

S. BROVERMAN EXAM MLC STUDY GUIDE - 2008
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Page 364, #9, (x) and (y) are independent lives

Page 364, #10, (60) and (70) are independent lives

Page 365, #11, The husband and wife have independent survival distributions

Page 365, #12, (40) and (41) are independent lives

Page 371, #34, the battery lifetimes are independent

Page 371, #12, (40) and (50) are independent lives

Page PE-36, #17, last line should be $7,142 \cdot \left(\frac{.12}{.04+.12}\right) = 5,357$

Page PE-55, #12, Solution should be

The APV of premiums can be formulated as the APV of the first 4 years of premium plus the APV of premiums paid from time 4 and later. A premium is paid if not in state 2. The APV of the first 3 premiums is $1 + v(1 - Q_0^{(0,2)}) + v^2(1 - {}_2Q_0^{(0,2)}) + v^3(1 - {}_3Q_0^{(0,2)})$.

At time 3, the state must be 1 or 2, since there is no transition into state 1 from time 2 to 3. Then, at time 4 and on the state must be 2, so the last possible premium is at time 3.

$$Q_0^{(0,2)} = .1,$$

$${}_0Q \times {}_1Q = \begin{bmatrix} 0.6 & 0.3 & 0.1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 0.6 & 0.3 & 0.1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0.36 & 0.18 & 0.46 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} \text{ so } {}_2Q_0^{(0,2)} = .46.$$

$${}_0Q \times {}_1Q \times {}_2Q = \begin{bmatrix} 0.36 & 0.18 & 0.46 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 0 & 0.3 & 0.7 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0.108 & 0.892 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\text{so } {}_3Q_0^{(0,2)} = .892.$$

$$\text{APV of premium is } 1 + \frac{1-.1}{1.1} + \frac{1-.46}{(1.1)^2} + \frac{1-.892}{(1.1)^3} = 2.3456.$$

The APV of benefits is $4[vQ_0^{(0,1)} + v^2{}_2Q_0^{(0,1)} + v^3{}_3Q_0^{(0,1)}]$ (as noted above, from time 4 and on, the state must be 2). APV of benefits is $4\left[\frac{.3}{1.1} + \frac{.18}{(1.1)^2} + \frac{.108}{(1.1)^3}\right] = 2.0105$.

$$\text{APV premium} - \text{APV benefits} = 2.3456 - 2.0105 = .34. \quad \text{Answer: C}$$