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Choices and Constraints over Retirement Income Streams: Comparing Rules and Regulations

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Choices and constraints over retirement income streams: comparing rules and regulations *

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Abstract:
The new Simplified Superannuation regulations for Australian superannuation provide tax concessions to retirement income streams which comply with legislated minimum drawdown rules. We evaluate these new drawdown rules against four alternatives, including three formula-based 'rules of thumb' and the previous legislated minimum drawdown limits for allocated pensions. We find that the new regulations are a substantial improvement on the previous rules for allocated pensions and, when compared with the four formula-based rules, are a good compromise in terms of simplicity, adequacy and risk. We also find that welfare is lower for most individuals who follow the Simplified Superannuation compared with welfare under an optimal path or a simple fixed percentage drawdown rule, but that outcomes could be improved through a further simplification of the rules.

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1. Introduction

The past two decades have witnessed substantial changes to retirement savings policies and products around the world, as policy makers and the wealth management industry have attempted to address the retirement needs of ageing populations. Retirement income reforms in Australia, in the form of the Superannuation Guarantee and incentives to make voluntary contributions, have resulted in a huge increase in the coverage of superannuation, from less than 50 per cent of employees in the mid 1980s to close to 100 per cent of full time employees by 2006. However, despite the imminent retirement of the first of the baby boomers, far less attention has been paid to policy and product development to enable an orderly drawdown of savings in retirement than to enabling accumulation.[1]

In Australia, in the absence of compulsion, successive governments have attempted to encourage the take-up of retirement income streams through incentives in the tax system and concessions under the Age Pension means tests. While these incentives and concessions have been continually modified over the past twenty years or so, they appear to have done little to address Australian retirees' preference for lump sum benefits.

The Simplified Superannuation measures introduced in the 2006/07 Federal Budget[2] have changed the constraints and concessions for Australian superannuants yet again. In particular, once the measures are fully implemented, retirees aged 60 and over will be exempt from tax on all retirement benefits – whether taken as a lump sum or an income

[1] This is despite a growing literature on annuities and retirement payments. See for example Mitchell *et al* (1999), Brown (2001), Doyle *et al* (2002), Davidoff *et al* (2005), Dus *et al* (2005), Kingston and Thorp (2005), Horneff *et al* (2007) and Mitchell *et al* (2006).

[2] Subsequently marketed to the Australian public as *Better Superannuation*.

stream – and all retirement income streams will be subject to the same Age Pension income and assets tests, irrespective of income stream type. As well, where the drawn down pattern complies with a legislated schedule of minimum percentages of account balance, earnings on the underlying assets also will be free of tax. These new income streams are called 'account-based pensions' and the revised drawdown schedule replaces the previous minimum and maximum drawdown limits for allocated pensions. The new rules appear to be designed to discourage retirees from using tax-concessional retirement savings for storing up bequests, while at the same time giving some guidance on a prudent spending plan (Bateman and Kingston 2007).

Economic theory[3] has long held that optimal drawdown plans in retirement will differ according to the preferences of each individual and the risks they face, while the financial planning industry has frequently proposed simple 'rules of thumb' as approximations to more complicated dynamic plans. In this study we investigate the benefits and risks of the new minimum drawdown requirements under Simplified Superannuation and compare them with outcomes under the previous legislated limits for allocated pensions and a range of simple 'rules of thumb', as well as theoretically optimal paths. We do this for retirees holding their retirement savings in typical investment plans, matching the most common offerings of allocated pension and superannuation investments, and accounting for longevity patterns drawn from the latest Australian Life Table projections.

We find that following the legislated minimum drawdown plan under Simplified Superannuation means lower welfare for most individuals when compared with following

[3] See the seminal paper by Merton (1971), and Campbell and Viceira (2002) for a more recent survey.

an optimal path or a simple fixed percentage drawdown rule. We also show that the regulations are a binding constraint on optimal drawdown plans, but the reductions in welfare when compared with the unconstrained plans are fairly small. Overall the new Simplified Superannuation regulations offer a substantial improvement over the previous allocated pension minimum valuation factors and are a good compromise in terms of simplicity, adequacy and risk. We conclude that welfare could be further improved with a minor simplification of the new drawdown rules.

We begin with a survey of retirement income stream products and policies in Australia. We then evaluate the new minimum drawdown requirements for account-based pensions under Simplified Superannuation against possible alternatives, using the criteria of simplicity, adequacy, risk and consumer welfare. We conclude by exploring ways to further improve the new rules and highlight avenues for future research.

2. Retirement income products and policies in Australia

The policy framework for retirement income streams in Australia has been evolving since the decision in the late 1970s to concentrate on encouraging (and later mandating) privately managed saving for retirement, rather than introduce the then popular OECD style system of earnings-related public pensions (Bateman, Kingston and Piggott 2001). However, the decision to mandate retirement saving did not include (and has not subsequently included) mandatory retirement incomes. Instead, retirement income policy (as opposed to retirement saving policy) has been the subject of a succession of reforms and changes as attempts have been made to encourage the voluntary take-up of income streams with particular features. These reforms commenced in the 1980s with the decision to exempt from tax the earnings

of assets underlying certain types of annuities and have evolved since then to include tax and Age Pension means test concessions for a wide range of income streams. The most recent changes are the Simplified Superannuation reforms, announced in the 2006 Commonwealth Budget and implemented throughout 2007, which were introduced with the stated aim of simplifying retirement income stream policies and products (Australian Treasury 2006a, 2006b).

An important initiative in the 1990s was the introduction of a statutory framework for a phased withdrawal product – called an allocated pension.[4] As compared to an annuity, the purchaser retiree retains ownership of the capital sum, is able to choose the underlying asset allocation and has some discretion over the drawdown pattern. Under the pre-Budget-2006 rules, drawings from allocated pensions had to be made at least annually and were subject to legislated minimum and maximum limits (which differed by the age of the account holder).[5]

At the time of the 2006 Budget, the regulatory framework recognized four types of retirement income streams: lifetime annuities, term certain annuities, allocated pensions (and annuities), and a hybrid product (introduced in 2004), called a term allocated pension (TAP) or market linked income stream.[6] These alternative products provide different benefits to Australian retirees. Lifetime annuities insure against longevity risk and investment risk and can be designed to address inflation risk. However, pricing issues and conservative asset allocations may compromise adequacy. Life expectancy term annuities

[4] An allocated pension is periodic drawdown from a retirement accumulation.
[5] The maximum payments were designed to exhaust the account balance by age 80, while the minimum payments were designed to last until past 100 years of age.
[6] See Thorp, Kingston and Bateman (2007) for a description of the product features.

have similar attributes, with the exception of longevity risk, while allocated pensions and TAPs have the possibility of higher expected returns, but leave retirees exposed to investment risk and longevity risk.

The pre-Budget-2006 approach provided, through the tax system and under the Age Pension means tests, the strongest incentives to purchase lifetime annuities, life expectancy term annuities and TAPs. The centerpiece was a 50 per cent exemption from the Age Pension assets test (which itself had been reduced from a 100 per cent exemption in 2004), and, in addition, income streams defined as 'complying annuities' were free of tax on the earnings of underlying assets. Further, retirees who took certain types of income streams were eligible for a higher pension retirement benefit limit (RBL) and a 15 per cent annuity rebate.[7]

The tax and Age Pension means tests treatment of each of these retirement income types, before and after the implementation of Simplified Superannuation, are summarized in Table 1.

<insert Table 1 about here>

Despite these incentives, the overwhelming preference of those Australian retirees who take income streams rather than lump sums at retirement, has been to purchase allocated pensions[8] or account-based pensions as they are now known. The market share for the four types of retirement income streams over the period 1999 to 2006 is illustrated in Figure 1.

[7] In 2006/07 the pension RBL was $1,356,291, or twice the lump sum RBL of $678,149.
[8] Allocated pension is defined to include allocated annuities.

<insert Figure 1 about here>

In the September quarter 2006, allocated pensions accounted for 87.6 per cent of the market for retirement income streams (by dollar amount sales). The remainder comprised 9.7 per cent for term annuities, 2.6 per cent for TAPs and less than 0.2 per cent for life annuities.

