

A nonparametric test for proportional covariance matrices in large dimension and small samples

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Abstract: This work is concerned with testing the proportionality between two high-dimensional covariance matrices. Several tests for proportional covariance matrices, based on modifying the classical likelihood ratio test and applicable in high dimension, have been proposed in the literature. Despite their usefulness, they tend to have unsatisfactory performance for nonnormal high-dimensional multivariate data in terms of size or power. This article proposes a new high-dimensional test by developing a bias correction to the existing test statistic constructed based on a scaled distance measure. The suggested test is nonparametric without requiring any specific parametric distribution such as the normality assumption. It can accommodate scenarios where the data dimension p is greater than the sample size n , namely the "large p , small n " problem.

With the aid of tools in modern probability theory, we study theoretical properties of the newly proposed test, which include the asymptotic normality and a power evaluation.

We demonstrate empirically that our proposal has good size and power performances for a range of dimensions, sample sizes and distributions in comparison with the existing counterparts.