3.3 Summary   🕐 **20m**

Previous sections covered basic classification ratemaking techniques for equity among insureds. This section introduces additional methods to set equitable rates based on specific risk factors:

- **Territorial Ratemaking**: Actuaries define geographic boundaries and calculate rate relativities for each territory. With location often correlating with other factors and limited data, specialized techniques assess area risk, grouping estimates into territories with calculated relativities.

- **Increased Limit Factors**: Due to the rarity of large losses, these factors are challenging to price. Actuaries divide severity at each limit by the basic limit using empirical or fitted data, sometimes applying multivariate techniques.

- **Deductible Pricing**: Deductibles affect losses under a set threshold. Actuaries calculate loss elimination ratios to estimate the losses reduced by deductibles, sometimes using multivariate analysis to capture policyholder behavior.

- **Workers Compensation**: While risk size isn't a standard rating variable, larger risks show distinct loss patterns. Insurers adjust for this with expense modifications and loss constants.

- **Insurance to Value**: Properties should be insured to their full value to ensure fairness. Insurers address underinsurance through coinsurance clauses or rate modifications, along with efforts to confirm accurate property valuations.

Territorial Ratemaking

Challenges with territorial ratemaking:

1. High correlation of territory with other rating variables.
2. Limited data within each territory.

Steps of territorial ratemaking:

1. Establishing territorial boundaries

   a. Determine the basic geographic unit

   b. Estimate the geographic risk associated with each unit

2. Determining rate relativities for the territories

Types of basic spatial smoothing techniques:

Spatial Smoothing Techniques	Description	Advantages / Disadvantages	Applica
Distance-based	Combines data from a primary geographic unit with data from neighboring units, using weights determined by distance from the primary unit. Weight decreases as the distance from the primary unit increases.	**Advantages:** Easy to understand and implement. **Disadvantages:** Assumes distance has the same impact on urban and rural risks and fails to consider natural or artificial boundaries	Weathe
Adjacency-based	Combines data from a primary geographic unit with data from rings of adjacent units, with closer adjacent rings having more weights.	**Advantages:** Accounts for the differences between urban and rural risks and consider physical boundaries.	Perils d socio-d charact

Categories of clustering techniques include:

- Quantile methods: Clusters are created based on equal numbers of observations or weights.

- Similarity methods: Clusters are created based on the closeness of the estimators.

  - Average linkage similarity method: Joins clusters with lower variances.

  - Centroid similarity method: More responsive to outliers.

  - Ward's clustering method: Produces clusters with equal numbers of observations.

A contiguity constraint has to be added if contiguous boundaries are desired.

Increased Limits Ratemaking

Reasons for growing importance in increased limits ratemaking:

1. Growth in personal wealth leads individuals to seek higher insurance coverage.

2. Inflationary trends have a greater impact on increased limits losses than on basic limits losses.

3. Surge in lawsuits and larger jury awards impact increased limits losses disproportionately.

Issues with using standard ratemaking approaches for increased limits ratemaking:

1. Limited data causes volatile results

2. GLMs may produce counterintuitive results

Under the Standard ILF Approach, the formula for calculating the indicated increased limit factor (ILF) at limit H is:

$$\text{Indicated ILF}(H) = \frac{\text{LAS}(H)}{\text{LAS}(B)}$$

and the limited average severity is calculated as

$$\text{LAS}(x) = \frac{(\text{Total Losses of Claims} < x) + (\# \text{ of Claims} \geq x) \times x}{\text{Total} \, \# \, \text{of Claims}}$$

When working with censored losses, policies with a limit smaller than the limit being priced cannot be used. The limited average severity for increased limits is calculated in layers. For $x < y$,

$$\text{LAS}(y) = \text{LAS}(x) + \frac{\text{Losses in the Layer between } x \text{ and } y}{\# \text{ of Claims in Policies with Limits} > x}$$

Historical losses used in the calculation of the ILFs should be trended and developed to ultimate. Either empirical data or fitted data can be used in the calculation.

Deductible Pricing

Types of deductibles:

1. Flat dollar deductibles

2. Percentage deductibles

Reasons why deductibles are popular:

1. Deductibles reduce insurance premiums.

2. Deductibles minimize the occurrence of small nuisance claims.

3. Deductibles provide a financial incentive for the insured to prevent losses.

4. Deductibles reduce an insurer's exposure to catastrophic losses and lower the risk of insolvency.

Under the loss elimination ratio (LER) approach:

$$\text{Indicated Deductible Relativity} = \frac{(L + E_L)_D}{(L + E_L)_B} = 1 - \text{LER}(D)$$

and

$$\text{LER}(D) = \frac{(L + E_L)_B - (L + E_L)_D}{(L + E_L)_B}$$

Only policies with deductibles less than or equal to the deductible being priced can be used to determine loss elimination ratios. Either empirical data or fitted data can be used in the calculation.

Considerations when using the LER approach:

1. Loss data used should be trended and developed to ultimate.

2. LER ignores the difference in claiming behavior for different deductible levels.

3. LER fails to recognize the behavioral differences that arise when insureds are allowed to choose their policy deductible.

When the premium savings implied by the deductible relativity is greater than the deductible amount, the insurer can:

1. Implement a cap on the amount of dollar credit from the deductible.

2. Calculate a different set of credits for different policies.

3. Use percentage deductibles.

Workers Compensation Size of Risk

Approaches used to adjust for the inequity of rates from using the All Variable Expense Method:

1. Apply the variable expense provision to the first $\$X$ of standard premium only.

2. Charge an expense constant to all risks.

3. Apply a premium discount to policies with premium exceeding a specified amount.

Theories explaining why smaller workers compensation risks typically have worse loss experience compared to larger risks:

1. Small companies often have less advanced safety programs.

2. Small companies may lack programs designed to help injured employees return to work.

3. Small insureds may have less motivation to prevent or manage injuries compared to large insureds.

Insurers can add a loss constant to the premium of small insureds to equalize the final expected loss ratios across all insured sizes.

Insurance to Value (ITV)

Insurance to value: The relationship between the selected insurance level and the overall value or replacement cost of the insured item.

Issues when properties are not fully insured:

1. The insurance payout will not be adequate to fully cover a total or near-total loss.

2. If the insurer assumes all homes are insured to full value when determining premium, the underinsured risks would be undercharged, leading to inequitable rates.

The issues of inequity and inadequacy of rates only exist if partial losses are possible, which is a common case in real life. Insurers have taken the following actions to ensure insurance to full value:

1. Vary rates based on the ITV level.

2. Implement a coinsurance clause, which reduces the insurance payout proportionally by the level of underinsurance.

$$\text{Apportionment Ratio, } a = \min\left(\frac{F}{cV}, 1\right) = \begin{cases} \dfrac{F}{cV}, & F < cV \\ 1, & F \geq cV \end{cases}$$

$$\text{Indemnity Payment, } I = \min\left(aL, F\right) = \begin{cases} aL, & L < cV \\ F, & L \geq cV \end{cases}$$

$$\text{Coinsurance Penalty, } e = \min\left(L, F\right) - I = \begin{cases} (1-a)L, & L < F < cV \\ F - aL, & F \leq L < cV \\ 0, & \text{otherwise} \end{cases}$$

Other ITV initiatives:

1. Offer guaranteed replacement cost (GRC), usually with a cap.

2. Use more sophisticated tools to estimate replacement costs.

3. Implement property inspections, indexation clauses, and education of insureds.