Figure 1 clearly illustrates the impact of changes to the tax rules, Age Pension means tests and regulatory environment on the take-up of the different types of income streams. For example, the announcement in the May 2004 Budget of a plan to reduce the assets test preference for lifetime and life expectancy annuities (from a 100 per cent to a 50 per cent exemption) from 20 September of that year saw an increase in sales of these products in the September quarter 2004, followed by a significant fall in subsequent quarters. This change, in conjunction with legislative approval for a market linked annuity product, led to a fall in the market share of life annuities from around 3 per cent to less than 0.2 per cent

Under Simplified Superannuation, the rules and regulations for the different types of retirement income streams were streamlined. Following implementation, all superannuation benefits will be tax free (for retirees aged 60 and over) and retirement income streams that meet minimum standards will accumulate free of tax. From 20 September 2007, the Age Pension means tests will apply equally (and fully) to all types of retirement income streams.

The new minimum standards for account-based pensions include the drawdown of a minimum amount at least annually, no residual capital value and transfer only upon death.[9] The minimum drawdown payments are defined as a percentage of the remaining account balance and vary by age as summarized in Table 2 below.[10] These rules for account-based pensions replace the previous minimum and maximum limits for allocated pensions.

<insert Table 2 about here>

In the analysis that follows, we evaluate these new drawdown rules against a number of alternatives using criteria to assess simplicity, adequacy, risk, and consumer welfare as measured by a utility function.

3. Evaluating alternative drawdown rules

Alternative drawdown rules

We compare the minimum drawdown payouts for account-based pensions under Simplified Superannuation against four alternative drawdown rules, including the previous legislated minimum payments for allocated pensions and three standard 'rules of thumb'. In summary, the five rules under consideration comprise two statutory rules and three formula-based rules[11], as follows:

- The minimum drawdown requirements for account-based pensions under Simplified Superannuation (referred to from now on as the 'new legislated minimum'). The

[9] However, the annual drawdown can be greater than the minimum, the aggregate amounts drawdown each year can vary and additional withdrawals can be made at any time.
[10] An exception is 'transition to retirement' pensions which are subject to a 10 per cent maximum.
[11] These formula-based payout rules were used in Horneff *et al* (2007) as the basis for their comparative analysis styled on policy and industry experience in the US and Germany.

minimum drawdown varies by age from 4 per cent of the outstanding account balance for those aged less than 65 to 14 per cent for retirees aged 95 and over (see Table 2);

- The pre-Budget-2006 legislated minimum payments for allocated pensions (referred to from now on as the 'previous legislated minimum'). The minimum (and maximum) drawdowns are determined by age-based statutory Pension Valuation Factors - where, for example, the minimum payment limit for a 65 year old would be the account balance divided by the minimum Pension Valuation Factor for a beneficiary aged 65; [12]
- A fixed percentage rule: where a constant fraction of the outstanding account balance is withdrawn each period;
- A $1/T$ rule: where the annual withdrawal is determined by $T = N - (x+t)$. That is the oldest age in mortality table (N) less the retirees current age $(x+t)$, where x is the age at retirement and t is the years since retirement ($t = 1 \ldots N\text{-}x$);
- A $1/E(T)$ rule: where $E(T)$ is life expectancy at the retiree's current age (age $x+t$).[13]

A standard metric for comparison of alternative drawdown rules is the benefit/wealth ratio (ω). For each year in retirement, t, this is defined as $\omega_\tau = B_t/V_t$, where B_t is the payout at time t and V_t is equal to the account balance (prior to payment of the benefit) at time t. For the fixed percentage rule we set the drawdown rate equal to the first year payout that the retiree would receive if they purchased a single life annuity in the current market using their retirement accumulation. We refer to this from now on as the 'benchmark life annuity' and the annual payment as the 'benchmark annuity payout'. Using current annuity prices,

[12] The minimum and maximum pension valuation factors by age are set out in the Superannuation Industry (Supervision) Amendment Regulations. We focus on the minimum drawdown regulations.

[13] The life expectancies are computed as 25 year improved survival probabilities from age 10 to age 110 from the 2002 Australian Life Tables.

we estimate the benefit/wealth ratio for the 'benchmark life annuity' at 6.0 per cent for females and 6.1 per cent for males.[14]

Figure 2 illustrates the benefit/wealth ratio paths (over the potential retirement period from age 60 to age 108) for each of the five drawdown rules under consideration. The results we present here, and from now on, are for a hypothetical female in retirement. As noted in Horneff *et al* (2007) it is appropriate to focus on the case of the female retiree as longevity risk is more important for women than for men.

<insert Figure 2 about here>

The benefit/wealth ratio paths differ substantially between the alternative drawdown rules. The fixed percentage rule, by definition, is a fixed throughout retirement at 6.0 per cent for females, while the new legislated minimum rules are almost as simple with seven different benefit/wealth ratios over the entire period of potential retirement. By comparison, the benefit/wealth ratio for $1/T$ rule commences at 2 per cent at age 60 and increases every year to 100 per cent at the oldest age in the Australian Life Tables, the $1/E(T)$ rule generates a gradual increase in the benefit/wealth ratio from 3.7 per cent to 87 per cent, while the drawdowns under the previous legislated minimum increase from 5.8 per cent to 28.6 per cent of the account balance.

Benefit/wealth ratios provide valuable information on the pattern of drawdowns by age and the complexity of the different rules (in terms of reasonably constant or continually

[14] The annuity payouts are the average of current annuity quotes for a single life annuity with no guarantee, purchased with a premium of $100,000. These are $6,110 for males and $6,000 for females. As a result, the benefit/wealth ratios assumed for the fixed percentage rule translate to 6.1 per cent for males and 6.0 per cent for females (see DEXX&R 2007 for the annuity quotes).

changing drawdown percentages), However, they provide no indication of the adequacy of these drawdowns rules to fund ongoing retirement expenses or of the risk associated with the underlying asset allocations. Nor do they assess how a retiree might evaluate the drawdown rules after taking account of risk aversion and time preference.

Portfolio return and volatility

One of the features of products allowing periodic drawdowns, such as Australia's previous allocated pensions and the new account-based pension products, as compared with standard annuity products, is the ability to choose the asset allocation of the portfolios underlying the income streams. For example, HESTA, one of Australia's largest industry superannuation funds offers choice of nine investment options for their new account-based pension product. These include five portfolios comprising different combinations of Australian shares, international shares, property, alternative investments, Australian fixed interest, international fixed interest and cash, and four portfolios which include socially responsible investments (SRIs) in the asset mix.[15] In order to realistically simulate and compare the alternative drawdown rules, we have constructed five 'representative' investment portfolios for our hypothetical account-based pension products. These are designated High Growth, Growth, Balanced, Conservative and Capital Stable and comprise different proportions of Australian shares, international shares, Australian property, Australian fixed interest and cash. Figure 3 shows the asset allocation pattern for each portfolio. The methodology underlying the construction of these portfolios as well as the portfolio returns and volatilities is set out in Appendix A.

[15] See the HESTA website at www.hesta.com.au

<insert Figure 3 about here>

We can now combine the drawdown patterns, as illustrated by the benefit/wealth ratios, with our representative portfolios to evaluate the alternative drawdown rules.

Assessment of the alternative drawdown rules for retirement incomes

We assess the five alternative drawdown rules using the criteria of simplicity, adequacy, risk and consumer welfare as measured by a utility function. Initially we assume that the underlying assets are held in a balanced portfolio (an assumption we later relax). As well, we ignore possible taxes on the earnings of the underlying assets and do not take account of interactions with the public Age Pension.[16]

Simplicity: Our gauge of simplicity is a clearly defined schedule of drawdown percentages, as indicated by the benefit to wealth ratios discussed earlier and summarized in Figure 2. Here the fixed percentage rule dominates (by definition) followed closely by the seven-phase minimum drawdown rule introduced as part of the Simplified Superannuation reforms. For the other rules evaluated here, the benefit to wealth ratio is different for every annual drawdown.

