

# **Modeling the residual error variance in Two-Level Random-Coefficient Multilevel Models**

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## **Abstract**

Multilevel models are a popular method of clustered and longitudinal data analysis in the social, behavioral and medical sciences. The standard two-level random-coefficient model for continuous responses nearly always assumes a constant residual error variance at level-1. However, there is no reason why this homogeneity assumption should hold in practice and in many studies it will be intrinsically interesting to relax it. In this paper, we model the level-1 residual error variance as a function of predictors and we allow a random-intercept and random-coefficients to be included in this function. We illustrate our approach through a real data application to modeling school effects on student achievement.

**Key Words:** heterogeneous within-group variances; heteroskedasticity; hierarchical linear models; log-linear variance models; mixed-effects models; variance functions