Two-Sample F-Test for Variances

The **TWO-SAMPLE F-TEST** is used to test whether the two samples are from normal populations with equal variances. The null hypothesis is that the variances for the two samples are equal. This F-test is very sensitive to non-normality, so it is recommended to check the normality of data.

Assumptions

Samples arise from normal populations with homogeneous variances.

How To

- ✓ RUN**: STATISTICS->BASIC STATISTICS->TWO-SAMPLE F-TEST FOR VARIANCES...**
- ✓ Select two variables.
- ✓ (v6.3+) Optionally, specify the test ratio other than 1 (variances are equal).
- ✓ **Listwise** deletion is used for missing values removal.

Results

SAMPLE SIZE, MEAN, VARIANCE, STANDARD DEVIATION, MEAN STANDARD ERROR are calculated for each input variable. See the **DESCRIPTIVE STATISTICS** procedure for more information.

F – test statistic, is the ratio of variances from both samples, has an F-distribution under the null hypothesis.

$$F = {\sigma_1^2}\Big/{\sigma_2^2}$$

F CRITICAL VALUE ($\alpha\%$) – critical values of the F distribution: one-tailed critical value $F_{crit}(\alpha, N_1 - 1, N_2 - 1)$, and two-tailed critical value $F_{crit}(\alpha/2, N_1 - 1, N_2 - 1)$.

P-LEVEL values are provided for the two-tailed test (alternative hypothesis H_1: $\sigma_1^2 \neq \sigma_2^2$), lower one-tailed test (H_1: $\sigma_1^2 < \sigma_2^2$) and for the upper one-tailed test (H_1: $\sigma_1^2 > \sigma_2^2$).

F [LARGER/SMALLER] SECTION

Many authors suggest using the sample with the largest variance for the numerator.

$$F_{l/s} = \frac{\sigma_{Larger}^2}{\sigma_{Smaller}^2}, \sigma_{Larger}^2 > \sigma_{Smaller}^2.$$

When using the sample with the largest variance for the numerator F is always greater than one, and we can simply compare the observed $F_{l/s}$ value with the two-tailed **CRITICAL VALUE** to determine whether the null hypothesis (variances are equal: $\sigma_1^2 = \sigma_2^2$) should be accepted. If the observed $F_{l/s}$ value is greater than the two-tailed critical value, the null hypothesis is rejected and the conclusion is that the two variances differ significantly.

References

Snedecor, George W. and Cochran, William G. (1989), Statistical Methods, Eighth Edition, Iowa State University Press.