Werner & Modlin 1: "Introduction"

in Basic Ratemaking, 2016, pp. 1–12

DEFINITIONS

Exposure	A basic unit used to quantify risk
Written Exposure	The exposures that arise during a period of time due to policies being issued
Earned Exposure	The portion of written exposures for which coverage has already been provided
Unearned Exposure	The portion of written exposures for which coverage has not yet been provided
In-force Exposure	The insured units at a particular point in time that are exposed to loss
Premium	The amount the insured pays for insurance coverage
Claim	The demand made by the insured to the insurer for indemnification for an event covered by the policy
Loss	The amount paid or payable to the insured under the insurance policy
Case Reserve	An estimate of the amount of money required to ultimately settle a claim
IBNR (or IBNYR)	Incurred But Not (Yet) Reported – the amount estimated to ultimately settle **unreported** claims
IBNER	Incurred But Not Enough Reported – the amount estimated to ultimately settle **reported** claims
LAE	Loss Adjustment Expense – expenses incurred during the claims settling process
ALAE	Allocated Loss Adjustment Expense – expenses incurred during the claims settling process that can be attributed to a specific claim
ULAE	Unallocated Loss Adjustment Expense – expenses incurred during the claims settling process that cannot be attributed to a specific claim (eg. office building expenses)
Uw Expenses	Underwriting Expenses – expenses incurred for acquisition and servicing of policies, including commisions and brokerage, other acquisition expenses, general expenses, and taxes, licences and fees

FORMULAS

Frequency	$\dfrac{\text{Number of Claims}}{\text{Number of Exposures}}$
Severity	$\dfrac{\text{Losses}}{\text{Number of Claims}}$
Pure Premium	$\dfrac{\text{Losses}}{\text{Number of exposures}} = \text{Frequency} \times \text{Severity}$
Average Premium	$\dfrac{\text{Total Premium}}{\text{Number of Exposures}}$

Loss Ratio	$\frac{\text{Losses}}{\text{Premium}} = \frac{\text{Pure Premium}}{\text{Average Premium}}$
LAE Ratio	$\frac{\text{Loss Adjustment Expenses}}{\text{Losses}}$
UW Expense Ratio	$\frac{\text{UW Expenses}}{\text{Premium}}$
Operating Expense Ratio	$\text{UW Expense Ratio} + \frac{\text{LAE}}{\text{Earned Premium}}$
Combined Ratio	$\text{Loss Ratio} + \frac{\text{LAE}}{\text{Earned Premium}} + \frac{\text{Underwriting Expenses}}{\text{Written Premium}}$
Retention Ratio	$\frac{\text{Number of Policies Renewed}}{\text{Number of Potential Renewals}}$
Hit Ratio (Close Ratio)	$\frac{\text{Number of Accepted Quotes}}{\text{Number of Quotes Written}}$

Werner & Modlin 3: "Ratemaking Data"

in Basic Ratemaking, 2016, pp. 36–48

DEFINITIONS

Policy Database	A database that contains the information about policies
Claims Database	A database that contains the information about claims
Policy identifier / number	A unique number assigned to the policy
Risk identifier	A unique identifier used to identify specific risks
Risk Characteristics	Descriptive of the policy and the risk
Calendar Year	It refers to when a transaction occurs or is incurred with no regard to the dates of the events
Accident Year	It only consider losses for accidents that occur during that time period
Policy/Underwriting Year	the calendar year (CY) during which the policy was sold
Report Year	The year in which the losses were reported
Statistical plans	The standardized formats used in the insurance industry to submit data to regulators
Competitor Filings / Manuals	The documents submitted by insurance companies to regulatory authorities

FORMULAS

Incurred Losses	Paid Losses + Case Reserves
Case Reserves	Ending Loss Reserve − Beginning Loss Reserve

Werner & Modlin 4: "Exposures"

in Basic Ratemaking, 2016, pp. 49–63

DEFINITIONS

Base rates	The rate for the base cell
Exposure units	The risk associated with a certain insurance type
Composite rating	A type of prospective rating plans where the underwriter adjusts future premiums based on exposures
Exposure Aggregation	The total exposures within a particular time frame
Policy Terms	The duration for which the policy is active
Exposure Blocks	The exposure of group of insurance policies where the policy information is consolidated and summarized at a monthly or quarterly frequency.

