WS #8 - Permuting

Monday, September 29, 2025

Math 154 - Jo Hardin

Name: _____

Names of people you worked with: _____

What is your favorite 5C dining hall? Why?

Task:

Consider the multiple linear regression model:

$$E[Y] = \beta_{0\cdot 1,2} + \beta_{1\cdot 2} X_1 + \beta_{2\cdot 1} X_2$$

[Note: $\beta_{1\cdot 2}$ means "the coefficient on X_1 given that X_2 is in the model."]

Your friend proposes to permute the variable X_1 in order to create a null sampling distribution for $b_{1\cdot 2}$ (that is, the distribution of $b_{1\cdot 2}$ under the condition that the null hypothesis, $H_0 : \beta_{1\cdot 2} = 0$, is true).

In what way does your friend's permutation scheme violate the exchangeability condition?

Solution:

In the original dataset, there may be a relationship between X_1 and X_2. However, in *every* sample where X_1 is permuted, there will be no correlation between X_1 and X_2.

While permuting X_1 does set up conditions for the null hypothesis to be true ($\beta_{1 \cdot 2} = 0$), it also violates exchangeability because the permuted samples come from a different data distribution than the original dataset.