Estimation of parameters in the extended growth curve model with a linearly structured covariance matrix

Joseph Nzabanita[1], Martin Ohlson[1] and Dietrich von Rosen[2]

[1] *Linköping University, Sweden, email: joseph.nzabanita@liu.se,
martin.ohlson@liu.se*
[2] *Swedish University of Agricultural Sciences, Sweden,
email: Dietrich.von.Rosen@et.slu.se*

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The extended growth curve model with two terms and a linearly structured covariance matrix is considered. In general there is no problem to estimate the covariance matrix when it is completely unknown. However, problems arise when one has to take into account that there exists a structure generated by a few number of parameters. In this paper an estimation procedure that handles linearly structured covariance matrices is proposed. The idea is first to estimate the covariance matrix when it should be used to define an inner product in a regression space and thereafter re-estimate it when it should be interpreted as a dispersion matrix. This idea is exploited by decomposing the residual space, the orthogonal complement to the design space, into three orthogonal subspaces. Studying residuals obtained from projections of observations on these subspaces yields explicit consistent estimators of the covariance matrix. An explicit consistent estimator of the mean is also proposed and numerical examples are given.