Detecting and Adjusting Structural Breaks in Time Series and Panel Data

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Detection and adjustment of structural breaks is an important step in modeling time series and panel data. In some cases, such as studying the impact of a new policy or an advertising campaign, structural break analysis might even be the main goal of a data analysis project. In other cases, the adjustment of structural breaks is a necessary step to achieve other analysis objectives, such as obtaining accurate forecasts and effective seasonal adjustment. All change-point analysis methodologies make some assumptions about the data generation model of the observation process. This workshop describes a general-purpose change-point analysis methodology that assumes that the observation process follows a (linear) state-space model (SSM). This assumption is relatively weak: most data generation models that are considered in the change-point analysis literature—such as the multiple linear regression model, univariate and multivariate ARIMAX models, unobserved components models (UCMs), and a variety of panel data models—can be formulated as SSMs.

The workshop will cover the following topics:

- brief introduction to change-point analysis problem
- brief survey of change-point analysis methods
- state-space model based change-point analysis
- data analysis examples (as time permits):
    - detection of change in trend for univariate and multivariate time series
    - detection of change in the common trend pattern in panel data
    - detection of change in the regression coefficients
    - detection of change in the seasonal pattern

Several commercial and open source-software tools are available for change-point analysis. This workshop uses SAS® software. The computations for the illustrative examples are carried out by two SAS procedures: PROC UCM (for univariate analysis) and PROC SSM (for multivariate and panel data analysis). These procedures are available through SAS/ETS® and SAS Forecast Server®. However, prior exposure to SAS is not necessary for understanding the workshop material.

Presenter: Rajesh Selukar, PhD. Rajesh is a Principal Research Statistician Developer at SAS. He has authored two procedures, PROC UCM and PROC SSM, which are used for time series modeling that is based on state space models.