

What do you want? Managing risks for better outcomes when you retire

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ABSTRACT

At retirement, investors invest the majority of their money, by amount, into living annuity products. This implicitly allocates part of that investment to finance a potential death benefit. This paper use actuarial techniques to bifurcate a living annuity investment into its component parts by value – a death benefit and an income benefit. In doing so, it shows that it is not possible to allocate the full investment in a living annuity product towards providing an income. By determining the relative value of the different benefits, we can provide more information about the investment decision at retirement based on what the investor is prioritising between the income benefit and the death benefit.

KEYWORDS

Living annuity; pooled annuity; income benefit; death benefit; value

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1. RETIREMENT INVESTMENT OPTIONS

Retirement fund regulations and tax legislation provide a regulatory framework for investment options at retirement. This framework provides beneficial tax treatment to the investment in certain investment vehicles. I broadly classify the investment vehicles as:

- **A Living Annuity investment vehicle.** A living annuity is an investment option that allows investors to:
 - invest in a wide range of investment portfolios,
 - draw an income of between 2.5% and 17.5% per annum of any remaining investment, and
 - receive any remaining capital as a benefit payable on the death of the investor.
- **A Guaranteed Life Annuity investment.** A guaranteed life annuity is provided in a policy of insurance with an insurance company. The insurance company is the guarantor of benefits and is required to hold capital to support this guarantee. The benefits are typically:
 - A minimum income to an investor for as long as the investor is alive.
 - An increase profile that may be 0% per annum, guaranteed as a percentage of the increase in the Consumer Price Index (CPI), or generated with some reference to the investment returns of an investment portfolio.
 - The option to provide a benefit payable on the death of the investor.
 - Typically, on death any capital that has not been utilised for income benefits is 'pooled' to fund the income benefits for surviving annuitants.
- **Fund investment benefit options.** These are when the retirement fund pays the benefits. Benefits can be in the form of an income promise, in which case they are more similar to a guaranteed life annuity. In this instance, the fund is the guarantor of the benefits rather than an insurance company. The investments held by the fund back these benefits. A fund may also offer a benefit structure that is more similar to a Living Annuity.

In-fund options are largely similar to investment options offered by third-party providers. However, there are some differences in the way legislation and/or guarantees are applied. I do not focus on these nuances in this paper.

An annual update to 30 June 2017 provided by the Association for Savings and Investments of South Africa (ASISA) shows that:

- For the year to 30 June 2017, R57.3bn was invested in living annuity solutions.
- R5.3bn was invested in compulsory annuities, which is the classification used to cover guaranteed annuities.

This indicates that over 90% of new investments (by amount) at retirement was invested in living annuity products in the year to 30 June 2017.

An initial question I wanted to investigate/understand was, “Why do the majority of investors at retirement (by amount) choose to invest into living annuities?”

I ended up actually trying to investigate/understand, “What is it that living annuity investors are actually investing in, i.e., what benefits are they investing for?”

This leads me to conclude:

- All investments at retirement are allocated towards either an income benefit or a death benefit.
- A living annuity investment makes an implied split between providing an income benefit and providing a death benefit.
- It is not clear that, at retirement, investors understand that they are indirectly allocating capital to a death benefit.
- This is for all living annuities.
- You can pool risk to replicate the benefits under a living annuity, that is, manage risks in a pool to replicate the expected benefits one can receive from a living annuity.
- Pooling provides a mechanism to bifurcate the benefits into a death benefit component and an income benefit component, and consider the expected value of each component.
- This allows an investor to consider how much to allocate to each component.
- Pooling also creates a framework for us to compare the value of the benefit components that can be provided.
- A special case of a pooled solution is where all the capital is allocated to provide income.
- It is not possible to allocate the full capital to provide an income benefit using a living annuity investment.
- I consider the concept of maximum drawdown equivalence – a maximum equivalent initial drawdown rate (MEIDDR). This is the maximum drawdown rate for the living annuity for which there is expected income and death benefit equivalence between the pooled annuity and the living annuity.
- This is also the maximum drawdown rate that ensures the living annuity does not breach the maximum drawdown of 17.5% over the lifetime of the annuitant.
- Using the assumptions in this paper, the maximum drawdown equivalent for both males and females aged 65 is 5.20%.
- Any drawdown rate above this will result in the income being restricted, before the final income payment, by the 17.5% maximum allowed drawdown.
- The bifurcation of benefits can help an investor understand the potential value trade-off between an expected death benefit in exchange for an income benefit.
- The ability to trade off benefit components can allow a pooled annuity to potentially enhance the income benefit received from a retirement investment relative to a living annuity.
- We can practically demonstrate this relative value trade-off, by considering a few different examples of ways to structure benefits.

2. REASONS TO INVEST IN A LIVING ANNUITY

I briefly investigate potential reasons for investors selecting a living annuity product. These include:

- A living annuity is easy to understand. An investor invests money, it earns investment returns and benefits are paid from the investment. It is a ‘tangible’, simple concept to understand.
- Extending the concept of simplicity. Whatever remains of the investment when the investor dies, is distributed to surviving beneficiaries.
- This concept of a ‘legacy’ benefit is often cited as a reason for choosing a living annuity over a pooled option like a guaranteed annuity. If you invest in a guaranteed option an investor anticipates the sense of loss associated with potentially getting nothing back when the investor dies, i.e., potential regret of paying everything away to an insurer.
- A living annuity provides flexibility in the distribution of income. You can choose a drawdown rate on remaining capital between 2.5% and 17.5% per annum.
- A living annuity can provide flexibility to choose where the capital is invested, i.e., where to invest the asset, to generate the return required to grow the investment.
- Related to this choice is a view that the individual making the choice has the opportunity to perform better, in terms of investment returns, than the manager of a guaranteed solution.
- While the concept of a living annuity may be simple to understand, there are a number of choices to make that add complexity for balancing the needs of the investor. This creates a need and opportunity for advice:
 - choosing a service provider,
 - managing the drawdown level, and
 - choosing an underlying investment portfolio.

A financial advisor is often required to assist with these choices. To the extent that a living annuity requires financial advice and advisors get remunerated for this advice, there is a potential bias for advisors to advise on selecting a living annuity.

The purpose of my paper is not to investigate the relative strength of these reasons, or to test their validity. I use them to test some benefit scenarios to meet certain needs, for example:

- maximising the drawdown rate,
- potentially maximising income, and
- the impact of the implied potential death benefit.

Evidence suggests:

- A living annuity is, perhaps, simpler to operate and understand than a guaranteed annuity.

- Investors in a living annuity perhaps do not understand that they are partially allocating their investment to a death benefit.
- The allocation of capital in a living annuity to a death benefit means that it is not possible for an investor to allocate all capital towards providing an income benefit in a living annuity.

3. DEVELOPING A FRAMEWORK TO INVESTIGATE AND COMPARE BENEFIT OUTCOMES

3.1 Pooling vs Insurance

Pooling 'experience' allows individuals to share risk and cross-subsidise individual experience with a pool of 'suitably similar' risks. Pooling:

- is an important component of insurance,
- helps manage risks by sharing experience, and
- is a key concept in my academic/professional background as an actuary.

Pooling does not require insurance. Many insurance solutions involve pooling. Accessing the benefit of pooling for post-retirement investment is currently largely restricted to purchasing insurance solutions.

I am not trying to identify a specific insurance solution/product as the optimal post-retirement investment option. I rather develop an academic framework to check whether there could be something better than the living annuity that the majority of investors seem to choose. There may be scope for the market to develop new solutions to provide these options to investors.

3.2 Annuity/Investment Options considered

I consider two options for an investor who is retiring.

3.2.1 A LIVING ANNUITY

This option provides the investor with:

- some choice around the strategy/portfolio where the money is invested,
- a flexible drawdown rate of capital – between 2.5% and 17.5% of remaining investment balance in any year, and
- a benefit payable on death of any remaining investment balance.

3.2.2 A POOLED ANNUITY

This option provides the investor with:

- benefit options that pool mortality risk,
- an income benefit option,
- a death benefit option, and
- an investment portfolio that earns returns on the assets in the pool.

I am not trying to be prescriptive with the type of pooled annuity one can use. I simply add the concept of pooling risk in what is otherwise the same as the living annuity investment. For the purpose of my discussion, I assume that the investment strategy for the assets in living annuity and pooled annuity options are the same.

This removes the complication of having to consider the impact of different investment returns.

3.3 Investor A and the Options available

I consider an investor (“Investor A”) with capital of R1,000,000 (R1m) to invest at retirement. This R1m will fund:

- an income benefit, and
- a lump-sum death benefit

I am not trying to establish how much is needed at retirement and what is considered an ‘adequate level’ of benefit. The initial amount is a constraint for the model to consider various potential (theoretical) outcomes on a relative basis. The quantum is somewhat arbitrary for the scenarios I investigate and is scalable.

Let us consider what Investor A can do with R1m.

- The R1m will determine what can be provided as benefits. Once the R1m is fully utilised, we can pay no more benefits. We do not create something from nothing.
- The R1m will grow with investment returns generated by how/where it is invested.
- The R1m will reduce with benefit payments.
- The R1m will reduce with charges.

In any investment scenario, benefits are constrained by the amount, plus investment returns, less charges, less benefit payments. I assume that:

- investment returns are the same for both options, and
- charges are the same in both options.

The only potential differences are:

- the level of benefits and how they develop, and
- pooling risk in the pooled option vs an individual risk in the living annuity option.

3.4 Assumptions

I use assumptions to develop benefits and compare these benefits on a relative basis.

The assumptions are to assist with benefit projections that we can use to compare relative benefits. Where an assumption is made that can apply to both options, I use the same assumption. The absolute level of individual assumptions has less impact on the relative outcomes.

The (initial) assumptions I use to test relative benefits are as follows:

- single life male,
- base age assumed as 65 to draw some general results,
- initial investment of R1,000,000,
- inflation (CPI) of 6% pa,
- real investment return of 6% pa (gross of fees),
- fees assumed at 1% pa,
- real investment return of 5% pa (net of fees), and
- mortality is consistent with the PA(90) mortality tables, rated down by three years, i.e., a 65-year-old experiences the mortality of a 62-year-old.

Under the living annuity option, benefits are as follows:

- Income drawdown of between 2.5% and 17.5% of the remaining capital in any year.
- Death benefit of any remaining capital at the time of death.

The pooled annuity entails:

- a number of investors
- invest money in a combined pool of assets
- to provide benefits to participants in the pool.

We pool risk to manage benefit payments payable contingent on the event they are designed for:

- income on survival, and
- lump sum (or other) on death.

By pooling experience we are able to pay the specified benefits per individual such that 'on average' we have sufficient assets. Pooling allows us group resources and pay benefits specific to an individual's circumstances (dead or alive) based on what we expect to be true for an 'average' individual.

3.5 Selecting a Drawdown Rate

We compare the way that benefits are able to develop under both options. We know that the present value of any asset is the R1,000,000 available for investment. We are also able to compare the benefits that are going to develop under the living annuity option for a given drawdown rate and compare this with a similar benefit progression under the pooled annuity. It follows that we are able to replicate outcomes that we should be able to replicate using our assumptions and

- the expected values payable for each benefit event, and
- the probability of paying each event happening.

I remove the living annuity constraint of a 17.5% maximum as one of the constraints from the pooled annuity.

4. COMPARING BENEFITS

I project the benefits payable from the living annuity as follows:

- Select an initial drawdown rate.
- This drawdown determines the annual amount payable as a percentage of the capital value at the beginning of the year.
- This annual amount is payable monthly.
- If the maximum drawdown rate applies, the monthly amount is determined as a percentage of the capital balance at the beginning of each month.

I then determine the present value of the projected income and death benefits as if they are funded by a pooled annuity. I use the assumptions in section 3.4.

Under the assumptions in 3.4, the pooled annuity and living annuity can have the same projected expected benefits, for every drawdown rate that does not result in the restriction of 17.5% being breached. I will call this the maximum equivalent initial drawdown rate (MEIDDR). This will also determine the maximum equivalent initial income (MEII) under both annuities.

The MEIDDR and MEII result in the following under both annuity options:

- The same progression of income and death benefit until the annuitant passes away.
- The income progression is the MEII plus the assumed annual increase.
- The expected death benefit at each age is the remaining capital that would be payable under the living annuity option.

I summarise some statistics from a number of different projections in Table 1. Points to note:

- The maximum equivalent drawdown rate (MEIDDR) for a male, aged 65, is 5.20%.
- The MEIDDR for a female, aged 65, is identical.
- This is because both males and females have the same assumed maximum survival age for the pooled annuity.
- Prior to this age, benefits can progress at the same rate under the pooled annuity and the living annuity.
- For a male, aged 65, the MEIDDR implies that in the living annuity R570,599 is in effect allocated to provide an income benefit and R429,441 is in effect allocated to provide a death benefit.
- The corresponding numbers for a female, aged 65, are R723,100 for the income benefit and R276,900 to the death benefit.
- If a male, aged 65, instead chose to allocate R750,000 to the income benefit and R250,000 to the death benefit he would:
 - have an initial drawdown rate of 6.83% in the living annuity to have the same starting income that could be funded in the pooled annuity,
 - reach the maximum allowable drawdown rate of 17.5% in the living annuity at age 84, and

- have a 45.9% chance of surviving to this age.
- From an income perspective, at least, he has a 45.9% chance of doing better under a pooled annuity than the living annuity under this revised allocation.

TABLE 1 Pooled annuity with different initial income rates or IDDRs

Retirement/ investment age	Gender	MEIDDR	IDDR	Present value of pooled annuity expected income benefit	Present value of expected death benefit	Age when maximum drawdown rate is reached in living annuity	Probability of survival to max drawdown age
60	M	5.10%	5.10%	R 632 500	R 367 500	112	0.0%
65	M	5.20%	5.20%	R 570 559	R 429 441	112	0.0%
65	M	5.20%	4.56%	R 500 000	R 500 000	N/A	0.0%
60	F	5.10%	5.10%	R 723 100	R 276 900	112	0.0%
65	F	5.20%	5.20%	R 665 414	R 334 586	112	0.0%
65	F	5.20%	3.91%	R 500 000	R 500 000	112	0.0%
65	M	5.20%	5.47%	R 600 000	R 400 000	104	0.0%
65	M	5.20%	5.92%	R 650 000	R 350 000	94	12.5%
65	M	5.20%	6.38%	R 700 000	R 300 000	88	31.1%
65	M	5.20%	6.83%	R 750 000	R 250 000	84	45.9%
65	M	5.20%	7.29%	R 800 000	R 200 000	81	56.6%
65	M	5.20%	7.74%	R 850 000	R 150 000	79	64.7%
65	M	5.20%	8.20%	R 900 000	R 100 000	77	71.4%
65	M	5.20%	8.65%	R 950 000	R 50 000	75	75.1%
65	M	5.20%	9.11%	R 1 000 000	—	74	79.5%
65	F	5.20%	5.47%	R 700 000	R 300 000	103	22.7%
65	F	5.20%	5.86%	R 750 000	R 250 000	95	45.9%
65	F	5.20%	6.25%	R 800 000	R 200 000	89	56.6%
65	F	5.20%	6.64%	R 850 000	R 150 000	86	64.7%
65	F	5.20%	7.03%	R 900 000	R 100 000	83	71.4%
65	F	5.20%	7.42%	R 950 000	R 50 000	80	75.1%
65	F	5.20%	7.81%	R 1 000 000	—	79	79.5%

A similar interpretation applies to the other allocations between income and death benefit.

However, we can add to the above table to consider the difference in the value for the expected death benefit. An additional perspective on the numbers is that for the male, aged 65:

- We cannot allocate R750,000 to the living annuity and have the same starting income as the pooled annuity.
- To achieve an equivalent expected value of the income benefit under the living annuity, the living annuity IDDR would be 7.27%.

If we then compare the pooled annuity with a starting income of R68,300 pa and a living annuity with an IDDR of 7.27% or annual income of R72,700.

- R750,000 in value under each option is allocated to the expected income benefit and R250,000 to the expected death benefit.
- The living annuity's starting income is 6.4% higher than the pooled annuity.
- The living annuity option will cap out at 17.5% at age 82.
- There is a 53.8% probability of surviving to that age.
- By age 85 and 4 months the annuitant will have received more in total income under the pooled annuity than the living annuity.
- There is a 41.1% probability of surviving to that age.
- The present value of expected benefits received under the pooled annuity will exceed the present value of the expected living annuity income benefits if the annuitant survives to age 88 and 4 months.
- There is a 29.9% probability of surviving to that age.

Alternatively, we can choose to have the same starting income. In this instance.

- The present value of the expected income benefit under the pooled annuity option is R26,015 higher than the expected value of the living annuity income benefit.
- We need to allocate R26,015 less to the present value of the expected death benefit under the pooled annuity.
- I accommodate this by curtailing the death benefit under the pooled annuity once the present value of the expected death benefit exceeds R250,000.
- This occurs at age 84 and 6 months.

Figure 1 shows the progression of the expected benefits using the MEIDDR. Under this option the income and death benefits under the pooled annuity and living annuity are the same.

Figure 2 shows the benefit progression if we allocate R750,000 to the income benefit and R250,000 to the death benefit for both the pooled annuity option and living annuity option. Under this option:

- An investment of R750,000 can secure a pooled annuity initial income of R68,300.
- A living annuity with an investment of R1m and an IDDR of 6.83% will breach the 17.5% cap on the drawdown rate.

