Statistics 251: Lab 6 Exercises – Inference (Part 1): Point Estimates

Important reminders:

1. Please go through the **Handout** to see the format that you need to answer the questions.
2. Keep track of time so that you will finish on time.
3. Recall the distinction between the sample size and the number of samples.

Exercises:

A certain species of bird is historically known to have a Normally distributed flight speed with a mean of 40 km/hr and a standard deviation of 3 km/hr. You would like to estimate the **true variance** of the flight speed using a sample of birds.

Find the *"best"* estimator of true population variance from the following three estimators:

$$S_0^2 = \frac{1}{n}\sum_{i=1}^{n}(X_i - \bar{X})^2$$

$$S_1^2 = \frac{1}{n-1}\sum_{i=1}^{n}(X_i - \bar{X})^2$$

$$S_2^2 = \frac{1}{n-2}\sum_{i=1}^{n}(X_i - \bar{X})^2$$

1. Do a simulation and examine your results. **(15 min)**
   Draw 10,000 samples of size 10 from the distribution identified above, and calculate the value of each of the above three estimators s_0^2, s_1^2, s_2^2 for each of the 10,000 samples.

2. Examine your results and make a decision. **(15 min)**
   Compare the center and spread of your results for s_0^2, s_1^2, s_2^2 using suitable plots and summary statistics. Which estimator would you choose as the best to estimate the population variance? Briefly justify your choice.

3. Other questions: **(5 min)**
   Generate a suitable plot of the results for the estimator you chose, and describe the shape of the distribution.
   Are there any disadvantages to using a *point estimate* to estimate the *population parameter*? Explain why or why not.