momentum
investments

Secure in risk

A whitepaper
on retirement income

September 2022

THE RESEARCH
HIVE

This research paper is intended only for investment professionals and financial advisers.

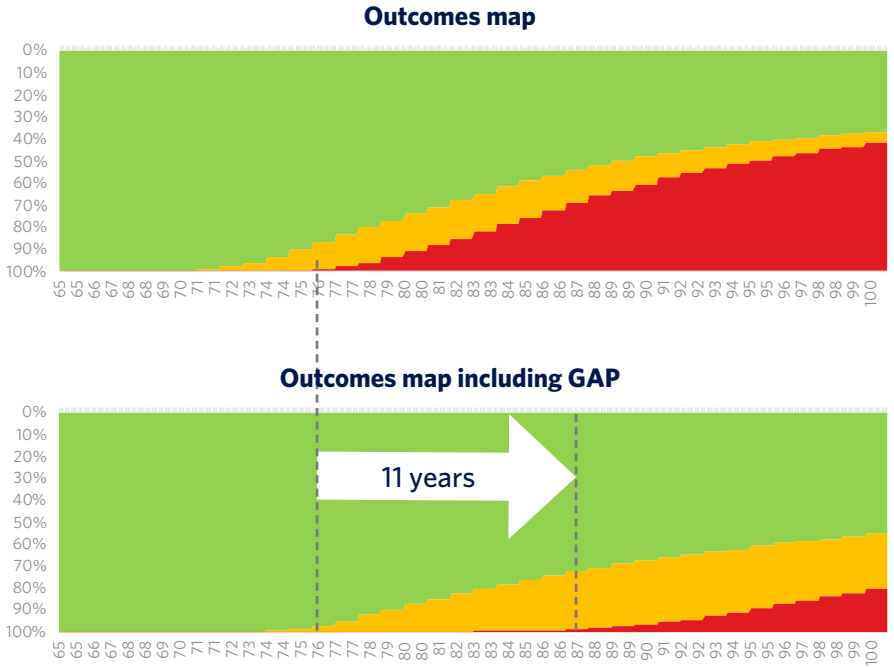
How much better could you live in retirement if you diversify to secure your risk?

In this whitepaper, we show that the required income from a living annuity to maintain a reasonable standard of living can be extended by as much as a decade and even longer, when harnessing risk in an efficient manner by hedging the primary retirement income risks.

Maintain a reasonable standard of living for an additional 10 years and longer

Retirement risks

To date, retirees had the primary options of investing in a living annuity or purchasing a life annuity, of which the living annuity has been the more popular option, especially for larger investment amounts. Yet, choosing a living annuity left retirees with significant market and longevity risk.



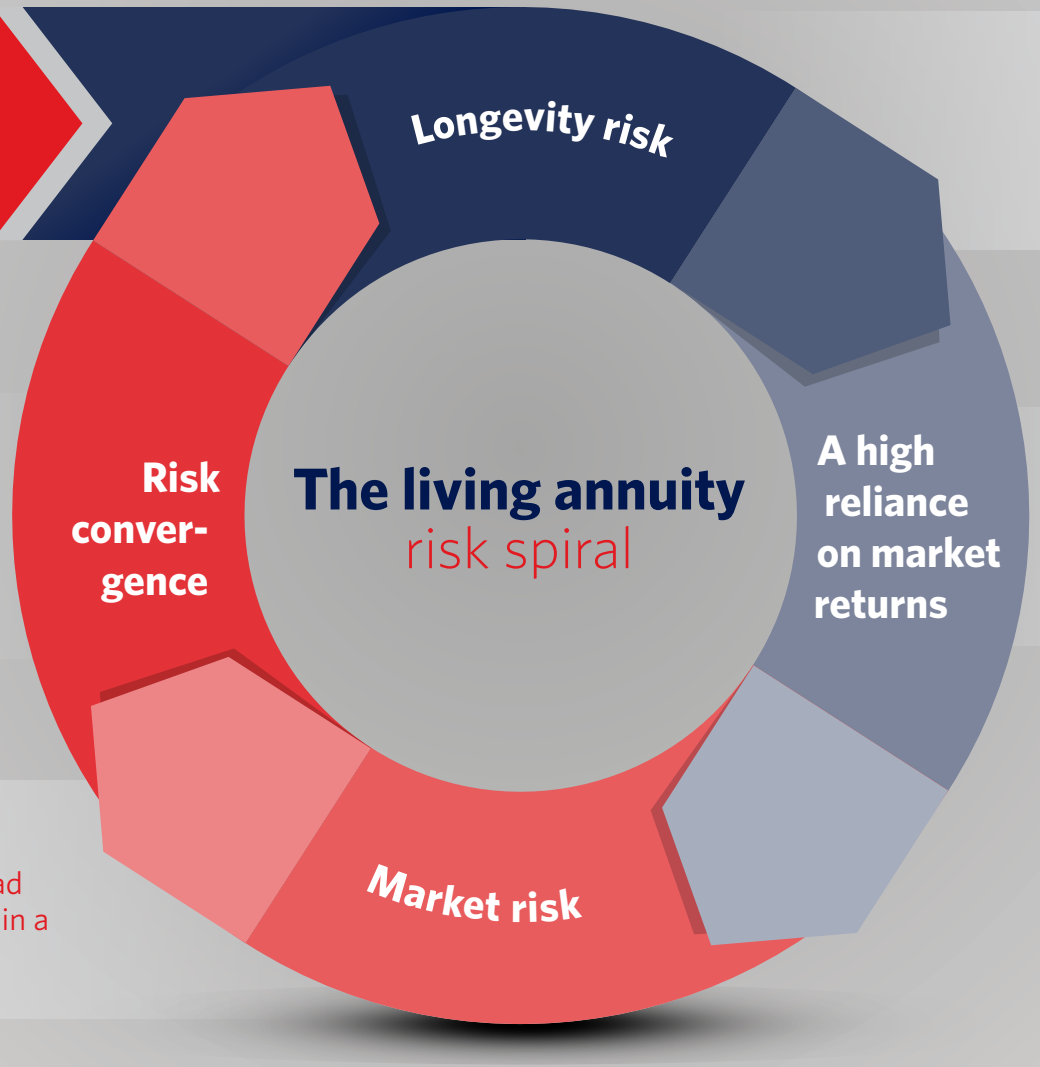
See assumptions in Annexure 5

This view of providing for retirement income is fragmented and does not consider the efficiencies that can be created when using a life annuity as an asset class within a living annuity.*

(*In this whitepaper, we refer to a life annuity used as an asset class or as a fund within a living annuity as a Guaranteed Annuity Portfolio or GAP.)

