

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 elimination 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) $\theta = 1522.03242$

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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 price for this reinsurance is \$ What is the policy limit u ?