

Chapters 5 – Past Test and Quiz Problems – Recursive Annuity Formula

(6 points) Let Y be the present value random variable for a whole life annuity due with annual payments of 100 issued to (84).

You are given:

- i. $\ddot{a}_{85} = 8$
- ii. ${}^2A_{84} = 0.4$
- iii. $i = 0.05$
- iv. $q_{84} = 0.040$
- v. $q_{85} = 0.045$

Calculate the $Var[Y]$.

Solution:

$$Var[Y] = (100)^2 \left(\frac{{}^2A_{84} - \{A_{84}\}^2}{d^2} \right)$$

$$\ddot{a}_{84} = 1 + vp_{84}\ddot{a}_{85} = 1 + (1.05)^{-1}(1 - 0.04)(8) = 8.314285714$$

$$A_{84} = 1 - d\ddot{a}_{84} = 1 - \left(\frac{0.05}{1.05} \right) (8.314285714) = 0.604081633$$

$$Var[Y] = (100)^2 \left(\frac{0.4 - \{0.604081633\}^2}{(0.05/1.05)^2} \right) = 154,727$$