ACSC/STAT 3703, Actuarial Models I

WINTER 2023
Toby Kenney

Homework Sheet 7

Due: Wednesday 29th March: 11:30

Note: This homework assignment is only valid for WINTER 2023. If you find this homework in a different term, please contact me to find the correct homework sheet.

Basic Questions

1. An insurance company has an insurance policy where the loss amount follows a Pareto distribution with $\alpha = 3.4$ and $\theta = 1000$. Calculate the expected payment per claim if the company introduces a deductible of d.

2. The severity of a loss on a worker's compensation insurance policy follows a gamma distribution with $\alpha = 0.3$ and $\theta = 10000$. Calculate the loss eliminatrion ratio of a deductible of \$5,000.

3. An insurance company has a policy where losses follow an inverse Pareto distribution with $\tau = 1$ and $\theta = 6000$. The companys wants the TVaR at the 95% level for this policy to be \$150,000. What policy limit should the company put on the policy to achieve this?

4. Aggregate payments have a compound distribution. The frequency distribution is negative binomial with $r = 2.2$ and $\beta = 3.5$. The severity distribution has mean 2,298 and variance 62,840,000. Use a Pareto approximation to aggregate payments to estimate the probability that aggregate payments are more than 70,000.

Standard Questions

5. For a certain insurance policy, losses follow an inverse Pareto distribution with $\tau = 4$ and $\theta = 5,000$. The policy limit of \$1,000,000 is applied before the deductible. The deductible is set to achieve a loss elimination ratio of 20%. What deductible achieves this loss elimination ratio?

(i) 1246.75

(ii) 9145.50

(iii)14547.20

(iv) 21335.65

Justify your answer.

6. An insurance company models loss frequency as negative binomial with $r = 4$ and $\beta = 2.8$, and loss severity as Pareto with $\alpha = 1$, and $\theta = 100$. The insurer wants to set a policy limit u per loss. The insurer buys stop-loss reinsurance for aggregate losses above 1.1 times the expected aggregate losses, the price for which is based on using a Pareto distribution for aggregate losses with parameters fitted using the method of moments. The insurer's loading is 20% for the whole policy, including the ceded part. The stop-loss insurance has a loading of 30%, and the insurer wants to ensure that no more than 25% of its total premiums are paid to the reinsurer. What is the largest value of u they can set to achieve this?

(i) $u = \$53,140.43$

(ii) $u = \$119,243.31$

(iii) $u = \$160,186.66$

(iv) $u = \$290,424.04$

Justify your answer.