The existing living annuity risk spiral

Traditional investment strategies do not provide a perfect hedge against the primary retirement risks*



The risk of living longer than expected requires a higher return to sustain a reasonable income
(example on page 9)

A higher required return demands a client to take on additional market risk

When markets underperform, higher market exposure can lead to an income that cannot sustain a reasonable standard of living

This reduced standard of living may now have to be maintained for an extended period if the client lives a prolonged life
(example on page 8)

*For simplicity, we ignored inflation risk as a primary retirement risk. This is the risk that clients need to increase their income by more than planned due to the increase in the costs of goods and services. Inflation risk can be reduced by using an inflation-linked life annuity.

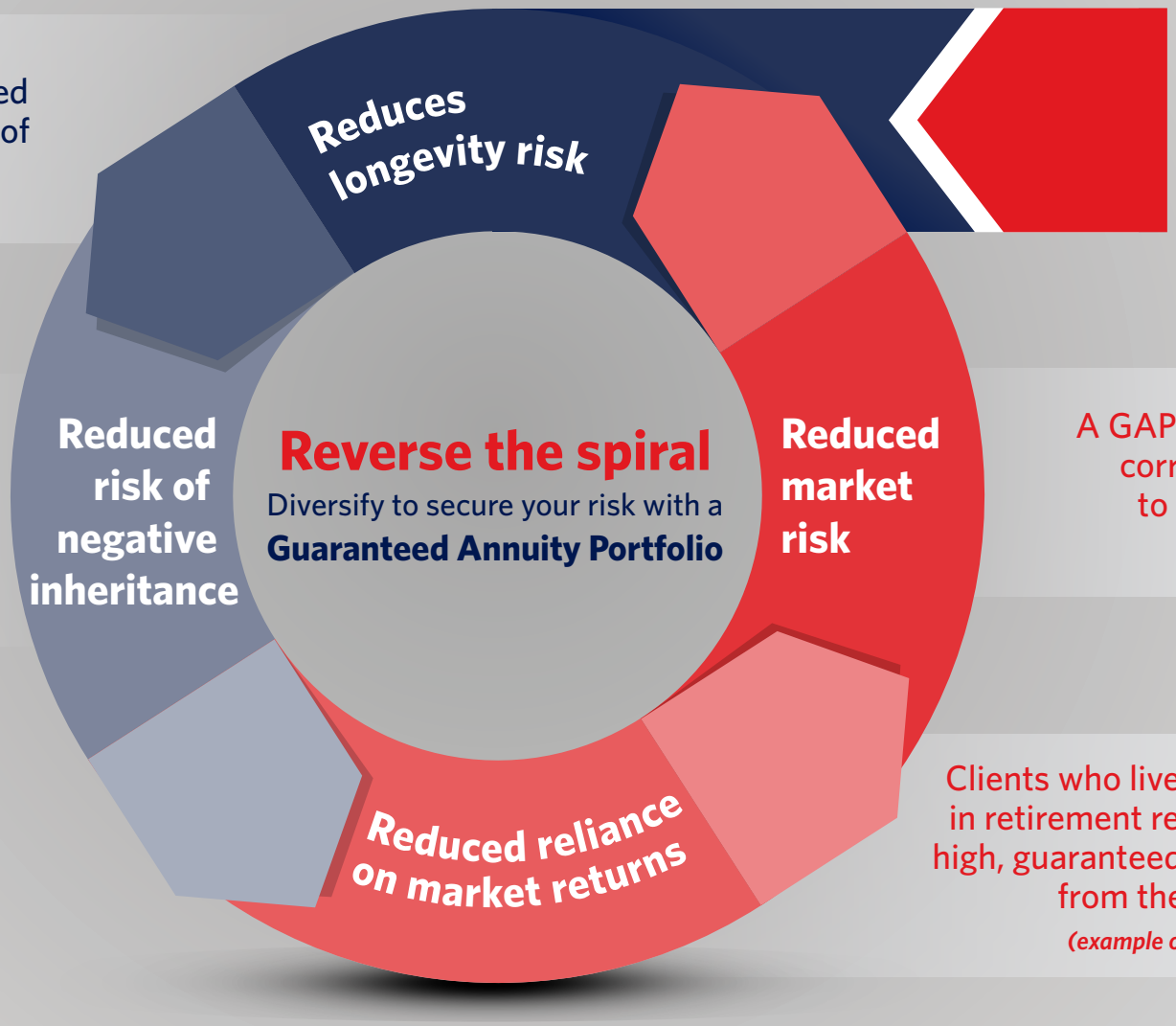
How introducing a GAP can reverse the living annuity risk spiral

The attributes of life annuities provide a form of hedging against the effects of the traditional retirement risks

The GAP pays a guaranteed income for the remainder of the client's life

The guaranteed income may uphold a reasonable standard of living

(example on pg 12)



A GAP has no correlation to market returns

Clients who live longer in retirement receive a high, guaranteed return from their GAP

(example on page 11)

Diversification
and retirement risks

For a living annuity, most investment strategies are based on the premise of taking enough risk, so the expected returns are at a high enough level to sustain the required income up to the client's life expectancy. In addition, risk is mitigated to some extent, by investing efficiently by means of a diversified portfolio, one that is exposed to the local and global asset classes of cash, bonds, property and equities.

Yet, with these strategies, the primary retirement risks remain, namely market risk and longevity risk.

A life annuity, on the contrary, has no exposure to market risk and longevity risk but it provides an inflexible income stream with no market participation.

Reimagining
retirement income

We have enhanced our living annuity (the Retirement Income Option) so advisers can add a life annuity as an investment component. This means they can now add the life annuity (the Guaranteed Annuity Portfolio) in a similar way to adding an equity fund, for example.

Even though the launch of this solution led to this whitepaper, we focus on the larger investment theme of **diversification** by using a different type of asset class, namely a life annuity. Our aim is to improve your understanding of the risk and return attributes as well as the efficiency it can bring to a living annuity.

Overview

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In this whitepaper, I start with the benefits of **diversification** and what a good outcome could be for a retiree.

For readers not familiar with a life annuity and a living annuity, I explain more about their features in two annexures.

