
Robust modelling of complex time series

Domenico Perrotta

European Commission, Joint Research Centre
Via Fermi 2749, 21027 Ispra, Italy

Peter Rousseeuw and Mia Hubert

Department of Mathematics, KU Leuven,
Celestijnenlaan 200B, BE-3001 Heverlee, Belgium

Marco Riani

Department of Economics
Via Kennedy 6, 43100 Parma, Italy

Abstract

Outliers and structure changes are commonly encountered in economic time series. For example, Granger and Hyung or Perron and Qu in a series of papers have reported strong evidence that these forms of data contamination are in fact a very real feature of many time series. The presence of these “extraordinary events” can easily mislead the conventional time series analysis procedures resulting in erroneous conclusions, especially if the starting point in which the change in level takes place is unknown. Widespread recognition of the importance of level shifts or structural breaks in time series has motivated a great deal of econometric research. This argument, however, despite of the considerable research, does not seem to be solved so far. In this paper we provide a robust unified framework which enables to treat, outliers, unknown level shifts and changes in the seasonal pattern in a integrated environment. The suggested procedure does not require non linear optimization routines but simply makes use of several fits based on least squares. We show the power of the suggested approach using real data coming from international trade which are affected by different sources of heterogeneity, presence of level shifts and multiple outliers.