Canonical form of a linear model and its applications

Czesław Stępiak

Maria Curie-Skłodowska University, Lublin, Poland

Abstract

Arbitrary linear model of type \( L(A\beta, V) \), \( L(A\beta, \sigma V) \) or \( N(A\beta, \sigma V) \) for a random sample \( X_1, \ldots, X_n \) is considered. It is well known that if the model is regular in the sense \( R(A) \subseteq R(V) \) then it admits a representation by a sample \( Y_1, \ldots, Y_m \) (\( m \leq n \)), where \( EY_i = \eta_i \) for \( i = 1, \ldots, k \) and zero for \( i = k + 1, \ldots, m \), while \( \text{Cov}(Y_i, Y_j) = \delta_{ij} \) or \( \sigma \delta_{ij} \), respectively. This canonical form, introduced by Kołodziejczyk (1935), was used, among others, by Schéffé (1959) and Lehmann (1959, 1986) for linear estimation and testing linear hypotheses. It appears that this technique may be extended for arbitrary, not necessarily regular model and, what is more, it may be applied for quadratic estimation. This enables us to derive many results in a simple way.

References:

