Basic property insurance ratemaking information

1. Introduction

The premium is the amount the insured pays for insurance coverage.

Premium = Cost + Profit.

The cost can be separated into multiple components: Losses, Loss adjustment expenses and underwriting expenses. We therefore end with the following formula:

Premium= Expected Losses + LAE + UW Expenses + Profit.

While the two various types of expenses are more or less stable, the expected losses component is much more volatile and difficult to predict.

2. Premium components

2.1 Expenses

2.1.1 Loss Adjustment Expenses

We are directly copying the description from the *Casualty Actuarial Society* (CAS) reference text on ratemaking[1], which can be found on page 4.

> In addition to the money paid to the claimant for compensation, the insurer generally incurs expenses in the process of settling claims; these expenses are called **loss adjustment expenses (LAE).** Loss adjustment expenses can be separated into **allocated loss adjustment expenses (ALAE)** and **unallocated loss adjustment expenses (ULAE)**
>
> LAE =ALAE +ULAE.
>
> ALAE are claim-related expenses that are directly attributable to a specific claim; for example, fees associated with outside legal counsel hired to defend a claim can be directly assigned to a specific claim. ULAE are claim-related expenses that cannot be directly assigned to a specific claim. For example, salaries of claims department personnel are not readily assignable to a specific claim and are categorized as ULAE.

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[1] Werner&Modlin, BASIC RATEMAKING, Fifth Edition
http://casact.org/library/studynotes/Werner_Modlin_Ratemaking.pdf

2.1.2 Underwriting Expenses

Again, based on the CAS reference text, from page 4 :

> *In addition to loss adjustment expenses (i.e., claim-related expenses), companies incur other expenses in the acquisition and servicing of policies. These are generally referred to as underwriting expenses (or operational and administrative expenses). Companies usually classify these expenses into the following four categories:*
>
> - *Commissions and brokerage*
> - *Other acquisition*
> - *General*
> - *Taxes, licenses, and fees*

2.2 Losses

The losses component is the most volatile one, because we don't know if an insured will even incur losses during his year insured with us.

For ratemaking purposes, this is why we use something called the Loss Cost or Pure Premium, which is essentially a measure of the average loss per policy.

However, some policies are riskier than others and it wouldn't make sense to charge the same premium to a policyholder with a $300,000 house compared to one with a $1.5M house.

Therefore, insurance companies put a lot of efforts on developing models attempting to predict the best average expected losses per risk profile.

2.2.1 Loss Cost Modelling

There are usually two approaches to loss cost modeling: Frequency*Severity modeling and Loss Cost modeling.

2.2.1.1 Frequency * Severity

The frequency is defined as the number of claims incurred by a profile, divided by the exposure (The exposure is assumed to be 1 for every case in the qualification phase). The Frequency is often modelled using a Poisson distribution assumption.

The severity is defined as the total incurred losses for a profile, divided by the claim count. The severity is often modelled using a Gamma distribution assumption.

2.2.1.2 Loss Cost

The loss cost is defined as the total incurred losses for a profile, divided by the exposure. This is often modelled using a Tweedie distribution assumption.

More information on these key insurance ratios can be found in chapter 1 of the Werner and Modlin reference text (BASIC INSURANCE RATIOS section). More information can be found on the distributions in section 2.7 of the CAS reference document in the footnote[2].

The techniques are very popular. However, they may not necessarily be the best techniques to capture effects like geographical correlation, or correlations between the various business types.

2.3 Loss trending

Since the premium attempts to predict future costs associated to a policy, we cannot simply rely on past losses to determine the loss cost. Therefore, actuaries use loss trending to project these past losses into the future.

Loss trending is typically done by fitting curves to multiple years of historical data. This information is often complemented with judgment and external data.

Since this topic is a complex one, we greatly simplified the assumptions impacting the application of loss trends. Therefore, this part should be straightforward even without knowledge of the actuarial best practices surrounding this topic.

3. Pure premium method

Chapter 8 of Werner &Modlin discusses Overall indications. When trying to determine rates for a new company, an indication can only be done through the Pure Premium method.

The information from chapter 8 is summarized here:

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

[2]Goldburd, Khare, Tevet, GENERALIZED LINEAR MODELS FOR INSURANCE RATING
https://www.casact.org/pubs/monographs/papers/05-Goldburd-Khare-Tevet.pdf