

**3.1.1 → RAK Classification**

3.1.1.1 → Importance of rating variables

→ Goal: To separate an order to choose the same rates to each group in the portfolio, thus resulting in same selection.

- choose selection means when you choose the same rate different risk segments
- In a riskier/more uncertain certain groups & other than that relatively more & more stable groups
- Improbable events
  - events which are more random/nominal
  - certain, predictable, etc.
  - specific to certain high-risk sources only
- opposite side is stable selection.
- "knowing the customer" is using risks characteristics to separate customers to select on lower-risk customers

### 3.1.2 → Criteria for evaluating rating variables

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

- **i) Statistical criteria**
  - Statistical significance → different levels of the rating variable should have different expected loss that are statistically significant so that over time
  - Homogeneity → the risks with the same level should have similar expected losses
  - Credibility → Each level should be large enough to allow credible estimates and tests
  - Intensity are in terms of how far it moves from zero
- **ii) Operational criteria**
  - Objective → clear & measurable
  - Intuitiveness → it should be able to obtain shouldn't be much difficult
  - Verifiable → not easily manipulated & easily verifiable
- **iii) Social criteria**
  - Acceptability → insurance should be available for all risks from high-risk to low-risk
  - Consistency → a clear correspondence between a rating variable & current losses will increase its acceptability
  - Credibility → rating bodies generally prefer to have some degree of control over to class to which they belong & the ability to influence premium classes (is it too extreme whether or not a security system is installed)
  - Policy currency → not inflation or currency are measured
  - Intensity not so much
- **iv) Legal criteria** → follows applicable laws
  - Classification markings → groups risks by similar characteristics / less proximity
  - appropriate when creates a homogeneous group of risks
  - Individual risk ratings is tailored to the individual insured
  - Standard rates set by the state are neither rating rules

→ Working of question  $\Rightarrow$  EVALUATED means DECREASED + RECOMMEND (highlight)

### 3.1.3 → Univariate classification

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

→ Pure premium approach

- The basic pure premium approach determines the insurance relativities by comparing the LRs for each rating levels within a rating variable. When using this approach, EP should be brought to the current level for each class in risk.
- The table below shows the indicated relativities for each territory using the LR approach.

Territory	Exposures	$\sum_{j=1}^n \frac{LR_j}{LR_j}$			$(S_j) / (S_n)$
		Pure Premium	Indicated Relativity	Relativity to Base	
1	300	\$15,698.08	0.733	0.733	0.733
2	390	\$28,221.07	0.728	1.000	0.728
3	310	\$24,072.96	1.142	1.000	1.142
Total	1,000	\$67,992.11	0.778	1.000	0.778

→ Less ratio approach

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

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

Territory	Exposures	$\sum_{j=1}^n \frac{LR_j}{LR_j}$			$(S_j) / (S_n)$
		Pure Premium	Indicated Relativity	Relativity to Base	
1	\$25,740.66	\$15,698.08	0.635	0.635	0.635
2	\$49,002.80	\$28,221.07	0.759	1.000	0.759
3	\$45,256.64	\$24,072.96	0.939	1.000	0.939
Total	\$120,000.10	\$67,992.11	0.666	1.000	0.666

→ Adjusted pure premium approach

→ In the LR approach requires premium at base for each level of the rating variable, which may not always be available or practical to obtain. In such cases, it is necessary to use the pure premium approach. To mitigate the impact of any distributional bias, the pure premium approach can be performed using exposures adjusted by the exposure-weighted average of all other variables

→ The exposure-weighted relativity for each territory is calculated as follows:

AOI	Charged AOI Factor	Exposures by Territory			$(S_j) / (S_n)$
		1	2	3	
Low	0.80	10	130	150	
Medium	1.00	110	120	120	
High	1.36	180	140	40	
Wtd Avg AOI Relativity by Territory		1.2093	1.0626	0.9497	

→ For example, the weighted average AOS relativity of territory 3 is

$$\frac{(0.80)(10) + (1.00)(130) + (1.36)(150)}{(0.80 + 1.00 + 1.36)} = 1.2093$$

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

Territory	Exposures	$\sum_{j=1}^n \frac{LR_j}{LR_j}$			$(S_j) / (S_n)$
		Pure Premium	Indicated Relativity	Relativity to Base	
1	300	\$12,093.55	0.635	0.635	0.635
2	390	\$18,221.07	0.759	1.000	0.759
3	310	\$24,072.96	1.142	1.000	1.142
Total	1,000	\$67,992.11	0.666	1.000	0.666

→ As the exposures have been adjusted using the current level of insurance relativities charged, the resulting relativities are the same as those calculated with the LR approach as well as the LR approach the remaining differences in the indicated relativities come from the variation between the true risk relativities & the risk relativities charged by the insurer.

$\Rightarrow$  LR approach results in AOS PP approach results

as well as premium @ each level

→ Potential drawbacks/benefits  $\rightarrow$  Univariate methods have an inability to adequately capture the effect of other rating variables

$\Rightarrow$  Thus many companies use alternative methods like multivariate classification

→ Adjusted pure premium approach

→ Adjusted pure premium approach