

## STATISTICAL ANALYSIS AND DATA MINING

Research Article

## Testing for white noise against locally stationary alternatives

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## Abstract

Many real - world systems have dynamics that evolve over time, yet stationary models still remain a popular choice in empirical time series studies. In this work, I show that one reason for seemingly correct stationary fits is a very low power of classic white noise tests against locally varying dynamics. In particular, if autocorrelations change over time but on average equal zero, standard white noise tests cannot detect this deviation from the null hypothesis due to their fundamental design. Here I introduce a moving - window version of the Ljung-Box statistic with an asymptotic  $\chi^2$  distribution under the null and much larger power facing processes with time - varying autocorrelations. Simulations and a case study of tree - ring data demonstrate the importance of the new test for applied time series studies. © 2012 Wiley Periodicals, Inc. Statistical Analysis and Data Mining, 2012

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