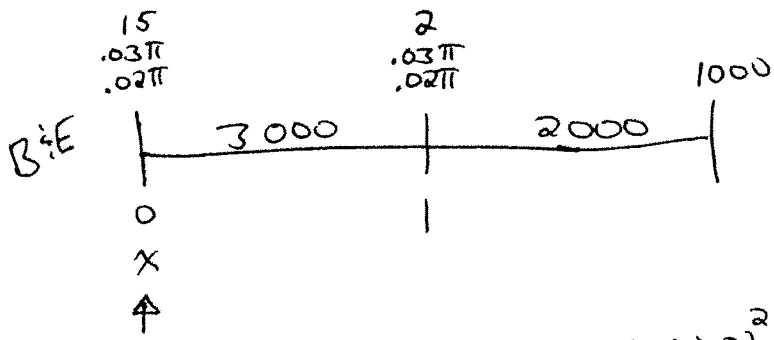
Solutions to MLCM355 Exercises

1)



$$EPV(B\&E) = 3000\,v\,q_x + 2000\,v^2\,{}_{1|}q_x + 1000\,v^2\,{}_2p_x + (15+.05\pi) + (2+.05\pi)\,v\,p_x$$

$$= \frac{3000(.1)}{1.04} + \frac{2000(.9)(.2)}{(1.04)^2} + \frac{1000(.9)(.8)}{(1.04)^2} + (15+.05\pi) + \frac{(2+.05\pi)(.9)}{1.04}$$

$$EPV(P) = \pi + \pi\,v\,p_x = \pi + \frac{\pi(.9)}{1.04}$$

$$\therefore \quad \pi + \frac{\pi(.9)}{1.04} = \frac{3000(.1)}{1.04} + \frac{2000(.9)(.2)}{(1.04)^2} + \frac{1000(.9)(.8)}{(1.04)^2} + (15+.05\pi) + \frac{(2+.05\pi)(.9)}{1.04}$$

$$\Longrightarrow \pi = 735.68$$

2) $APV(B \& E) = 1000 \bar{A}^{\,1}_{x:\overline{n}|} + 10\, \ddot{a}_{x:\overline{n}|}$

$APV(P) = \pi \cdot \ddot{a}_{x:\overline{n}|}$

$\therefore \quad \pi\, \ddot{a}_{x:\overline{n}|} = 1000\, \bar{A}^{\,1}_{x:\overline{n}|} + 10\, \ddot{a}_{x:\overline{n}|}$

$$\Longrightarrow \pi = \frac{1000\, \bar{A}^{\,1}_{x:\overline{n}|}}{\ddot{a}_{x:\overline{n}|}} + 10$$

$$\bar{A}^{\,1}_{x:\overline{n}|} \overset{UDD}{=} \frac{i}{\delta} A^{\,1}_{x:\overline{n}|}$$

$$\therefore \quad \pi = \frac{1000 \cdot \frac{i}{\delta} \cdot A^{\,1}_{x:\overline{n}|}}{\ddot{a}_{x:\overline{n}|}} + 10$$

$$= 1000 \cdot \frac{i}{\delta} \cdot P^{\,1}_{x:\overline{n}|} + 10$$

$$= 6.73\, \frac{.05}{\ln(1.05)} + 10 = 16.90$$

3) (See Video Solution)

$100000\, P^e = 398.44$

4) (See Video Solution)

$$\Pi = 4669.95$$

5) $E[{}_0L] = EPV(B \,\&\, E) - EPV(P^g)$

$$= \bar{A}_x + .02 + .003\,\bar{a}_x - P^g \cdot \bar{a}_x$$

$$P^g = P^n + .0066$$

$$P^n = \frac{\bar{A}_x}{\bar{a}_x} = \frac{1-\delta\bar{a}_x}{\bar{a}_x} = .04\overline{3}$$

$$\Rightarrow P^g = .0499\overline{3}$$

$$\therefore E[{}_0L] = (1-\delta\bar{a}_x) + .02 + .003\bar{a}_x - .0499\overline{3}\,\bar{a}_x$$

$$= -.0232$$

Note: P^g is not the premium determined by the equivalence principle, since $E[{}_0L] \neq 0$.