ASRM 461 Project

Due April 23rd

Simulation and Classification

In this project you will use a programming language such as Excel, R, or Python to simulate data from different distributions. Your final submission will include your code, outputs, and explanations.

Part 1 Convolutions

In this part, you will see the effect of adding two distributions together. Simulate X_1, X_2, and then compute their sum $Y = X_1 + X_2$. Classify *Y* as an (a, b, 0) distribution and give its parameters.

a. $X_1 = \text{Geo}(\beta = 12), X_2 = \text{Geo}(\beta = 12)$
b. $X_1 = \text{Bin}(m = 24, q = 0.6), X_2 = \text{Bin}(m = 36, q = 0.6)$
c. $X_1 = \text{Poi}(\lambda = 16), X_2 = \text{Poi}(\lambda = 20)$

Part 2 Compound Distributions

In this part, you will create a collective risk model with *N* being the number of claims and X_i being the amount of loss. Simulate N, X_i, and the sum $S = X_1 + X_2 + \cdots + X_N$. Compute $E[S]$, $Var[S]$, and compare to the theoretical values using the law of total expectation.

a. $N = \text{Poi}(\lambda = 25), X_i = \text{Exp}(\theta = 100)$
b. $N = \text{Poi}(\lambda = 100), X_i = \text{LogNormal}(\mu = 1, \sigma = 2)$
c. $N = \text{Bin}(m = 36, q = 0.6), X_i = \text{Gamma}(\alpha = 100, \theta = 2)$

Part 3 Credibility Theory

For each of the three models in Part 2, determine the credibility standards with

a. $r = 0.99, p = 0.9$
b. $r = 0.95, p = 0.95$
c. $r = 0.90, p = 0.99$