

Lesson 09: Statistical Inference, Hypothesis Testing for Single Populations

References

- Black, Chapter 9 Statistical Inference: Estimation for Single Populations (pp. 265-307)
- Kabakoff, Chapter 7 Basic Statistics (pp.158-160)
- Davies, Chapter 18 Hypothesis Testing (pp. 384-433)
- Stowell, Chapter 10 Hypothesis Testing (pp. 144-146, 158)

Exercises:

Data Set: `hot_dogs.csv` (Original source: Consumer Reports, June 1986, pp. 366-367)

Description: Results of a laboratory analysis of calories and sodium content of major hot dog brands. Researchers for Consumer Reports analyzed three types of hot dog: beef, poultry, and meat (mostly pork and beef, but up to 15% poultry meat). Fifty four observations are reported.

Variable Names:

1. Type = Type of hotdog (beef, meat, or poultry)
 2. Calories = Calories per hot dog
 3. Sodium = Milligrams of sodium per hot dog
- 1) Use `hot_dogs.csv` data and hypothesis tests to determine which type of hot dog has average calories less than 140 with 95% confidence. Present boxplots of calories by type of hot dog.
 - 2) Using `hot_dogs.csv` data and hypothesis tests at the 95% confidence level, determine which type of hot dog has an average Sodium level different from 425 milligrams.
 - 3) Using `hot_dogs.csv` data and hypothesis tests, determine if the variance in Sodium values for beef hot dogs is different from 6000 with 95% confidence.
 - 4) Assume a random sample of size 100 is drawn from a normal distribution for which the mean and variance are unknown. Assume the sample mean is 50 and the standard deviation of the sample is 2. Test the hypothesis that the true mean is 56, and also test the hypothesis the true mean is 40. Report p-values and comment on the results.
 - 5) A coin is flipped 100 times. If it is unbiased the probability of a heads should equal the probability of a tails. At the 95% confidence level, test the null hypothesis the coin is unbiased versus the alternative that it is biased if 43 heads are obtained. Test the same hypothesis if 63 heads are obtained. Use one-sided hypothesis tests.
 - 6) `salaries.csv` contains data derived from a November 8, 1993 article in Forbes titled “America’s Best Small Companies”. The file gives the CEO age and salary for 60 small business firms. Use these data to test the hypothesis at 95% confidence that at least 50% of the CEOs are 45 years old or older. Also test the hypothesis at 95% confidence that at least 50% of the CEOs earn less than \$500,000 per year. Use one-sided hypothesis tests.