

OPTIMAL PROCEDURES BASED ON
INTERDIRECTIONS
AND PSEUDO-MAHALANOBIS RANKS
FOR TESTING MULTIVARIATE WHITE NOISE
AGAINST ARMA DEPENDENCE

Marc Hallin and Davy Paindaveine

Université Libre de Bruxelles, Belgium

Abstract

We propose a multivariate generalization of signed-rank tests for testing elliptically symmetric white noise against ARMA serial dependence. These tests are based on Randles (1989)'s concept of interdirections and the ranks of pseudo-Mahalanobis distances. They are affine-invariant, and asymptotically equivalent to a strictly distribution-free statistic. Depending on the score function considered (van der Waerden, Laplace, . . .), they allow for locally asymptotically maximin tests at selected densities (multivariate normal, multivariate double-exponential, . . .). Local powers and asymptotic relative efficiencies with respect to the Gaussian procedure are derived. We extend to the multivariate serial context the classical Chernoff-Savage result, showing that classical correlogram-based procedures are uniformly dominated by the van der Waerden version of our tests, so that correlogram methods are not admissible in the Pitman sense. We also prove an extension of the celebrated Hodges-Lehmann “.864 result”, providing, for any fixed space dimension k , the lower bound for the asymptotic relative efficiency of the proposed multivariate Spearman type tests with respect to the Gaussian test. These asymptotic results are confirmed by a Monte-Carlo investigation.