Adequacy: Our metric for adequacy is 'expected benefit'. This is defined as the annual expected benefit from a particular downdown rule as a proportion of the annual payment from the 'benchmark life annuity'. Figure 4 shows expected benefit paths for each of the five drawdown rules, assuming that the individual survives to age 108, and the underlying assets are invested in the balanced portfolio plan.

[16] While all benefits are now tax free, the earnings on the underlying assets are only tax free where the minimum standards are met.

<insert Figure 4 about here>

As shown in Figure 4, there are significant differences in the expected benefit by drawdown rule and age. The expected benefit under the fixed percentage rule starts off at 100 per cent of the benchmark life annuity (by design) and then gradually increases with age (as the rate of return on the underlying assets exceeds that on the lifetime annuity). The expected benefit under the 1*/T* rule is the lowest of the five rules at age 60, but continues to rise by age, reaching 200 per cent of the benchmark annuity when the retiree is in her mid-80s, and 500 per cent if she is still alive in her mid-90s. This happens because the rule results in small payouts in the early years, leading to higher accumulations to be paid out in later years. Finally, the 1*/E(T)* rule initially provides a lower expected benefit of around 60 per cent of the benchmark annuity at age 60, which rises to peak at 235 per cent of the benchmark annuity at age 85, and then falls rapidly at very old ages if the pensioner is still alive.

Of the statutory rules, the path of expected benefits under the previous legislated minimum tracks the 1*/E(T)* rule quite closely, although it is higher for the first 13 years of retirement and peaks at around 160 per cent of the benchmark annuity at age 80 (under our assumptions). The Simplified Superannuation legislated minimum generates a path of expected benefits below the benchmark annuity (and the fixed percentage rule) for the first six years of retirement. Thereafter, the expected benefits increase as a proportion of the benchmark annuity as the higher percentage drawdown takes effect, peaking at around 260 per cent of the benchmark annuity at age 95. Payouts under this rule then fall back to around 100 per cent of the benchmark annuity for those still alive after age 100.

The impact of changing the underlying asset allocation from a balanced portfolio to the alternatives of high growth, growth, conservative and capital stable, is to change the level of expected benefits, but not the rankings of the alternative drawdown rules by age. The expected benefit paths for the Simplified Superannuation drawdown rules under the five illustrative portfolio allocations are illustrated in Figure 5. Our estimates indicate that the expected benefit will be less than the benchmark annuity until the retiree reaches age 65 for all of our illustrative portfolios – suggesting that the new legislated minimum drawdown for the early years of retirement may be too low.

The impact of choice of portfolio allocation for retirement income adequacy is clearly illustrated by the pattern of expected benefits by age for the alternative portfolio allocations illustrated in Figure 5. For example, at age 85, the capital stable portfolio delivers a drawdown 60 per cent higher than the benchmark annuity, compared with 97 per cent higher for the conservative portfolio, 130 per cent higher under the balanced portfolio, 164 per cent under the growth portfolio and 172 per cent higher under the high growth portfolio.

<insert Figure 5 about here>

Risk: As a measure of risk, we construct a metric representing a 'worst case scenario' for each drawdown rule, given an underlying asset allocation. More precisely our metric is defined as the dollar amount of retirement income represented by the first percentile[17] of the payout distribution, as generated using the rates of return and standard deviations estimated for the illustrative portfolios (see Table A1), as a proportion of the annual

[17] We assume that portfolio returns are log-normally distributed in choosing the 1% quantile.

payment from the 'benchmark life annuity'.[18] Figure 6 illustrates this worst case scenario for each of the five drawdown rules under consideration where the retirement accumulation is invested in a balanced portfolio. With the exception of the 1*/E(T)* rule, where the minimum benefit reaches the benchmark annuity by age 77, all of the worst case scenarios are below the benchmark annuity payouts until retirees reach their mid-80s.

<insert Figure 6 about here>

In the early years of retirement (for retirees in their 60s) the probable minimum benefits are quite similar under both the previous legislated minimum and the fixed percentage rule, but are lower for both the 1*/E(T)* rule and the new rules under Simplified Superannuation. Under the fixed percentage rule and the previous legislated minimum rule, the probable minimum benefit is less than the benchmark annuity payout for the entire potential period of retirement (from age 60 to age 108 in our analysis).

On the other hand, the probable minimum payments under the 1*/T* rule start at very low levels (of less than 50 per cent of the benchmark annuity payout) in the early years of retirement but increase rapidly in later retirement to over 300 per cent of the benchmark annuity for those who live into their 90s. Where the retirement accumulation is invested in a balanced portfolio, the Simplified Superannuation rules result in a minimum benefit well in excess of the benchmark annuity for retirees who live past their mid 80s.

[18] It is noted, however, that if the retiree were still alive, she would receive an annual drawdown of at least this minimum payout with a probability of 99 per cent.

As with expected benefits, the impact of altering the underlying portfolio allocation, is to change the level of the minimum benefit, but not the rankings by age of the alternative drawdown rules. The minimum benefit paths under Simplified Superannuation for the five alternative portfolio allocations are illustrated in Figure 7. The minimum expected benefit under all five portfolio allocations (except capital stable) is less than the benchmark annuity until retirees reach age 80. As would be expected, for those portfolios with a very high proportion of equities such as the high growth portfolio (with 50 per cent domestic equities and 30 per cent international equities), the minimum benefit does not exceed the benchmark annuity at any age.

<insert Figure 7 about here>

Consumer welfare: Finally, to take account of risk aversion and the time preference of the retirees, we evaluate the five drawdown rules using a utility framework.

Following the approach taken in Horneff *et al* (2007) we adopt CRRA preferences with uncertainty over survival and assume that the retiree's objective function U is defined over total benefits received and a bequest left at death. Our assumed utility function (U), takes the form

$$U = E\sum_{t=0}^{T} \left\{ \left(\prod_{i=0}^{t-1} p_{x+t} \right) \left[\beta^t \, p_{x+t} \left(\frac{B_t^{1-\gamma}}{1-\gamma} \right) + k\beta^t \left(1 - p_{x+t}\right) \left(\frac{V_t^{1-\gamma}}{1-\gamma} \right) \right] \right\} \quad \text{- (1)}$$

where β is the time preference of the investor which is set to 0.96 (following previous analysis - Horneff *et al* 2007, Blake *et al* 2003), k is the strength of the bequest motive

(ranging from 0 to 1), p_{x+t} is the probability that a female of age $x+t$ survives one more year [19] and the individual's coefficient of relative risk aversion is represented by γ, which ranges from 0.5 to 8 in this analysis.[20] As indicated earlier, the nominal benefit from a drawdown plan in period t is given by B_t and the value of assets remaining in the account is V_t.

As with our earlier analysis we initially assume that the assets underlying the retirement income stream are invested in a balanced portfolio. To compare the utility of different rules, we calculate the expected lifetime utility (using equation 1) for each of the five alternative drawdown rules, for levels of risk aversion ranging from 0.5 to 8. Initially we assume no bequests, so the bequest weight, k, is set at 0. We then translate each utility level into an equivalent annuity income stream for life and express this as a proportion of the 'benchmark annuity'. The annuity equivalent income stream can be interpreted as the constant nominal lifetime income stream that would provide the same level of utility to the retiree as the drawdown in question. We also compute the optimal path of drawdown using dynamic programming for each level of risk aversion to provide a point of comparison with arbitrarily chosen paths. [21]

Differences in welfare derived from a particular drawdown path are illustrated in Figure 8. For each of the five withdrawal rules (and the optimal path), we graph the annuity

[19] As noted earlier, the life expectancies are computed as the 25 year improved survival probabilities from age 10 to 110 from the 2002 Australian Life Tables.
[20] As indicated in Horneff *et al* 2007, γ below 1 represents low risk aversion, γ of between 1 and 5 represents moderate risk aversion, while γ above 5 represents high risk aversion.
[21] See Horneff *et al* 2007 for a detailed description of the dynamic programming problem. Solutions presented here are derived numerically using optimization routines in Matlab.

equivalent income stream as a proportion of the benchmark annuity stream, for levels of risk aversion from 0.5 to 8.

