Testing the significance of coefficients in the linear model. The case of the trend in a AR(1) time series

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Abstract

The aim of this work is to study some tests to the regression coefficients of a model with a linear trend. It is assumed that the error term follows an AR(1), and the autoregressive parameter is unknown. The focus is on the test for one slope and on the test which compares slopes of two or more periods in the same time series. For the case of one slope tests under study are based on the Ordinary Least Squares estimators and in a nonparametric counterpart. For the second case of two slopes the study presents the matrix approach of the model and explores the behaviour of the parametric test. The autoregressive parameter is obtained through some competing estimators. The accuracy of the estimation of this parameter is also analysed. The performance of the tests is compared through a simulation study under different assumptions.

Finally, the methods are applied to a pair of series of physico-chemical variables collected within a framework of a monitoring program of water quality.

Keywords

Trend tests, Ordinary least squares, Autocorrelation, Nonparametric tests, Environmental variables.

References

Alpuim, T. and El-Shaarawi, A. (2008). On the efficiency of regression analysis with AR(p) Errors. *J. of Applied Statistics 35*, 717–737.

Costa, M. and Alpuim, T. (2010). Parameter estimation of state space models for univariate observations. *J. Statist. Plann. Inference*, doi:10.1016/j.jspi.2010.01036.

Ramos, M.R. (2006). Trend tests with application to water quality assessment: Comparison between parametric and non parametric methods. PhD Thesis (in portuguese).

Yue, S. and Wang., C.Y. (2004). The Mann-Kendall test modified by Effective Sample Size to detect trend in serially correlated hydrological series. *Water Resour. Manage. 18*, 201–218.