

Quiz 6
STAT 479
October 19, 2010

1. Hewitt Health Insurance Company sells a hospital indemnity program that covers adults and children.

For adults, there is a 10% chance of a claim. Claims for adults are distributed as a gamma distribution with $\alpha = 4$ and θ .

For children, there is a 5% chance of a claim. Claims for children are distributed as a gamma distribution with $\alpha = 2$ and θ .

Hewitt has 1000 policies covering adults and 200 policies covering children.

The variance of Hewitt's portfolio of policies is 75,920,000.

Determine θ .

$$\text{Var} = \sum (q \cdot \sigma^2 + (q)(1-q)(\mu^2))$$

$$\text{Adults} = E(x) = \alpha\theta = 4\theta$$

$$\text{Var}(x) = \alpha\theta^2 = 4\theta^2$$

$$\text{Children} \Rightarrow E(x) = \alpha\theta = 2\theta$$

$$\text{Var}(x) = \alpha\theta^2 = 2\theta^2$$

$$\text{Var} = (1000) \left[(0.10)(4\theta^2) + (0.10)(0.90)(16\theta^2) \right] + 200 \left[(0.05)(2\theta^2) + (0.05)(0.95)(4\theta^2) \right]$$

$$= 1898\theta^2 = 75,920,000$$

$$\theta = \sqrt{\frac{75,920,000}{1898}} = \underline{\underline{200}}$$

2. The Pareto distribution is being discretized using the Method of Moment Matching where the first moment is being matched. The Pareto distribution has parameters of $\alpha = 3$ and $\theta = 400$.

The span used in this process is 250.

Calculate the probability assigned 500.

$$\begin{aligned}
 f &= \frac{2E[X \wedge ih] - E[X \wedge (i-1)h] - E[X \wedge (i+1)h]}{h} \\
 &= \frac{2E[X \wedge 500] - E[X \wedge 250] - E[X \wedge 750]}{250} \\
 &= \frac{2 \left[\frac{400}{2} \left(1 - \left(\frac{400}{900} \right)^2 \right) \right] - \frac{400}{2} \left[1 - \left(\frac{400}{650} \right)^2 \right] - \frac{400}{2} \left[1 - \left(\frac{400}{1150} \right)^2 \right]}{250} \\
 &= \underline{\underline{0.0836956}}
 \end{aligned}$$