<insert Figure 8 about here>

The results show the importance of risk aversion in determining the preferred drawdown rule.[22] After the optimal paths, which are most preferred for any level of risk aversion by construction, the 1/*E(T)* rule and the previous legislated minimum are most preferred for females with low levels of risk aversion, but least preferred for females with medium to high levels of risk aversion, while the 1/*T* rule is least preferred for females with low levels of risk aversion and then ranks mid range as levels of risk aversion increase. The fixed percentage rule dominates all other strategies for female retirees with medium and high levels of risk aversion.[23] The new rules for account-based pensions under Simplified Superannuation, rank mid range across the spectrum of risk tolerance, while the previous legislated minimum drawdown for allocated pensions ranks poorly, except for females with very low levels of risk aversion.

So far we have assumed that the underlying assets are held in a balanced portfolio. The impact of the alternative portfolio allocations on consumer preferences is to change the size of the certainty equivalent annuity estimates (as a proportion of the benchmark annuity), but not the rankings by risk tolerance of the alternative drawdown rules. As would be expected, the path of certainty equivalent annuity estimates become flatter as one changes

[22] As has been shown in previous studies (Brown 2001, Horneff *et al* 2007).
[23] Similar results were found for male retirees.

the underlying asset allocation from high growth, to growth, to balanced, conservative, and then capital stable. Further, the results do not change significantly if we relax the assumption of no bequests.

4. Discussion and concluding comments

We have assessed five alternative drawdown rules in terms of simplicity, adequacy, risk and consumer preferences. A key finding is that the different drawdown rules perform differently under each of the criteria for assessment, for retirees at different ages and for different levels of risk aversion. Further, as one would expect, modifying the underlying asset allocation changes the drawdown amounts, but not the ranking of the alternative drawdown rules under each of the assessment criteria.

In summary:

- The benefit/wealth ratios provide some indication of simplicity – where simplicity is defined as clearly identified drawdown percentages. The fixed percentage rule ranks first (by assumption) closely followed by the new legislated minimum rules.
- Under the metric for expected benefit - expected drawdown as a percentage of the 'benchmark annuity payment' – the previous legislated minimum for allocated pensions performs well for younger retirees, the $1/T$ rule does well for older retirees, while the fixed percentage rule and the new Simplified Superannuation rules for account-based pensions do quite well for retirees of all ages.
- Similarly, under the metric for risk - the minimum expected benefit defined as the dollar amount of retirement income represented by the first percentile of the payout distribution as a proportion of the 'benchmark annuity payment' - the previous

legislated minimum rules for allocated pensions perform best for younger retirees, the $1/T$ does best for older retirees, and the Simplified Superannuation rules have reasonably high minimum benefits for all ages. However, where the accumulation is invested in a balanced portfolio the probable minimum benefit under the fixed percentage rule, is below the benchmark annuity over the entire period of retirement.

- The analysis of consumer welfare indicates that the fixed percentage rule dominates the new legislated minimum drawdowns for account-based pensions at high levels of risk aversion while the $1/E(T)$ is preferred for females with a low level of risk aversion. The optimal path is (by construction) preferred to all rules for any level of risk aversion, with the fixed percentage rule preferred next for all except those with low levels of risk aversion.

Overall, the new legislated minimum drawdown rules for account-based pensions under Simplified Superannuation perform reasonably well under all criteria, and offer a substantial improvement over the previous allocated pension minimum drawdown limits. However, the fixed percentage rule also performs well under all criteria and is preferred to the illustrative drawdown rules we consider for all except retirees with high tolerance to risk. This conclusion was also reached in Horneff *et al* (2007) in a similar analysis motivated by US and German pensions.

So far we have treated the minimum drawdown regulations as if they were fixed. We note, however, that the new minimum drawdown rules are not upper bounds on withdrawals, and retirees are free to make drawdowns of more than the minimum if they wish. In this context we investigate the case where the fixed percentage or optimal drawdown rules are

followed, except where they breach the new rules – in which case the new legislated minimum rules apply.

We focus on the optimal path and the fixed percentage rule – as the most preferred drawdown patterns. We compare the certainty equivalent annuity (as a proportion of the benchmark annuity) for the so-called 'unconstrained' drawdowns (as discussed above and set out in Figure 8), with the certainty equivalent annuity proportions where the drawdowns are 'constrained' by new rules.

Our results, summarized in Figure 9, show that utility improves slightly across all levels of risk aversion where the drawdown patterns of the fixed percentage rule are constrained by the new seven-phase drawdown rules. However, a retiree following an optimal path is made slightly worse off by having to abide by the minimum drawdown at higher levels of risk aversion. The reason for the improvements in welfare when the fixed percentage rule is constrained by the new minimum regulations is that the retiree is compelled to consume at a faster rate towards the end of life by the regulations, a pattern which mimics more closely the optimal path. Similarly, the fixed percentage rule increases consumption in early retirement compared with the new legislated minimum rules, again aligning closer to the optimal path. The combination of both rules improves welfare for most consumers. Slightly lower utility attaches to the constrained optimal path compared with the unconstrained path because the new legislated minimum rules compel very risk-averse retirees to consume slightly faster than they would like at older ages.

<insert Figure 9 about here>

An outcome of this analysis is that we can 'back-out' the drawdown patterns implied by the 'constrained' paths. In Figure 10 we compare the implied drawdown patterns under the 'constrained' optimal path for three illustrative levels of risk aversion – set at relative risk aversion of 2, 5 and 7 - with the implied drawdown pattern under the 'constrained' fixed percentage rule and the new seven-phase drawdown rule for account-based pensions under Simplified Superannuation. As with our earlier analysis we assume that the underlying assets are invested in a balanced portfolio and there are no bequests.

<insert Figure 10 about here>

The comparison indicates that the implied drawdowns under the 'constrained' optimal path are reasonably insensitive to levels of risk aversion for younger retirees, but that risk averse older retirees drawdown at slower rate than their more risk tolerant counterparts and a close examination of the graph shows that the regulatory minimum constraint is binding for the more risk averse from ages in the mid-80s to the late 90s.

A feature of all three of the illustrative implied optimal drawdown rules, is that the drawdown pattern is different in every period. These can be compared with the seven-phase drawdown pattern under the new legislated minimum drawdown rules for account-based pensions, and the implied drawdown pattern under the constrained fixed percentage rules which compress into a five-phase rule. The implied drawdowns under the optimal rules at specific ages are compared with the constrained fixed percentage and Simplified Superannuation rules in Table 3.

<insert Table 3 about here>

We note the simplicity of the implied drawdown pattern for the constrained fixed percentage rule.

In sum, our analysis indicates that the new legislated minimum drawdown rules for account-based pensions are not only a significant improvement on the previous drawdown limits for allocated pensions, but perform well against a range of alternative rules. However, we find that welfare can be improved for all retirees where the current seven-phase drawdown rule is further simplified to a five-phase rule, under which retirees are required to drawdown at a faster rate during their earlier years of retirement – as indicated by the 'constrained fixed percentage' column in Table 3.

So far we have ignored taxes and the interaction of the drawdowns with the public Age Pension. While superannuation benefits are tax free (for retirees age 60 and above), the earnings on the underlying assets are only free of tax where the legislated minimum drawdown requirements are met. In circumstances where the legislated minimum drawdown rules are not met, the effective tax rate applying to the earnings of the underlying assets will then depend upon the particular portfolio allocation (due to the working of the imputation system). As well, although the Age Pension means tests now apply equally to all retirement income streams, the availability of a public Age Pension (which has the features of an indexed life annuity) would influence the estimates of utility.

Overall, our analysis suggests that welfare could be further improved with even more simplification of Simplified Superannuation. Future research will explore whether these results still hold when account is taken of taxes and public Age Pension interactions.

