

# Quadratic subspaces and construction of admissible estimators of variance components

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## Abstract

Let  $A_1, \dots, A_m$  be given, symmetric  $n \times n$  matrices. We are interested in finding a basis of  $Q$ , the smallest subspace of the space of all  $n \times n$  symmetric matrices containing  $A_1, \dots, A_m$  and satisfying the "quadratic subspace condition":

$$A \in Q \implies A^2 \in Q.$$

Solutions for some cases corresponding to certain classes of linear mixed models are given e.g. in Zmyślony (1976) or Wojtasik and Zontek (2000). Malley (1994) proposed several algorithms for solving this problem in general case. However, implementation of these algorithms may pose some numerical challenges. In this paper we discuss these issues. We show that by using appropriate numerical techniques it is possible to obtain satisfactory results. We also present numerical results illustrating the efficiency of this approach in constructing admissible quadratic estimators of variance components in linear mixed models.

**Keywords** Quadratic admissible estimator, Quadratic subspace

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