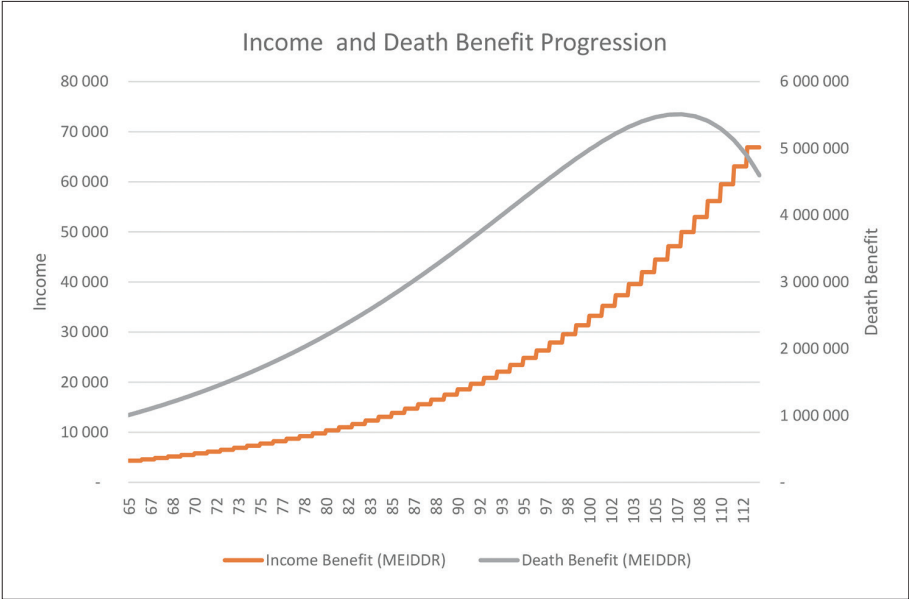


FIGURE 1 Income and death benefit progression using MEIDDR

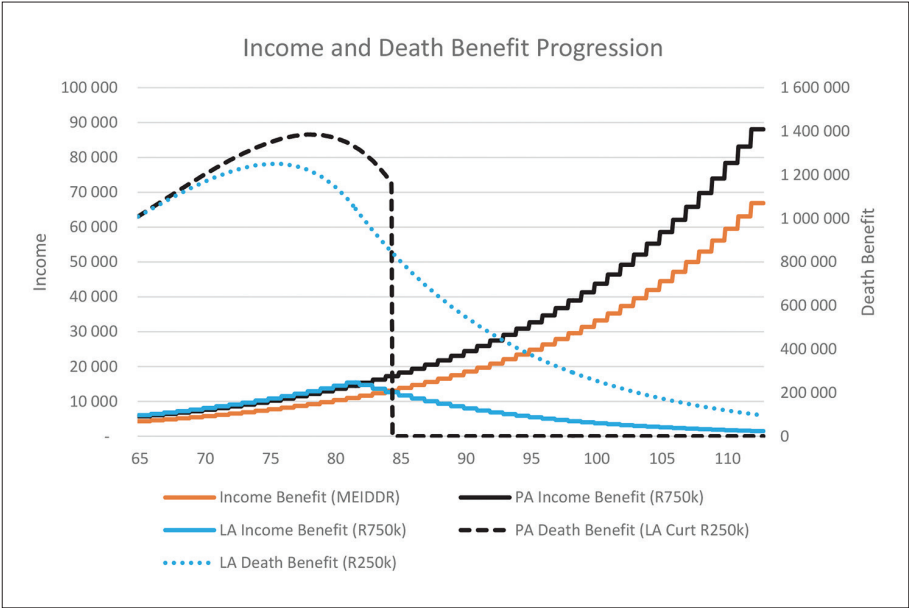


FIGURE 2 Income and death benefit progression for both pooled annuity and living annuity options

- So the expected income under the living annuity option will be lower than the pooled annuity with the same starting income.
- The value of the expected income from a living annuity with an IDDR of 6.83% is R724,000 (rounded to the nearest R1,000).
- The value of the expected death benefit progression under this living annuity is R276,000.
- I have curtailed this expected death benefit progression for the pooled option to restrict the expected present value of the death benefit to R250,000.
- The income progression for the living annuity option is such that the expected present value of this progression is R750,000 (instead of R724,000).
- The starting annual income for this living annuity option is R72,700, i.e., 6.4% higher than the pooled annuity starting income.

Figure 3 shows graphically what happens to the income benefit component only, under the various options.

Figure 4 compares only the income progression of the two living annuity options on a different scale.

The income projection seems to visually favour the R724k living annuity option. The R750k living annuity income level starts 6.4% higher than the R724k living annuity option. The present value of the expected income benefit for the living annuity R724k option is R26,015 less than the living annuity R750k option.

