdown patterns. The chart is based on a purchase price of \$400,000, with drawdowns commencing at age 65. A number of drawdown patterns are shown – the minimum permitted drawdown rate (solid line) and three faster drawdown rates (dashed lines).

4.9 The chart below shows the average outcomes from all simulations. These average outcomes represent reasonable expectations based on the model parameters². Of course, these average outcomes are not guaranteed as actual results will be affected, in particular, by fluctuating investment returns. The impact of fluctuating investment returns is covered later in this paper.

Figure 1: Account based pension drawdown patterns



Drawing down at the minimum rate

4.10 Drawing down at the minimum rate results in real average annual retirement income of around \$19,200. Retirement income varies between around \$17,000 and \$24,000 until the retiree reaches their mid-90's, where-after the level of income drops somewhat to around \$15,000. The minimum drawdown factors were designed to deliver a fairly stable retirement income profile (real terms) while having virtually no risk of running out of money. For a retiree with an account-based pension who does not know when they will die (most retirees), drawing

² The downwards kink at the start of the curves relates to the structure and output of the stochastic investment model that was used. For more detail refer to the appendix.

down at the minimum rates is, in fact, the only way to achieve a reasonably smooth income profile while retaining a zero risk of running out of money.

- 4.11 Since, under the minimum rate draw down strategy there is no risk of completely running out of money, some money will always be left over on death. If an account-based pension is drawn down at the minimum rate, then, based on the assumptions adopted, we estimate that for a 65 year old male around 31 per cent of the initial balance (net present value terms) will be left over on death on average. For some it will be more and for others less but we estimate about 31 per cent on average. This means that for these retirees only about 69 per cent of the initial balance, on average, is actually used for retirement income purposes.
- 4.12 This further suggests that if it is possible to find a way to ensure that more than 69 per cent of the initial balance is used for retirement income purposes, then it would be possible to improve average living standards in retirement. In fact, there is scope for improvement in average living standards for account-based pensioners who draw down at minimum rates of up to 31/69. That is, there is scope for more than 40 per cent improvement.
- 4.13 First, we consider whether this can be achieved while remaining in an account-based pension environment. Obviously, it is possible to draw down an account-based pension at faster than the minimum rate and this is discussed below.

Drawing down over the period till life expectancy

- 4.14 Running the account balance down over the period to life expectancy (about 22 years for a 65 year old male) results in annual real income of around \$27,000 which is about 40 per cent more than the expected average minimum drawdown of \$19,200. However, although annual retirement income of around \$27,000 is generated, this is for a period of no more than 22 years. The account balance (by design under this drawdown strategy) is exhausted at age 87.
- 4.15 In other words, although a retiree who adopts this drawdown strategy can enjoy 40 per cent better living standards than the retiree who draws their account-based pension down at minimum rates, this benefit can only be achieved by accepting an increased risk of outliving savings. The money runs out if the retiree happens to live past their life expectancy. Based on our projected mortality rates, there is around a 50 per cent chance that this will happen. So, although drawing down the account-based pension at a rate faster than the minimum rate results in improved living standards up to age 87, the risk of running out of money has increased from zero to 50 per cent.
- 4.16 Finally, although there is, in this circumstance, a 50 per cent chance of running out of money (that is, a 50 per cent chance of surviving past age 87), there is also a 50 per cent chance of dying before this age. If this happens, some money will be left over in the account on death. Thus, while for half of all retirees, there will be no money left over in the account on death (those that live past 87), for the other half (those that die before age 87) there will be some money left over on death. We

estimate that, under this drawdown strategy, around 13 per cent of the initial balance will be left over on death, on average (across all 65 year old male retirees).

Drawing down over longer periods

We modelled two other faster drawdown scenarios – drawing down to age 90 and drawing down to age 96. The table below summarises the key metrics that results from these two drawdown strategies.

Table 1: Account based pension trade-offs

	Drawdown strategy			
	minimum	To age 87	To age 90	To age 96
Average annual income	\$19,200	\$27,000	\$25,000	\$22,000
Increase over ABP minimum	N/A	40 per cent	30 per cent	15 per cent
Probability of outliving savings	0 per cent	50 per cent	40 per cent	16 per cent

4.17 If the account is drawn down at a rate of about \$25,000 per annum (real terms), then it will last until about age 90. During the period up to age 90, a retiree who adopts this drawdown strategy can enjoy 30 per cent better living standards than the retiree who draws their account-based pension down at minimum rates. However, again, this drawdown strategy involves an increased risk of completely running out of money. We estimate that about 40 per cent of all 65 year old males will survive to age 90. This means that the 30 per cent improvement in retirement living standards during the period up to age 90 comes at a cost of accepting a 40 per cent risk (up from zero) of running out of money.

4.18 If the account is drawn down at a rate of about \$22,000 per annum (real terms), then it will last until about age 96 which represents almost 15 per cent better living standards than the retiree who draws their account-based pension down at minimum rates. However, since about 16 per cent of males will live to age 96, the 15 per cent improvement in retirement living standards during the period up to age 96 comes at a cost of accepting a 16 per cent risk (up from zero) of running out of money.

Conclusion

4.19 The discussion above has shown that drawing an account-based pension down at the minimum rates ensures that there is no risk of running out of money. However, this drawdown strategy results in an expectation that around 31 per cent of the initial balance together with investment returns (for 65 year old males) will be left over in the account on death. Any money left over in the account on death is not applied to retirement income purposes. If it were possible to apply that money to

retirement income purposes, there would be scope to improve living standards in retirement.

4.20 The discussion above has also shown that it is possible to run an account-based pension down at faster than the minimum rate and that, doing so, will result in improved living standards in retirement for as long as some money remains in the account. However, this improvement in living standards comes at the cost of an increased risk of running out of money later in life.

4.21 Later in this paper, we investigate retirement income products which can simultaneously:

- deliver higher income in retirement to retirees than is possible with an account-based pension; and
- do this without any increase in the risk of outliving their savings.

5 Longevity risk

5.1 Longevity risk refers to the uncertainty, at the time of retirement, around ones future lifespan.

5.2 The discussion in the previous section highlighted that an account-based pensioner needs to decide how much money to draw out of their account-based pension in any given year, subject to satisfying the minimum drawdown requirements.

5.3 Since an account-based pensioner is unlikely to know how long they will live, they need to find a balance between the risks of:

- using up the money in the account too quickly and therefore running out of money; and
- drawing the money down too slowly and unnecessarily compromising living standards during retirement.

5.4 Notably, the majority of account-based pensioners are believed to draw down their pensions at the minimum permissible rate. This behaviour is consistent with a desire to minimise the risk of outliving their savings.

Life expectancy

5.5 The chart below shows the distributions of lifespans for 65 year-old males from each of the past 8 Australian Life Tables (that is, from the early 1970's onwards) prepared by the Australian Government Actuary. The chart shows the probability of a 65 year old male dying at a particular age.

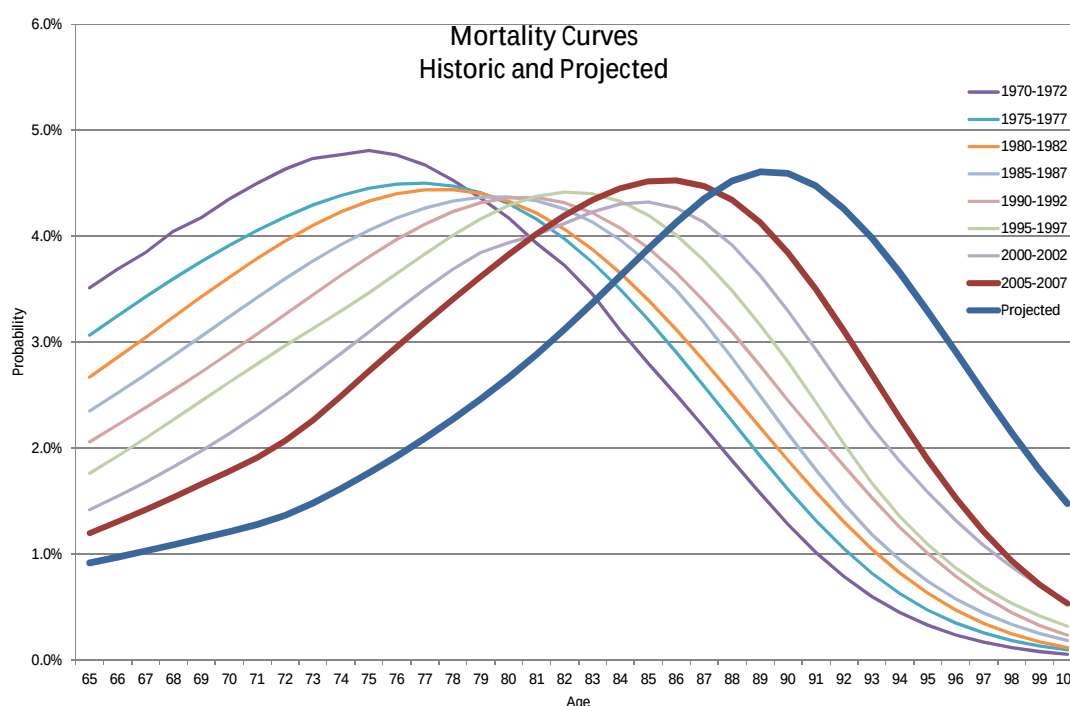
Figure 2: Historic mortality curves



- 5.6 The curves have moved consistently to the right, meaning that life expectancies of 65 year-old males have been increasing since about the mid 1970's.
- 5.7 The red curve illustrates the situation in 2005-07, the most recent period considered by Australian Life Tables published by AGA³. However, this distribution is likely to misrepresent the life span distribution for 65 year old males today. First, another 8 years have passed since the 2005-07 tables were produced. Second, and more importantly, these curves do not allow for future mortality improvements. For example, a 65 year old today who survives to age 80 will turn 80 in 2029. The mortality of 80 year olds in 2029 will be lighter than the mortality of 80 year olds today, if the recent experience is any guide. Yet the red curve is based on an assumption that there will be no further improvement in mortality from that observed in 2005-07. In other words, a more realistic distribution of the lifespans of today's 65 year old males would be even further to the right than the red curve.
- 5.8 To get a more realistic idea of the lifespan distribution of today's 65 year olds it is necessary to allow for future improvements in mortality. The chart below illustrates and is based on an assumption that mortality rates will continue to improve in line with rates of improvement observed over the 25 years from 1980 to 2005.

³ At the time of preparing this report ALT 2010-12 was nearing completion.

Figure 3: Historic and projected mortality curves



- 5.9 Although it is reasonable to expect that life expectancies will continue to increase, it is also reasonable to expect that the distribution of lifespans will remain somewhat wide. That is, an individual retiree will still not generally know when they are going to die. This has important implications for a retiree seeking to manage longevity risk.

Idiosyncratic and systematic longevity risk

- 5.10 There are two sources of uncertainty for a retiree wondering how much longer they will live. These are referred to as systematic and idiosyncratic longevity risk.

Systematic longevity risk

- 5.11 Systematic risk refers to the (unpredictable) forces that can affect the mortality of many or all people in a group in the same or a similar way. For example, heart bypass surgery introduced several decades ago has had a positive impact on the life expectancy of many older Australians.
- 5.12 The charts above show that the lifespan distribution for 65 year old males has moved systematically to the right since the early 1970's. The average age at death, for example, has increased by around 9 years. This represents a large increase in life expectancy of almost 70 per cent.
- 5.13 Despite the systematic improvement in mortality that has occurred during this period, it can be seen that the lifespan distribution has remained doggedly wide. Even though 65 year old males today can expect, on average, to live 9 years longer than 40 years ago, there remains a wide age range within which they will die. Despite the systematic mortality improvement, there remains a significant

degree of unpredictability or randomness in the age of death for any given individual.

Idiosyncratic longevity risk

- 5.14 Around 40 years ago, we could not be any more confident than predicting that 80 per cent of 65 year old males would die within a 23 year age band (between ages 67 and 90). The chart below illustrates⁴. The chart also shows life expectancy at 79 years and the median⁵ of the lifespan distribution at 78 years.

Figure 4: 1970-1972 male mortality curve

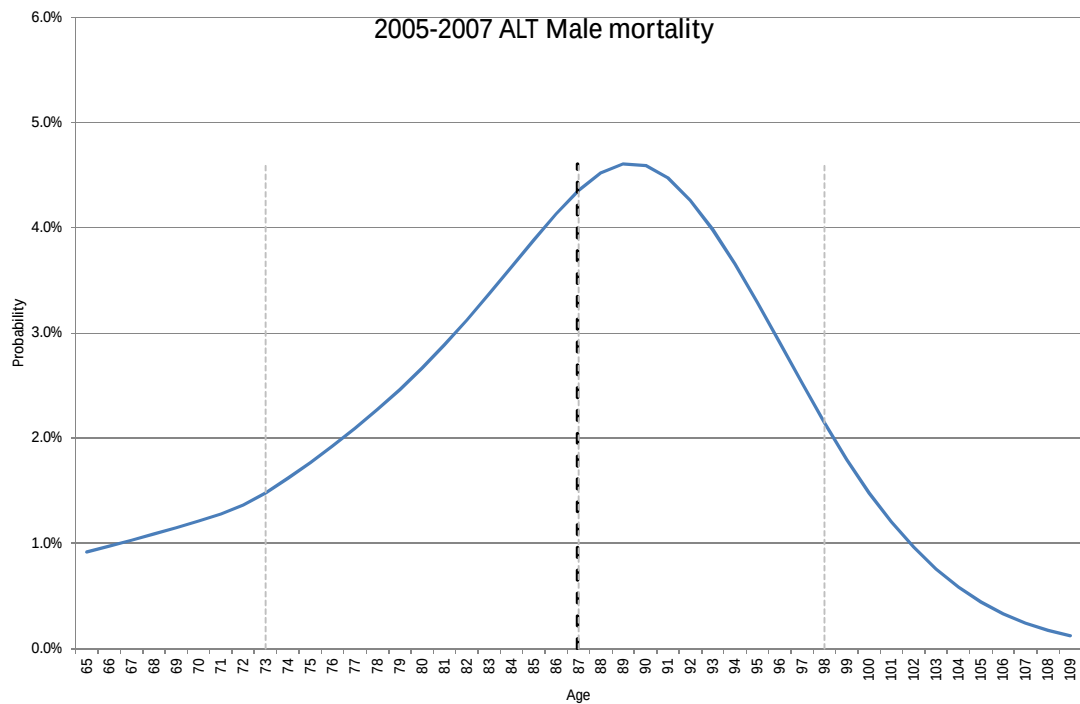


- 5.15 Today we cannot be any more confident than predicting that 80 per cent of 65 year old males would die within a (albeit different) 25 year age band (between ages 73 and 98), as illustrated in the chart below.

⁴ This curve is somewhat flatter than the purple curve at paragraph 5.8 as some allowance has been made for mortality improvement here.

⁵ The age above and below which 50 per cent of 65 year old males are expected to die

Figure 5: 2005-2007 male mortality curve



- 5.16 Idiosyncratic risk refers to this individual randomness that has been and remains a feature of our mortality experience. For example, we might be reasonably confident that, due to systematic mortality improvement, the average future lifespan of a group of typical 65 year old males might be, say, around 22 years today compared with, say, 13 years 40 years ago. However, due to idiosyncratic uncertainty, the actual future life span for any one individual picked at random from that group could be anywhere from a few days to more than 40 years.
- 5.17 The corresponding charts for females tell a similar story, even though the shapes are somewhat different.

