

2.2.1 → Examining effects of rate & benefit changes

→ insurance companies can make changes that an insurer may implement or cancel on a specific date in the future during or under the historical period, that can impact the historical premium & losses used in ratemaking. We will start from scratch by examining the types of changes that may be made & their impacts on premiums & losses. So for the remaining subsections, we will focus on adjustments that can be made to historical data during ratemaking to incorporate these changes.

→ Types of changes → The types of changes we will cover are: 1) rate changes & 2) benefit/coverage changes

→ Rate changes → Adjustments to the insurer's rating plan can shift the distribution of premiums & losses across the rating book or business.

→ Rate changes implemented by the insurer will impact all policies that start on or after the effective date of the rate change. So any policies that are currently in-force won't be affected by the rate change. If any in-force policies are renewed after the effective date, their premiums would then be determined using the new rates.

→ Law changes or court rulings can also require insurers to implement rate changes. The changes may affect all policies that start on or after a certain date, or they may affect all policies (new and/or renewed) starting on a certain date.

→ Benefit/coverage changes

→ This includes changes to the benefits or coverage provided on an insurance policy. These changes can directly affect the frequency & severity of claims, thus impacting the premiums & losses.

in the insurer may choose to implement benefit or coverage changes, such as expanding or contracting coverage w/ respect to the types of losses covered or increasing or decreasing the amount of current offered benefit or coverage changes implemented by the insurer typically occur all changes resulting from policies written on or after the effective date.

→ Law changes or court rulings can also require insurers to change benefits of coverage, such as workers' compensation statutory benefit levels or the caps on possible damages for auto liability coverage. These changes may affect all claims (new and/or renewed) written on or after a certain date, or they may affect all claims that occur after a certain date.

→ Recall that when using past data for ratemaking, it is important to adjust the data so that it's expected to be fair when rates will be in effect. If historical data is used, then rates will decrease (or decrease) over the experience period, the projected premiums will be underestimated (or overestimated). Likewise, if historical data are not adjusted for increases (or decreases) in benefits/coverage, the projected losses will be underestimated (or overestimated).

→ For instance, assume that all insurance providers during the historical period were written at a rate of \$100. After the historical period, a rate increase of 10% went into effect, which means the current rate is projected to be \$110.

→ Now, assume the indicated rate for some future rating period is \$100. The base rate increase that went into effect after the historical period is not considered, so the historical rate of \$100 will be compared to the indicated rate of \$110, then will help to current rates should increase by 10%. However, this would cause rates to actually increase by relatively 20%, which is higher than what was indicated.

→ By first adjusting the historical premium to the current rate level of \$110, the actual rate increase would for an indicated rate of \$110 can be calculated:

$$\frac{110}{100} = 1 + 0.10\%$$

→ It is important to perform manual analysis to determine the effects of rate & benefit changes. However, industry tables may also be used when available. For instance, the National Council on Compensation Insurance (NCCI) publishes estimated industry factors at the state level on benefit levels for workers' compensation.

→ Effects of changes

→ Changes to rates or benefits can increase premiums or losses in two primary ways: direct effects & indirect effects.

→ Direct effects are those & short-term impacts on premium or losses resulting from changes in rates or benefits. Examples include:

→ Increasing the rate charged on a policy, which directly raises the premium collected.

→ Increasing a policy limit, which pays less premiums at a lower maximum value.

→ Expanding the maximum benefits or increasing the maximum benefit for certain compensation, leading to higher potential losses.

→ Providing coverage for certain injuries or diseases, reducing losses by eliminating exposure for those excluded conditions.

→ Indirect effects arise from changes in claimant behavior influenced by rates or benefit adjustments. These effects are less straightforward & quantity often require mathematical judgment. Examples include:

→ Reducing premium property coverage on a homeowner's insurance policy, which very few people insured to purchase a personal vehicles. Result: less additional protection if losses from the homeowner's policy become secondary to the ADP, homeowner policy losses may decrease.

→ Reducing the workers' compensation wage replacement rate, which may lead to more claims being filed or delayed returns to work.

→ To be able to estimate losses for ratemaking, it is important to understand the rate & benefit changes & their direct effects (& possibly, indirect effects) on premium or losses.

→ Direct effects on premium

→ The direct effects of rate changes on premium can be calculated by comparing the historical premiums for all in-force policies to the premiums that would be charged using the current rates.

→ Here is a simple example:

Assume that all policies have annual terms, and premium is calculated according to the following formula:

$$\text{Premium} = \text{Exposure} \times \text{Rate per Exposure} \times \text{Discount Factor} + \text{Policy Fee}$$

On May 1, 2023, two policies became effective. Policy A consists of six exposures and qualifies for a low-risk discount, while Policy B consists of four exposures.

At the time the policies became effective, the rate per exposure was \$100, the policy fee was \$20, and the premium policies were given a 15% discount.

Starting January 1, 2024, the base rate and policy fee will be adjusted to achieve an overall rate increase of 5%. Additionally, the discount for low-risk policies will be reduced to 10%.

Calculate the direct effect of these rate changes on the ten policies.

→ At the time of writing, the total premium was:

Policy	Exposure	Written Premium	Policy Fee	Discount Factor	Final Premium
A	6	\$600	\$20	0.85	\$530
B	4	\$400	\$20	0.85	\$340

→ After the rate changes:

Policy	Exposure	Written Premium	Policy Fee	Discount Factor	Final Premium
A	6	\$600	\$20	0.90	\$588
B	4	\$400	\$20	0.90	\$340

Total: \$928

→ Direct effect = $\frac{\text{New Premium} - \text{Old Premium}}{\text{Old Premium}} = \frac{928 - 840}{840} = 0.10\%$

→ This is just showing Change/Original_X100!!!