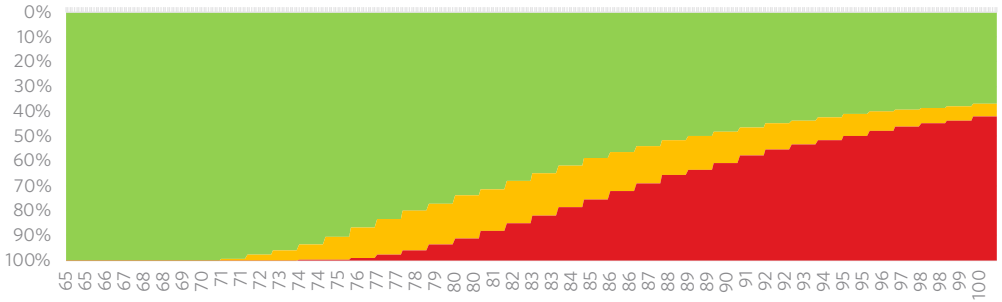
I briefly touch on the choice of annuities. However, I focus on the popular choice, which is the living annuity, and how the risks inherent to this product (market and longevity risk) transpire. Here, I discuss the link between longevity risk and the additional required return to offset this risk.

I then turn your attention to a case study that showcases the market risk and longevity risk inherent in a living annuity. The case study (Greg retires) starts by analysing a single simulation, it then moves to three simulations whereafter it looks at the distribution of a set of 2 000 simulations.

It is built up in this manner to explain a new concept to you, which is a graphic devised specifically for the purpose of this whitepaper that will be referred to as an outcomes map.

The outcomes map shows you, through the use of colour, the probability (and severity) of running out of income the longer the retiree lives in retirement

Outcomes map



For all outcomes maps in this document, the vertical axis represents the probability of receiving a certain level of income per age, where age is depicted on the horizontal axis.

Once you are equipped to interrogate an outcomes map, I introduce the new asset class, which is the life annuity or GAP.

I start by interrogating the GAP's ability to hedge the primary retirement risks through its return and correlation attributes.

Another case study (Gina retires) follows, with the same client needs, but with an investment strategy where I introduce the GAP as an asset class within the living annuity.

Conclusion

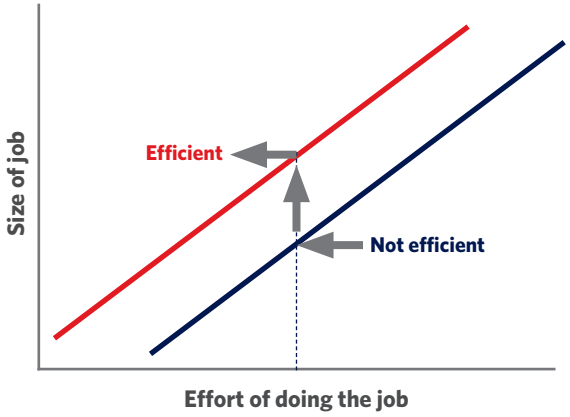
Adding a life annuity as an asset class within a living annuity can significantly reduce market risk and longevity risk to enhance the certainty of receiving a sustainable income in retirement

"Diversification is the only free lunch"

Nobel Prize laureate Harry Markowitz

The benefits of diversification in investments can be compared to working efficiently. When doing things efficiently, you can translate the same amount of effort into more output or better-quality output. Stated differently, you can do the same job with much less effort, or much quicker.

Figure 1: High effort does not always equate to high output

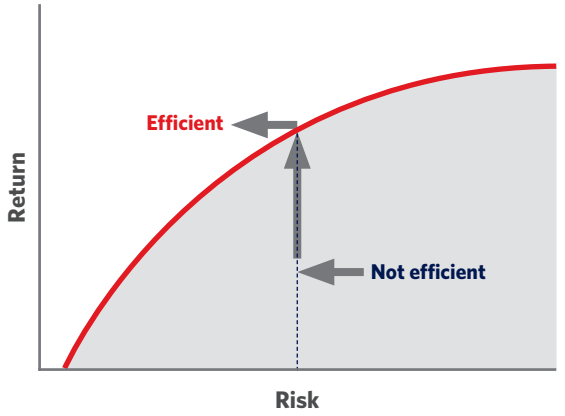


With **the same effort**, you can do a larger job if your work efficiently

For investments, the strive to efficiency is achieved by diversifying in an optimal manner.

The key to the diversification of investments is using more asset classes, and the less correlated those assets classes are, the better. Diversification creates the opportunity to improve client outcomes without taking on more risk. It creates the opportunity to create efficient investments – ones that provide better outcomes.

Figure 2: The efficient frontier is used to describe efficient investments



An efficient investment portfolio can provide a higher expected return (a better outcome) for **the same amount of risk**

Here, a good outcome is to get the highest expected return for a certain amount of risk.

But what is a good outcome for a retiree in a living annuity?

We define a good outcome as the clients' ability to replace their income in such a way as to sustain their current lifestyle fully, but if not, at least at a reasonable standard of living for as long as they live.

Technical information about the assumptions

- Sustain the current lifestyle = 100% of specified need/income required. **(indicated as green)**

  This assumes you can meet your living (discretionary) expenses and your life (essential) expenses.

- Sustain a reasonable standard of living = between 50% and 100% of specified need/income required. **(indicated as amber)**

  This assumes you can partially meet your living expenses but your life expenses in full.

- Sustain an unsatisfactory lifestyle = less than 50% of specified need/income required. **(indicated as red)**

  This assumes you can't meet your living expenses and only a part of your life expenses.

