

ON EIGENVALUES OF A HIGH-DIMENSIONAL SPATIAL-SIGN COVARIANCE MATRIX

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Abstract: This paper investigates limiting properties of eigenvalues of multivariate sample spatial-sign covariance matrices when both the number of variables and the sample size grow to infinity. The underlying p -variate populations are general enough to include the popular independent components model and the family of elliptical distributions. A first result of the paper establishes that the distribution of the eigenvalues converges to a deterministic limit that belongs to the family of generalized Marcenko-Pastur distributions. Furthermore, a new central limit theorem is established for a class of linear spectral statistics. We develop two applications of these results to robust statistics for a high-dimensional shape matrix. First, two statistics are proposed for testing the sphericity. Next, a spectrum-corrected estimator using the sample spatial-sign covariance matrix is proposed. Simulation experiments show that in high dimension, the sample spatial-sign covariance matrix provides a valid and robust tool for mitigating influence of outliers.