We now bring together the compound interest discount factor v^n with the life contingency factors ${}_tq_x$ and ${}_tp_x$ in order to calculate premium rates for insurance contracts.

Whole Life Assurance

A whole life insurance contract is an agreement to pay a sum assured on the death of the life assured. We will start by considering the case where payment of 1 is made at the end of the year of death. At the start of the insurance let the insured be aged x.

Probability of death in year k is $d_{x+k}/l_x = {}_kp_x\, q_{x+k}$

Therefore the expected present value (EPV) of these payments at the end of year of death is:

$$\sum_{k=0}^{\infty} v^{k+1}\, {}_kp_x\, q_{x+k}$$

The actuarial terminology for this is A_x

If the sum assured is S then the EPV is $S.A_x$

Term Assurance

This is an agreement to pay a sum assured on the death of the life assured on condition that death occurs within a stated period. Let the insured be aged x; the term n years and payment of 1 be at the end of the year of death.

$$EPV = \sum_{k=0}^{n-1} v^{k+1}\, {}_kp_x\, q_{x+k}$$

The actuarial terminology is $A^{1}_{x\,\overline{n}|}$

Pure Endowment

A pure endowment provides a sum assured at the end of a fixed term on condition that the life assured survives to the end of the term. Let the insured be aged x , the term n and the endowment sum 1.

$EPV = v^n\, {}_np_x$

The actuarial terminology is $A_{x\,\overline{n}|}^{1}$

Endowment assurance

An endowment assurance is a combination of a pure endowment and a term assurance for the same term. In other words the sum insured is paid on death during the term of the contract or on survival to the end of the contract.

$EPV = A^{1}_{x\,\overline{n}|} + A_{x\,\overline{n}|}^{1}$ which in actuarial terminology is: $A_{x\,\overline{n}|}$

Life annuity