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Improved seasonal Mann-Kendall tests for trend analysis in water resources time series.
(English) [Zbl 1368.62305](#)

Li, Wai Keung (ed.) et al., Advances in time series methods and applications. The A. Ian McLeod festschrift, University of Ontario, ON, Canada, June 2–3, 2014. Toronto: The Fields Institute for Research in the Mathematical Sciences; New York, NY: Springer (ISBN 978-1-4939-6567-0/hbk; 978-1-4939-6568-7/ebook). Fields Institute Communications 78, 215-229 (2016).

Summary: Nonparametric statistical procedures are commonly used in analyzing for trend in water resources time series [*K. W. Hipel* and *A. I. McLeod*, Time series modelling of water resources and environmental systems. New York: Elsevier (2015)]. One popular procedure is the seasonal Mann-Kendall tau test for detecting monotonic trend in seasonal time series data with serial dependence [*R. M. Hirsch* and *J. R. Slack*, “A nonparametric trend test for seasonal data with serial dependence”, *Water Resour. Res.* 20, No. 6, 727–732 (1984; [doi:10.1029/wr020i006p00727](#))]. However there is little rigorous discussion in the literature about its validity and alternatives. In this paper, the asymptotic normality of a seasonal Mann-Kendall test is determined for a large family of absolutely regular processes, a bootstrap sampling version of this test is proposed and its performance is studied through simulation. These simulations compare the performance of the traditional test, the bootstrapped version referred to above, as well as a bootstrapped version of Spearman’s rho partial correlation. The simulation results indicate that both bootstrap tests perform comparably to the traditional test when the seasonal effect is deterministic, but the traditional test can fail to converge to the nominal levels when the seasonal effect is stochastic. Both bootstrapped tests perform similarly to each other in terms of accuracy and power.

For the entire collection see [[Zbl 1362.62010](#)].

MSC:

- [62P12](#) Applications of statistics to environmental and related topics
- [62G10](#) Nonparametric hypothesis testing
- [62H20](#) Measures of association (correlation, canonical correlation, etc.)
- [62M10](#) Time series, auto-correlation, regression, etc. in statistics (GARCH)

Keywords:

[Kendall correlation](#); [Spearman partial correlation](#); [weakly dependent observations](#); [stationary ARMA process](#); [bootstrap](#); [hydrology](#)

Software:

[rkt](#); [R](#); [Kendall](#); [TSA](#)

Full Text: [DOI](#)

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