Structured families of models with Commutative Orthogonal Block Structure

João T. Mexia

Faculdade de Ciências e Tecnologia - Universidade Nova de Lisboa
CMA - Centro de Matemática e Aplicações

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When models with the same structure correspond to the treatments of a base design we have a structured family of models. The joint analysis of such models will enable the study of the action of the factors in the base design on the models on the family.

When the models in the family are mixed with the same variance components the family will be isomorphic. Then the study of the actions of the factors in the base design will be centered on the estimable vectors of the models in the family.

We will consider such a study for isomorphic families of models with Commutative Orthogonal Block Structure (COBS). The family of variance-covariance matrices for such models will be

$$\boldsymbol{V} = \left\{ \sum_{j=1}^{m} \gamma_j \boldsymbol{Q}_j \right\}$$

where the $\boldsymbol{Q}_1, \ldots \boldsymbol{Q}_m$ are pairwise orthogonal orthogonal projection matrices such that $\sum_{j=1}^{m} \boldsymbol{Q}_j = \boldsymbol{I}_n$, so the model will have Orthogonal Block Structure. Moreover we will assume that the orthogonal projection matrix on the space spanned by the mean vectors commute with $\boldsymbol{Q}_1, \ldots \boldsymbol{Q}_m$.

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