ACSC/STAT 4703, Actuarial Models II
Fall 2015
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Homework Sheet 6
Due: Friday 27th November: 10:30 PM

Basic Questions

1. An insurance company sells car insurance. It estimates that the standard deviation of the aggregate annual claim is $1,326.

    (a) How many years history are needed for an individual or group to be assigned full credibility? (Use $r = 0.05$, $p = 0.95$.)

    The standard premium for this policy is $1,102. An individual has no claims in the last 10 years.

    (b) What is the Credibility premium for this individual, using limited fluctuation credibility?

2. A health insurance company classifies individuals as healthy or unhealthy. Annual claims from healthy individuals follow a Gamma distribution with shape $\alpha = 0.25$ and scale $\theta = 1044$. Annual claims from unhealthy individuals follow a Gamma distribution with shape $\alpha = 0.5$ and scale $\theta = 1370$. 80% of individuals are healthy individuals.

    (a) Calculate the expectation and variance of the aggregate annual claims from a randomly chosen individual.

    (b) Given that an individual's total claims over the past 2 years are $396, what are the expectation and variance of the individual's total claims next year?

3. The number of claims made by an individual in a year follows a Poisson distribution with mean Λ, where the value of Λ follows a Gamma distribution with $\alpha = 2.3$ and $\theta = 0.07$. Given that an individual has made 6 claims in the past 2 years, what is the expected number of claims made in the next year?

Standard Questions

4. For a certain insurance policy, the book premium is based on average claim frequency of 0.5 claims per year, and average claim severity of $3,040. A particular group has made 60 claims from 187 policies in the last year. The average claim severity is $3,914. Estimate the credibility premium for this group using limited fluctuation credibility if the standard for full credibility is:

(a) 203 claims for claim frequency, 700 claims for severity.

(b) 406 years for claim frequency, 700 claims for severity.

(c) 523 years for aggregate claims.

5. A group insurance policy covers 168 individuals. The insurance company reviews the last 3 years of aggregate claims for each insured. For individual i, the aggregate claims in year j are denoted X_{ij}. We have the following:

$$\mathbb{E}(X_{ij}) = \mu$$
$$\text{Var}(X_{ij}) = \sigma^2$$
$$\text{Cov}(X_{ij}, X_{kl}) = \begin{cases} \rho & \text{if } i = k, j \neq l \\ \tau & \text{if } i \neq k, j = l \\ \zeta & \text{if } i \neq k, j \neq l \end{cases}$$

Calculate the credibility estimate for $X_{i,4}$.