MKTG/STAT 4760/7760
Spring 2026

Homework #3

1. In Canvas, I've placed a spreadsheet containing data on the number of prescriptions for a particular drug written by a sample of 1923 doctors in a given month.
   a. Fit the NBD model to this dataset using MLE, MOM, and "Mean and Zeros." Compare the resulting parameter estimates.
   b. Using MLE, also fit the NBD with spike at zero. How well does it compare to the regular NBD (showing the appropriate histograms and using the chi-square goodness-of-fit test)?
   c. Using the likelihood ratio test, discuss the suitability of the spike at zero.
   d. Which model would you choose as "best" and why? Using your preferred model, what is the expected distribution for the number of prescriptions over a 12-month period?

2. Here is an extract from a report on mobile phone app usage by US consumers:

2 App User Habits

- More than one-third of all U.S. smartphone owners download at least one app per month. The average smartphone user within this segment downloads three apps per month, meaning that the average among the entire smartphone population comes out to slightly more than one. Moreover, the total number of app downloads is highly concentrated within a small segment of the smartphone population, with the top [redacted] percent of owners accounting for nearly half of all download activity in a given month.

   a. Estimate the NBD parameters for the distribution of apps downloaded in a month
   b. What is your estimate of the missing quantity (i.e., the top *x* percentage of owners accounting for nearly half of all download activity in a given month)?

3. Let's revisit our Facebook analysis in two separate ways:

   a. Using the DAU data and the Facebook parameter estimates from class, what would MAU have to be in order for Facebook to conform perfectly to the 80:20 rule?

   b. Now redo the original classroom analysis (with MAU=272/360) but using a week as the unit of time instead of a day. (You should assume that there are 13/3 weeks per month.) How do the parameters of the model change (and does this make sense)? Discuss some relevant inferences about weekly behavior.