OPTIMAL DESIGNS FOR CORRELATED RANDOM VARIABLES[*]

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Suppose that $Y = (Y_i)$ is a normal random vector with mean Xb and covariance $\sigma^2 I_n$, where b is a $p-$dimensional vector (b_j), $X = (X_{ij})$ is an $n \times p$ matrix. Given a family C of A-(D-, E- or more general)optimal designs, a design Z in C is chosen that is robust in the sense that Z is A-(D-, E-or more general)optimal in C when the covariance of $Y_i, Y_{i'}$ is $\rho \neq 0$. Such designs depend on the sign of ρ. The general results are applied to the situation where $X_{ij} \in \{-1, 1\}$; this corresponds to a factorial design with $-1, 1$ representing low or high level respectively, or corresponds to a weighing design with $-1, 1$ representing an object j with weight b_j being weight on the left and right of a chemical balance respectively.