EXAM C QUESTIONS OF THE WEEK

S. Broverman, 2007

Week of April 9/07

W is a random variable with mean $E[W]$ and variance $Var[W]$. In a partial credibility analysis of W, the manual premium used is $M = 1000$. A sample of 350 observations of W is available and the sum of the observed values is 300,000. Partial credibility is applied to determine a credibility premium based on the "5% closeness" and "90% probability" criteria.
If the credibility standard used is the one based on the expected number of observations of W needed, then the partial readability premium is 884.40. If the credibility standard used is the one based on the expected sum of the observed values of W needed, then the partial readability premium is 887.19. Using this information, find the mean and variance of W.

The solution can be found below.

<u>**Week of April 9/07 - Solution**</u>

The full credibility standard based on the number of observations needed is $1082.4\,\frac{Var[W]}{(E[W])^2}$
and based on the sum of the observed values it is $1082.4\,\frac{Var[W]}{E[W]}$.

From the given information, the sample mean of the observed values is $\bar{W} = \frac{300{,}000}{350} = 857.14$.
The credibility premium based on partial credibility using is $Z\bar{W} + (1-Z)M$,
where $\bar{W} = 857.14$, $M = 1000$ and Z is the partial credibility factor.

Using the credibility standard based on the expected number of observations needed,
$Z = \sqrt{\frac{350}{1082.4\,\frac{Var[W]}{(E[W])^2}}}$, so that $857.14Z + 1000(1-Z) = 884.40$, from which we get
$Z = .809$, and therefore $\frac{350}{1082.4\,\frac{Var[W]}{(E[W])^2}} = .654$, so that $\frac{Var[W]}{(E[W])^2} = .494$.

Using the credibility standard based on the expected sum of the observed values needed,
$Z = \sqrt{\frac{300{,}000}{1082.4\,\frac{Var[W]}{E[W]}}}$, so that $857.14Z + 1000(1-Z) = 887.19$, from which we get
$Z = .790$, and therefore $\frac{300{,}000}{1082.4\,\frac{Var[W]}{E[W]}} = .623$, so that $\frac{Var[W]}{E[W]} = 445$.

Then, $E[W] = \frac{Var[W]/E[W]}{Var[W]/(E[W])^2} = \frac{445}{.494} = 901$, and $Var[W] = 401{,}000$.