Problem MLC 002

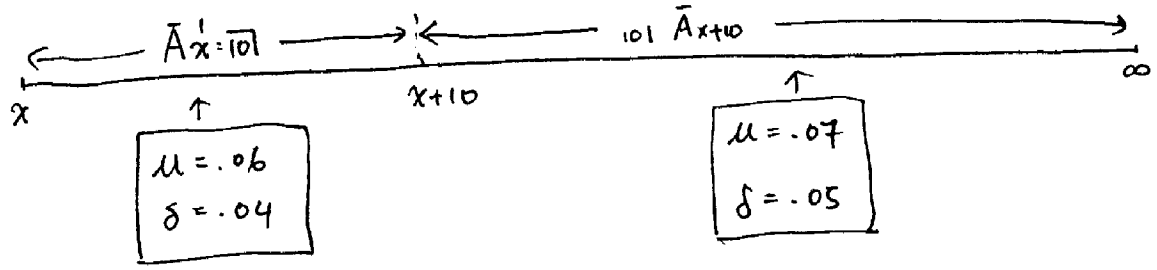
Asked to find: Single Benifit Premium

Need to Calculate: the Acturial Present Value of the Benefit

Given: whole Life

$1,000

moment of death



* different forces of motality

* different interest rate

→ divide the timeline into two parts

$$1000 \cdot \bar{A}_x = 1000 \cdot \left(\bar{A}^{1}_{x:\overline{10}|} + {}_{10|}\bar{A}_{x+10} \right)$$

$$= 1000 \left(\int_0^{10} v^t \cdot {}_tP_x \cdot \mu_{x+t}\, dt + {}_{10}P_x \cdot v^{10} \cdot \int_0^{\infty} v^s \cdot {}_sP_{x+10} \cdot \mu_{x+10+s}\, ds \right)$$

$$= 1000 \cdot \left(\int_0^{10} e^{-.04t} \cdot e^{-.06t} \cdot (.06)\, dt + e^{-.06\times 10} \cdot e^{-.04\times 10} \cdot \int_0^{\infty} e^{-.05s} \cdot e^{-.07s} (.07)\, ds \right)$$

$$= 1000 \cdot \left(0.6 \cdot \int_0^{10} e^{-0.1t}\, dt + e^{-1}(0.07) \cdot \int_0^{\infty} e^{-.12s}\, ds \right)$$

$$= 1000 \left(\frac{0.6}{0.1}(1 - e^{-1}) + e^{-1} \frac{0.07}{0.12}(1 - e^{-1.2}) \right)$$

$$= 593.87$$

(E)

Alternative Method

* Constant force of mortality & interest rate

$$\bar{A}_x = \frac{\mu}{\mu+\delta}$$

$$\bar{A}_{x+10} = \bar{A}_x = \frac{\mu}{\mu+\delta}$$

$$\bar{A}^{1}_{x:\overline{10}|} = \bar{A}_x - {}_{10}E_x \, \bar{A}_{x+10}$$

$$= \frac{\mu}{\mu+\delta} \left(1 - {}_{10}P_x \cdot v^{10}\right)$$

$$= \frac{\mu}{\mu+\delta} \left(1 - e^{-10(\mu+\delta)}\right)$$

$${}_{10|}\bar{A}_x = {}_{10}E_x \cdot \bar{A}_{x+10}$$

$$= e^{-10(\mu+\delta)} \frac{\mu^*}{\mu^*+\delta^*}$$ * new mortality and interest rate

$$1000\,\bar{A}_x = 1000 \left(\bar{A}^{1}_{x:\overline{10}|} + {}_{10}E_x \cdot \bar{A}_{x+10}\right)$$

$$= 1000 \left(\frac{\mu}{\mu+\delta}\left(1 - e^{-10(\mu+\delta)}\right) + e^{-10(\mu+\delta)} \cdot \frac{\mu^*}{\mu^*+\delta^*}\right)$$

$$= 1000 \left(\frac{0.06}{0.06+0.04}\left(1 - e^{-1}\right) + e^{-1} \cdot \frac{0.07}{0.07+0.05}\right)$$

$$= 593.87$$

(E)