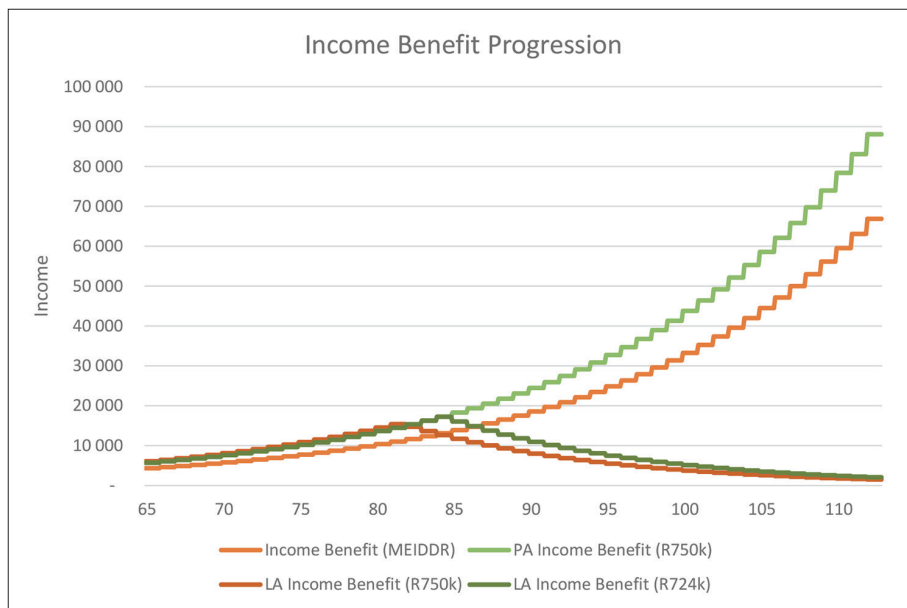


FIGURE 3 Income benefit progression

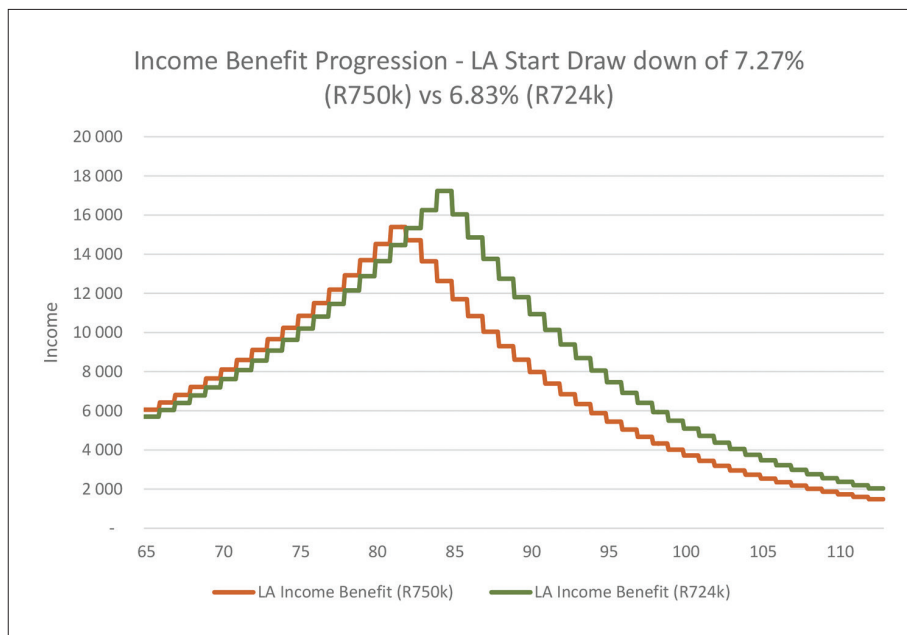


FIGURE 4 Income benefit progression: LA start drawdown of 7.27% (R750k) vs 6.83% (R724)

5. THE BIFURCATION OF BENEFITS

The comparisons in section 4 allow us to make a critical observation. It is possible to bifurcate the initial investment into two components:

- a value allocated to an income benefit, and
- a value allocated to a lump sum death benefit.

In doing so, investors can make a better-informed decision about allocating capital at retirement towards benefits that may be more relevant for the investor's particular circumstances. If one does not consider these components, an investor investing in a living annuity is potentially unaware:

- that they are in effect making an allocation to a death benefit by selecting a living annuity;
- of the potential implications for the income benefit, if the selected drawdown rate is above the MEIDDR; and
- that choice on the level of income is also a choice about the potential death benefit.

Some of these observations might seem obvious, but it may be challenging for an investor to understand potential future implications at the time of making a decision.

Pooling can assist to shape the benefits in a pool based on expected outcomes. Risks around these expectations can be managed in the pool. In a living annuity product, an investor is managing all the complexity (and risk) on their own.

Table 2 provides more context to the numbers in Table 1. In addition to the value of the expected income benefit from the pooled annuity, it shows the value of the expected income benefit from the living annuity, assuming the living annuity has the same starting income as the pooled annuity.

TABLE 2 Difference in value of income benefit for pooled annuity vs living annuity

Retirement/ Investment age	Gender	MEIDDR	IDDR	Present value of pooled annuity expected income benefit	Present value of living annuity expected income benefit	Age when maximum drawdown rate is reached in living annuity	Probability of survival to max drawdown age
60	M	5.10%	5.10%	R 632 500	R 632 500	112	0.0%
65	M	5.20%	5.20%	R 570 559	R 570 559	112	0.0%
65	M	5.20%	4.56%	R 500 000	R 500 000	N/A	0.0%
60	F	5.10%	5.10%	R 723 100	R 723 100	112	0.0%
65	F	5.20%	5.20%	R 665 414	R 665 414	112	0.0%
65	F	5.20%	3.91%	R 500 000	R 500 000	112	0.0%
65	M	5.20%	5.47%	R 600 000	R 599 964	104	0.0%
65	M	5.20%	5.92%	R 650 000	R 648 127	94	12.5%
65	M	5.20%	6.38%	R 700 000	R 690 000	88	31.1%
65	M	5.20%	6.83%	R 750 000	R 723 985	84	45.9%
65	M	5.20%	7.29%	R 800 000	R 751 014	81	56.6%
65	M	5.20%	7.74%	R 850 000	R 772 580	79	64.7%
65	M	5.20%	8.20%	R 900 000	R 790 035	77	71.4%
65	M	5.20%	8.65%	R 950 000	R 804 050	75	75.1%
65	M	5.20%	9.11%	R 1 000 000	R 815 764	74	79.5%
65	F	5.20%	5.47%	R 700 000	R 699 871	103	22.7%
65	F	5.20%	5.86%	R 750 000	R 746 382	95	45.9%
65	F	5.20%	6.25%	R 800 000	R 784 290	89	56.6%
65	F	5.20%	6.64%	R 850 000	R 813 281	86	64.7%
65	F	5.20%	7.03%	R 900 000	R 835 351	83	71.4%
65	F	5.20%	7.42%	R 950 000	R 852 342	80	75.1%
65	F	5.20%	7.81%	R 1 000 000	R 865 666	79	79.5%

