On admissibility of decision rules derived from submodels in two variance components model

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Abstract

The statistical inference on model parameters (e.g. for models ANOVA) is often conducted through the combined analysis using the information from independent submodels obtained by orthogonal decomposition of the observed vector ([7], [6], [1]). The statistical decision rules obtained in this way are uniquelly given and have under corresponding submodels the desirable statistical properties (e.g. inter- and intra- block estimators of variance components for a mixed linear model corresponding to a randomized block design). Only, in special cases (see [2]), estimation and testing under the overall randomization model are relevant. Generally, the estimators of variance components derived from submodels are inadmissible in the class of all invariant quadratic unbiased estimators (e.g. estimator of variance of block effects, see [4]). In reference to tests concerning variance components the ratio tests allowing the information from different submodels (strata) have a structure of Wald's test and generally are admissible, although the tests have weak statistical properties (cf. [6], where author shows how to recover the intra-block information to improve tests of hypotheses concerning inter-block parameters, see also [5]).

In this article author presents a subclass of admissible bayesian invariant quadratic unbiased estimators (cf. [3]) which uniformly dominate the unbiased inter-block estimator of the variance of block effects proposed by Caliński and Kageyama in 1991. It will be illustrated by numerical examples for some connected and disconnected orthogonal block designs. Besides, author gives some results concerning admissibility of biased bayesian quadratic estimators of inter-block variance component in mixed linear model with two variance components corresponding to block designs.

Keywords

Admissibillity, Block designs, Variance components, Inter- and intra-block estimators, Invariant quadratic unbiased bayesian estimators, Testing of hypotheses.

References

[1] Caliński, T. and S. Kageyama, S. (1991). On the randomization theory of intra-block and inter-block analysis. *Biom. Lett. 28*, 97–122.

[2] Caliński, T., S. Gnot and A. Michalski (1998). On admissibility of the intra-block and inter-block variance component estimators. *Biom. Lett. 35(1)*, 11–26.

[3] Gnot, S. and J. Kleffe (1983). Quadratic estimation in mixed linear models with two variance components. *J. Statist. Plann. Inference 8*, 267–279.

[4] Gnot, S. and A. Michalski (1991). Linear and quadratic estimation from inter- and intra-block sources of information. *Statistics 22(1)*, 17–32.

[5] Gnot, S. and A. Michalski (1994). Tests based on admissible estimators in two variance components models. *Statistics 25*, 213–223.

[6] Portnoy, S. (1973). On recovery of intra-block information. *J. Amer. Statist. Assoc. 68*, 384–391.

[7] Rao, C.R. (1956). On the recovery of inter-block information in variety trials. *Sankhya 17*, 105–114.