

ST511 HW #5

Reading: Read Chapters 6 and 7 of Ott & Longnecker.

See Canvas Calendar for due date.

20 points total, 2 points per problem part unless otherwise noted.

1. Refer to Problem 6.42 which deals with lung capacity of rats exposed to ozone. Note: For consistency, please calculate the differences as After – Before for all questions.
 - A. Are the differences normally distributed? Support your answer by including a qqplot of differences in your assignment.
 - B. Is there sufficient evidence to support the conjecture that ozone exposure increases lung capacity? Use the paired t-test with $\alpha=0.05$. State the hypotheses, test statistic, p-value and conclusion. **(4 pts)**
 - C. Estimate the size of the increase in lung capacity after exposure and construct a 95% t-based CI. Note: provide a standard “two-sided” CI here.
 - D. Rerun the test from part A using the Wilcoxon Paired (Signed Rank) test. Give your p-value and conclusion. Use the `wilcoxsign_test()` function from the `coin` package with `distribution = “exact”`. Remember to use a one-sided alternative.
2. Refer to problem 7.6 which deals with vehicle speeds. Based on a sample of size $n=100$, the sample standard deviation was found to be 11.35. Note: Table 7 (chi-square) does not have information for $df=99$, so please use the `qchisq()` R function to calculate the table values needed for parts A and B.
 - A. Construct a 95% CI for σ .
 - B. Using $\alpha=0.05$, test $H_A: \sigma > 10$. Give your test statistic, rejection rule and conclusion. **(4 pts)**
 - C. What distributional assumption is required for the CI and test to be valid?
 - D. Explain why we reject H_0 for part B even though 10 is contained in the CI from part A.