ACSC/STAT 3703, Actuarial Models I

WINTER 2025

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Homework Sheet 7

Due: Thursday 27th March: 14:30

Note: This homework assignment is only valid for WINTER 2025. 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 an inverse Gamma distribution with $\alpha = 3$ and $\theta = 200$. Calculate the expected payment per claim if the company introduces a deductible of d.
- 2. The severity of a loss on a home insurance policy follows a log-logistic distribution with $\gamma = 2$ and $\theta = 1500$. Calculate the loss eliminatrion ratio of a deductible of \$2,000.
- 3. An insurance company has a policy where losses follow a Pareto distribution with $\alpha = \frac{1}{3}$ and $\theta = 1000$. The company wants the TVaR at the 95% level for this policy to be \$10,000,000. 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 = 2.4 and $\beta = 0.5$. The severity distribution has mean 2,278 and variance 11,925,000. Use a Pareto approximation to aggregate payments to estimate the expected payment on a reinsurance policy with attachment point \$500,000.

Standard Questions

5. For a certain insurance policy, losses follow a Pareto distribution. with no policy limit, a deductible of \$1,000 would achieve a loss elimination ratio of 10%, and a deductible of \$5,000 would achieve a loss elimination ratio of 20%. What is the loss elimination ratio of a \$1,000 deductible with a policy limit of \$100,000 applied after the deductible.

[The parameter θ for the Pareto distribution is one of the following values: (i) $\theta = 437.04846$ (ii) $\theta = 630.39300$ (iii) $\theta = 883.47821$ (iv) $\theta = 1522.03242$]

6. An insurance company models loss frequency as negative binomial with r = 0.2 and $\beta = 160$, and loss severity as Pareto with $\alpha = 0.5$ and $\theta = 1600$. The insurer sets a policy limit u per loss. The insurer buys stop-loss reinsurance for aggregate losses above 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 expected payment on this reinsurance is \$500,000. What is the policy limit u?