See Annexure 1 for information about what is a good outcome for a retiree in a living annuity
See Annexure 2 for information about a living annuity

The choice of wrappers – a life annuity and a living annuity

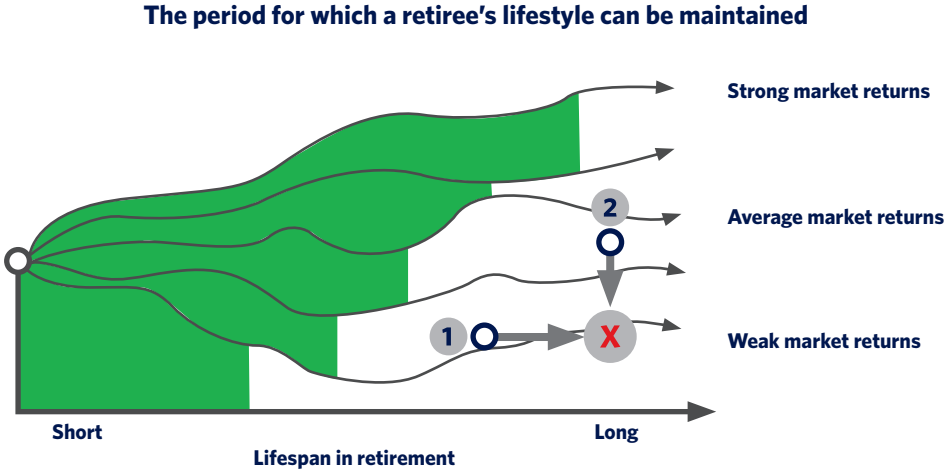
Until now, clients had to choose between a living annuity and a life annuity that provides a guaranteed income for life (see annexure 3 for more information about a life annuity). Each of these annuity types offer different advantages and disadvantages, making it difficult for clients to achieve all their retirement goals, especially when viewed in the light that most clients might not have saved enough for retirement.

Historically, the living annuity has been the most popular choice, attracting about 90% of the flows on our platform, but with the market uncertainty of the past few years, this percentage has dropped to about 70%.

How the risks in a living annuity transpire

When markets do perform well, a living annuity does provide the opportunity to reach the perfect outcome in terms of meeting clients' income and inheritance needs. Of course, markets do not always perform well, and when it performs badly, the risks inherent in a living annuity may not transpire immediately. These risks, namely market risk and longevity risk, can remain hidden and their effects on a retiree's standard of living are discussed below.

Figure 3: How market risk and longevity risk influence the standard of living that can be achieved in retirement



1. Below-average returns from the market put a client's income at risk (the timing is based on the degree of underperformance).
2. A client's income can become unsustainable when living to a high age (even if markets perform reasonably well).

X When retirement risks converge – longevity coupled with weak-performing markets.

Here, we can see that a client could run out of money if markets perform below expectations and if the client lives for longer than expected.

This implies that clients are faced with two significant risks, namely market risk and longevity risk.

Longevity and its effect on the return a client requires

Clients who live longer in retirement will require a higher return on their investments to sustain their real required income. In our example, clients will have to aim for a return of about CPI (inflation) plus 4% per year to sustain their income for a reasonable amount of time, but the return requirement could increase to CPI plus 6.5% per year for people who live up to a very old age.

Table 1: The growth needed to provide an income over a term

Years of retired life	15	25	35
Return required	8.8%	10.8%	11.5%
Real return required*	CPI + 3.8%	CPI + 5.8%	CPI + 6.5%
Survival probability**	70.9%	32.9%	3.3%

* Assumed inflation of 5%. A starting income of 7% is assumed. Fees have been ignored.
** The survival probabilities are for a male aged 65 (as per the GAP pricing assumptions)

Case study 1

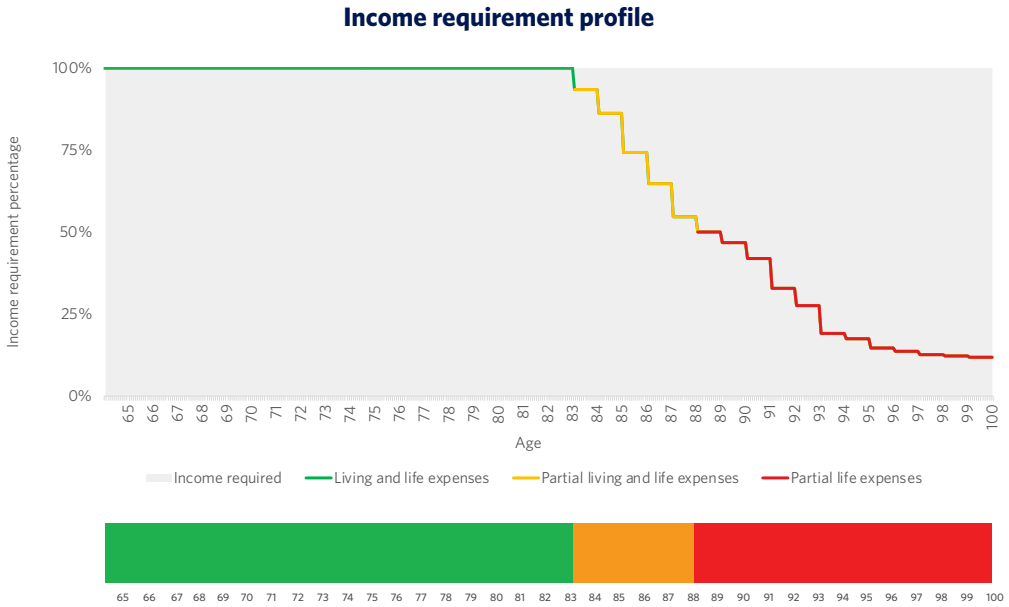
Greg retires

An example of a living annuity and the corresponding market risk and longevity risk

Greg is 65 years old and about to retire. He will be transferring R2 million from his retirement savings to a living annuity as he wants to participate in markets. His income requirement from the living annuity is R140 000 per year, increasing at 5% per year. This will sustain his current lifestyle. He chooses a medium-risk fund.

To start the analysis, we will show the result of one of the 2 000 simulations which we ran. Here, Greg managed to maintain his income requirement up to the age of 83, after which this income started to reduce quickly.

Figure 4: Simulation of a pure living annuity with a medium-equity multi-asset-class investment



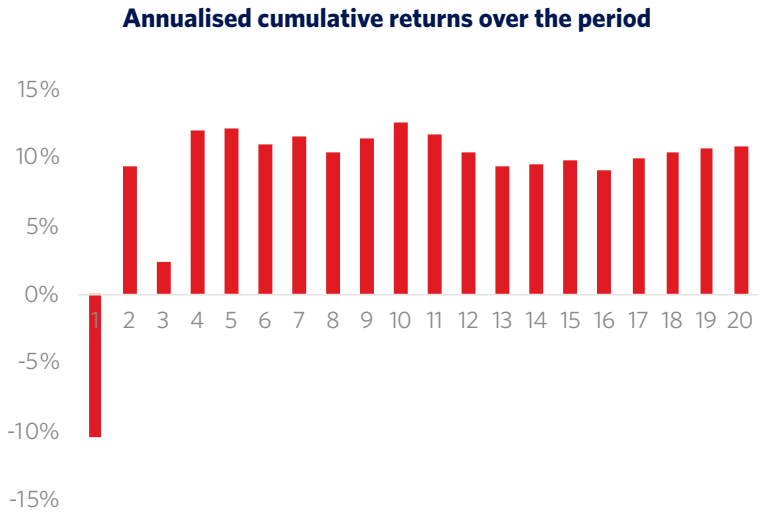
Assumptions: The 40th percentile simulation was selected from a set of 2 000 simulations. These simulations were adjusted to be aligned to our forward-looking expectations of market returns. Additional assumptions can be found in Annexure 5.

In our example, markets were on average providing a long-term return of just under 11% (see figure 5) per year for the first 20 years. Yet, more importantly, markets stumbled in the first few years (market risk materialising as sequence risk – the risk of markets performing badly at the start of your investment), placing the entire income requirement under pressure. But here, failure to meet the full requirement did not occur until the age of 84.

This is an ideal example to show that market risk and longevity risk may not become evident in a living annuity as the required income could be maintained for almost 20 years.

This is illustrated by the colour of the line in figure 4 changing.

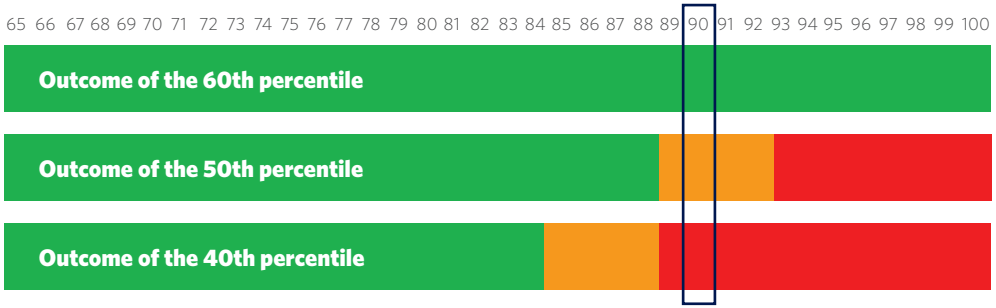
Figure 5: The simulated returns used in the example



Yet, this is only one simulation. As we used the 40th percentile simulation, it means that 60% of the time we expect the simulations to do better than this and 40% of the time we expect them to do worse.

To understand the experience over all 2 000 simulations, we will expand on the number of simulations, by jumping from one simulation to three simulations. If we look at the 40th, 50th and 60th percentile simulations individually, we see the risks transpiring as follows.

Figure 6: A simplified outcomes map



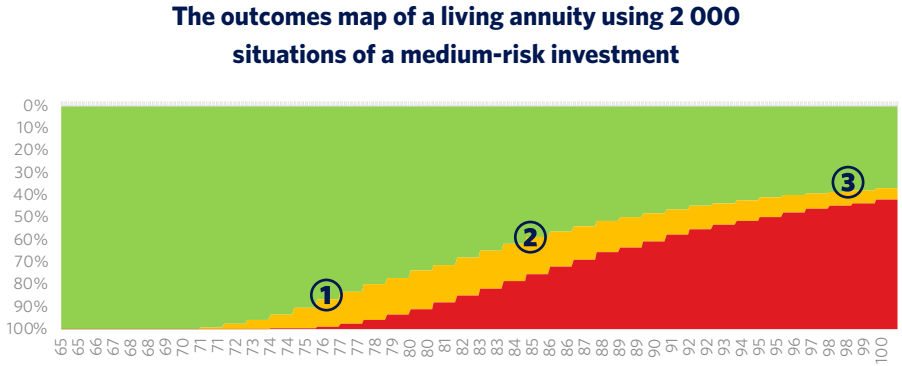
See assumptions in annexure 5

Looking at figure 6, what you do not want to see as you move from left – the early years in retirement (where the risks have not yet transpired) – to the right – the latter years in retirement – is more yellow and especially red (over each age – see block). You also do not want to see the yellow and red creeping up to the left of the chart as this means an increased probability of a retiree running out of income earlier.

The outcomes map shows, through the use of colour, the probability (and severity) of running out of income the longer the retiree lives in retirement

Let's now go to the full simulation.

Figure 7: The living annuity outcomes map (medium risk)



See assumptions in Annexure 5

From the above, there are a few risks that come to the fore:

1. Short-term and medium-term market risk (as well as sequence risk)
2. Long-term market risk
3. Longevity risk

1. Even though markets tend to show a form of mean reversion, in the short term, markets can fall significantly. A recovery from a fall does become harder in a living annuity as the income drawdowns are selling additional units whose values are depressed to fund the income (that is set as a fixed amount).
2. Even though markets do perform more consistently in the long run, their returns are still variable and, in the periods where markets perform under expectation, their returns may not meet client expectations.
3. It is very hard for markets to meet client needs for extended periods of time (especially as their income need to keep up with inflation).

A new asset class to hedge the retirement risks – making a life annuity available as an asset class

A life annuity is well known as a solution that reduces longevity risk. Yet, the return and diversification benefits of a life annuity are not as widely discussed.

From a diversification perspective, it is easy to understand that markets have no effect on the income received from a life annuity (once the annuity has been purchased, the income and increases are fixed). This reduces the variability of the income a client can expect when adding a life annuity as an asset class. It also adds another significant diversification benefit. It limits the number of units that needs to be sold from market-linked funds to pay the client's income when markets go through phases of underperformance (when the distributions of the life annuity are used first).

On top of this, it places a floor on the downside in even the worst market conditions, since the minimum income is always guaranteed.

From a return perspective, even though the income and its increase pattern is fixed, the actual return (IRR) you get from a life annuity is not fixed and has largely been ignored in financial literature.

The reason why the return is variable is due to the uncertainty of the term for which this income will be paid as it is linked to the client's lifespan. As such, clients do not know the total they will be paid for the remainder of their lives.*

* This can be made more certain by adding a guarantee term. This is not covered in this version of the whitepaper.

A somewhat surprising fact about the shape and level of the return (IRR) clients get from a life annuity is that it creates an efficient hedge against market risk at the time it is needed most.

In figure 3, the **X** marked the dreaded spot clients do not want to reach, which is living a long life without the ability to look after themselves from a financial perspective. Clients living to this advanced age need a high return to sustain their income and it is here where a life annuity brings an entirely new type of return/income profile into the equation.

