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Tut. Sess. 10

Ch 16: Credibility p. 397 Textbook

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* pb 16.3 p. 398

Ans:

at $p = 0.9$, $\Phi(y_p) = (1+p)/2 = 0.95$

$\Rightarrow y_p = 1.645$ (calculated from standard Normal prob. distn, Table

$\because \lambda_0 = (y_p / r)^2 \therefore \lambda_0 = \left(\frac{1.645}{0.05}\right)^2 = 1082.41$

where $r = 0.05$

The mean is $\xi = E(X_j)$

$$= \frac{475 + 550 + 400}{3} = 475$$

, Variance is

$$\sigma^2 = \frac{\sum_j (x_j - \xi)^2}{n-1} = \frac{0^2 + 75^2 + 75^2}{2}$$

$$\sigma^2 = 5625 \Rightarrow \sigma = \sqrt{5625} = 75$$

For full credibility

$$n \geq \lambda_0 \left(\frac{\sigma}{\xi}\right)^2$$

$$n \geq 1082.41 \left(\frac{75}{475}\right)^2$$

$$n \geq 26.9853$$

The credibility factor is

$$Z = \sqrt{\frac{n}{\lambda_0 \sigma^2 / \xi^2}} = \sqrt{\frac{3}{26.9853}}$$

$$\therefore Z = 0.3334$$

The partial credibility through premium is

$$P_c = Z\bar{X} + (1-Z)M$$

$$= 0.3334(475) + 0.6666(600)$$

$\therefore P_c = 558.325$, where the average of payments is $\bar{X} = 475$ and the manual premium M is 600.

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pb 16.1 p.397 Textbook

Ans:

at $p = 0.95$, $\Phi(y_p) = (1+p)/2 = 0.975$

$\Rightarrow y_p = 1.96$ (by using Standard Normal dist^n Table)

$\Rightarrow \lambda_0 = (y_p/r)^2 = (1.96/0.05)^2 = 1536.64$

$$E(X) = \int_0^{100} x\left(\frac{100-x}{5,000}\right)dx$$

$$= \int_0^{100} \frac{100x - x^2}{5,000}\,dx$$

$$= \frac{1}{5,000}\left[100\left(\frac{x^2}{2}\right) - \frac{x^3}{3}\right]_0^{100}$$

$$E(X) = \frac{100^3}{5,000}\left(\frac{1}{2} - \frac{1}{3}\right) = \frac{1000}{5}\left(\frac{1}{6}\right) = \frac{100}{3}$$

$$E(X^2) = \int_0^{100} x^2\left(\frac{100-x}{5000}\right)dx$$

$$E(X^2) = \int_0^{100}\left(\frac{100x^2 - x^3}{5000}\right)dx \ \ldots$$

$$= \frac{5,000}{3}$$

$$\therefore Var(X) = E(X^2) - [E(X)]^2$$

$$= \frac{5000}{3} - \frac{10,000}{9} = \frac{5,000}{9}$$

To get the expected number of claims use the following formula:

$$n\lambda = \lambda_0\left[1 + \frac{\sigma^2}{\theta^2}\right]$$

where $\sigma^2 = Var(X)$, $\theta = E(X)$

$\therefore$ the expected # of claims $= 1,536.64\left[1 + \frac{5,000}{10,000}\right]$

$= 1536.64\,(1.5)$

$= 2,304.96$

$\simeq 2,305$

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pb 16.7 p.398

at $P = 0.90$, $\Phi(y_p) = (1+P)/2 = 0.95$

$\Rightarrow y_p = 1.645$ (by using Standard Normal distn table)

$\Rightarrow \lambda_0 = (y_p/r)^2 = (1.645/0.06)^2 = 751.6736$

To get the expected number of claims, use the following formula:

$$n\lambda = \lambda_0 \left[1 + \frac{\sigma^2}{\theta^2}\right]$$

where $\sigma^2 = (7,500)^2$, $\theta = 1,500$

$\therefore$ The expected # of claims $= 751.6736 \left[1 + \frac{(7,500)^2}{(1,500)^2}\right]$

$= 19,543.51$

$\simeq 19,544$

H.W * Assignment * # (5) Mid II

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