Location tests in the IC model using marginal ranks

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Abstract

A common multivariate model formulation is

$$Xi = \Lambda Z_i + \mu, \qquad i = 1, \ldots, n,$$

where Zi is centered at the origin. For inference about the location parameter Λ the standard parametric test is Hotelling's T^2 which assumes that Z_i is normal distributed or has at least finite second order moments. A fully nonparametric counterproposal can be based on the marginal signs and ranks of X_i as for example described in Puri and Sen (1971). These nonparametric location tests are however unfortunately not affine equivariant. In this talk we will introduce the tests developed in Nordhausen et al. (2008) which also use the marginal signs and ranks, however not those of X_i but of Z_i, assuming the components of Z_i are independent and symmetric. Under these assumptions is assumed that the data follows the so called restricted independent component model and the first step needed is to recover the unobserved values of Z_i, which is normally done by estimating Λ. The tests introduced here need only a $\sqrt{n}$-consistent estimate of Λ that is not effected under individual sign changes of observations.

We will show asymptotic as well as finite sample efficiencies of the test using different score functions compared to Hotelling's T^2 and compare the robustness of the tests when outliers in Z_i are present. The results shown are obtained by applying the two different scatter matrices method of Oja et al. (2006) to estimate Λ where moment assumptions can be avoided.

At the end we will show how Λ can be estimated and the test performed using the R packages ICS and ICSNP.

Keywords

Independent component analysis, Asymptotic relative efficiencies.

References

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