BROWN—Chapter 3, Review (continued)

Define two methods for calculating the overall average rate change:

Loss Cost (or Pure Premium) Method

New Average Loss Cost =

$$\frac{\text{Exp. \$ of Loss in Effective Period (Developed and Trended)}}{\text{Number of Earned Exposure Units}}$$

$$\text{New Average Gross Rate} = \frac{\text{New Average Loss Cost}}{\text{Permissible Loss Ratio}}$$

Loss Ratio Method

$$\text{Indicated Rate Change} = \frac{\text{Expected Effective Loss Ratio}}{\text{Permissible Loss Ratio}}$$

where

Expected Effective Loss Ratio =

$$\frac{\text{Exp. \$ of Loss in Effective Period (Developed and Trended)}}{\text{\$ of Earned Premium at Current Rates}}$$

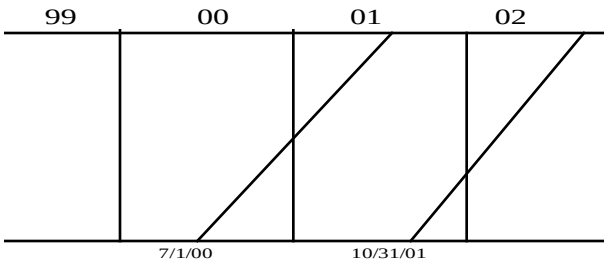
What are two ways of calculating

"Dollars of Earned Premiums at Current Rates?"

1. Take the history of past exposures and use the rate manual to rate each exposure as if it were sold at current rates. This is called "extending exposures."
2. Estimate the effect of rate changes on past premiums. This is called the "parallelogram method."

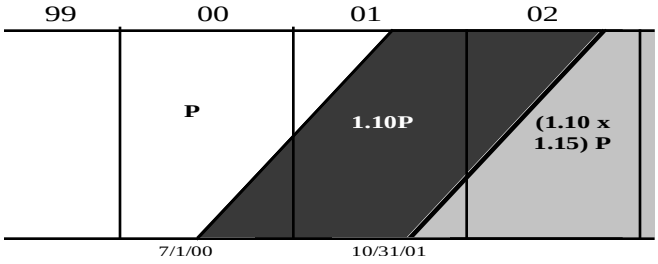
Draw a "parallelogram" picture representing:

- Annual Policies
- Earned Premium in years 2000, 2001, and 2002
- Rate changes as of 7/1/00 and 10/31/01



"Squares" represent years of earned premium.
"Diagonal lines" represent policy effective dates.

If the rate changes on 7/1/00 and 10/31/01 were 10% and 15%, respectively, what would the effect on premiums be, in the picture above?



How would an “on-level” factor for 2001 earned premiums be calculated?

The “on-level” factor is the factor needed to bring historical 2001 earned premiums up to the current rate level. Based upon the diagram, 2001 had earned premiums from three different rate levels: the white area needs to be increased by 1.10 x 1.15; the dark gray area needs to be increased by 1.15; and the light gray area is at current rate level and does not need to be increased. The on-level factor for 2001 can be calculated by taking a weighted average of these factors, where the weights are given by the proportions of the corresponding shaded areas in the 2001 square.

The white triangle area = (1/2 x 1/2)/2 = 1/8
The light gray triangle area = (1/6 x 1/6)/2 = 1/72
The remainder = 1 - 1/8 - 1/72 = 62/72

The on-level factor is therefore:

(1/8 x 1.10 x 1.15) + (62/72 x 1.15) + (1/72 x 1.0) = 1.163

On what key assumption does the parallelogram method rely?

Premium income is distributed uniformly over any calendar year.

Are the loss cost (pure premium) method and the loss ratio method of estimating rate changes algebraically equivalent?

See proof on Page 78.

Why might the indicated rate change calculated by either of these methods not be the final step in determining the overall rate change?

Usually need to apply a credibility factor; e.g.,

Credibility Weighted Indicated Rate Change =

(Z x Company Indication) + [(1-Z) x Industry Indication]

What are risk classifications (classes)?

These are subdivisions of the overall group of insureds. Subdivisions are made so that rates can be computed for smaller but more homogeneous groupings of insureds. E.g., automobile insureds are subdivided by territory, age, gender, type of car, etc.

What is the base class (or base cell)?

This is one classification, often the largest one, or the one with the greatest statistical credibility. Other classifications' rates are usually computed based upon a relationship with this classification.

What is a class relativity (differential)?

The ratio of the class rate to the base class rate.

What is the loss ratio method formula for an indicated class (i) relativity?

Indicated Relativity (i) = Current Relativity (i)

$$\times \frac{\text{Loss Ratio (i)}}{\text{Loss Ratio (base)}}$$

What is the loss cost method formula for an indicated class (i) relativity?

$$\text{Indicated Relativity (i)} = \frac{\text{Loss Cost (i)}}{\text{Loss Cost (base)}}$$

Describe a limitation to the accuracy of these methods.	There is a problem of "cross variables." Usually there are many dimensions of classifications—not just one. If relativities are computed one dimension at a time, there may be biases in the estimates if the distributions of the remaining "cross variables" are not homogeneous. (For a given class i, the "cross variables" are j, k, l, etc.)
Describe how credibility may be applied when calculating relativities.	Credibility Weighted Indicated Differential = (Z x Indicated Relativity) + [(1-Z) x Existing Relativity)
Why is an "off-balance" factor needed in calculating changes to overall rates and class relativities at the same time?	An "off-balance" can occur when the actuary calculates the overall rate change, changes the class relativities, but leaves the base class differential at 1.00 (as is desired).
What is the formula for an off-balance factor?	<u>Proposed Average Relativity</u> Current Average Relativity
What is the formula for a "balance-back" factor?	The reciprocal of the off-balance factor.
What do you do with the balance back factor?	New Base Rate = Current Base Rate x Overall Rate Change x Balance-Back Factor
What are the three basic steps in a rate-change process?	1. Determine overall rate change needed. 2. Determine change in class relativities needed. 3. Balance back to the overall rate change.
Example 3.7 gives an entire step-by-step calculation of overall rate change and territory relativity change using both the loss ratio and the loss cost methods. Also, Exercises 3.17 and 3.18 cover many of the concepts in this chapter.	