ACSC/STAT 3703, Actuarial Models I

WINTER 2025

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Homework Sheet 8

Due: Thursday 3rd April: 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.

1. An insurance company has the following portfolio of fire insurance policies:

Type of policy	Number	Probability of claim	mean claim	standard deviation
Retail	350	0.0242	\$3,522	\$4,820
Office	631	0.0110	\$2,710	\$9,024
Manufacture	402	0.0524	\$8,015	\$14,254

They model aggregate losses using an inverse gamma distribution. Calculate the cost of reinsuring losses above \$500,000, if there is a 30% loading on the reinsurance premium.

2. An insurance company sells medical malpractice insurance. It estimates that the standard deviation of the aggregate annual claim is \$420,000 and the mean is \$28,000.

   (a) How many years history are needed for a clinic to be assigned full credibility? (Use $r = 0.05$, $p = 0.99$.)

   The standard net premium for this policy is \$28000. A clinic has claimed a total of \$92,032 in the last 24 years.

   (b) What is the net Credibility premium for this company, using limited fluctuation credibility?

Standard Questions

3. An auto insurer divides drivers into two categories: Safe and Dangerous. The number of claims made by a policyholder follows a Poisson distribution with a certain mean λ, depending on the type of driver. The characteristics of each type of policy are given in the following table.

Category	λ	mean claim	standard deviation of claim
Safe	0.01	14309	293054
Dangerous	0.03	25234	402346

The insurer sells a total of 800 policies. The insurer buys stop-loss reinsurance from a reinsurer which models aggregate losses as following a Pareto distribution. The reinsurer charges a loading of 30%. If the attachment point is set equal to 1.5 times average aggregate losses, then the reinsurance premium is equal to 50.25% of expected aggregate losses. How many of each policy type does the insurer insure?

4. A home insurance company sets the standard for full credibility as 4142 policy-years. The book estimates are 0.09 claims per policy-year for claim frequency and \$2,038 per claim for claim severity.

   The company changes the standard to 3922 policy-years for frequency and 408 claims for severity. For a particular policyholder with 28 policy-years of experience, who made 8 claims in that time, this results in a 3% increase in premiums. What was the total amount claimed by this policyholder?