On the Size of the F-Test for the One-Way Random Model with Heterogeneous Error Variances

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Traditional analysis of variance (ANOVA) tests are based on the assumption of homogeneous error variances, which often fails in real situations. Violation of this assumption affects not only the power of the standard F-test, but also its size. When a design is unbalanced, the effect of unequal error variances is even more complicated. In this paper, we study the effect of heterogeneous error variances on the size of the F-test concerning the among-group variance component in an unbalanced random one-way model. We also provide a method for maintaining a desired level of significance of the test.

Key Words: Among-group variance component, Davies' algorithm, Level of significance, Measure of imbalance, Unbalanced design.