

Bartlett's Test for Homogeneity of Variances

José Maurício Schneedorf Ferreira da Silva

2026-02-10

Bartlett's test evaluates whether a dataset composed of k groups exhibits homogeneous variance among its elements. The logic of the test involves computing the T statistic and comparing it with the predicted value from the χ^2 distribution.

1 Equation:

$$T = \frac{(N - k) \ln(s_p^2) - \sum_{i=1}^k (N_i - 1) \ln(s_i^2)}{1 + \frac{1}{3(k-1)} \left(\sum_{i=1}^k \frac{1}{N_i - 1} \right) - \frac{1}{N - k}}$$

With:

$$s_p^2 = \sum_{i=1}^k (N_i - 1) \frac{s_i^2}{N - k}$$

Where:

- s_i^2 = variance of group i ;
- N_i = size of group i ;
- N = total sample size;
- k = number of groups;
- s_p^2 = pooled variance.

2 Files

- Program;
- Example
- Source code;
- This tutorial

3 Bart1matrix

Based on a simple data matrix (column vectors), the program outputs the critical χ^2 value at 5% significance level ($\alpha = 0.05$), the T statistic, and the associated p -value.

4 Usage and example

1. Enter the data `matrix` (column vectors);
2. Run `"Bart1matrix"`.

The compressed file includes an example comparing the dry weight of control plant groups with two treatment groups. The data were obtained from the `datasets` library of the statistical computing environment [R](#) — *PlantGrowth*. The figures below illustrate the execution of the program using this example dataset.

When compared with results obtained using *R* (see Figure below), the p -value was 0.2371 ($\chi^2 = 2.966$), in agreement with NIST (2026).



(a) Example as a data matrix.

(b) Results obtained from Bartlett's test.

Figure 1: *Bart1matrix* program running on the Android version of the HP50G calculator (Go49gp), showing data input and results using the example dataset.

5 References:

1. NIST. *Engineering Statistics Handbook*. Bartlett's Test. Available at: <https://www.itl.nist.gov/div898/handbook/eda/section3/eda357.htm>. Accessed on Feb 9, 2026.

Author

José Maurício Schneedorf Ferreira da Silva
Dept. Biochemistry, Institute of Biomedical Sciences
Federal University of Alfenas - UNIFAL-MG, Brazil
Email: jose.dasilva@unifal-mg.edu.br

Site: <https://bioquanti.netlify.app>
Lattes: <http://lattes.cnpq.br/0436922594542722>
ORCID: 0000-0002-2031-6315