

Estimating variance components in models with additivity

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Abstract

We compare triple minimization with a method based on the algebraic structure of the model for the estimation of variance components. To do this we consider a model in which three factors cross. The first factor has fixed effects and is additive to the other two.

Keywords

Linear mixed models, Variance components, Maximum likelihood estimation methods, Pivot variables.

References

- [1] Hartley, H. and J. Rao (1967). Maximum-likelihood estimation for the mixed analysis of variance model. *Biometrika* 54(1-2), 93–108.
- [2] Khuri, A.I. and H. Sahai, H. (1985). Variance components analysis: a selective literature survey. *Int. Statist. Rev.* 53, 279–300.
- [3] LaMotte, L.R. (1973). Quadratic estimation of variance components. *Biometrics* 29(2), 311–330.
- [4] Littell, R.C. (2002). Analysis of unbalanced mixed model data: a case study comparison of ANOVA versus REML/GLS. *J. Agric. Biol. Environ. Stat.* 7(4), 472–490.
- [5] Mexia, J.T. (1990). Best linear unbiased estimates, duality of F tests and the Scheffé multiple comparison method in the presence of controlled heteroscedasticity. *Comput. Statist. Data Anal.* 10(3), 271–281.
- [6] Patterson, D. and R. Thompson (1974). Maximum likelihood estimation of components of variance. In: *Proceedings of the 8th International Biometric Conference* (197–207).
- [7] Schott, J. (1997). *Matrix Analysis for Statistics*. John Wiley & Sons, Inc, New York.

- [8] Searle, S.R. (1971). Topics in variance component estimation. *Biometrics* 27, 1–76.
- [9] Searle, S.R., G. Casella, and C.E. McCulloch (1992). *Variance Components*. Wiley.
- [10] Searle, S.R. (1995). An overview of variance component estimation. *Metrika* 42, 215–230.
- [11] Spall, J. (2003). *Introduction to Stochastic Search and Optimization: Estimation, Simulation, and Control*. Wiley.
- [12] Stern, S. and A. Welsh (2000). Likelihood inference for small variance components. *Canad. J. Statist.* 28(3), 517–532.
- [13] van Leeuwen, D., D. Birkes, D., and J. Seely (1999). Balance and orthogonality in designs for mixed classification models. *Ann. Statist.* 27(6), 1927–1947.
- [14] Wu, M., K. Yu, A. Liu, and T. Ma (2010). Simultaneous optimal estimation in linear mixed models. *Metrika* (DOI: 10.1007/s00184-010-0337-1).