

Exercise 6.15

Let G be the initial annual gross premium. The APV of premiums then is

$$\text{APV}(\text{premiums}) = G \ddot{a}_{[55]} - \frac{1}{2}G {}_{10}E_{[55]} \ddot{a}_{65}.$$

The APV of the death benefits is

$$\text{APV}(\text{benefits}) = 100000 A_{[55]} - 50000 {}_{10}E_{[55]} A_{65} = 50000(2 A_{[55]} - {}_{10}E_{[55]} A_{65}).$$

The APV of the expenses is

$$\text{APV}(\text{expenses}) = 0.22G + 0.03G \ddot{a}_{[55]} - 0.015G {}_{10}E_{[55]} \ddot{a}_{65}.$$

Solving for G ,

$$\begin{aligned} G &= \frac{50000(2 A_{[55]} - {}_{10}E_{[55]} A_{65})}{0.97 \ddot{a}_{[55]} - 0.485 {}_{10}E_{[55]} \ddot{a}_{65} - 0.22} \\ &= \frac{50000[2(0.2349624) - (0.593656)(0.3547719)]}{0.97(16.06579) - 0.485(0.593656)(13.54979) - 0.22} \\ &= 1131.131. \end{aligned}$$