ACSC/STAT 3703, Actuarial Models I

WINTER 2024

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Homework Sheet 8

Due: Wednesday 4th April: 13:00

Note: This homework assignment is only valid for WINTER 2024. 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 inland marine insurance policies:

Type of policy	Number	Probability of claim	mean claim	standard deviation
Trucking	570	0.0833	\$1,502	\$4,820
Rail	490	0.0142	\$14,814	\$89,241
Other	220	0.0351	\$4,424	\$6,395

They model aggregate losses using a Pareto distribution. Calculate the cost of reinsuring losses above \$2,000,000, if there is a 35% loading on the reinsurance premium.

2. An insurance company sells Workers' Compensation insurance. It estimates that the standard deviation of the aggregate annual claim is \$290,000 and the mean is \$26,000.

(a) How many years history are needed for a company to be assigned full credibility? (Use $r = 0.1$, $p = 0.95$.)

The standard net premium for this policy is \$26000. A company has claimed a total of \$136,902 in the last 18 years.

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

Standard Questions

3. A home insurer divides policyholders into three categories: Urban; Suburban; and Rural. The number of claims made by a policyholder follows a Poisson distribution with a certain mean λ, depending on the type of home. The insurance company has the following portfolio of policies.

Category	Number insured	λ	mean claim	standard deviation of claim
Urban	2884	0.05	1309	52401
Suburban	N	0.02	1624	93228
Rural	844	0.09	4014	169212

The insurance company is currently advertising heavily in suburban areas and hopes that this will increase the number of policies sold to those homeowners. The insurer models aggregate losses as following a Pareto distribution. The insurer charges a loading of 20% of the expected payments. It buys stop-loss reinsurance with attachment point 1.1 times expected payments. The reinsurer uses the same Pareto distribution to model aggregate losses, and charges a loading of 40% for the reinsurance. The insurer wants the total reinsurance payment to be less than 10% of premiums received. How many additional suburban policies does it need to sell in order to achieve this?

4. An auto insurance company sets the standard for full credibility as 1264 car-years. The book estimates are 0.17 claims per car-year for claim frequency and \$1,885 per claim for claim severity.

   The company changes the standard to 820 car-years for frequency and 232 claims for severity. For a particular policyholder with 17 car-years of experience, who claimed a total of \$20,975.07 in that time, this results in a 2% decrease in premiums. How many claims did this policyholder make?