

On locally optimal invariant unbiased tests for the variance components ratio in mixed linear models

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Abstract

In the paper the problem of testing of two sided hypotheses for variance components in mixed linear models is considered. When the uniformly most powerful invariant test (UMPIT) does not exist (Das and Sinha 1987, Gnot and Michalski, 1994; Michalski and Zmysłony, 1996) then to conduct the optimal statistical inference on model parameters a construction of a test with locally best properties is desirable (Michalski, 2003). A main goal of this article concerns a construction of the locally best invariant unbiased test (LBIUT) for a single variance component (or eq. for a ratio of variance components). The result has been obtained on the basis Anderson's and Wijsman's approach connected with a representation of density function of maximal invariant (Anderson, 1982; Khuri, Mathew, and Sinha, 1998) and from generalized Neyman-Pearson's lemma (Rao, 1973). For some examples of models corresponding to two-way layouts the losses of power function of the test by comparison with the attainable upper bound of power (AUB) are given, too.

Keywords

Mixed linear model, Variance components, Invariant test; Unbiased test.

References

- Anderson, S. (1982). Distribution of maximal invariants using quotient measures. *Ann. Statist. 10*, 955-961.
- Das, R. and B.K. Sinha (1987). Robust optimum invariant unbiased tests for variance components. *Proc. of the Second International Tampere Conference in Statistics* (T. Pukkila and S. Puntanen, Eds.), 317-342. Tampere, Finland.
- Gnot, S. and A. Michalski (1994). Tests based on admissible estimators in two variance components models. *Statistics 25*, 213-223.
- Khuri, A.I., T. Mathew, and B.K. Sinha (1998). *Statistical Tests for Mixed Linear Models*. Wiley & Sons, New York, Toronto.

- Michalski, A. and R. Zmysłony (1996). Testing hypotheses for variance components in mixed linear models. *Statistics 27*, 297-310.
- Michalski, A. (2003). On some aspects of the optimal statistical inference of variance components in mixed linear models. *Tatra Mountains Mathematical Publications 26*, 1-21.
- Rao, C.R. (1973). *Linear Statistical Inference and its Applications*. 2nd ed, Wiley, New York.