STAT 479
Test 1
Spring 2017
February 14, 2017

1. Riley Renters Insurance Company sells policies providing coverage on rental property. The policies sold during 2016 did not have a deductible or upper limit. The claims for 2016 were distributed as a Pareto distribution with a mean of 600 and variance of 540,000.

   Riley sold 10,000 identical policies to Purdue Housing to cover the students in the dorms. The risk under each policy was independent. Riley charged Purdue a premium that should be sufficient (greater than claims) 90% of the time.

   a. Assuming the normal distribution, calculate the premium.

   During 2017, Riley Renters expects claims to increase by an inflation factor of 10% so each claim in 2017 will be 110% of the same claim in 2016. During 2017, Riley Renters also imposes an upper limit of 800 and an ordinary deductible 100. The upper limit will be imposed prior to the application of the deductible.

   Let Y^L be the random variable representing the amount that Riley will pay for each loss per loss.

   b. Calculate $E[Y^L]$.

2. The number of claims for medical insurance represented by the random variable N is distributed as a negative binomial with parameters β and $\gamma = 4$. The parameter β is distributed as a gamma distribution with parameters $\theta = 2$ and $\alpha = 3$.

   Find the unconditional expectation and variance of N.

3. Losses are distributed as a Pareto distribution with $\theta = 5000$ and $\alpha = 3$.

   a. Calculate the Standard Deviation Principle with $k = 2$.

   b. Determine the value of p so that $TVaR_p(x)$ is equal to the same value as in Part a. If you could not get Part a., assume that Part a. was equal to 10,000.

4. For an insurance policy, losses are distributed exponentially with a variance of 1,000,000. Additionally, if a loss is less than 800, the company will pay 20% of the difference between 800 and the loss to the agent. In other words, if the loss is 800 or greater, no bonus is paid. If the loss represented by X is less than 800, then a bonus equal to $0.2[800 - X]$ will be paid to the agent.

   The insurance company wants to set the premium to be the expected value of claims plus the expected value of bonuses.

   Determine the premium for this coverage.

5. The number of claims in a year under a dental policy can be modeled as a zero modified Poisson distribution. Under this zero modified Poisson distribution, $p_1 = 0.1915560$ and $p_2 = 0.2298672$.

Calculate $E[N]$

6. Losses are distributed as a Pareto distribution with $\theta = 10,000$ and $\alpha = 5$. An insurance company wants to establish an ordinary deductible of d so the loss elimination ratio will be 0.37214.

   Determine d.

7. The random variable X is distributed as a Burr distribution with parameters $\alpha=1,\ \gamma=2,$ and $\theta=40$.

   The random variable Y is distributed as a Pareto distribution with parameters $\alpha=1$ and $\theta=1600$.

   The random variable Z is a mixture of X and Y with equal weights on each component.

   Determine the median of Z.

8. You are given that losses for an insurance coverage has the following distribution function:

$$S_X(x) = 1 - 0.001x^3 \quad \text{for } 0 \le x \le 10$$

Let Y^P be the random variable representing the payment per payment under this coverage assuming a franchise deductible of 5.

Calculate the $E[Y^P]$.

9. You are given the following sample of automobile accident claims:

   450 530 690 1000 1240 1500 1500 4200 12,000

   You treat this data as an empirical distribution of the loss random variable X .

   Calculate:

   a. $E[X]$

   b. $Var[X]$

   c. Median

   d. Mode

   e. Coefficient of Variation