

**Chapter 6 – Past Test and Quiz Problems – Single Policy Probability (Percentile)**

The Chung Life Insurance Company sells life insurance policies to people who are age 70 only.

The Company uses the Standard Ultimate Life Table and 5% interest to calculate all net premiums. They also assume that deaths are uniformly distributed between integral ages.

All policies are sold to insureds whose death is independent of the death of any other insured.

- a. (3 points) The annual net premium for a whole life policy with a death benefit of 100,000 paid at the end of the year of death is 3600 to the nearest 100. Calculate the net premium to the nearest 1.

**Solution:**

$$PVP = PVB \implies P\ddot{a}_{70} = 100,000A_{70}$$

$$P = \frac{(100,000)(0.42818)}{12.0083} = 3565.70$$

Let  $L_0^n$  be the loss at issue random variable based on the net premium.

- b. (8 points) For a single policy, calculate the probability that the policy generates a loss.

**Solution:**

$$L_0^n = 100,000v^{K_{70}+1} - 3565.70\ddot{a}_{\overline{K_{70}+1}|}$$

$$100,000v^{K_{70}+1} - 3565.70\left(\frac{1-v^{K_{70}+1}}{d}\right) = 0 \implies 1.335471691v^{K_{70}+1} = 1 - v^{K_{70}+1}$$

$$v^{K_{70}+1} = 0.428179 \implies K_{70} + 1 = \frac{\ln(0.3428179)}{\ln[(1.05)^{-1}]} = 17.38 \implies 17$$

A loss is generated by an early death so probability of a loss is

$${}_{17}q_{70} = 1 - \frac{l_{87}}{l_{70}} = 1 - \frac{53,934.7}{91,082.4} = 0.40785$$