SIMULTANEOUS PERMUTATION-BASED CHANGE POINTS DETECTION APPROACH WITH AN APPLICATION ON CHICAGO MORTALITY DATA

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SUMMARY

Mortality related variables received an intensive study, however detecting and testing whether there are simultaneous change points associated with these variables is very limited. Therefore, this paper introduces a unified approach to simultaneously estimate the mortality-related variables function and to detect simultaneous change points in mortality associated with temperature, humidity and Ozone. An algorithm, based on a permutation test, is introduced to examine the significance of the simultaneous change points detected. A simulation study is conducted to compare the proposed algorithm and the likelihood ratio test. The advantage of our approach is demonstrated using epidemiological data on mortality and related variables for Chicago, Illinois, the Unites States. The data cover the period from 1987 to 2000. It is found that there are three simultaneous change points: at 23^oC associated with temperature, at 78 associated with humidity, and at 33 associated with Ozone.

Keywords and phrases: Change points detection; Mortality data; Permutation-based test; Poisson regression; Simultaneous change points.

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