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Clustering Macroeconomic Variables

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Abstract

Numerous studies have highlighted the structural instability in certain macroeconomic time series. This issue has been typically addressed through three econometric methodologies: structural breaks, Regime-Switching, and time-varying parameter models, all requiring some ex ante structure to define the changes. Drawing on the recurrent Chinese restaurant process, a model for an autoregressive process is introduced and estimated via a particle filter. This methodology is employed to study the instability in post World War II US inflation. The application displays a good fit to the data, producing a clusterization of the time series that can be interpreted in terms of economic history, given a relative small number of estimated clusters. In addition, it is able to recover key data features without making restrictive assumptions, as in the case of one-break or time-varying parameter models.

Keywords: evolutionary clustering, non-parametric Bayesian analysis, particle filter, structural changes.
JEL classification: C18, C22, C51, E17.

1. Introduction

Several studies have presented evidence of structural instability in macroeconomic time series. This study introduces an evolutionary clustering procedure to detect these structural changes, with an application to US inflation, aiming to contribute to the literature on econometric approaches to structural changes and on the sources of inflation instability.
Different types of change-point models that allow for unstable parameters have been applied to the study of instability, which can be broadly divided into three econometric methods: structural breaks (or $k-$breaks), Regime-Switching, and time-varying parameter (TVP) models[1]. The three methods span from a single-break point to a continuous series of changes, each with different advantages and drawbacks. The main advantage of models with a small number of structural breaks, typically in the interval $1-3$, is that they do not restrict the magnitude of change in the coefficients after a break. However, they implicitly assume that there will be no more breaks after the last estimated break in the sample; moreover the researcher is required to exogenously impose the number or dates of breaks. By contrast, TVP models are flexible but implicitly assume ex ante that the probability of a break in the

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[1]As it may be obvious, this survey is reductive with respect to the extensive literature on structural changes. For example, Perron and Zhu (2005) and Perron and Wada (2009) analyze the decomposition trend cycle to identify broken trends in US real activity around 1970.