

## BROWN—Chapter 3, Review

Briefly describe four essential objectives of ratemaking:

1. To cover expected losses and expenses equitably among insureds (i.e., without cross-subsidizing).
2. To produce rates that include an adequate provision for profit/contingencies.
3. To encourage loss control. This refers to designing the classification plan to provide discounts for loss-prevention behavior.
4. To satisfy rate regulators.

And three (not essential, but desirable) objectives:

1. To produce reasonably stable rates.
2. To produce rates reasonably responsive to changes. (Note: there needs to be a balance between items 2 and 1.)
3. To be as simple and easy to understand as possible.

Four input variables needed for any “contingent cash-flow model” (such as insurance ratemaking):

1. Claim frequency distribution based upon recent experience data ( $f$  = number of incurred claims / units of earned exposure).
2. Loss distribution modeling severity ( $s$  = dollars of incurred losses / number of incurred claims).
3. Rate of interest.
4. The times at which loss payments will be made.

Define loss cost.

Loss Cost =

Average Claim Frequency x Average Loss Severity,

which also equals:

Losses / Earned Exposures.

This is often called the pure premium (by P/C actuaries), or net premium (by life actuaries).

Define accident year.

Most common way to compile P/C actuarial data. Any action on claims arising from a loss event (accident) in calendar year Z will be accounted for as “accident year Z,” regardless of when the actual transaction took place.

Define policy year.

Any action on claims arising from a policy that became effective in calendar year Z will be accounted for as “policy year Z,” regardless of when the actual transaction took place.

Why would one policy year encompass losses from more than one (usually two) accident years?

Here is an example. Policy year 2001 would include all claims on all policies that had inception dates during 2001. The subject policies that are, say, 12 months long would include, at the extremes, one that began on 1/1/01 (and expired 12/31/01) and one that began on 12/31/01 (and expired 12/30/02). Therefore, claims could occur on these policies any time from 1/1/01 to 12/30/02.

Define calendar year.

In this chapter’s context, it refers to the year in which certain transactions occurred (regardless of when the related claim occurred or when the subject policy was written).

Calendar year Z incurred losses =

What are five criteria for a good exposure base?

Show a time line relationship between the experience period (from which the actuary gathers the ratemaking data to be used) and the expected effective period (for the new rates that the actuary is trying to predict):

If the actuary were trying to use more recent data in predicting rates for some future effective date, would he/she use accident year data or policy year data?

Why not use calendar year data?

Define written premium.

Define earned premium.

What is "loss development" intended to measure?

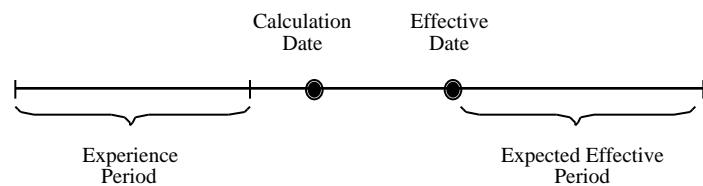
Why are trend factors needed?

How can one determine what trend factor to use?

Paid losses in calendar year Z + the change in reserves during calendar year Z

= Paid losses in CY Z + unpaid losses at the end of Z - unpaid losses at the beginning of Z (equivalent to the end of Z-1).

1. An accurate measure of the quantitative exposure.
2. Easy for the insurer to calculate.
3. Not be subject to manipulation.
4. Easy to record and administer.
5. Easily understood by the policyholder.



Accident year data.

Not related as well to exposures.

Counts the entire premium at the time when the policy started.

Counts the portions of written premium that have accrued during the period, to match up with exposures.

The adjustments needed to reflect the fact that all aspects of the numbers and sizes of claims are not known the instant the accidents occur (i.e., it takes time for losses to be reported to the company and to be settled and closed).

Review Tables 3.1 and 3.2 on page 58-59.

Because losses from a past experience period are being used to predict how much loss there will be at a future date. Trend factors are estimated and used in order to predict future cost levels.

Fit curves to data using linear least-squares regression.  
Fit curves to logs of data using linear least-squares regression.  
Many other methods, within the actuary's judgment.

How does one determine how far to extend the trend to reach the desired estimation point?

What subjective factors may alter an actuary's trend factor selection beyond what the curve fitting exercises indicate?

What are:

Loss adjustment expenses (LAE)?

Allocated loss adjustment expenses?

Unallocated loss adjustment expenses?

What other types of insurer expenses are there?

What is an expense ratio?

How is the permissible loss ratio calculated?

If you know the amount of loss cost that is predicted, how can you compute the needed gross rate?

What if the expenses can and should be divided into two parts: those that are considered "fixed" relative to premium (F) and those that are directly "variable" with premium (V x Gross Rate)?

Define "loading for profit and contingencies."

First, ask "what is the proposed effective date?"

Assume new rates will be in effect for a year.

New policies will therefore have an "average written date" of 6 months beyond the effective date.

If policies are annual, then the average accident date for the policies will be 6 months beyond this average written date.

This date is 12 months beyond the effective date.

Recent court decisions.

Recent law changes.

Changes in economic inflation.

Changes in other economic indicators that affect insurance.

Changes in product underwriting definitions.

Changes in benefit levels.

Expenses related to the adjustment and payment of losses.

Claim-related expenses that can be attributed to specific claims. These tend to behave in a similar way to losses.

Claim-related expenses that are more general, and are not usually associated with specific claims. A typical instance of this type of expense is the salary of a company claim department employee.

Commissions to selling agents.

Premium taxes, licenses, and other fees paid to states and municipalities.

General administrative expenses ("head office" expenses).

Allowance for "profit and contingencies."

Expenses other than ALAE / Gross Rate

1 - Expense Ratio

$$\frac{\text{Incurred Loss Cost (developed and trended)}}{\text{Permissible Loss Ratio}}$$

Then the needed gross rate should be:

$$\frac{\text{Incurred Loss Cost (developed and trended)} + F}{1 - V}$$

There is a variance associated with the estimated loss cost. There also is a variance associated with future losses. It is normal to include some margin for adverse deviation in the rates. Also, a specific profit amount is often explicitly built in.

What is a credibility factor used for?

It is a way the actuary can balance his/her judgment with regard to the stability/responsiveness of the experience data. If data are sparse, then they should not be given "full credibility."

List three "mathematical" properties for a credibility factor  $Z$ :

$0 < Z < 1$ . (If  $Z = 1$ , then the loss data are said to have full credibility.)

$\frac{dZ}{dE} > 0$ , where  $E$  is a measure of exposures. (Credibility increases with increased exposures.)

$\frac{d}{dE} \left( \frac{Z}{E} \right) < 0$ . (The percentage change in credibility should decrease as the number of exposures increases.)

Why would investment income be important in P/C ratemaking?

Because sometimes losses take many years to settle, but the insurer collects the premium "up-front". There may be substantial investment income gained in the time period between these two points.