



McMaster Workshop 2024

January 2024

Introduction

XYZ insurance is interested in improving the pricing of their private passenger automobile product. Currently, for every vehicle, they estimate the frequency of loss, and multiply this by the average severity of all claims, to arrive at a pure premium for each vehicle.

$$\text{Pure Premium} = \underbrace{E[\text{Number of Claims}]}_{\text{Frequency}} * \underbrace{E[\text{Cost of Claim} \mid \text{There was a Claim}]}_{\text{Severity}}$$

Then they load this for expenses and a profit provision to arrive at an indicated rate, or premium:

$$\text{Indicated Average Rate} = \frac{\text{Pure Premium (including LAE)} + \text{Fixed UW Expense Per Exposure}}{1.0 - \text{Variable Expense\%} - \text{Target UW Profit\%}}$$

The Chief Actuary has stated that the easiest way to improve their pricing is to update the severity model. Currently, the estimate is the same for everyone. This initiative aims to use modeling to give each vehicle a different severity estimate. Frequency, expenses, and target UW profit don't change.

Furthermore, after finding the new premium, management is expected to present to leadership and inform them on the expected dislocation, or the change in premiums, that policyholders can expect.

Dislocation

"Dislocation" is defined as:

$$\text{Dislocation} = \left[\frac{\text{New Premium}}{\text{Old Premium}} \right] - 1$$

This quantity helps stakeholders understand the impact of a rate change. For example, the sales department will want to understand the change in premium to their client base. Market analysts are interested in knowing if they are lowering premiums on the right segments to pursue growth opportunities. Actuaries are interested in the statistical justification of the changes in premium and if it represents a more accurate prediction of future loss. Regulators are interested in the affordability of insurance, and if the rate increases are too aggressive and potentially discriminatory.

There are many reasons this quantity may be analyzed, and we are interested in your perspective!

The Data

All the data can be found in the *March 9th.zip* file that was emailed to your team.

Data Dictionary – Definitions for the fields in the data.

Claims_years_1_to_3.csv – Dataset to create new severity model using this dataset.

Submission_Data.csv – Dataset to predict on using new severity model.

Dislocation_dataset.csv – Dataset to calculate premium & dislocation using new severity model. Contains the "old" severity target underwriting profit, fixed expense, variable expense, target profit that will utilize to complete dislocation.

Workshop Objectives

You have two main tasks at the final round. First, you must quantify dislocation from the new severity model utilizing the data provided and the above definitions of premium and dislocation. Second, you will present the analysis of your results to share your findings and conclusions – this is your opportunity to demonstrate your communication and comprehension skills!

To guide you, The Chief Actuary wants to understand the following through your presentation:

1. In general, what kind of clients have high premiums? And low premiums?
2. Who will see a premium increase after the rate change? Who will be charged less?
3. How many clients, and what % of clients, will have rate decreases/increases between (-100%,-25%), [-25%,-10%),[-10%,-5%),[-5%,0%),[0,5%),[5%,10%),[10%,25%),[25%,100%)?
4. When data is sparse, is any judgement or calculation performed to adjust the results? Why?
5. What makes you believe that the proposal will have a positive impact on the book of business?
6. Are there any other considerations that may require adjustment to the new premiums?

Numerical submission sent to McMaster Workshop email by 12:30pm:

1. Submit your dislocations.
2. Your updated severity models.

Presentation submission sent to McMaster Workshop email by 1:30pm: