Homework Chapter 6 2012

Saturday, October 22, 2011
8:37 AM

(65) (a) PVP = PVB

$$P\ddot{a}_{65} = 50{,}000\ A_{65}$$

$$P = \frac{50{,}000(.43980)}{9.8969} = \boxed{2221.91}$$

(b) $$L_0^n = 50000\,v^{K_x+1} - 2221.91\,\ddot{a}_{\overline{K_x+1}|}$$

(c)

$$Var[L_0^n] = \left(S + \frac{P}{d}\right)^2\left({}^2A_x - (A_x)^2\right)$$

$$= \left(50{,}000 + \frac{2221.91}{\left(\frac{.06}{1.06}\right)}\right)^2\left(.23603 - (.43980)^2\right)$$

$$= \boxed{339{,}408{,}907}$$

(d) PVP = PVB

$$12P\ddot{a}_{65}^{(12)} = 50{,}000\,A_{65}$$

$$P = \frac{50{,}000(.43980)}{12(\alpha(12)\ddot{a}_{65} - \beta(12))}$$

$$= \frac{50{,}000(.43980)}{12[(1.00028)(9.8969) - 0.46812]}$$

$$= \boxed{194.29}$$

66 a

$$PVP = PVB$$

$$P\bar{a}_{75} = 50000\bar{A}_{75}$$

$$P = \frac{50000\ \bar{A}_x}{\bar{a}_{75}}$$

$$= \frac{50000\ \bar{A}_{75}}{\frac{1-\bar{A}_{75}}{\delta}}$$

$$= \frac{50000\left(\frac{i}{\delta}\right)A_{75}\ (\delta)}{1-\left(\frac{i}{\delta}\right)A_{75}}$$

$$= \frac{50000(.06)(.59149)}{1-(1.02971)(.59149)}$$

$$= \boxed{4539.02}$$

b $L_0^n = 50000\,v^{T_x} - 4539.02\,\bar{a}_{\overline{T_x}|}$

c $Var[L_0^n] = \left(S + \frac{P}{\delta}\right)^2\left({}^2\bar{A}_{75} - (A_{75})^2\right)$

$= (50000 + 4539.02)^2$

$$= \left(50000 + \frac{4539.02}{\ln(1.06)}\right)^2 \cdot$$

$$\left(\frac{(1.06)^2-1}{2\ln(1.06)}\ {}^2A_{75} - (1.02971)^2(.59149)^2\right)$$

$$= \boxed{642{,}744{,}265}$$

(67) (a) $PVP = PVB$

$$P\ddot{a}_{40:\overline{25|}} = 25000\,A_{40:\overline{25|}}$$

$$P = \frac{25000\,A_{40:\overline{25|}}}{\ddot{a}_{40:\overline{25|}}}$$

$$A_{40:\overline{25|}} = A_{40} - {}_{25}E_{40}\,A_{65} + {}_{25}E_{40}$$

$$= .16132 - (.27414)(.68756)(.43980)$$

$$+ (.27414)(.68756)$$

$$= .26691$$

$$\ddot{a}_{40:\overline{25|}} = \frac{1 - A_{40:\overline{25|}}}{d}$$

$$P = \frac{25000\,(.26691)}{\frac{1 - .26691}{\frac{.06}{1.06}}} = \boxed{515.22}$$

(b) $25000\,v^{\min(K_x+1,\,25)}$

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$$- 515.22\, \ddot{a}_{\overline{\min(K_x+1,\,25)}|}$$