FORMULAS

Written Exposures (PY)	Earned Exposures + Unearned Exposures
Written Exposures (CY)	Earned Exposures + Ending Unearned Exposures – Beginning Unearned Exposures

Werner & Modlin 5: "Premium"

in Basic Ratemaking, 2016, pp. 64–89

DEFINITIONS

Calendar Year Aggregation	Considers all premium transactions that occur during a calendar year.
Accident Year Aggregation	Considers all premium transactions that occur during the year that an accident occured.
Blocks of Policies	an insurer's underwritten insurance policies that have the same terms and characteristics.
Extension of Exposures	Calculating the earned premium at current rates by recalculating previous years' premium using new rates
Parallelogram Method	Used for adjusting earned premium since premiums may change from year to year. It achieves this by assuming that earned premium at each rate level flows in uniformly throughout the year, as it would if the volume of business did not grow or shrink.
Exposure trend	The adjustments made to historical exposures so that they are at levels expected in the future
Premium Trend	The change in average premium level resulting from distributional changes
One-Step Trending	Premium trend is selected based on historical data using linear or exponential trend

FORMULAS

Unearned Premium	Unearned Premium = Written Premium − Earned Premium
CY Unearned Premium	CY Written Premium − CY Earned Premium + Unearned Premium at the Beginning of the CY
On-level Factor	$\frac{\text{Current Rate Level}}{\text{Rate Level of Historical Period}}$
Current Premium Trend Factor	$\frac{\text{Latest Average WP at Current Rate Level}}{\text{Historical Average EP at Current Rate Level}}$
Total Premium Trend Factor	Current Year Premium Trend Factor + Projected Trend Factor
Calendar Year Projected Earned Premium	CYEP at Current Rates × Current Trend Factor × Projected Trend Factor − expected to continue

Werner & Modlin 6: "Losses and LAE"

in Basic Ratemaking, 2016, pp. 90–124

DEFINITIONS

Large Losses / Shock Losses	High severity, low frequency event for individual policy
Catastrophe Losses	High severity, low frequency event for gourp of policies
Reinsurance	Insurance for insurance companies
Proportional Reinsurance	premiums and losses are shared proportionally between the primary insurer and the reinsurer
Non-proportional Reinsurance	A predefined portion of losses are reinsured for a portion of the premium
Chain-Ladder Method	A method of calculating future reserves purely based in past payments, ignoring the loss ratio
Link ratios	Age-to-Age development factors
Salvage	Recovery to the insurance company from disposal of damaged property
Subrogation	Recovery from another insurer whose insured was liable
Basic Limit Losses	losses right censored at a pre-defined limit
Excess Losses	left truncated loss amount above the basic limit
DCC	Costs the company incurs from defending claims
AAO	All other LAE not included in DCC

FORMULAS

Total Loss	Basic limit Loss + Excess Loss
Excess Trend	$\frac{(\text{Loss})(1+\text{Overall Trend})-\text{Limit}}{\text{Loss}-\text{Limit}}$

Werner & Modlin 7: "Other Expenses and Profit"

in Basic Ratemaking, 2016, pp. 125–140

DEFINITIONS

Underwriting Expense	Costs associated with acquiring and servicing insurance contracts
All-Variable Expense Method	A method for calculating expense provision where all expenses are treated as variable expenses
Premium Based Projection Method	A method for calculating expense provision that looks at fixed and variable expenses separately
Exposure/Policy-Based Projection Method	A method that treats variable expenses like the Premium-Based Method but allocates fixed expenses by number of policies rather than premium size, resulting in an average cost per policy.
Variable Expenses	Vary with premium over time, so as premium changes, the variable expenses do as well since they're a percentage of premium
Fixed Expenses	Constant dollar amount but the expectation is that they will increase due to inflationary forces
Permissible Loss Ratio	Loss ratio that will produce expected target profit given the expense assumptions

FORMULAS

Premium	Losses + LAE + Underwriting Expenses + Underwriting Profit $L + E_L + (E_F + V \times P) + (Q_T \times P)$ where UW Expenses $= (E_F + V \times P)$ $(L + E_L + E_F) \div (1 - V - Q_T)$
Total Profit	Investment Income + Underwriting Profit
UW Profit	Premium − Losses − LAE − UW Expenses
VPLR	1 − Variable Expense % − Target Profit % $1 - V - Q_T$
PLR	1 − Total Expense % − Target Profit % $1 - (F + V) - Q_T$

Werner & Modlin 8: "Overall Indication"

in Basic Ratemaking, 2016, pp. 141–149

FORMULAS

Indicated Average Rate	$\dfrac{\text{Pure Premium (Including LAE)} + \text{Fixed UW Expense per Exposure}}{1 - \text{Variable Expense Ratio} - \text{Target Profit Percentage}}$
Average indicated premium	$\overline{P}_I = \dfrac{\overline{L + E_L} + \overline{E}_F}{1 - V - Q_T}$
Indicated Change Factor	$\dfrac{\text{Loss \&LAE Ratio} + \text{Fixed Expense Ratio}}{1 - \text{Variable Expense Ratio} - \text{Target UW Profit \%}} = \dfrac{(L + E_L)/P_C + F}{1 - V - Q_T}$
Indicated Change	$\dfrac{(L + E_L)/P_C + F}{1 - V - Q_T} - 1$

Werner & Modlin 9: "Traditional Risk Classification"

in Basic Ratemaking, 2016, pp. 150–169

DEFINITIONS

Classification Ratemaking — A process of establishing insurance rates by categorizing similar risks together and applying the same rate to everyone in a particular group.

