Summary 5M

## Full Credibility

Classical credibility theory, also known as limited fluctuation credibility theory, states that full credibility for aggregate claims should be given to the sample if the following condition is fulfilled:

$$\Pr\left(\left|\,\bar{S}-\mu_S\,\right| \le k\mu_S\right) \ge p$$

In general, the standard for full credibility can be measured in two units:

- Number of exposures, $n_e$
    - For full credibility of **aggregate claims**,

$$n_e = \left[\frac{z_{(1+p)/2}}{k}\right]^2 \left(CV_S^2\right)$$

- Expected number of claims, $n_c$
    - For full credibility of **aggregate claims/pure premiums**,

$$n_c = \left[\frac{z_{(1+p)/2}}{k}\right]^2 \left(\frac{\sigma_N^2}{\mu_N} + CV_X^2\right)$$

    - For full credibility of **claim frequency**, set the severity component to zero.

$$n_c = \left[ \frac{z_{(1+p)/2}}{k} \right]^2 \left( \frac{\sigma_N^2}{\mu_N} \right)$$

- For full credibility of **claim severity**, set the frequency component to zero.

$$n_c = \left[ \frac{z_{(1+p)/2}}{k} \right]^2 (CV_X^2)$$

To convert between $n_e$ and $n_c$, apply the relationship below:

$$n_c = n_e \cdot \mu_N \quad \Leftrightarrow \quad n_e = \frac{n_c}{\mu_N}$$

## Partial Credibility

In the case of partial credibility, the future outcome is predicted by taking the weighted average of the sample mean and the manual premium.

$$\begin{aligned} P_C &= Z\bar{x} + (1 - Z)M \\ &= M + Z(\bar{x} - M) \end{aligned}$$

where

- $P_C$ represents the credibility premium
- $Z$ represents the credibility factor/credibility
- $\bar{x}$ represents the sample mean
- $M$ represents the manual premium

Apply the square root rule to calculate the partial credibility factor $Z$:

$$Z = \sqrt{\frac{n}{n_e}} = \sqrt{\frac{n'}{n_c}}$$

where

- $n$ is the actual number of exposures