Ch 16: Credibility

- **Definition**

Credibility means How insurer adjust the future premium (insurance payment) for insureds that based on past experience with a risk or a group of risks.

* For Full credibility

$$n \geq \lambda_0 \left(\frac{\sigma}{\xi}\right)^2$$

- n is the number of exposure units
- $\xi = E(X_j)$, $\sigma^2 = Var(X_j)$ where X_j are claims or losses..., $j = 1, 2, \ldots, n$
- σ/ξ is the coefficient of variation and
- $\lambda_0 = (y_p/r)^2$ where $\Phi(y_p) = (1+p)/2$, $p \to 1$ (percent), $r \to 0$ (ratio)

Note that y_p is $(1+p)/2$ percentile of the standard normal distribution (S.N.D)

i.e. if $r = 0.05$ and $p = 0.90 \Rightarrow \Phi(y_p) = \frac{1+0.9}{2} = 0.95$

$\Rightarrow y_p = 1.645$

* For partial credibility

$$P_c = Z\bar{X} + (1-Z)M$$

P_c: partial credibility (or credibility premium); $\bar{X}$: average of past losses or claims; M: manual premium

- Z is called the credibility factor, $0 \leq Z \leq 1$

$$Z = \sqrt{\frac{n}{\lambda_0 \sigma^2/\xi^2}}$$

Note that

$$pr\left(\left|\frac{\bar{X}-\xi}{\xi}\right| \leq 0.05\right) \geq 0.90$$

(r: 0.05, p: 0.90)

هذا يعني بأن احتمال البعد بين $\bar{X}$ وتكون أقل من أو يساوي 0.05 بإحتمال أكبر من أو يساوي 0.90.

EX 16.5 p.395 Textbook

Given

Manual premium $M = 175$, $\sigma = 140$

$n = 100 + 110 = 210$ observations (# of exposure units) (100 ← 1st Yr, 110 ← 2nd Yr)

Average, $\bar{X}$ for claims $= 150$, Consider $\rho = 0.90$ and $r = 0.05$

R.T.F

Full & partial credibility and credibility premium for 125 lives that will be insured next year.

Ans:

• For Full credibility

$$n \geq \lambda_0 \left(\frac{\sigma}{\delta}\right)^2$$

To get λ_0

$$\lambda_0 = \left(\frac{y_p}{r}\right)^2,$$

$$\Phi(y_p) = \frac{1+\rho}{2} = 0.95 \Rightarrow y_p = 1.645 \quad \text{... SND}$$

$$\lambda_0 = \left(\frac{1.645}{0.05}\right)^2 = 1082.41$$

$$\therefore n \geq 1082.41 \left(\frac{140}{150}\right)^2 \simeq 942.9$$

• For partial credibility (credibility premium per person)

$$P_c = Z\bar{X} + (1-Z)M$$

$$Z = \sqrt{\frac{n}{\lambda_0 \sigma^2/\delta^2}} = \sqrt{\frac{210}{942.9}} = 0.4719$$

$$\therefore P_c = 0.4719(150) + 0.5281(175)$$

$$= 163.2$$

The credibility premium for 125 liver will be insured next year $= 125\,(163.2) = 20{,}400$

125 ( ) ...