

Exact and near-exact distributions for likelihood ratio test statistics used to test for stationarity and circularity in multivariate models

Carlos A. Coelho¹, Sandra Oliveira²,
and Filipe Marques¹

¹*New University of Lisbon, Portugal*

²*Polytechnic Institute of Setúbal, Portugal*

Abstract

In this paper we obtain the exact distribution for the likelihood ratio test (l.r.t.) statistics to test that in a multivariate normal model: i) the mean vector is null and the covariance matrix is circular, ii) the means in the mean vector are all equal and the covariance matrix is circular. The authors show that in the first case the exact distribution of the l.r.t. statistic may be written as an infinite mixture of Generalized Near-Integer Gamma (GNIG) distributions, while in the second case the exact distribution of the l.r.t. statistic is a Generalized Integer Gamma (GIG) distribution. For the first l.r.t. statistic, in which case the exact distribution is less manageable, it is thus desirable and useful the development of near-exact distributions. These will assume the form of finite mixtures of GNIG distributions.

Keywords

Circular covariance matrix, Sums of independent Gamma r.v.'s, Sums of independent Logbeta r.v.'s, Product of independent Beta r.v.'s.

References

- Coelho, C.A. (2004). The generalized near-integer Gamma distribution, a basis for "near-exact" approximations to the distributions of statistics which are the product of an number of independent Beta random variables. *J. Multivariate Anal.* 89, 191–218.
- Olkin, I. and Press, S.P. (1969). Testing and estimation for a circular stationary model. *Ann. Math. Statist.* 40, 1358–1373.
- Tricomi, F.G. and Erdly, A. (1951). The asymptotic expansion of a ratio of Gamma functions. *Pacific J. Math.* 1, 133–142.