

149. L: loss
U: unreimbursed loss
A: # of accidents

$$L \sim \text{Exp}(\text{mean} = 0.8) \quad E(L) = 0.8 \quad \text{Var}(L) = 0.8^2$$

$$U = 0.3L$$

$$E(U) = E(0.3L) = (0.3)(0.8) = 0.24$$

$$\text{Var}(U) = \text{Var}(0.3L) = (0.3)^2(0.8)^2 = 0.0576$$

A is a binomial

$$E(A) = n \cdot p = 3 \cdot (0.25) = 0.75$$

$$\text{Var}(A) = n \cdot p \cdot q = 3 \cdot (0.25)(0.75) = 0.5625$$

$$\text{Var}(U) = \text{Var}(E(U|A)) + E(\text{Var}(U|A)) \quad \leftarrow \text{conditional variance formula}$$

$$\text{Var}(E(U|A))$$

$$\begin{aligned} E(U|A) &= E(U_1 + U_2 + \dots + U_A) \\ &= A \cdot E(U) \\ &= A \cdot (0.24) \end{aligned}$$

$$\text{Var}(0.24A)$$

$$\begin{aligned} &= 0.24^2 \text{Var}(A) \\ &= 0.24^2 (0.5625) \\ &= 0.0324 \end{aligned}$$

$$E(\text{Var}(U|A))$$

$$\begin{aligned} \text{Var}(U|A) &= \text{Var}(U_1 + U_2 + \dots + U_A) \\ &= A \cdot \text{Var}(U) \\ &= A \cdot (0.0576) \end{aligned}$$

$$E(0.0576A)$$

$$\begin{aligned} &= 0.0576 E(A) \\ &= (0.0576) \cdot (0.75) \\ &= 0.0432 \end{aligned}$$

$$\begin{aligned} \text{Var}(U) &= 0.0324 + 0.0432 \\ &= 0.0756 \end{aligned}$$

B