



ACTEX Learning Flashcards

Learning & Memorizing Key Topics and Formulas

CAS Exam MAS-II

Fall 2018 Edition

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Part A:
Introduction to Credibility

(Source: **Nonlife Actuarial Models**)

Chapter 1

Limited Fluctuation Credibility

Learning objective:

Understand the basic framework of credibility and be familiar with **limited fluctuation credibility**, including **partial credibility** and **full credibility**

(Source: CAS MAS-II Exam)

Prediction

Determine the updated prediction of a loss measure.

The updated prediction is a weighted average of D (data) and M (manual rate):

$$U = Z D + (1 - Z) M.$$

The weight Z , $0 \leq Z \leq 1$, assigned to D is called the **credibility factor**. (Source: Nonlife Actuarial Models Chapter 6)

Aggregate loss

Define the **aggregate loss** if N is the number of claims and X_i is the i th claim, $i = 1, \dots, N$.

The **aggregate loss** is

$$S = X_1 + X_2 + \cdots + X_N$$

where N is the number of claims and X_i is the i th claim, $i = 1, \dots, N$

Pure premium

Let E be the number of exposure units. Define the **pure premium** per exposure unit.

The **pure premium** per exposure unit is

$$P = \frac{S}{E}$$

where E is the number of exposure units.

Requirement for full credibility for claim frequency

What is the requirement for full credibility for **claim frequency** for a given precision parameter k and the coverage probability $1 - \alpha$?

The probability that the observed number of claims is within k of the true mean is at least $1 - \alpha$, i.e.

$$\Pr(\mu_N - k \mu_N \leq N \leq \mu_N + k \mu_N) \geq 1 - \alpha.$$

Standard for full credibility for claim frequency

Determine the standard for full credibility for claim frequency if the probability that the observed number of claims is within k of the true mean is at least $1 - \alpha$.

The standard for full credibility for **claim frequency** is

$$\lambda_F = \left(\frac{z_{1-\alpha/2}}{k} \right)^2$$

Requirement for full credibility for claim severity

What is the requirement for full credibility for **claim severity** for a given precision parameter k and the coverage probability $1 - \alpha$?

The probability of \bar{X} being within k of the true mean of claim loss μ_X is at least $1 - \alpha$, i.e.

$$\Pr(\mu_X - k \mu_X \leq \bar{X} \leq \mu_X + k \mu_X) \geq 1 - \alpha$$

Standard for full credibility for claim severity

Determine the standard for full credibility for claim severity if the probability of \bar{X} being within k of the true mean of claim loss μ_X is at least $1 - \alpha$.

The standard for full credibility for **claim severity** is $\lambda_F C_X^2$ where $\lambda_F = \left(\frac{z_{1-\alpha/2}}{k} \right)^2$ is the standard for full credibility for **claim frequency** and $C_X = \frac{\sigma_X}{\mu_X}$ is the coefficient of variation of X .

Requirement for full credibility for aggregate loss

What is the requirement for full credibility for **aggregate loss** for a given precision parameter k and the coverage probability $1 - \alpha$?

The probability of S being within k of the true mean μ_S is at least $1 - \alpha$, i.e.

$$\Pr(\mu_S - k \mu_S \leq S \leq \mu_S + k \mu_S) \geq 1 - \alpha,$$

where $\mu_S = \mu_N \mu_X$.

Standard for full credibility for aggregate loss

Determine the standard for full credibility for aggregate loss if the probability of S being within k of the true mean μ_S is at least $1 - \alpha$.

The standard for full credibility for **aggregate loss** is

$$\lambda_F (1 + C_X^2)$$

where $\lambda_F = \left(\frac{z_{1-\alpha/2}}{k}\right)^2$ is the standard for full credibility for **claim frequency** and $C_X = \frac{\sigma_X}{\mu_X}$ is the coefficient of variation of X .

Requirement for full credibility for pure premium

What is the requirement for full credibility for **pure premium** for a given precision parameter k and the coverage probability $1 - \alpha$?

The probability of P being within k of the true mean $E(P) = \mu_s/E$ is at least $1 - \alpha$, i.e.

$$\Pr[E(P) - k E(P) \leq P \leq E(P) + k E(P)] \geq 1 - \alpha$$

$$\implies \Pr[\mu_s - k \mu_s \leq S \leq \mu_s + k \mu_s] \geq 1 - \alpha$$

It's the same as the requirement for aggregate loss.

**Standard for full credibility
for pure premium**

Determine the standard for full credibility for pure premium if the probability of P being within k of the true mean $E(P)$ is at least $1 - \alpha$.

The standard for full credibility for **pure premium** is

$$\lambda_F (1 + C_X^2)$$

where $\lambda_F = \left(\frac{z_{1-\alpha/2}}{k}\right)^2$ is the standard for full credibility for **claim frequency** and $C_X = \frac{\sigma_X}{\mu_X}$ is the coefficient of variation of X .