

Wishartness and Independence of Matrix Quadratic Forms For Kronecker Product Covariance Structures

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ABSTRACT

Let \mathbf{X} be an observation matrix distributed as normal with mean \mathbf{M} and covariance matrix $\mathbf{W} \otimes \mathbf{V}$, where \mathbf{W} and \mathbf{V} are nonnegative definite matrices. The classical results on the Wishartness and independence of matrix quadratic forms in \mathbf{X} were obtained under the assumption both \mathbf{W} and \mathbf{V} are positive definite or assuming only that \mathbf{V} is positive definite. We build on those results and extend them to the case where both \mathbf{W} and \mathbf{V} are nonnegative definite. We also present a multivariate version of the Cochran's theorem. The results are used to characterize the class of nonnegative definite matrices \mathbf{W} such that the matrix quadratic forms that occur in multivariate analysis of variance, are independent and Wishart except for a scale factor.