

Approximations to Most Powerful Invariant Tests for Multinormality

Piotr Majerski, majerski@agh.edu.pl

Faculty of Applied Mathematics. AGH University of Science and Technology, 30-059
Kraków, Poland.

Keywords: Most powerful invariant test. Laplace approximation.

AMS: 62H15

Abstract

We consider the problem of testing multinormality against alternatives invariant with respect to some subgroup of affine transformations. In [3], a general form of the most powerful invariant (MPI) test has been obtained. Unfortunately, applicability of the MPI test is rather limited, due to complicated, intractable integrals. With the aid of the Laplace method for integrals, we derive large sample approximations for the MPI tests. The cases of bivariate exponential and uniform alternatives are studied in details, whereas higher dimensional extensions are outlined. It is shown in the both bivariate cases, that a further approximation for the Laplace approximation can be given. This leads to the likelihood ratio (LR) test statistic. A final conclusion is that the likelihood ratio test statistic can be seen as a formal expansion of the MPI test statistic, with a known upper bound for the relative error of the approximation. The Monte Carlo simulation study shows, that powers of both, the Laplace approximation, as well as the LR test are very close to the power of the most powerful invariant test even in small sample sizes.

Acknowledgements: The research was partly supported by the KBN local grant No 11.420.04

References

- [1] Ducharme, G.R., Frichot, B. (2003), *Quasi-most powerful invariant goodness-of-fit tests*, Scand. J. Statist., 30, 399-414;
- [2] Majerski, P. (2007), *Approximations to Most Powerful Invariant Tests for Multinormality*, To be published;
- [3] Szkutnik Z. (1988). *Most powerful invariant tests for binormality*. Ann. Statist., 16, 292-301.