ACSC/STAT 4703, Actuarial Models II

FALL 2023

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Homework Sheet 8

Due: Thursday 30th November: 14:30

Basic Questions

1. The file `HW8_data` contains a run-off triangle. Fit an overdispersed Poisson model to this data and use it to find the 95th percentile of estimated outstanding claims.

2. A workers' compensation insurance company classifies companies as "Manufacture", "Office" and "Construction". The experience from policy year 2022 is:

Policyholder	Current differential	Earned premiums (000s)	Loss payments (000s)
Office	1	11,600	9,040
Construction	1.83	4,400	3,330
Manufacture	1.64	6,100	5,720

The base premium was \$1,050. If the expense ratio is 20%, calculate the new premiums for each type of policyholder (ignoring inflation) for policy year 2024.

3. An insurer uses two variables to classify its policyholders. The categories and differentials are given in the following table:

Age Category		Marital Status	
Young	1.72	Single	0.81
Middle-aged	1	Married	1
Old	1.30	Divorced/Widowed	1.12

The earned premiums from accident year 2022 are:

	Marital Status			
Age Category	Single	Maried	Divorced/Widowed	Total
Young	2,842	1,910	273	5,025
Middle-aged	1,041	4,424	1,827	7,292
Old	377	2,061	4,738	7,176
Total	4,260	8,395	6,838	19493

And the claims are:

Category	Total Claims
Young	4,324
Middle-aged	6,603
Old	6,450
Single	3,567
Married	7,551
Divorced/Widowed	6,259

The expense ratio is 0.25. Ignoring inflations, by what factor should they increase the base premium in future years?

Standard Questions

4. An insurance company uses two variables: sex and risk-class to distinguish policyholders. The base classes are "female" and "low risk". They have the following data from policy-year 2022:

Class	Differential	Earned premiums	Losses
Female	1	15,498	13,190
Male	1.21	14,903	12,895
Low risk	1	23,794	19,844
High risk	1.92	6,607	6,241

The expense ratio is 0.15. For policy year 2023, assuming no inflation, by how much does the base premium increase if 10% of female policyholders were "high risk"?