Test for bandedness of high dimensional covariance matrices with bandwidth estimation

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Abstract.

Motivated by the latest effort to employ banded matrices to estimate a high dimensional covariance Σ, we propose a test for Σ being banded with possible diverging bandwidth. The test is adaptive to the "large p, small n" situations without assuming a specific parametric distribution for the data. We also formulate a consistent estimator to the bandwidth of a banded high dimensional covariance matrix. The properties of the test and the bandwidth estimator are investigated by theoretical evaluations and simulation studies, as well as an empirical analysis on a protein mass spectroscopy data for prostate cancer.

Key Words and Phrases: Banded covariance matrix; Bandwidth estimation; High data dimension; Large p, small n; Nonparametric.