

RPM Workshop 3: Basic Ratemaking

Introduction to Ratemaking Relativities

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Introduction to Ratemaking Relativities

- What is the purpose of rate relativities?
- Considerations in determining rating distinctions
- Basic methods and examples

The Purpose of Rate Relativities

Example – Personal Auto:

Overall Indicated Change for State = +10% or

Overall Indicated Premium is \$110

Should everyone's rate be \$110 or increased by 10%?

Same for youthful drivers vs. adults?

Same for urban vs. suburban vs. rural?

Same for all policy limits or deductibles?

The Purpose of Rate Relativities

Example:

Base Rate = \$100 (Adult, Suburban, \$250 Deductible)

Insured	Age	Territory	Deductible	Premium
Adult Age 40 Suburban \$250 Ded	1.00	1.00	1.00	\$100
Senior Age 70 Rural No Ded	1.25	0.80	1.50	\$150
Youth Age 18 Urban \$500 Ded	2.00	1.50	0.85	\$255

Considerations in Selecting Rate Relativities

- Actuarial (Statistical)
- Operational
- Social
- Legal

Actuarial Considerations

- Accuracy
 - Rating variable closely related to cost differences
 - Provides the fairest price (fair discrimination)
 - Example: Middle Initial vs Driver Age
 - Reduces Adverse Selection

Adverse Selection

Adverse selection can result when a group can be accurately separated into 2 or more distinct groups, but has not been.

Consider the following scenario:

- Group A expected costs = \$100
- Group B expected costs = \$200
- Your company charges \$150 for both
- Competitor charges \$100 for A, and \$200 to B

Adverse Selection (cont.)

At the outset, your company is collecting enough to cover expected costs for both groups. Life is good.

All of your insureds in Group A learn about your competitor's lower rate and switch.

Your company is left with all of Group B at a \$150 rate.

You have been selected against!

Typically this process happens gradually

Actuarial Considerations (cont.)

- Homogeneity
 - Members of a class have similar expected cost
 - Variability within class always exists – grouping is necessary since individual lacks credibility
 - Example: For Workers' Compensation, group office & construction workers vs separate by nature of work performed

Actuarial Considerations (cont.)

- Credibility

- Class groups should be large enough to measure costs with sufficient accuracy
- There is a trade-off between the need to estimate costs accurately for an individual and the need for enough data to do it
- Example: group of 2 drivers vs entire zip code

Actuarial Considerations (cont.)

- Reliability
 - Estimated cost differences between groups should be relatively stable over time
 - This does not mean they will be the same over time
 - Example: relative differences between genders may change over time as societal roles change

Operational Considerations

- Objective
 - Must have an objective definition
 - Should be little ambiguity, class differences should be mutually exclusive & should minimize likelihood of administrative error
 - Example: “Maturity” vs Age & Marital Status

Operational Considerations (cont.)

- **Administrative expense**
 - Cost of obtaining & verifying information should not exceed the value of additional accuracy
 - Example: Where an insured drives vs where they live

- **Verifiability**
 - Example: amount of sleep a person has gotten in the previous 24 hours vs accident history

Social Considerations

- **Privacy**
 - Insureds may be reluctant to disclose some personal information
 - Example: psychological profile vs age
- **Causality**
 - Causal relationship to insurance costs
 - Example: Credit vs Mileage

Social Considerations (cont.)

- **Controllability**

- A variable that can be impacted by the insured
- Example: Age of Home vs Installing Sprinklers

- **Affordability**

- Greater segmentation necessarily creates higher rates for some classes
- Balance with availability, which can be reduced if rates are artificially capped
- Example: Florida coastal homeowners insurance

Legal Considerations

Choice of rating variable may be prohibited by law at many levels (e.g. Federal, State). Some examples:

- Race
- Gender (always in Health ins, sometimes in other lines – even auto)
- Income

Basic Methods for Determining Rate Relativities

- Loss ratio relativity method
 - Compare “actual” LR to expected LR to produce an indicated change in relativity
- Pure premium relativity method
 - Develop expected cost per unit of exposure to produce indicated relativity

The methods produce identical results when identical data and assumptions are used.

