

Premium at Current Rate Level - Extension of Exposures

 10M

In order for historical premiums to be useful in the ratemaking process, they must be brought to the current rate level. This step is analogous to developing losses to ultimate.

There are two approaches to adjust premiums to the current rate level: the extension of exposures method and the parallelogram method.

Extension of Exposures

An **exposure** is the basic unit used to determine premium. This unit varies depending on the product and line of business. Note that this is no different from how exposures were defined in previous sections. For example, auto insurers typically measure exposures on a "per car, per year" basis. Therefore:

- A one-year auto policy on one car represents one unit of exposure.
- A three-year auto policy on two cars represents six units of exposure.

Similar to premiums, we can define exposures in three ways: written, earned, and unearned. In ratemaking, we will use earned exposures to match premiums and loss experience.

Then, the **extension of exposures** method involves recalculating the premiums of historical policies under the current rate level. In other words, we take the rating characteristics of every policy in the historical period and use those characteristics to recalculate the premium at the current rates.

The extension of exposures method is the most accurate current rate level method. However, companies often do not have all the necessary historical rating information to apply it.

Let's briefly discuss the general process for pricing an insurance product before we go into more details on how this method works. Before an insurance policy is written, the underlying risk is evaluated and classified with different rating variables. These rating variables can be based on many things, like a person's attributes (e.g. age, gender) or a dwelling's characteristics (e.g. value, geographic location).

Each rating variable has a **base cell**, which is typically the risk classification cell with the highest number of exposures. In other words, the base cell is typically the

most common attribute or characteristic. The rate (i.e. premium) for the base cell is known as the **base rate**.

Each rating variable also has a set of **rate differentials** with the base cell assigned a differential of 1.00. Differentials are called **relativities** if they are multiplicative.

Let's look at a quick example. Consider an insurance policy with two rating variables, gender and age, and a base rate of 100.

Gender	Rate Relativity		Age	Rate Relativity
Male	1.00		Under 25	0.90
Female	0.80		25 to 65	1.00
			Over 65	1.15

From the table above, the base cell for gender is male, and the base cell for age is 25 to 65.

- An insured who is male and age 25 to 65 will be charged the base rate, which is 100.
- An insured who is female and over 65 will be charged:

$$100 (0.80) (1.15) = 92$$

Now, consider the following rate change history for an insurance product with a simple rating algorithm:

Effective Date	Rate Per Exposure	Relativities					
		Class Factor			Territory Factor		
		X	Y	Z	A	B	C
Initial	300	1.00	1.20	0.90	1.00	1.10	0.80
4/1/2015	310	1.00	1.25	0.80	1.00	1.15	0.85
1/1/2016	340	1.00	1.25	0.75	1.00	1.20	0.80
7/1/2017	330	1.00	1.30	0.80	1.00	1.20	0.70

What was the premium charged for a policy written on 1/1/2015 with class factor Y and territory factor C?

Since the policy was written before any rate changes, the base rate was 300. The relativities were 1.20 and 0.80 because the policy had class factor Y and territory factor C, respectively. Thus, the premium charged was:

$$300 (1.20) (0.80) = \mathbf{288}$$

What would the on-level premium be for the same policy?

The *on-level premium* is the value of the premium after it has been brought to the current rate level. Use the most recent base rate and relativities to compute the answer. The on-level premium for this policy is:

$$330 (1.30) (0.70) = \mathbf{300.30}$$

If we repeat this calculation for all policies in the historical period and then aggregate them by calendar/policy year, we will get the on-level premiums we need for the ratemaking process.