A life annuity's IRR increases with a client's lifespan (independent of market returns). This can bring the total investment portfolio's IRR closer to what is needed to offset longevity risk, especially when markets underperform.

Table 2: Analysis of a life annuity

Income from age 65 until age	The percentage of capital returned in nominal terms	How many years it took	IRR
75	100%	10	**1.48%**
78	150%	13	**6.47%**
81	200%	16	**9.21%**
84	250%	19	**10.84%**
86	300%	21	**11.58%**
88	350%	23	**12.13%**
90	400%	25	**12.55%**
92	450%	27	**12.88%**
93	500%	28	**13.02%**
95	550%	30	**13.25%**
96	600%	31	**13.34%**

See life annuity assumptions in annexure 5

Thus, it does not take many years in retirement for clients to receive back more than the purchase amount, and by the time the client has received 15 years of income (80 years old in our example), the IRR is already about 8.5%. From there, it does not take long to reach the point where the client has received R2 for every R1 of the purchase amount and shortly thereafter, the implied IRR reaches guaranteed double-digit returns for the clients who are still alive.

This IRR can even exceed 13% for clients who live up to a very old age.

When considering these older clients who need high returns from a pure living annuity, this type of return is not impossible from markets, but it is one that surely does not happen consistently. We can just look at the previous decade to know that this is true. Clients with requirements similar to Greg, who live up to these ages, will require returns of close to 11% (while not experiencing significant sequence risk) for three decades to maintain such an income stream.

The reality is clients and advisers are faced with uncertainty – uncertainty in terms of the lifespan of clients and the returns they will receive from markets.

Using a life annuity as an asset class can improve consistency in an unpredictable world

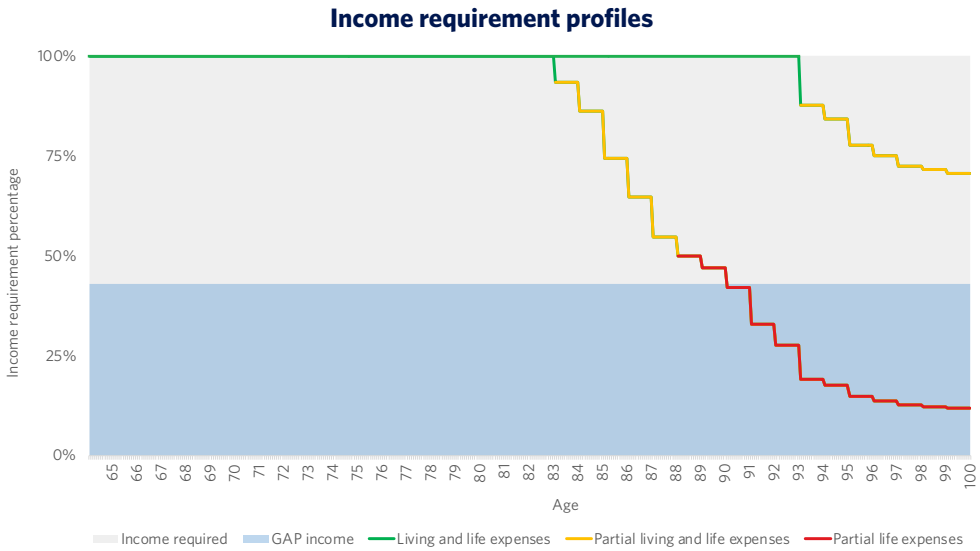
An example of a living annuity (with exposure to a life annuity or GAP) and the corresponding market and longevity risk

Gina is 65 years old and about to retire. She will be transferring R2 million from her retirement investments to a living annuity as she wants to participate in markets. Her income requirement from the living annuity is R140 000 per year, increasing at 5% per year. This will sustain her current lifestyle. She will, however, allocate 35% (R700 000) of her retirement savings to a life annuity. This life annuity will provide a guaranteed income for as long as she lives, starting at R5 013 per month (R60 155 per year) and increases every year by 5%. She chooses a medium-risk fund (the same fund as Greg) with the remaining 65%.

Below are the results from one of the 2 000 simulations for Gina and Greg.

Where Greg managed to maintain his income requirement up to the age of 83, Gina was able to maintain her income at the required level well into her nineties. What is even more significant, is that her income was always able to provide her with a reasonable standard of living.

Figure 8: Simulation of a living annuity with a medium-equity multi-asset-class investment (with and without a GAP)



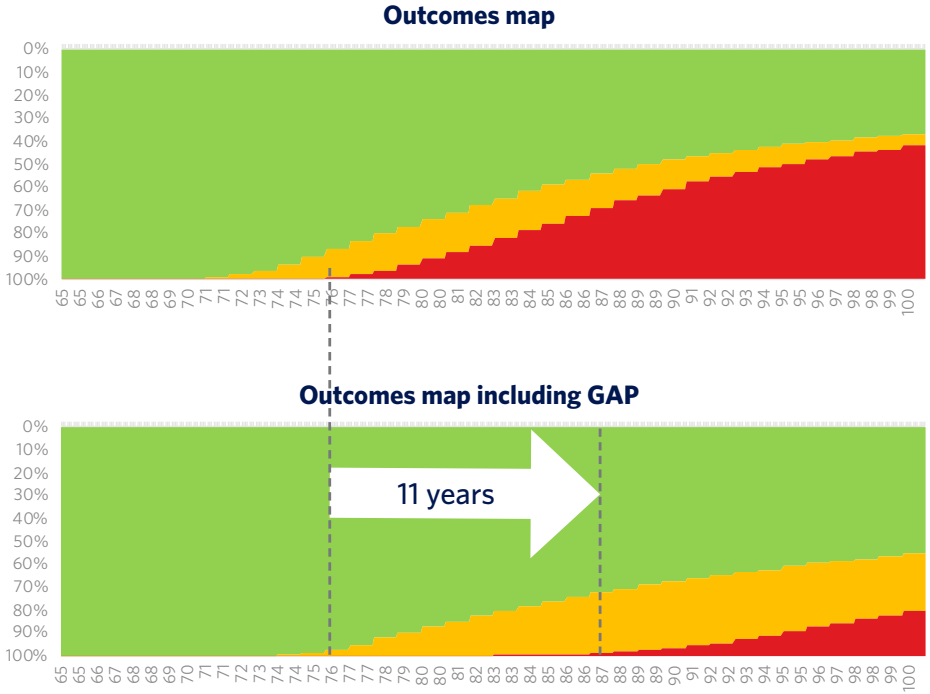
See assumptions in annexure 5

It is important to note that for better-performing simulations, the pure living annuity can and will outperform the living annuity with a life annuity as an asset class. It will outperform in terms of the ability to provide income (and to increase the income above the levels that were originally required) and it will also provide a higher benefit to any dependants.

