Sampling Distributions
STAT-UB.0103 – Statistics for Business Control and Regression Models

Normal Random Variables (Review)

1. Suppose that X is a normal random variable with mean $\mu = 26$ and standard deviation $\sigma = 4$. What is the probability that X will take a value greater than 34?

Normal Inverse CDF

2. Suppose that Z is a standard normal random variable. Find the value w so that $\mathrm{P}(|Z| \leq w) = 0.60$.

3. A machine that dispenses corn flakes into packages provides amounts that are approximately normally distributed with mean weight 20 ounces and standard deviation 0.6 ounce. Suppose that the weights and measures law under which you must operate allows you to have only 5% of your packages under the weight stated on the package. What weight should you print on the package?

4. Suppose X is a normal random variable with mean $\mu = 10$ and standard deviation $\sigma = 3$.

   (a) Find the value M such that $P(X \geq M) = 0.75$.

   (b) Find the value K such that $P(|X - \mu| \leq K) = 75\%$.

Design-Based Inference

5. In the following scenarios, identify the sample, a relevant population, and the relevant population parameter or parameters. All parameters will either be proportions or means.

   (a) You survey your classmates and ask them whether or not they are international students.

   (b) You want to quickly gauge the performance of internet company stocks over the past week. You check last week's returns for Facebook, Google, and Yahoo.

   (c) A department store manager selects 10 receipts from yesterday's purchases and records the purchase amounts.

   (d) A garment factory is ready to make a shipment of 100 new sweaters. A quality control inspector checks 10 of these sweaters for defects.

Model-Based Inference

6. In the following scenarios, it is more natural to think of the population as a random process. Identify the sample, then describe the population as a random process, and identify the relevant population parameters. In each case, give at least one example of where the random process perspective could be useful. All parameters will either be probabilities or expectations.

   (a) The NYU admissions office reports that the average SAT Math score for the current Freshman class (5625 students) is 685, and the standard deviation is 80.

   (b) You are considering buying a new Vizio LED TV. You look at customer ratings of the product on Amazon.com and find the average star rating.

   (c) A bakery wants to know how many sales to expect this year. They look at weekly sales data from last year.

   (d) You own and operate a shoe store in SoHo. Some proportion of customers who make purchases eventually return their merchandise. Suppose you want to estimate this proportion based on all purchases made in January, of this year.