

Experience effects

So far we have assumed that events during a particular year are exactly as predicted (i.e. interest earned equals the i assumed and mortality follows the chosen table)

In practice this is not the case and surplus or deficit arises as a result. Consider the position with mortality.

The death strain at risk is the maximum cost to which the insurance company would be liable if an individual policyholder dies. Given that the insurance company holds the policy value at the end of the year ${}_{t+1}V_x$ and the sum assured is 1, the death strain at risk is $1 - {}_{t+1}V_x$.

We can recast the recursive equation as follows:

$$({}_tV_x + P_x)(1+i) = q_{x+t} + p_{x+t} * {}_{t+1}V_x = q_{x+t} + (1-q_{x+t}) * {}_{t+1}V_x = {}_{t+1}V_x + q_{x+t} (1 - {}_{t+1}V_x)$$

In other words, the value at the start of the year, accumulated with premium and interest is sufficient to provide the value at the end of the year plus the death strain at risk in respect of the probability of death during the year.

The "Expected Death Strain" is the amount the company expects to pay extra to the year end reserve (i.e. $q_{x+t} (1 - {}_{t+1}V_x)$)

Now consider a group of N identical policies each for unit sum assured.

The Expected Death Strain (EDS) is $N * (q_{x+t} (1 - {}_{t+1}V_x))$

The "Actual Death Strain" (ADS) is $\Sigma (1 - {}_{t+1}V_x)$ summed across the number of deaths during the year.

The Mortality Profit for the year is then $EDS - ADS$

Gross Premiums

In contrast to the "net premium" the office or gross premium allows for the expenses of conducting the insurance business.

Expenses can be expressed in a number of ways:

- Fixed £ amounts
- Amounts increasing with inflation
- Amounts as a percentage of the premium
- Amounts as a percentage of the sum assured