(c) $Var = \left(S + \frac{P}{d}\right)^2 \left({}^2A_{40:\overline{25}|} - \left(A_{40:\overline{25}|}\right)^2\right)$

$$= \left(25{,}000 + \frac{515.22}{\frac{.06}{1.06}}\right)^2 \cdot$$

$$\left({}^2A_{40} - v^{50}\frac{l_{65}}{l_{40}}\,{}^2A_{65} + v^{50}\frac{l_{65}}{l_{40}} - \left(A_{40} - v^{25}\frac{l_{65}}{l_{40}}A_{65} + v^{25}\frac{l_{65}}{l_{40}}\right)^2\right)$$

$$= 1{,}162{,}961{,}409\left(0.08218129 - (.266909)^2\right)$$

$$= \boxed{12{,}723{,}898}$$

(d) $PVP = PVB$

$$12P\,\ddot{a}^{(12)}_{40:\overline{25}|} = 25000\, A_{40:\overline{25}|}$$

$$P = \frac{25000(.26691)}{12\left(\frac{1 - i/i^{(m)}\, A_{40:\overline{25}|}}{d^{(12)}}\right)} \leftarrow \text{from part a}$$

$$= \frac{25000(.26691)}{12\left(1 - (1.02721)(.26691)\right)}$$

0.05813

$= \boxed{44.53}$

68 $PVP = PVB$

$12P\ddot{a}^{(12)}_{35:\overline{15}|} = 500{,}000\bar{A}^{1}_{35:\overline{30}|}$

$$P = \frac{500000\left(\frac{i}{\delta}\right)\left(A_{35} - {}_{30}E_{35}A_{65}\right)}{12\left(\alpha(12)\ddot{a}_{35} - \beta(12) - {}_{15}E_{35}\left[\alpha(12)\ddot{a}_{50} - \beta(12)\right]\right)}$$

$$= \frac{34{,}743.12898}{118.2384112} = \boxed{293.84}$$

69 $PVP = PVB$

$P = 1000(12)\left(\ddot{a}^{(12)}_{25}\right)$

$= 1000(12)\left(\alpha(12)\ddot{a}_{25} - \beta(12)\right)$

$= \boxed{189{,}127}$

70

$PVP = PVB$

$P\ddot{a}_{20:\overline{10}|} = 100000\,{}_{45|}\ddot{a}_{20}$

$$P = \frac{100000\,{}_{45}E_{20}\,\ddot{a}_{65}}{\ddot{a}_{20} - {}_{10}E_{20}\,\ddot{a}_{30}}$$

$= 100{,}000\,v^{45}\frac{l_{65}}{l_{20}}(9.8969)$

$$= \frac{100{,}000\, v^{45} \frac{l_{65}}{l_{20}} (9.8969)}{16.5133 - (.55164)(15.8561)}$$

$$= \boxed{7252.05}$$

(71) (a) PVP = PVB

$$P(1000 + 900v + 720v^2 + 432v^3 + 216v^4)$$

$$= 5000(100v + 180v^2 + 288v^3 + 216v^4 + 216v^5)$$

$$P = \frac{4{,}403{,}894.381}{3099.749221} = \boxed{1420.73}$$

(b) $$\left(5000 + \frac{1420.73}{d}\right)^2 \left({}^2A_{90} - (A_{90})^2\right)$$

$$A_{90} = 0.8807788762$$

$${}^2A_{90} = \frac{100v^2 + 180v^4 + 288v^6 + 216v^8 + 216v^{10}}{1000}$$

$$= 0.777681904$$

$$Var = \boxed{3{,}360{,}293}$$

(c) PVP = PVB

$$12 P \ddot{a}^{(12)}_{90:\overline{2}|} = 5000 \bar{A}_{90}$$

$$P = \frac{5000\left(\frac{.04}{\ln(1.04)}\right)(.8307788762)}{12\left(\frac{1 - \frac{.04}{12[(1.04)^{1/12}-1]}\left(\frac{100v+180v^2}{1000}\right) - \frac{720}{1000}v^2}{12\left[1-(1.04)^{-\frac{1}{12}}\right]}\right)}$$

$$= \frac{4491.396537}{12(1.710200869)} =$$

$$= \boxed{218.85}$$

(72) (a) PVP = PVB

$$350(99802 + 99689v + 99502v^2)$$
$$= S\{(99{,}802 - 99689)v +$$
$$(99689 - 99502)v^2 + (99502 - 99283)v^3\}$$

$$S = \frac{98{,}841{,}628.27}{456.9097309} =$$

216,326.38

(b) $L^n_0 = 216{,}326.38\, v^{K_x+1} - 350\ddot{a}_{\overline{K_x+1}|}$

	L^n_0	Prob
$K_x = 0$	203,731.49	113/99802
$K_x = 1$	191,849.52	187/99802

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$K_x = 2$ $180,640.11$ $219/99802$

