Print

Homogeneity-of-variance Tests

Bartlett's test for homogeneity of variance (HOV) in a one-way ANOVA model (HOVTEST=BARTLETT in the MEANS statement) is a modification of the normal-theory likelihood ratio test. Although Bartlett's test has accurate Type I error rates and optimal power when the underlying distribution of the data is normal, it can be very inaccurate if that distribution is even slightly nonnormal (Box 1953). Therefore, Bartlett's test is not recommended for routine use.

All other HOV tests available in PROC GLM (Brown and Forsythe, Levene, and O'Brien) use the approach that leads to tests that are much more robust to the underlying distribution. This approach transforms the original values of the dependent variable to derive a *dispersion variable* and then performs analysis of variance on this variable. The significance level for the test of homogeneity of variance is the p-value for the ANOVA F test on the dispersion variable. The difference among the different tests depends on how the dispersion variable is derived.

Levene's test (Levene 1960) is widely considered to be the standard homogeneity-of-variance test (the HOVTEST=LEVENE option in the MEANS statement). O'Brien (1979) proposes a test (HOVTEST=OBRIEN) that is basically a modification of Levene's squared dispersion variable. Brown and Forsythe (1974) suggest using the absolute deviations from the group *medians* as the dispersion variable (HOVTEST=BF).

Simulation results (Conover et al. 1981, Olejnik and Algina 1987) show that, although all of these ANOVA-based tests are reasonably robust to the underlying distribution, the Brown-Forsythe test seems best at providing power to detect variance differences while protecting the Type I error probability. However, because the within-group medians are required for the Brown-Forsythe test, it can be resource intensive if there are very many groups or if some groups are very large.

Close