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Appendix A: Methodology for construction of investment portfolios

Using monthly observations on asset class returns indices (30 December 1989 -- 30 December 2005), we calculate monthly periodic returns and then take a weighted average to make the periodic portfolio return. The net of fees portfolio return is then

$$r_{P,t} = \ln(1 + i_{P,t}) - \ln(1 + f_{P,t})$$

Where $i_{P,t}$ is the periodic nominal portfolio return and $f_{P,t}$ is the percentage rate of management fees. The annualized expected value and volatility of this process are:

$$\mu = 12\frac{1}{N}\sum_{n=1}^{N} r_{P,t} + \frac{1}{2}\sigma^2$$

$$\sigma = s\sqrt{12}$$

$$s = \sqrt{\frac{1}{N-1}\sum_{n=1}^{N}\left(r_{P,t}\right)^2 - \frac{1}{N(N-1)}\left(\sum_{n=1}^{N} r_{P,t}\right)^2}$$

where N is the number of observations in the sample. Table A1 sets out the annualized net-of-fees returns and standard deviations for each investment strategy.

Table A1: Portfolio returns and volatilities

Investment Option	Nominal Rate of Return	Nominal Return less fees	Std. Deviation
High Growth	10.4%	8.50%	9.88%
Growth	10.0%	8.20%	7.90%
Balanced	9.2%	7.50%	5.82%
Conservative	8.5%	6.80%	3.80%
Capital Stable	7.5%	5.90%	1.50%

Notes: This table presents estimates of nominal returns and standard deviation values for five representative investment portfolios. Returns are the annualised log change in the weighted sum of monthly periodic returns to the component asset classes, less a deduction for management fees. (Weights for each portfolio are given in Figure 1.) We compute monthly gross returns to each asset class index where Australian equities are the Australia-DS Market index, International equities are the AC WORLD INDEX ex AUSTRALIA translated into Australian dollars at the end-month AUD/USD exchange rate, fixed income is the UBS Composite All Maturities index for Australia, property is the S&P/ASX 300 Property index and cash is the UBS AU Bank Bills All Maturities index, all from Datastream. The total return price index (RI) of the relevant asset class index was used for calculations of the periodic monthly returns. Sample data runs monthly from December 1989 – December 2005

The sample period from which these returns are calculated includes a long period of strong performance in the domestic equity and property markets, which may slightly favour self-insurance over annuitisation in our analysis since annuity payouts are dependent on returns from fixed interest securities. Notwithstanding some possible overstatement of investment returns, if we condition on a specific allocation, comparisons between alternative draw-down paths and the regulated minimum are valid.

Table 1: Taxation and Age Pension means test treatment of retirement income streams from a taxed fund

	Income streams purchased pre 2007		Income streams purchased post 2007	
Product type	**Taxation**	**Means tests**	**Taxation**	**Means tests**
Life pension or annuity Life expectancy pension or annuity Term allocated pension (TAP)	Taxable income adjusted for annual deductible amount [a] Earnings on underlying assets tax exempt	50% assets test exemption [b c] Income adjusted for return of capital	Benefits tax exempt Earnings on underlying assets tax exempt if satisfy minimum standards [d]	Assets test: Full assets test applies [e] Income test: Deemed income for account-based income streams Income adjusted for return of capital for non account-based income streams
Allocated pension or annuity	Taxable income adjusted for annual deductible amount [a] Earnings on underlying assets tax exempt	Full assets test applies Income adjusted for return of capital		
Other term annuity (> 5 years)	Taxable income adjusted for annual deductible amount Earnings on underlying assets taxed	Full assets test applies Income adjusted for return of capital		

Source: Bateman and Kingston (2007).

a. Annual deductible amount = undeducted purchase price (UPP)/life expectancy (or term).
b. Asset test taper: $3 per fortnight for every $1,000 of assets above assets test free area.
c. 100% assets test exemption if purchased before 20 September 2004.
d. Earnings on underlying assets taxed at 15 per cent for pensions which do not satisfy the 'minimum standards'.
e. Assets test taper halved to $1.50 per fortnight for every $1,000 of assets above assets free area. Applies to assets purchased on or after 20 September 2007

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Table 2: Minimum drawdown by age under Simplified Superannuation

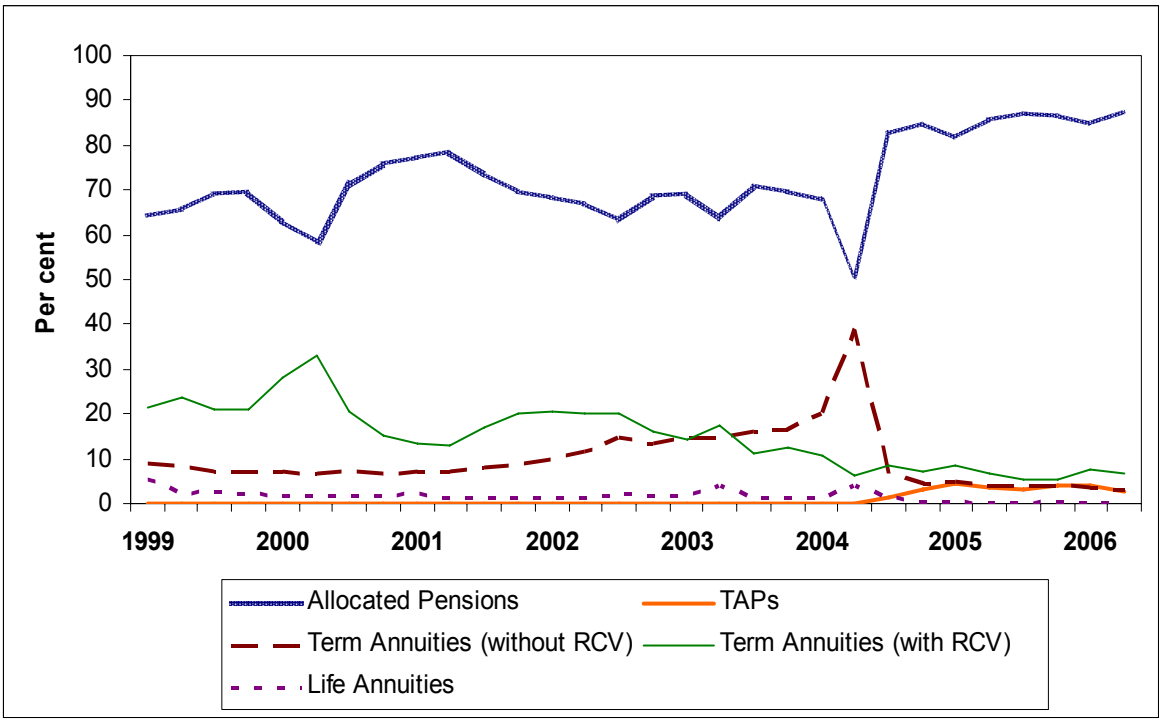
Age	per cent of account balance
under age 65	4
65-74	5
75-79	6
80-84	7
85-89	9
90-94	11
95 and over	14

Source: Superannuation Industry (Supervision) Amendment Regulations 2007 (No.1), Schedule 3.

Table 3: Actual and implied drawdown rules

Age	Simplified Superannuation	Constrained fixed percentage	Constrained optimal (rra = 2)	Constrained optimal (rra = 5)	Constrained optimal (rra = 7)
	(per cent of account balance)				
under age 65	4	6	6.7 (age 60)	6.6 (age 60)	6.4 (age 60)
65-74	5	6	7.1 (age 65)	6.9 (age 65)	6.7 (age 65)
75-79	6	6	8.7 (age 75)	7.8 (age 75)	7.4 (age 75
80-84	7	7	10.0 (age 80)	8.5 (age 80)	8.0 (age 80)
85-89	9	9	12.0 (age 85)	9.6 (age 85)	9.0 (age 85)
90-94	11	11	14.4 (age 90)	11.0 (age 90)	11.0 (age 90)
95 and over	14	14	17.3 (age 95)	14.0 (age 95)	14.0 (age 95)

Figure 1: Market share of retirement income streams (1999-2006)



Source: Plan for Life Research, The Pension and Annuity Market Research Report, Quarterly 1999-2006.