Figure 6: 1970-72 female mortality curve

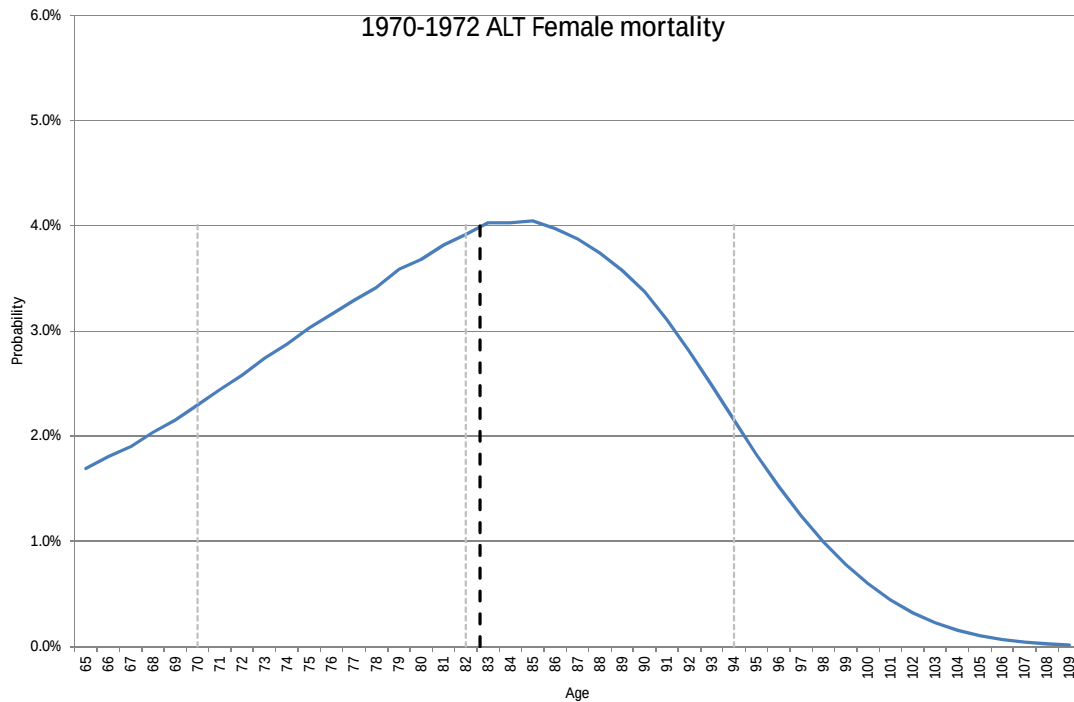
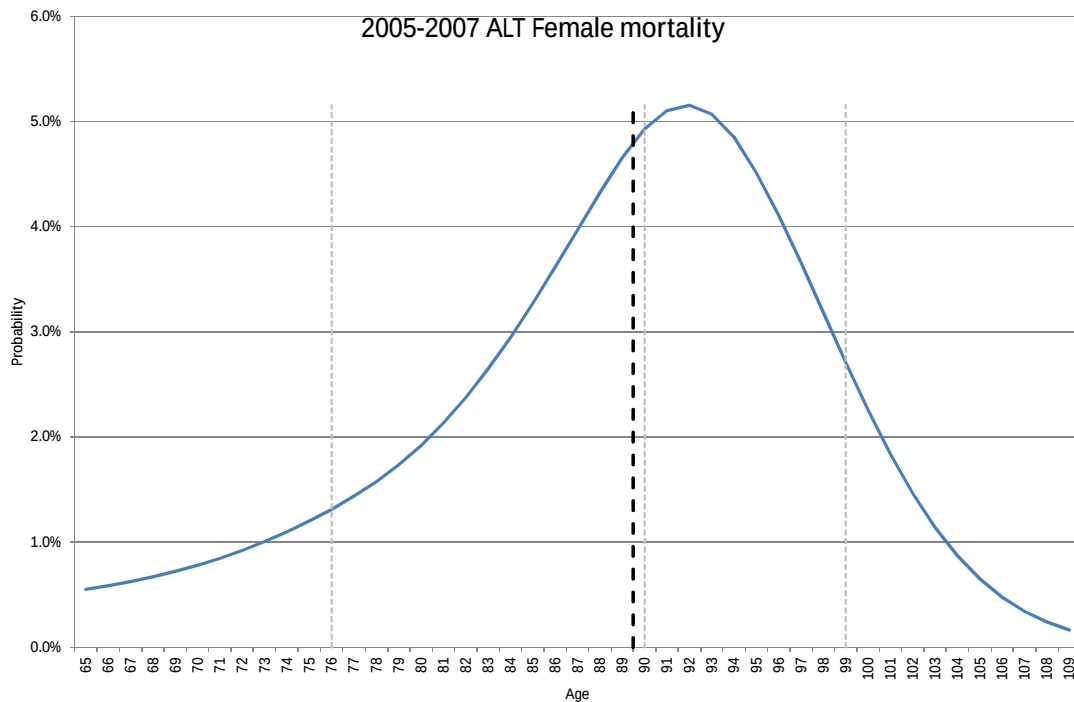


Figure 7: 2005-07 female mortality curve



- 5.18 For an individual retiree seeking to plan the drawdown of their account-based pension, idiosyncratic longevity risk is likely to be a bigger risk than systematic risk. That is, the width of the lifespan distribution is a bigger concern to an individual retiree than the midpoint. In other words, it is only of limited use to a retiree to know that their life expectancy is, say, 22 years when their actual future

lifespan could be anywhere between a few months and 40 years. As long as the distribution of lifespans remains somewhat wide, a retiree cannot know with confidence how long they will live, even though they might understand their 'life expectancy'.

- 5.19 If a retiree does not know how long they will live, it is impossible for that retiree to know the rate at which their account-based pension should be drawn down, if the objective is to maximise living standards throughout retirement. A rational retiree with an account-based pension who was seeking to minimise the risk of outliving their superannuation savings would seek to draw their account-based pension down at the minimum rate. Most Australians with account-based pensions are believed to draw down at the minimum rate.
- 5.20 Following the GFC there were calls from retirees to have the minimum drawdown factors reduced. These calls were also consistent with the behaviour of people who were worried about the risk of outliving their superannuation savings.
- 5.21 While the behaviour described above is consistent with the behaviour of people who were worried about the risk of outliving their superannuation savings, the result is sub-optimal living standards in retirement given that, on average, about 31 per cent⁶ of their initial balance is not used for retirement income purposes.
- 5.22 Pooling longevity risk provides a mechanism for dealing with this uncertainty.
- 5.23 Pooling longevity risk is not the same as eliminating or transferring all longevity risk to another party. Rather, pooling longevity risk is about sharing longevity risk with others in the pool. In fact, pooling longevity risk can significantly reduce idiosyncratic risk but not systematic risk.
- 5.24 Importantly, pooling longevity risk allows retirees to enjoy better living standards in retirement than they can enjoy with an account-based pension, but without any increase in the risk of outliving their savings.
- 5.25 The next section looks at a retirement income product which seeks to pool longevity risk.

6 Group Self Annuity (GSA)

- 6.1 The main features of a simple GSA include:
- Retirees pay their accumulated superannuation balance at retirement into a 'pool'
 - Each year, surviving retirees are paid an income from the pool according to a pre-determined formula (to provide transparency)

⁶ For 65 year old males

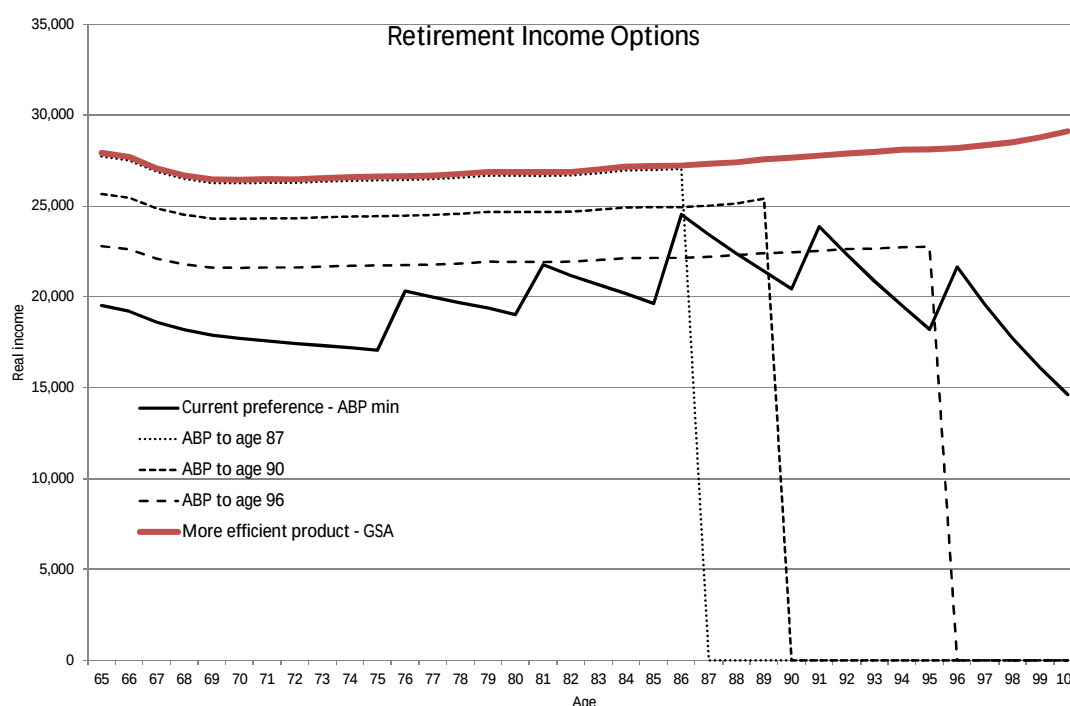
- No death benefits are payable
 - There is no scope to withdraw from the pool after commencement
- 6.2 More complex GSAs could incorporate a limited death benefit or a limited withdrawal benefit and period into their design. As noted in the previous section, pooling longevity risk reduces idiosyncratic risk⁷ and enables the generation of higher retirement income than from an account-based pension without any increase in the risk of running out of money. Substantial gains can be achieved with even fairly small pools. Maximum gain is achieved when no death benefit or withdrawal benefit is payable. That is, while death and withdrawal benefits could be included in the GSA concept, they reduce efficiency. The purpose of this paper is to consider efficient products, and so, here, the simple product design only is considered (that is, no death or withdrawal benefit).
- 6.3 For the purpose of this paper, for simplicity, we have modelled a closed pool of 500 65 year old males.
- 6.4 Each member contributes \$400,000 to the pool upon retirement at age 65. This allows direct comparison with the outcomes for account-based pensions which were illustrated above.
- 6.5 The annual (financial year) payout to each surviving member of the pool is governed by the following formula:
- $$\text{Total pool balance at 1 July} / [\text{number of survivors at 1 July}] \times \text{factor}_{\text{age}}$$
- 6.6 We have assumed net investment return averaging 6.3 per cent pa. This is 0.3 per cent less than the return assumed on the account-based pension (this additional fee is assumed to relate to the additional costs of administering the pool).
- 6.7 Details of the assumptions are in the appendix.

Retirement income generated directly by the GSA

- 6.8 The chart below compares the expected income payable to surviving members of the GSA pool with the expected income payable under the account-based pension (ABP) arrangements above.

⁷ The main source of longevity risk from the retiree's perspective

Figure 8: Group self annuity income pattern



- 6.9 The benefit payable from the GSA is consistently higher than the income available from an account-based pension.
- 6.10 Income levels are about 40 per cent higher than they are for an account-based pension drawn down at minimum rates. Thus, while the account-based pension with minimum drawdown supports average annual real income of around \$19,200, the GSA supports, in expectation, annual real income for life of around \$27,000.
- 6.11 Unlike drawing down an account-based pension at a faster rate, the GSA delivers this higher retirement income without any increase in the risk of outliving savings.

Design issues

- 6.12 GSAs present challenges. This includes design challenges. At the same time, GSAs present considerable opportunity for innovation. These design (and other) issues are beyond the scope of this paper but will require careful consideration as this type of retirement income product is developed and brought to market. A few issues are mentioned here very briefly.

Pool size

- 6.13 GSAs pool idiosyncratic longevity risk. Larger pools are more efficient than smaller pools and some scale is necessary. However, reasonable efficiency gains are possible with even fairly small pools. Further, the marginal improvement in efficiency decreases as the size of the pool increases.

- 6.14 We estimate that, on the assumptions adopted, a 90 per cent confidence interval for the life span of a 65 year old male would be around 32 years⁸. That is, we estimate that 90 per cent of deaths will occur between age 69 and 101. The 90 per cent confidence interval for the average life span of a pool of 65 year old males can be approximately found by dividing 32 by the square root of the initial size of the pool⁹. A pool of 50, therefore, sees a reduction in the confidence interval from 32 years to only 4 or 5 years. Similarly, a pool of 500 sees a reduction in the confidence interval from 32 years to less than 1.5 years.

Homogeneity

- 6.15 Conventional wisdom is that pools work better when they are 'homogeneous' (all pool members are the same age and gender etc and have a similar risk of dying in a particular year and contribute the same amount to the pool).
- 6.16 However, it is possible to design pools that accommodate members of different ages and genders and different risk characteristics.
- 6.17 This is likely to be desirable as well as possible because, among other things, it makes it easier to derive scale benefits.

New entrants

- 6.18 It is also possible and, again, likely to be desirable to design pools that are open to new entrants. Closed pools are likely to become increasingly difficult to manage as the membership reaches very old ages. On the other hand, allowing new entrants has a number of desirable benefits. First, it allows a longer time horizon to be taken when deciding on an investment strategy. Second, it makes it easier to manage the distributions to very old pool members.

Regulation

- 6.19 The need for, and nature of, any product and/or provider regulation will also require careful consideration as these products become part of the retirement income product marketplace.

Conclusion

- 6.20 The discussion above points to the possibility of designing retirement income products that:
- deliver higher income in retirement to retirees than an account-based pension; and
 - do this without increasing the risk of outliving savings.

⁸ Note again that we have considered only idiosyncratic risk and not systematic risk.

⁹ On the assumption that the underlying mortality curve is known and in line with our assumptions

- 6.21 If an account-based pension is drawn down at minimum rates then some money will be left over in the account on the death of the retiree. That is, some of the money saved up in the superannuation system for retirement income purposes is ultimately not used as retirement income¹⁰. Rather it is left to the estate of the retiree. A feature of Australia's retirement income system is the potential for money that will be bequeathed on death to be accumulated in a tax-advantaged (superannuation) environment.
- 6.22 Even under a faster drawdown scenario, there is a possibility that money will be left over in the account on death. For example, if the drawdown rate is set to exhaust the account at life expectancy (say, age 87) then:
- About half of all retirees will die before this age and for these retirees, some money will be left over on death; and
 - About half of all retirees will live beyond this age, and so outlive their savings.
- 6.23 On the other hand, the GSA works by ensuring that all money that is accumulated in the superannuation system during the accumulation phase is applied to retirement income purposes. In effect, the GSA redistributes money that would otherwise be applied to bequests to other retirees.
- 6.24 GSAs present design challenges. However, we do not believe that these challenges are insurmountable. The important point is that GSAs present an opportunity to deliver higher retirement incomes to retirees and to do this without any increase in the risk of outliving their savings.

7 Investment risk

- 7.1 It was noted in the previous section that account-based pensioners face both idiosyncratic and systematic mortality risk. It was also noted that while members of a GSA are exposed to systematic mortality risk, idiosyncratic mortality risk is reduced and this allows the GSA members to enjoy higher living standards than an account-based pensioner without any increase in the risk of outliving their savings.
- 7.2 This section looks at investment risk. Investment risk refers to the uncertainty in the performance of investments. In some years investments will perform well while in other years they will perform poorly. Poor investment performance can have a negative impact on retirement incomes. More generally, it is not possible to predict with confidence how investments will perform. Retirees who face investment risk face uncertainty around the level of their future retirement income.
- 7.3 Account-based pensioners face investment risk.

