Problem 1 – Assumptions

Goal: Estimate a population mean.

- When σ is known, the normal distribution and *z*-scores are used.
- When σ is not known, two assumptions are made:

  1. It is a simple random sample.

  2. The sample is from a normally distributed population, or *n* (the sample size) > 30.

  If these assumptions are true, use a *t* distribution. For a sample size *n* of a *t* distribution, the degrees of freedom is *n* – 1.

On page 1.3, graph the normal distribution and a *t* distribution with *n* = 3. Adjust the window appropriately. Then increase the value of *n* for the *t* distribution.

1. What happens as $n \to 30$?

2. How does the size of the sample play a role in the accuracy of the estimation?

3. Determine whether to use a normal distribution, *t* distribution, or neither.

a. *n* = 50, $\bar{x}$ = 10, *s* = 4, population is skewed.

b. *n* = 15, $\bar{x}$ = 10, *s* = 4, population is normally distributed.

c. *n* = 50, $\bar{x}$ = 10, σ = 4, population is very skewed.

d. *n* = 15, $\bar{x}$ = 10, *s* = 4, population is skewed.

Problem 2 – Estimating the interval

The true mean for the population will always be contained in an interval $\bar{x} \pm E$ (an error). The error is dependent upon the confidence interval chosen. The larger the probability, the larger the interval. $E = t_{\alpha/2}\frac{s}{\sqrt{n}}$ where 1 – α is the probability that μ (the mean) is in interval.

So, if we desire a 95% confidence interval, then α = 0.05.

4. Find a 95% confidence interval for a sample where *n* = 25, $\bar{x}$ = 15, and *s* = 0.5.

Step 1: Find $t_{\alpha/2}$. On page 2.3, choose **MENU > Statistics > Distributions, Inverse t**. Fill in the boxes with the appropriate responses (Area = 0.025, since α = 0.05, and df = 24). Take the absolute value of this number.

Step 2: Calculate the value of E and store as **e**.

Step 3: Find the interval: $\bar{x}$ – E < μ < $\bar{x}$ + E

Extension – Using data

The data on page 3.2 gives the normal average January minimum temperature in degrees Fahrenheit of 56 cities. Find an interval that contains the population mean with:

1. 90% confidence

2. 95% confidence

3. 99% confidence