THE CONSTRUCTION OF MULTIPLE DECREMENT MODELS FROM ASSOCIATED SINGLE DECREMENT EXPERIENCES
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I. THE CONSTRUCTION OF A MORTALITY TABLE.

II. THE FUTURE PROYECTION OF A PORTFOLIO

III. THREE CAUSES OF DECREMENT: MORTALITY, DISABILITY AND WITHDRAWAL.

IV. BENEFITS THAT DEPEND ON AN ACCIDENT DEATH.

CONCLUSIONS
I. THE CONSTRUCTION OF A MORTALITY TABLE

Change of parameters like mortality or persistency on a “Stress Testing”.

Mortality from others experiences. How was it constructed? Do you have pressure by law?.

Expressions that separate the mortality decrement \((m)\) from other decrement associated.

\[
\ln \left( p_x^{(m)} \right) = \left( \frac{q_x^{(m)}}{q_x^{(\tau)}} \right) \ln(p_x^{(\tau)})
\]

\[
q_x^{(\tau)} = q_x^{(m)} + q_x^{(s)}
\]

\(q_x^{(s)}\) Represent the probability of leavers.
II. THE FUTURE PROJECTION OF A PORTFOLIO.

- Survival functions that include mortality and persistency.
- Project the match of actives and passives.
- The future cash flows.
- The reserve of Solvency II.

If you have the persistency probability and you need to associate with an exterior mortality rate, you can use these formulas. By uniform distribution of enters and leavers during the year.

\[ q_x'(s) = \frac{q_x(s)}{1 - \frac{1}{2} q_x'(m)} \quad p_x'(\tau) = (1 - q_x'(m))(1 - q_x'(s)) \]
III. THREE CAUSES OF DECREMENT: MORTALITY, DISABILITY AND WITHDRAWAL.

To obtain decrement rates from the probabilities associated, the formula will be the same before presented.

\[
\ln(p_x^{(j)}) = \left(\frac{q_x^{(j)}}{q_x^{(\tau)}}\right) \ln(p_x^{(\tau)})
\]

\[j = 1 \text{ for dead, } j = 2 \text{ for disability, } j = 3 \text{ for withdrawal}\]

\[q_x^{(\tau)} = q_x^{(1)} + q_x^{(2)} + q_x^{(3)}\]

For example \(q_x^{(1)} = 0.006\), \(q_x^{(2)} = 0.005\), \(q_x^{(3)} = 0.100\)

The associate rate \(q_x^{(1)} = 0.00634\), \(q_x^{(2)} = 0.00529\), \(q_x^{(3)} = 0.10057\)
MORTALITY, DISABILITY AND WITHDRAWAL.(Continuación)

If you have from your portfolio a probability of withdrawal (0.10), and you need to import from other experience the mortality and disability rates.

Then, you need to find the withdraw rate, without knowing $q_x^{(\tau)}$, taking into account that you have one probability and two rates

$$q_x^{(3)} = q_x^{(3)} (1 - \frac{1}{2} (q_x^{(2)} + q_x^{(1)}) + \frac{1}{2} q_x^{(2)} q_x^{(1)})$$

$$q_x^{(3)} = 0.10058$$

$$q_x^{(\tau)} = 1 - (1 - q_x^{(1)}) (1 - q_x^{(2)}) (1 - q_x^{(3)}) = 0.11101$$

Finally solving the logarithm formula for the probabilities,

$$q_x^{(1)} = 0.005, \quad q_x^{(2)} = 0.006, \quad q_x^{(3)} = 0.10001$$
IV. BENEFITS THAT DEPEND ON AN ACCIDENT DEATH
DOUBLE INDEMNITY

- $q_{x}^{(1)}$ Represent the probability of death by accident.
- $q_{x}^{(2)}$ The probability of death by other causes.

- The probability of surviving $p_{x}^{(\tau)}$ is the same $px$ of the Mortality Table.
- The probability of the payment of 2 from an accident death and 1 covering the death for all causes will be, $q_{x}^{(1)} + q_{x}^{(\tau)}$

- The probability of accident death from the rate of accident death $q_{x}^{(1)} = q_{x}^{(\tau)} \left[ \frac{\ln(p_{x}^{(1)})}{\ln(p_{x}^{(\tau)})} \right]$
- If $q_{x}^{(1)} = 0.00040$ and $q_{x}^{(\tau)}=0.0032$, then $q_{x}^{(1)} = 0.000399$
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ITAM

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