¹⁰ At least some of this money might be used as retirement income if the retiree has a surviving spouse.

- 7.4 Similarly, members of a GSA are also exposed to investment risk.
- 7.5 We have developed a stochastic model to investigate the combined forces of longevity and investment risk. Again, the purpose is to compare the retirement income experience of GSA members with that of account-based pensioners. Key assumptions are that the investment performance will be in line with that observed over the past 40 years and that mortality rates will continue to improve at the rate of improvement observed over the 25 years to 2005 and that the distribution of lifespans will remain somewhat wide. Clearly all three of these assumptions are subject to uncertainty.
- 7.6 However, before we illustrate the impact of the combined forces of investment risk and longevity risk, it is worth comparing a GSA to a traditional life annuity.

Life Annuities

- 7.7 At one level, a GSA and a traditional life annuity are similar products – in both cases, a superannuation lump sum is paid to a provider in return for a lifetime income.
- 7.8 Key differences are:
- A traditional life annuity pays a guaranteed level of income for life while the GSA described above does not provide any guarantees around the level of income paid
 - The income paid from a GSA is higher, in expectation, than the income paid from a life annuity
 - There is a risk that the income paid from a GSA may turn out to be lower than the income paid from a life annuity
- 7.9 Since a life annuity provides a guarantee around the level of income, the provider needs to hold capital to support that guarantee. That capital needs to be serviced and so part of the purchase price is required for that purpose. As a result, not all of the accumulated superannuation money is available, in expectation, to be applied to retirement income purposes.
- 7.10 On the other hand, since the GSA does not provide any guarantee around the level of income that will be paid, all of the accumulated superannuation money is available to be applied to retirement income purposes.
- 7.11 Looked at another way, a life annuity transfers longevity and investment risk from the retiree to the annuity provider.
- 7.12 The annuity provider manages longevity risk by:
- insuring a large enough group of annuitants to reduce idiosyncratic mortality risk to a low level; and

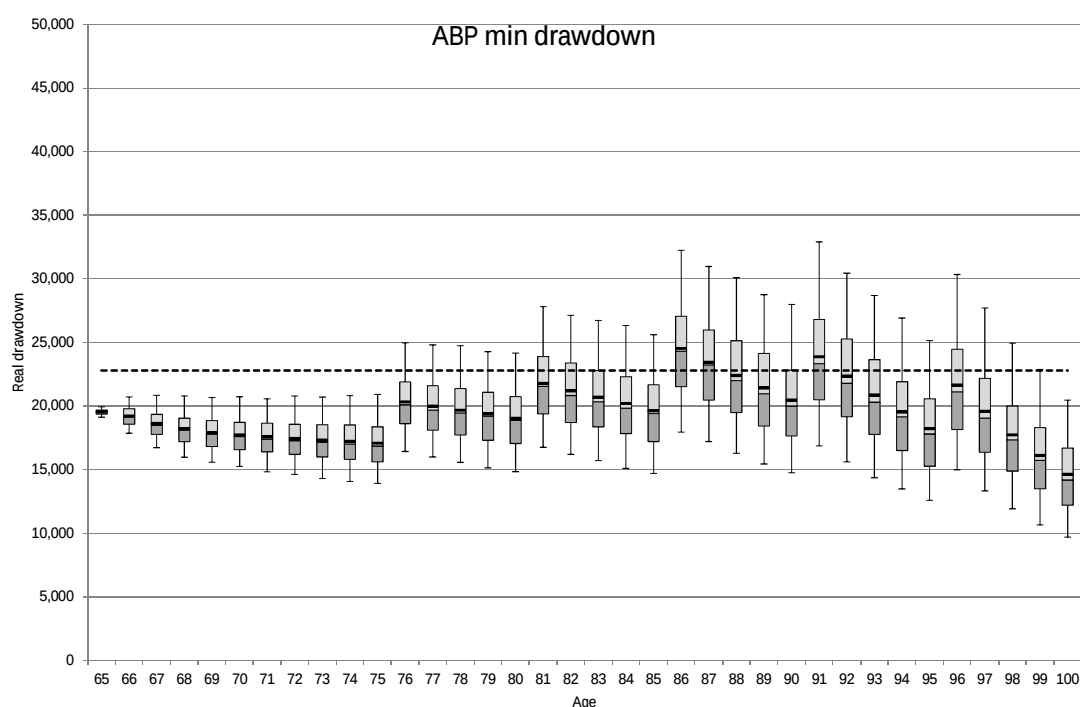
- holding a sufficiently large capital reserve to deal with the residual uncertainty (systematic mortality risk¹¹).
- 7.13 The provider manages investment risk by:
- Investing in assets which match as far as possible the profile of the annuity payment streams. In practice, this results in investing substantially in low risk (low return) fixed interest type investments; and
 - holding a sufficiently large capital reserve to deal with the residual uncertainty around investment return.
- 7.14 The annuity provider's pricing (ie the rate that it offers prospective annuitants) has to be sufficiently conservative to ensure both a very high probability that it will be able to honour its obligations to annuitants and also that it will be able, at least in expectation, to adequately service its capital.
- 7.15 On the other hand, as noted above, the GSA does not transfer longevity risk to a third party – rather (idiosyncratic) longevity risk is reduced by being pooled among members of the GSA. Systematic mortality risk including selection risk is retained within the pool and, as a result, the GSA cannot (and does not) offer guarantees around the level of income to be paid.
- 7.16 Taken together, these points explain why the income from the GSA is higher, in expectation, than the income from a life annuity. They also explain why there is a risk that the income from the GSA will be less than from the life annuity.
- 7.17 Looked at another way, the life annuity protects the annuitant against the risk of poor investment performance but also prevents the life annuitant from enjoying any upside benefit from good investment performance. On the other hand, the GSA allows members to benefit from good investment performance but at the same time, exposes them to the risk of poor investment performance. Similarly, the life annuity protects, at a price, the annuitant against the risk that the cohort of annuitants will live longer than expected, on average, but also prevents the life annuitant from enjoying any upside benefit from higher than expected mortality rates (more deaths). On the other hand, the GSA allows members to benefit from heavier than expected mortality experience but at the same time, exposes them to the risk of lighter mortality experience (fewer deaths).
- 7.18 For the purpose of this paper, the FSI has asked us to assume an annuity price of \$5,700 per \$100,000 for a 65 year old male. That is, we have assumed that for a purchase price of \$100,000 a 65 year old male will be paid a guaranteed CPI-indexed annuity for life, commencing at \$5,700 per annum.

¹¹ Systematic mortality risk for a life annuity provider also entails so-called selection risk. Not only is the insurer uncertain about the extent of future improvements in mortality but also about the underlying mortality of the group of people who choose to purchase an annuity.

Product comparison

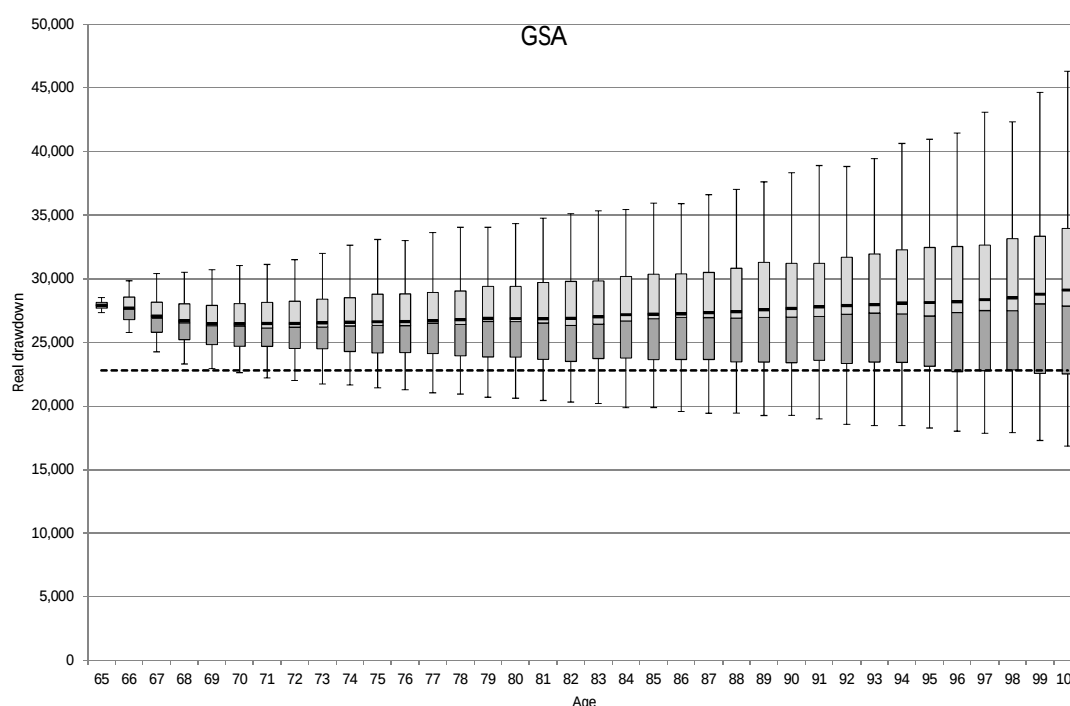
- 7.19 The charts below illustrate the combined impacts of investment and longevity risk on retirement income levels for the three product types considered so far. The boxes show the interquartile range (25 per cent to 75 per cent) of simulated outcomes and the whiskers show the 5th and 95th percentiles. The average (mean) outcome is also shown in each box as a thick line.
- 7.20 The first chart compares the drawdown pattern for an account-based pension drawn down at minimum rates with the life annuity (represented by the dashed line).

Figure 9: Account based pension distribution of annual drawdowns



- 7.21 Based on the assumptions adopted here (that is, the life annuity pricing assumptions and the assumed investment and inflation environment), the life annuity outperforms the account-based pension in most years.
- 7.22 The chart below compares the income pattern for a GSA with the life annuity (dashed line).

Figure 10: Group self annuity distribution of annual income



- 7.23 The GSA delivers more retirement income than the life annuity in expectation. There is, of course, a risk that the GSA will deliver less retirement income than the life annuity. Based on the assumptions adopted here, that risk is estimated to be less than 5 per cent. Note, of course, that the assumptions are subject to a deal of uncertainty and the range of reasonable assumptions is wide. Nonetheless, in expectation, a GSA will outperform a life annuity where the measure is average annual retirement income. Clearly a life annuity will outperform a GSA if the measure is stability or predictability in retirement income.

8 Flexible longevity risk management

- 8.1 The previous sections have discussed two products that can address longevity risk – the GSA and the life annuity.
- 8.2 In both cases, a retiree uses their accumulated superannuation money to purchase a retirement income product that pays an income stream for life.
- 8.3 Both products deliver higher expected retirement income than an account-based pension drawn down at minimum rates. As discussed in section 4 the minimum drawdown strategy is the best way for an account-based pensioner to ensure a reasonably stable retirement income profile while at the same time having no risk of completely running out of money.
- 8.4 The GSA delivers about 40 per cent more retirement income on average than the account-based pension drawn down at minimum rates. The life annuity delivers almost 20 per cent more retirement income than the account-based pension and,

at the same time, provides the retiree with complete certainty around the level of retirement income that they can expect.

8.5 However, both products involve the loss of some flexibility for retirees. This is because, as described, they both involve the retiree paying their entire accumulated superannuation balance to the provider and thereafter having their annual retirement income determined formulaically. Accordingly, retirees lose control of their capital.

8.6 It is possible to at least partially address this loss of control while still delivering better retirement living standards without any increase in the risk of running out of money.

8.7 This section looks at a number of flexible longevity risk management strategies.

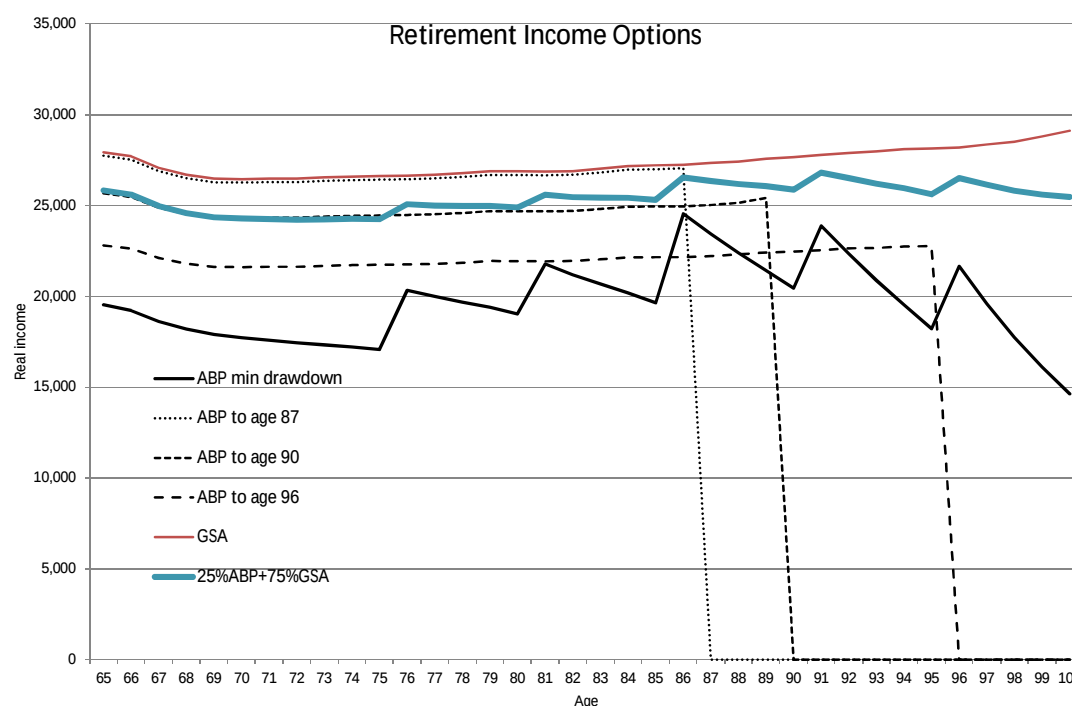
8.8 First, it is obviously possible for a retiree to retain a portion of their initial superannuation balance to be used as an account-based pension, while, for example, using the rest of their initial balance to purchase a GSA.

8.9 We have modelled this product combination on the following assumptions:

- 25 per cent of the initial \$400,000 balance is retained and used as an account-based pension drawn down at minimum rates
- The remaining 75 per cent is used to purchase a GSA

8.10 The chart below compares the expected outcomes for this product combination with the 100 per cent account-based pension and with the 100 per cent GSA.

