EXAM C QUESTIONS OF THE WEEK

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Question 8 - Week of September 12

Suppose that for a compound Poisson claims distribution S with severity Y, the standard for full credibility for S based on expected total amount of claims is 1,200,000. If the severity distribution was changed to be a constant equal to the original $E[Y]$, the standard for full credibility for S based on expected total amount of claims would be 800,000.

(a) Assuming $E[Y] = 400$, find the variance of the severity distribution for the original Y.

(b) Using $E[Y] = 400$ and the $Var[Y]$ found in part (a), and the usual credibility requirement $P[|\overline{S} - E[S]| < kE[S]] = .90$, find k (i.e., given the probability criterion is 90%, find the closeness criterion).

(c) Suppose that a total number of 2000 claims are observed. Using $E[Y] = 400$ and the $Var[Y]$ found in part (a) and the same n_0, find the partial credibility factor for S.

The solution can be found below.

Question 8 Solution

We are given $E[Y] = 400$, where Y is the claim amount random variable.

(a) The value of 1,200,000 is the total claim amount needed for full credibility for S, the random variable of aggregate claim per period when $Var[Y] > 0$. This is full credibility standard (2) for the random variable S. Thus, $1,200,000 = n_0 \cdot \left[E[Y] + \frac{Var[Y]}{E[Y]}\right]$.

The value of 800,000 is the total claim amount needed for full credibility for S when $Var[Y] = 0$.

Thus, $800,000 = n_0 \cdot \left[E[Y] + \frac{0}{E[Y]}\right] = n_0 \cdot E[Y]$ when $Var[Y] = 0$.

Then, $\frac{1,200,000}{800,000} = 1 + \frac{Var[Y]}{(E[Y])^2} = 1 + \frac{Var[Y]}{400^2} \rightarrow Var[Y] = 80,000$.

(b) $n_0 = \frac{800,000}{400} = 2,000 = (\frac{1.645}{k})^2 \rightarrow k = .0368$.

(c) The full credibility standard for number of claims is $n_0 \cdot \left[1 + \frac{Var[Y]}{(E[Y])^2}\right] = 2000[1 + \frac{1}{2}] = 3000$.

The partial credibility factor will be $\sqrt{\frac{2000}{3000}} = .816$.