

## 浙江大学概率统计学术报告

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题目: Testing High-dimensional Covariance Matrices under the Elliptical Distribution and Beyond

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摘要: We study testing high-dimensional covariance matrices when data exhibit heteroskedasticity. The observations are modeled as  $Y_i = \omega_i Z_i$ , where  $Z_i$ 's are i.i.d.  $p$ -dimensional random vectors with mean 0 and covariance Sigma, and  $\omega_i$ 's are random scalars reflecting heteroskedasticity. The model is an extension of the elliptical distribution, and accommodates several stylized facts of real data including heteroskedasticity, heavy-tailedness, asymmetry, etc. We aim to test  $H_0 : \Sigma \propto \Sigma_0$ , in the high-dimensional setting where both the dimension  $p$  and the sample size  $n$  grow to infinity proportionally. We remove the heteroskedasticity by self-normalizing the observations, and establish a CLT for the *linear spectral statistic* (LSS) of  $\tilde{S}_n := \frac{p}{n} \sum_{i=1}^n Y_i Y_i^T / |Y_i|^2 = \frac{p}{n} \sum_{i=1}^n Z_i Z_i^T / |Z_i|^2$ . The CLT is different from the existing ones for the LSS of the usual sample covariance matrix  $S_n := \frac{1}{n} \sum_{i=1}^n Z_i Z_i^T$  ((Bai and Silverstein(2004), Najim and Yao (2016))). Our tests based on the new CLT neither assume a specific parametric distribution nor involve the fourth moment of  $Z_i$ . Numerical studies show that our tests work well even when  $Z_i$ 's are heavy-tailed.

欢迎大家参加

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