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Semiparametric Gaussian copula models: Geometry and efficient rank-based estimation

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Abstract

For multivariate Gaussian copula models with unknown margins and general correlation structures, a simple, rank-based and semiparametrically efficient estimator is proposed. An algebraic representation of relevant subspaces of the tangent space is constructed that allows to easily study questions of adaptivity with respect to the unknown marginal distributions and of efficiency of the pseudo-likelihood estimator and the normal-scores rank correlation coefficient. Some well-known examples are treated explicitly: circular correlation matrices, factor models, and Toeplitz matrices, special cases being exchangeable structures, moving average models and autoregressive models. For constructed examples, the asymptotic relative efficiency of the pseudo-likelihood estimator can be as low as 20 percent. For finite samples, these findings are confirmed by Monte Carlo simulations.