WS #2 - Confident Intervals

Math 150, Jo Hardin

Monday, January 27, 2025

Your Name: _____

Names of people you worked with: _____

Discuss with your partner(s) the different moving pieces of this class. Do you have any questions about what assignment to do, what platform to pay attention to, which emails to read, where to submit the assignments, what to do to be prepared for each class, or how to participate when you have no clue what is going on in class? Write down something logistical that still seems daunting, or report that you are feeling comfortable with the logistics.

Task: Consider what we called "Model 2":

$$y_i = \beta_0 + \beta_1 x_i + \epsilon_i \quad i = 1, 2, \ldots, n \tag{1}$$

$$\epsilon_i \sim N(0, \sigma^2), \text{ independently} \tag{2}$$

$$E[Y_i] = \beta_0 + \beta_1 x_i \tag{3}$$

Which part of "Model 2" (might be a full equation, might just be a word) demonstrates each of the following technical conditions:

1. The average value for the response variable is a linear function of the explanatory variable.
2. The error terms follow a normal distribution around the linear model.
3. The error terms have a mean of zero.
4. The error terms have a constant variance of σ^2.
5. The error terms are independent.
6. The error terms are identically distributed.

Solution: Which part of "Model 2" (might be a full equation, might just be a word) demonstrates each of the following technical conditions:

1. The average value for the response variable is a linear function of the explanatory variable.

   (3) shows that the relationship is linear in the population,.

2. The error terms follow a normal distribution around the linear model.

   We actually need both (1) and (2). The errors are normal, but they also need to be distributed around the line.

3. The error terms have a mean of zero.

   The "zero" value in $N(0, \sigma^2)$ says that the errors are centered around zero.

4. The error terms have a constant variance of σ^2.

   The σ^2 value in $N(0, \sigma^2)$ says that the errors have variance σ^2 (note that there is no "i" index on σ^2).

5. The error terms are independent.

   The "independent" part is explicitly stated in (2).

6. The error terms are identically distributed.

   The "identical" part is that there is no "i" in $N(0, \sigma^2)$, therefore the model doesn't change for the different values of "i", i.e., the different observations in the population or in the sample.