This is covered in annexure 4: The effect of the GAP on the IRR of a living annuity.

While this is true, the living annuity with a GAP provides a more consistent outcome in terms of income provision as it is better protected against the main uncertainties, namely market risk and longevity risk. This can be seen from the corresponding outcomes maps.

Figure 9: The outcomes maps for both examples (medium risk)



See assumptions in annexure 5

Here, the yellow and red are pushed to the right and to the bottom. The area where the income provision is affected also has a much lower percentage of red.

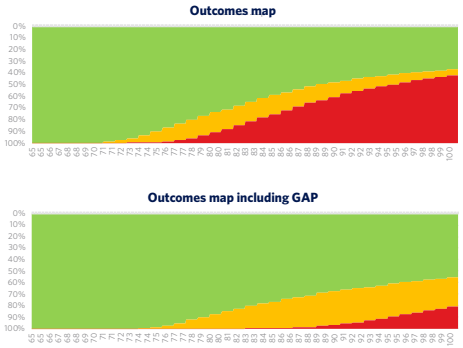
This implies that the chances of a retiree being affected by a fall in income only happens later and it implies that the chances that that fall is severe, is also significantly lower, whether that fall is due to market risk or longevity risk.

In fact, the areas where the two simulations start to show more than a 1% possibility of being red are more than 11 years apart.

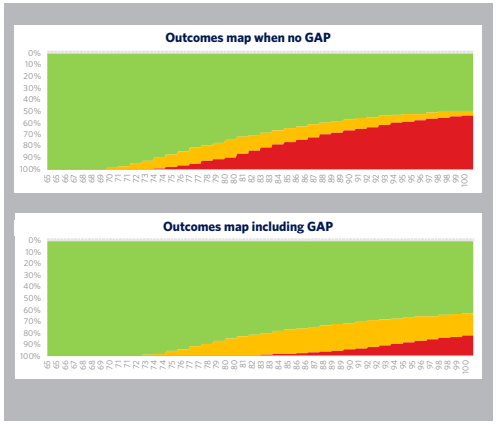
The outcomes maps for both examples (with and without a GAP) when using a high-risk investment

In addition to the medium-risk investment, we also ran the simulations using different asset allocations to see the effect of taking on more risk with and without a GAP. The medium-risk outcomes maps were kept for ease of reference.

Medium-risk investment



High-risk investment



See assumptions in annexure 5

In the above analysis, you can see that taking on more risk has contrasting implications.

Firstly, it reduces the number of simulations that are unable to reach the desired outcome. This is because the higher-risk investment should be able to provide a higher long-term return.

Secondly, in many instances, it increases the severity by which the lower-performing simulations miss the outcome.

Conclusion

Adding a life annuity as an asset class within a living annuity can significantly reduce market risk and longevity risk to enhance the certainty of receiving a sustainable income in retirement

click here

For more information about our new retirement solution

click here

to view our client video about the differences between the available retirement options

Annexure 1

But what is a good outcome for a retiree in a living annuity?

Is it taking enough risk to grow your investment or playing it safe to protect your investment against significant market downturns as we experienced in 2008 and 2020? Maybe it is to provide a reasonable amount to your dependants as a legacy?

Retirement is arguably one of the most complex life events for many people and each client's circumstances are unique with different personal requirements.

A perfect outcome for clients would probably be to meet their income and capital needs during retirement, as well as their need to leave a legacy when they die.

Thus, for this whitepaper, we have to make a few assumptions about what a good outcome means.

We define a good outcome as the clients' ability to replace their income in such a way as to sustain their current lifestyle fully, but if not, at least at a reasonable standard of living for as long as they live

Technical information about the assumptions

- Sustain the current lifestyle = 100% of specified need/income required. **(indicated as green)**

  This assumes you can meet your living (discretionary) expenses and your life (essential) expenses.

- Sustain a reasonable standard of living = between 50% and 100% of specified need/income required. **(indicated as amber)**

  This assumes you can partially meet your living expenses but your life expenses in full.

- Sustain an unsatisfactory lifestyle = less than 50% of specified need/income required. **(indicated as red)**

  This assumes you can't meet your living expenses and only a part of your life expenses.

We also assumed that clients would want to make use of a living annuity (as opposed to a pure life annuity) so that they can cater for their additional requirements
These could be their requirement to participate in market growth, to have income flexibility (if needed) and to be able to leave a legacy for their dependants.

Annexure 2

A living annuity

With a living annuity, retirees can tailor their income by choosing an income level of between 2.5% and 17.5% of the investment value, which they can adjust every year. They also have the flexibility to choose investment components to suit their investment strategies.

Example

Let's say a client invests R1 million into a living annuity. If he chooses an income of 6%, he will get an income of R60 000 for the year (some tax may be deducted.)

If his investment had grown by more than the income, let's say it grew by R100 000 (ignoring the income), his investment would have grown to R1 040 000 after the first year. He can now choose between 2.5% and 17.5% of this new amount. If he chooses 6% again, the new income will be R62 400.

If initially, instead of an income of R60 000, he chose R120 000, his investment would be worth R980 000 after the first year.

As such, the long-term value of the living annuity and its ability to maintain an income is dependent on the funds you select (and how they grow) as well as the income you withdraw from the living annuity.

