Section 03: Life insurance products: In-class examples

A. Constant paying benefits

Assume that $T_x \sim Uniform(120 - x)$, assume $\delta = 0.05$

1. n-year term insurance

$$A^1_{20:\overline{45|}} = \sum_{k=0}^{45-1} \left(e^{-\delta}\right)^{k+1} {}_kp_x q_{x+k} = \sum_{k=0}^{45-1} (e^{-0.05})^{k+1} \times \frac{1}{120-20}$$

$$= \frac{e^{-0.05}}{100} \sum_{k=0}^{45-1} (e^{-0.05})^k$$

$$= \frac{e^{-0.05}}{100} \times \left(\frac{e^{-0.05\times 45} - 1}{e^{-0.05} - 1}\right) \approx 0.17448$$

$$\overline{A}^1_{20:\overline{45|}} = \int_0^{45} e^{-\delta t} {}_tp_x \mu_{x+t} dt = \int_0^{45} e^{-0.05t} \times \frac{1}{120-20} dt$$