Adverse Selection — The likelihood of persons with high-risk profiles to buy insurance products due to information asymmetry

Favorable Selection — The selection of insureds based on data that reveals a tendency for use of the insurance product in that population group to be lower than expected or estimated

FORMULAS

Indicated rate differential for level I

$$R1_{I,i} = \frac{[\overline{L+E_L}]_i}{[\overline{L+E_L}]_B}$$

Indicated Differential Change

$$\frac{R1_{I,i}}{R1_{C,i}} = \frac{\text{Loss \&LAE Ratio for i}}{\text{Loss \&LAE Ratio for B}}$$

Werner & Modlin 10: "Multivariate Classification"

in Basic Ratemaking, 2016, pp. 170–187

DEFINITIONS

Bias Function — Compares observations against indicated values

Sequential Analysis — Indicated relativities calculated on the first variable and exposures are then adjusted before calculating the indicated relativity on the second variable…then repeating for all subsequent variables

Generalized Linear Models — Use a variety of distributions outside normal and allow for more complex relationships between the predictors and responses

Linear Model — A statistical method used to model the linear relationship between the response variable Y and a set of explanatory variables $X_1, X_2, \ldots, X_p$

Standard Errors — An indicator of the speed with which the log-likelihood falls from the maximum given a change in parameter

Deviance — Measure of how a fitted value varies from the observations

Model Validation Techniques — Assessing the performance and accuracy of a model by testing it on a separate data set, known as the test data

Data Mining Techniques — Extract relevant information from big data sets

Factor Analysis — The technique used to reduce the number of parameter estimates in classification analysis.

Cluster Analysis	The technique where observations are grouped into similar homogeneous groups or clusters
CART	Create decision trees that forecast the value of a response variable based on a set of predictor variables
MARS	Used to predict the values of continuous response variables using a collection of predictors
Neural Networks	Extracts linear combinations of inputs as derived features and models the response as a nonlinear function of the derived features

FORMULAS

Linear Model Equations

$$Y = \mu + \varepsilon$$

$$Y = (\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4) + \varepsilon$$

Werner & Modlin 11: "Special Classification"

in Basic Ratemaking, 2016, pp. 188–215

DEFINITIONS

Territorial Ratemaking	The method employed by insurers to calculate insurance rates by taking into account the geographical location of the policyholder
Geographic Residual Variation	Systematic variation not captured by the geographic variables
Geographic Signal	Composite risk index or score from various geographic predictors including that for geographic residual variation
Smoothing	A method used to remove noise from a dataset, while preserving significant patterns in the data.
Spatial Smoothing	Improve estimates using information from surrounding areas
Increased Limits Ratemaking	A method employed to determine charges for projected losses at higher levels of liability
Basic Limit	Lowest coverage level offered
Increased Limits	Higher levels of coverage offered
Single Limit	Defined amount of coverage per claim
Compound Limits	Two or more limits on a claim
Loss Elimination Ratio (LER)	Losses eliminated divided by the total losses
Insured To Value	risk is insured for the full value/replacement cost
Coinsurance Clause	A restriction to benefits for the insured in the primary dwelling coverage of a homeowners insurance policy

FORMULAS

Standard ILF Approach

$$\text{Indicated ILF(H)} = \frac{[\overline{L+E_L}]_H}{[\overline{L+E_L}]_B}$$

Simplified Approach

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

Limited Average Severity

$$LAS(H) = \int_0^H x f(x)\,dx + H\int_H^\infty f(x)\,dx$$

Increased Limit Factor

$$\text{ILF}(H) = \frac{\int_0^H x f(x)\,dx + H\int_H^\infty f(x)\,dx}{\int_0^B x f(x)\,dx + B\int_B^\infty f(x)\,dx}$$

Indicated Deductible Relativity

$$D = \frac{[\overline{L+E_L}]_D}{[\overline{L+E_L}]_B} = 1 - LER(D)$$

Loss Elimination Ratio Approach

$$LER(D) = \frac{\text{Losses and LAE Eliminated by Deductible}}{\text{Total Ground-up Losses and LAE}} = \frac{(L+E_L)_B - (L+E_L)_D}{(L+E_L)_B}$$

Empirical Distribution

$$LER(D) = 1 - \frac{\sum_{\text{All Losses}} Maximum[0, \text{Loss Amount} - D]}{\sum_{\text{All Losses}} \text{Loss Amount}}$$

Fitted Data Approach

$$LER(D) = \frac{\int_0^D x f(x)\,dx + D\int_D^\infty f(x)\,dx}{\int_0^\infty x f(x)\,dx}$$

