T-TEST

DEFINITION:

A t-test is an analysis of two populations means through the use of statistical examination; a t-test with two samples is commonly used with small sample sizes, testing the difference between the samples when the [variances](http://www.investopedia.com/terms/v/variance.asp) of two [normal distributions](http://www.investopedia.com/terms/n/normaldistribution.asp) are not known.

A t-test looks at the t-statistic, the t-distribution and [degrees of freedom](http://www.investopedia.com/terms/d/degrees-of-freedom.asp) to determine the probability of difference between populations; the test statistic in the test is known as the t-statistic. To conduct a test with three or more variables, an [analysis of variance (ANOVA)](http://www.investopedia.com/terms/a/anova.asp) must be used.

T-TEST FORMULA:

T test is used to compare two different set of values. It is generally performed on a small set of data. T test is generally applied to normal distribution which has a small set of values. This test compares the mean of two samples. T test uses means and standard deviations of two samples to make a comparison. The formula for T test is given below:

T Test Formula

Where,  
x1¯x1¯ = Mean of first set of values  
x2¯x2¯ = Mean of second set of values  
S1 = Standard deviation of first set of values  
S2 = Standard deviation of second set of values  
n1 = Total number of values in first set  
n2 = Total number of values in second set.  
  
The formula for standard deviation is given by:

Formula for Standard Deviation

Where,  
x = Values given  
x¯x¯ = Mean  
n = Total number of values.

HTPOTHESIS:

Like many statistical procedures, the paired sample *t*-test has two competing hypotheses, the null hypothesis and the alternative hypothesis. The null hypothesis assumes that the true mean difference between the paired samples is zero. Under this model, all observable differences are explained by random chance. Conversely, the alternative hypothesis assumes that the true mean difference between the paired samples is not equal to zero. The alternative hypothesis can take one of several forms depending on the expected outcome. If the direction of the difference does not matter, a two-tailed hypothesis is used. Otherwise, an upper-tailed or lower-tailed hypothesis can be used to increase the power of the test.

TYPES OF T-TEST:

\*PARIED T-TEST

\*UNPARIED T-TEST

PARIED T-TEST

The paired sample *t*-test, sometimes called the dependent sample *t*-test, is a statistical procedure used to determine whether the mean difference between two sets of observations is zero.

In a paired sample *t*-test, each subject or entity is measured twice, resulting in *pairs* of observations. Common applications of the paired sample *t*-test include case-control studies or repeated-measures designs.

Suppose you are interested in evaluating the effectiveness of a company training program. One approach you might consider would be to measure the performance of a sample of employees before and after completing the program, and analyze the differences using a paired sample *t*-test.

Here also we can use the same t-test formula

T Test Formula

STEPS&hypothesis:

1. Firtly we can take 2 sets of values
2. Find the mean of the each set of values by using the formula

x¯= ∑x/n

1. Formula for Standard DeviationThen find the standard deviation for each set of values by using the formula

4.calculate the each set of values

\*number of terms in first set(n1) and number of terms in second term(n2)

\*means of the values of 2sets of data

5. Then apply these values for finding of paired t-test value

T Test Formula

6.then find the “p” from the t-table

Finally:

7.we can get the mean difference between the 2paried samples is zero it is a null hypothesis otherwise it is a alternate hypothesis.

UNPARIED T-TEST:

This function gives an unpaired two sample [Student t](http://www.statsdirect.com/help/distributions/t.htm) test with a confidence interval for the difference between the means.

The unpaired t method tests the null hypothesis that the population means related to two independent, random samples from an approximately normal distribution are equal

Here also use the same formula but u can change the size of sets may or may not be.(n1&n2 diff)

T Test Formula

STEPS & hypothesis:

1. Firtly we can take 2 sets of values
2. Find the mean of the each set of values by using the formula

x¯= ∑x/n

1. Formula for Standard DeviationThen find the standard deviation for each set of values by using the formula

4.calculate the each set of values

\*number of terms in first set(n1) and number of terms in second term(n2) are not same some times

\*means of the values of 2sets of data

5. Then apply these values for finding of paired t-test value

T Test Formula

6.then find the “p” from the t-table

Finally:

7.we can get the mean difference between the 2paried samples is zero it is a null hypothesis otherwise it is a alternate hypothesis.

Example:

**Question 1:**Find the t-test value for the following two sets of values:  
7, 2, 9, 8 and 1, 2, 3, 4?  
  
**Solution:**

Formula for mean:  
x¯x¯ = ∑xn∑xn  
Formula for standard deviation:  
S=∑(x−x¯)2n−1−−−−−−√S=∑(x−x¯)2n−1  
Calculation for first set:  
Number of terms in first set:  
n1 = 4  
Mean for first set of data:  
x1¯x1¯ = 6.5  
Construct the following table for standard deviation:

|  |  |  |
| --- | --- | --- |
| x1 | x1−x1¯x1−x1¯ | (x1−x1¯)2(x1−x1¯)2 |
| 7 | 0.5 | 0.25 |
| 2 | -4.5 | 20.25 |
| 9 | 2.5 | 6.25 |
| 8 | 1.5 | 2.25 |
|  |  | ∑(x1−x1¯)2∑(x1−x1¯)2 = 29 |

Standard deviation for first set of data:  
S1 = 3.11  
Calculation for second set:  
Number of terms in second set:  
n2 = 4  
Mean for second set of data:  
x2¯x2¯ = 2.5  
Construct the following table for standard deviation:

|  |  |  |
| --- | --- | --- |
| x2 | x2−x2¯x2−x2¯ | (x2−x2¯)2(x2−x2¯)2 |
| 1 | -1.5 | 2.25 |
| 2 | -0.5 | 0.25 |
| 3 | 0.5 | 0.25 |
| 4 | 1.5 | 2.25 |
|  |  | ∑(x2−x2¯)2∑(x2−x2¯)2 = 5 |

Standard deviation for first set of data:  
S2 = 1.29  
Formula for t-test value:  
tt = x1¯−x2¯S21n1+S22n2√x1¯−x2¯S12n1+S22n2  
tt = 6.5−2.59.6674+1.6674√6.5−2.59.6674+1.6674  
t = 2.3764 = 2.38 (approx)