STAT 479
Quiz 5
Spring 2022
April 4, 2022

Introduction

Barwegen Auto Company sells automobile insurance. Barwegen splits drivers into three categories – Safe, Not So Safe, and Crazy. You have the following information:

Type	Proportion of Total Drivers	Claim Frequency Poisson Annual
Safe	0.7	0.05
Not So Safe	0.2	0.15
Crazy	0.1	0.40

For each driver, frequency and severity are independent.

During 2021, five drivers are selected randomly from one type. During 2021, these five drivers have one claim.

1. What is the expected value of the process variance of the claim frequency?

   Solution:

   $Var[N \mid Safe] = 0.05$

   $Var[N \mid NotSoSafe] = 0.15$

   $Var[N \mid Crazy] = 0.40$

   $EPV = (0.7)(0.05) + (0.2)(0.15) + (0.1)(0.4) = 0.105$

2. What is the variance of the hypothetical mean of the claim frequency?

    Solution:

    $E[N] = (0.7)(0.05) + (0.2)(0.15) + (0.1)(0.4) = 0.105$

    $E[N^2] = (0.7)(0.05)^2 + (0.2)(0.15)^2 + (0.1)(0.4)^2 = 0.02225$

    $VHM = 0.02225 - (0.105)^2 = 0.011225$

3. Use Buhlmann-Straub Credibility and the information in Questions 1 and 2 to estimate the number of claims in 2022 for these five drivers.

    Solution:

    $$Z = \frac{N}{N+K} = \frac{5}{5 + \dfrac{0.105}{0.011225}} = 0.34833$$

    $$Expected = 5\left[0.34833\left(\frac{1}{5}\right) + (1 - 0.34833)(0.105)\right] = 0.69046$$