Varying Rates Based on ITV Level

$$\text{Discrete Rate} = \frac{f\left[\sum_{L=1}^{F} Ls(L) + F\left(1 - \sum_{L=1}^{F} s(L)\right)\right]}{F}$$

$$\text{Continuous Rate} = \frac{f\left[\int_0^F Ls(L)\,dL + F\left(1 - \int_0^F s(L)\,dL\right)\right]}{F}$$

Werner & Modlin 12: "Credibility"

in Basic Ratemaking, 2016, pp. 216–238

DEFINITIONS

Law of Large Numbers — The number of observations increases, the difference between the observed relative frequency of an event and the true underlying probability tends to zero

Credibility — How much confidence or weight is given to actual data for its predictive value

Classical Credibility — Limit random fluctuations' effect to the risk estimate

Bühlmann Credibility — Minimize square of error between estimate and true expected value

Bayesian Analysis — It involves making an initial, or prior, estimate of a quantity, and then updating that estimate after new sample information becomes available

First Dollar Ratemaking	Ratemaking on products that cover losses from the first dollar of loss up to a specified limit
Excess Loss Ratemaking	Ratemaking on products that cover losses that exceed a high attachment point

FORMULAS

Classical Credibility	$\text{Estimate} = Z \times \text{Observed Estimate} + (1 - Z) \times \text{Related Experience}$
Square Root Rule	$Z = \sqrt{Y/E[Y]}$
Bühlmann Credibility	$\text{Estimate} = Z \times \text{Observed Experience} + (1 - Z) \times \text{Prior Mean}$ where $Z = \frac{N}{N+K}$
Larger Group Rate Complement	$\frac{(\text{Current Loss Cost of Subject Experience})(\text{Large Group Indicated Loss Cost})}{\text{Larger Group Current Average Loss Cost}}$
Harwayne's Method Complement	$\frac{\hat{L}_{1,B} \times X_{1,B} + \hat{L}_{1,C} \times X_{1,C}}{X_{1,B} + X_{1,C}}$
Pure Premium	$C = \text{Present Rate} \times \text{Loss Trend Factor} \times \frac{\text{Prior Indicated Loss Cost}}{\text{Loss Cost Implemented with Last Review}}$
Loss Ratio	$C = \frac{\text{Loss Trend Factor} \times \text{Prior Indicated Loss Cost}}{\text{Premium Trend Factor} \times \text{Loss Cost Implemented with Last Review}}$
Increased Limits Analysis	$L_A \times \left(\frac{ILF_{A+L} - ILF_A}{ILF_A}\right) = L_A \times \left(\frac{ILF_{A+L}}{ILF_A} - 1\right)$
Lower Limits Analysis	$L_d \times \left(\frac{ILF_{A+L} - ILF_A}{ILF_d}\right)$
Limits Analysis	$LR \times \sum_{d \geq A} P_d \times \frac{ILF_{min(d,A+L)} - ILF_A}{ILF_d}$
Fitted Curve	$\%\text{Losses in Layer (A, A + L)} = \frac{\int_A^{A+L} (x - A) f(x) dx + \int_{A+L}^{\infty} L f(x) dx}{\int_{-\infty}^{+\infty} x f(x) dx}$

Werner & Modlin 13: "Other Considerations"

in Basic Ratemaking, 2016, pp. 239–262

DEFINITIONS

Close Ratio	A measure of the rate at which quoted business purchase a new policy
Retention Ratio	A measure of which existing business renews their policy
Lifetime Value Analysis	Improves standard ratemaking by considering longer term profitability of an insured
Cumulative Persistency	Probability that the insured will continually renew their policy up to a certain point in time
Adjusted Profit	Profit adjusted to reflect cumulative persistency
Hard Market	Defined by high price levels and increased profitability
Soft Market	Defined by lower profitability

Werner & Modlin 14: "Implementation"

in Basic Ratemaking, 2016, pp. 263–288

DEFINITIONS

Variable Premium	Portion of total premium that varies by risk characteristic
Flat (Additive) Premium	Portion of total premium
Seed Base Rate	Proposed base rate's initial approximation
Minimum Premiums	Cover fixed expenses plus minimum expected loss
Premium Transition Rule	Rule limiting the maximum/minimum premium change an insured receives at renewal

FORMULAS

Proposed Additive Fee

$$A_P = \frac{\bar{E}_F}{1 - V - Q_T}$$

Proposed Base Rate

$$B_P = \frac{B_C \bar{P}_P}{\bar{P}_C} \text{ (no additive premiums)} \qquad \frac{(B_C)(\bar{P}_P - A_P)}{\bar{P}_C - A_C} \text{ (with additive premiums)}$$

Extension of Exposures

$$\text{Proposed Base Rate} = B_P = \frac{(B_S)(\bar{P}_P - A_P)}{\bar{P}_S - A_P}$$

$$\text{Proposed Base Rate} = B_P = \frac{B_S \bar{P}_P}{\bar{P}_S}$$

$$\text{Proposed Premium} = \bar{P}_P = (1 + \Delta\%)\bar{P}_C \text{ (Loss Ratio Method)}$$

