`RLRsim`: Testing for Random Effects or Nonparametric Regression Functions in Additive Mixed Models

Fabian Scheipl[1], Sonja Greven[2], and Helmut Küchenhoff[1]

[1] Institut für Statistik, Ludwig-Maximilians-Universität München, Germany
[2] Department of Biostatistics, Johns-Hopkins University, USA

Abstract. Testing for a zero random effects variance is an important and common testing problem. Special cases include testing for a random intercept, and testing for polynomial regression versus a general smooth alternative based on penalized splines. The problem is non-regular, however, due to the tested parameter on the boundary of the parameter space. Our package `RLRsim` uses the approximate null distribution for the Restricted Likelihood Ratio Test proposed in Greven et al. (2008) to provide a rapid, powerful and reliable test for this problem. This method extends the exact distribution derived for models with one random effect (Crainiceanu & Ruppert, 2004) to obtain a good approximation for models with several random effects. The test performed better than a number of competitors in an extensive simulation study covering a variety of typical settings (Scheipl et al. , 2008). `RLRsim` also proved to be an equivalent and fast alternative to computationally intensive parametric bootstrap procedures. Our package can be used in a variety of settings, providing convenient wrapper functions to test terms in models fitted using `nlme::lme`, `lme4::lmer`, `mgcv::gamm` or `SemiPar::spm`.

References

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Keywords

Linear Mixed Model; Non-regular Problem; Penalized Splines; Restricted Likelihood Ratio Test; Variance Component