$K_x > 2$ -991.69 $99283/99802$

Since this is a term insurance, if the insured lives 3 years, we will have paid no benefits and collect 3 premiums. Our loss is $0 - 350\,\ddot{a}_{\overline{3|}}$. The probability of this loss is ${}_3p_x$.

$$E[L] = 0$$

$$Var[L] = E[L^2] - (E[L])^2$$

$$= E[L^2] =$$

$$(203,731.49)^2\left(\frac{113}{99802}\right) + (191,849.52)^2\left(\frac{187}{99802}\right) + (180,640.11)^2\left(\frac{219}{99802}\right) + (-991.69)^2\left(\frac{99,283}{99802}\right)$$

$$= 188,541,302.8$$

$$SD = \sqrt{Var} = 13,731.03$$

(c) $Prob\{L_0 > 0\} = 1 - \frac{99283}{99802}$

$$= \boxed{0.0052}$$

(73) For both, the formula is

$$PVP = PVB$$

$$P\left(1 + v\,p_{21} + v^2\,{}_2p_{21}\right)$$

$$= 100{,}000\left(v\,q_{21} + v^2\,p_{21}\,q_{22} + v^3\,{}_2p_{21}\,q_{23}\right)$$

$$P = \frac{100{,}000\left(v\,q_{21}) + v^2 p_{21} q_{22} + v^3\,{}_2p_{21}\,q_{23}\right)}{1 + v\,p_{21} + v^2\,{}_2p_{21}}$$

The p's & q's will be different.

For Lingxiao, we use values straight out of our table

$$P = \frac{100{,}000\left[\left(\frac{1}{1.05}\right)(.00106) + \left(\frac{1}{1.05}\right)^2(1-.00106)(.0011) + \left(\frac{1}{1.05}\right)^3(1-0.00106)(1-0.0011)(0.00113)\right]}{1 + \frac{1}{1.05}(1-.00106) + \left(\frac{1}{1.05}\right)^2(1-0.00106)(1-0.00110)}$$

$$= \frac{298.02278}{2.85644} = 104.33$$

For Matthew, the mortality is different

$${}_1p_{21} = (p_{21})\left(e^{-0.05}\right) = (1-0.00106)e^{-0.05}$$

$${}_1p_{21}^{\upsilon\upsilon} = (p_{21})\left(e^{-0.05}\right) = (1-0.00106)e^{-0.05}$$

from table

$$= 0.95022$$

$${}_2p_{21} = {}_2p_{21}\left(e^{-0.05(2)}\right)$$

$$= (1-0.00106)(1-0.0011)\left(e^{-0.10}\right)$$

$$= 0.90288$$

$${}_3p_{21} = {}_3p_{21}\left(e^{-0.005(3)}\right)$$

$$(1-0.00106)(1-0.0011)(1-0.00113)e^{-0.15}$$

$$= 0.85788$$

$$q_{21} = 1 - p_{21} = 0.04978$$

$${}_2p_{21} = p_{21} \cdot p_{22} = p_{21}(1-q_{22})$$

$$\therefore\ q_{22} = 1 - \frac{{}_2p_{21}}{p_{21}} = 0.04982$$

$${}_3p_{21} = {}_2p_{21} \cdot p_{23} = {}_2p_{21}(1-q_{23})$$

$$\therefore\ q_{23} = 1 - \frac{{}_3p_{21}}{{}_2p_{21}} = 0.04985$$

$$P=\frac{100{,}000\left\{\left(\frac{1}{1.05}\right)(0.04978)+\left(\frac{1}{1.05}\right)^2(1-0.04978)(0.04982)+\left(\frac{1}{1.05}\right)^3(1-0.04978)(1-0.04982)(0.04985)\right\}}{1+\frac{1}{1.05}(.95022)+\left(\frac{1}{1.05}\right)^2(.90288)}$$