Data and Data Adjustments

- Policy Year or Accident Year data
- Premium Adjustments (LR method)
 - Current Rate Level
 - Premium Trend/Coverage Drift (not typical)
- Loss Adjustments
 - Loss Development (project to ultimate)
 - Loss Trend (project to same time period)
 - Coverage Adjustments (diff Ded's, Limits?)
 - Catastrophe Adjustments (“Shock Losses”)

Loss Ratio Relativity Method

Class	Premium @CRL	Trended & Developed Losses	Loss Ratio	Loss Ratio Adjustment	Current Relativity	Proposed Relativity
1	\$1,168,125	\$759,281	0.65	1.00	1.00	1.00
2	\$2,831,500	\$1,472,719	0.52	0.80	2.00	1.60

Pure Premium Relativity Method

Class	Exposures	Trended & Developed Losses	Pure Premium	Pure Premium Relativity
1	6,195	\$759,281	\$123	1.00
2	7,508	\$1,472,719	\$196	1.60

Incorporating Credibility

- Credibility: how much predictive weight do you assign to a given body of data?
- Credibility is usually designated by Z
- Credibility Weighted Loss Ratio:
$$LR = (Z) * LR_{\text{class}} + (1-Z) * LR_{\text{complement}}$$
- *Methodology covered in a later section*

Loss Ratio Method – Credibility Considered

Class	Loss Ratio	Credibility	Credibility Weighted Loss Ratio	Loss Ratio Adjustment	Current Relativity	Proposed Relativity
1	0.65	0.50	0.61	1.00	1.00	1.00
2	0.52	0.90	0.52	0.85	2.00	1.70
Total	0.56					

Off-Balance Adjustment

Class	Premium @CRL	Current Relativity	Premium @ Base Class Rates	Proposed Relativity	Proposed Premium
1	\$1,168,125	1.00	\$1,168,125	1.00	\$1,168,125
2	\$2,831,500	2.00	\$1,415,750	1.70	\$2,406,775
Total	\$3,999,625				\$3,574,900
Impact on Current Premium ("Off-Balance") →					-10.6%

If rate need is not -10.6%, need to adjust base rates for the off-balance.

Off-Balance Adjustment (cont.)

- Let's say your current base rate is \$100 & your overall rate need was +5.0%
- Final base rate = current base rate x (1 + rate need) / (1 + off-balance)
- $\$100 \times 1.05 / 0.894 = \117

Exercise: Loss Ratio Method

Class	Premium @CRL	Trended & Developed Losses	Credibility	Current Relativity
1	\$5,650,000	\$3,750,000	0.80	1.00
2	\$2,575,000	\$1,475,000	0.40	0.80
Total	\$8,225,000	\$5,225,000		

Exercise: Loss Ratio Method (cont.)

Class	Loss Ratio	Credibility	Credibility Weighted Loss Ratio	Loss Ratio Adjustment	Current Relativity	Proposed Relativity
1		0.80			1.00	
2		0.40			0.80	
Total						

Exercise: Loss Ratio Method (cont.)

Class	Loss Ratio	Credibility	Credibility Weighted Loss Ratio	Loss Ratio Adjustment	Current Relativity	Proposed Relativity
1	0.66	0.80	0.66	1.00	1.00	1.00
2	0.57	0.40	0.61	0.92	0.80	0.74
Total	0.64					

Exercise: Off-Balance Adjustment

Class	Premium @CRL	Current Relativity	Premium @ Base Class Rates	Proposed Relativity	Proposed Premium
1	\$5,650,000	1.00		1.00	
2	\$2,575,000	0.80		0.74	
Total	\$8,225,000				
Impact on Current Premium ("Off-Balance") →					

Exercise: Off-Balance Adjustment (cont.)

Class	Premium @CRL	Current Relativity	Premium @ Base Class Rates	Proposed Relativity	Proposed Premium
1	\$5,650,000	1.00	\$ 5,650,000	1.00	\$5,650,000
2	\$2,575,000	0.80	\$3,218,750	0.74	\$2,381,875
Total	\$8,225,000				\$8,031,875
Impact on Current Premium (“Off-Balance”) →					-2.3%

Exercise: Off-Balance Adjustment (cont.)

- Current base rate is \$200
- Overall rate need is -5.0%

Exercise: Off-Balance Adjustment (cont.)

- Current base rate is \$200
- Overall rate need is -5.0%
- Final base rate = current base rate x (1 + rate need) / (1 + off-balance)
- $\$200 \times 0.95 / 0.977 = \194

Expense Flattening

- Rating factors are applied to a base rate which often contains a provision for fixed expenses
 - Example: \$62 loss cost + \$25 VE + \$13 FE = \$100
- Multiplying by rating factor means fixed expense no longer “fixed”
 - Example: $(62+25+13) * 1.70 = \$170$
 - Should charge: $(62*1.70 + 13)/(1-.25) = \158
- “Flattening” relativities accounts for fixed expense
 - Flattened factor = $\frac{(1-.25-.13)*1.70 + .13}{1 - .25} = 1.58$