STAT 472
Fall 2021
Quiz 5

November 16, 2021

1. For a special whole life insurance on (30), you are given:
   - i. Death benefits are payable at the end of the year of death.
   - ii. The death benefit is 10,000 during the first 10 years and 25,000 thereafter.
   - iii. Expenses, payable at the beginning of the year, are 100 in year 1 and 10 in years 2 and later.
   - iv. P^n is the level annual net premium, determined using the equivalence principle.
   - v. $P^g = P^n + 50$ is the level annual gross premium.
   - vi. Mortality follows the Standard Ultimate Life Table.
   - vii. $i = 0.05$

   a. (5 points) Calculate P^g .

   Solution:

$$PVP = PVB$$

$$P^n \ddot{a}_{30} = 10,000 A_{50} + 15,000 \cdot {}_{10}E_{30} \cdot A_{40}$$

$$P^n = \frac{(10,000)(0.07698) + (15,000)(0.61152)(0.12106)}{19.3834} = 97.00$$

$$P^g = P^n + 50 = 97.00 + 50 = 147.00$$

   b. (5 points) Calculate $E[L_0^g]$.

   Solution:

$$E[L_0^g] = 10,000 A_{30} + 15,000 \cdot {}_{10}E_{30} \cdot A_{40} + 90 + 10\ddot{a}_{30} - 147.00\ddot{a}_{30}$$

$$= (10,000)(0.07698) + (15,000)(0.61152)(0.12106) + 90 - (147 - 10)(19.3834)$$

$$= -685.27$$

c. (5 points) Determine $E[L_{10}^{n}]$.

Solution:

$$E[L_{10}^{n}] = 25,000A_{40} - 97.00\ddot{a}_{40} =$$

$$(25,000)(0.12106) - (97.00)(18.4578) = 1,236.09$$

d. (5 points) Calculate ${}_{10}V^{g}$.

Solution:

$${}_{10}V = 25,000A_{40} + 10\ddot{a}_{40} - 147.00\ddot{a}_{40} =$$

$$(25,000)(0.12106) - (147.00 - 10)(18.4578) = 497.78$$