F-test (statistics) T-test Statistical Hypothesis Testing +3

What's the difference between an F-Test and T-Test?

Answer Request Follow 31 Comment Share Downvote

7 Answers

Madhav Banerjee, Completed a course on Data Analytics from IIM Bangalore
Written 26 Jan

T-test and F-test are completely two different things.

1. T-test is used to estimate population parameter, i.e. population mean, and is also used for hypothesis testing for population mean. Though, it can only be used when we are not aware of population standard deviation. If we know the population standard deviation, we will use Z-test.

For eg. Suppose a data suggests that the average height of boys between 10-16 years in city X is 6 Feet. So, we want to test this hypothesis,whether the height of boys between 10-16 years in city X is less than, more than, or equal to 6 Feet. For doing so, we will take some samples, say 2000, and find out the height of boys between age 10 to 16 years. We will calculate the standard deviation of the 2000 boys, and calculate the **t-statistic**=

$$t = \frac{\overline{X} - \mu}{\frac{s}{\sqrt{N}}}$$

X bar = sample mean

u= pop mean

S= sample standard deviation

n= sample size

df= n-1

Once we calculate t-statistic, we will compare it with the critical value. Suppose, we take **α**=.05, as it is two tailed test, **α/2= .025,** we then look at the table value for t, with **degrees of freedom** =n-1, 2000-1, and **α/2=0.25** which is=±1.96.

Once we get the t-value, we will compare whether our t-statistic is greater than +1.96 or less than -1.96. . If it is greater than +1.96 or less than -1.96, we reject the null hypothesis, which means, that the average height of boys in city X is not equal to 6 feet. If our t-statistic is between ±1.96, we fail to reject the null hypothesis, which means, that the average height of boys in city X is equal to 6 feet. This is when we conduct hypothesis testing.

2. We can also use t-statistic to estimate population mean:

Eg. Suppose,a large conglomerate like TCS(Indian IT company), which has employees more than 300,000. So, TCS wants to estimate average over time an employee works for the company, in a week. So, it is might not be possible to get required data(hypothetical situation, though these days it might be possible) from all employees. Therefore, the company takes a sample, say 3000, and finds the number of extra hours of work, employees have done in week. With the help of the sample mean and sample standard deviation; for the entire population- one can estimate the range of average number of extra hours of work, employees have done in week.

Confidence interval to find out the range= $\bar{x} \pm t\alpha/2,n-1 * S/\sqrt{n} \leq \mu \leq \bar{x} \pm t\alpha/2,n-1 * S/\sqrt{n}$.

3. t-statistic is also used for finding out the difference in two population mean with the help of sample means.

For eg, suppose, if we want to understand buying behaviour of customers from two cities for a particular product. We want to understand whether there is any difference in buying

More Related Questions

Question Stats

31 Followers

55,810 Views

Last Asked 11 Jun

1 Merged Question

Edits

behaviour in these cities,or is it similar.

F-statistic

Z statistic or t-statistic is used to estimate population parameters- population mean & proportion. It is also used for testing hypothesis for population mean or population proportion.

Unlike Z-statistic or t-statistic, where we deal with mean & proportion, Chi-square or F-test is used for finding out whether there is any variance within the samples. F-test is the ratio of variance of two samples.

Eg. Suppose, in a manufacturing plant there are 2 machines producing same products, and the management wants to understand, whether there is any variability among the products produced by these two machines. Researcher will take samples from both the machines and find out the variability, and test it against the null hypothesis, i.e. the prescribed limit.

F-statistic also forms the basis for ANNOVA.

Happy to receive any suggestion.

Justin Ma, PhD Student in Plant Breeding and Genetics, MS Analytics
Written 16 Oct 2013 · Upvoted by Jay Verkuilen, PhD Psychometrics, MS Mathematical Statistics, UIUC

A t-test is a specific case of an F-test, where you only have two treatments/populations.

Note that F=t^2.

Also note, both of these are special cases of a linear regression.

27.9k Views · View Upvotes

Upvote 8 Downvote Comment

Jay Verkuilen, PhD Psychometrics, MS Mathematical Statistics, UIUC
Written 11 Jun · Upvoted by Peter Flom, Independent statistical consultant for researchers in behavioral, social and medical sciences

Primarily, the number of parameters included in them. The t test is equivalent to a 1 numerator df F test. They make the same decision and indeed if you square the t statistic it's equivalent to the F test. (Try it with simple linear regression and see.) The F test is more general because it includes more coefficients, which are tested simultaneously.

