

EXAM M QUESTIONS OF THE WEEK

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Week of August 14/06

The following information is given about a fully discrete whole life insurance of \$100,000 issued to (50) with level benefit premiums for life:

- mortality follows DeMoivre's Law
- $_{10}V = 5679.60$
- $_{11}V = 6361.45$
- $_{12}V = 7067.98$
- $i = .082$

Find the DeMoivre upper age limit ω .

The solution can be found below.

Week of August 14/06 - Solution

We use the recursive reserve relationship $({}_kV + P)(1 + i) - (b_{k+1} - {}_{k+1}V) \cdot q_{x+k} = {}_{k+1}V$.

For $k = 10$ we get

$$(5679.60 + P)(1.082) - (100,000 - 6361.45)\left(\frac{1}{\omega-60}\right) = 6361.45.$$

For $k = 11$ we get

$$(6361.45 + P)(1.082) - (100,000 - 7067.98)\left(\frac{1}{\omega-61}\right) = 7067.98.$$

Subtracting the first equation from the second equation results in

$$\begin{aligned} (6361.45 - 5679.60)(1.082) - (100,000 - 7067.98)\left(\frac{1}{\omega-61}\right) + (100,000 - 6361.45)\left(\frac{1}{\omega-60}\right) \\ = 7067.98 - 6361.45. \end{aligned}$$

This reduces to the equation $\frac{92,932.02}{\omega-61} - \frac{93,638.55}{\omega-60} = 31.2317$, or equivalently

$$31.2317(\omega - 60)(\omega - 61) = 92,932.02(\omega - 60) - 93,638.55(\omega - 61).$$

This is a quadratic equation in ω . The two roots are $\omega = 105$ and -6.6 .

We ignore the negative root.