

Using error covariance change to generate new datasets with the same BLUEs and BLUE covariances for a linear model and each of its submodels

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Abstract

Necessary and sufficient conditions for BLUEs of estimable functions of parameters in a linear fixed effect model remaining un-altered by a change in error covariance structure are outlined in [1]. For submodels, where the original full linear model is made smaller by reducing the number of regressors, block diagonal or diagonal matrices provide insight into conditions for the full model and its entire set of submodels each to retain their own BLUEs ([3]; [2]). These results extend to establishing conditions for which covariances of these BLUEs are also retained. These error covariance changes can be used to produce a very wide range of new cloned data sets all of which have the same BLUEs and BLUE covariances, both for the full model and for each submodel. The results have connections data confidentiality and encryption.

This talk is based on joint work with Jarkko Isotalo, Augustyn Markiewicz and Simo Puntanen.

Keywords

BLUE, BLUP, Confidentialised unit record files, Covariance, Data cloning, Data confidentiality, Encryption, Linear model, Residuals.

References

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- [2] Haslett, S.J., Isotalo, J., Markiewicz, A., Puntanen, S. (2023) Permissible covariance structures for simultaneous retention of BLUEs in small and big linear models. Chapter 11 in *Springer proceedings of the conferences in honor of C R Rao A K Lal: Applied Linear Algebra, Probability and Statistics (ALAPS)*.
- [3] Haslett, S.J., Puntanen, S. (2023) Equality of BLUEs for full, small, and intermediate linear models under covariance change, with links to data confidentiality and encryption. Chapter 14 in *Springer proceedings of the conferences in honor of C R Rao A K Lal: Applied Linear Algebra, Probability and Statistics (ALAPS)*.