Figure 2: Benefit to wealth paths under alternative drawdown rules

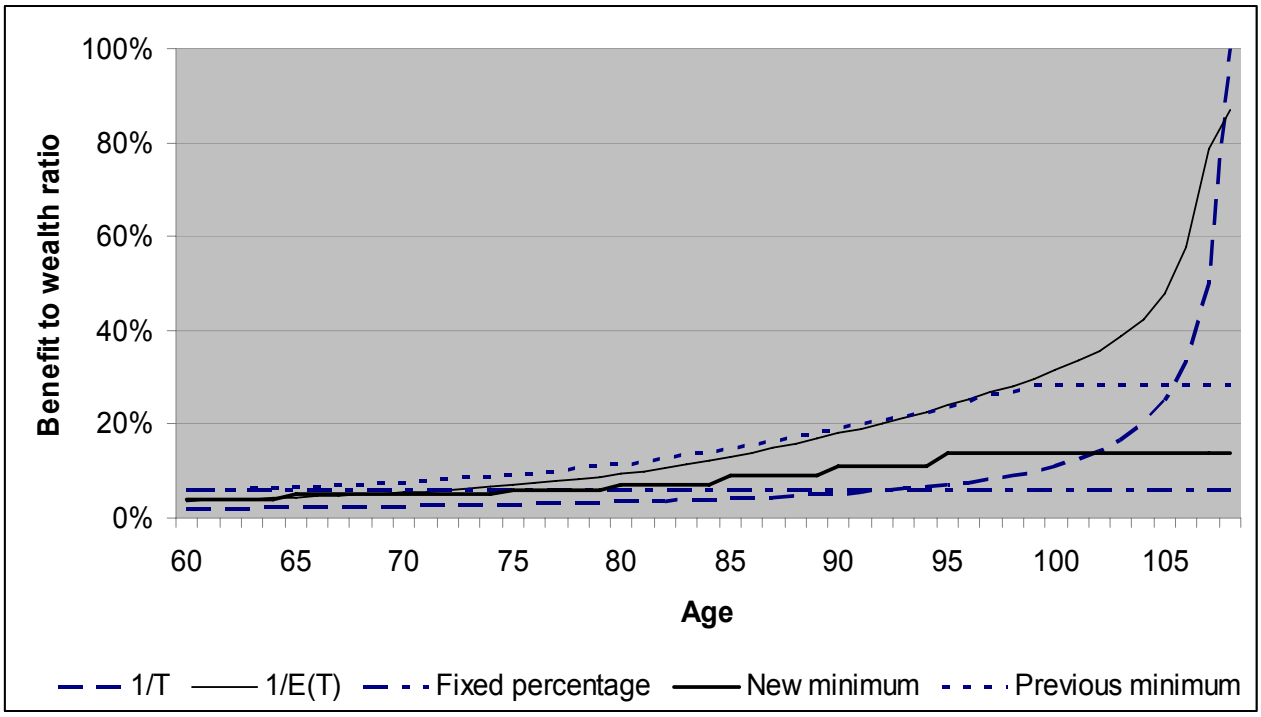
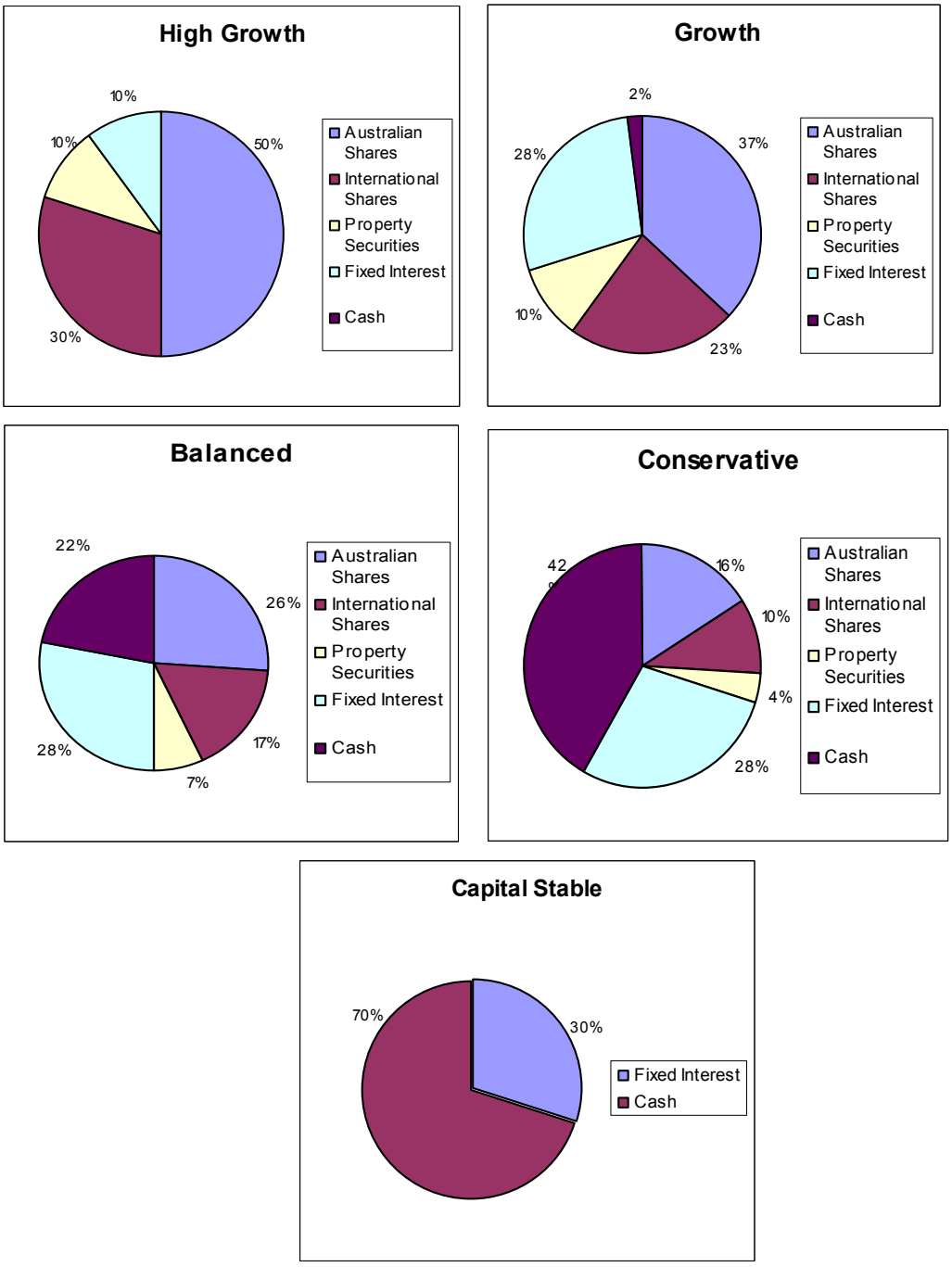


Figure 3: Portfolio allocations underlying retirement payouts



This figure presents the compositions of representative investment portfolios. Each investment is a combination of two or more asset classes including Australian shares, international shares, Australian property securities, Australian fixed interest and cash.