Annexure 3

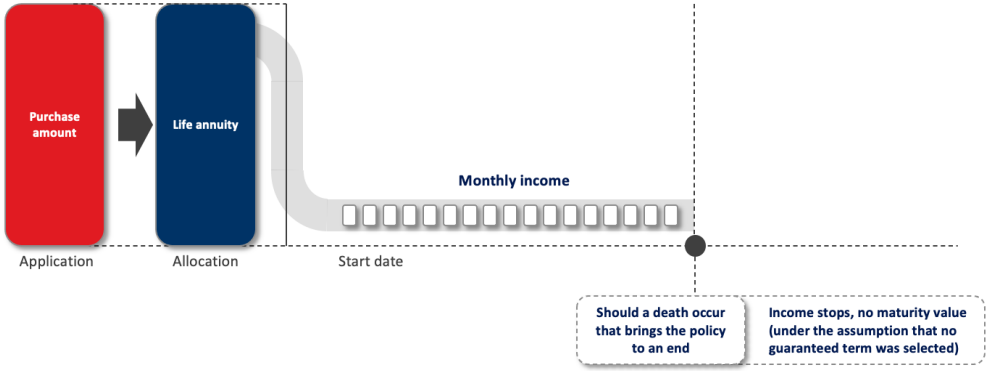
A life annuity

A life annuity provides a guaranteed income for life. The starting income amount and the escalation rate are guaranteed, and their values are interlinked. For example, the same retiree could have a choice of the following income profiles:

Monthly starting income	Escalation
R9 945	0%
R7 161	5%
R4 550	10%
R2 592	15%

Retirees also have the option to add a guaranteed term and the annuity could also be for a single or a joint life.

Visual illustration of a life annuity paying a non-escalating income



Annexure 4

The effect of the GAP on the IRR of a living annuity

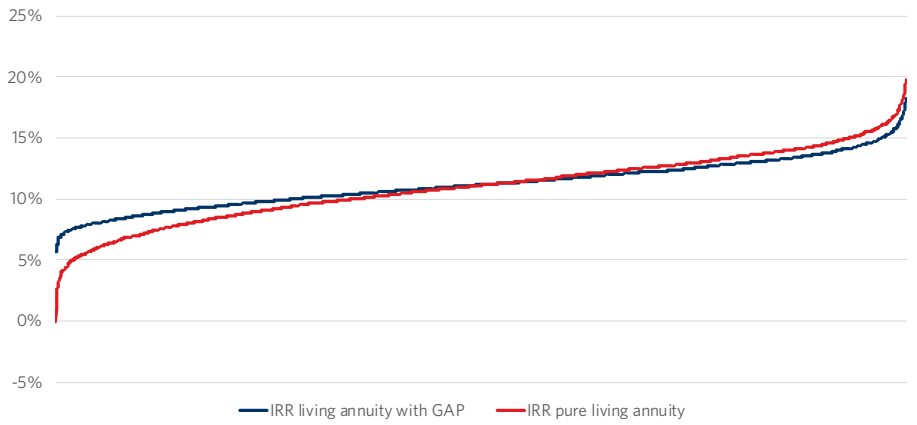
By adding a GAP to a living annuity, the return profile is altered as the GAP is not exposed to market fluctuations. As such, simulations that were exposed to market underperformance had the benefit of an improved IRR as the GAP can provide IRRs of more than 10% for individuals who live longer in retirement.

The key finding is that the effect it has on the IRR is an improvement to the IRRs for underperforming simulations (when clients need it most) while it reduces the IRR for the simulations with the strongest returns. In all the below simulations, it was assumed that the client lived 20 years in retirement and that the GAP did not have a guaranteed term.

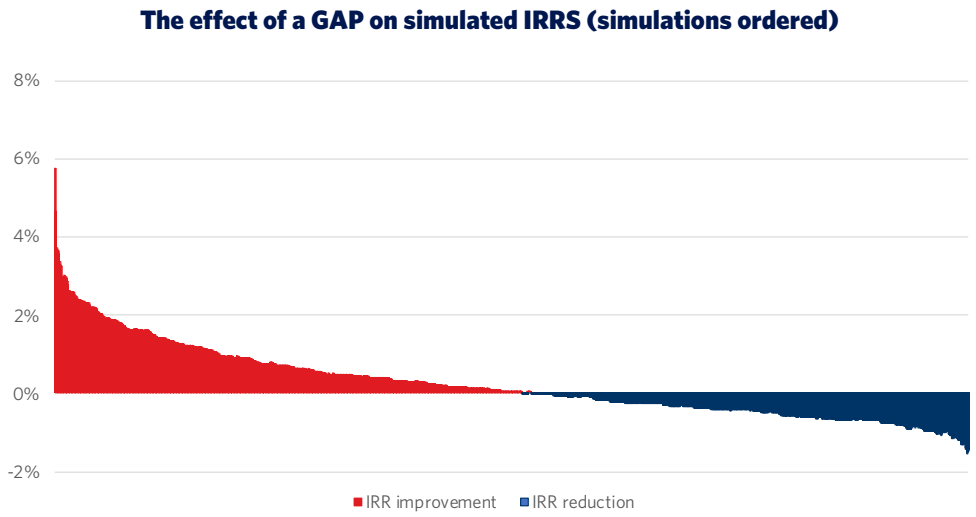
The IRR improvements were between 2% and 2.4% at the 2.5% and 5% confidence intervals.

The IRR reductions were between 0.9% and 1% at the 95% and 97.5% confidence intervals (this effect should be higher in monetary terms).

The variation of the simulated IRRs (simulations ordered)



See assumptions in annexure 5



Annexure 5

Assumptions

Most of the examples in the whitepaper refer to one overriding analysis where most of the information and parameters were kept constant. In all these instances, the user is directed to this annexure.

We used R2 million as the investment amount, 7% per year as the starting income drawn in equal monthly installments and escalating at 5% per year. These assumptions and our definition of the split between living and life expenses will have a direct effect on the results that can be interpreted from the corresponding outcomes map. Thus, different case studies will have different outcomes maps which may or may not show that adding a life annuity as an asset class can be beneficial.

We assumed rates of R85 936 per year for the life annuity per R1 million invested escalating at 5%, which equates to R60 155 per year on a R700 000 GAP when set at 35% (or R5 012 per month), also escalating at 5% per year. These were the rates at the time of constructing the whitepaper for a male aged 65. The rates vary weekly.

For more information on our life annuity and living annuity, please visit momentum.co.za.

Where needed, we used the operational workings of the Momentum Retirement Income Option to do the analysis.

Simulation assumptions

We applied a Monte Carlo simulation methodology to a set our forward-looking expectations of market returns at an asset class level.

We used the following asset allocations for the medium-risk and high-risk investments:

	Local equities	Local Bonds	Local property	Local Cash	Global equities & property	Global cash and bonds
Medium-risk investment	30%	23%	2.50%	12%	23.50%	9%
High-risk investment	42%	10%	3%	4%	35.50%	5.50%

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