Explanation of STAR Financial LLC Actuarial Pricing Model

The expected IRR of an insurance policy is calculated in the same general way as a regular IRR, by matching the NPV of all discounted positive cash flows against the negative cash flows.

A standard NPV is calculated by the formula:

$$\mathrm{NPV} = \sum_{i-1}^{n} \frac{values_i}{(1+rate)^i}$$

The Greek letter sigma is a summary notation representation of the values of the series of future cash flows, the subscript and superscript over and under the sigma define the index of summation (or the upper and lower bounds of cash flows considered in the equation), with n representing the number of future cash flow periods and the *i* representing the index of summation or the time parameters of the investment period.

However, a life insurance policy has an additional complication: it must be actuarially calculated, by multiplying each payment by its probability of actually occurring, to achieve the projected mean negative cash flow per period. A payment to the insurance company at time t is multiplied by ${}_tp_x$, the probability of still being alive. A benefit payment at time t is multiplied by ${}_{t-1}p_x\, q_x$, the probability of dying within the previous year, to achieve the projected mean positive cash flow for that period. We have a proprietary software platform that constructs a matrix of these actuarial and mortality values for all ages, and then multiplies them by each scheduled payment, and schedule of death benefit, to generate the series of future probalistic cash flow to calculate the Actuarial IRR of the resulting discounted cash flow streams using the following formula:

$$\sum_{t=0}^{n}\left[P\cdot\left(\frac{1}{1+i}\right)^{t}\cdot{}_tp_x - B\cdot\left(\frac{1}{1+i}\right)^{t+1}\cdot{}_tp_x q_x\right]$$

where *P* = payments, *B* = Benefit amount, t=time period, p=chance of dying, q =chance of remaining alive, & x=being a variable for a specific year

We do not have hard and fast cash flows that are definitely known, however, we can use these accepted statistical and actuarial principles to calculate the expected positive and negative cash flows per period, using the laws of probability, integrated with mortality projections off of a current and authoritative mortality table (e.g. Society of Actuaries 2008 Valuation Basic Table, Male Non-Smoker, Age Last Birthday, Relative Risk RR100, Primary Mortality Table). We can then use these probalistic cash flow streams, to calculate a NPV to represent the current value of a policy asset, and to calculate a future projected IRR of investment returns.

Disclaimer: Our STAR Financial Actuarial Calculator v.2.1 software employs standardized actuarial methods to project expected returns based upon the laws of statistical averages and actuarial science. The actual real life return on investment in any one specific case might be significantly higher or lower than the average projection.