F Test Calculator

The F test calculator compares the equality of two variances..
It also validates the data normality, checks the test power, identify the outliers and generates the R syntax.

Video

Calculators

F distribution
Levene's test
Chi-Square test
F sample size
F test power
ANOVA
Linear Regression

Tails: Two (H₁:σ1 ≠ σ2)

Significance level (α): 0.05

Outliers: Included

Effect: Medium

Ratio Var_1/Var_2: 1.15

- ○ Enter summarized data: SD, n
- ◉ Enter raw data directly
- ○ Enter raw data from excel

Group1	Group2
2608	2636
2617	2631
2616	2637
2617	2648
2616	2637
2628	2631
2607	2637
2615	2613
	2611
	2630
	2632
	2645
	2635
	2637

Calculate | Clear | Validate | Load last run

Group1 contains 8 values
Group2 contains 20 values
validation:success

Group name:	Group1	Group2
Sample SD (S):	6.436503	9.221828
Sample size (n):	8	20
Sample average (x̄):	2615.5	2631.9
Skewness:	0.660029	-0.754572
Skewness Shape:	Potentially	Potentially
Normality:	0.1712	0.1603
Outliers:	2628	2611, 2613
Outlier count:	1	2

How to do with R?

F test for variances, using F distribution (df_{num}=7,df_{denom}=19) (two-tailed) (validation)

1. H_0 hypothesis
Since p-value > α, H_0 cannot be rejected.
The standard deviation (S) of **Group1's** population is assumed to be **equal to** the standard deviation (S) of **Group2's** population.
In other words, the difference between the sample standard deviation (S) of **Group1** and **Group2** is not big enough to be statistically significant.

2. P-value
The p-value equals 0.3357, (p(x≤F) = 0.1678). It means that the chance of type I error, rejecting a correct H_0, is too high: 0.3357 (33.57%).
The larger the p-value the more it supports H_0.

3. The statistics
The test statistic F equals 0.4872, which is in the 95% region of acceptance: [0.2231 : 3.0509].
$S1^2/S2^2$=0.7 ,is in the 95% region of acceptance: [0.4723 : 1.7467].
The 95% confidence interval of σ_1^2/σ_2^2 is: [0.1597 , 2.1839].

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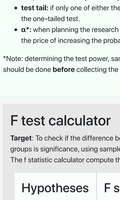

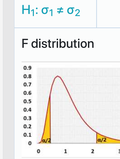

Test validation

The requested test was calculated, however, this may not be the right of test for the hypothesis.

- **Outliers**

Outliers' detection method: Tukey Fence, k=1.5
Group1 contains 1 potential outlier, which is 12.5% of the observations.
Group2 contains 2 potential outliers, which is 10% of the observations.

- **Normality assumption**

The assumption was checked based on the Shapiro-Wilk Test, (α=0.05)
It is assumed that **Group1** is normally distributed (p-value is 0.171), or more accurately, you can't reject the normality assumption.
It is assumed that **Group2** is normally distributed. (p-value is 0.16), or more accurately, you can't reject the normality assumption.

- **Test power**

The priori power is low (0.05984), hence the test may not reject an incorrect h_0

Recommendations
Please check carefully the outliers.

It is suggested to improve the test power by:

- **sample size:** use a larger sample.
- **σ:** check if the standard deviation can be reduced by eliminating noises that are not relevant to the tested measurement.
- **effect size*:** when planning the research it was possible to increase the effect size, at the price of the ability to identify smaller effect sizes.
- **test tail:** if only one of either the positive or negative changes is relevant, change to the one-tailed test.
- **α*:** when planning the research it was possible to increase the significance level (α), at the price of increasing the probability of a type I error.

*Note: determining the test power, sample size, effect size and the significant level (α) should be done **before** collecting the data.

F test calculator

Target: To check if the difference between the population's standard deviations of two groups is significance, using sample data
The f statistic calculator compute the p-value, the F statistic, and the test power.

Hypotheses	F statistic
H_0: $\sigma_1 = \sigma_2$ H_1: $\sigma_1 \neq \sigma_2$	$F_{n_1-1,n_2-1} = \frac{S_1^2}{S_2^2}$

F distribution

Assumptions

Normal distribution - the F test for variances is very sensitive to the normality assumption.

Required Sample Data

S S_1, S_2 -Sample standard deviations of group1 and group2.

n n_1, n_2 - Sample size of group1 and group2.

R syntax

The following R code should produce the same results:

```
rm(list = ls())
if(!"stats" %in% installed.packages()){install.packages("stats")}
library(stats)
x1<-c(2608,2617,2616,2617,2616,2628,2607,2615)
x1<-
```