
Homework 2

Confidence Intervals and Hypothesis Tests

Purpose

Use confidence intervals and hypothesis tests to answer practical questions about hotel performance, wine, and restaurant sales. For each analysis, define the population parameter, state the hypotheses, check the relevant assumptions, report the interval and test result, and answer the question in context.

General Requirements

Use a significance level of $\alpha = 0.05$ and 95% confidence intervals. Report the estimate, confidence interval, test statistic, degrees of freedom when applicable, and p-value. A normality test by itself is not enough. Use a graph and consider the sample size and unusual observations.

Tasks

Hotel ADR and RevPAR

Use `ADR.csv`, which contains Average Daily Rate (ADR) and Revenue per Available Room (RevPAR) for 39 randomly selected hotel days.

1. Is the population mean ADR different from \$130? Use a one-sample confidence interval and hypothesis test.
2. Is the population mean RevPAR different from \$130? Use a one-sample confidence interval and hypothesis test.
3. For each variable, inspect the distribution and explain whether the method is reasonable for these data.

Alcohol Content of Red and White Wine

Use `winequality.csv`.

1. Compare the population mean alcohol content of red and white wine using an independent two-sample method.
2. State whether you used the equal-variance or Welch procedure and justify the choice.
3. Report the estimated difference in means with its 95% confidence interval. Interpret the direction and size of the difference.

Paired Restaurant Sales

Use `Two_restaurants.csv`, which records sales for two fast-food restaurants during the same 11:30 a.m. to 1:00 p.m. periods.

1. Explain why the observations are paired rather than independent.
2. Test whether the population mean sales differ between the restaurants.
3. Construct and interpret a 95% confidence interval for the population mean paired difference.
4. Check the distribution of the paired differences and discuss any concern.

Submission Checklist

Submit through WebCampus (Canvas) by the deadline posted there. Submit both of the following files:

- a rendered PDF report; and
- the complete `.Rmd` source file used to produce the report.

The PDF must include your name and assignment title, answer every question in the order presented, show readable and labeled tables and figures, and explain results in complete sentences. The `.Rmd` file must contain all code needed to reproduce the report. Both files must run from the same data supplied for the assignment. Do not submit unexplained software output. You are responsible for checking all results and explaining every choice you made.

A Note About AI

AI can be used as a resource, but it cannot do the assignment for you. I do not want to read AI slop. Do not paste pages of generated writing, code, or interpretations into your report and expect me to sort through it. In the real world, you cannot send AI garbage to a boss, client, or customer. You should not submit it in this class either.

If you use AI, use it to help you learn. Check what it gives you. Make sure the code works. Internalize the material, interpret it, and then explain it in your own words and voice. You should understand every part of your submission and be able to defend the choices you made. Include a short note at the end of the report that names the tool and tells me how you used it. If the work reads like unreviewed AI output, it will receive a 0%, and you will have the opportunity to redo it under the policy in the syllabus.

How Your Work Will Be Evaluated

Credit is based on the statistical reasoning, correct use of R, appropriate checks of assumptions, quality of visual and numerical evidence, and accuracy of the interpretation. A correct number without an explanation is not a complete answer.