

Basic formulas:

Loss Ratio = Losses / Premium

Expense Ratio = Expenses / Premium

Combined Ratio = (Losses + Expenses) / Premium = Loss Ratio + Expense Ratio

Underwriting Profit = 100% – Combined Ratio

Example:

Loss Ratio = 70% (ratios may be expressed as a % or a decimal; either is correct)

Expense Ratio = 25%

Combined Ratio = 95% I.e. 95% of premium is used to pay losses & expenses.

Underwriting Profit = 5% I.e. After paying losses & expenses, the company has 5% of premium left over for profit.

Other important terms:

- **Exposures** are the basic unit of risk underlying insurance premium (i.e., the number of risks being insured).
 - For Auto insurance, the exposure base is # of autos.
 - For Homeowners insurance, the exposure base is # of homes.

- Many insurance policies are priced using **classification (class) plans or rating plans**.

The class plan begins with a **Base Rate** which is similar to an overall average rate for all risks. Then Class Relativities are applied to the Base Rate to modify the rate for individual risk characteristics. E.g., youthful drivers have a class relativity greater than 1.00 to increase the premium above the base rate. Mature drivers have a relativity less than 1.00 to decrease the premium below the base rate.

Premium = Base Rate x Class Relativity x # Exposures

- **Trend** is the upward or downward pattern exhibited by data over time. E.g., inflation generally causes losses to increase over time.
- **% change (multiplicative) vs. points of change (additive)**
 - E.g., given a factor of 0.50, a 10% increase would result in a new factor of 0.55.
 - E.g., given a factor of 0.50, a 10 point increase would result in a new factor of 0.60.

Please note this is a fictional scenario with a fictional insurance company and fictional data.

Oceanside Insurance Company (Oceanside) is domiciled in the state of California. Management’s goal for Oceanside is to maximize both profit and growth. The growth objective is important to Oceanside in order to ensure long-term success.

You work in the actuarial pricing department at Oceanside. You have the following current annual data for Oceanside’s automobile insurance in California.

2016 Auto Data

Exposure = 2,000 autos

Premium = \$2,000,000

Average premium = \$1,000 per auto (= \$2,000,000/2000 autos)

Loss Ratio = 72.5%

Expense Ratio = 25.0%

Combined Ratio = 97.5% (= Loss Ratio + Expense Ratio)

Underwriting Profit % = 2.5% (= 100% - Combined Ratio)

Oceanside Insurance Company currently uses the following class plan relativities based on vehicle type. (Please note, in reality, there would be many more classes in a typical rating plan. This is an illustrative simplified example for purposes of this case study).

Vehicle Type

	Class Relativity	Exposure Distribution
Sedan	0.97	76%
Truck	1.02	4%
SUV	1.11	20%
Total	1.00	100%

Oceanside management has noticed that competitors have started to use a new class of vehicles that have exceptional safety devices integrated into their automated systems (e.g., forward collision warning with autonomous braking, adaptive headlights, lane departure warnings, and more). The new vehicle class is intended to incentivize and recognize car owners who drive these cars by giving them lower rates. This new class of cars is called “safety sedans.”

Oceanside has asked you to evaluate the estimated change in profitability over the next 3 years (2017-2019) if Oceanside was to recognize a new vehicle class for “safety sedans” with a lower class relativity. Management is concerned that if they do not pursue this change, they could lose premium as customers move to other insurance companies that offer lower premium for these vehicles. On the other hand, they are also concerned with collecting lower premium which means that profit could be lower if they do make the change.

You eagerly accept the assignment to evaluate this proposal.

You begin by meeting with other actuaries in the company to discuss available data and assumptions for the analysis. You and the other actuaries agree to the following assumptions:

A. Base Scenario: Do not change current class plan

Based on the feedback from management that Oceanside will lose customers if no change is made, you and your colleagues estimate that the annual changes in exposure over the next 3 years will be as shown below if no change is made. This exposure decrease recognizes that you may lose more and more customers if other competitors do make a change and Oceanside does not.

Annual (year-over-year) Exposure Change

2017	-2.0%
2018	-2.0%
2019	-2.0%

Aside from the exposure change, you assume the book of business will be stable for the next 3 years.

i.e.,

- no change to base rate
- no change in class relativities
- no change in exposure distribution by vehicle type
- no change in losses per exposure (Losses/Exposures) or expenses per exposure (Expenses/Exposure).

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B. Proposed Scenario: Add a new vehicle class type for “safety sedans”

Based on feedback from management and research you have conducted, you and your actuarial colleagues believe the downward exposure trend will reverse and exposures will begin to grow slowly if you make this class change. You estimate the following exposure changes would take place if a new class type was added.

Annual Exposure Change

2017	+1.0%
2018	+0.5%
2019	+0.5%

You don’t have any loss experience to show exactly what the new class relativity should be for “safety sedans”, but based on past experience with other safety improvements, you believe the new relativity should be approximately 3-4 points lower than the current “sedan” class relativity. However, the marketing department has told you that the other companies are offering a 5 point discount and if you don’t offer a 5 point discount, then it’s not worth doing. Given the uncertainty, you agree to test a 5 point discount off the current “sedan” relativity and carefully document the assumption for management.

You also need to estimate how many exposures will be affected by this change. Based on auto sales market data, you are able to estimate that approximately 5% of your total auto exposures will get reclassified from the “sedan” class to the new “safety sedan” class. Once this shift is made in 2017, you assume the new distribution is stable for 2018-2019.

To maintain a small margin of conservatism in your scenario, you assume that losses per exposure (Losses/Exposures) and expenses per exposure (Expenses/Exposure) do not change over the forecast period. This is a conservative assumption because you believe losses may decrease 3%-4% due to these safety devices, but you don’t have any data to prove this yet.

Lastly, you assume no change in Base Rate over the forecast period. This is because you are trying to test the sensitivity of other assumption changes and you don’t know what the base rate changes might be. Also, base rate changes should affect both scenarios similarly.

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An Excel workbook has been provided for your analysis. The first sheet named “Base” is for your base scenario. The second sheet named “Safety Sedan” is for the proposed scenario. Please ask Janet if you need help with your excel workbook

For both scenarios, please remember to document important assumptions or concerns as you go along. You will want to explain your assumptions and concerns to management when you present.

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Please analyze the following results as part of your group exercise:

- a. Compare the ending Combined Ratios between the two scenarios. Is the Combined Ratio in each scenario trending up, down, or remaining stable?
- b. Compare the 3-year Profit \$ between the two scenarios. Are the Profit \$ in each scenario trending up, down, or remaining stable.
- c. Compare the Profit % between the two scenarios. Is the Profit % in each scenario trending up, down, or remaining stable?
- d. Is total premium volume in each scenario trending up or down?

Optional: If you have extra time before other teams have finished, please test the sensitivity of your assumptions by varying your input to see how it changes the output.

- e. How sensitive are your results to the estimates you made for exposure growth in the forecast period?

After your analysis, present the following to Oceanside management (i.e. all workshop participants)

- 1. Which scenario would you recommend to your management and why?**
- 2. Explain any important assumptions or concerns underlying your analysis.**
- 3. Anything else you'd like to discuss with Oceanside management?**