

## Lab Activity: Hypothesis Testing – Matched Pairs

In this lab activity, you will conduct hypothesis testing for claims involving matched pairs.

### Student Learning Outcomes

By the end of this chapter, you should be able to do the following:

- Perform hypothesis testing for matched pairs using Statcato
- Interpret the results of hypothesis tests

### Preliminary

**Read** Chapter 10 Hypothesis Testing: Two Means, Paired Data, Two Proportions in:

Illowsky, Barbara, and Susan Dean. Collaborative Statistics. Connexions. 2 Mar. 2010  
<<http://cnx.org/content/col110522/1.37/>>.

### Background


In this activity, you will test a claim describing the relationship of the labor force participation rate (LFPR) of women in the U.S. during the year of 1972 and 1968. The sample data consists of matched pairs, each of which represents the LFPR of women in a U.S. city in each of the two years.

### Loading Data

This lab uses data obtained from <http://lib.stat.cmu.edu/DASL/Datafiles/LaborForce.html> (Original Source: United States Department of Labor Statistics). The data file is also available on the Statcato web site.



#### Loading an Online Dataset

- Go to **File > Load Dataset**. Or click the  icon in the toolbar.
- Under Online Datasets, enter the web address: <http://www.statcato.org/labs/data/labor.xls>. Select “Excel” in the dataset file type drop-down menu.
- Click **Load Dataset**.

The data should now be in Data window. The labels of the samples (city) are in C1, and the labor force participation rates of women in 1972 and 1968 are in C2 and C3, respectively.

### Formulating the Hypothesis Test

Answer the following questions in **LR: Hypotheses**.

- State the claim that you are testing. Make a guess on the relationship between the LFPR in 1972 and that in 1968.

- On average, the LFPR in 1972 is (less than/equal to/not equal to/greater than) the LFPR in 1968.
- State the null and alternative hypotheses.
  - $H_0$ :
  - $H_a$ :
- Is this a right-tailed, left-tailed, or two-tailed test?
- Define the random variable for this test.

### ***Performing the Hypothesis Test***

Using Statcato, you will perform calculations for the hypothesis test using a significance level of 0.05 ( $\alpha = 0.05$ ).



#### **Performing Hypothesis Test: Matched Pairs**

Go to **Statistics > Hypothesis Tests > Matched Pairs**.

- For **Inputs**, select **Samples in Columns**. Select **C2** for the **First Sample** and **C3** for the **Second Sample**.
- For **Significance Level**, enter **0.05**.
- For **Alternative Hypothesis**, choose the appropriate form of the alternative hypothesis in the drop-down menu. Enter **0** in the **Hypothesized Mean Difference** text box.
- Click **OK**.

Copy the computation results to **LR: Hypothesis Test**.

### ***Making Conclusions***

Based on the computer-generated results, you will make decisions and draw conclusions for the hypothesis tests. Record your answers in **LR: Interpretation**.

#### **Decisions on Null Hypothesis**

Recall that

- If  $\alpha \leq p\text{-value}$ , do not reject  $H_0$ .
- If  $\alpha > p\text{-value}$ , reject  $H_0$ .

Based on the significance level  $\alpha$  and the computed p-values, decide whether to reject  $H_0$  and explain why.

#### **Conclusions**

Based on your decisions on the null hypothesis, make a conclusion about your claim. For example, your conclusion could be worded as follows:

At the 5% level of significance, the sample data (shows / does not show) sufficient evidence to support the claim that \_\_\_\_\_.

## ***Discussion***

Answer the following questions in **LR: Discussion**.

1. Test the same claim using a hypothesis test for two independent means (t-test). Compare the results with those obtained earlier using a hypothesis test for matched pairs. Explain why the results of the two tests are different.