$$=\frac{12922.83584}{272.39102}=4744.22$$

$$\Delta \text{ in Prem} = 4744.22-104.33=4639.89$$

14) $PVB = PVP$

$PVB = 25{,}000\, A'_{[25]:\overline{3}|}$

$PVP = P\ddot{a}^{(4)}_{[25]:\overline{3}|}$

$$l_{[25]}A_{[25]:\overline{3}|}=v\,d_{[25]}+v^2\,d_{[25]+1}+v^3\,d_{[25]+2}$$

$$1100A=\left(\frac{1}{1.06}\right)(40)+\left(\frac{1}{1.06}\right)^2(60)+\left(\frac{1}{1.06}\right)^3(100)$$

$$A_{[25]:\overline{3}|}=\frac{175.09756}{1100}=0.1591796$$

$$\ddot{a}^{(4)}_{[25]:\overline{3}|}=\ddot{a}_{[25]:\overline{3}|}\,\alpha(4)-\beta(4)(1-{}_3E_{[25]})$$

$${}_3E_{[25]}=v^3\,{}_3p_{[25]}=\left(\frac{1}{1.06}\right)^3\left(\frac{900}{1100}\right)$$

$$=0.68696$$

$$\ddot{a}_{[25]:\overline{3}|}=1+v\,p_{[25]}+v^2\,{}_2p_{[25]}$$

$$=1+\frac{1}{1.06}\left(\frac{1060}{1100}\right)+\left(\frac{1}{1.06}\right)^2\left(\frac{1000}{1100}\right)$$

$$=2.71818$$

$= 2.71818$

$\ddot{a}^{(4)}_{[25]:\overline{3|}} = (2.71818)(1.00027)$
$- 0.38424\,(1 - 0.68696)$

$= 2.59863$

$\text{ANN PREM} = \dfrac{25{,}000\,(0.159786)}{2.59863} = 1531.38$

$\text{Quarterly} = 1531.38/4 = 382.84$

(75) $PVB = PV\,P$

$PVB = 50{,}000\, A_{40} - 25{,}000\,{}_{25}E_{40}\, A_{65}$
$+ 25{,}000\,{}_{25}E_{40}$

$= 50{,}000\,(.16132) -$
$25{,}000\,(.27414)(.68756)(.43980)$
$+ 25000\,(.27414)(.68756)$

$= 10{,}705.77$

$PVP = P\ddot{a}_{40} + P\,{}_{10}E_{40}\,\ddot{a}_{50}$

$= P\,(14.8166 + .53667\,(13.2668))$

$= P\,(21.9365)$

$P = \dfrac{10{,}705.77}{21.9365} = 488.03$

(76) PVP = PVB + PVE

$$P\ddot{a}_{60} = 40000\bar{A}_{60} + .75P +$$

$$.05P\ddot{a}_{60} + 275$$

$$+ 25\ddot{a}_{60}$$

$$P = \frac{40000\left(\frac{i}{\delta}\right)A_{60} + 275 + 25\ddot{a}_{60}}{.95\ddot{a}_{60} - .75}$$

$$= \frac{40000(1.02971)(.36913) + 275 + (25)(11.1454)}{(.95)(11.1454) - .75}$$

$$= \frac{15757.50909}{9.83813}$$

$$= \boxed{1601.68}$$

(77) PVP = PVB + PVE

$$P\ddot{a}_{80} = 10{,}000A_{80} + 0.05P\ddot{a}_{80}$$

$$+ (c - 0.05)P + 275 + 25\ddot{a}_{80}$$

$$(1279.21)(5.9050) = 10{,}000(.66575) +$$

$$(.05)(1279.21)(5.9050) + (c - 0.05)(1279.21)$$

$$+ 275 + 25(5.9050)$$

$$c = \frac{159.88}{1279.21} = \underline{\underline{12.5\%}}$$

(78) First, find the Annual Benefit Premium

$$PVP = PVB$$

$$P\left(\ddot{a}_{40} - {}_{20}E_{40}\,\ddot{a}_{60}\right) = 100{,}000\;{}_{20}E_{40}\,A_{60}$$