Figure 11: 25% ABP + 75% GSA combination income pattern



- 8.11 This product combination delivers about 30 per cent more retirement income than the account-based pension drawn down at minimum rates. At the same time, it does not result in any increase in the risk of outliving savings. The product delivers less income than the 100 per cent GSA – this is the price to be paid for the additional flexibility offered by the account-based pension component.
- 8.12 Notably, this product combination also delivers about the same level of retirement income as an account-based pension which is run off over the period to age 90. Thus, an account-based pensioner could achieve the same level of retirement income (around \$25,000 per annum in real terms) by drawing down their account-based pension faster. However, relevantly, this drawdown strategy results in an increased risk of running out of money. Any retiree who survives to age 90 will, in fact, run out of money under this drawdown strategy. We estimate that about 40 per cent of 65 year old males will survive to age 90. Therefore, although it is possible to use an account-based pension to deliver income at this level for a period of time, the strategy also involves a 40 per cent risk of running out of money.
- 8.13 Second, for the purpose of this paper, we describe a simple deferred GSA. The main features of the deferred GSA are:
- Retirees pay a proportion of their accumulated superannuation balance at retirement into a ‘deferred longevity pool’. No payments are made from the deferred longevity pool before contributors reach the ‘trigger age’
 - The balance of the accumulated superannuation account balance is available to be drawn down by the retiree on an account-based pension basis
 - For retirees who survive to the ‘trigger age’, payments are made each year from the deferred longevity pool according to a pre-determined formula (to provide transparency)
 - No death benefits are payable
 - There is no scope to withdraw from the deferred GSA¹²
- 8.14 In order to allow comparison with the other products we have modelled the deferred GSA product as follows:
- Retirees are assumed to be 65 year old males with a superannuation retirement balance of \$400,000
 - Retirees contribute around 13 per cent of their balance (around \$52,000) into a deferred GSA¹³

¹² As for GSAs more complex deferred GSAs could contemplate the inclusion of limited death and withdrawal benefits.

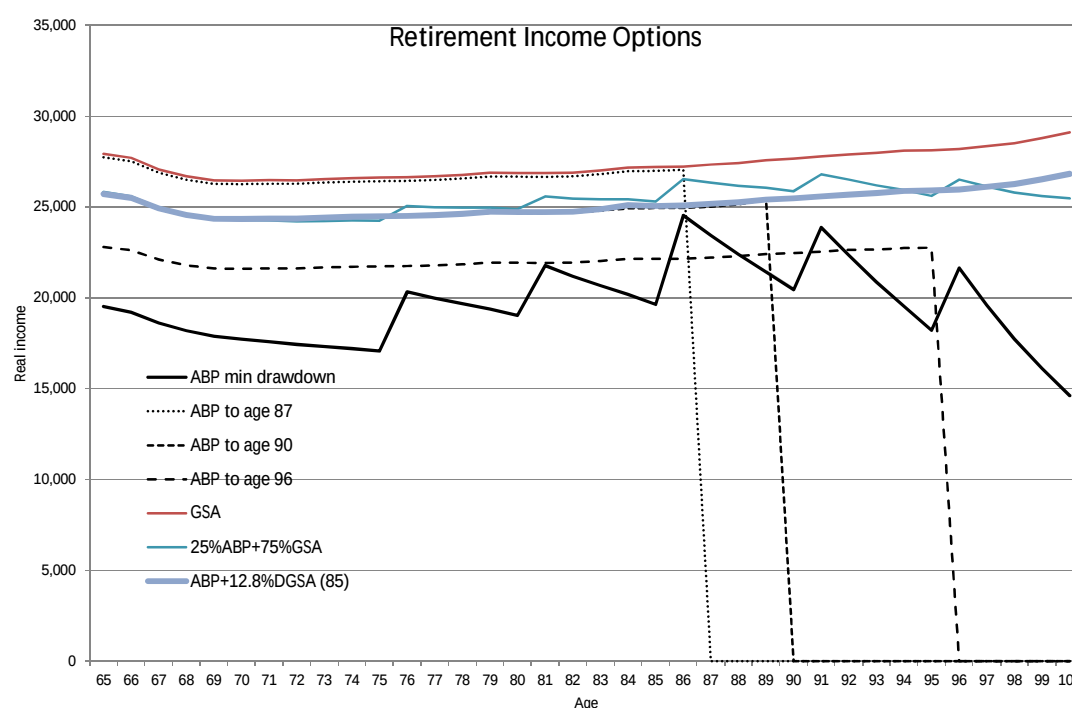
- The trigger age for the deferred GSA is 85. For those who survive to age 85, the deferred GSA works from that age onwards in the same way that the GSA works from age 65.
- The remaining balance (around \$348,000) is used as an account-based pension and is drawn down progressively over the 20 years from retirement to age 85

8.15 The deferred GSA provides a form of longevity risk insurance. That is, it secures a level of income later in retirement (for those who survive that long). We estimate that more than 60 per cent of retirees will survive to age 85.

8.16 Since later life retirement income is secured by the deferred GSA, this allows the residual balance (again, applied to an account-based pension) to be drawn down more quickly without increasing the risk of running out of money. Indeed, this is likely to be the primary reason for constructing this type of product combination.

8.17 The chart below shows the income payable from the combined account-based pension and deferred GSA arrangement with the income paid from the products considered earlier in this paper.

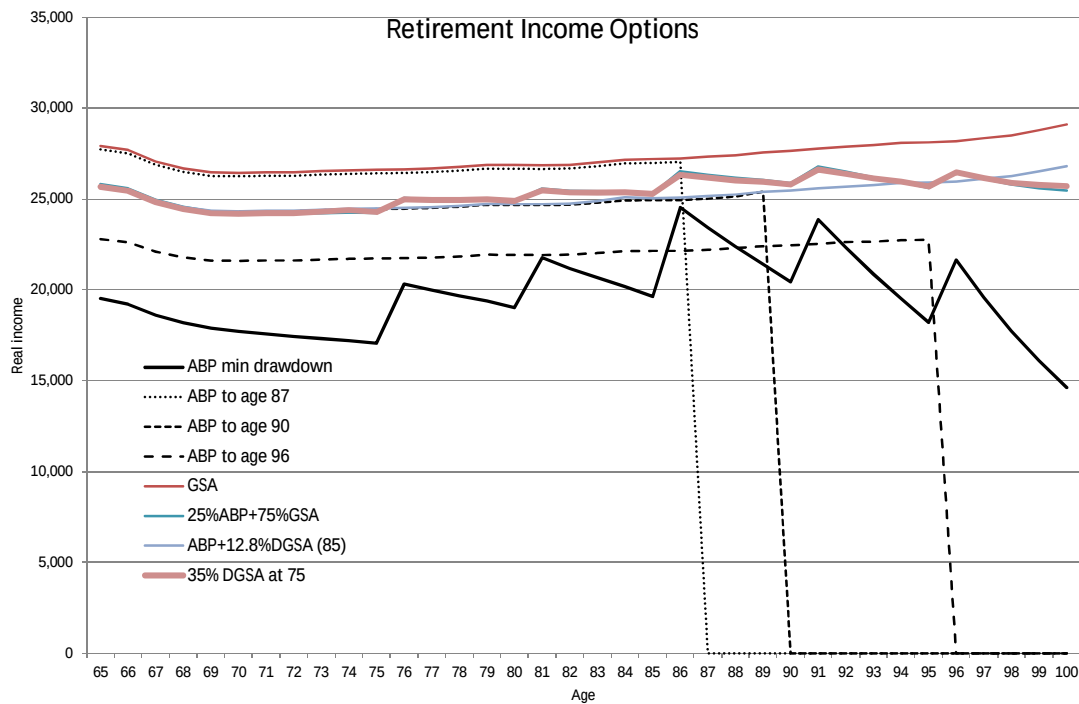
Figure 12: ABP + 12.8% DGSA combination income pattern



¹³ The 13 per cent contribution was selected to ensure a reasonably stable income throughout retirement, in expectation. A higher contribution would be expected to result in higher post age 85 income levels at the expense of lower pre-age 85 income levels and vice-versa.

- 8.18 As for the previous product combination, this product combination is more efficient than an account-based pension but is somewhat less efficient than the 100 per cent GSA.
- 8.19 In fact, it delivers an income profile which is similar to the first product combination described above.
- 8.20 The fact that these two product combinations give similar results (in terms of retirement income expectations) indicates a 'frontier' of reasonably efficient product combinations. It is easy to envisage a family of product combinations where $x\%$ of the initial balance is used to purchase a GSA product with payments commencing from the GSA product at age y while retaining the other $(1-x\%)$ in an account-based pension. Here, the combination of 25 per cent account-based pension/75 per cent GSA has x at 75 per cent and y at 65 years. The combination of 87 per cent account-based pension/13 per cent deferred GSA has x at 13 per cent and y at 85 years.
- 8.21 To illustrate the concept we have described another product combination which gives similar outcomes. In this combination:
- Retirees are assumed to be 65 year old males with a superannuation retirement balance of \$400,000
 - Retirees contribute 35 per cent of their balance (around \$140,000) into a deferred GSA
 - The trigger age for the deferred GSA is 75. For those who survive to age 75, the deferred longevity pool works from that age onwards in the same way that the GSA works from age 65.
 - Of the remaining balance (\$260,000), 80 per cent (\$208,000) is used as an account-based pension and is drawn down progressively over the 10 years from retirement to age 75
 - The final \$52,000 is retained in an account until age 75 where-after it is drawn down at account-based pension minimum rates
- 8.22 The chart below illustrates that this product combination again delivers around \$25,000 in annual retirement income in expectation, similar to the other product combinations discussed above.

Figure 13: ABP + 35% DGSA combination income pattern



Source of retirement income

8.23 It is interesting to see how the account-based pension and the GSA product interact in each of these three product combination strategies to deliver the retirement income. In the 25 per cent account-based pension/75 per cent GSA combination both products contribute to the retirement income in each year. In the 87 per cent account-based pension/13 per cent GSA, the account based pension is used up over the period until age 85 and the deferred GSA is used thereafter. In the third combination, the account-based pension is used throughout retirement and the deferred GSA kicks in from age 75 onwards. The charts below illustrate.

Figure 14: 25% ABP + 75% GSA combination income split

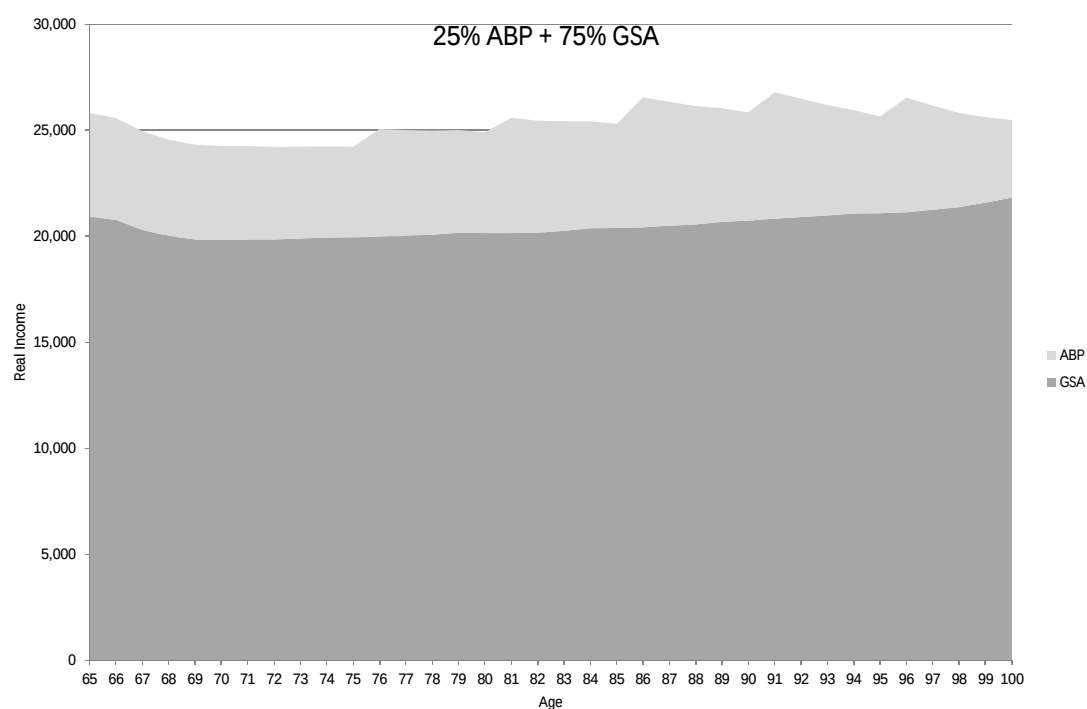


Figure 15: ABP + 12.8% DGSA combination income split

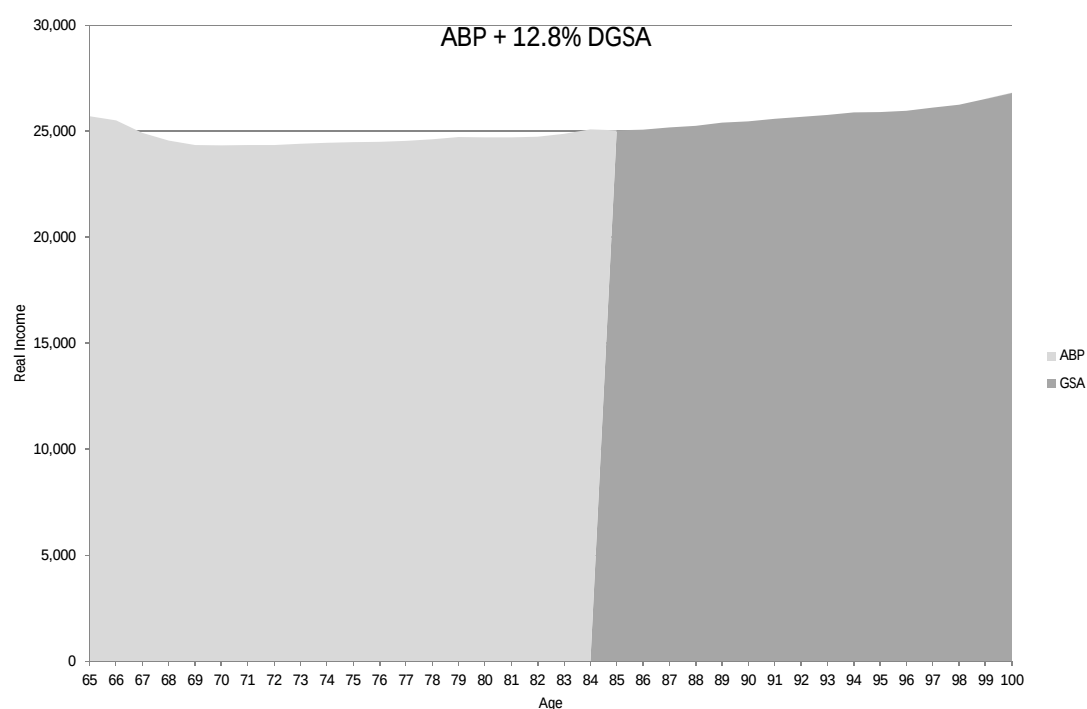
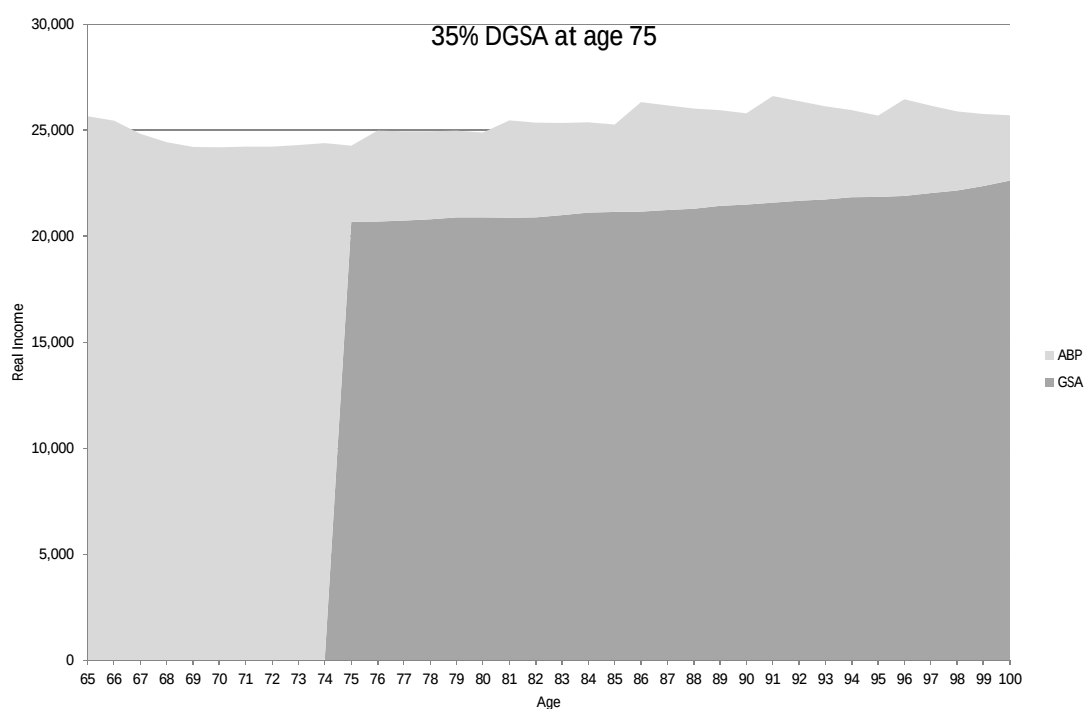