Figure 4: Expected benefit as a proportion of the benchmark annuity payment, under alternative drawdown rules

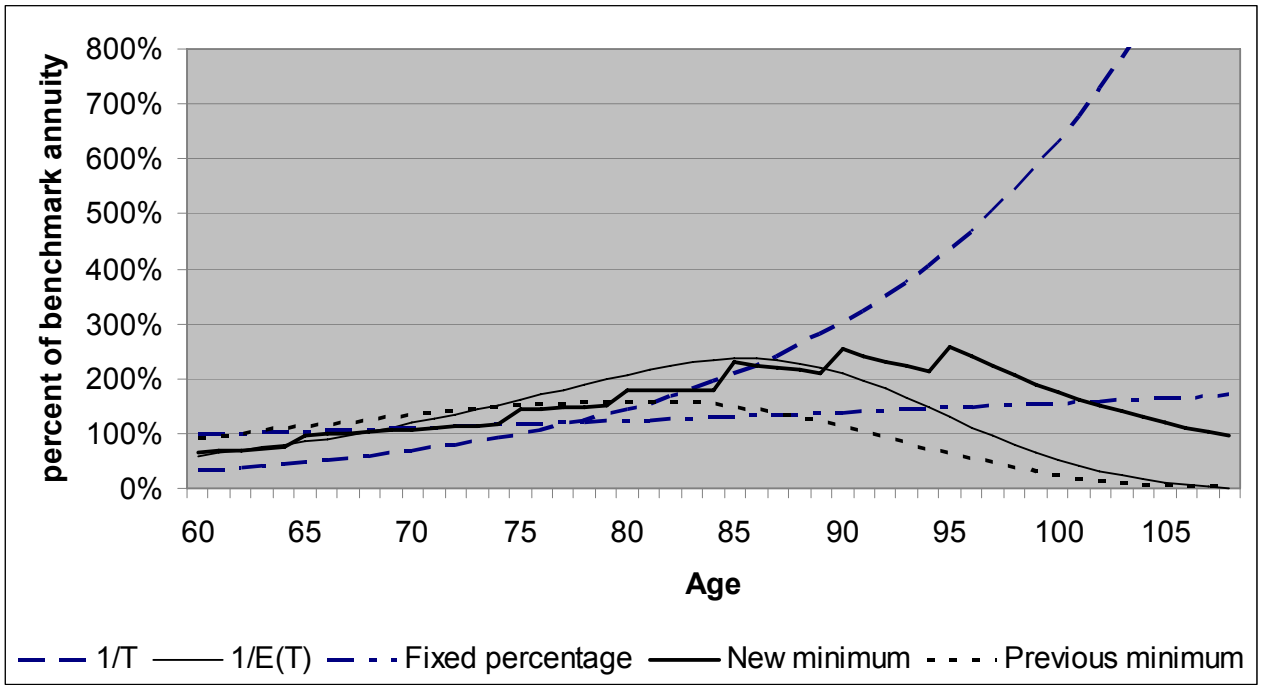


Figure 5: Expected benefit from Simplified Superannuation as a proportion of benchmark annuity payment, under alternative portfolio allocations

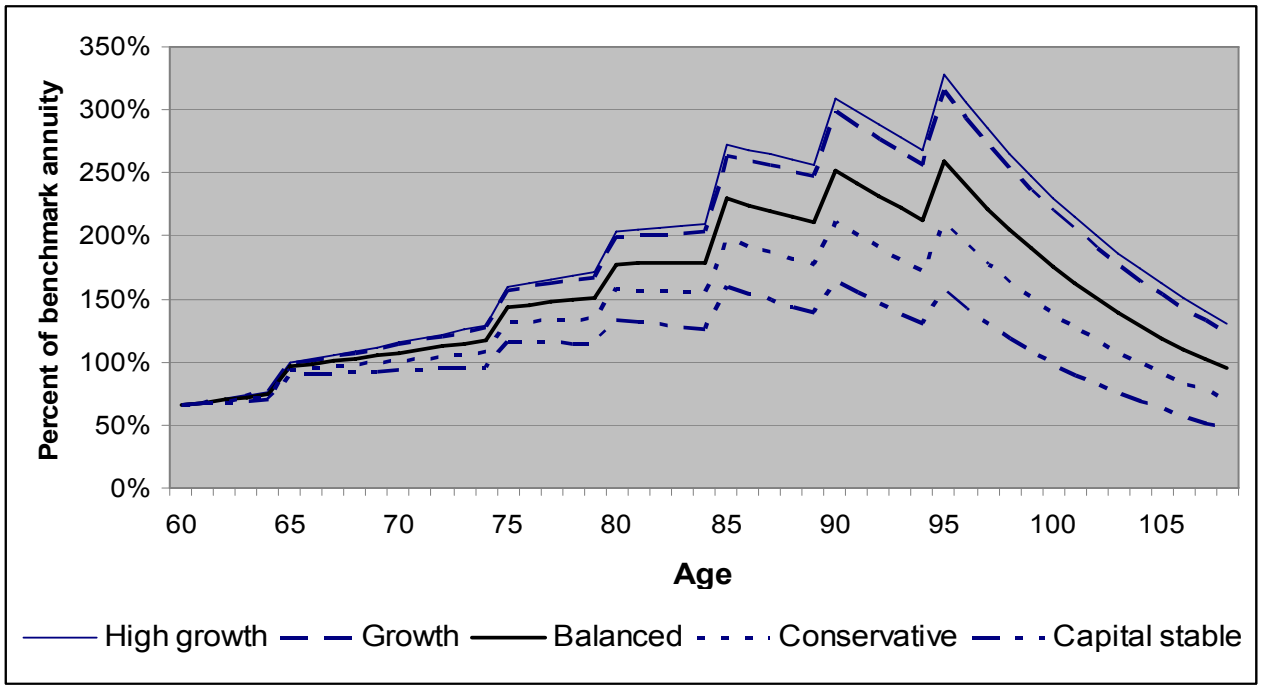


Figure 6: Probable minimum benefit as a proportion of benchmark annuity payment, under alternative drawdown rules

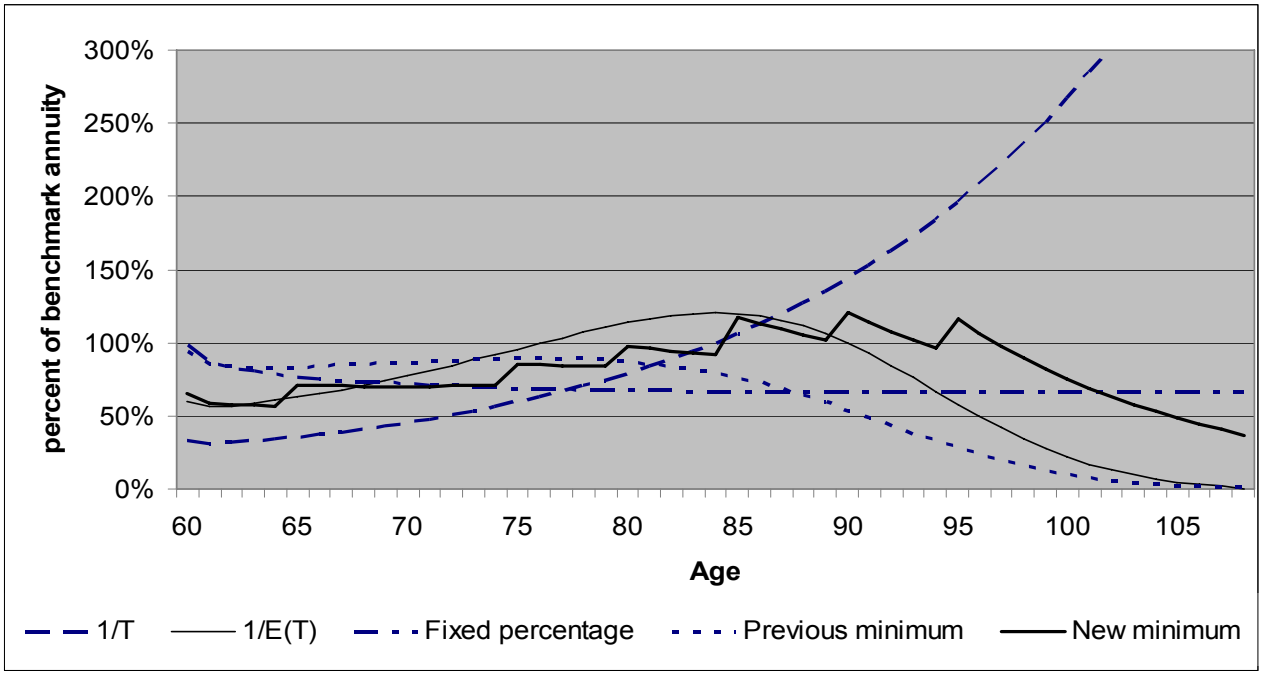


Figure 7: Probable minimum benefit from Simplified Superannuation as a proportion of benchmark annuity payment, under alternative portfolio allocations

