ON EXACT D-OPTIMAL DESIGNS FOR REGRESSION MODELS WITH CORRELATED OBSERVATIONS

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Abstract. Let τ^* be an exact D-optimal design for a given regression model $Y_\tau = X_\tau \boldsymbol{\beta} + Z_\tau$. In this paper sufficient conditions are given for designing how the covariance matrix of Z_τ may be changed so that not only τ^* remains D-optimal but also that the best linear unbiased estimator (BLUE) of $\boldsymbol{\beta}$ stays fixed for the design τ^*, although the covariance matrix of Z_{τ^*} is changed. Hence under these conditions a best, according to D-optimality, BLUE of $\boldsymbol{\beta}$ is known for the model with the changed covariance matrix. The results may also be considered as determination of exact D-optimal designs for regression models with special correlated observations where the covariance matrices are not fully known. Various examples are given, especially for regression with intercept term, polynomial regression, and straight-line regression. A real example in electrocardiography is treated shortly.

Key words and phrases: D-optimality, exact designs, correlated observations, linear regression, robustness against disturbances.