Week 6

Difficulty level*is 2

Risk categories are discretely and uniformly distributed for from 1 to 5. The number of claims for an individual risk is Poisson with a mean equal to its risk category number. Let X be the number of claims experienced by a randomly selected individual.

Compute $Var(X)$.

A) 1.3
B) 4.3
C) 3.0
D) 3.7
E) 5.0

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 5

Difficulty level*is 5

You are given:

i. A set of 100 claims has 30% credibility.

ii. The standard is set so claim severity will be with in 5% of the true value 95% of the time.

If the standard is changed so claim severity will be within 5% of the true value 99% of the time what would be the revised credibility factor for 300 claims?

A) 0.396
B) 0.228
C) 0.453
D) 0.163
E) 0.528

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 4

Difficulty level*is 1

You are given:

i. The standard for full credibility is 1600 claims.

ii. The population being studied has a known average of 10.

iii. 300 observations from a subpopulation have an average of 5.

Find the credibility weighted average for the subpopulation.

A) 7.84
B) 6.94
C) 5.16
D) 8.97
E) 7.17

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 3

Difficulty level*is 4

You are given:

i. The number of claims has a Poisson distribution.

ii. Claim sizes have a Pareto distribution with parameters $\theta = 2$ and $\alpha = 10$.

iii. The number of claims and claim sizes are independent.

iv. The observed pure premium should be within 10% of the expected pure premium 95% of the time.

Determine the expected number of claims needed for full credibility.

A) 864
B) 576
C) 481
D) 609
E) 394

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 2

Difficulty level*is 1

You are given:

i. Losses follow a distribution with cumulative distribution function

$$F(x) = 1 - \left(\frac{\theta}{x+\theta}\right)^3$$

ii. The sample of losses is 10, 20, 30, 50, 80

Calculate the estimate of θ by matching the first moment.

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 1

Difficulty level*is 6

You are given:

i. Losses follow a Pareto distribution with cumulative distribution function $F(x) = 1 - \left(\frac{\theta}{x+\theta}\right)^2$

ii. The sample of losses is 100, 200, 500, 1000.

Estimate θ by percentile matching using the 25^{th} empirically smoothed percentile estimate.

A) 808
B) 372
C) 646
D) 1292
E) 987

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 6

Let Y represent the risk category of the selected individual.

$$
\begin{aligned}
Var(X) &= E(Var(X|Y)) + Var(E(X|Y)) \\
&= E(Y) + Var(Y) \\
&= 3 + \frac{25-1}{12} = 5
\end{aligned}
$$

Week 5

Let X_0 be the original standard for full credibility and X_n be the revised standard.

$$\sqrt{\frac{100}{X_0}} = 0.3$$

$$\frac{100}{X_0} = 0.09$$

$$X_0 = 1111$$

$$X_0 = \left(\frac{CV^2(1.96)}{0.05}\right)^2$$

$$X_n = \left(\frac{CV^2(2.575)}{0.05}\right)^2 = \left(\frac{2.575}{1.96}\right)^2 X_O$$

$$= \left(\frac{2.575}{1.96}\right)^2 (1111)$$

$$= 1918$$

$$\text{So revised credibility} = \sqrt{\frac{300}{1918}} = 0.396$$

Week 4

$$Z = \sqrt{\frac{300}{1000}} = 0.433$$

$$\text{C.W. Average} = 0.433(5) + (1 - 0.433)10 = 7.835$$

Week 3

The standard for full credibility is

$$\left(\frac{Z_{\alpha/2}}{k}\right)^2(1+cv^2)$$

where cv is the coefficient of variation for the claim size x.

$$E(X)=\frac{\theta}{\alpha-1}=\frac{2}{9}=0.2222$$

$$Var(x)=\frac{2\theta^2}{(\alpha-2)(\alpha-1)}-\left(\frac{2}{9}\right)^2=\frac{8}{72}-\frac{4}{81}=0.06173$$

So

$$cv^2=\frac{0.06173}{(0.2222)^2}=1.25$$

So the standard for full credibility is

$$\left(\frac{1.96}{0.1}\right)^2(1+1.25)=864$$

Week 2

The formula for the first moment is

$$\mu = \frac{\theta^1}{\alpha - 1} = \frac{\theta}{2}$$

From our sample

$$\overline{x} = \frac{190}{5} = 38$$

so the estimate is

$$\frac{\theta}{2} = 38 \text{ or } \theta = 76$$

Week 1

First we must find the 25^{th} smoothed empirical percentile. The 4 sample points are taken as the 20^{th}, 40^{th}, 60^{th} and 80^{th} percentiles. Interpolating we get

$$Q_1 = 100 + \frac{0.05}{0.20}(200 - 100) = 125$$

Matching these with F(x) we get

$$0.25 = 1 - \left(\frac{\theta}{125 + \theta}\right)^2$$

Solving we get

$$\left(\frac{\theta}{125 + \theta}\right)^2 = 0.75$$
$$\frac{\theta}{125 + \theta} = \sqrt{0.75}$$
$$\theta = 125\sqrt{0.75} + \sqrt{0.75}\,\theta$$
$$\theta = \frac{125\sqrt{0.75}}{1 - \sqrt{0.75}} = 808.01$$