ACSC/STAT 3703, Actuarial Models I

WINTER 2023
Toby Kenney

Homework Sheet 8

Due: Wednesday 5th April: 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.

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

Type of dwelling	Number	Probability of claim	mean claim	standard deviation
Apartment	4,800	0.0133	\$5,502	\$3,220
Condominium	2,300	0.0242	\$2,814	\$4,331
House	8,700	0.0473	\$3,424	\$8,925

They model aggregate losses using a Gamma distribution. Calculate the cost of reinsuring losses above \$2,500,000, if there is a 35% loading on the reinsurance premium.

2. An insurance company sells inland marine insurance. It estimates that the standard deviation of the aggregate annual claim is \$8290 and the mean is \$4011.

(a) How many years history are needed for an individual or group to be assigned full credibility? (Use $r = 0.05$, $p = 0.9$.)

The standard net premium for this policy is \$4011. A policyholder has claimed a total of \$136,824 in the last 430 policy-years.

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

Standard Questions

3. A workers compensation insurer divides insureds into three categories: Manufacturing; Mining; and Others. The number of claims made by a company follows a negative binomial distribution with parameters r and β. The insurance company has the following portfolio of policies.

Category	Number insured	r	β of claim	mean claim (thousands)	standard deviation (thousands)
Manufacturing	84	0.001	11	94.2	274.9
Mining	49	0.040	4	81.6	366.4
Other	115	0.014	6	34.1	220.4

The insurance company models the aggregate losses as following an Pareto distribution with the correct mean and variance. It charges a 20% loading on the part of its premiums that it covers itself. It wants to buy stop-loss reinsurance for its policies with an attachment point of $3,000,000. The reinsurance company uses the same Pareto distribution to model aggregate losses and charges a 40% loading. What is the insurer's total loading?

4. A health insurance company sets the standard for full credibility as 841 person-years. The book estimates are 0.28 claims per person-year for claim frequency and $388 per claim for claim severity.

   The company changes the standard to 220 person-years for frequency and 293 claims for severity. For a group with 192 person-years of experience, including a total of 114 claims, this results in a 39% increase in premiums. What was the aggregate claim from this group over those 192 person-years?