

### Question #176

Answer: C

$$\text{Var}[Z] = E[Z^2] - E[Z]^2$$

$$\begin{aligned} E[Z] &= \int_0^{\infty} (v^t b_t)_t P_x \mu_{x+t} dt = \int_0^{\infty} e^{-0.08t} e^{0.03t} e^{-0.02t} (0.02) dt \\ &= \int_0^{\infty} (0.02) e^{-0.07t} dt = \frac{0.02}{0.07} = \frac{2}{7} \end{aligned}$$

$$\begin{aligned} E[Z^2] &= \int_0^{\infty} (v_t b_t)^2 {}_t P_x \mu_{x+t} dt = \int_0^{\infty} (e^{-0.05t})^2 e^{-0.02t} (0.02) dt \\ &= \int_0^{\infty} 0.02 e^{-0.12t} \mu_{x+t} dt = \frac{2}{12} = \frac{1}{6} \end{aligned}$$

$$\text{Var}[Z] = \frac{1}{6} - \left(\frac{2}{7}\right)^2 = \frac{1}{6} - \frac{4}{49} = 0.08503$$