Simultaneous confidence region for ρ and σ^2 in the growth curve model with uniform correlation structure

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The basic model we consider is the standard growth curve model with uniform correlation structure:

$$Y = XBZ' + \mathbf{e}, \quad \text{vec}(\mathbf{e}) \sim N\left(0, \Sigma \otimes I_n\right), \quad \Sigma = \sigma^2\left((1-\rho)I_p + \rho\mathbf{1}\mathbf{1}'\right).$$

Here $Y_{n\times p}$ is a matrix of independent p-variate observations, $X_{n\times m}$ is an ANOVA design matrix, $Z_{p\times r}$ is a regression variables matrix, and $\mathbf{e}_{n\times p}$ is a matrix of random errors. As for the unknown parameters, $B_{m\times r}$ is an location parameters matrix, and σ^2, ρ are (scalar) variance parameters. The vec operator stacks elements of a matrix into a vector column-wise.

This model has obtained increasing attention, since it allows to keep the number of variance parameters low even in high dimensional models, and its assumptions are in many situations close to reality. Even if estimators proposed by Žežula (see [2]) and Ye & Wang (see [4]) seem to be quite different, they are identical. Žežula & Klein found their marginal distributions, see [3]. We will present the joint distribution of the two estimators and investigate simultaneous confidence regions for both variance parameters.

References

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