If you look at the two sample t test, it has

$t = \left(\frac{\bar{y}_1 - \bar{y}_0}{s_{pooled}}\right)\sqrt{\frac{1}{n_0} + \frac{1}{n_1}}$ where

$s^2_{pooled} = \frac{(n_0-1)s_0^2 + (n_1-1)s_1^2}{n_0+n_1-2}$,

which is a degree of freedom weighted average of the two sample variances. If you square t and do some rearranging,

This is equivalent to an F-statistic with 1 numerator df and $n_0 + n_1 - 2$ error df, and is indeed of the general form of

$F = \frac{BetweenSumofSquares}{WithinSumofSquares} \times (SampleSize).$

It's kind of math-heavy, but near the end of Hotelling's T-squared distribution you can see the two-sample t-test worked out in terms of the Hotelling's T-squared, which is an F test.

8.5k Views · View Upvotes · Answer requested by Sandeep Dongre, Ashley Haselwood, and 5 more

Upvote 6 Downvote Comment

Related Questions

What are some example uses of the F-test?

What is meant by F Test in statistics?

Can I use a t-test to compare the means of two groups with different sizes (100 and 900 people)?

What do the following terms mean: OLS estimates, t and F tests?

How do I know if I should use T-Test of F-Test? And

Lilit Khachatryan, All models are wrong, but some are useful.
Written 16 Oct 2013

A t-test is used for testing the mean of one population against a standard or comparing the means of two populations if you do not know the populations' standard deviation and when you have a limited sample (n < 30), while
an F-test is used to compare 2 populations' variances. The samples can be any size. It is the basis of ANOVA.

Difference between Z-test, F-test, and T-test

19.3k Views · View Upvotes

Upvote 9 Downvote Comment

Patrick Yan, Learned something about it
Written 4 Jan 2012

Put simply, an F-test is used for a general linear test, while a t-test is used for a simple linear test.

When you have a complex model, you can test your null and alternative hypotheses with

How do I know if I should use T-Test or F-Test? And how do I recognize it?

What do the individual t-statistics and p-values for each term in a regression have to do with the difference-of-means tests between treatment...

Why would a t-test show a significant difference between two groups, when the results from an experiment showed no difference?

How do I find whether the difference between two t-tests is significant?

17.3k Views · View Upvotes

Upvote 7 Downvote Comment

Sahil Talwar, I'm Jack's raging curiosity!
Written 30 Apr 2015

A t-statistic is a ratio of a standard normal and under root of chi square divided by its degree of freedom i.e, t=z/undrt(chi-sq/df) whereas f statistic is the ration of two chi square variates divided by there respective df i.e, f= (chi-sq1/df1)/(chi-sq2/df2). It is only one case when both these statistics have a relation when df of numerator is 1 then t statistic is under root f statistic i.e t(k)= undrt(F(1,k)) in words underoot of f statistic with df 1,k

Related Questions

What are some example uses of the F-test?

What is meant by F Test in statistics?

Can I use a t-test to compare the means of two groups with different sizes (100 and 900 people)?

What do the following terms mean: OLS estimates, t and F tests?

How do I know if I should use T-Test or F-Test? And

equals t statistic with df k.
In regression hypothesis testing the difference is most prominent. t statistic is used to test the significance of indivisual coefficients and f statistic is used to test the overall significance of the model.
So these two statistics although having a relation, are still very different from each other, in theory as well as in practical applications.

12.2k Views · View Upvotes

Upvote 4 Downvote Comment

How do I know if I should use T-Test or F-Test? And how do I recognize it?

What do the individual t-statistics and p-values for each term in a regression have to do with the difference-of-means tests between treatment...

Why would a t-test show a significant difference between two groups, when the results from an experiment showed no difference?

How do I find whether the difference between two t-tests is significant?

Top Stories from Your Feed

Related Questions

What are some example uses of the F-test?

What is meant by F Test in statistics?

Can I use a t-test to compare the means of two groups with different sizes (100 and 900 people)?

What do the following terms mean: OLS estimates, t and F tests?

How do I know if I should use T-Test of F-Test? And