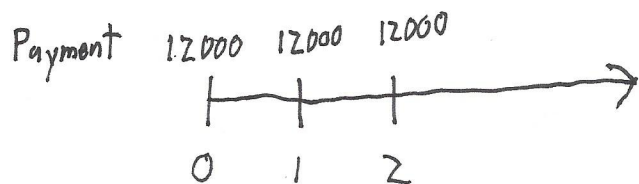


MLC #25

Given:



$$d = .08$$

Want to add death benefit of b per year, where b minimizes variance

Let $X \sim$ PV random variable

$$X = 12000 \ddot{a}_{\overline{K_x+1}|} + b v^{K_x+1}$$

$$= 12000 \left(\frac{1 - v^{K_x+1}}{d} \right) + b v^{K_x+1}$$

$$= \frac{12000 - 12000 v^{K_x+1}}{d} + \frac{b d v^{K_x+1}}{d}$$

$$= \frac{12000 - (12000 - b d) v^{K_x+1}}{d}$$

recall $\text{Var}(aX) = a^2 \text{Var}(X)$, so

$$\text{Var}(X) = \frac{(12000 - b d)^2}{d^2} \times \text{Var}(v^{K_x+1}) = \left(\frac{12000}{d} - b \right)^2 \text{Var}(v^{K_x+1})$$

$$\frac{\partial}{\partial b} \text{Var}(X) = -2 \left(\frac{12000}{d} - b \right) \text{Var}(v^{K_x+1})$$

$$0 = -2 \left(\frac{12000}{d} - b \right) \text{Var}(v^{K_x+1})$$

$$0 = \frac{12000}{d} - b \rightarrow b = \frac{12000}{.08} = 150000$$

