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A Simulation Study on Tests of Hypotheses for Fixed Effects in Mixed Models for One-Way ANOVA under the Violation of the Equal Variances Assumption of the Treatment Groups with and without Missing Data

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Abstract. This article considers the analysis of experiment of one-way completely randomized design (one-way ANOVA) that is frequently used in every discipline. We investigate a common problem that is data collected in practice usually violate parametric assumptions to some degree. We concentrated our attention on ANOVA when the equal variances assumption for the treatment groups is violated. We investigate the performance of a general linear fixed effects model approach (GLM procedure of the SAS System) in analyzing one-way ANOVA under the violation of only one assumption that is heterogeneous variances. Also, we investigate the performance of a general linear mixed effects model approach (MIXED procedure of the SAS System) in analyzing one-way ANOVA under the violation of only one assumption that is heterogeneous variances as alternative to GLM procedure of the SAS System. The main result of our article is that the general linear mixed effects model approach can be recommended to be used in case of the suspicion of the violation of the equal variances assumption specially in case of unbalanced data where the general linear fixed effects model approach showed serious departures upward from the nominal level.

Keywords: One-Way ANOVA, GLM procedure, MIXED procedure, Kenward-Roger method, Restricted maximum likelihood (REML).