An investor with R1m, who invests in a living annuity with an IDDR of 6.83% that is expected to increase at 6% per annum, is, in effect, allocating R723,985 to an expected income benefit and R26,015 to an expected death benefit.

If, instead, the investor wants to secure an initial pooled annuity income benefit of R68,300 (increasing at 6% per annum), this will require an allocation of R750,000 to the expected income benefit. This implies that the investor has to reduce the amount that would be allocated to the expected death benefit under the living annuity by R26,015.

6. ALTERNATIVE BENEFIT OUTCOMES/DESIGNS

I test some alternative benefit designs using the pooled annuity construct, which:

- utilise the bifurcation of the income and death benefit,
- explore ways that we can take value away from one benefit to allocate to another, and
- are not exhaustive. They demonstrate a few ways that the trade-in value between the income and death benefits may be done.

I test four alternative benefit designs:

1. An annuity that starts at the maximum drawdown rate level of 17.5% of R1m, R175,000, and decreases each year. This annuity proxies a living annuity where the maximum drawdown is selected.
2. An annuity with a fixed lump-sum death benefit of the initial investment amount of R1,000,000 for a period of ten years after retirement.
3. An annuity as in example 2, except that the lump sum increases at 6% per annum.
4. A pooled annuity where the initial death benefit of R1,000,000 reduces by R100,000 per annum over the ten years to a balance of R0.

6.1 Maximum Drawdown Proxy

In the living annuity we start with an initial annual income amount of R175,000 or 17.5% of the R1,000,000 investment. I use assumptions to project both the income and death benefits. I determine a present value of the expected benefits and use this to construct a pooled annuity option where:

- the initial annual income is R175,000, and
- the income reduces every year.

For a male aged 65 – with mortality of PA(90) adjusted down by three years – this annual reduction would be 7.37%. If you construct a pooled annuity for a male, aged 65, with an initial income of R175,000, then this income would have to reduce by 7.37% per annum to create an investment that has the same value as a living annuity with an initial drawdown rate of 17.5%. A few more observations from this comparison:

- A living annuity with an IDDR of 17.5%, has the same value as an income stream that we expect to reduce by 7.37% each year.

- The present value of the expected income stream of the living annuity is R875,500 for a male aged 65. So even if we maximise the income benefit paid from the living annuity, R124,500 in value is still being allocated to an expected death benefit.
- The similar figures for a female aged 65 are an implied annual reduction in income of 7.37%, with R69,000 in present value allocated to the expected death benefit.

This supports the theory that an investor is unable to maximise the income benefit they are able to receive in retirement from a living annuity. To do this an investor would need to invest all the capital in an option that pools benefits in some way.

We can assist investors at retirement, by first determining how much of their investment is allocated to an expected income benefit and how much is allocated to an expected death benefit. A pooled option can then create the ability to trade in value between these two benefits.

For the majority of investors who invest in living annuities, this allocation happens indirectly through the choice of a living annuity product and the drawdown rate. However, it is not clear that the impact of the drawdown rate is well understood in terms of an expected value.

6.2 Fixed Death Benefit of R1,000,000 for Ten Years

Some context for this option:

- The annuity factor for a pooled annuity using the assumptions in this paper is just over 10.
- This implies an approximate run down of the capital over approximately ten years.
- Fixing the term for the death benefit at ten years gives more certainty.
- If the annuitant passes away during the period where they expect to use the investment for income, then they get the initial capital back.
- It potentially addresses a need to leave a known amount for dependants, on death.

Key elements of this option:

- Present value of expected death benefit is R220,029.
- Present value of expected income benefit is R779,071.
- Initial income from the pooled annuity is R71,056 pa.
- This equates to an initial drawdown rate of 7.1% if the investor wants the same start income from a living annuity.

Under a living annuity option with an IDDR of 7.1%:

- The present value of the expected death benefit is R259,106 – higher than the allocation for the pooled annuity.
- The present value of the expected income benefit is R740,894 – lower than the allocation for the pooled annuity.
- Maximum drawdown would be reached at age 83.

- The probability of surviving to 83 is 50%.

6.3 Increasing Lump Sum Death Benefit over Ten Years

The context is similar to the option in section 6.2. In addition, the lump sum increases to proxy the growth in the potential lump-sum death benefit under a living annuity option – due to the net positive impact of investment returns.

