



Robust and nonparametric detection of change-points in time series using U-statistics and U-quantiles

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Tests for detecting change-points in weakly dependent (more precisely: near epoch dependent) time series are studied. Our theory covers many standard models of time series analysis, such as ARMA and GARCH processes. The presentation gives certain emphasis to the basic problem of testing for an abrupt shift in location, but other questions like changes in variability are also considered. The popular CUSUM test is not robust to outliers and can be improved in case of non-normal data, particularly for heavy-tails.

The talk investigates CUSUM-type tests based on the 2-sample Wilcoxon statistic or the 2-sample Hodges-Lehmann estimator, which is the median of all pairwise differences between the samples, by analyzing asymptotical properties and by comparing the performance in finite samples via simulation experiments. The 2-sample Hodges-Lehmann estimator is highly robust and has a high efficiency under normality.

The asymptotics of the new change-point tests are established under general conditions without any moment assumptions. Both tests offer similarly good power against shifts in the center of the data, but the test based on the Hodges-Lehmann estimator performs superior if a shift occurs far from the center.