

Multivariate Nonparametric Tests and Treatment Effect Estimates in a Randomized Complete Block Design

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Abstract

Multivariate extensions of the Friedman and Page tests for the comparison of several treatments are proposed. Related unadjusted and adjusted treatment effect estimates for the multivariate response variable are also found and their properties discussed as well. The test statistics and estimates are analogous to the traditional univariate methods. In test constructions, the univariate ranks are replaced by multivariate spatial ranks. Asymptotic theory is developed to provide approximations for the limiting distributions of the test statistics and estimates. The tests are rotation invariant only, but affine invariant versions can be easily constructed. The theory is illustrated by an example. The talk is based on the paper by Möttönen, Hüsler and Oja (2003, *J. Multiv. Analysis*, **87**, 328-355).

Key words: Affine invariance; Multivariate Friedman test; Multivariate Page test; Pitman efficiency; Rotation invariance; Spatial rank