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F-Test

Explorable.com, Lyndsay T Wilson62.2K reads

Any statistical test that uses F-distribution can be called an F-test. It is used when the sample size is small i.e. $n < 30$.

For example, suppose one is interested to test if there is any significant difference between the mean height of male and female students in a particular college. In such a situation, a t-test for difference of means can be used.

However one assumption of the t-test is that the variance of the two populations is equal; in this case the two populations are the populations of heights for male and female students. Unless this assumption is true, the t-test for difference of means cannot be carried out.

The F-test can be used to test the hypothesis that the population variances are equal.

The banner features the Explorable logo at the top center. Below it are three quiz cards arranged horizontally. Each card has a small image at the top and a title below. The first card shows roller skates on a wooden deck with the title 'Quiz: Psychology 101 Part 2'. The second card shows a fan of colorful pens with the title 'Quiz: Psychology 101 Part 2'. The third card shows a Ferris wheel at sunset with the title 'Quiz: Flags in Europe'. To the right of the cards is a link that says 'See all quizzes =>'.

F-tests for Different Purposes

There are different types of t-tests for different purposes. Some of the more common types are outlined below.

- 1.

F-test for testing equality of variance is used to test the hypothesis of the equality of two population variances ^[1]. The height example above requires the use of this test.

2. *F-test for testing equality of several means*. The test for equality of several means is carried out by the technique called ANOVA ^[2].

For example, suppose that an experimenter wishes to test the efficacy of a drug at three levels: 100 mg, 250 mg and 500 mg. A test is conducted among fifteen human subjects taken at random, with five subjects being administered each level of the drug.

To test if there are significant ^[3] differences among the three levels of the drug in terms of efficacy, the ANOVA technique has to be applied. The test used for this purpose is the F-test.

3. *F-test for testing significance of regression* is used to test the significance of the regression model. The appropriateness of the multiple regression ^[4] model as a whole can be tested by this test. A significant F value indicates a linear relationship between Y and at least one of the Xs.

Assumptions

Irrespective of the type of F-test used, one assumption has to be met: the populations from which the samples are drawn have to be normal. In the case of the F-test for equality of variance ^[1], a second requirement has to be satisfied in that the larger of the sample variances has to be placed in the numerator of the test statistic.

Like t-test, F-test is also a small sample test and may be considered for use if sample size is < 30.

Deciding

In attempting to reach decisions, we always begin by specifying the null hypothesis ^[5] against a complementary hypothesis called the alternative hypothesis ^[6]. The calculated value of the F-test with its associated p-value is used to infer whether one has to accept or reject the null hypothesis.

All statistics software packages provide these p-values. If the associated p-value is small i.e. (< 0.05) we say that the test is significant at 5% and we may reject the null hypothesis and accept the alternative one.

On the other hand if the associated p-value of the test is > 0.05, we should accept the null hypothesis and reject the alternative. Evidence against the null hypothesis will be considered very strong if the p-value is less than 0.01. In that case, we say that the test is significant at 1%.

Source URL: <https://explorable.com/f-test?gid=1586>

Links

- [1] <https://explorable.com/statistical-variance>
- [2] <https://explorable.com/anova>
- [3] <https://explorable.com/significance-test>
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