

2.1 → Rating principles, considerations, & adjustments

2.1.0 → overview + 2.1.1 → Rating principles & considerations

→ Rating is the process of determining the premium so that the fundamental insurance equation is balanced

$$\text{Premium} = \text{Losses} + \text{LAE} + \text{var Expenses} + \text{var Profit}$$

→ Rating principles or rules charged by insurance companies should be developed by following these four principles:

→ Principle 1 → A rate is an estimate of the expected value of future loss

→ Principle 2 → A rate provides for all costs associated with the transfer of risk (ie balance at aggregate level)

→ Principle 3 → A rate provides for the costs associated with an individual risk transfer (ie balance at individual level)

→ Principle 4 → A rate is reasonable & 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

→ Rating by components → Tries to take into account when developing ratemaking methodologies

→ Exposure units, claim organization, & data, influences on data, adjustments to data, heterogeneity, credibility, classification plans, individual risk factors, actuarial statement

Statement of principles regarding P&C ratemaking

⇒ At rate changes which take an account of these principles

⇒ For some specific principles

→ Influences on data → There three to be considered

→ Policy provisions, risk, & business, operational changes, other influences

→ Evaluating & adjusting ratemaking data → Adjustments to make to data reflect anticipated future costs accurately

→ Risk losses, reinsurance, benefit & rate adjustments, development, trends, expenses, profit & insurance provision

2.1.2 → Shock losses

→ Overview: historical losses need several adjustments before they can be used for ratemaking, including:

- Replacing extraordinary events in the historical data w/ long term expectations
- Adjusting losses to ensure fair bounds, including changes required by law
- Declining insurance losses to their ultimate settlement value

→ Trending losses to reduce the benefit & cost levels occurring during the period the rates will be in effect

→ There isn't a specific order in which these adjustments need to be made, but each should still be considered without the prior adjustments are made. For instance, if the loss projection for reinsurance losses has already been treated w/ the prior methods will be affected, this projection should not be added to historical losses until these losses have also been treated to the same method.

→ Principles: benefit & expenses are shock losses

→ If no shock losses occur, rates will be underestimation of losses compared to the true ones when shock losses are included ⇒ Indicates risk

→ If shock losses do occur, rates will be overestimation of losses ⇒ Indicates risk

→ Adjustments for shock losses (steps)

→ 1) Options available → Including shock losses entirely

→ Excluding all losses equal to or more than amount of insurance written, typically referred to as the basic limit, or the limit associated w/ the base rate

→ Excluding losses at a distance loss threshold

→ If shock losses are removed entirely, the remaining losses are referred to as non-shock losses.

→ If shock losses are capped at a threshold, then only the portion of losses above that threshold, referred to as excess losses, will be removed. The remaining losses are known as non-excess losses.

→ 2) Indicate provision → First need to consider how cancellation goes through when determining the threshold

→ Option 1: treating losses as parallel

→ Option 2: indication variability on the ratemaking model

→ Determining shock loss provision

→ If a threshold is set for excluding or capping shock losses, a provision for shock losses can be calculated using the following steps:

- 1) Separate all losses into excess losses & non-excess losses
- 2) Sum the excess losses
- 3) Sum the non-excess losses
- 4) Calculate the ratio of excess losses to non-excess losses
- 5) Calculate the excess loss loading factor as 3 plus the ratio found above.

$$\begin{aligned} &\rightarrow \text{In general: } \text{Ratio} = \frac{\text{Excess Losses}}{\text{Non-Excess Losses}} \\ &\text{Factor} = 1 + \text{Ratio} \\ &\text{Years: } \text{Excess Losses} = \text{Non-Excess Losses} \times \text{Factor} \end{aligned}$$

→ Then this factor is multiplied to the historical non-excess losses to account for the long term average expected shock loss.

2.1.3 → Catastrophe data

→ Adjusting for catastrophes

→ To adjust for catastrophes when projecting future losses for reinsurance, actual catastrophe losses can be replaced by the average expected cat loss.

→ The method for determining the expected cat loss can vary by the type of insurance & the type of cat loss. Cat losses are typically broken down into the following two types:

- 1) non-modified cat losses
- 2) modified cat losses

→ Non-modified cat analysis is used for events that occur somewhat regularly over a period of many years, like heat storms.

→ In contrast, modified catastrophe analysis is used for events that occur very infrequently but that result in high severity claims, like hurricanes & earthquakes

→ Not events, but it shows need to use $\rightarrow \text{Total cat premium} = \text{unmodified cat P\&C Premium} + \text{modified cat P\&C Premium}$

→ Determining non-modified cat loss provision

→ Method 1: cat loss loading factor → one method for setting the non-modified cat loss provision is to follow the same process used for the shock loss provision.

- 1) Sum the cat losses
- 2) Sum the non-cat losses
- 3) Calculate the ratio of cat losses to non-cat losses
- 4) Calculate the cat loss loading factor as 3 plus the ratio found above.

→ Then, multiply non-cat losses used in the ratemaking analysis by the factor above to incorporate the long-term average expected non-modified cat loss.

→ Method 2: cat loss pure premium → A different method for incorporating non-modified cat losses is to develop a pure premium less ratio just for the non-modified cat exposure.

→ For instance, assume we used the same cat loss projection for a homeowner's book of business using the average AT&T for the total book of business during the calendar year, the formula for determining the pure premium is:

- 1) calculate the ratio of non-modified cat losses to AT&T for each year
- 2) average the non-modified cat losses per AT&T
- 3) divide the non-modified cat premium per AT&T by the average AT&T per exposure expected in the future to get the non-modified cat pure premium

→ Method 3: cat loss ratio → In general: $\frac{\text{Cat Loss}}{\text{AT\&T}} \times \frac{\text{AT\&T}}{\text{Exposure}} = \text{Cat PP}$

→ Method 4: cat loss ratio → $\frac{\text{Cat Loss}}{\text{Exposure}} \times \frac{\text{Exposure}}{\text{AT\&T}} = \text{Cat PP}$

→ Method 5: cat loss ratio → Appropriate to use a large loss loading factor when there has been a large loss, but...

→ Method 6: cat loss ratio → For each year relative to the historical avg excess loss (not pure)

→ Method 7: cat loss ratio → goal is to smooth losses out rather than losses over years bc they are seasonal

→ Treat losses BEFORE calculating shock loss factor

→ X5 loss factor → Rather than calculating total X5 (loss & total non-cat losses), do $\frac{\text{X5 Losses}}{\text{X5 Non-Cat Losses}}$

→ Method 8: cat loss ratio → first calculate X5 loss & total non-cat losses, & do $\frac{\text{X5 Losses}}{\text{X5 Non-Cat Losses}}$

→ Method 9: cat loss ratio → Another way to calculate X5 loss is to do $\frac{\text{X5 Losses}}{\text{X5 Non-Cat Losses}} \times \text{X5 Non-Cat Losses}$

→ Method 10: cat loss ratio → Another way to calculate X5 loss is to do $\frac{\text{X5 Losses}}{\text{X5 Non-Cat Losses}} \times \text{X5 Non-Cat Losses}$

→ Method 11: cat loss ratio → Another way to calculate X5 loss is to do $\frac{\text{X5 Losses}}{\text{X5 Non-Cat Losses}} \times \text{X5 Non-Cat Losses}$

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→ Method 47: cat loss ratio → Another way to calculate X5 loss is to do $\frac{\text{X5 Losses}}{\text{X5 Non-Cat Losses$