

P Chapter 11 Projects

Project A: Hypothesis Testing for Two Population Parameters

Choose one of the three questions to answer, collect data from members of the appropriate population, and perform a hypothesis test to answer the question. After you have written your conclusion, look at the “truth” and determine if your hypothesis test produced a correct decision, a Type I error, or a Type II error.

Pick one of the following questions to test:

- Is there a difference in study habits for college students who are 25 and older versus those students who are aged 18-24? Ask at least 30 students 25 and older and at least 30 students aged 18-24 to estimate the amount of time they spend studying each week. Assume that the population variances are equal. Use a 0.10 level of significance.
- Do college freshmen spend less money each week eating out than seniors? Ask between 10 and 20 freshmen and between 10 and 20 seniors to estimate the amount of money they spend each week eating out. Assume that the population variances are different and both population distributions are approximately normal. Use a 0.05 level of significance.
- Are the percentages of students and faculty who exercise regularly the same? Ask at least 30 students and at least 30 faculty if they exercise at least three times per week. Record the number of students and the number of faculty who say “yes.” Use a 0.01 level of significance.

Step 1: State the null and alternative hypotheses.

What are the null and alternative hypotheses?

Step 2: Determine which distribution to use for the test statistic, and state the level of significance.

Based on the description of the test you chose, what formula should be used for the test statistic? Also, state the level of significance for your hypothesis test.

Step 3: Gather data and calculate the necessary sample statistics.

Collect data on the claim from the appropriate populations. Discuss which method of data collection you used. List any potential for bias. Calculate the sample statistics needed in order to compute the test statistic.

Calculate the test statistic using your sample statistics.

Step 4: Draw a conclusion and interpret the decision.

Determine the type of your hypothesis test: left-tailed, right-tailed, or two-tailed.

State the decision rule in terms of either the p -value or the rejection region for the test statistic.

What is your conclusion? Be sure to answer the original question.

Types of Errors

Suppose the “truths” are as follows.

- The mean amount of time spent studying each week is higher for students 25 and older in college than for college students aged 18-24.
- The mean amount of money spent eating out each week is higher for freshmen than for seniors.
- The percentage of students who exercise at least three times per week is the same as the percentage of faculty.

Based on your conclusion, did you make a Type I error, Type II error, or a correct decision? Explain.

Project B: ANOVA

A lack of adequate parking is one of the most common complaints of students on any college campus. Is there a difference in the mean number of parking tickets received in one semester by students who commute to campus, students who live in residential housing on campus, students who live in fraternity houses, and students who live in sorority houses? Let's perform a one-way ANOVA test to help us answer this question.

To begin, label the populations as follows.

Population 1: Students who commute to campus

Population 2: Students living in residential housing on campus

Population 3: Students living in fraternity houses

Population 4: Students living in sorority houses

Step 1: State the null and alternative hypotheses.

What are the null and alternative hypotheses?

Step 2: Determine which distribution to use for the test statistic, and state the level of significance.

Assuming that the population distributions are all approximately normal and the population variances are all equal, what formula should be used for the test statistic? Also, choose a level of significance of 0.10, 0.05, or 0.01.

Step 3: Gather data and calculate the necessary sample statistics.

Collect data from five students in each population. Record the number of parking tickets that each student received last semester in a table similar to the one below.

Parking Tickets			
Commuters	Residence Hall	Fraternity House	Sorority House

Use the formulas given in Section 11.6, or available technology (as described in Example 11.6.2), to complete a one-way ANOVA table.

Step 4: Draw a conclusion and interpret the decision.

- a.** Draw a picture of your rejection region, labeling the critical value, or state the rejection rule for p -values depending on the method chosen to draw a conclusion.
- b.** Based on the calculated value of F from the ANOVA table, should you reject the null hypothesis?
- c.** Is there a difference in the mean number of parking tickets received by students who commute to campus, students who live in residential housing on campus, students who live in fraternity houses, and students who live in sorority houses?
- d.** Does your hypothesis test provide any indication that one of the populations receives more parking tickets than another? Explain.