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Tests 12 & 13 Key

$$1) (a) \quad {}_5V = 1000$$

$$(b) \quad {}_t\dot{V} = {}_tV \cdot (.04) + 45 - 10 - .01(1000 - {}_tV) \\ = {}_tV \cdot (.04) + 35 - 10 + .01 \cdot ({}_tV)$$

$$\therefore {}_t\dot{V} = 25 + .05({}_tV)$$

$$(c) \quad {}_5V = {}_{4.5}V + .5({}_{4.5}\dot{V})$$

$${}_{4.5}\dot{V} \stackrel{(b)}{=} 25 + .05({}_{4.5}V)$$

$${}_5V \stackrel{(a)}{=} 1000$$

$$\therefore 1000 = {}_{4.5}V + .5(25 + .05({}_{4.5}V))$$

$$\Rightarrow 1000 = 12.5 + 1.025({}_{4.5}V)$$

$$\Rightarrow {}_{4.5}V = 963$$

$$2) \quad AS_{10} = 10000 (.9)(.02) + 1500 (.9)(.1) + .03(300) - 300 + AS_{11} (.9)(.88)$$

$$AS_{11} = 230$$

$$\Rightarrow AS_{10} = 206.16$$

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$$3) (a) Pr_1 = (0 + 100 - 60)(1.1) - 1000(.03) - 0(.97) \\ \Rightarrow Pr_1 = 14$$

$$(b) G_1^{(1)} = Pr_1(\text{actual values}) - Pr_1(\text{expected values}) \\ = [(100 - 60)(1.08) - 1000(.02)] - [(100 - 60)(1.1) - 1000(.03)] \\ \therefore G_1^{(1)} = 14$$

$$(c) G_1^i = Pr_1 \left(\begin{matrix} A-i \\ E-m, \text{exp} \end{matrix} \right) - Pr_1 \left(\begin{matrix} E-i \\ E-m, \text{Exp} \end{matrix} \right) \\ = [(100 - 60)(1.08) - 1000(.02)] - [(100 - 60)(1.1) - 1000(.03)] \\ = -0.8$$

$$(d) G_1^{i,m} = Pr_1 \left(\begin{matrix} A-i,m \\ E-\text{exp} \end{matrix} \right) - Pr_1 \left(\begin{matrix} A-i \\ E-m, \text{exp} \end{matrix} \right) \\ = [(100 - 60)(1.08) - 1000(.02)] - [(100 - 60)(1.08) - 1000(.03)] \\ = 10$$

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$$4) \vec{\pi} = (-300, 260, \overset{57}{60(.95)}, \overset{17.48}{20(.95)(.92)})$$

K	NPV(K) using $i=.05$
0	-300
1	$-300 + \frac{260}{1.05} = -52.38\dots$
2	$-300 + \frac{260}{1.05} + \frac{57}{1.05^2} = -0.68\dots$
3	$-300 + \frac{260}{1.05} + \frac{57}{1.05^2} + \frac{17.48}{1.05^3} = 14.419\dots = NPV$

(a) DPP = 3

(b) $PM = \frac{NPV}{EPV(\text{Premiums})} = \frac{14.419\dots}{50 + 50v(.95) + 50v^2(.95)(.92)} = .1069\dots$

(c) $NPV_{.08} = -300 + 260v + 57v^2 + 17.48v^3 \stackrel{i=.08}{=} 3.48\dots$

$NPV_{.10} = \dots \stackrel{i=.10}{=} -3.39\dots$

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$$5) AV_2 = (AV_1 + \pi - e - \text{COI}) (1+i)$$

$$AV_2 = 5500$$

$$\pi = 3000$$

$$e = .07(3000) + 10 = 220$$

$$(a) \text{COI} = (50000 - 5500) \cdot \frac{1}{1.05} \cdot \frac{3}{1000}$$

$$\Rightarrow AV_1 = 2585$$

$$(b) \text{COI} = 50000 \cdot \frac{1}{1.05} \cdot \frac{3}{1000}$$

$$\Rightarrow AV_1 = 2601$$

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$$b) \text{ @ } 1/12000 \quad x = 45 \quad n = 10$$

$$S_{35} = 50000$$

$$\text{Using TUC, } B_{45} = .02 \cdot \bar{S}_{45} \cdot 10$$

$$\bar{S}_{45} = \frac{1}{3} (S_{44} + S_{43} + S_{42})$$

$$= \frac{1}{3} \cdot 50000 (1.03^9 + 1.03^8 + 1.03^7) = 63357$$

$$\therefore B_{45} = .02(63357)(10) = 12671$$

$$(a) AL_{45} = EPV(B_{45}) = 12671 \cdot \ddot{a}_{65} \cdot {}_{20}E_{45} \stackrel{ILT}{=} 32147$$

$$(b) NC_{45} = EPV(b_{45}) \quad b_{45} = B_{46} - B_{45}$$

$$B_{46} = .02 \cdot \bar{S}_{46} \cdot 11 \quad \bar{S}_{46} = 1.03 \bar{S}_{45} = 65258$$

$$\Rightarrow B_{46} = .02(65258)(11) = 14357$$

$$\Rightarrow b_{45} = 14357 - 12671 = 1686$$

$$\therefore NC_{45} = 1686 \cdot \ddot{a}_{65} \cdot {}_{20}E_{45} \stackrel{ILT}{=} 4277$$

$$\text{Using PUC, } B_{45} = .02 \cdot \bar{S}_{65} \cdot 10 \quad \text{and } B_{46} = .02 \bar{S}_{65} \cdot 11$$

$$\therefore b_{45} = B_{46} - B_{45} = .02 \cdot \bar{S}_{65}$$

$$\bar{S}_{65} = \bar{S}_{45} \cdot (1.03)^{20} = 114430$$

$$\therefore B_{45} = 22886 \Rightarrow \text{(c)} AL_{45} = 58061$$

$$b_{45} = 2289 \Rightarrow \text{(d)} NC_{45} = 5806$$