Average Rate Differential

$$\text{Proposed Base Rate} = B_P = \frac{\bar{P}_P - A_P}{\bar{S}_P}$$

$$\%\text{Change in Base Rate} = \Delta_B\% = \frac{(1 + \Delta\%)\bar{P}_C - A_P}{\bar{P}_C - A_C} \times \frac{1}{1 + \Delta_s\%} - 1$$

$$\text{Overall change} = 1 + \Delta_S\% \approx \prod_w (1 + \Delta_{S,w}\%)$$

$$1 + \Delta_{S,R1}\% = \frac{\sum_w (R1_{P,i}/R1_{C,i})(P_{C,i} - A_C)}{\bar{P}_C - A_C}$$

$$\text{Average change for rating variable R1} = 1 + \Delta_{S,R1}\% \approx \frac{\bar{R1}_P}{\bar{R1}_C}$$

$$\text{Proposed average differential for R1} = \bar{R1}_P = \frac{\sum_i (R1_{P,i})(X_i)}{X}$$

$$\text{Current average differential for R1} = \bar{R1}_C = \frac{\sum_i (R1_{C,i})(X_i)}{X}$$

Approximated change for additive discounts D1 and D2

$$= 1 + \Delta_{S,(1-D1-D2)}\% \approx \frac{1 - \bar{D1}_P - \bar{D2}_P}{1 - \bar{D1}_C - \bar{D2}_C}$$

Minimum Premium Effect

$$\frac{\text{Premium With Minimum}}{\text{Premium Without Minimum}} - 1$$

Base Rate Adjustment

$$BRA = 1 + \frac{\text{Premium Shortfall}}{\text{Premium from Noncapped Levels}}$$

Differential Adjustment

$$DA = \left(1 + \frac{1 + \text{Cap Percentage}}{(\text{Off-Balance Factor})(1 + \text{Selected Overall Change})}\right) \times \left(\frac{1}{\text{BRA}}\right)$$

Werner & Modlin 15: "Commercial Lines Rating Mechanisms"

in Basic Ratemaking, 2016, pp. 289–311

DEFINITIONS

Expected Loss Rate	Expected loss costs reflected in the manual rates
Actual Experience Ratio	Measure of actual loss experience to expected loss experience
Expected Experience Ratio	Complement of the company's loss costs
Composite Rating	A type of prospective rating plans where the underwriter adjusts future premiums based on exposures
Risk Margin	Increased uncertainty of losses above a large deductible should demand a higher risk margin
Insurance Charge	Cost of limiting retro premium with a maximum
Insurance Savings	Savings of limiting retro premium with a minimum

FORMULAS

Experience Modification Factor (generic)	$M = \dfrac{Z_p A_p + (1-Z_p)E_p + Z_e A_e + (1-Z_e)E_e}{E}$
Experience Modification Factor (NCCI)	$M = \dfrac{A_p + wA_e + (1-w)E_e + B}{E+B}$
Retro Premium	[Basic Premium + Converted Losses] × Tax Multiplier
Trended Composite Exposure	Composite Exp. × Exp. Trend Factor
Adjusted Premium	$\dfrac{\text{Trended Ultimate Loss\&}ALAE}{\text{Expected Loss\&ALAE Ratio}}$
Composite Rate	$\dfrac{\text{Adjusted Premium}}{\text{Trended Composite Exposure}}$
Large Deductible Premium	$\dfrac{\text{Losses Above Deductible} + \text{ALAE} + \text{Fixed Expense} + \text{Credit Risk} + \text{Risk Margin}}{1 - \text{Variable Expense Provision–Profit Provision}}$
Retro Premium	[Basic Premium + Converted Losses] × Tax Multiplier
Basic Premium	[Expense Allowance $-$ $Expense$ $-$ LCF + Net Insurance Charge] × Standard Premium
Net Insurance Charge	[Insurance Charge − Insurance Savings] × ELR × LCF
Converted Losses	Reported Losses × LCF
Minimum Retro Prem.	Standard Premium × Minimum Retro Premium Ratio
Maximum Retro Prem.	Standard Premium × Maximum Retro Premium Ratio

Werner & Modlin 16: "Claims-Made Ratemaking"

in Basic Ratemaking, 2016, pp. 312–321

DEFINITIONS

Reporting Lag	Time between occurrence and notification to insurance company
Settlement Lag	Time between report data and loss settlement
Claims-made	when the claim is made
Occurrence	when the claim occurs
Step Factor	Factor recognizing the exposure growth for each successive claims-made policy during the transition

CAS Committee on Ratemaking Principles

Statement of Principles Regarding Property and Casualty Insurance Ratemaking, 1988

