

High-dimensional Covariance Matrix Estimation under Elliptical Factor Model with $2 + \epsilon$ th Moment

Yi Ding

Faculty of Business Administration, University of Macau

(with Xinghua Zheng)

We study the estimation of high-dimensional covariance matrices under elliptical factor models with $2 + \epsilon$ th moment. For such heavy-tailed data, robust estimators like the Huber-type estimator in Fan et al. (2018) can not achieve sub-Gaussian optimal convergence rates. We develop an idiosyncratic-projected self-normalization (IPSN) method to remove the effect of heavy-tailed scale parameter, and propose a robust pilot estimator for the scatter matrix and show that the estimator enjoys the optimal sub-Gaussian rate. We further develop a consistent generic POET estimator of the covariance matrix and show that it achieves a faster convergence rate than the generic POET estimator in Fan et al. (2018).