

How to Perform a Paired Samples t-test in Stata

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A Paired Samples t-test is a statistical test used to compare the means of two related groups or conditions. It is commonly used in research studies to determine if there is a significant difference between the means of two variables measured from the same individuals. In Stata, this test can be conducted by using the "ttest" command and specifying the two variables to be compared. Stata will automatically calculate the mean difference between the two variables and perform the t-test, providing results such as the t-statistic, degrees of freedom, and p-value. The output can then be interpreted to determine if there is a significant difference between the two groups or conditions. This allows for a quick and efficient analysis of paired data in Stata.

Perform a Paired Samples t-test in Stata

A is used to compare the means of two samples when each observation in one sample can be paired with an observation in the other sample.

This tutorial explains how to conduct a paired samples t-test in Stata.

Example: Paired samples t-test in Stata

Researchers want to know if a new fuel treatment leads to a change in the average mpg of a certain car. To test this, they conduct an experiment in which they measure the mpg of 12 cars with and without the fuel treatment.

Since each car receives the treatment, we can conduct a paired t-test in which each car is paired with itself to determine if there is a difference in average mpg with and without the fuel treatment.

Perform the following steps to conduct a paired t-test in Stata.

Step 1: Load the data.

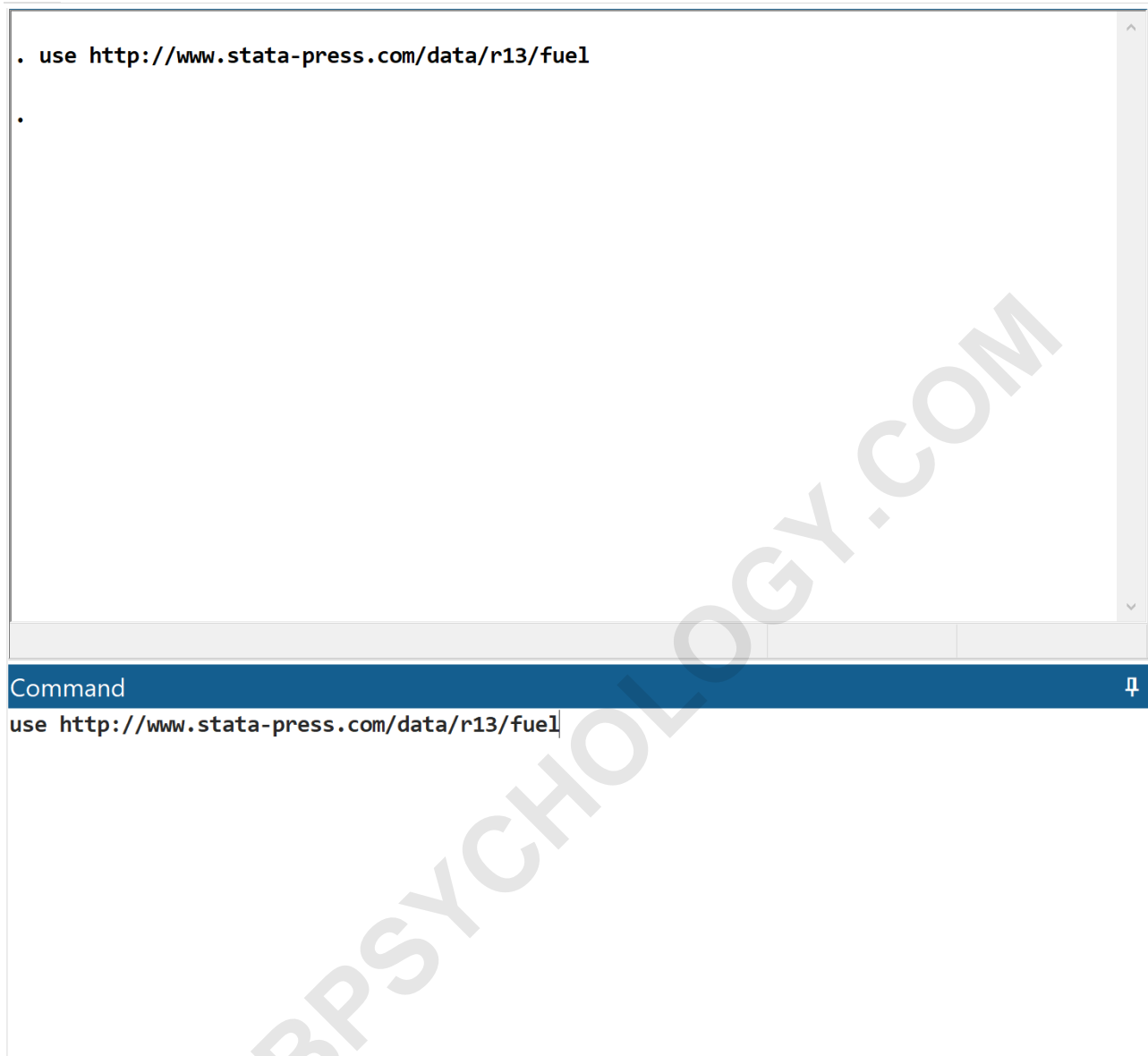
First, load the data by typing use <http://www.stata-press.com/data/r13/fuel> in the command box and clicking Enter.

