

Distribution-free REMLS estimation of the AR(1) covariance structure

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Abstract

The paper propose a restricted expected multivariate least squares (REMLS) approach for estimating the parameters of the first-order autoregressive covariance structure in multivariate linear models. The resulting estimators are available in closed form, satisfy the admissible parameter space without additional modifications, and require only mild distributional assumptions. Exact finite-sample moments are established for the scale estimator, whereas higher-order bias and variance approximations are derived for the correlation estimator. Particular attention is paid to elliptical distributions, where the influence of non-Gaussianity on the finite-sample properties is characterized explicitly through the fourth-order moments. Under Gaussian errors, the proposed scale estimator coincides with the maximum likelihood estimator. Monte Carlo experiments indicate that the REMLS estimators achieve finite-sample performance comparable to, and in several settings superior to, maximum likelihood estimation while remaining applicable under substantially weaker distributional assumptions.

Keywords

Restricted expected multivariate least squares, Autoregressive covariance structure, Covariance parameter estimation, Multivariate linear model, Elliptical distributions.

Acknowledgements

The research was supported by the Slovak Research and Development Agency under the Contract No. APVV-21-0369, and grant VEGA No. 1/0585/24.