$$P = \frac{100{,}000\,(.27414)(.36913)}{14.8166 - (0.27414)(11.1454)}$$

$$= 860.40$$

$$\text{Gross} = 1.25\,P = 1.25\,(860.40)$$

$$= 1075.50$$

$$E[L_0] = PVB + PVE - PV\text{ Gross Prem}$$

$$= PVB + PVE - PV\,(1.25)\text{ Ben Prem}$$

$$= PVE - PV\,(.25)\text{ Ben Prem}$$

since $PVB = PV$ of Ben Prem

$$E[L_0] = 0.2\,(1075.50)$$

$$+ 0.05\,(1075.50)\left(14.8166 - (0.27414)(11.1454)\right)$$

$$+ 60 + 50\,(14.8166)$$

$+ 60 + 50(14.8166)$

$- 0.25(860.40)(14.8166 - (0.27414)(11.1454))$

$= -881.44$

(79) $PVP = PVB + PVE$

$P\ddot{a}_{70:\overline{20|}} = 1{,}000{,}000 A^{1}_{70:\overline{20|}}$

$+ 0.07 P \ddot{a}_{70:\overline{20|}} + 0.43P$

$+ 1000 + (1)(1000) + 40\ddot{a}_{70:\overline{20|}}$

$+ 500 A^{1}_{70:\overline{20|}}$

$$P = \frac{1{,}000{,}500 A^{1}_{70:\overline{20|}} + 2000 + 40\ddot{a}_{70:\overline{20|}}}{.93\ddot{a}_{70:\overline{20|}} - 0.43}$$

$A^{1}_{70:\overline{20|}} = A_{70} - {}_{20}E_{70} A_{90}$

$= .51495 - (0.04988)(.79346)$

$= 0.475372215$

$\ddot{a}_{70:\overline{20|}} = \ddot{a}_{70} - {}_{20}E_{70}\ddot{a}_{90}$

$= 8.5693 - (0.04988)(3.6488)$

$= 8.38729785b$

$$P = \frac{477,845.383}{7.370187006}$$

$$= 64,848.48$$

(80) PVB + PVE = PVP

$$300000\,A_{35} - 100{,}000\,{}_{10}E_{35}\,A_{45}$$

$$- 100{,}000\,{}_{20}E_{35}\,A_{55} - 100{,}000\,{}_{30}E_{35}\,A_{65}$$

$$+ (.45)(3G) +$$

$$+ 50\left(\ddot{a}_{35} - {}_{30}E_{35}\,A_{65}\right) + 400$$

$$= (.95)\left(3G\,\ddot{a}_{35} - G\,{}_{10}E_{35}\,\ddot{a}_{45} - G\,{}_{20}E_{35}\,\ddot{a}_{55} - G\,{}_{30}E_{35}\,\ddot{a}_{55}\right)$$

$\uparrow$

TO REFLECT 5% of Prem Commission

$$G = \frac{100{,}000\left[3(.12872) - (.54318)(0.20120) - (.28600)(0.30514) - (.28600)(.48686)(0.43980)\right] + 50\left[15.3926 - (.28600)(.48686)(9.8969)\right] + 400}{(.95)\left[(3)(15.3926) - (.54318)(14.1121) - (.28600)(12.2768) - (.28600)(.4866)(9.8969)\right] - (.45)(3)}$$

$$G = \frac{13940.61106}{30.59416} = \underline{\underline{455.66}}$$

(81) (a) PVP = PVB + PVE

$$P\,\ddot{a}_{35} = 250{,}000A_{35} + 300 + 50\ddot{a}_{35}$$

$$P = \frac{250{,}000(.12872)+300}{15.3928} + 50$$

$$= 2160.10$$

(b)

