Comparing point and interval estimates in the bivariate t-copula model with application to financial data

Abstract:
The paper considers joint maximum likelihood (ML) and semiparametric (SP) estimation of copula parameters in a bivariate t-copula. Analytical expressions for the asymptotic covariance matrix involving integrals over special functions are derived, which can be evaluated numerically. These direct evaluations of the Fisher information matrix are compared to Hessian evaluations based on numerical differentiation in a simulation study showing a satisfactory performance of the computationally less demanding Hessian evaluations. Individual asymptotic confidence intervals for the t-copula parameters and the corresponding tail dependence coefficient are derived. For two financial datasets these confidence intervals are calculated using both direct evaluation of the Fisher information and numerical evaluation of the Hessian matrix. These confidence intervals are compared to parametric and nonparametric BCA bootstrap intervals based on ML and SP estimation, respectively, showing a preference for asymptotic confidence intervals based on numerical Hessian evaluations.