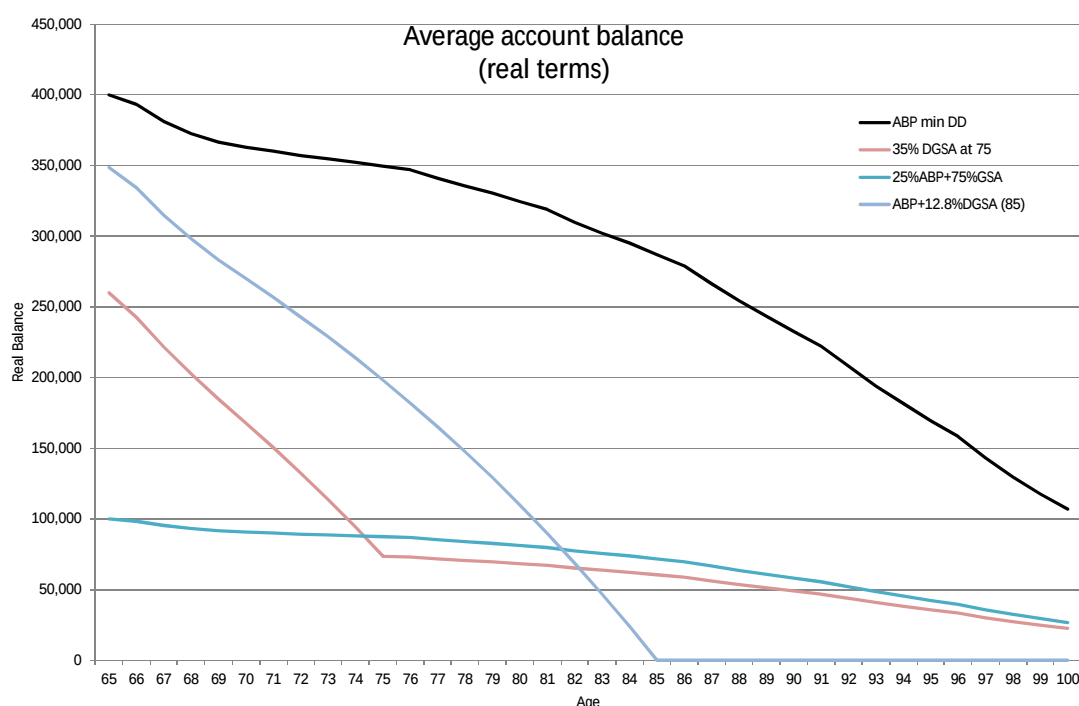
Figure 16: ABP + 35% DGSA combination income split



Death benefits

- 8.24 Since these product combinations involve the use of an account-based pension, they provide for a limited death benefit as well as providing about 30 per cent more retirement income than an account-based pension drawn down at minimum rates. Obviously, the death benefit that is available is lower than that which is available from the account-based pension drawn down at minimum rates. This is because GSA products redistribute money that would otherwise be applied to bequests to increase the income paid to all retirees in the pool.
- 8.25 The chart below shows the average account balance (real terms) that would be available to the retiree's estate on death at each age under each of these product combinations and under the account-based pension drawn down at minimum rates.

Figure 17: Product combinations real account balance



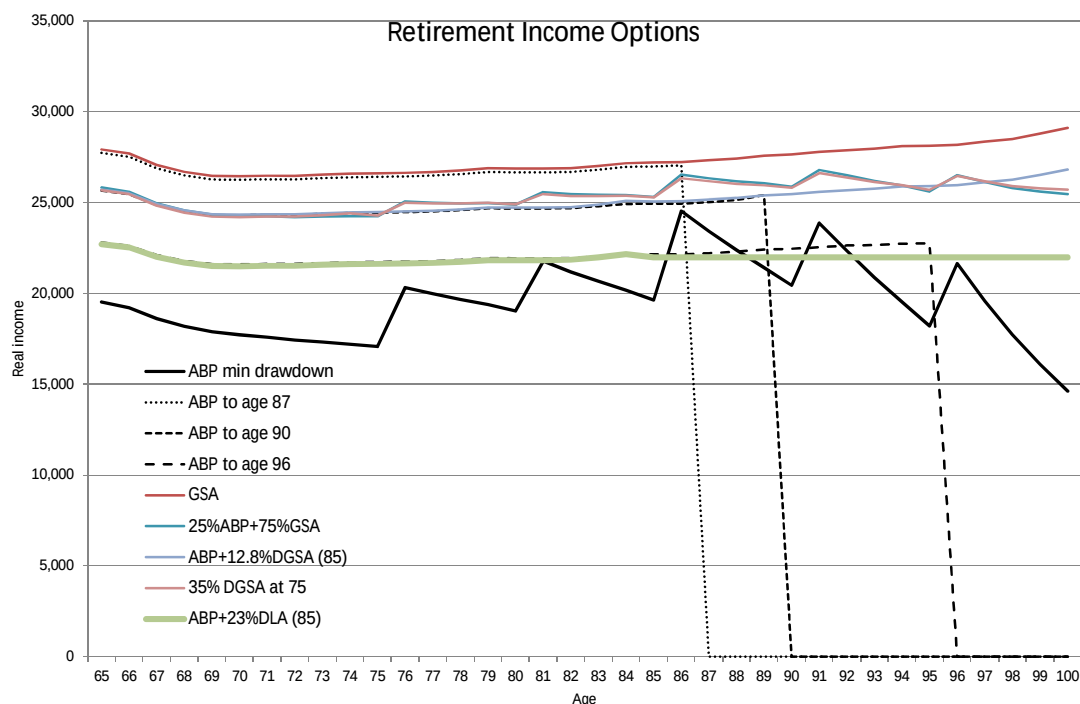
Deferred life annuities

- 8.26 A deferred GSA should not be confused with a deferred life annuity. A deferred life annuity provides for a guaranteed level of income commencing from the trigger age. Like immediate life annuities, deferred life annuities require capital to support the guarantee. As a result, they are relatively inefficient. Indeed, they are less efficient than immediate life annuities.
- 8.27 The FSI has asked us to model a product combination which involves the use of a deferred life annuity commencing at age 85. We have been asked to assume that a purchase price of \$10,000 will provide a CPI-indexed deferred life annuity for a 65 year old male, with annual payments commencing at \$2,390 per annum (today's dollars).
- 8.28 In order to ensure that a combination of an account-based pension and a deferred life annuity will provide a reasonably smooth income throughout retirement in expectation we have made the following assumptions:
- Retirees are assumed to be 65 year old males with a superannuation retirement balance of \$400,000

- Retirees contribute 23 per cent of their balance (around \$92,000) to purchase a deferred life annuity¹⁴
- The trigger age for the deferred life annuity is 85. For those who survive to age 85, the deferred life annuity provides a guaranteed CPI-indexed income stream for life
- The remaining 77 per cent of the initial balance is applied to an account-based pension which is drawn down steadily over the period until age 85

8.29 The chart below illustrates that this product combination delivers somewhat less annual retirement income in expectation, when compared with the product combinations discussed above.

Figure 18: ABP + 23% DLA combination drawdown pattern



8.30 This product combination delivers about 14 per cent more retirement income than the account-based pension drawn down at minimum rates. At the same time, it does not result in any increase in the risk of outliving savings.

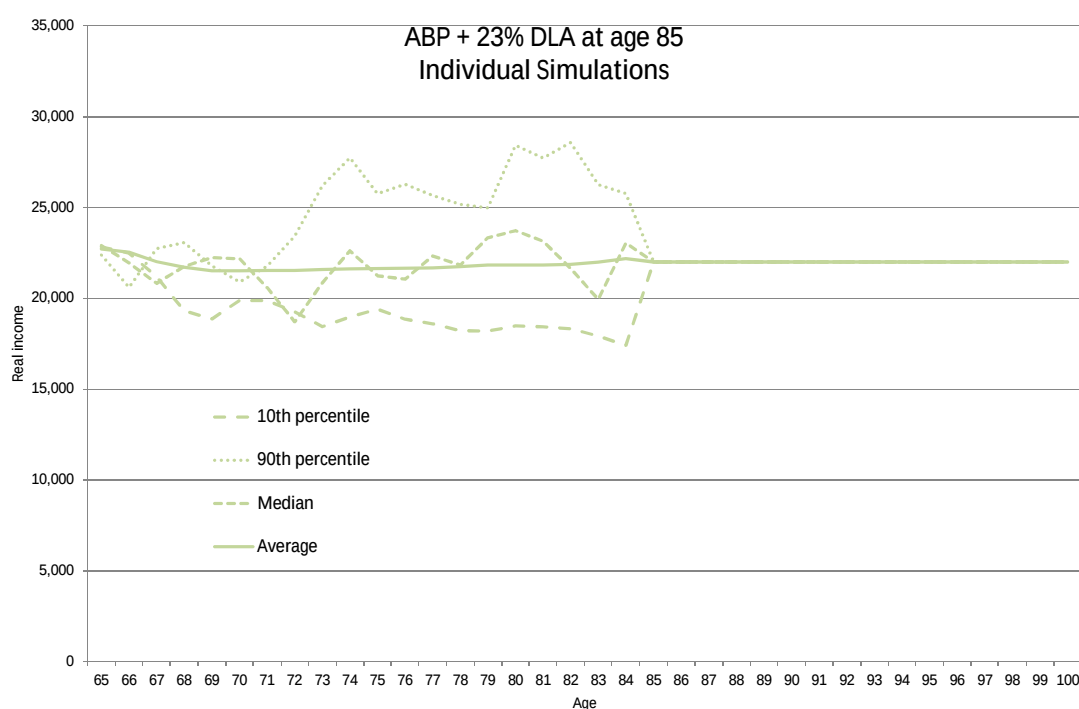
8.31 Notably, this product combination also delivers about the same level of retirement income as an account-based pension which is run off over the period to age 96. Thus, an account-based pensioner could achieve the same level of retirement income (around \$22,000 per annum in real terms) by drawing down their account-

¹⁴ The 23 per cent contribution was selected to ensure a reasonably stable income throughout retirement, in expectation. A higher contribution would be expected to result in higher post age 85 income levels at the expense of lower pre-age 85 income levels and vice-versa.

based pension faster. However, relevantly, this drawdown strategy results in an increased risk of running out of money. Any retiree who survives to age 96 will, in fact, run out of money under this drawdown strategy. We estimate that about 16 per cent of 65 year old males will survive to age 96. Therefore, although it is possible to use an account-based pension to deliver income at this level for a period of time, the strategy also involves a 16 per cent risk of running out of money.

- 8.32 The reason that this product combination delivers less expected retirement income than the earlier combinations relates to the price that needs to be paid to secure the guaranteed income later in life. Unlike a deferred GSA, the deferred life annuity provides a guarantee and this guarantee necessarily comes at a price.
- 8.33 It is interesting to consider the effect of the guarantee by looking at individual simulations from the model output. The chart below repeats the line above which showed the average outcome for each age and then adds three individual simulations. The simulations chosen represent the 10th percentile, median and 90th percentile of all the simulated investment environments. It can be seen that this product combination can result in a cliff shift in retirement income at trigger age.

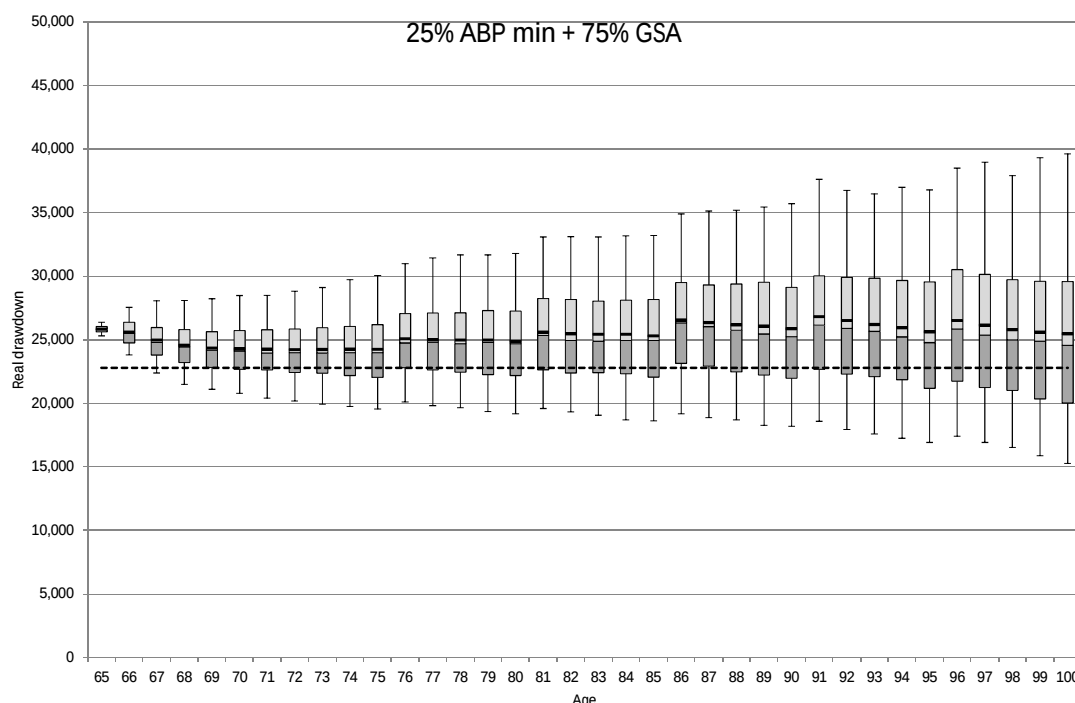
Figure 19: ABP + 23% DLA combination individual simulations



- 8.34 To further illustrate the effect of the guarantee, the charts below illustrate the impact of investment risk on some of the various product combinations discussed so far. Again, the life annuity curve (dashed line) is included for comparison.
- 8.35 The first chart illustrates the 25 per cent account-based pension/75 per cent GSA combination discussed above, again compared with an immediate life annuity. Although this combination delivers more income in expectation than the life

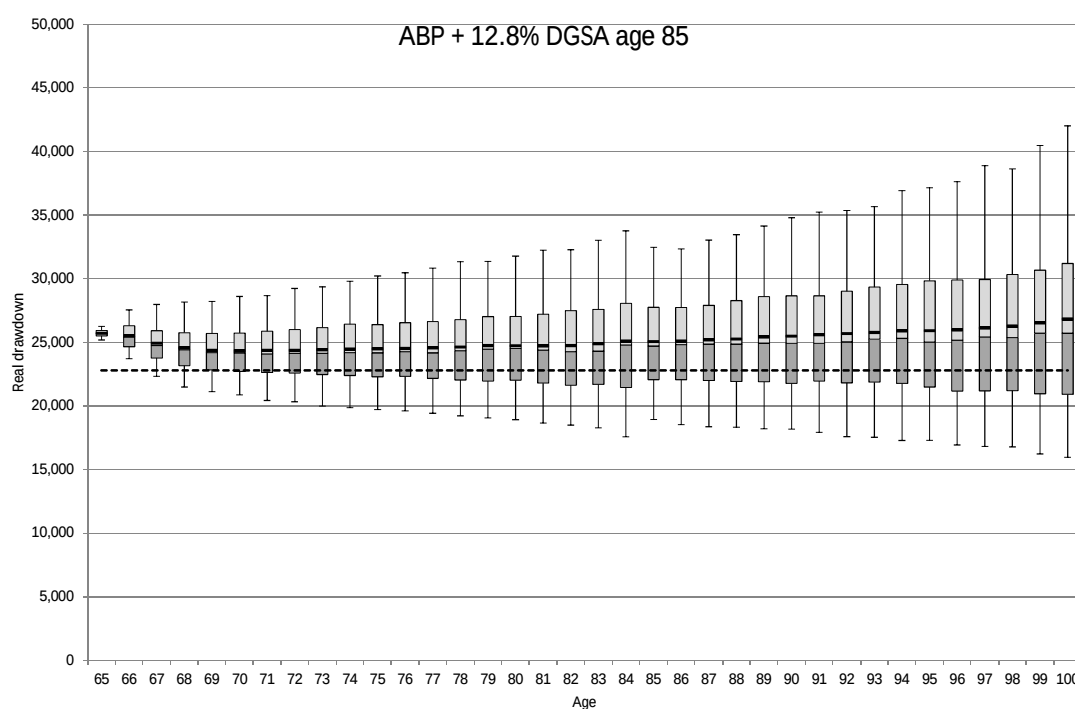
annuity, when compared with the 100 per cent GSA there is an increased risk that it will underperform the life annuity. On the assumptions adopted, that risk is more than 15 per cent.

