

Characteristics of quadratic spaces of block matrices

Augustyn Markiewicz, Malwina Mrowińska

Department of Mathematical and Statistical Methods, Poznań University of Life Sciences, Poznań, Poland

Abstract

In this paper we introduce a general characterization of quadratic spaces of symmetric matrices which enables the characterization of the quadratic spaces of block matrices with separately linearly structured blocks, possibly with non-zero off-diagonal blocks. We apply this characterization in statistical problems in the estimation of a structured covariance matrix using the shrinkage method. The shrinkage estimator is a convex combination of the least squares estimator and a target matrix, where the target matrix is the orthogonal projection of the least squares estimator onto a chosen quadratic subspace of the structure space. Since the properties of the estimator depend on the choice of the target space, a characterization of all possible quadratic subspaces of the structure space is strongly needed. Moreover, through simulation studies, it is shown how the choice of quadratic target subspace affects the properties of the estimator. Recommendations are given for choosing a suitable target quadratic subspace of the structure space.

Keywords

Quadratic spaces, Covariance matrix, Block linear structure, Orthogonal projection, Shrinkage method.

References

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