DEFINITIONS

Ratemaking	An actuarial process involving several considerations in establishing insurance rates
Principle 1	A rate is an estimate of the expected value of future costs
Principle 2	A rate should provide for all costs associated with the transfer of risk
Principle 3	A rate provides for the costs associated with an individual risk transfer
Principle 4	A rate is reasonable and not excessive, inadequate, or unfairly discriminatory if it is an actuarially sound estimate of the expected value of all future costs associated with an individual risk transfer

ASOP 12: "Risk Classification (for All Practice Areas)"

Revised Edition, December 2005 (updated in 2011)

DEFINITIONS

Advice	Profession opinion or recommendation of an actuary
Adverse Selection	Using know information to the financial disadvantage of a financial or personal security system
Credibility	Measure of a data body's predictive value
Risk	Financial or personal security systems cover these entities
Financial or Personal Security System	Private or governmental program intended to lessen the potential unfavorable impact of contingent events
Equitable (Fair) Rates	Rates where the differences in expected costs are reflected in the rate differentials

ASOP 13: "Trending Procedures in Property/Casualty Insurance Ratemaking"

Revised Edition, June 2009 (updated in 2011)

DEFINITIONS

Coverage	The terms of a contract that creates obligation contingent on certain events
Experience Period	Timeframe of data being used in analysis
Forecast Period	Time period to which data is being projected
Social Influences	Insurance cost impact on societal and noneconomic factors
Trending Period	Time from experience period to the forecast period
Trending Procedure	Process to evaluate the effect on loss costs, expenses, etc. due to changes over time

Friedland 1: "Overview"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 4–16

DEFINITIONS

Claims Reserves	Estimate of current unpaid liabilities for claims occurring prior to the financial reporting date
Captive Insurer	Limited purpose insurer whose main purpose it to insure/reinsure the business of the captive's owners
Self-Insurance	Financial arrangement where a company pays all (or most) of their own losses
Underwriting Pools and Associations	Created to provide coverage for specific exposures
Automobile Property Damage	Auto liability coverage covering damage to property of a third party from an auto incident
Collision	Auto physical damage coverage covering damage to the insured's vehicle from a collision with another vehicle or object
Crime Insurance	Protects against loss of money, securities, or inventory resulting from crime
General Liability	Wide array of insurance covering; premises liability, operations liability, operations liability, products liability, completed operations liability, and professional liability
Personal Automobile Insurance	Provides a variety of coverages in regard to the operation of a vehicle
Property Insurance	Protects against risk to property from several types of perils
Umbrella and Excess Insurance	Liability coverage provided above and beyond limits of primary insurance policies
US Workers Compensation	Provides benefits to claims arising from workplace injuries
Insurer	The entity bearing the risk for a P&C exposure
Reserves	Amounts set aside in financial statements for unpaid liabilities

Friedland 2: "Claims Process"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 17–25

DEFINITIONS

Tabular Estimate	Predetermined formula used to estimate the reserve based on characteristics of the injured party and insurance coverage (common in WC)
Dates associated with a claim	Policy Effective Date: Date of policy issuance Accident Date: Date of loss Report Date: When the insurer is notified of the claim Transaction Date: Date of payment or case outstanding transaction Closing Date: When the claim is closed Reopening Date: When the claim is reopened

FORMULAS

Incremental Reported Claims	Reported at the End of the Period − Reported at the Beginning of the Period
Reported Claims	Paid Claims During the Period + Case Outstanding at the End of the Period − Case Outstanding at the Beginning of the Period

Friedland 3: "Understanding the Types of Data Used in the Estimation of Unpaid Claims"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 27–43

DEFINITIONS

Wiser's 4-Phase Approach	i. Explore the data to identify key characteristics and any anomalies ii. Apply the appropriate techniques iii. Evaluate the different results of the various methods iv. Monitor the projections
Credibility	Predictive value given to a group of data
Deductibles	First party: Deductibles comes out before payment Third-party: Deductibles recovered from insured
Salvage	Amount the insurer can recover from the sale of damaged property
Subrogation	Recovery of the claim amount from a responsible third-party
Accident Year Data	Grouping claims according to occurrence date
Policy Year Data	Data grouped by when the policy was written directly matching premium and losses on policies
Underwriting Year Data	Grouping of data, commonly by reinsurers, based on when the reinsurance policy became effective
Report Year Data	Data grouped based on when the claim is reported to the insurer

FORMULAS

CY WP	All WP during the CY
CY EP	WP + Beginning Unearned Premium Reserve − Ending Unearned Premium Reserve

Friedland 4: "Meeting with Management"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 44–50

DEFINITIONS

Tort Reform	Legislation modifying liability rules aimed to reduce liability costs by limiting damages

Friedland 5: "The Development Triangle"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 51–62

DEFINITIONS

Development Triangle	Shows how the values of a cohort changes over time at various evaluation points
Development	The change in value for a cohort over time
Maturity	The age of the data being evaluated

Friedland 6: "The Development Triangle as a Diagnostic Tool"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 63–77

