Can the Bartlett test really detect the heterogeneity of variances?

Crysttian Arantes Paixão*
Universidade Federal de Santa Catarina, Curitibanos/SC, Brasil
crysttian.arantes.paixao@ufsc.br

Katia Alves Campos*
Instituto Federal de Educação, Ciência e Tecnologia, Machado/MG, Brasil
katia.campos@ifsuldeminas.edu.br

Augusto Ramalho de Morais*
Universidade Federal de Lavras, Departamento de Ciências Exatas, Lavras/MG, Brasil
armorais@dex.ufla.br

The hypotheses about the variances were established to propose a favorable situation (simulation on $H_0$ is true, $H_0 : \sigma^2_1 = \sigma^2_2 = \sigma^2_3 = \sigma^2_4$ and an unfavorable one (on $H_0$ is false, $H_1 : 4\sigma^2_i$, with $i = 0, 1, 2$ e 3) in order to assess the efficiency of Bartlett’s Test (1937). Six scenarios with seven response variables were generated without considering correlation between the variables: two under the hypothesis about the true averages, without differences as to the variance simulation ($H_0 - H_0$), and about heteroscedasticity ($H_0 - H_1$), two under $H_1$ homoscedastic, with two standard deviations of difference between the averages, $H_1 : 2s - H_0$ and also with eight standard deviations of difference, $H_1 : 8s - H_0$, and two under $H_1$ heteroscedastic, $H_1 : 2s - H_1$ e $H_1 : 8s - H_1$, respectively. In order to evaluate the tests in each simulated response variable, the number of accepted null hypotheses was calculated. The results were presented as percentage (accepted number of $H_0/1000$). Overall, Bartlett’s Test obtained high acceptance values of homoscedasticity, even for the simulated scenario under means difference of eight standard deviations (95.8%). This result suggests that in addition to Bartletts test other means of evaluating the variance homogeneity should also be used.

**Keywords:** Multivariate Analysis; simulation; Bartletts Test; variance homogeneity.