

Stats 1
(PSCI 8356)
Professor Jim Bisbee

PROBLEM SET 3: Due Tuesday, October 10th at beginning of class.

A reminder: you may work with others in the class on this problem set, and you are in fact encouraged to do so. However, the work you hand in must be your own. Handwritten work is acceptable, but word-processed work (e.g., using L^AT_EX or RMarkdown) is preferred.

1. Solve WMS 5.11 and 5.79
2. Show that, if Y_1 and Y_2 are independent, then:

$$\text{COV}(Y_1, Y_2) = 0$$

3. What is $\text{COV}(Y_i, Y_i)$?
4. Show that S_U^2 is an unbiased estimator for σ^2 :

$$S_U^2 = \frac{\sum_i (Y_i - \bar{Y})^2}{n - 1}$$

5. Is the sample variance $S_n^2 = \frac{\sum_i (Y_i - \bar{Y})^2}{n}$ consistent?
6. There was a poll of 1,006 adults between Sep. 15 and 20, 2023 asking about a hypothetical vote choice if the election were held tomorrow, found that 50% of respondents indicated they would support Trump, and 46% indicated they would support Biden. This marks a reduction in Trump support from a previous tracking poll fielded a week earlier of 1,203 adults who indicated 52% support for Trump and 46% support for Biden.
 - (a) Propose an estimator and prove that it is unbiased.
 - (b) Calculate the 95% confidence interval for this estimator. Does it include zero? How can we interpret this?
 - (c) What about the 90% confidence interval? Does it still include zero?
 - (d) At what level of confidence would we conclude that Trump's support changed between the two surveys? (HINT: use R to help calculate this!)