DEFINITIONS

Average Rate Level	Successive multiplication of rate changes up to the point in time being analyzed
Annual Exposure Change	Annual change in earned premium ÷ Rate change in the year

FORMULAS

Average Reported Value	$\dfrac{\text{Reported Claims}}{\text{Reported Claim Counts}}$
Average Paid Claim	$\dfrac{\text{Paid Claims}}{\text{Closed Claim Counts}}$
Average Case Outstanding	$\dfrac{\text{Reported Claims} - \text{Paid Claims}}{\text{Reported Claim Counts} - \text{Paid Claim Counts}}$

Friedland 7: "Development Technique"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 84–130

DEFINITIONS

Development Technique	i. Assumes future claims development is similar to past experience ii. Observed claims are an indicator of claims yet to be observed iii. Consistent claims processing iv. Stable business mix v. Stable policy limits vi. Stable reinsurance retention limits
Age-to-Age Factors	The change in claims from one evaluation point to the next
Medial average	Average excluding the highest and lowest value
Geometric average	The n^{th} root of the cumulative product of the n age-to-age factors

FORMULAS

Unpaid Claims Estimate	Estimated IBNR + Case Outstanding
Unpaid Claims Estimate	Projected Ultimate Claims − Actual Paid Claims
Projected Unpaid Claims	Projected Ultimate Claims − Cumulative Paid Claims
Unpaid Claim Estimate	Case Outstanding + IBNR(using AY data)
IBNR	Projected Ultimate Claims − Reported Claims
IBNR	Total Unpaid Claims − Case Outstanding
Cumulative % Reported	$\frac{1}{\text{Reported CDF}}$
Incremental % Reported	Difference of cumulative % reported at successive ages

Friedland 9: "Bornhuetter-Ferguson Technique"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 152–173

FORMULAS

Ultimate Claims	Actual Reported Claims + Expected Unreported Claims = Actual Reported Claims + Expected Claims × (% Unreported)
Ultimate Claims	Actual Paid Claims + Expected Unpaid Claims = Actual Paid Claims + Expected Claims × (% Unpaid)
% Reported	$= \frac{1}{\text{Reported CDF}} = 1 - \%$ Unreported
% Paid	$= \frac{1}{\text{Paid CDF}} = 1 - \%$ Unpaid
Projected Ultimate Claims	$= Z \times$ Dev. Technique $+ (1 - Z) \times$ Expected Claims Technique

Friedland 10: "Cape Cod Technique"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 174–193

DEFINITIONS

Cape Cod Technique	Splits ultimate claims into two parts: Actual reported (or paid) claims, Expected unreported (or unpaid) claims
Used-Up Premium	Earned Premium × % of Claims Reported
Total Unpaid Claim Estimate	Projected Ultimate Claims − Paid Claims

FORMULAS

Ultimate Claims	Actual Reported Claims + Expected Unreported Claims
Used-Up Premium	Earned Premium × % of Claims Reported
Estimated IBNR	Projected Ultimate Claims − Reported Claims
Total Unpaid Claim Estimate	Projected Ultimate Claims − Paid Claims

Friedland 11: "Frequency-Severity Techniques"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 194–264

DEFINITIONS

Types of F-S Techniques	i. Development technique applied separately to claim counts and average values ii. Development technique with exposures and inflation incorporated iii. Disposal rate analysis

FORMULAS

Projected Ultimate Claims	Estimated Ultimate Claims × Estimated Ultimate Avg. Value
Estimated IBNR	Projected Ultimate Claims − Reported Claims
Unpaid Claim Estimate	Case Outstanding + Estimated IBNR

Friedland 12: "Case Outstanding Development Technique"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 265–282

FORMULAS

CODF	$\frac{(\text{Reported CDF to Ultimate} - 1)(\text{Paid CDF to Ultimate})}{\text{Paid CDF to Ultimate} - \text{Reported CDF to Ultimate}} + 1$

Friedland 13: "Berquist-Sherman Technique"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 283–328

DEFINITIONS

Disposal Rate	Cumulative closed claim counts as a % of ultimate claim counts

Friedland 14: "Recoveries: Salvage and Subrogation and Reinsurance"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 329–344

DEFINITIONS

Estimated S&S Recoverable	Projected Ultimate S&S – Received S&S

Friedland 16: "Estimating Unpaid Allocated Claim Adjustment Expenses"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 369–385

DEFINITIONS

Unpaid ALAE	Projected Ultimate ALAE – Paid ALAE

Friedland 17: "Estimating Unpaid Unallocated Claim Adjustment Expenses"

in Estimating Unpaid Claims Using Basic Techniques, 2010, pp. 386–417

DEFINITIONS

Dollar-Based Techniques	Assumes ULAE tracks with timing and amount of claim amounts
Classical Technique	ULAE:Claim Amount relationship is stable and predictive of the future relationship
	Volume and cost of ULAE on open claims and IBNR claims will be proportional to their claim amounts
	Assumes that half of ULAE is incurred when claim is opened and one half when the claim is closed
Broad IBNR	Liability for claims not yet reported and development
Pure IBNR (Narrow IBNR)	Liability for claims incurred not yet reported only (IBNYR)
IBNER	Liability for development on known claims
Kittel's Refinement	ULAE is incurred when a claim is reported even if no payment is made
	ULAE for a CY is related to both claims reported and paid