Key elements of this option:

- Present value of expected death benefit is R298,818.
- Present value of expected income benefit is R701,182.
- Initial income from the pooled annuity is R63,878 pa.
- This equates to an initial drawdown rate of 6.39% if the investor wants the same start income from a living annuity.

Under a living annuity option with an IDDR of 6.39%:

- The present value of expected income is R690,877 – lower than the allocation for the pooled annuity.
- The present value of expected income is R309,123 – higher than the allocation for the pooled annuity.
- Maximum drawdown would be reached at age 88.
- The probability of surviving to 88 is 31%.

6.4 Decreasing Lump Sum Death Benefit over Ten Years

Some context for this option:

- We assume a starting investment amount of R1,000,000.
- We expect income benefits to be paid out from a pooled option to start at just under R100,000 per annum.
- We can also think about the potential death benefit decreasing at round 10% per annum over ten years.

Key elements of this option:

- Present value of expected death benefit is R109,519.
- Present value of expected income benefit is R890,481.
- Initial income from the pooled annuity is R81,123 pa.
- This equates to an initial drawdown rate of 8.12% if the investor wants the same start income from a living annuity.

Under a living annuity option with an IDDR of 8.12%:

- The present value of expected income is R213,110 – lower than the allocation for the pooled annuity.
- The present value of expected income is R776,880 – higher than the allocation for the pooled annuity.

- Maximum drawdown would be reached at age 78.
- The probability of surviving to 78 is 68%.

7. DIFFERENT ASSUMPTIONS

I test the sensitivity of results to different assumptions:

- Changing the net real return assumption to be 4% in excess of inflation, or CPI+4% pa.
- Changing the net real return assumption to be 3% in excess of inflation, or CPI+3% pa.
- Changing the inflation/increase assumption from 6% pa to 5% pa.

I consider the MEIDDR for these assumptions as well as an implied IDDR to match the initial income from a pooled annuity allocating R750,000 to the income component. Table 3 summarises some results.

TABLE 3 Results under different increase and real return assumptions

Increase/ Inflation (per annum)	Gross real rate of return	Age	Gender	MEIDDR	IDDR	Present value of pooled annuity expected income benefit	Present value of living annuity expected income benefit (same IDDR)	Age when maximum drawdown rate is reached
6%	6%	65	M	5.20%	5.20%	R 570 559	R 570 559	N/A
6%	6%	65	F	5.20%	5.20%	R 665 414	R 665 414	N/A
6%	5%	65	M	4.44%	4.44%	R 528 168	R 528 168	N/A
6%	5%	65	F	4.44%	4.44%	R 623 182	R 623 182	N/A
5%	5%	65	M	4.44%	4.44%	R 529 937	R 529 937	N/A
5%	5%	65	F	4.44%	4.44%	R 624 986	R 624 986	N/A
6%	4%	65	M	3.72%	3.72%	R 482 995	R 482 995	N/A
5%	4%	65	M	3.72%	3.72%	R 577 197	R 577 197	N/A
6%	6%	65	M	5.20%	6.83%	R 750 000	R 723 985	84
6%	5%	65	M	4.44%	6.30%	R 750 000	R 715 260	84
5%	5%	65	M	4.44%	6.29%	R 750 000	R 715 718	84
6%	4%	65	M	3.72%	5.78%	R 750 000	R 705 658	83
5%	4%	65	M	3.72%	5.76%	R 750 000	R 706 060	83

We see that:

- The real return assumption has a larger impact on the MEIDDR than the absolute value of the increase assumption.
- Lowering the real rate of return:
 - Increases the amount one needs to allocate to a pooled investment per unit of initial income, i.e., increases the annuity factor.
 - The MEIDDR compensates for this by lowering the implied MEIDDR.
 - The combination of a lower real rate and lower nominal return results in less capital being allocated to income if we apply the MEIDDR.
- If we allocate the same amount of capital to income under the different assumption scenarios:
 - The implied IDDR from the pooled annuity construct is lower as the real rate of return decreases.
 - The implied IDDR is less sensitive to absolute changes in the nominal return, e.g., if the increase inflation assumption changes and the real return stays constant.

8. CONCLUDING OBSERVATIONS

One important aspect of investing at retirement is to provide an income benefit. The majority of retirees are investing in living annuity products. A living annuity product implicitly allocates part of the investment to fund a death benefit. A living annuity does not allow investors to allocate the maximum capital towards providing an income benefit.

At a drawdown rate below (or equal to) the MEIDDR it is possible for a pooled annuity and a living annuity to provide identical benefits. We can use actuarial assumptions to place a value on the expected income and death benefits. This can provide context to better understand the relative value of allocating capital at retirement.

We can use pooling to potentially trade in this value between an income and a death benefit. This can create flexibility for investors to better allocate capital at retirement for specific outcomes applicable to their specific circumstances.