$$\tau = \frac{1}{\delta}\ln\left[\frac{P-e+Sd}{P-e-Id}\right]$$

$$= \frac{1}{\ln(1.06)}\ln\left[\frac{2160.10 - 50 + (250{,}000)\left(\frac{.06}{1.06}\right)}{2160.10 - 50 - (300)\left(\frac{.06}{1.06}\right)}\right]$$

$$= \frac{1}{\ln(1.06)}\ln(7.76881029)$$

$$= 35.18$$

$$\Pr\{K_x + 1 > 36.18] =$$

$$\Pr\{K_x \geq 35] = \frac{l_{70}}{l_{35}}$$

$$= \frac{6{,}616{,}155}{9{,}420{,}657} = \boxed{.70230}$$

(c)

$$L_{0,i} = 250{,}000\,v^{K_{35}+1} + 300$$

$$+ 50\,\ddot{a}_{\overline{K_{35}+1}|} - P\,\ddot{a}_{\overline{K_{35}+1}|}$$

$$+ 50\, \ddot{a}_{\overline{K_{35}+1|}} - P\, \ddot{a}_{\overline{K_{35}+1|}}$$

$$E[L_{0,i}] = 250{,}000\, A_{35} + 300 + 50(\ddot{a}_{35}) - P\, \ddot{a}_{35} =$$

$$250000(.12872) + 300 + 50(15.3926) - P(15.3926)$$

$$= 33{,}249.63 - 15.3926P$$

$$Var[L_{0,i}] = Var\left[250{,}000\, v^{K_{35}+1} + 300 + 50\left(\frac{1-v^{K_{35}+1}}{d}\right) - P\left(\frac{1-v^{K_{35}+1}}{d}\right)\right]$$

$$= Var\left[\left(250{,}000 + \frac{P-50}{d}\right) v^{K_{35}+1} + 300 + \frac{50}{d} - \frac{P}{d}\right]$$

$$= \left(250{,}000 + \frac{P-50}{d}\right)^2 \left(Var\left[v^{K_{35}+1}\right]\right)$$

$$= \left(250{,}000 + \frac{P-50}{d}\right)^2 \left({}^2A_{35} - (A_{35})^2\right)$$

$$= \left(250{,}000 + \frac{P-50}{d}\right)^2 \left(0.03488 - (.12872)^2\right)$$

$$= \left(250{,}000 + \frac{P-50}{d}\right)^2 (0.018311162)$$

$$= \left(250{,}000 + \frac{P-50}{a}\right)^2 (0.018311162)$$

$$\frac{E[L]}{\sqrt{Var[L]}} = -\phi^{-1}(.95) = -1.645$$

$$E[L] = N\, E[L_{0,i}]$$

$$Var[L] = N\, Var[L_{0,i}]$$

$$\frac{(10{,}000)(33{,}249.63 - 15.3926P)}{\sqrt{(10000)\left(250{,}000 + \frac{P-50}{a}\right)^2 (0.018311162)}}$$

$$= -1.645$$

$$= \frac{100\,(33{,}249.63 - 15.3926P)}{\left(250{,}000 + \frac{P-50}{d}\right)(0.135318741)} = -1.645$$

$$3324{,}963 - 1539.26P =$$

$$-55453.20283 - 3.932588P$$

$$P = \frac{3{,}324{,}963 + 55453.20283}{1539.26 - 3.932588}$$

$$= \boxed{2201.76}$$

82 (a) $PVP = PVB + PVE$

ⓐ $PVP = PVB + PVE$

$$P(900+720v+432v^2+216v^3)$$

$$= 10000\underbrace{(180v+288v^2+216v^3+216v^4)}_{ⓑ}$$

$$+(900)(200)+$$

$$40\underbrace{(900+720v+432v^2+216v^3)}_{ⓐ}$$

ⓐ $= 2183.73919$

ⓑ $= 816.6100312$

$$P = \frac{10000(816.6100312)+180{,}000+40(2183.73919)}{2183.73919}$$

$$= \boxed{3859.18333}$$

ⓑ $L_0^g = 10000v^{K_x+1} + 200 + 40\ddot{a}_{\overline{K_x+1}|} - 3859.18\,\ddot{a}_{\overline{K_x+1}|}$

