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*Tests for Covariance Matrices in High Dimension with Less Sample Size*

In this artice we propose tests for covariance matrices of high dimension with fewer observations than the dimension for a general class of distributions with positive definite covariance matrices. In one-sample case, tests are proposed for sphericity and diagonality of the covariance matrix $\Sigma$, by providing an unbiased estimator of $tr\Sigma^2$ under the general model which requires no more computing time than the one available in the literature for normal model. In the two-sample case, tests for the equality of two covariance matrices are given. The asymptotic distributions of proposed tests are derived under the assumption that the sample size $N = \mathrm{O}(p^\delta)$, $0 < \delta < 1$, where $p$ is the dimension of the random vector, and $\mathrm{O}(p^\delta)$ means that $(N/p)$ goes to zero as $N$ and $p$ go to infinity.