MATH 4/50056
MTWR 8:50

Actuarial Mathematics II

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Quiz Score: 20 /20

Excellent

Quiz 3: Thursday, February 5, 2015

P = monthly prem so 12P all together ✓

1. An insurer issues a whole life insurance policy with sum insured \$500,000 to a select life aged 47. Level monthly premiums are payable throughout the term of the policy. The insurer incurs expenses of 10% of the total of the first year's premiums at the issue of the policy. Renewal expenses are 3% of each premium, including those of the first year. The death benefit is payable at the end of the month of death.

   (a) Write down a formula for L_0^g, the present-value-of-gross-future-loss random variable. *(Simplify if possible.)*

$$L_0^g = 500{,}000\, v^{K^{(12)}_{[47]}+\frac{1}{12}} + .1(12P) + (.03)\left|12P\ddot{a}^{(12)}_{K^{(12)}_{[47]}+\frac{1}{12}}\right| - 12P\ddot{a}^{(12)}_{K^{(12)}_{[47]}+\frac{1}{12}}$$

$$= 500{,}000\, v^{K^{(12)}_{[47]}+\frac{1}{12}} + 1.2P + .36P\ddot{a}^{(12)}_{K^{(12)}_{[47]}+\frac{1}{12}} - 12P\ddot{a}^{(12)}_{K^{(12)}_{[47]}+\frac{1}{12}}$$

(b) Find an expression for the monthly premium, P, using the equivalence premium principle. *(Write it in terms of actuarial symbols; you don't have enough information to find a numerical answer.)*

(EPV of benefit) + (EPV of expenses) = EPV of premium income ✓

$$500{,}000\, A^{(12)}_{[47]} + 1.2P + .36P\ddot{a}^{(12)}_{[47]} = 12P\ddot{a}^{(12)}_{[47]}$$

$$500{,}000\, A^{(12)}_{[47]} + 1.2P = 11.64P\ddot{a}^{(12)}_{[47]}$$

$$500{,}000\, A^{(12)}_{[47]} = 11.64P\ddot{a}^{(12)}_{[47]} - 1.2P$$

$$500{,}000\, A^{(12)}_{[47]} = P\left(-1.2 + 11.64\ddot{a}^{(12)}_{[47]}\right)$$

$$P = \frac{500{,}000\, A^{(12)}_{[47]}}{-1.2 + 11.64\ddot{a}^{(12)}_{[47]}}$$ ✓