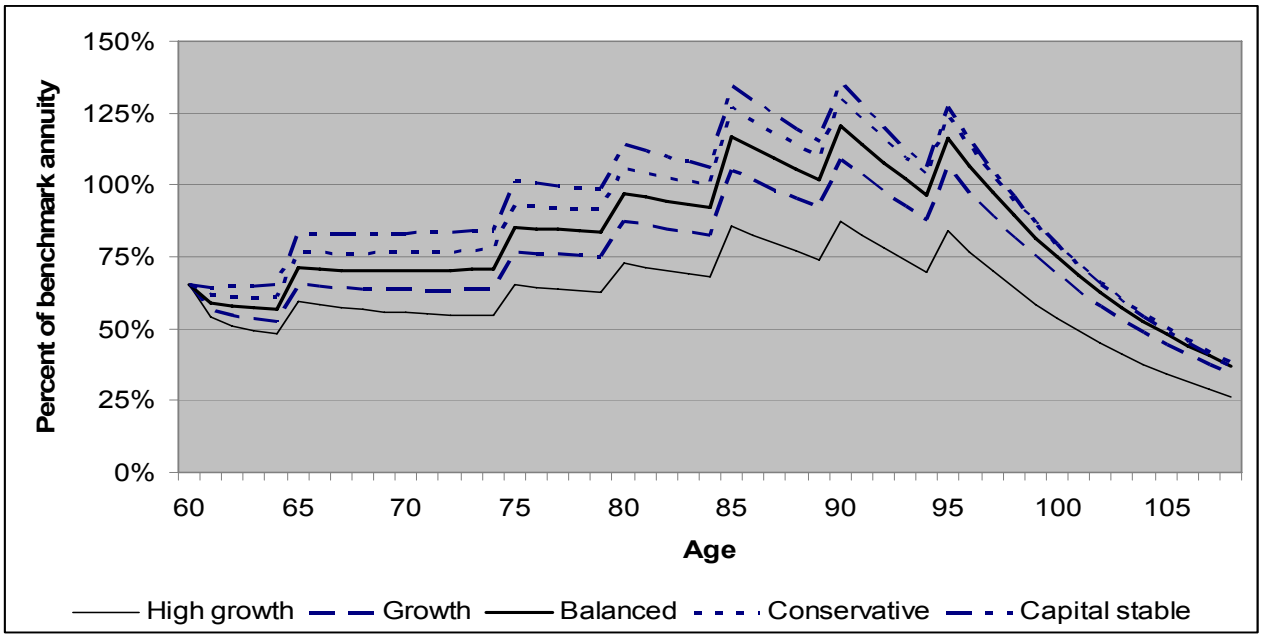


Figure 8: Comparison of drawdown rules for a range of risk tolerances

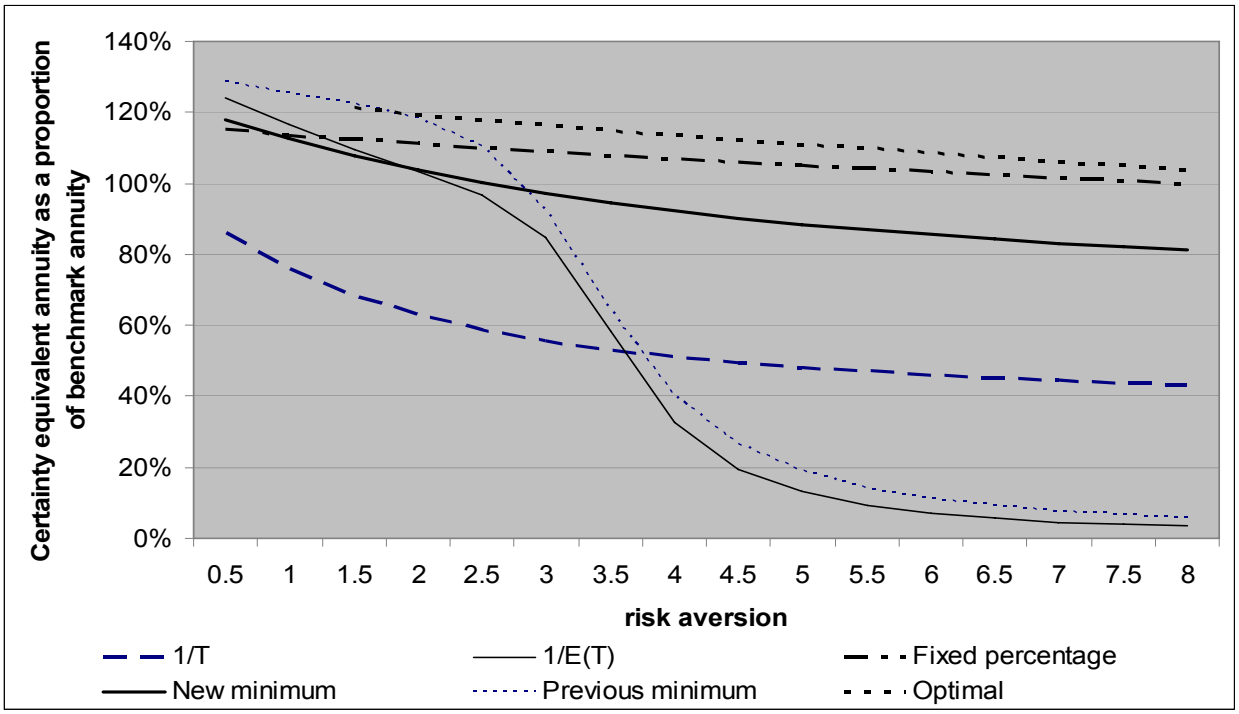


Figure 9: Comparison of constrained with unconstrained drawdown rules

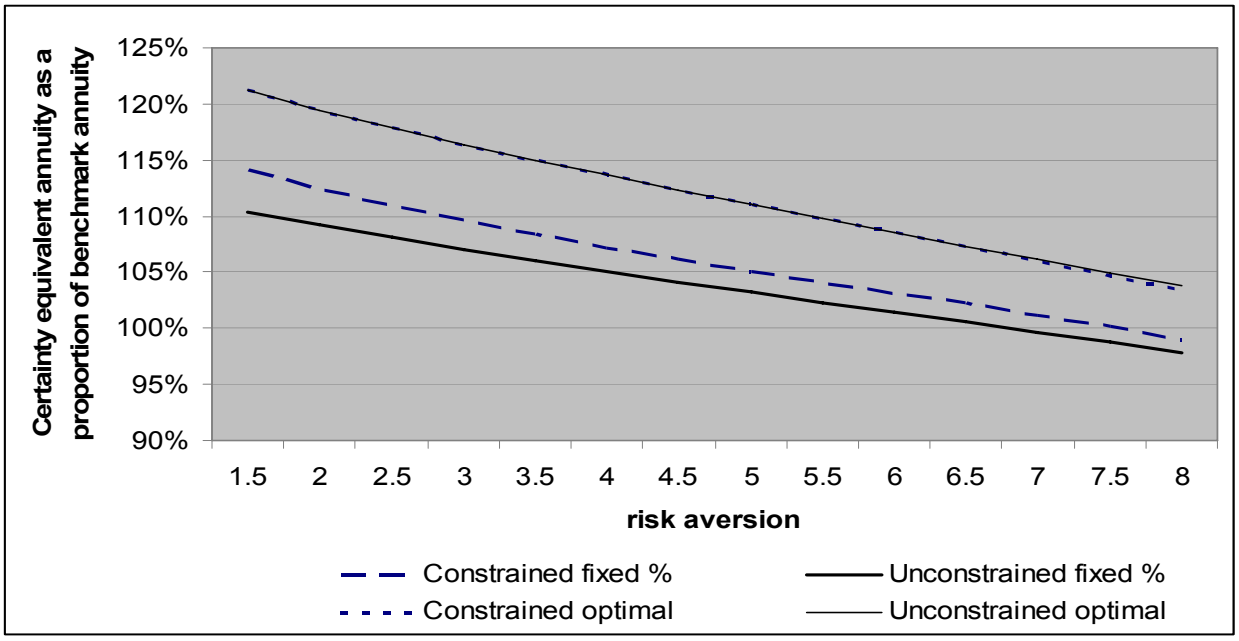


Figure 10: A comparison of actual and implied drawdown rules