	L_0^g	Prob
$K_x=1$	5996.20	$\frac{180}{900}$
$K_x=2$	1954.09	$\frac{288}{900}$
$K_x=3$	-1932.65	$\frac{216}{900}$
$K_x=4$	-5669.71	$\frac{216}{900}$

$E(L) = 0.008$ ✓

$E(L) = 0.008$ ✓

(c) $Var(L) = E(L^2) - (E(L))^2$

$= E(L^2) - (0)^2 = E(L^2)$

$E(L^2) = (5996.20)^2 \left(\frac{180}{900}\right) + (1954.09)^2 \left(\frac{288}{900}\right) + (-1932.55)^2 \left(\frac{216}{900}\right) + (-5869.71)^2 \left(\frac{216}{900}\right) =$

$\boxed{17,024,079.2}$

(d) $L_0^g = 10000\, v^{K_x+1} + 200 + 40\, \ddot{a}_{\overline{K_x+1}|} - 4000\, \ddot{a}_{K_x+1}$

	L_0^g	Prob
$K_x = 1$	5855.38	$\frac{180}{900}$
$K_x = 2$	1677.87	$\frac{288}{900}$
$K_x = 3$	-2338.97	$\frac{216}{900}$
$K_x = 4$	-6201.32	$\frac{216}{900}$

$E\{L_0^g\} = \boxed{-341.68}$

$E[L_0^2] = 18,300,490 - (341.68)^2$

$\boxed{18,183,745}$

(83) $L_{0,i} = 400000 v^{K_{60}+1} + 275 +$

$25\ddot{a}_{\overline{K_{60}+1|}} + .75P + .05P\ddot{a}_{\overline{K_{60}+1|}}$

$- P\ddot{a}_{\overline{K_{60}+1|}}$

$= 400000 v^{K_{60}+1} + 275 + 25\ddot{a}_{\overline{K_{60}+1|}}$

$+ .75P - .95P\ddot{a}_{\overline{K_{60}+1|}}$

$E[L_{0,i}] = 400000(.36913) + 275$

$+25(11.1454) + .75P - .95P(11.1454)$

$= 148,205.635 - 9.83813P$

$\Rightarrow E[L] = 100(148205.635 - 9.83813P)$

$Var[L_{0,i}] = Var\Big[400000 v^{K_{60}+1} + 275$

$+ 25\left(\frac{1-v^{K_{60}+1}}{d}\right) + .75P -$

$.95P\left(\frac{1-v^{K_{60}+1}}{d}\right)\Big]$

$= Var\left[\left(400000 + \frac{.95P - 25}{d}\right) v^{K_{60}+1}\right]$

$= \left(400000 + \frac{.95P - 25}{d}\right)^2 \left({}^2A_{60} - (A_{60})^2\right)$

$= \left(400000 + \frac{.95P - 25}{d}\right)^2 \left(.17741 - (.36913)^2\right)$

$$= \left(400000 + \frac{.95P - 25}{d}\right)\left(.17741 - (.36913)^2\right)$$

$$Var[L] = 100\left(400000 + \frac{.95P - 25}{d}\right)^2 (0.041153643)$$

$$\frac{E[L]}{\sqrt{Var[L]}} = -\Phi^{-1}(.8) = -0.842$$

$$\frac{\cancel{100}^{10}\left(148205.635 - 9.83813P\right)}{\cancel{10}_{1}\left(400{,}000 + \frac{.95P - 25}{d}\right)(.20286128)}$$

$$= -0.842$$

$$1{,}482{,}056.35 - 98.3813P$$

$$= -68{,}323.96471$$

$$- 2.86659686P$$

$$+ 75.44104437$$

$$= \boxed{16{,}231.09}$$