Quiz 4
STAT 479
September 28, 2010

1. Losses prior to any deductible for a health insurance policy are distributed as a Pareto distribution with $\theta = 1000$ and $\alpha = 5$. Losses are subject to a franchise deductible of d.

   The expected value per payment after the deductible is 820.

   Calculate d.

$$E(Y^P) = \frac{E(X) - E(X \wedge d) + d\left(1 - F(d)\right)}{1 - F(d)}$$

$$= \frac{\frac{\theta}{\alpha-1} - \frac{\theta}{\alpha-1}\left\{1 - \left(\frac{\theta}{d+\theta}\right)^{\alpha-1}\right]}{1 - \left[1 - \left(\frac{\theta}{d+\theta}\right)^{\alpha}\right]} + d$$

$$= \frac{\frac{\theta}{\alpha-1}\left[\left(\frac{\theta}{d+\theta}\right)^{\alpha-1}\right]}{\left(\frac{\theta}{d+\theta}\right)^{\alpha}} + d$$

$$= \frac{\theta}{\alpha-1}\left[\frac{d+\theta}{\theta}\right] + d = \frac{d+\theta}{\alpha-1} + d$$

$$820 = \frac{d+1000}{4} + d = \tfrac{5}{4}d + 250$$

$$d = (820-250)(.8) = \underline{\underline{456}}$$

2. Losses follow an exponential distribution with a mean of 1000. The insurance company wants to implement an ordinary deductible that will result in a loss elimination ratio of 0.5.

Calculate the ordinary deductible to be implemented.

$\theta = 1000$ $\qquad$ $LER = .5$

$$LER = \frac{E(X \wedge d)}{E(X)} = .50$$

$$\Rightarrow E(X \wedge d) = (.5)(E(X)) = (.5)(1000) = 500$$

From Tables

$$E(X \wedge d) = \theta\left(1 - e^{-\frac{d}{\theta}}\right)$$

$$1000\left(1 - e^{-\frac{d}{1000}}\right) = 500$$

$$1 - e^{-\frac{d}{1000}} = .5$$

$$e^{-\frac{d}{1000}} = .5$$

$$\frac{d}{1000} = -\ln(.5)$$

$$d = (-\ln(.5))(1000)$$

$$= 693.15$$