Figure 20: 25% ABP + 75% GSA combination distribution of annual income



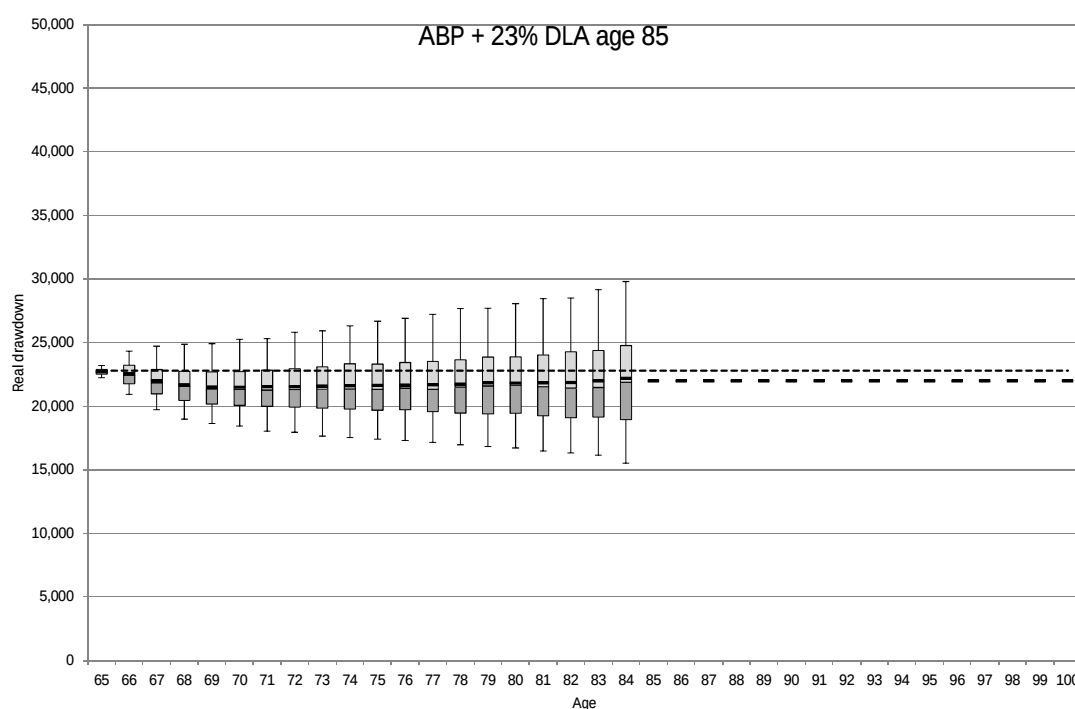
- 8.36 The next chart illustrates the 87 per cent account-based pension/13 per cent deferred GSA combination discussed above, again compared with an immediate life annuity. Although this combination delivers more income in expectation than the life annuity, again there is a risk that it will underperform the life annuity. On the assumptions adopted, that risk is more than 20 per cent. The chart also suggests that this product combination entails some additional risk as the retiree approaches the trigger age for the deferred GSA – the boxes and whiskers are wider just before age 85 than just after.

Figure 21: ABP + 12.8% DGSA combination distribution of annual income



8.37 The final chart illustrates the 77 per cent account-based pension/23 per cent deferred life annuity combination discussed above, again compared with an immediate life annuity.

Figure 22: ABP + 23% DLA combination distribution of annual income



8.38 Although this combination delivers more income than the basic account-based pension in expectation, it underperforms the life annuity as illustrated above. This is further evidence of the risks to life insurers involved with providing a deferred life annuity product. It is also noteworthy that this product combination entails material investment risk and the possibility of quite volatile incomes during the period before age 85 and then certainty thereafter. The result can be a step change in income upon reaching trigger age.

8.39 Finally, we have summarised in the table below a number of informative metrics derived from our analysis of these various product combinations. To obtain these metrics we considered each of the 1,000 simulations individually. (The charts above summarise the information by age whereas in the table below we have summarised the information by individual simulation produced by our model). First we present the table with some discussion further below.

Table 2: Product comparisons

	Product	Life Annuity	GSA	25%ABP + 75%GSA	87%ABP + 13%DGSA(85)	77%ABP + 23%DLA(85)	ABP min
	Expected income	22,800	27,000	25,100	24,900	21,900	19,200
Prob >	22,800	0%	97%	83%	80%	25%	4%
percentile	5%	22,800	23,200	21,600	21,400	19,600	16,600
	10%	22,800	23,900	22,200	22,000	20,000	17,000
	50%	22,800	26,900	25,000	24,800	21,800	19,200
relative to ABP min		119%	140%	130%	129%	114%	100%
NPV retirement income		328,000	388,000	359,000	357,000	314,000	275,000

8.40 The first row shows the expected average annual income (real terms) delivered by each product combination. To calculate this we first calculated the average annual retirement income in each simulation individually. This average was a weighted average where the weights were the probability of dying at each future age after 65. Then we averaged these averages across all simulations.

8.41 For example, on average, the GSA will deliver expected annual retirement income of around \$27,000 on the assumptions adopted. By comparison, the expected annual income derived from an account-based pension drawn down at minimum rates is around \$19,200. Trivially, the income expected from the life annuity is \$22,800.

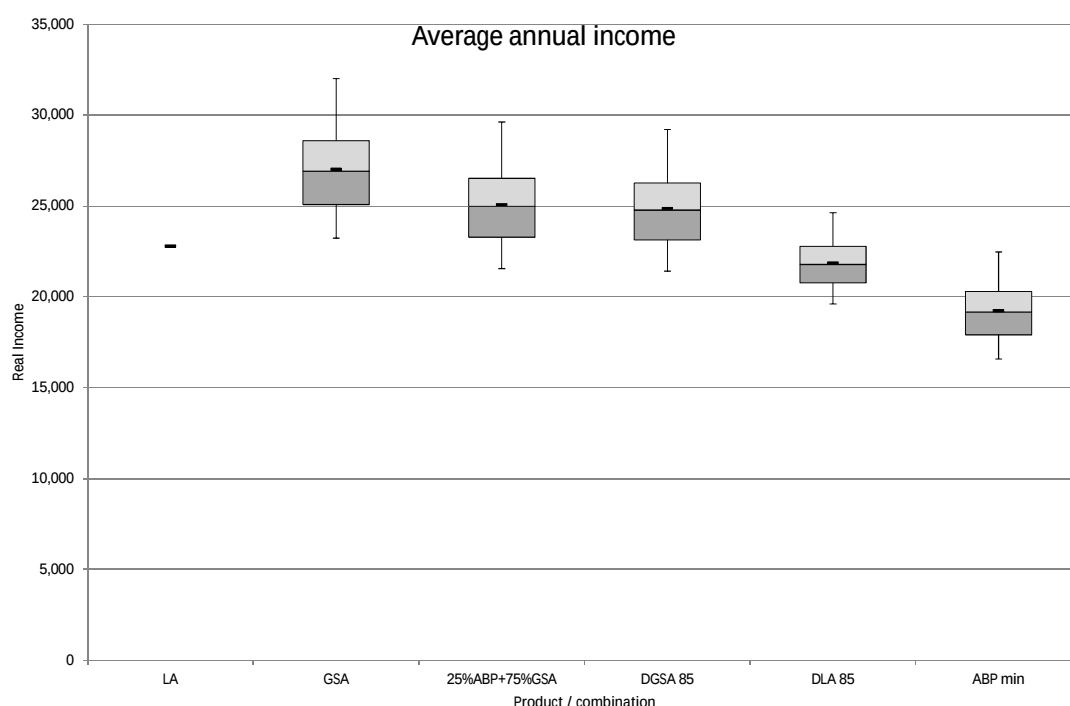
8.42 The next row shows the probability that each product will deliver higher average retirement income than the life annuity (again on the adopted assumptions). This shows, for example, that, of the 1,000 simulations, 970 resulted in the GSA outperforming the life annuity¹⁵. In 830 out of 1,000 simulations the 25 per cent

¹⁵ We tested a scenario where the life expectancy of GSA members was about two years longer than assumed here (that is, around 24 years compared with 22 years). In that circumstance the probability that the GSA delivers higher average retirement income than the life annuity is estimated at around 85 per cent.

account-based pension/75 per cent GSA combination outperformed the life annuity. In only 40 out of 1,000 simulations did the account-based pension outperform the life annuity. These 40 simulations would necessarily have involved unusually good investment performance.

- 8.43 The next three rows show various percentiles of average annual income delivered by each combination. For example, in 10 per cent of simulations, the average annual income delivered by the GSA was less than about \$23,900. This means that there is a 90 per cent chance (on the assumptions adopted) that the GSA will deliver more than \$23,900 per annum on average. On the other hand the 25 per cent account-based pension/75 per cent GSA combination is estimated to deliver average annual income of at least \$22,200 90 per cent of the time.
- 8.44 The next row summarises the performance of each combination relative to the account-based pension drawn down at minimum rates. The two GSA product combinations deliver, in expectation, around 30 per cent more income than the account-based pension.
- 8.45 The final row shows the expected net present value of the retirement income that is generated by each product and can be compared with the purchase price of \$400,000. This was calculated by discounting the expected retirement income cashflows at the average modelled investment return rate, net of account-based pension management fees. The GSA has a net present value of slightly less than \$400,000 because of the allowance for additional management fees. For other product combinations, there is a level of leakage (maximised for the account-based pension drawn down at minimum rates) related to the money expected to be left over in the account-based pension on death. Finally, for the deferred life annuity combination, there is a further margin in the pricing to support the required capital.
- 8.46 Finally, the chart below illustrates the distribution of average annual retirement income generated by each product combination.

Figure 23: Average annual income distributions by product/combination



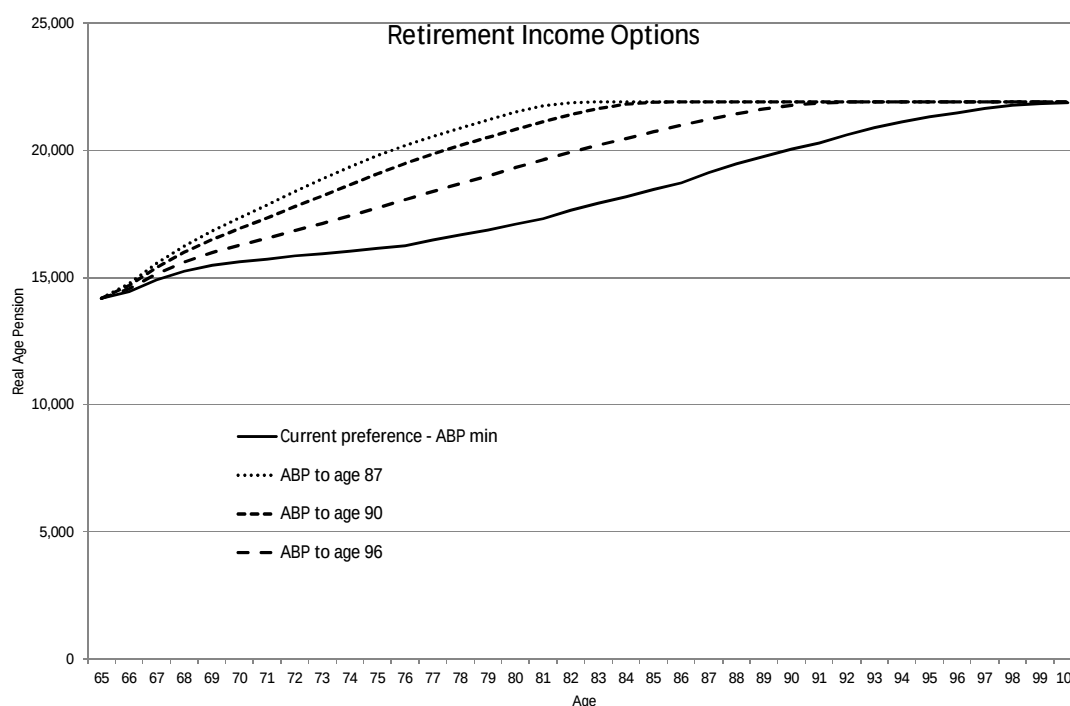
9 Age pension

- 9.1 The government funded age pension is means tested. In Australia, means testing arrangements involve both an assets test and an income test.
- 9.2 Most retirees will get some age pension at some stage during their retirement.
- 9.3 This section looks briefly at a few issues related to the interaction of the age pension means testing arrangements and the retirement income products described earlier.
- 9.4 For the purpose of the discussion here, we have made the simplifying assumptions that the only source of income available to the retiree is from their retirement income product and that the individual is single and a home owner.
- 9.5 We have also assumed that the age pension means testing arrangements for account-based pensions are the arrangements that come into force on 1 January 2015. In other words, we have assumed that the application of the income test to account-based pensions is based on deemed income rather than actual drawdown.
- 9.6 Finally, for simplicity we have assumed that increases in the age pension as well as the means test thresholds are in line with increases in the CPI and that the age pension is available from age 65.

Account-based pension

- 9.7 Retirees with a low account balance at a given time (less than roughly \$150,000 in today's dollars) will be entitled to a full age pension. Retirees with a large account balance (more than roughly \$770,000) will not be entitled to any age pension.
- 9.8 In general, the amount of age pension entitlement for an account-based pensioner depends on the balance in their account and therefore, over time, depends on their drawdown strategy¹⁶. In general, the faster that an account-based pension is drawn down, the higher is the subsequent level of age pension entitlement, all else equal¹⁷.
- 9.9 The chart below illustrates the age pension payable to an account-based pensioner with an initial balance of \$400,000 and assuming the drawdown strategies discussed earlier in this paper and assuming that all money drawn down is consumed. The minimum drawdown strategy results in least age pension cost to the taxpayer.

