



DECOMPOSITION APPROACHES OF A CONSTRAINED GENERAL LINEAR MODEL WITH FIXED PARAMETERS*

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Abstract. The well-known ordinary least-squares estimators (OLSEs) and the best linear unbiased estimators (BLUEs) under linear regression models can be represented by certain closed-form formulas composed by the given matrices and their generalized inverses in the models. This paper provides a general algebraic approach to relationships between OLSEs and BLUEs of the whole and partial mean parameter vectors in a constrained general linear model (CGLM) with fixed parameters by using a variety of matrix analysis tools on generalized inverses of matrices and matrix rank formulas. In particular, it establishes a variety of necessary and sufficient conditions for OLSEs to be BLUEs under a CGLM, which include many reasonable statistical interpretations on the equalities of OLSEs and BLUEs of parameter space in the CGLM. The whole work shows how to effectively establish matrix equalities composed by matrices and their generalized inverses and how to use them when characterizing performances of estimators of parameter spaces in linear models under most general assumptions.

Key words. General linear model, Restriction, Estimability, OLSE, BLUE, Equality, Statistical interpretation.

AMS subject classifications. 15A03, 15A09, 62H12, 62F30.

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