

Additional Guidance

Initial exposed to risk and expected claims

Let $E(x)$ denote the initial exposed to risk at age x for an individual policyholder. This is broadly the time which that policyholder spent under observation whilst aged x , during the period of the investigation.

This time spent under observation multiplied by the individual's sum assured gives an individual amount exposed to risk: $E^{\alpha}(x)$.

Summing this over all individuals who are aged x at some point during the investigation period gives the total initial amounts exposed to risk at age x : $E^{\alpha*}(x)$.

The total **expected amount of claims at age x** will then be:

$$\text{Expected amount of claims}(x) = E^{\alpha*}(x) \times q_x$$

where q_x is the corresponding initial rate of mortality.

Derivation of term assurance factors payable at the end of the year of death

The term assurance factor for age x and term n can be derived using the recursive relationship:

$$A_{x:n}^1 = (1+i)^{-1} \times \left[q_x + (1-q_x) \times A_{x+1:n-1}^1 \right]$$

This gives the term assurance factor for a claim which is payable at the end of the year of death.

Derivation of temporary single life annuity factors payable in advance

The annuity in advance factor for age x and term n can be derived using the recursive relationship:

$$\ddot{a}_{x:n} = 1 + \left[(1+i)^{-1} \times (1-q_x) \times \ddot{a}_{x+1:n-1} \right]$$

Determination of the level annual premium for an n year term assurance

The level annual premium, P , payable by a life age x for a sum assured of S plus loading can be determined using the following:

$$P \times \ddot{a}_{x:n} = S \times (1 + \text{loading}) \times A_{x:n}^1$$