

EXAM M QUESTIONS OF THE WEEK

S. Broverman, 2006

Week of August 21/06

A company takes out a "key employee" insurance policy with a face amount of \$5,000,000 on two employees with independent future lifetimes. The two employees are 50 years old and 60 years old. The insurance policy is a fully discrete whole life policy that pays at the end of the year of the second death, with premiums payable until the first death occurs. Mortality follows the Exam M Illustrative Table with interest at 6%. During the first year of the policy, the two employees who are insured will be traveling to a number of high risk locations, and for the first year only their mortality probabilities are double the probabilities in the table. Find the level annual premium for this policy.

The solution can be found below.

Week of August 21/06 - Solution

The insurance benefit is a last survivor insurance, but with a special mortality basis in the first year. The APV of the insurance benefit is

$$5,000,000A'_{50:60} = 5,000,000(A'_{50} + A'_{60} - A'_{50:60}),$$

where

$$A'_{50} = vq'_{50} + vp'_{50} \cdot A_{51}^{IT} = v \cdot (2q_{50}) + v(1 - 2q_{50}) \cdot A_{51}^{IT} = .253185,$$

$$A'_{60} = vq'_{60} + vp'_{60} \cdot A_{61}^{IT} = v \cdot (2q_{60}) + v(1 - 2q_{60}) \cdot A_{61}^{IT} = .377147,$$

and

$$A'_{50:60} = vq'_{50:60} + vp'_{50:60} \cdot A_{51:61}^{IT} = v \cdot (1 - p'_{50:60}) + vp'_{50:60} \cdot A_{51:61}^{IT}.$$

To find $p'_{50:60}$, we use independence,

$$p'_{50:60} = p'_{50} \cdot p'_{60} = (1 - 2q_{50})(1 - 2q_{60}) = .960966.$$

$$\text{Then } A'_{50:60} = .433277.$$

The APV of the insurance is $5,000,000(.253185 + .377147 - .433277) = 985,275$.

The annual premium is payable until the first death, so APV of premiums is $P \cdot \ddot{a}'_{50:60}$.

$$\text{But } \ddot{a}'_{50:60} = \frac{1 - A'_{50:60}}{d} = 10.0121.$$

$$\text{The annual premium is } \frac{985,275}{10.0121} = 98,408.$$

