

Asymptotic non-null distributions of the LR criteria in a parallel profile model with random effects

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ABSTRACT. We consider a parallel profile model which is a mixture of the MANOVA and GMANOVA models. The covariance structure based on a random-effects model is assumed. Asymptotic non-null distributions of the likelihood ratio tests for two hypotheses are derived under the parallel profile model. A numerical example is also presented.

1. Introduction

Suppose that a response variable x has been measured at p different occasions on each of N individuals, and each individual belongs to one of k groups or treatments. Let $\mathbf{x}_j^{(g)} = (x_{1j}^{(g)}, \dots, x_{pj}^{(g)})'$ be a p -vector of measurements on the j -th individual in the g -th group, and assume that $\mathbf{x}_j^{(g)}$ are independently distributed as $N_p(\boldsymbol{\mu}^{(g)}, \Sigma)$, where $j = 1, \dots, N_g$, $g = 1, \dots, k$. Further, we assume that profiles of k groups are parallel, i.e.,

$$(1.1) \quad \boldsymbol{\mu}^{(g)} = \delta^{(g)} \mathbf{1}_p + \boldsymbol{\mu}, \quad g = 1, \dots, k,$$

where $\mathbf{1}_p$ is a p -vector of ones. Without loss of generality we may assume that $\delta^{(k)} = 0$. In the following we shall do this. Let

$$X = [\mathbf{x}_1^{(1)}, \dots, \mathbf{x}_{N_1}^{(1)}, \dots, \mathbf{x}_1^{(k)}, \dots, \mathbf{x}_{N_k}^{(k)}]'$$

Then the model of X can be written as

$$(1.2) \quad X \sim N_{N \times p}(A_1 \boldsymbol{\delta} \mathbf{1}'_p + \mathbf{1}_N \boldsymbol{\mu}', \Sigma \otimes I_N),$$

where $N = N_1 + \dots + N_k$,

$$A_1 = \begin{bmatrix} \mathbf{1}_{N_1} & & O \\ & \ddots & \\ O & & \mathbf{1}_{N_{k-1}} \\ & \dots & \\ & & O \end{bmatrix}$$

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