EXAM C QUESTIONS OF THE WEEK

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Week of July 30/07

The loss random variable X has an exponential distribution and an ordinary deductible is applied to all losses. You are given the following:

- The variance of the cost per loss random variable is 20,480.
- The variance of the cost per payment random variable (excess loss random variable) is 25,600.

Find the average cost per loss.

The solution can be found below.

Week of July 30/07 - Solution

X has an exponential distribution with mean θ and an ordinary deductible of d is applied.

The cost per loss random variable Y_L has mean $E[Y_L] = E[(X-d)_+] = \theta e^{-d/\theta}$,
and has variance $Var[Y_L] = \theta^2 e^{-d/\theta} \cdot (2 - e^{-d/\theta}) = 20,480$.

Since X is exponential, the cost per payment (excess loss) random variable Y_P is exponential with mean θ, and variance $\theta^2 = 25,600$. Therefore, $\theta = 160$.

We then get the equation $25,600 e^{-d/\theta}(2 - e^{-d/\theta}) = 20,480$, so that
$e^{-d/\theta}(2 - e^{-d/\theta}) = .80$. If we let $c = e^{-d/\theta}$, then we get a quadratic equation in c:
$c(2-c) = .8$, or $c^2 - 2c + .8 = 0$. The roots are $c = .5528\, ,\ 1.4472$.
Since $c = e^{-d/\theta}$, we ignore the root greater than 1.
Then $e^{-d/160} = .5528$ (so that $d = 94.84$) .

The average cost per loss is $E[Y_L] = 160(.5528) = 88.4$.