How can I check for homogeneity of variance in a factorial ANOVA design?

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A factorial ANOVA design is a statistical method used to analyze the effects of multiple independent variables on a dependent variable. One important assumption of this design is the homogeneity of variance, which means that the variance of the dependent variable is equal across all levels of the independent variables. To check for homogeneity of variance in a factorial ANOVA design, one can use various statistical tests such as Levene's test or Bartlett's test. These tests compare the variances of the dependent variable across different groups and provide a p-value, which indicates whether the assumption of homogeneity of variance is violated or not. It is important to check for homogeneity of variance as violations can lead to inaccurate and unreliable results in the factorial ANOVA analysis.

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To analyze a factorial anova you would use the anova command. The anova command does not have a check for homogeneity of variance. However, the oneway command automatically performs a Bartlett's test for homogeneity of variance along with a one-way anova. The trick is to convert your factorial design into a one-way design.

Let's say that you want to run a 2×4 factorial using the file crf24.dta. The following commands will illustrate the process:

use https://stats.idre.ucla.edu/stat/stata/faq/crf24
anova y a b a#b

Number of obs = 32 R-squared = 0.9214

Root MSE = .877971 Adj R-squared = 0.8985

Source | Partial SS df MS F Prob > F

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Model | 217.00 7 31.00 40.22 0.0000

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a | 3.125 1 3.125 4.05 0.0554

b | 194.50 3 64.8333333 84.11 0.0000

a*b | 19.375 3 6.45833333 8.38 0.0006

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Residual | 18.50 24 .770833333

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Total | 235.50 31 7.59677419

Now enter these commands:

egen cell = group(a b)

robvar y, by(cell)

| Summary of y

group(a b) | Mean Std. Dev. Freq.

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1 | 3.75 1.5 4

2 | 4 .81649658 4

3 | 7 .81649658 4

4 | 8 .81649658 4

5 | 1.75 .5 4

6 | 3 .81649658 4

7 | 5.5 .57735027 4

8 | 10 .81649658 4

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Total | 5.375 2.7562246 32

W0 = .74805195 df(7, 24) Pr > F = .63460714

W50 = .13714286 df(7, 24) Pr > F = .99422247

W10 = .74805195 df(7, 24) Pr > F = .63460714

The variable cell created using the egen command takes on the values 1
through 8. The robvar command gives you Levene's test of homogeneity
(labeled W0).

Note: Levene's test is relatively more robust to nonnormality than other
tests of homogeneity but can still be influenced by nonnormality and should be used with caution.