

Solutions to Chapter 6 Exercises

Exercise 6.1

See Chapter 6 Exercises.xls for complete solution.

Sample calculation of the policy reserve at the end of year 28:

$$\begin{aligned} {}_{28}V_{35} &= {}_{28}P_{35} \times v^0 \times (\$0 - {}_{28}P_{35}) \\ &+ {}_{29}P_{35} \times v^1 \times ({}_{29}C_{35} - {}_{29}P_{35}) \\ &+ {}_{30}P_{35} \times v^2 \times ({}_{30}C_{35} - {}_{29}P_{35}) \\ &= 0.00108 \times 1.00000 \times (\$0 - \$100.00) \\ &+ 0.00085 \times 0.95238 \times (\$496.75 - \$100.00) \\ &+ 0.00067 \times 0.90703 \times (\$505.34 - \$0) \\ &= \$0.52 \end{aligned}$$

The annual claims are assumed to occur at the end of each year. Therefore, ${}_{28}C_{35}$ is \$0 at the beginning of year 28 because the claim does not occur until the end of year 28.

Exercise 6.2

See Chapter 6 Exercises.xls for complete solution.

Sample calculation of the policy reserve at duration 28:

$$\begin{aligned} {}_{28}V_{37}^{2PT} &= {}_{26}P_{37} \times v^{26-28+2} \times (\$0 - {}_{26}P_{37}) \\ &+ {}_{27}P_{37} \times v^{27-28+2} \times ({}_{27}C_{37} - {}_{27}P_{37}) \\ &+ {}_{28}P_{37} \times v^{28-28+2} \times ({}_{28}C_{37} - {}_{28}P_{37}) \\ &+ {}_{29}P_{37} \times v^{29-28+2} \times ({}_{29}C_{37} - {}_{29}P_{37}) \\ &+ {}_{30}P_{37} \times v^{29-28+2} \times ({}_{29}C_{37} - {}_{29}P_{37}) \\ &= 0.00133 \times 1.00000 \times (\$0 - \$105.00) \\ &+ 0.00105 \times 0.95238 \times (\$512.20 - \$105.00) \\ &+ 0.00083 \times 0.90703 \times (\$521.92 - \$105.00) \\ &+ 0.00065 \times 0.86384 \times (\$530.95 - \$0) \\ &= \$0.88 \end{aligned}$$

The annual claims are assumed to occur at the end of each year. Therefore, ${}_{28}C_{35}$ is \$0 at the beginning of year 28 because the claim does not occur until the end of year 28.

Exercise 6.5

- a. Week 12 termination rate = $0.094 \times 1.049 \times 1.049 \times 0.974 \times 0.959 \times 0.950 = 0.092$
Week 13 termination rate = $0.082 \times 1.027 \times 1.038 \times 0.962 \times 0.967 \times 0.984 = 0.080$
Month 4 termination rate = $0.224 \times 1.172 \times 0.989 \times 1.039 = 0.270$

- b. Number remaining on claim after week 12 (3 months)
= $100,000 \times (1 - 0.092) = 90,800$

Number remaining on claim after week 13
= $100,000 \times (1 - 0.092) \times (1 - 0.080) = 83,536$

Number remaining on claim after month 4
= $100,000 \times (1 - 0.092) \times (1 - 0.080) \times (1 - 0.270) = 60,981$