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```
. use http://www.stata-press.com/data/r13/fuel1
.
```

Command

```
use http://www.stata-press.com/data/r13/fuel1
```

A screenshot of the Stata command window. The main window shows the command '. use http://www.stata-press.com/data/r13/fuel1' followed by a blank line and a period. Below this is a blue bar labeled 'Command' with the same command entered. A large, diagonal watermark 'ARABPSYCHOLOGY.COM' is overlaid across the entire image.

Step 2: View the raw data.

Before we perform a paired t-test, let's first view the raw data. Along the top menu bar, go to **Data > Data Editor > Data Editor (Browse)**. The first column, *mpg1*, shows the mpg for the first car without fuel treatment while the second column, *mpg2*, shows the mpg for the first car

with the fuel treatment.

	mpg1	mpg2		
1	20	24		
2	23	25		
3	21	21		
4	25	22		
5	18	23		
6	17	18		
7	18	17		
8	24	28		
9	20	24		
10	24	27		
11	23	21		
12	19	23		

Step 3: Perform a paired t-test.

Along the top menu bar, go to **Statistics > Summaries, tables, and tests > Classical tests of hypotheses > t test (mean-comparison test)**.

Choose **Paired**. For First variable, choose **mpg1**. For Second variable, choose **mpg2**. For Confidence level, choose any level you'd like. A value of 95 corresponds to a significance level of 0.05. We will leave this at 95. Lastly, click **OK**.

Obs: The number of observations. There are 12 observations in each group.

Mean: The mean mpg. In group 0, the mean is 21. In group 1, the mean is 22.75.

Std. Err: The standard error, calculated as σ / \sqrt{n}

Std. Dev: The standard deviation of mpg.

95% Conf. Interval: The 95% confidence interval for the true population mean of mpg.

t: The test statistic of the paired t-test.

degrees of freedom: The degrees of freedom to be used for the test, calculated as $\#pairs - 1 = 12 - 1 = 11$.

The p-values for three different two sample t-tests are displayed at the bottom of the results. Since we are interested in understanding if the average mpg is simply different between the two groups, we will look at the results of the middle test (in which the alternative hypothesis is $H_a: \text{diff} \neq 0$) which has a p-value of 0.0463.

Since this value is smaller than our significance level of

0.05, we reject the null hypothesis. We have sufficient evidence to say that the true mean mpg is different between the two groups.

Step 5: Report the results.

Lastly, we will report the results of our paired t-test. Here is an example of how to do so:

A paired t-test was conducted on 12 cars to determine if a new fuel treatment lead to a difference in mean miles per gallon.

Results showed that the mean mpg was statistically significantly different between the two groups ($t = -2.2444$ w/ $df=11$, $p = .0463$) at a significance level of 0.05.

A 95% confidence interval for the true difference in population means resulted in the interval of (-3.466, -.034).

Based on these results, the new fuel treatment leads to a statistically significantly higher mpg for cars.