	ULAE:Claim relationship derived from Paid ULAE:Average Paid and Incurred Claims
	ULAE on not-yet-reported and reported-but-not-yet-closed claims will be proportional to IBNR and case outstanding respectively
Conger and Nolibos Method	ULAE expenses are proportional to the claim dollars handled
	ULAE opening costs are proportional to ultimate claims reported cost
	ULAE maintenance costs are proportional to payments made
	ULAE closing claims are proportional to ultimate claims closed cost
	Appropriateness and sensitivity of the assumptions should be reviewed
Mango-Allen Refinement	ULAE:Claim relationship based on Paid ULAE:Expected claims
	ULAE on not-yet-reported and reported-but-not-yet-closed claims will be proportional to IBNR and case outstanding respectively
	50/50 assumption used in this method as well
Count-Based Techniques	Assumes same kind of transactions require the same ULAE regardless of claim size
Early Count Techniques	Breake ULAE into five transaction types: Claim opening, Claim maintenance, Single payments, Claim closings, Claim reopenings
Wendy Johnson Technique	ULAE estimate by transaction is derived by calculating weighted claim counts to total ULAE cost within that time period then applying to future weighted claim counts
Mango-Allen Claim Staffing Technique	Future CY ULAE = Future Claim Staff Count × ULAE per Staff Member
Rahardjo	The longer a claim is open, the more ULAE is required
Spalla	Using claims data information systems to track time spent on an individual claim by employee
Triangle-Based Techniques	
Allocation Based on Claim Payments	ULAE allocation based on pattern of claim payments
Slifka's Adjustment	Use time-and-motion study to estimate ULAE allocation between current and prior years

FORMULAS

CY Incurred Claims	CY Paid Claims + Change in Liabilities
Incurred Claims	Reported Claims + IBNR
Kittel's Refinement	
CY Paid ULAE	$\frac{1}{2}\times$ Payments on Prior Outstanding Reserves + 1 × Losses Opened and Paid during the year + $\frac{1}{2}\times$ Losses opened remaining open
CY Average of Paid and Incurred	Losses opened and paid + $\frac{1}{2}\times$ Payments on prior outstanding + $\frac{1}{2}\times$ Losses opened remaining open
Conger Nolibos	$M = (U_1 \times R \times W) + (U_2 \times P \times W) + (U_3 \times C \times W)$

	$W = \frac{M}{B}$ where $B = U_1 \times R + U_2 \times P + U_3 \times C$
	$Ultimate\ ULAE, U = W^* \times L$
Approach #1	$Unpaid\ ULAE = W^* \times L - M$
Approach #2	$Unpaid\ ULAE = W^* \times (L - B) = W^* \times \{U_1 \times [L - R(t)] + U_2 \times [L - P(t)] + U_3 \times [L - C(t)]\}$
Approach # 3	$Unpaid\ ULAE = M \times \left(\frac{L}{B} - 1.00\right)$
Claim count basis	$b = (v_1 \times r) + (v_2 \times o) + (v_3 \times c)$,
Unpaid ULAE	$\sum_i w_i^* \times [(v_1 \times r_i) + (v_2 \times o_i) + (v_3 \times c_i)]$
Simplification of Generalized Approach	$Estimated\ B = (U_1 \times A) + (U_2 \times P)$, where A = Ultimate claims for the AY $W = \frac{M}{(Estimated\ B)}$ Unpaid ULAE $= \sum_i w_i^* \times [(v_1 \times r_i) + (v_2 \times o_i) + (v_3 \times c_i)]$

ASOP 43: "Property/Casualty Unpaid Claims Estimates"

June 2007; Updated for Deviation Language Effective May 1, 2011

DEFINITIONS

Actuarial Central Estimate	The expected value over the reasonably possible range outcomes
Claim Adjustment Expense	Costs of administering, determining coverage for, settling, or defending a claim even if claim is proven to be invalid
Event	Incident triggering the potential for claim
Method	Procedure for estimating reserves
Model	Mathematical representation of a specified phenomenon
Model Risk	Risk that the methods aren't appropriate, or the models aren't representative of the risk
Parameter Risk	Risk that parameters used are not representative of future outcomes.
Principal	The actuary's employer
Process Risk	Risk that the projection of future contingencies that are inherently variable
Unpaid Claim Estimate	The actuary's estimate of future claims obligations
Accounting Date	Delineation date of paid versus unpaid
Valuation Date	Date through which transactions are included
Review Date	Date through which information is included in the process