Calculating a life annuity

The calculation an annuity payable for the remaining lifetime of an annuitant needs to take account of four primary factors:

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<th>Investment lump sum</th>
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### The Pattern of Income

The present value of all future income payments must always equal the investment lump sum. The graph below illustrates the resulting change in initial income if you choose a payment pattern that escalates over time. The higher your income escalation the further the deferral of income to a later date.

### The Expected Investment Return

Any guaranteed annuity product makes use of a yield curve. This is a curve of expected future investment returns (see formula below). The graph below is an example of the current yield curve. As you will see the curve increases over time which means that annuitants benefit from expected increases in the yield curve.

### The Probability of being alive

A guaranteed annuity will pay you an income for the rest of your life and cease when you pass away. The probability of you being alive to receive a payment is therefore very important. Normal insurers only use age and gender to calculate your probability of being alive. Your annuity “probability” is therefore typically based on the average person of your age and gender. Paramount Life also uses your Lifestyle and Medical information. This ensures that your annuity is unique to you and not subsidising another person’s annuity. The graph on the rights shows the probability of a male currently aged 65 being alive at various ages in the future (using the PA(90) mortality table).

### The Investment Lump Sum

The investment lump sum is the amount of money that will be invested to provide an annuity. It is therefore the most important driver of an annuity. The formula below shows how all the factors come together to calculate an annuity. Additionally the effect of each of the other three primary factors on the investment lump sum and visa versa is shown.

\[
\text{Lump Sum} = \text{The sum of the present value of each expected income payments} = \sum_{i=0}^{\infty} \text{Payment}_i \times \text{Probability Alive}_i \times \text{Discount Factor}_i
\]

\[
= \sum_{i=0}^{\infty} \text{Payment}_i \times \text{Probability Alive}_i \times \frac{1}{(1 + \text{Return}_i)^i}
\]

Where

- \( i \) equals number of periods since inception
- \( \sum \) equals the sum using all values of \( i \)
- Expenses have been ignored

Therefore if all other factors are held constant:

- \( \text{Payment}_i \)  = \( \text{Lump sum} \)
- \( \text{Probability Alive}_i \)  = \( \text{Lump sum} \)
- \( \text{Return}_i \)  = \( \text{Lump sum} \)

Always ensure that you:

- Choose your own unique pattern of income according to your requirements
- Use QuoteMax™ to calculate your unique life expectancy
- Use QuoteMax™ to determine a yield curve related to your own life expectancy

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