A novel and fast methodology for simultaneous multiple structural break estimation and variable selection for nonstationary time series models

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A class of nonstationary time series such as locally stationary time series can be approximately modeled by piecewise stationary autoregressive (PSAR) processes. But the number and locations of the piecewise autoregressive segments, as well as the number of nonzero coefficients in each autoregressive process, are unknown. In this talk, by connecting the multiple structural break detection with a variable selection problem for a linear model with a large number of regression coefficients, a novel and fast methodology utilizing modern penalized model selection is introduced for detecting multiple structural breaks in a PSAR process. It also simultaneously performs variable selection for each autoregressive model and hence the order selection. Numerical results from simulation and a real data example show that the new methodology is faster and more accurate than its competitor.