→ Direct effect on losses

→ This section outlines 3 common methods for estimating the direct impact of benefit or coverage changes on losses.

These methods vary in their complexity, data requirements, & practical feasibility.

→ 1) Restimating individual claims (a least squares)

The most accurate method for estimating the impact of benefit or coverage changes is to isolate each claim individually, then adjust the historical claims data to reflect the new benefit levels, while proportionately reducing the predicted adjustments, thus making the historical data more relevant to the new benefit levels. The outcome is greater historical data making it ideal in theory but often impractical in real-world applications due to time & resource constraints.

→ 2) Simulating losses under new conditions

This simulation models or projects the expected losses under the new benefit conditions. This approach uses past claims data as a baseline, adjusting the claims outcomes under the updated benefits, although it doesn't require claim-by-claim data, this method often depends on a robust understanding of claim dynamics & the realization of appropriate actuarial assumptions.

→ 3) Using aggregate loss distributions

This method estimates the impact by adjusting based on the distribution of losses within specific segments (eg injury type, loss severity, age, gender, etc.) & applying changes to equal across different segments to determine the overall effect.

Loss generation adjustments rely on the standardized outputs of historical losses & the anticipated effects of new changes, while less informative than item 2, it's more conservative. Some estimation error is inevitable, but it's generally more improved equality by the change.

→ In-Shop Research → In practice, the claim data usually depends on:

→ Data availability: Detailed claim data supports the restatement method, while summary data may be sufficient for less distributions.

→ Resource constraints: Isolating individual claims is labor intensive, whereas using loss distribution makes a quicker, albeit less precise solution.

→ Precision needs: When high accuracy is essential, such as in regulatory or high-exposure scenarios, methods methods may prove less precise estimation capabilities (restatement or simulation) may be required.

→ The ability to quantify the effect of a benefit change on losses often depends on whether the benefits are increasing or decreasing.

Consider the following example:

You are given the following loss information for insurance policies with a limit of \$5,000.

Claim #	Losses Capped at \$5,000
1	2,120
2	1,850
3	4,300
4	5,000
5	3,810
6	5,000
7	4,600
8	4,125

Calculate the direct effect on the losses if the limit is decreased to \$4,000.

Claim #	Losses Capped at \$5,000	Losses Capped at \$4,000
1	2,120	2,120
2	1,850	1,850
3	4,300	4,000
4	5,000	4,000
5	3,810	3,810
6	5,000	4,000
7	4,600	4,000
8	4,125	4,000

Recalculate the losses with a limit of \$4,000.

Claim #	Losses Capped at \$5,000	Losses Capped at \$4,000
1	2,120	2,120
2	1,850	1,850
3	4,300	4,000
4	5,000	4,000
5	3,810	3,810
6	5,000	4,000
7	4,600	4,000
8	4,125	4,000

The direct effect of the coverage change is:

$$\frac{27,750 - 26,750}{26,750} = 1 = -0.038\%$$

→ Note that if the limit had been increased to \$6,000 instead, we would have been unable to calculate the direct effect w/ the information given.

This is b/c we would not know the actual loss amount for those losses that were previously capped at \$5,000. In general, it's easier to determine the effects of coverage decreases, rather than coverage increases. In cases where the coverage increases claim severity may need to be evaluated in order to determine gross losses.

→ Direct effect on losses

→ This section details 3 common methods for estimating the direct impact of benefit or coverage changes on losses.

These methods vary in their complexity, data requirements, & practical feasibility.

→ 1) Restimating individual claims (a least squares)

The most accurate method for estimating the impact of benefit or coverage changes is to isolate each claim individually, then adjust the historical claims data to reflect the new benefit levels, while proportionately reducing the predicted adjustments, thus making the historical data more relevant to the new benefit levels. The outcome is greater historical data making it ideal in theory but often impractical in real-world applications due to time & resource constraints.

→ 2) Simulating losses under new conditions

This simulation models or projects the expected losses under the new benefit conditions. This approach uses past claims data as a baseline, adjusting the claims outcomes under the updated benefits, although it doesn't require claim-by-claim data, this method often depends on a robust understanding of claim dynamics & the realization of appropriate actuarial assumptions.

→ 3) Using aggregate loss distributions

This method estimates the impact by adjusting based on the distribution of losses within specific segments (eg injury type, loss severity, age, gender, etc.) & applying changes to equal across different segments to determine the overall effect.

Loss generation adjustments rely on the standardized outputs of historical losses & the anticipated effects of new changes, while less informative than item 2, it's more conservative. Some estimation error is inevitable, but it's generally more improved equality by the change.

→ In-Shop Research → In practice, the claim data usually depends on:

→ Data availability: Detailed claim data supports the restatement method, while summary data may be sufficient for less distributions.

→ Resource constraints: Isolating individual claims is labor intensive, whereas using loss distribution makes a quicker, albeit less precise solution.

→ Precision needs: When high accuracy is essential, such as in regulatory or high-exposure scenarios, methods methods may prove less precise estimation capabilities (restatement or simulation) may be required.

→ The ability to quantify the effect of a benefit change on losses often depends on whether the benefits are increasing or decreasing.

Consider the following example:

You are given the following loss information for insurance policies with a limit of \$5,000.

Claim #	Losses Capped at \$5,000
1	2,120
2	1,850
3	4,300
4	5,000
5	3,810
6	5,000
7	4,600
8	4,125