

ECONOMIC TREND RESISTANT FRACTIONAL FACTORIAL DESIGNS OF RESOLUTION IV BASED ON HADAMARD MATRICES

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This article utilizes the Normalized Sylvester-Hadamard $2^k \times 2^k$ Matrices of order 2^k and their associated saturated orthogonal arrays $OA(2^k, 2^k - 1, 2, 2)$ in $(2^k - 1)$ factors to construct (by factor projection) two categories of economic systematic $2^{n-(n-k)}$ designs of resolution IV: minimum cost fractional factorial designs ($2^{k-2} \leq n \leq 2^{k-1}$) and minimum cost linear trend free fractional factorial designs ($2^{k-2} \leq n \leq (2^{k-1} - 2)$), where each systematic $2^{n-(n-k)}$ design is economic and allows for the estimation of all factor main effects unbiased by the linear time trend or by non-negligible two-factor interactions. The article provides for each proposed $2^{n-(n-k)}$ design: the k independent generators to sequence its $2^{n-(n-k)}$ runs by the Generalized Foldover Scheme to minimize the cost of factor level changes between successive runs and the minimum total cost of factor level changes between the $2^{n-(n-k)}$ successive runs. Proposed systematic $2^{n-(n-k)}$ designs compete well and are better than existing systematic $2^{n-(n-k)}$ designs cost-wise and trend resistance-wise.