Figure 24: Account based pension age pension receipts



- 9.10 In the discussion above it has been noted that account-based pensioners face both longevity and investment risk. Taxpayers fund age pension costs and are

¹⁶ This also depends on investment performance.

¹⁷ This assumes that all money drawn down from the account is consumed.

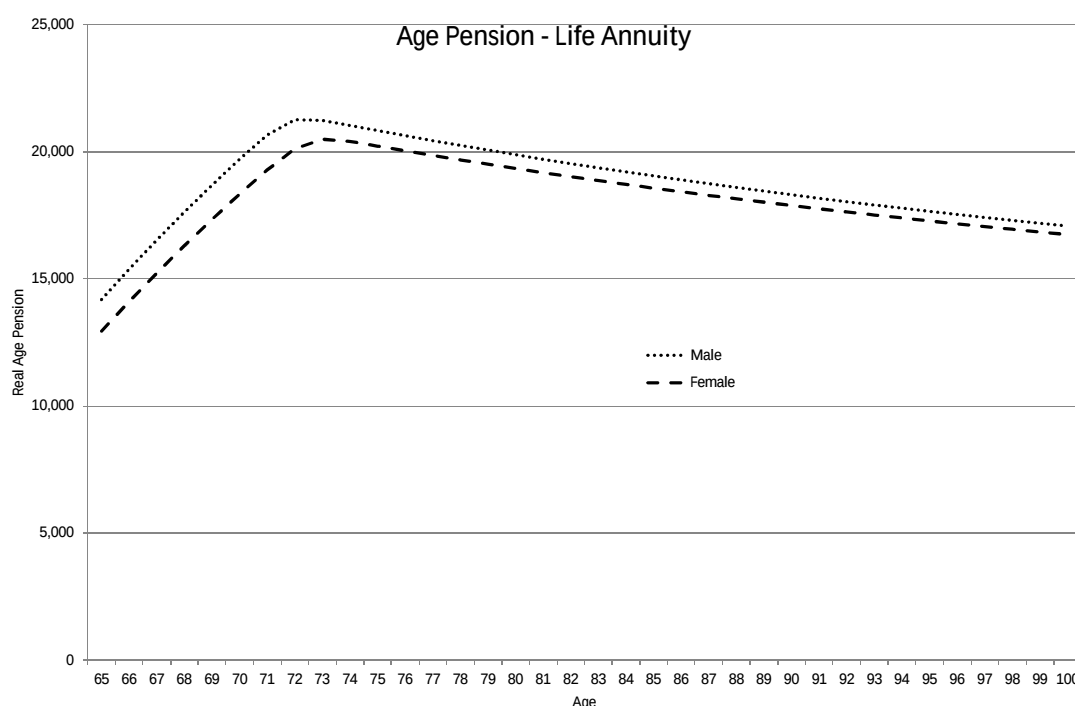
also exposed to these risks. Both poor investment performance and increased longevity expose the taxpayer to higher age pension outlays, all else equal.

- 9.11 At the same time, as illustrated in the chart above, the taxpayer is exposed to behavioural risk since the level of taxpayer support provided to a retiree via the age pension who owns an account-based pension is linked directly to the retiree's own drawdown choices.

Life annuity

- 9.12 As discussed earlier, a traditional life annuity pays a guaranteed level of retirement income for life. In this paper, we have considered CPI-indexed life annuities.
- 9.13 The example that we have used in this paper sees a life annuity which pays \$22,800 pa (real) throughout retirement.
- 9.14 Even though the retiree receives a constant real income from the life annuity throughout retirement (and, by assumption, no other income), the age pension payable to the retiree is not constant throughout retirement. The amount of age pension payable increases until the annuitant reaches their early-70s, after which it decreases. Moreover, on the pricing assumptions provided to us, a male with a \$22,800 life annuity would be entitled to more age pension than a female with a \$22,800 life annuity. The chart below illustrates the age pension payable from year to year to a male and female life annuitant who is each in receipt of a \$22,800 CPI indexed life annuity.

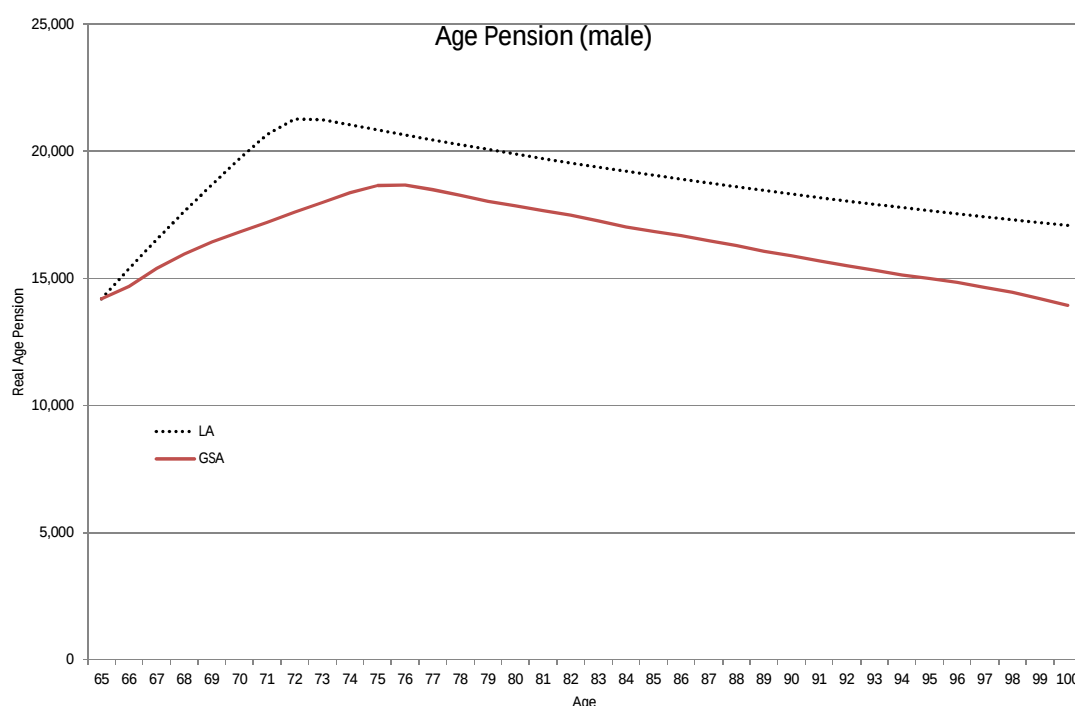
Figure 25: Life annuity age pension receipts



GSA

- 9.15 The means testing arrangements for a GSA will be dependent on the income and assets available to the customer from the product. As there are no GSA's currently in payment it is not possible to know exactly how the means test would apply to a GSA.
- 9.16 Since the simple GSA discussed in this paper is a product with zero residual capital value, it is possible that the application of the income test to a GSA could be similar to that of a life annuity (based on actual payment from the product less an amount for return of capital). For the purpose of this paper we have assumed that this is how the income test would be applied. Further, since the GSA entails at least a notional asset balance for each member, it is possible that the assets test could have regard to this notional balance (rather than being based on a formulaically depreciating purchase price as for a life annuity). For the purpose of this paper we have assumed that this is how the assets test would be applied.
- 9.17 The chart below illustrates the resulting age pension. To allow comparison with the result for a life annuity, the chart also includes the curve shown further above (for the male).

Figure 26: Group self annuity age pension receipts



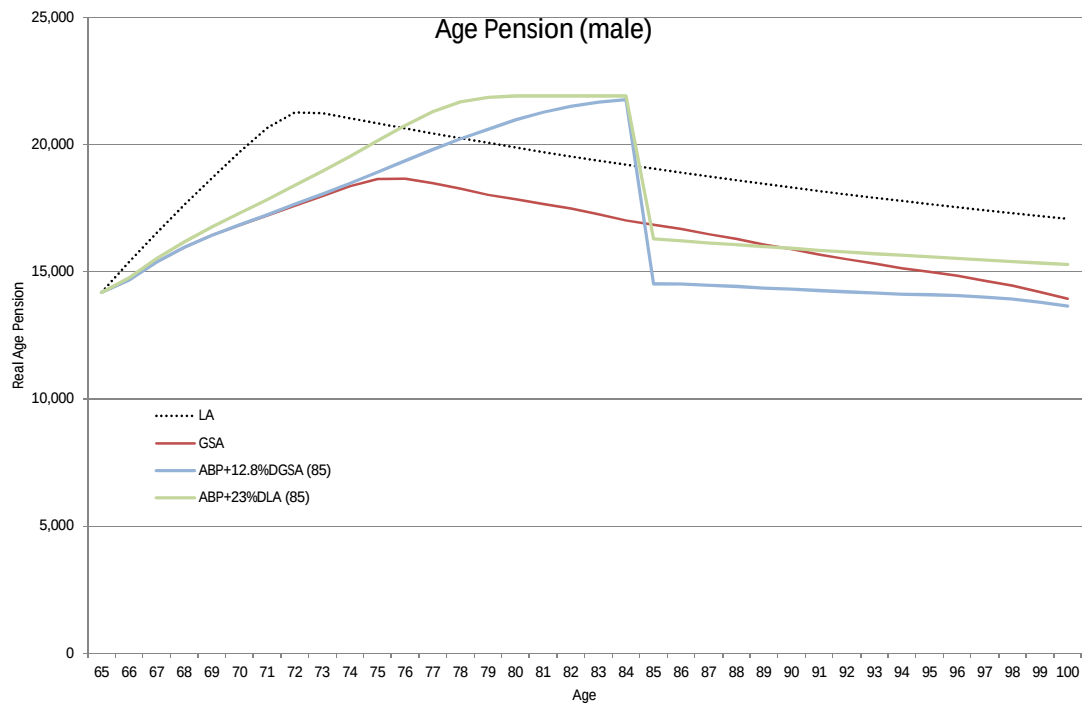
- 9.18 On the assumptions adopted, the GSA would result in lower age pension outlays than the life annuity, due mainly to the higher levels of assessed income. However, similar to the life annuity, the shape of the age pension curve is noticeably convex even though the average annual payment from the GSA is reasonably steady in real terms.

Products with a deferral period

- 9.19 The means testing arrangements for products which involve a deferral period will be dependent on the income and assets available to the customer from the product. As there are no deferred products currently available it is not possible to know exactly how the means test would apply.
- 9.20 For the purposes of our modelling, the deferred GSA is assumed to be treated essentially the same as the (assumed treatment of the) GSA, with the only difference being that the assessed income during deferment is zero. The account balance is assumed to be fully asset tested during deferment.
- 9.21 For the purpose of modelling the deferred life annuity, we have assumed that the asset test during deferment would apply to the initial purchase price with no reduction for return of capital. Once the deferred life annuity commences payment it is assumed to be treated in the same way as a standard life annuity.
- 9.22 The chart below illustrates that, on the assumptions adopted¹⁸, the means testing arrangements would result in a cliff shift in age pension for products involving a deferral period. The cliff shift happens when the retiree reaches the product's trigger age. In general, the deferred GSA results in less age pension than the deferred life annuity. This reflects the differences in the assumed means testing arrangements as well as differences in the residual account-based pension balance (during the period before trigger age). Again, it is important to note that this age pension modelling is based on a series of assumptions regarding means test treatment. It is very conceivable that the actual means test treatment could differ from that which has been assumed.

¹⁸ Which includes the assumed drawdown strategy for the account-based pension

Figure 27: Deferred products age pension receipts



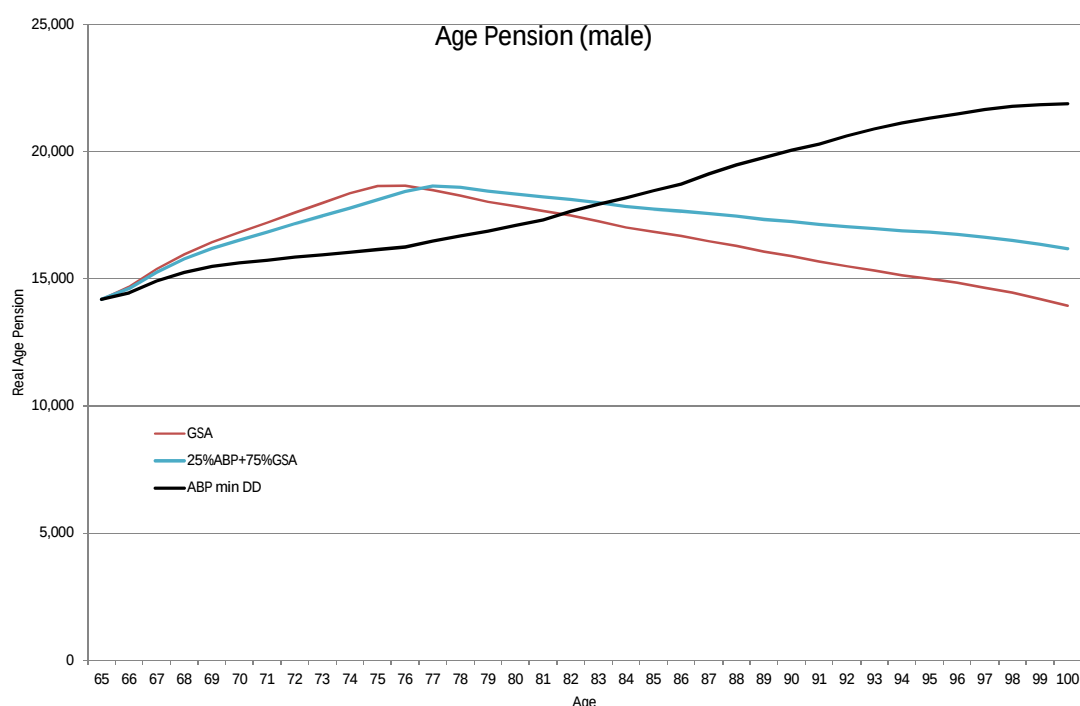
Product combinations

9.23 The chart below compares the age pension outcome for:

- a GSA;
- an account-based pension drawn down at minimum rates; and
- a 25 per cent account-based pension and 75 per cent GSA combination.

9.24 The chart illustrates that, for a period during the late-70s and early-80s the retiree would get more age pension out of the combination than they would get from either of the two products individually.

Figure 28: Combined account based pension and group self annuity age pension receipts



Conclusion on age pension

- 9.25 Age pension outcomes from the means testing arrangements depend on all of an individual's relevant circumstances. However, based on our simplified assumptions, the means testing arrangements do not appear to be product neutral. We have only provided a few simple illustrations here and there are other examples where the outcomes are more extreme.
- 9.26 There is a deal of uncertainty around exactly how the means testing arrangements would apply to both GSAs and products with a deferral period.
- 9.27 These issues need consideration.
- 9.28 Two principles that could reasonably be considered, given the long term nature of these income stream products, are:
- two people with the same means should have the same age pension outcome, regardless of their product choice; and
 - if a person's means do not change from one year to the next then their age pension outcome should not change either.

10 Concluding remarks

- 10.1 The dominant retirement income product in Australia is the account-based pension. Account-based pensions involve an inevitable and unavoidable trade-off between living standards during the early retirement years and the risk of running out of money during older age. That is, with an account-based pension, the price

to be paid for higher early retirement living standards is an increased risk of outliving savings.

