

3.1 → RAR Classification

3.1.1 → Importance of reinsurance rates

- Goal is to separate in order to charge the true rates to each group in the portfolio, thus making a fair selection.
- Reinsurance reduces what you charge the same rate instead of separating.
- In a reinsurance, underwriting certain groups & over time, your actuaries make more efficient pricing.
- Unreliable
 - Units rates
 - i) segment in a more refined manner,
 - ii) better distribution, etc.
 - iii) operates in return-to-risk reward only
 - Reliable
 - i) segment in a more refined manner,
 - ii) better distribution, etc.
 - iii) operates in return-to-risk reward only
 - Reputable ...- Opposite we have a feasible solution.
- "Knowing the cover" is using risk characteristics + stability, return, & select the lower-risk rewards.

3.1.2 → Criteria for evaluating rating variables

→ The first step in classification methodology is to identify the rating variables that will be used to classify risks. The criteria for evaluating the importance of rating variables can be grouped into four categories:

→ **i) Statistical criterion**

- a) Consistency → different levels of the rating variable should have different expected units that are statistically different to reflect our view.
- b) Homogeneity → the rates with the same level should have similar expected units.
- c) Credibility → Each level should be large enough to allow reliable estimates of costs.

→ **b) Inferiority in terms of how able to make the same**

- reason to not include a variable are just the negative or opposite of these

→ **c) Operational criterion**

- i) Objective → clear & measurable
- ii) Insurable → insurable to obtain shareholder's insurance premium benefit
- iii) Verifiable → not easily manipulated & easily verifiable

→ **d) Factor criterion**

- a) Reliability → insurer should be insurable for all risks from high-risk to low-risk to increase credibility of the classification.
- b) Credibility → ability to make a prediction about the future based on historical data (e.g. to know whether we have a security system or not).

→ **e) Policy factors** → not related to rating we assumed

→ **f) Legal criteria** as follows applicable laws

→ Classification methods → groups riskier & similar characteristics / less propensity \rightarrow Both use historical data to risk characteristics to determine a rate

→ Individual risk rating → tailored to the individual insured

→ Standard rates set by the state are neither ratings plan

→ Working of question → **EVALUATED RATES DECLARED + RECOMMEND (yes/no)**

3.1.3 → Univariate classification

→ Goal → determine relativities for each level of a rating variable \Rightarrow (i) determines rate differentials by quantifying historical experience

→ Goal → determine relativities for each level of a rating variable \Rightarrow (ii) determines rate differentials by quantifying historical experience of each level w.r.t. base level independently

→ There are three approaches:

→ Pure premium approach

→ The basic pure premium approach determines the indicated relativities by comparing the LRs for each single levels within a rating variable.

→ When using the pure premium approach, the user needs to understand the loss & claim aspects on the nature of the portfolio.

→ Data should be adjusted for extremities & catastrophic events prior to a classification analysis.

→ The table below shows the indicated relativities for each territory using the pure premium approach.

Territory	Exposures	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
		Loss & ALAE	AOI	Pure Premium	Indicated Relativity	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base
1	300	\$15,698.08	52.33	0.6966	0.4558	0.6731	0.7237	0.6966	0.4558	0.6731	0.7237	0.6966	0.4558	0.6731	0.7237	0.6966	0.4558
2	390	\$28,221.07	57.65	1.0643	1.0643	0.7236	1.0643	1.0643	0.7236	1.0643	1.0643	1.0643	0.7236	1.0643	1.0643	0.7236	1.0643
3	310	\$24,072.96	53.19	0.9588	1.3000	1.2204	1.3000	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204
Total	1,000	\$67,992.11	56.66	1.0000	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000

→ **Loss ratio approach**

→ The loss ratio approach determines the indicated relativities by comparing the LRs for each single levels within a rating variable. When using this approach, EP should be limited to the current level for each class in PIA.

→ The table below shows the indicated relativities for each territory using the LR approach.

Territory	Exposures	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		
		Premium at Current Level	Weighted AOI	Loss & ALAE	AOI	Indicated Change	Current Relativity	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity
1	315,740.66	\$15,698.08	60.99%	1.0763	0.6966	0.4558	0.6731	0.6966	0.4558	0.6731	0.7237	0.6966	0.4558	0.6731	0.7237	0.6966	0.4558	0.6731
2	549,002.80	\$28,221.07	57.59%	1.0164	1.0000	1.0164	1.0000	1.0164	1.0000	1.0164	1.0000	1.0164	1.0000	1.0164	1.0000	1.0164	1.0000	1.0164
3	545,256.64	\$24,072.96	53.19%	0.9588	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204
Total	\$120,000.10	\$67,992.11	56.66	1.0000	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396

→ **Adjusted pure premium approach**

→ For LR approach requires premium at each level of the rating variable, which may not always be available or practical to obtain. In such cases, if it is necessary to use the pure premium approach, to reduce the impact of any distributional bias, the pure premium approach can be performed without exposures adjusted by the exposure-weighted average relativity on all other variables.

→ The exposure-weighted relativity for each territory using the LR approach.

Territory	Exposures	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		
		Premium at Current Level	Weighted AOI	Loss & ALAE	AOI	Indicated Change	Current Relativity	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity
1	300	\$15,698.08	52.33	0.6966	0.4558	0.6731	0.7237	0.6966	0.4558	0.6731	0.7237	0.6966	0.4558	0.6731	0.7237	0.6966	0.4558	0.6731
2	390	\$28,221.07	57.65	1.0643	1.0643	0.7236	1.0643	1.0643	0.7236	1.0643	1.0643	1.0643	0.7236	1.0643	1.0643	0.7236	1.0643	1.0643
3	310	\$24,072.96	53.19	0.9588	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204	1.3000	1.2204
Total	1,000	\$67,992.11	56.66	1.0000	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396	1.0000	0.9396

→ **Adjusted pure premium approach**

→ For example, the weighted average AOI relativities of territories 1 is

$$\frac{10(0.6966) + 11(1.0643) + 10(1.2204)}{10 + 11 + 10} = 1.0283$$

→ The table below shows the indicated relativities for each territory using the PPA approach.

Territory	Exposures	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
Premium at Current Level	Weighted AOI	Loss & ALAE	AOI	Indicated Change	Current Relativity	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base	Pure Premium	Indicated Relativity	to Base

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