- 10.2 Unless a retiree knows when they are going to die, drawing an account-based pension down at the minimum rates is the only way for an account-based pensioner to achieve a reasonably smooth income profile while retaining a zero risk of running out of money.
- 10.3 Longevity risk refers to the uncertainty, at the time of retirement, around ones future lifespan. The two sources of uncertainty for a retiree wondering how much longer they will live are referred to as systematic and idiosyncratic longevity risk.
- 10.4 Systematic risk refers to the (unpredictable) forces that can affect the mortality of many or all people in a group (or population) in the same or a similar way and affects the average life expectancy of a group.
- 10.5 Idiosyncratic risk refers to this individual randomness that has been and remains a feature of our mortality experience. For an individual retiree seeking to plan the drawdown of their account-based pension, idiosyncratic longevity risk is likely to be a bigger risk than systematic risk. In other words, it is only of limited use to a retiree to know that their life expectancy is, say, 22 years when their actual future lifespan could be anywhere between a few months to 40 years.
- 10.6 By pooling longevity risk a GSA provides an efficient means of reducing idiosyncratic longevity risk. As a result a GSA can deliver retirement incomes that are, in expectation, about 40 per cent higher than from an account-based pension drawn down at minimum rates. Importantly, this result can be achieved without any increase in the risk of outliving savings. In effect, the GSA redistributes money that would otherwise be applied to bequests to other retirees.
- 10.7 A traditional life annuity delivers a guaranteed level of retirement income in retirement. The price of the guarantee means that the income from a life annuity is very likely to be less, on average, than the income from a GSA.
- 10.8 Both pure GSAs and life annuities involve loss of flexibility for retirees (when compared with an account-based pension). Product combinations (eg a combination of an account-based pension and a GSA) can deliver significantly more retirement income than an account-based pension while retaining a degree of flexibility. Importantly, this result can again be achieved without any increase in the risk of outliving savings.

- 10.9 Similar results can be achieved by combining account-based pensions with deferred GSAs.

A handwritten signature in dark ink, consisting of a series of loops and a long horizontal stroke extending to the right.

Peter Martin
Australian Government Actuary

1 December 2014

Appendix – Model details and assumptions

The model that underlies the results presented in the report uses a simulation approach to project a range of potential outcomes for each of the products/combinations considered. Product income, account balances and age pension entitlements are projected over a 45 year period starting at age 65. Variation between individual projections is driven by both stochastic investment returns and stochastic mortality.

There are four main parts to the model:

- Investment returns;
- Mortality;
- Product income; and
- Age pension.

The first two components of the model are stochastic while the last two are deterministic. That is, once the investment and mortality scenarios have been simulated, product income and age pension receipts can be calculated deterministically.

In order to compare different products/combinations in a consistent manner, we have essentially used a seeded random variable approach in undertaking our projections. This means that we have first simulated 1,000 combined 45 year investment return scenario and 45 year mortality scenarios. We have then applied each product/combination to each of the pre-simulated investment and mortality scenarios to get a consistent set of projections across these sets of scenarios. That is, for each of the 1,000 simulations, the simulated investment returns and number of deaths is the same for each product/combination. Any differences between product outcomes therefore relate solely to differences in product features rather than any stochastic variation.

Each of the four parts of the model is discussed further below.

Investment returns

The investment return model is based to a large degree on a commonly used actuarial investment model known as the Wilkie model. The Wilkie model is an example of a both a cascade model, where economic variables influence each other through a well-defined cascade structure, and a stochastic asset model, where individual asset returns are allowed to vary randomly over time.

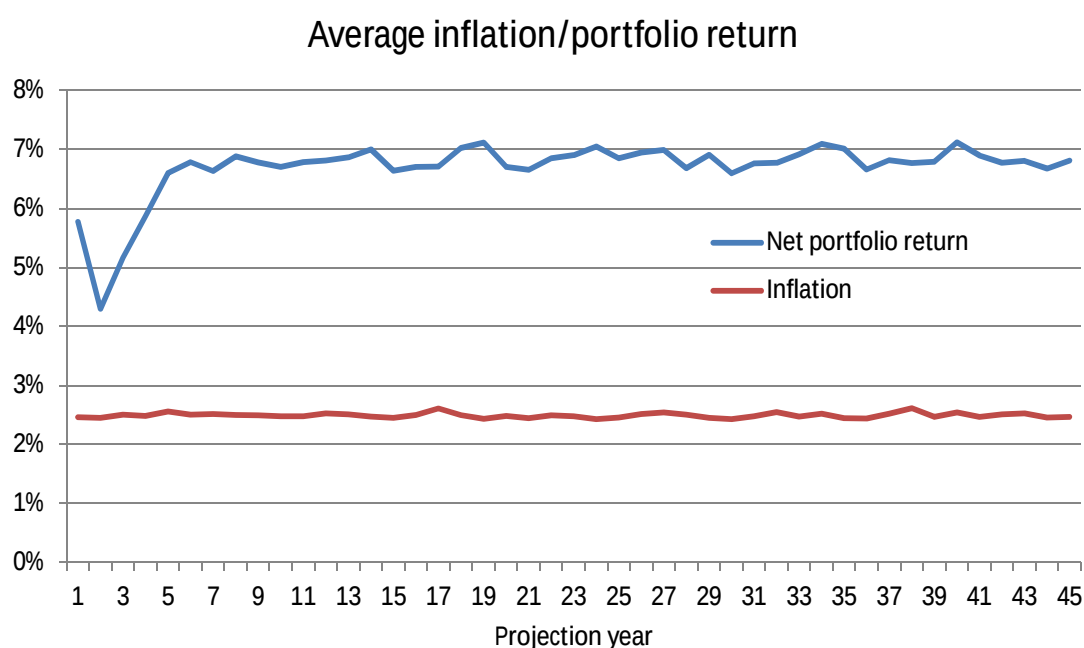
The model uses a broadly similar cascade structure to that of the Wilkie model, but with some adjustments made to the individual asset return models. Similar to the Wilkie model, the AGA model uses price inflation as the independent exogenous variable with consequent economic variables dependent on price inflation.

The model produces return projections for the following asset classes and economic variables; price inflation, long-term interest rates (10-year Government bonds), short-term interest rates (90-day bank bills), domestic bonds, and domestic equities (ASX 200 accumulation index).

In order to calibrate our model we have used roughly 41 years of publicly available data taken from the RBA and ABS websites. The available data contained all relevant variables, with the exception of total bond returns which we have dealt with separately. We have also used a significant amount of judgement in selecting our model parameters and have not relied solely on statistical model fitting techniques. In particular, we have adjusted our expected return on equity in order to achieve a desired portfolio return of 6.6 per cent per annum, net of fees for an account-based pension and in the context of CPI inflation of around 2.5 per cent per annum.

Simulated portfolio returns

As above, we simulated 1,000, 45 year investment return scenarios using the investment model described above. The average simulated portfolio return (net of management fees) for each projection year is shown in the chart below. As can be seen, returns for the first 4 years are somewhat lower than the long run average of around 6.6 per cent. This is primarily due to the mean reverting nature of the equity model combined with the relatively high returns experienced over the last two financial years. It also reflects the current relatively low interest environment which impacts on both cash and bond returns in the first couple of years. Essentially, the projected investment returns are assumed to commence in the 2014-15 financial year.



Mortality assumptions/simulations

Underlying mortality is assumed to follow Australian Life Tables (ALT2005-07) with an allowance for mortality improvement (MI) in line with the 25 year factors from ALT2005-07. Projected mortality rates (q_x) for a male aged 65 at retirement (in 2014) are shown in the table below:

Towards more efficient retirement income products

ALT2005-07 male q_x			ALT2005-07 male q_x			ALT2005-07 male q_x		
Age	Base	With MI	Age	Base	With MI	Age	Base	With MI
65	0.0120	0.0092	80	0.0576	0.0345	95	0.2311	0.1713
66	0.0132	0.0098	81	0.0642	0.0387	96	0.2432	0.1827
67	0.0146	0.0105	82	0.0716	0.0435	97	0.2544	0.1939
68	0.0160	0.0112	83	0.0798	0.0491	98	0.2646	0.2049
69	0.0176	0.0120	84	0.0890	0.0555	99	0.2737	0.2155
70	0.0192	0.0128	85	0.0991	0.0630	100	0.2821	0.2260
71	0.0210	0.0137	86	0.1102	0.0715	101	0.2918	0.2382
72	0.0232	0.0148	87	0.1224	0.0812	102	0.3002	0.2500
73	0.0260	0.0163	88	0.1353	0.0917	103	0.3077	0.2616
74	0.0294	0.0181	89	0.1489	0.1029	104	0.3144	0.2733
75	0.0331	0.0201	90	0.1629	0.1143	105	0.3207	0.2852
76	0.0372	0.0224	91	0.1770	0.1258	106	0.3261	0.2971
77	0.0415	0.0249	92	0.1910	0.1370	107	0.3311	0.3094
78	0.0463	0.0277	93	0.2048	0.1484	108	0.3366	0.3228
79	0.0517	0.0308	94	0.2182	0.1599	109	0.3419	0.3370

Everyone is assumed to die by age 110.

Actual simulated mortality experience was projected using a binomial model based on the above mortality rates (including an allowance for mortality improvement). In particular, the number of deaths in each years was simulated using a random binomial distribution with number of trials equal to the number of people alive at the beginning of the year and probability of success (death in this case) equal to the relevant q_x for the year.

Deaths were assumed to occur at the end of the year, after any product drawdowns/payments.

Product income

Account Based Pension

Account based pension (ABP) drawdowns were assumed to occur annually at the end of each year. For most scenarios, the ABP drawdowns were assumed to be at the current minimum rates as set out in the table below:

Age	Factor
65 - 74	5%
75 - 79	6%
80 – 84	7%
85 - 89	9%
90 - 94	11%
95+	14%

Drawdowns in each year were calculated as account balance at the start of the year multiplied by the relevant drawdown factor, subject to a maximum of the accumulated account balance. That is, the drawdown cannot exceed the account balance.

For products where the ABP component is assumed to be run down faster than at the minimum, we have used suitable annuity factors based on the period over which the ABP is assumed to be run down in order to determine the drawdown pattern. For example, where the ABP component is assumed to be run down by age 85 we have used annuity factors to age 85 to determine the drawdown pattern.

Management fees for the ABP products were set at 0.4 per cent per annum of the account balance.

Life Annuity

Both immediate and deferred life annuities were assumed to be payable (and indexed) annually in arrears.

Annuity pricing was based on information provided to the AGA by the FSI as shown in the table below:

Annuity type	Age payable	Gender	Real payout per \$10,000 invested
Immediate	65	Male	\$570
Immediate	65	Female	\$528
Deferred	85	Male	\$2,390
Deferred	91	Male	\$4,651

Note that these prices are for indexed annuities for a person aged 65 at the date of purchase with no death or withdrawal benefits.

Group Self Annuity

The GSA model is based on a homogeneous pool of 500 65 year old males. Each pool member starts with the same account balance (\$400,000) and therefore receives the same annual income from the pool. The pool operates much like an account based pension in that each person has a 'notional' account balance and receives drawdowns from the account. However, there are two main differences between the GSA and the ABP.

Firstly, drawdowns are set by the pool rather than by the individual. In particular, pool drawdowns are based on whole of life annuity factor using the mortality rates outlined above (which include an allowance for mortality improvement). The annuity factors are calculated assuming investment returns (net of fees) of 6.3 per cent per annum and inflation of 2.5 per cent per annum. The calculated annuity factors and corresponding drawdown factors are given in the table below:

Towards more efficient retirement income products

Age	Annuity factor	Drawdown factor	Age	Annuity factor	Drawdown factor	Age	Annuity factor	Drawdown factor
65	13.983	7.2%	80	8.418	11.9%	95	4.038	24.8%
66	13.653	7.3%	81	8.033	12.4%	96	3.877	25.8%
67	13.316	7.5%	82	7.652	13.1%	97	3.727	26.8%
68	12.973	7.7%	83	7.278	13.7%	98	3.585	27.9%
69	12.622	7.9%	84	6.912	14.5%	99	3.450	29.0%
70	12.263	8.2%	85	6.558	15.2%	100	3.317	30.1%
71	11.896	8.4%	86	6.218	16.1%	101	3.184	31.4%
72	11.520	8.7%	87	5.895	17.0%	102	3.055	32.7%
73	11.138	9.0%	88	5.593	17.9%	103	2.924	34.2%
74	10.752	9.3%	89	5.313	18.8%	104	2.786	35.9%
75	10.365	9.6%	90	5.055	19.8%	105	2.634	38.0%
76	9.976	10.0%	91	4.818	20.8%	106	2.457	40.7%
77	9.586	10.4%	92	4.601	21.7%	107	2.237	44.7%
78	9.196	10.9%	93	4.399	22.7%	108	1.947	51.3%
79	8.806	11.4%	94	4.212	23.7%	109	1.542	64.8%

Secondly, at the end of each year, after drawdowns have occurred, each surviving account is credited with a mortality bonus depending on the number of people who die during the year. For the purposes of our modelling, we have not allowed for any death or withdrawal benefits from the GSA. As such, each member forfeits their entire account balance on death. It would also be possible for the GSA to provide a small death benefit although this would necessarily reduce the efficiency of the product.

Since the pool consists of homogeneous members with identical account balances, the mortality credit for each surviving member is equal to the sum of the forfeited account balances divided by the number of survivors at the end of the year. Note that deaths are assumed to occur at the end of the year, after drawdowns.

Management fees for the GSA are assumed to be equal to the management fees for the ABP, plus an additional 0.3 per cent per annum of the notional account balance.

Deferred Group Self Annuity

The deferred GSA works similarly to the immediate GSA described above with the only difference being that drawdowns do not commence until the individual reaches the deferral age. During deferral, surviving members continue to accrue mortality credits while those who die during deferral forfeit their entire balance.

Age Pension

Payment rates and means tests

Current age pension payment rates and means test arrangements (as at 1 July 2014) are set out in the table below:

Towards more efficient retirement income products

	Singles	Couples
<i>Payment rates</i>		
Maximum rate	\$21,913 p.a.	\$33,036 p.a.
<i>Assets test</i>		
Lower threshold	\$202,000	\$286,500
Upper threshold	\$764,000	\$1,134,000
Taper rate	3.9%	3.9%
<i>Income test</i>		
Lower threshold	\$4,160 p.a.	\$7,384 p.a.
Upper threshold	\$47,986 p.a.	\$73,455 p.a.
Taper rate	50%	50%
<i>Deeming rates</i>		
Threshold	\$48,000	\$79,600
Rate below threshold	2.0%	2.0%
Rate above threshold	3.5%	3.5%

Current rules for current products

Current products (ABPs and life annuities) were assessed based on the means testing rules that are currently in place.

For life annuities, the income test applies to the actual annuity payment less an amount that represents a return of capital. The assets test is applied to the original purchase price less accumulated return on capital.

For account based pensions, we have applied the new deeming rules which will come into effect from 1 January 2015. The income test is therefore based on deemed income rather than the drawn income less a return of capital (as is the case currently). The assets test is applied to the actual account balance.

Current rules for new products

For products that are not currently available in the market (GSA, DGSA and DLA), there is some uncertainty about how the current means testing rules would apply. For the purposes of our modelling, we have applied the current means test rules based on our interpretation of how these rules might apply in practice. It is possible that these products may be treated differently from what we have assumed.

For the GSA, we have essentially treated it as an asset tested long term income stream that is backed by an account balance. In this case, the income test is applied to assessed income (actual drawdowns less a return of capital, as per the life annuity) and the assets test is applied to the notional account balance, as per the ABP.

The DGSA is essentially treated the same as the GSA, with the only difference being that the assessed income during deferment is zero. The account balance is fully asset tested during deferment.

For the DLA, we have assumed that the assets test during deferment would apply to the initial purchase price with no reduction for return of capital. Once the DLA commences payment it is treated in the same way as a standard life annuity.